Wildlife DNA Forensics Course

Lecture E2

Forensic options for investigators

No: E2	Lecturer: R. Ogden	Date: 04/08/10		
Introduction				
Investigators are trained to ask questions that help understand the events of a crime. Wildlife forensic can help to answer these questions. Although they do not need to understand the science, It is important for investigators to understand what questions scientists can answer and how this determines how forensic analysis can be used. This lecture introduces the basic techniques of wildlife DNA forensics, examines how questions can be answered and highlights the need to include forensic analysis when planning any wildlife crime investigation.				
Lecture A	ms			
 To understand how investigative questions relate to scientific questions To learn what forensic techniques are available, what might be in the future and what won't be. To think about how forensic analysis needs to be planned To recognize the need to discuss cases with forensic scientists as early as possible 				
Lecture Se	ummary			
 Investigative questions need to be matched with scientific questions in order to maximize the power of forensics. Exclusion tests are easier to perform than identification tests Planning a wildlife crime investigation should include discussion with a forensic scientist to understand what tests are / are not available Where forensic tests are not formally available, scientists may still be able to provide intelligence, but this should not be used as evidence in court 				
Further Reading				
None				



Introduction

Suspect's clothing

ab sample 2

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How can wildlife forensics help investigators?

Identifying products or evidence:





Aims

- To understand how investigative questions relate to scientific questions
- To learn what forensic techniques are available, what might be in the future and what won't be.
- To think about how forensic analysis needs to be planned
- To recognize the need to discuss cases with forensic scientists as early as possible

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Points to Prove

Whole animal /plant

- Is it illegal?
 - What is it?
 - Where did it come from?
 - Was it wild caught?
 - When was it killed / chopped down?

Trace evidence

- Does it provide a link in the investigation?
 - Where is it from?
 - Does it match a particular animal / plant?

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Scientific Questions			
The identification questions			
1. What is it?	Species ID		
2. Where did it come from?	Geographic Origin ID		
3. Was it wild caught?	Parentage ID		
4. When was it killed / chopped down?	Aging		
5. Which individual is it from?	Individual ID		
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Exclusion vs Identification					
Characteristic Hair colour Eye colour Sex Height Date of birth Name	Description Black Brown Male 1.80m 20/02/78 Paul Jones	Suspect 1 Black Brown Male 1.80m 20/02/78 Paul Jones	Suspect 2 Black Blue Female 1.50m 31/01/85 Sarah Green		
NO. LEGS	Excl	usion is easy!	2 Omaxwa		



Exclusion vs Identification					
Characteristi Hair colour Eye colour Sex Height Date of birth What is the cha = How many of 1 in 5,000 ? He	c Description Black Brown Male 1.80m 20/02/78 ance that the susp ther people in the ow do you know?	Suspect 1 Black Brown Male 1.80m 20/02/78 ect is not the per region have the s You need inform	What is the chance that the suspect was not the person at the crime scene? son at the crime scene? same characteristics? nation about the population		
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What is the chance that the suspect is not the person at the crime scene? = How many other people in the region have the same characteristics? 1 in 5,000 ? How do you know? You need information about the population Identification is difficult					

Exclusion vs Identification			
The exclusion questions:			
1. Is it an elephant?	Species ID		
2. Did it come from country Malaysia?	Geographic Origin ID		
3. Are these animals the parents?	Parentage ID		
4. Was it alive after 1947?	Aging		
5. Does it match this individual?	Individual ID		
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Available Tests

Enforcement officers want to know what tests are available

It is very difficult to list what tests are available

It depends on:

The exact scientific question The type of sample The condition of the sample Sample processing (e.g. inclusion vs exclusion)
(e.g. meat / hair / faeces / blood)
(e.g. old, rotting, wet or fresh and dry)
(e.g. cooked, mixed with other species)

But in order to provide some guidance...

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Available Tests

Animals

Species ID is usually possible from meat, blood, hair, horn, ivory & fish

Plants

Genus ID is usually possible from leaves and timber e.g. ramin, *Gonystylus*

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Possible Tests Animal Species ID *may* be possible from: Traditional Medicines Processed meats Old degraded samples Geographic origin ID may be possible for tigers, pangolins, turtles, tortoises, ivory, rhino horn, at some levels of geographic separation. E.g. India vs Africa Sumatra vs Borneo

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Possible Tests

Animal

Parentage exclusion (wild vs captive) *may* be possible for many species, including: Most mammals Some birds (e.g. Parrots, cockatoos) Some reptiles (e.g. lizards)

Individual exclusion/identification (sample matching) may be possible for some mammals (e.g. tigers), but not many.

Parentage and individual identification require good quality samples

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Possible Tests

Plants

Species level ID may be possible from leaves and timber E.g. Gonystylus bancanus

Species level ID *may* be possible from Traditional Medicines or processed products E.g. Agarwood

Geographic origin ID *may* be possible for ramin and merbau, at some levels of geographic separation. E.g. Borneo vs Sumatra

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Impossible Tests

There are often exceptions, but usually we cannot perform:

- Individual identification of most birds, reptiles and fish
- Geographic origin identification where the genetic boundaries do not match political boundaries
 E.g. Northern Cambodia, southern Laos
- · Identify something as 'wild' without claimed captive parents.
- Accurate aging of samples within the last 40 years

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Forensics vs Intelligence

- Can you use information that has not been generated under forensic conditions?
- Information may be used for *intelligence* purposes, but is not relied on as evidence in court
- Acceptance depends on legal system and precise use of the information
- Approach is unpopular with some human forensic scientists
- It should not be an excuse to bypass validation exercises

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Examples

Captive bred vs wild caught cockatoos

- DNA profiling shows that cockatoos being sold cannot be from captive stock
- DNA profiling system not fully validated for forensic use
- Investigator knows there is illegal trade occurring and now has to find alternative evidence to prove it
- Additionally, help forensic scientists to get support for validation!



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Examples

Individual identification of Sumatran rhinoceros

- DNA profiling shows a match between rhino horn and a carcass
- No population data to calculate a match statistic, therefore match has no evidential strength
- Investigator knows the horn links to the carcass but must find alternative ways to join up the evidence



 Additionally, help forensic scientists to get support for producing population data!

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Using Forensic Analysis

Always take samples

- Samples may not be available later
 Crime scene may be destroyed
 - Shipments may have moved on
 - DNA may have degraded
- Samples are not expensive to collect
 Tamper proof evidence bags, information and signatures
- · The forensic scientist may not be available to ask



Using Forensic Analysis

Seek advice from forensic scientists as early as possible

- Tests available
- · Samples to take
- Strength of results
- Preferably get forensic opinion before raiding a premises
- · Keep the telephone number of the lab in your mobile phone

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Using Forensic Analysis

Seek advice from forensic scientists as early as possible

Where to find help?

- Laboratories
- Websites: www.asean-wfn.org; www.tracenetwork.org
- Colleagues on this course
- International and national

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Summary

- Wildlife forensic techniques are being developed to help you
- It is important to match the investigative questions with the scientific questions
- Exclusion is normally easier than identification
- Many tests are available, many are not. Always ask first.
- Testing may help provide intelligence rather than forensic evidence be careful in how intelligence is used
- Plan the use of forensic analysis in your casework, remember to contact scientists as early as possible

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