



Timber Forensics
Paris, October 2016



Timber Forensics

Scientific Analysis for Trade Control & Enforcement

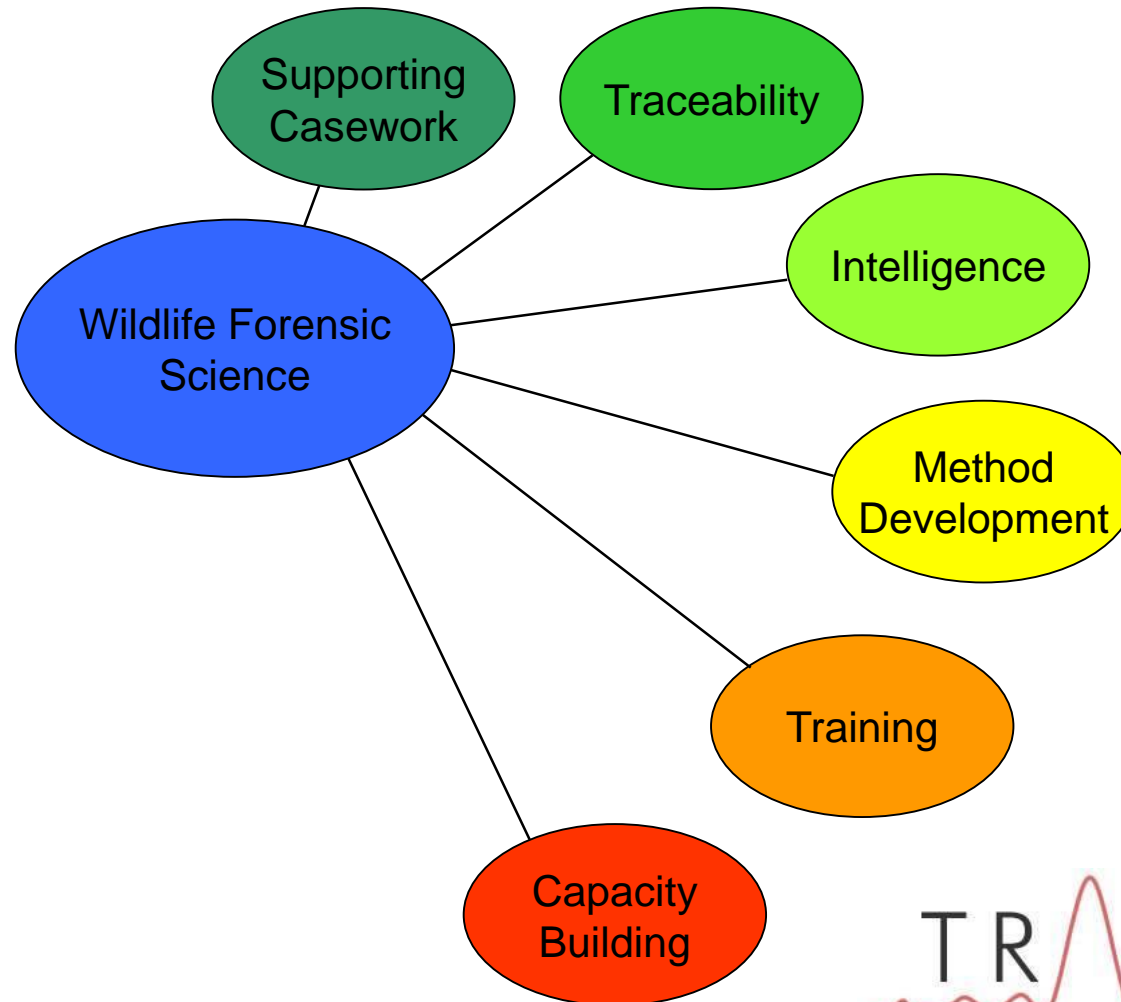
Dr. Rob Ogden

Programme Director
TRACE Wildlife Forensics Network



Introductions

- Development and application of forensic science to wildlife law enforcement

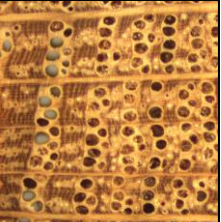


Talk Overview

- Types of wildlife forensic application
- How can forensic application increase compliance?
- Principle methods
- Example applications
- International timber forensic initiatives



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Background

Challenge Identification or verification of products in trade



Identification: What species is it? Where's is it from?
Verification: Does it match the paperwork?

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Wildlife Forensic Applications

Casework

- Prosecutions
- Forensic evidence
- Admissible in court
- Gold standard

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Wildlife Forensic Applications



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Traceability

- Trade regulation
- Detecting fraud
- Deterrent systems

Wildlife Forensic Applications



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Intelligence

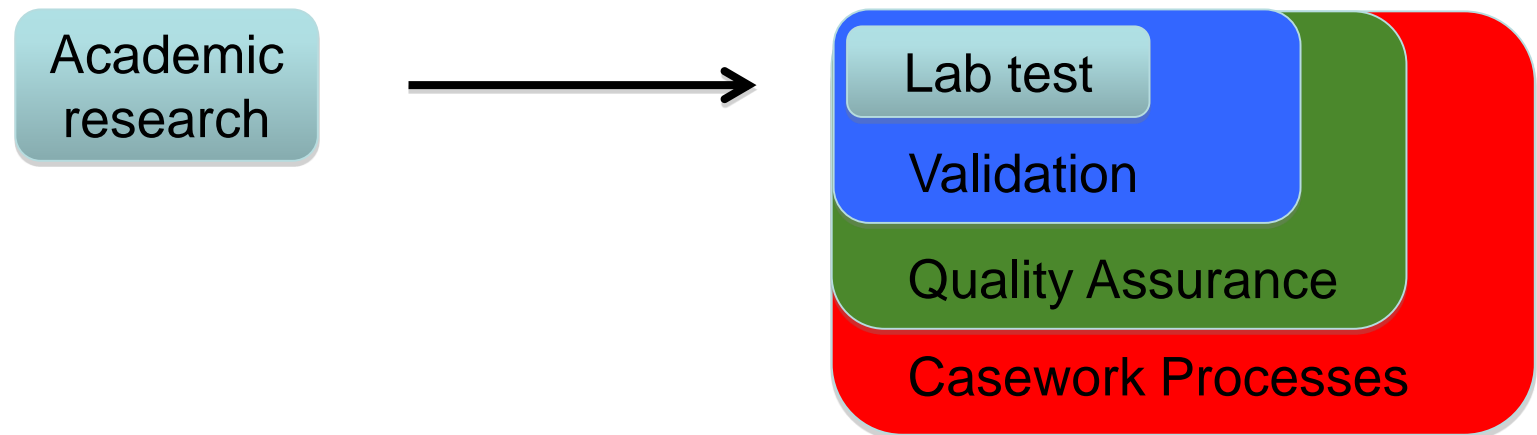
- Building pictures
- Trade route analysis
- Informing strategy

Forensic Science vs Research

What is forensics?

- The application of science to a legal question enforced by a criminal justice system
- 'Forensic' describes the end use of the result data
- 'Forensic' describes the control processes surrounding a test

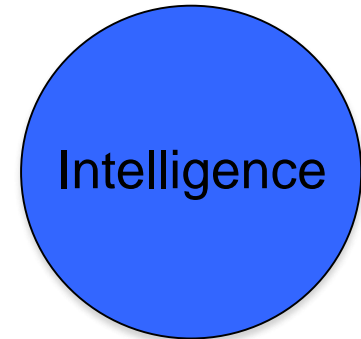
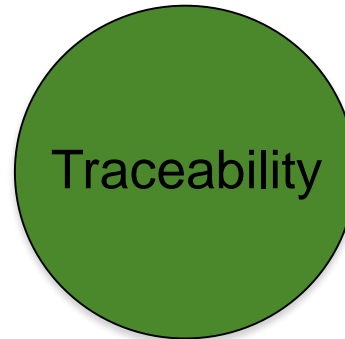
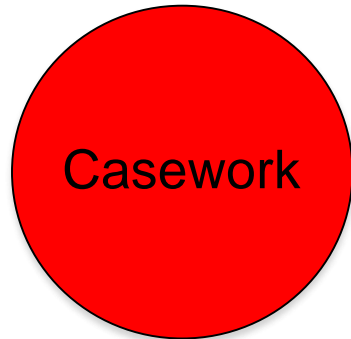
Very important for wildlife scientists, enforcers and the judiciary to understand the distinction between research and forensics.



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Wildlife Forensic Applications



Three broad applications:

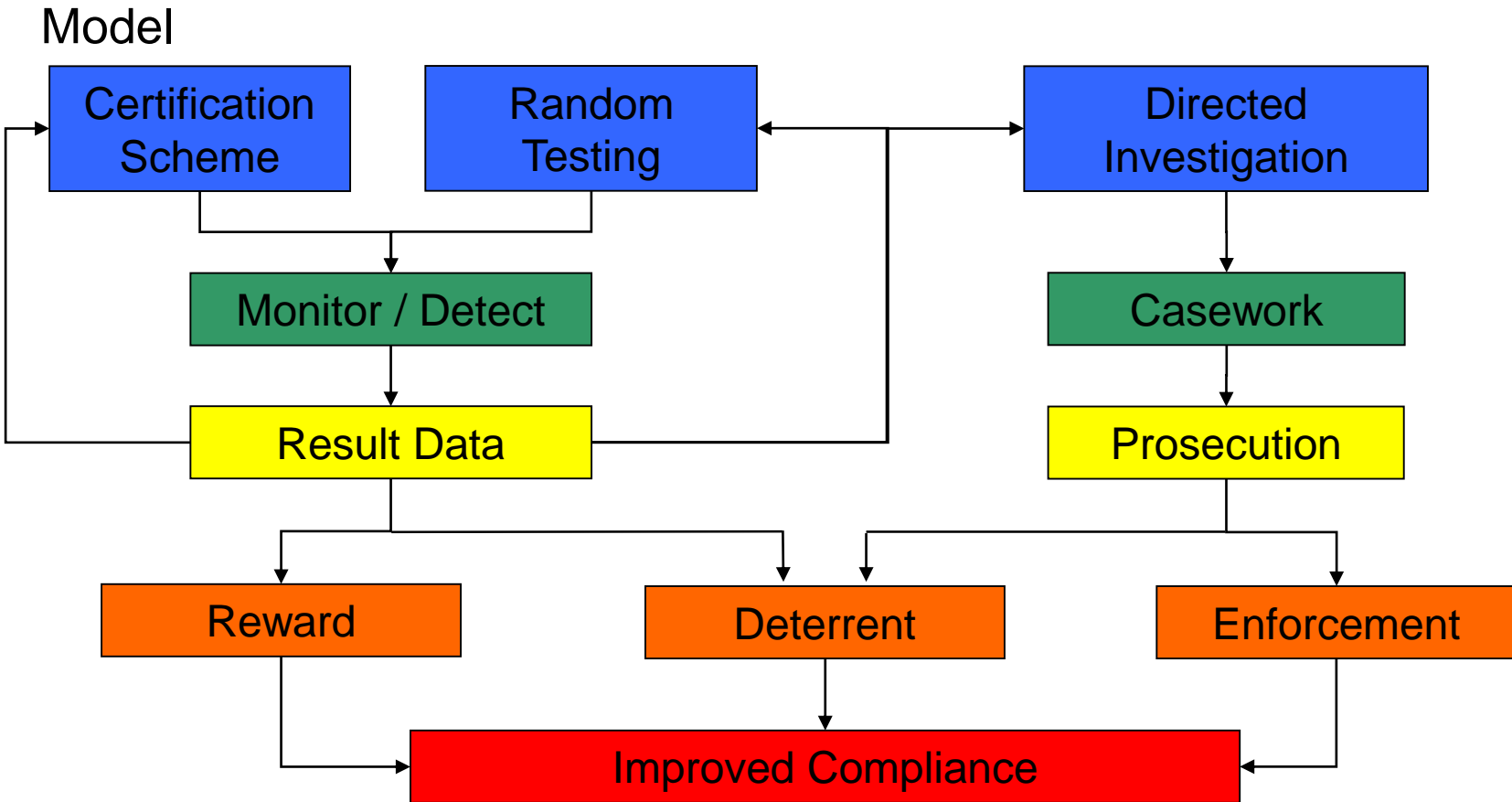
- A common analytical toolkit (DNA, Morphology, Chemistry)
- Variation in purpose
- Variation in quality requirements

Implications:

- Casework applications are restricted and tightly controlled
- Traceability applications enable self-regulation / certification
- Intelligence applications address a wider range of questions



Improving Compliance

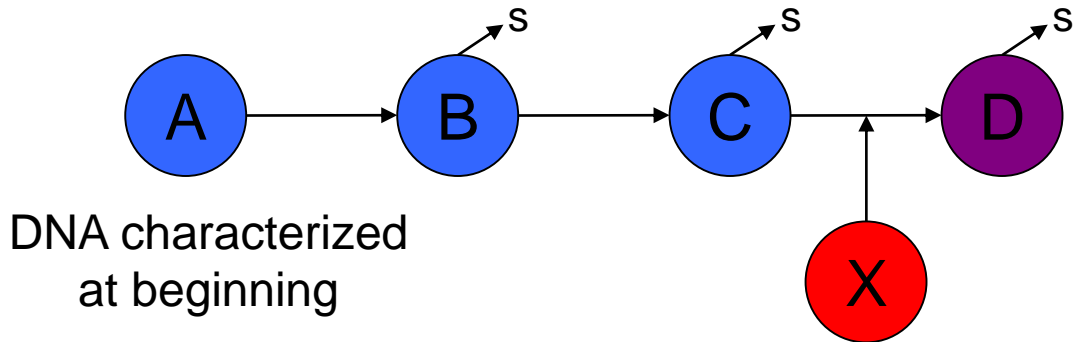


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Timber Traceability

Supply Chain Verification – stump to shop

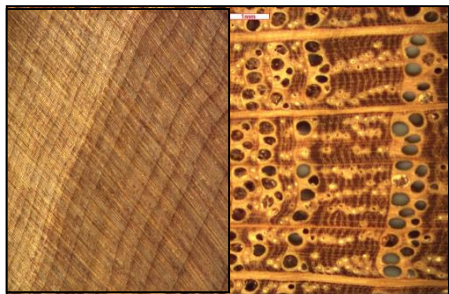


Substitution or mixing detected as a difference from previous lot

- Available for species verification
- Within species, currently available for certain genetically characterized consessions

Timber ID Methods

Identification Solutions – Taxonomic ID



Wood Anatomy



DNA analysis



DART TOF Mass Spec

Low set-up cost	High set-up cost	Very high set-up cost
Low running cost	Medium running cost	Low running cost
1-3 hours	1-2 days	< 1 hour
Very specialist	Lab trained staff	Lab trained staff
Genus level	Species level	Genus-species level
Expertise	DNA extraction	Reference data



Timber ID Methods

Identification Solutions – Geographic Origin

Options:

- | | |
|-----------------|---|
| DNA assignment | relies on biological population genetic differences among regions |
| DART-MS | relies on molecular products (proteins) varying among regions |
| Stable isotopes | relies on relating elemental isotope ratios in a product to the environmental background (isoscape) |

All methods require extensive reference data and validation
Product verification is MUCH easier than unknown origin ID

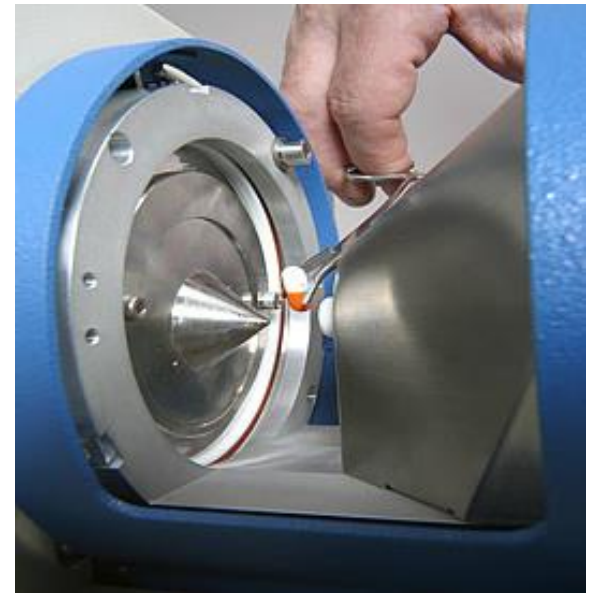


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DART ToF Mass Spectrometry

Revolutionary sampling advance:
From days to seconds



Slides and data from E. Espinoza, USFWS

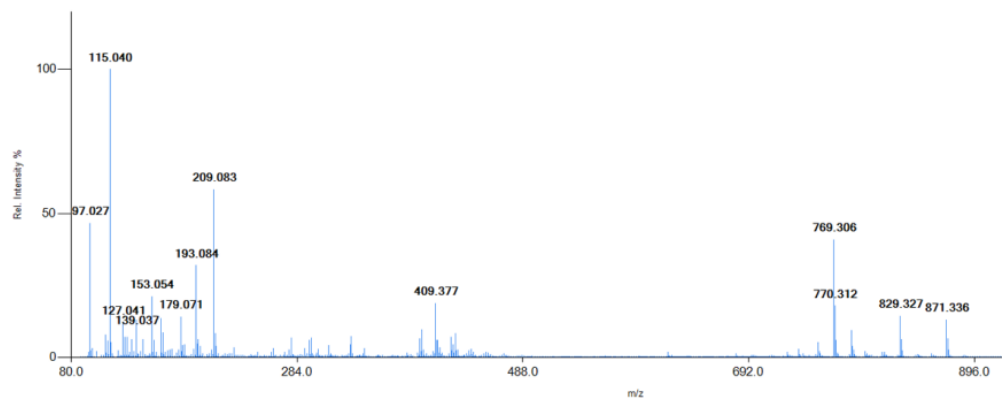
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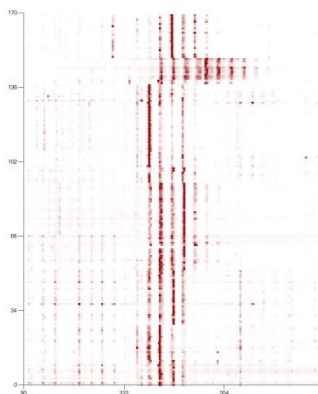
DART ToF Mass Spectrometry



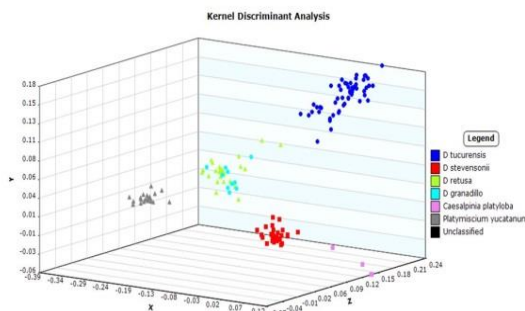
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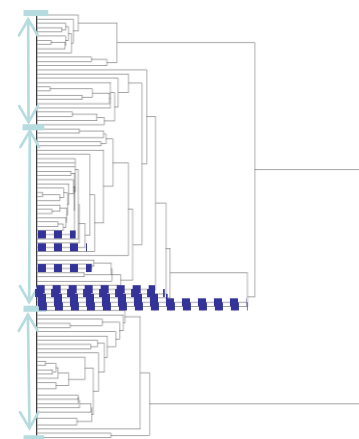
Heat Map



Multivariate Analysis



Hierarchical Cluster Analysis

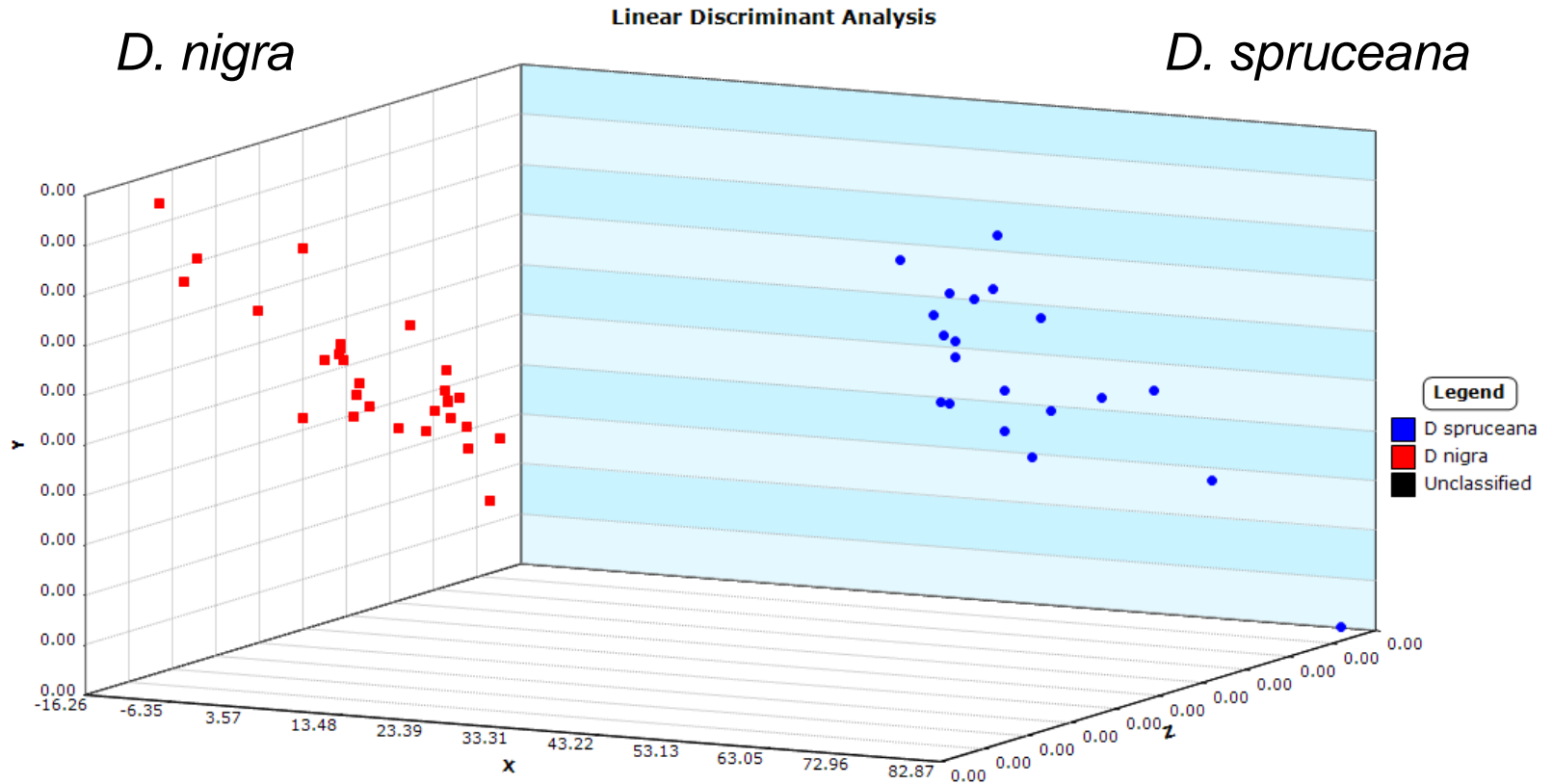


Slides and data from E. Espinoza, USFWS

DART ToF Mass Spectrometry



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- Species differentiation
- Geographic origin
- Wild vs cultivated (Aquilaria)

Example Scenarios

Czech Republic – Jan Ďoubal

1. Geographic origin – Europe or Russia?

- Requires extensive reference sampling of claimed and suspected origins
- Research on a case-by-case basis
- DNA, chemical profiling, or stable isotopes

2. Species ID - Timber product composition

- Microscopic ID challenging but possible to some level
- DNA methods limited due to breakdown of DNA and presence of mixtures
- DART-MS probably best option – requires ref standards

3. 'Recycled' status of timber products

- Need to convert into scientific / diagnostic question



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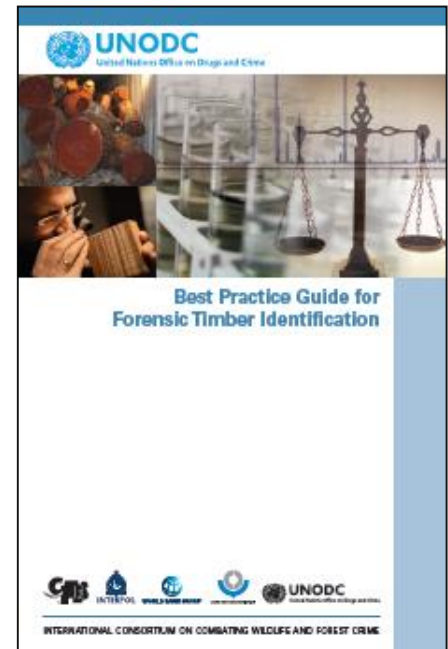


UNODC Timber Analysis Guide

Information for Investigators, Scientists & Legal Professionals



AGENCY:		CHAIN-OF-CUSTODY RECORD	CASE #
DATE AND TIME OF SEIZURE:	REGION:	EVIDENCE/PROPERTY SEIZED BY:	
SOURCE OF EVIDENCE/PROPERTY (person and/or location): <input type="checkbox"/> TAKEN FROM: <input type="checkbox"/> RECEIVED FROM: <input type="checkbox"/> FOUND AT:		CASE TITLE AND REMARKS:	



www.unodc.org/documents/Wildlife/Guide_Timber

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Analytical Standards

Setting forensic standards

SWGILD Standards and Guidelines

(Version 2.0-Accepted by SWGWILD December 19, 2012)

1.0 Scope

This document provides minimum standards and additional guidelines for wildlife forensic analysts in the subdisciplines of DNA and morphology. This document covers good laboratory practices, evidence handling, and training which are central to all forensic laboratories. They also include critical considerations of phylogeny, taxonomy, and reference collections that are specific to wildlife forensic science.



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Discussion

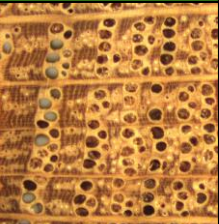
Forensic timber identification: It's time to integrate disciplines to combat illegal logging



Eleanor E. Dormontt^a, Markus Boner^b, Birgit Braun^c, Gerhard Breulmann^d, Bernd Degen^e, Edgard Espinoza^f, Shelley Gardner^g, Phil Guillery^h, John C. Hermansonⁱ, Gerald Koch^j, Soon Leong Lee^k, Milton Kanashiro^l, Anto Rimbawanto^m, Darren Thomasⁿ, Alex C. Wiedenhoft^o, Yafang Yin^p, Johannes Zahnen^q, Andrew J. Lowe^{a,*}

Laboratory Options

- Casework – options very limited, very few labs accredited
- Traceability/Monitoring
 - Commercial labs, e.g. double helix
 - National labs, e.g Thünen Institute – Germany
- General lack of laboratory services in the area
 - Lack of equipment
 - Lack of expertise
 - Lack of service provision – research focus
 - Supply / Demand issues – strong economies of scale





SOCIETY FOR WILDLIFE FORENSIC SCIENCE

International Wildlife Forensic Science Meeting

University of Edinburgh, Scotland, June 2017

One-Week Scientific Meeting, 5-9th June

4th WFS Meeting on Wildlife Forensic Science

- Invited speakers
- Training workshops
- Expert discussions
- Presentations & posters
- Networking
- Banquet & dance
- Excursions
- Stunning location

Join us for a fantastic week in Edinburgh to share the latest developments in wildlife forensics

One-Day International Symposium, 7th June

Integrating Policy, Enforcement and Forensic Science for tackling illegal trade

- Plenary speakers
- Panel discussions
- Knowledge exchange
- Full-day programme & evening reception
- Dedicated sessions:
 - Wildlife trade
 - Fisheries
 - Timber
 - National wildlife crime

- For further information visit: www.wildlifeforensicscience.org/2017-meeting
- Registration opens September 2016, student and early bird discounts available

Email: wfs2017@wildlifeforensicscience.org