EUROPEAN WILDLIFE FORENSIC NETWORK

NATUREFIRST

WILDLIFE FORENSIC TOOLKIT COMPETITION 2ND EDITION

THE HANDBOOK

Funded by the European Union

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INTRODUCTION: WILDLIFE FORENSIC TOOLKIT COMPETITION 2ND EDITION 2025

Nature FIRST is an EU-funded project that enhances nature conservation efforts by combining ecological and environmental forensic principles with satellite and on-site observations. These tools are tested in four European regions encompassing six biogeographical zones within the Natura2000 area.
As part of Nature FIRST, the Wildlife Forensic Toolkit Collaboration has evolved into a hands-on, interdisciplinary project aimed at designing practical and locally adaptable forensic tools to address wildlife and environmental crimes. This collaborative initiative brings together students, universities, and field experts to develop innovative solutions that can make a tangible impact in combating poaching and protecting biodiversity. Students will work within their respective curricula, integrating the project into their academic programs as credits or extracurricular assignments.

What's new this year and what are the objectives?
Building on last year's foundation (read more here; watch the winner announcement here), this edition prioritises collaboration over competition, enabling students to contribute to developing functional and field-ready wildlife forensic toolkits. The winning toolkit from the previous edition will serve as the base for new modules, and students will have access to previous toolkit videos and feedback to inform their designs. The focus is on creating modular solutions that address real-world challenges and are locally implementable across different regions and species.

The final toolkits will combine the expertise of students, universities, and rangers into actionable products that can be tested, implemented, and refined. Students will have the opportunity to pitch their solutions collaboratively at the Nature FIRST Conference in June 2025, where all contributions are integrated into one unified presentation.

Toolkit Highlights
Toolkit Base and Modular Design: Students will collaboratively design a base toolkit (e.g., a fanny pack) with add-on modules tailored to specific country or ranger needs. Universities will align their contributions based on their specialisations. Modules can include tools for field evidence collection, health and safety components, or digital solutions for tracking wildlife crime.
Ranger Input and Collaboration: Each group will work with a dedicated ranger to ensure tools are practical, implementable, and relevant to fieldwork. Rangers' insights will guide toolkit design and provide real-world feedback.
Field Testing and Innovation: Final toolkits will be designed for testing, with an emphasis on simplicity, affordability, and adaptability to ensure usability across different field conditions.

Presentation at the Nature FIRST Conference: The toolkit designs will be presented at the Nature FIRST Conference in June 2025.

Timeline

Each university will determine their own deadlines according to their academic schedules. The key milestones are as follows:

Application Period: December 2024 - January 2025
Kick-off Meeting: Mid-February, 2025 TBA
Initial Project Plan Submission: Early March 2025
Development Phase: February - May 2025
Conference Presentation: June 2025

Support

Participating students will receive: Reimbursement for travel expenses to attend the conference, conference admission tickets and a hosted dinner during the event. In addition, students will gain early access to the European Wildlife Forensic Network, a collaborative initiative developed by the Nature FIRST project.

WILDLIFE FORENSICS ANTI-POACHING TOOLKIT FOR BROWN BEARS

BY FAMKE STRIKWERDA AND YANNICK NAGELHOLT

Ranger: Nikola Doykin

We interviewed Dr. Nikola Doykin. He is a Bulgarian wildlife expert working at the Directorate of the Vitosha Nature Park near Sofia. In addition, he is a PhD candidate at Sofia University "St. Kliment Ohridski" and an active researcher at the Bulgarian Academy of Sciences. His expertise lies in biodiversity monitoring, carnivore behavior, and promoting human-wildlife coexistence.

Work and Research:

Dr. Doykin plays a central role in the management and protection of the brown bear population in the Vitosha Mountains. He is closely involved with the Vitosha Bear Museum, a small-scale museum located in a former mountain lodge. The museum focuses on ecological education for children, teaching visitors about bears and their habitat. It also offers practical tips on how to act during a bear encounter and emphasizes the importance of protecting their environment.

The toolkit addresses these core challenges

Crime type: Illegal poaching of brown bears in Bulgaria

Species: Ursus arctos (brown bear)

Conservation area: Rila Mountains, Pirin Mountains, Stara Planina

Key forensic issues:

- Difficulty locating the original crime scene
- Lack of field-ready tools for DNA, trace, and environmental sample collection
- Insufficient documentation and chain-of-custody procedures

Example of a wildlife crime where our toolkit would be useful:

In Bulgaria, brown bears are often illegally killed and their bodies moved by poachers to hide the original crime scene. Our toolkit can help rangers document the secondary scene, search for traces that lead to the primary crime location, and collect forensic evidence such as DNA, footprints, or environmental traces that support legal prosecution.

How does our module work and why is it built this way?

Our toolkit is designed for ease of use, field durability, and legal reliability. It includes:

- Crime Scene Documentation Tools:
  - Evidence flags, labels, and documentation checklists
  - Forensic scale and reference cards

- Sample Collection Equipment:
  - Sterile swabs for DNA and poison residue
  - Paper and plastic evidence bags (to prevent mold or degradation)
  - Test tubes, scalpels and tweezers

- Contamination Prevention:
  - Gloves, masks, shoe covers

It was built through design-based research (DBR) combined with participatory action research (PAR), using insights from real rangers to ensure practicality. Testing was conducted in simulated field conditions using the trial-and-error method

Special features of this toolkit compared to traditional methods

Low-cost: Most materials are affordable and replaceable
Field-tested: Toolkit is compact, light, and water-resistant
Co-designed: Developed with input from rangers like Nikola, Galan and Stani

What would we like (conference) visitors to remember after seeing our toolkit?

Wildlife crime is not just a conservation issue, it's a criminal act. With the right tools, rangers can act as forensic investigators, turning the tide in the fight against poaching and helping protect endangered species like the brown bear.

SAXION UNIVERSITY OF APPLIED SCIENCES

PRESERVING FINGERPRINT EVIDENCE: BEST PRACTICES IN VARYING WEATHER CONDITIONS

Hogeschool van Amsterdam

BY MAYA YARAN AND IMARA DIJK

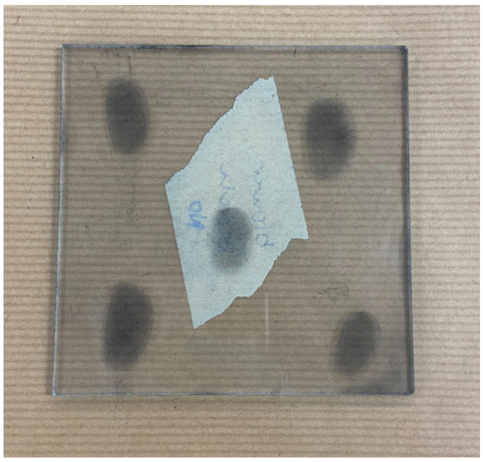
Interview with an expert in wildlife crime investigation

As part of the Wildlife Forensic Toolkit Collaboration project, I had the opportunity to speak with Ondrej Koporec. Mr. Koporec lives in Slovakia, and he plays a key role in environmental protection. He is the head of the investigation unit in the Department of Detection of Hazardous Materials and Environmental Crime. In this position, he manages organised investigations into environmental crime, acts as an international and interagency contact point, and oversees the professional development of the Police Force in this field.

Besides this, he is also the chairperson of EnviCrimeNet, a European law enforcement network focused on tackling environmental crime. Under his leadership, EnviCrimeNet has grown from an informal network into an international non-profit organization with stronger structure and operations. Through our conversations, Mr. Koporec shared valuable insights into his work and explained how wildlife crime scenes are typically handled in Slovakia: “During a wildlife crime scene investigation, roles are divided. Each team member plays a crucial role in making sure the investigation is done properly, and all evidence is handled correctly. This helps reconstruct what happened and identify a suspect for prosecution.” When a dead animal is found in the forest by hunting guards, they call the police officer in charge. The officer sends a patrol to confirm if the case is relevant or not. If it is, the main investigator, who has the highest authority at the crime scene, is informed and coordinates the investigation. He brings in forensic experts to search, document and collect evidence, and if needed, asks a specialized veterinarian to perform an autopsy on the animal.”

Fingerprint evidence in wildlife crimes

In Slovakia, the most common wildlife crimes involve the illegal hunting of bears, wolves, and lynx. For Slovak authorities, it is crucial to identify and prosecute hunters who have illegally killed wildlife.



During such crimes, hunters may leave fingerprints on objects they handle, such as weapons, ammunition, or traps. Fingerprints can be key evidence linking a suspect to a wildlife crime scene. However, collecting and storing this type of evidence in outdoor environments is challenging. The changing and sometimes extreme weather conditions in the natural habitats of bears, wolves, and lynx can cause fingerprints to degrade quickly. In order to preserve the quality of these traces, it is essential to use proper methods for collecting and storing them. This increases the chance of successfully identifying suspects and can support legal prosecution for illegal hunting. In short, the goal of my research is to identify the most effective methods for collecting and storing fingerprint evidence on field objects under different weather conditions in the Slovak habitats of bears, wolves, and lynx.

Methodology: Simulating wildlife crime conditions in the laboratory

Note: From the interview with O. Koporec, it became clear that wildlife crimes in Slovakia are professionally investigated by forensic specialists. These cases are treated similarly to regular human crime scenes and rely on the use of a standard forensic toolkit. For this reason, my research does not focus on developing a new toolkit, but rather on addressing the practical challenges that forensic teams may face in the field.

This research was conducted in a laboratory setting. Fingerprints were systematically applied to three different surface types: steel, plexiglass, and lacquered birch wood, each cut into 10 x 10 cm plates. To ensure the study remained practical and applicable to real field situations, the materials were selected based on objects commonly found at wildlife crime scenes, such as weapons, ammunition, or traps. Steel is widely used in components like firearm barrels, trap mechanisms, or shell casings. The bodies of camera traps, often used by poachers to monitor animal movement, are typically made from strong, weather-resistant plastics such as ABS (Acrylonitrile Butadiene Styrene) or PC (Polycarbonate). Since these plastics are difficult to cut into squares without damage, plexiglass was chosen instead. It is also a thermoplastic and has similar surface properties. As for wood, the stock (rear part) of traditional firearms is often made from hardwoods like beech or walnut. Because these woods are expensive and harder to obtain, birchwood was used instead. The wood was coated with lacquer to prevent the fingerprints from soaking into the surface during testing.

Before exposing the samples to weather conditions, a baseline measurement was taken. Fingerprints were developed using different techniques to assess their visibility under normal, controlled circumstances. These methods were selected based on the equipment that are already available to Slovak forensic teams, who in wildlife cases typically use basic field techniques such as powdering and lifting.

After reviewing which powders were available in the laboratory and most likely to perform well on the selected surfaces, the following were chosen:

- Special Black/Silver powder (applied using a squirrel hairbrush)
- Magnetic Silver powder (applied using a magnetic wand)
- Blower Black powder (applied with a zephyr brush)

The lifting material used was transparent gelatine lifters with white backing sheets, which provide strong contrast for both black and silver powders. This is essential for ensuring the colour of the fingerprint is darker than the colour of the lifting background.

Once the baseline measurements were completed, the fingerprints were exposed to simulated weather conditions:
- High temperature of 25°C (room temperature in the laboratory)
- Low temperature of –20°C (in a freezer)
- Rain (using a water spray bottle)
- Snow (using crushed ice)

The heat and cold samples were evaluated after 24, 48, and 72 hours to assess both short- and long term exposure. Rain and snow simulations were shorter, with a fixed exposure time of approximately two minutes before development.

These specific conditions were selected because they reflect the wide range of weather Slovakia experiences throughout the year. Although the country has a designated hunting season (November– January), the illegal hunting of bears, wolves, and lynx happens all year round. As such, this study focuses on extreme weather, like intense cold, heat, and moisture, factors that significantly increase the risk of fingerprint degradation. Milder temperatures (0–15°C), common in European climates and generally less harmful to fingerprint quality, were excluded from testing.

After exposure, the fingerprints were developed using the selected powders and lifted with gelatine sheets. Each print still needs to be evaluated for visibility, ridge detail, and unique characteristics, both with the naked eye and under a forensic light source. Based on these analyses, the most effective method for collecting fingerprints will be identified. The corresponding storage method will also be tested for its suitability. Both the ease of use and cost of the collection and storage methods will be taken into account in the final evaluation.

Final Thoughts

At the time of writing this document, the final results of my research are not yet available, so no firm conclusions can be drawn just yet. However, by the time you read this, the project will likely have progressed significantly. With this research, I hope to contribute to a better understanding of how to collect and preserve fingerprint evidence in challenging outdoor conditions. This knowledge could ultimately support more effective responses to wildlife crime in Slovakia.

WILDLIFE FORENSIC TOOLKIT FOR DEERS IN LUXEMBOURG

BY LINN POTGIETER AND ALWIN VAN DER HAAK

SAXION UNIVERSITY OF APPLIED SCIENCES

Our ranger:
Our ranger is Carole Back. Carole Back is head of Department of the environmental Police Unit of the Nature & Forest Administration (ANF) in Luxembourg (Chef de l'Entité Mobile).
Her unit is responsible for various tasks related to law enforcement in nature conservation, forestry, hunting and fishing throughout the territory of the Grand Duchy of Luxembourg
In addition to leading the team, her tasks mainly consist of investigations, controls and reports concerning violations of legislation for which special laws have granted them the required judicial police powers (nature protection, hunting, forestry,...)

Our toolkit:
Our toolkit is designed to support rangers in determining the cause of death and estimating the time of death of roe deer, fallow deer, and red deer in Luxembourg. When a report is received of a dead animal found in the field, rangers can take the toolkit with them on-site. The bag contains all essential tools needed to make an initial assessment directly in the field. While the toolkit is specifically developed for deer species, it can also be used for other animals when relevant.

In developing the toolkit, we focused on creating clear and easy-to-use protocols that rangers can apply in the field without the need for laboratory equipment. These protocols help identify external signs that may indicate the time of death (such as body posture, skin discoloration, or insect activity), and they provide guidance in assessing possible causes of death, such as road collisions, disease, or poaching.

In addition to the protocols, the bag includes practical tools such as gloves, sampling materials, evidence bags, and digital devices. Carabiners are attached to the outside of the bag, allowing a camera bag to be clipped on. This setup allows the camera bag to be used flexibly in other situations as well.

We chose to design the bag to be user-friendly, resistant to outdoor conditions, and compact enough to carry easily. We also chose to make the bag bright orange, so it stands out clearly when used in nature and is easily visible when a ranger is on their way to a scene. The tools and protocols are well coordinated and can also be used independently.

What makes this toolkit valuable is that a single ranger, equipped with this bag, can take important first steps in a potential forensic investigation right on the spot. This helps to preserve information that might otherwise be lost and allows for a faster determination of whether a death was natural or, for example, caused by poaching.

What we want visitors to our booth to remember is that even with simple tools, you can accomplish a lot. By observing carefully and following the right steps, a ranger can gather crucial information that contributes to the protection of wildlife and the investigation of illegal activities.

RAPID TEST MANUAL FOR WILDLIFE CSI TOOLKIT

BY STIJN AND ASHLEY

Introduction

Wildlife poaching is a significant issue in South Africa, threatening endangered species and disrupting ecosystems. The illegal hunting of animals such as rhinos, elephants, lions, and leopards is primarily driven by the demand for ivory, horns, bones, and skins in the international black market. Despite strict anti-poaching laws and conservation efforts, criminal networks continue to illegally poach wildlife, often using advanced methods to evade Detection.

One of the key challenges in forensic wildlife investigations is determining how long an animal has been dead, which is also known as the Post Mortem Interval (PMI). Estimating the time of death helps rangers distinguish between fresh kills and older ones, which can indicate whether the poaching event was recent and if the perpetrators are still in the area. Use transmission towers to locate cell phones, vehicles etc around the time of death and use the PMI in Court for evidence.

The test is based on the detection of hypoxanthine, a biochemical marker that accumulates in the blood after death due to ATP breakdown. The concentration of hypoxanthine increases over time, making it an indicator for estimating the Post Mortem Interval (PMI).

A test strip method was designed where the intensity of the color change correlates with the PMI, allowing rangers to quickly estimate the time of death

Goal

Development of a rapid test that allows rangers to estimate Post Mortem Interval (PMI) based on blood analysis. The test will be based on detecting hypoxanthine. By designing a portable test strip, rangers will be able to quickly determine how long an animal has been deceased without the need for laboratory equipment.

Hypothesis

It stated that hypoxanthine levels in blood increase predictably over time, which makes it a reliable biomarker for estimating PMI. By developing a colorimetric enzyme-based test strip, we expect to be able to detect these hypoxanthine levels through a visible color change Additionally, to make the test practical for field use, we will make use of a chitosan-based method, which eliminates the need for centrifugation. We expect that the use of a chitosan solution will successfully separate the plasma from the red blood cells in the whole blood, so that we can use a colorless samples for testing.

Theoretical Background

Hypoxanthine Rapid Test

Hypoxanthine (C5H4N4O) is a purine base and an intermediate product in purine metabolism, involved in the recycling and breakdown of nucleic acids. Hypoxanthine is released during the breakdown of adenosine. The enzyme hypoxanthine-guanine phosphoribosyltransferase (HGPRT), hypoxanthine can be converted to inosine monophosphate, an energy storage molecule. If hypoxanthine is not reused, it is converted by xanthine oxidase into xanthine and uric acid, which are excreted via the kidneys. During this process, hydrogen peroxide is released. This process is crucial for regulating purine levels in the body and can be used as a biomarker for cell damage. Hypoxanthine is suitable for determining PMI. Normally, hypoxanthine is converted into uric acid, but after death, the blood circulation stops, and the enzyme xanthine oxidase becomes less effective, causing hypoxanthine to accumulate in the blood. A hypoxanthine rapid test can be made using filter paper/membrane as a base with xanthine oxidase to convert hypoxanthine into uric acid. TMB is used to react with the produced H2O2, resulting in a colour change.

Xanthine oxidase (XO) is an enzyme that plays an important role in purine metabolism. It helps break down purines, which are nitrogen-containing compounds found in DNA and RNA.

Xanthine oxidase is the key enzyme in the hypoxanthine rapid test because it is directly responsible for converting hypoxanthine into uric acid while producing hydrogen peroxide (H_2O_2) as a byproduct. If you were to test without active XO, hypoxanthine would remain unchanged in the sample, preventing the reaction that leads to hydrogen peroxide formation. This means that no reaction with TMB would occur, which means no color change would occur. XO is therefore an important part to make sure the test works.

Method

Method lab preparation

First a coating buffer consisting of Na_2CO_3, $NaHCO_3$ and Demiwater was prepared. The Ph was set to 9,6 with HCL or NaOH using a PH-meter. Xanthine Oxidase(XO) was dissolved in DSMO and added to the solution with a final concentration of 0,1U/ml and HRP was dissolved with PBS(pH 7,4) and added with a final concentration of 0,1 mg/ml. An 1% PVA solution was used for the stabilizing and improves adhesion to the strip. 10% BSA was used to stop non-specific binding. Another coating solution was made without XO. a droplet of coating solutions was added to acryl strip with 3 absorbance filters and was air dried for 1 hour.

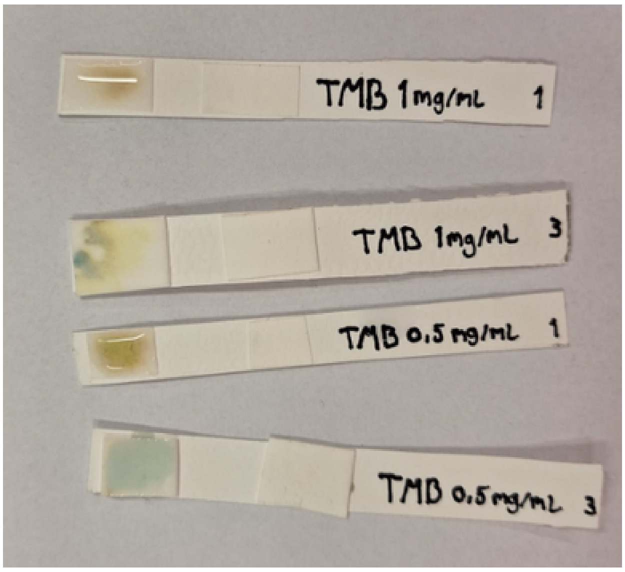
For TMB solution, TMB was added to a small volume of DSMO for an organic solution. 0.1 M Acetate buffer(pH5,5) was added to form a 1mg/ml TMB solution and stored in aluminum foil to prevent the solution from sunlight. For the separation of plasma from blood, a 1% chitosan solution was made with chitosan and demiwater

Method field

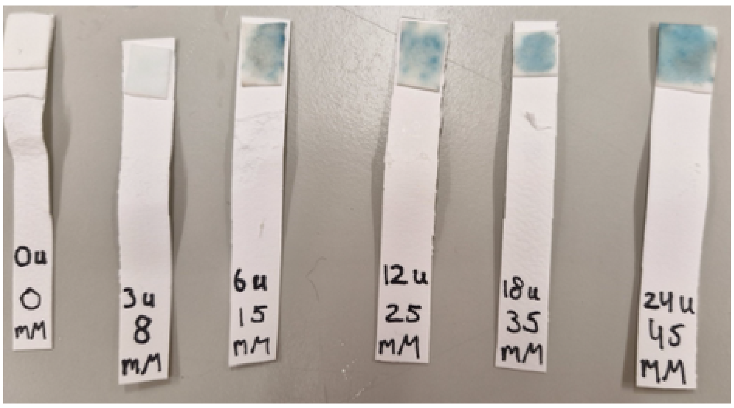
First, the blood needs to be extracted or gathered from the animal on the crime scene. Then the whole blood needs to be separated from the blood plasma. This is done by using the 1% Chitosan solution. Take around 1mL of Chitosan solution and 1mL of the blood (If there's not enough blood for 1mL, use whatever you have, and make sure the blood to chitosan solution ratio is 1:1). Wait around 5-10 minutes for the plasma to separate from the whole blood, take the plasma layer out using a pipette, and transfer it to a new tube.
Grab a test strip and transfer a drop of the plasma onto the strip. Wait until the plasma is fully absorbed. Grab the TMB solution and transfer a drop of it onto the test strip and wait around 30 seconds to see the result. Look and compare at the color matrix to determine the PMI.

Examples of results

To test the absorbance of the strip, 1 or 3 filter papers were used to determine the best strip with the ability to hold the coating. At the same time the best concentration for TMB was researched. Looking at the result, the strip with 3 filter papers thick and a TMB concentration of 0,5mg/ml works best and gives the expected results. The other strips give a more brown color instead of the expected blue color. This is probably because of the high TMB concentration in comparison to the concentration of enzymes on the strip



We also tested a standard series of H2O2 to see the difference in colour between H2O2 concentrations. These concentrations are linked to a time of death. When you look at the result you can see no colour change at 0 mM (0 hours after death), a light blue colour change at 8 mM (3 hours after death), and a darker blue colour change at 15 mM (6 hours after death). The rest of the standard series, so 25 mM, 35 mM and 45 mM, display the same colour as the 15 mM one. This is probably because the reaction that causes the colour change, is saturated, which means there is no more products left to form the colour change, which in turn means you'll see the same colour starting from 15 mM. So we can tell the difference between H2O2 concentrations, and thus in time of death, starting from 0 mM (0 hours) to 15 mM (6 hours).



TRACKING THE KILL: FORENSIC BLOOD ANALYSIS IN BULGARIAN BEAR POACHING

Hogeschool van Amsterdam

BY LAUREEN RUESINK AND CHHAYA KALLOE

Ranger: Vladimir Todorov

Vladimir has been working with bears, their study, and conservation for 15 years, and for the past 10 years he has been a member of the Bulgarian Academy of Sciences. He is particularly interested in methods to combat poaching and frequently assists the police in related investigations. He began as a volunteer in 2006 with an NGO focused on bear tagging. This marked the beginning of his involvement with the team working on bear conservation in Bulgaria. Although it started as a volunteer position, it has since become an integral part of his professional work, much like many of the activities he continues to undertake on a voluntary basis. He has been working at Nature FIRST for nearly four years. Vladimir has a strong aversion to poaching, which he sees as an aspect of hunting, an activity he generally disapproves of.

The problem

The decline of biodiversity is one of the most urgent challenges facing humanity. Developing tools to combat wildlife crime is therefore of critical importance. A forensic toolkit already exists that allows rangers to conduct investigations at crime scenes. However, this toolkit must be optimized for cases involving the brown bear in Bulgaria.

Securing blood traces at crime scenes in regions inhabited by brown bears is essential for the effective investigation and prevention of crimes against this species. In Bulgaria, the preservation of blood evidence is complicated by various environmental factors. Currently, there is not enough knowledge regarding the most effective methods for securing blood traces at wildlife crime scenes in the country.

This lack of insight increases the risk that crucial evidence may not be properly collected and preserved, which in turn hampers both investigations and efforts to combat wildlife crime.

Research

The aim of this research was to determine which method is most suitable for securing blood traces under various conditions at crime scenes in Bulgaria related to the brown bear.
This research examined which blood trace collection methods were most effective on different types of surfaces. The surfaces tested included grassy terrain, rocky ground, and substrates covered with (dead) leaves.

To determine which method was most effective for collecting blood traces from various surface types, two swabbing techniques were compared:

1. Dry swabbing
2. Moist swabbing

Each method was applied to every surface type under investigation.

For each surface/method combination, three drops of blood (each 50 μL) were applied. After sampling, the swab was placed into a microcentrifuge tube and diluted with demineralised water.
The effectiveness of each method was evaluated based on absorption levels, which were analysed using spectrophotometry, a technique used to measure the light absorption of specific substances. Blood contains components such as hemoglobin, which absorbs light at approximately 415 nm and 540 nm.

To measure absorption:
• Blood was first extracted from the swab by soaking it in demineralised water for 10 min.
• The resulting liquid sample was transferred to a cuvette and placed in the spectrophotometer.
• Absorbance was then measured at **415 nm** and again at **540 nm**.




To keep costs low, simple plastic swabs without storage tubes were used. In this study, each swab was immediately cut and placed directly into a microcentrifuge tube, which served as a more cost-effective alternative.

FIELD FORENSICS ADD-ON: AVIAN/BIRD & MAMMAL EVIDENCE COLLECTION KIT

BY FRANCESCA SNELLEKSZ AND CAMERON MARPLES

This toolkit module has been developed as an extension to the standard field forensic toolkit, specifically to support rangers dealing with complex and species-specific wildlife crimes involving birds and mammals. It equips enforcement officers and conservation practitioners with innovative, field-ready tools to detect, document, and collect critical evidence in remote and challenging environments.

Ranger Insight: Alexandru – Bridging Ecology and Conservation in Romania

To guide the development of this module, Alexandru is a conservation biologist and field specialist based in Romania. His work focuses on both birds and mammals, particularly at the intersection of behavioural ecology and conservation biology. Alexandru is deeply interested in how environmental change and human activities affect wildlife behaviour and habitat use. His fieldwork spans rural and mountainous regions, where the threat of poaching, illegal trapping, and habitat degradation is increasingly evident.

The Problem This Module Tackles

Wildlife crimes involving raptors, songbirds, and large mammals are often under-investigated due to a lack of specialised tools that rangers can use on-site. Illegal snaring, poisoning, pole traps, egg theft, and horn removal are rampant in many conservation areas, yet evidence collection in these cases is often ad hoc or inadequate. Our add-on module addresses these gaps by providing tools that support:

- The collection and preservation of delicate evidence like feathers and broken eggshells,
- The documentation of toolmarks on horns and traps,
- The recovery of ballistic evidence and poisoned bait,
- The detection and interpretation of footwear and tyre impressions, which can aid in tracking offenders.

Real-Life Application: Raptor Poaching Case in Eastern Europe

In many parts of Eastern Europe, birds of prey such as eagles and falcons are targeted using pole traps, especially during the breeding season. These traps often leave feathers, blood traces, and sometimes cracked eggs near nest sites. Using this module, a ranger could:

- Safely dismantle and package the trap using purpose-designed evidence tubes,
- Collect feathers using feather-specific tubes for DNA analysis,
- Package eggshell fragments in a way that prevents contamination or further breakage,
- And photograph and cast any footwear impressions left by the poacher near the trap.

How the Module Works – Built for Rangers, by Ranger Insights

This toolkit was designed to be modular, intuitive, and durable, with practical input from field practitioners. It includes:

- A feather collection tube system to preserve fragile feather evidence,
- Eggshell packaging trays lined with foam for safe transport of broken or partial eggs,
- A small handheld drill with clean bits for extracting toolmarks from horns or tusks,
- Trap evidence tubes large enough for pole traps and wire snares,
- Ballistics bags for recovering spent ammunition,
- And casting kits for toolmarks and tyre/footprint impressions.

Each item is clearly labelled, fits into a compact carry case, and is designed for single operator use in field conditions. The layout prioritises speed, contamination control, and chain-of-custody awareness.

What Makes This Module Special?

This toolkit is not just an extension; it is a practical innovation co-developed with field experts like Alexandru. It emphasises:

- Low-cost, rugged materials adapted to local field conditions,
- No reliance on lab power or refrigeration,
- Easy deployment and use by solo rangers,
- Compatibility with existing forensic workflows, including chain-of-custody protocols.

Its strength lies in being locally adaptable and immediately usable, bridging the gap between forensic science and boots-on-the-ground conservation work.

One Thing Visitors Should Remember

Every feather, footprint, or toolmark could be the clue that protects an entire species. With the right tools, rangers can turn hidden signs into powerful forensic evidence—bringing wildlife criminals to justice and safeguarding our natural heritage.

MAMMAL WILDLIFE CRIME KIT COMPONENTS

Item (+ purchase link)	Purpose
Ballistics evidence sleeves (tamper-proof)	To safely store spent bullets or casings found near poached mammals for ballistic analysis.
Portable metal detector (compact, foldable)	Used to detect embedded projectiles in carcasses or hidden ballistic evidence in soil.
Tooth extraction forceps with DNA-safe coating	For collecting teeth without damaging DNA evidence, useful in species ID or age estimation.
Horn/antler impression wax	To capture unique tool marks left behind when horns/antlers are forcibly removed.
Flexible silicone casting compound kit	For collecting tool marks or impressions (e.g., bolt cutters used on cages or fences).
Tyre impression mat with grid (rollable)	Allows field rangers to preserve track marks from suspect vehicles near the scene.
Footwear impression gel lifters	For lifting fine shoeprints left in dry or dusty soil without contamination.
Entomology evidence vial set (with breathable caps)	Collects maggots and insects from carcasses to estimate time of death.
Poison bait collection tongs and tamper-proof vial set	Safely picks up suspected poison baits left in the wild for forensic toxicology testing.
Mini UV flashlight	Detects residues of blood, urine, or poison bait traces not visible to the naked eye.

BIRD WILDLIFE CRIME KIT COMPONENTS

Item (+ purchase link)	Purpose
Feather collection tubes (anti-static, rigid)	Prevents feather damage and preserves trace DNA for species or individual identification.
Egg shell packaging kit (foam-lined boxes with compartments)	Designed to protect and isolate cracked or intact eggs for smuggling or disturbance evidence.
Broken egg fragment bags (soft mesh with hard frame)	Preserves broken eggshells without further fracturing them during transport.
Snare & trap evidence tubes (wide rigid tubes)	Used to safely store snares or pole traps used illegally against birds of prey.
Pole trap casting mould putty	For recording unique tool marks or mouth/jaw impressions from illegal pole traps.
Avian skeleton or bone bag (breathable forensic mesh)	Stores fragile bird remains to avoid loss of small bones like keel or beak pieces.
Miniature nest mapping sketchbook (weatherproof)	For rangers to record nest site layout and proximity to disturbances or traps.
Raptor talon swabbing brush	For swabbing talons for trace blood or residue if the bird is suspected of contact in an altercation.
Bird band cutter (for rescue/confiscation)	Removes illegal or tight ID bands used in trafficking without damaging leg tissue.
Glide test angle ruler (foldable)	Used to analyse wing structure in injured birds to assess if they were impacted by projectiles.

FORENSIC TOOLKIT AGAINST ABALONE POACHING

University of Staffordshire

BY CHLOE LOMAS AND VICTORIA KHOTSANA

Underwater species, specifically abalones are illegally poached on average of 2 thousand tonnes annually which is considered 20 times the legal intake (Okes, 2018). We, at the University of Staffordshire, designed this kit to assist rangers in the wild when tackling such crimes.

The module is designed to be easily attached to the rangers thighs to store and carry equipment that can be easily accessible during a dive. This will consist of water testing kit to test for oxygen and ion levels of the water which is crucial to safely targeting the right areas of poaching in order to sustain and protect the environment of surrounding species.

Once samples are extracted, they are placed into a mesh bag for collection. These will be transferred into evidence bags and boxes for wet samples. During the process, a diving slate will be used by the rangers to communicate and share information about air supply, depth, time or observations and for dive planning and navigation.