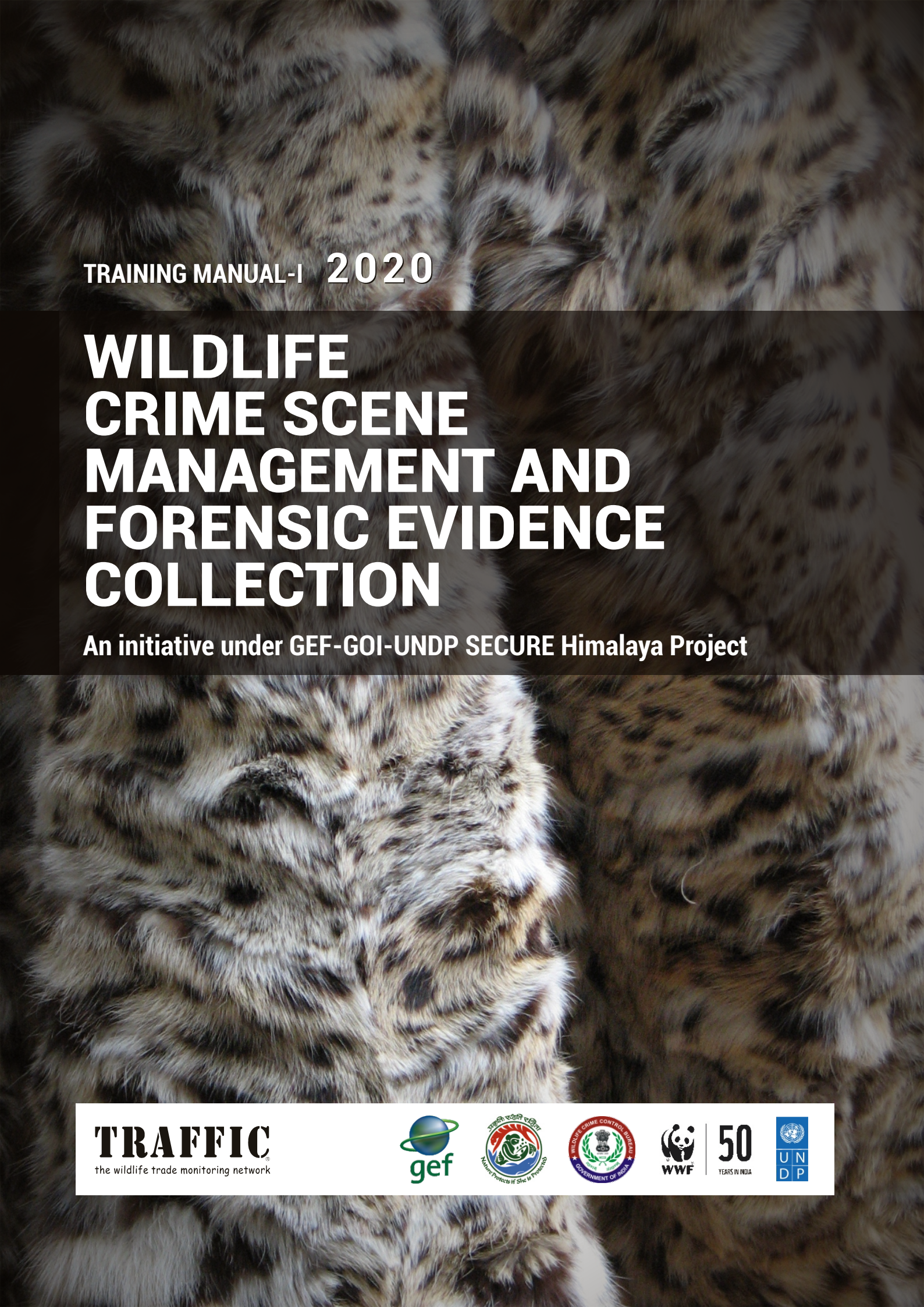

TRAINING MANUAL-I 2020

WILDLIFE CRIME SCENE MANAGEMENT AND FORENSIC EVIDENCE COLLECTION

An initiative under GEF-GOI-UNDP SECURE Himalaya Project

TRAFFIC
the wildlife trade monitoring network

gef

WWF 50 YEARS IN INDIA

UNDP

WILDLIFE CRIME SCENE MANAGEMENT AND FORENSIC EVIDENCE COLLECTION

An initiative under GEF-GOI-UNDP SECURE Himalaya Project

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2020

Disclaimer:

This is a user guide to facilitate various enforcement agencies in their effort for mitigating illegal wildlife crime. The content of this manual may be freely used for wildlife enforcement and training purpose with due acknowledgments.

Even though efforts have been made to provide accurate information in this publication, TRAFFIC, India Office/ WWF India would not be responsible for any errors. TRAFFIC, India Office would appreciate if readers would draw their attention to errors if any by communicating on the contact details given at the back cover or writing to TRAFFIC, India Office at trafficind@wwfindia.net.

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Content

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Wildlife Crime Scene Management and Forensic Evidence Collection

Course Aim: To build capacities of trainees towards better handling of wildlife crime cases and use of forensics for achieving better results in wildlife crime prosecution.

Course Objectives

- To impart background information about the status of wildlife crime and Illegal Wildlife Trade, globally as well as in India.
- To improve capacities of law enforcement agencies staff towards identification of major wildlife products in trade.
- To build capacities of the trainees towards Wildlife Crime investigation and management of Scene of Crime.
- To improve basic understanding of the trainees towards principles of forensic and its utility in wildlife crime investigation and methods of forensic evidence collection.

Target Group:

- Field officers
    - Forest Department: Field level staff up to Divisional Forest Officer (DFO) level
    - Police: CO/SP/SSP
    - Other enforcement agencies: Customs/Railway Protection Force/ Central Industrial Security Force/ Border Police etc.

Species identification as a topic is suggested for Police and other enforcement agencies as it is a specialized topic. The police are well trained for forensic while other enforcement agencies hand over the seized items to the Forest or Police department hence not required.

Methodology of Training:

- The method of pedagogy to be adopted during the training/ workshop would include lecture sessions and interactive exercises supported by hands on laboratory sessions and field trips.
- In case of difficulties in delivering the training via physical face to face mode, improvisations would be required to do it via virtual mode.

Course Duration: 2 days

COURSE STRUCTURE (2 Days)

Day - 1

No.	Subject	Time (hour)	Method used
S1	**Introduction to wildlife crime and illegal wildlife trade** Status of Wildlife crime and IWT in India and world and major species affected.	1.5	Presentation/ Reading material **Tool:** Reports, Factsheets.
S2	**Introduction to Wildlife Forensics** Principles of Wildlife Forensics and its utility in the field of Wildlife crime investigation.	1	Presentation/ Reading Material Tool: Case studies
	B R E A K		
S3	**Wildlife Crime Scene Management** • Locating, securing, and protecting the crime scene • Crime scene search and methods of investigation	1.5	Presentation, Reading material
S4	**Wildlife Forensic Evidence Collection:** Requirement, types of samples, techniques used and Do's and Don'ts of sample collection use of Forensic kits	1.5	Presentation Tool: Forensic kit and user manual

Day - 2

No.	Subject	Time (hour)	Method used
S5	**Field Setup:** Investigating a wildlife crime scene	1.5	Practical/On field exercise In virtual mode: Special crime scene slides/ videos.
S6	Presentation and evaluation of the field findings	1.5	Presentation by trainees (Virtual mode: Open discussion)
	B R E A K		
S7 S8	Identification and differentiation of critical wildlife products in trade: skins, claws, canines, tusks, horns, furs, fake products, timber etc. Post training evaluation*	2 0.5	Presentation/ Sample display Tools: Id cards/ short films

Note: S = Session; # = number; 0.5 = half an hour (30 minutes); * optional.

I. Introduction

Session 1: Wildlife crime and illegal wildlife trade

Session Objectives: By the end of the session the trainees will develop a better understanding regarding:

- Status of Wildlife crime and IWT in India and the world.
- Major species poached/ illegally collected, products traded and trade routes used. (Special reference to Indian Species like Tigers, Leopards, Elephant tusks, Pangolins, Turtles and Tortoises, Shark fins, Mongoose hairs, Red sanders, Agar wood etc.)
- Emerging problems in illegal wildlife trade such as use of internet, local consumption, spread of zoonotic diseases, etc.

Guiding Resource:

- UNODC (2017, 2020) reports
- Skin and Bones report (TRAFFIC)
- Interpol's assessment on Environmental crime
- ICCWC assessment

Lesson plans:
Drivers for Wildlife crime and Illegal wildlife trade with examples from India
Transnational linkages

Drivers for Wildlife crime and Illegal wildlife trade: India

Wildlife crime and illegal wildlife trade are one of the biggest threats to the wildlife of the country. The universal driving force for these crimes is the existence of a trade network with demands and resources that sustain them. There exists a demand for wildlife and their derivatives for the purposes of consumption, traditional medicines, decorations, and pets among others around the world. Indian wildlife species like the big cats, pangolins, elephants, and birds among others are victims of this inhuman practice. India is an unfortunate ground for wildlife crimes and illegal trade, being a biodiversity rich land that has become a sourcing ground of wildlife for criminals trading them in national and international markets. There is a lack of awareness regarding the protected status of many lesser known species of wildlife, especially marine species like sharks and corals that are sold to unaware customers by illegal traders. Other lesser known species like the monitor lizard and many species of owls are victims of the rampant occult practices that promote wildlife crimes to obtain their derivatives for the same. Another reason for the rampant rate of wildlife crimes in India is the porous nature of the borders it shares with neighboring countries of China, Bhutan, Bangladesh, and Nepal which are active transit and destination countries for wildlife trade. A growing cyber presence and availability of resources for the same has made the social media and online trade an emerging player in wildlife crimes and illegal trade with the utilization of these platforms as clandestine trading points of wildlife. All these factors along with loopholes in enforcement, investigation and execution of wildlife laws are drivers for wildlife crime and illegal trade and needs to be addressed to safeguard the future of the wildlife of the country.

Transnational linkages of wildlife crime

One of the most notorious aspects of wildlife crimes is its transnational nature, operating across borders with multiple countries participating as source, transit, processing and destination points. A growth in the transnational trade between countries is being exploited by criminals to smuggle illegal wildlife derivatives across borders by concealing them as or with legal products. The illegal trade also utilizes weaker legislations regarding wildlife crimes in the participant countries. The lack of awareness regarding the protected status of many species among the enforcement agencies also acts in the favor of the criminal network. Illegal wildlife trade operates as an organized crime network with multiple participant countries as well stakeholders involved. Countries like India with a rich biodiversity act as source of wildlife and their derivatives that are transported across porous borders and/or through international transports to their transit and/or destination countries. The transit countries act as processing locations or stop points till further transport. Destination countries are the ones with active markets and a demand for the derivatives where they are transferred to the customers. Destination countries have demand for derivatives for various purposes like consumption (Shark fins, pangolin meat,), medicines (Rhino horn, pangolin scales, and Tokay gecko), decorations (pelts, ivory), and pets (Birds, otters, marmosets) among others. The cross-border transport is reflected through seizures of wildlife derivatives at border outposts and bordering areas of many countries. Criminals utilize these borders to facilitate transport of such derivatives through local smugglers. Air transport is often used as a mode of transport of wildlife with multiple seizures observed at national and international airports. Marine enforcement officials also have encountered seizures of marine species derivatives as well as large seizures of pangolin scales at international ports. It is depictive of the vulnerability of these international modes of transports in being exploited for illegal trade. The growing cyber network is also helping the criminals find suppliers and clients in easier ways. The transnational nature of wildlife crimes calls for international cooperation in terms of enforcement and exchange of Intel and resources to counter the growing network of trade. The Convention on International Trade in Endangered Species is an international agreement that aims to ensure that trade in wildlife species do not threaten their survival.

II. Wildlife Crime Scene Investigation and Management

Session 2: Introduction to Wildlife Forensics

Session Objectives: By the end of the session the participants will develop a working knowledge of:

- Basic principles of Forensics and laws
- Types of wildlife crimes and common tools used in committing these crimes
- Utility of Forensics in the field of Wildlife crime investigation

Guiding Resource:

- Investigation Manual (TRAFFIC and WCCB)
- SoPs by NTCA

Lesson plans:

Principle of Forensic science: Locard's Exchange Principle, Law of individuality, comparison, analysis, and progressive exchange
National level Wildlife Forensic labs in India
Uses of Forensic in wildlife crime investigation: with case studies

Introduction to Wildlife Forensics

Basic principles of Forensic science

Forensic science is *'The application of theories and principles of diverse scientific disciplines in the aid of the criminal justice system'.*
The application of forensic science is targeted at recognition, identification, individualization, and evaluation of evidences encountered during the investigation.

Principles and laws of forensic science

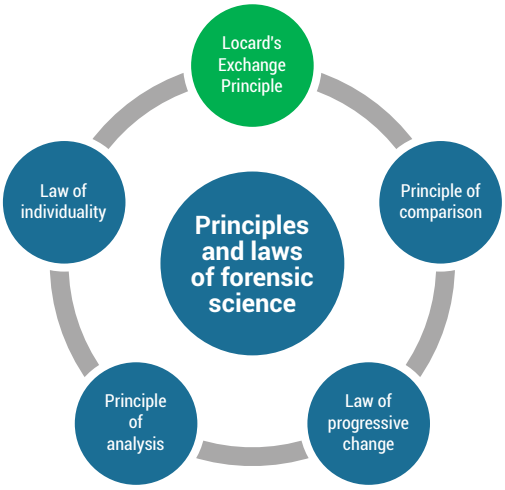


Fig 2.1 Diagrammatic representation of Forensic Principles

The main principle of forensic science is the "Locard's Exchange Principle" which states that *'every contact leaves a trace and these traces can be identified and analyzed to establish a link between suspect, victim and evidence involved in a crime'.*

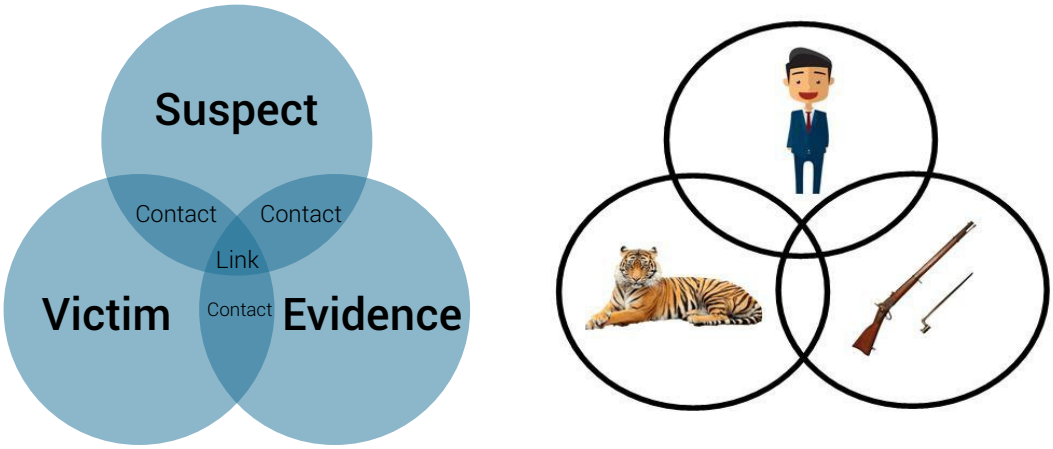


Fig 2.2 Diagrammatic representation of Locard's Exchange Principle
(Source: http://insertmedia.office.microsoft.com)

There are other fundamental principles of forensic science that governs the practices of the field. They are:

a) Law of individuality:

Every living or dead thing in this world is unique and is individualistic in nature. This law allows identification and individualization of evidence through analyzing its traits that make them unique. For example: Tiger is unique due to its striking stripe pattern, similarly, firearms and tools are unique due to the markings they acquire during manufacturing processes as well as day to day wear and tear from use.

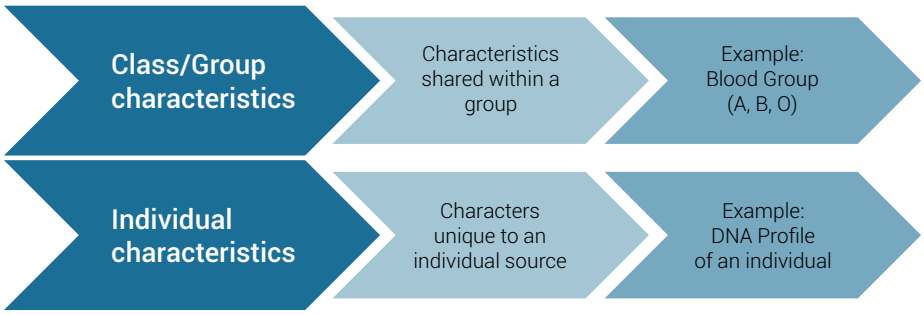


Fig 2.3 a. Law of individuality

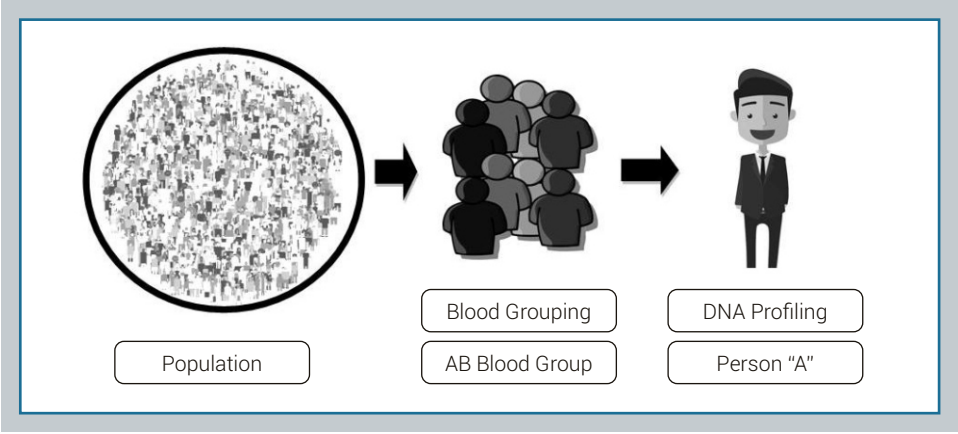


Fig 2.3 b. Law of individuality: an example
(Source: http://insertmedia.office.microsoft.com)

b) Principle of comparison:

Reference samples used for comparison with the questioned ones are to be similar in nature. For which a reference library needs to be created and managed.
For example: Ivory/horn/ bullet can be compared with another of its kind.

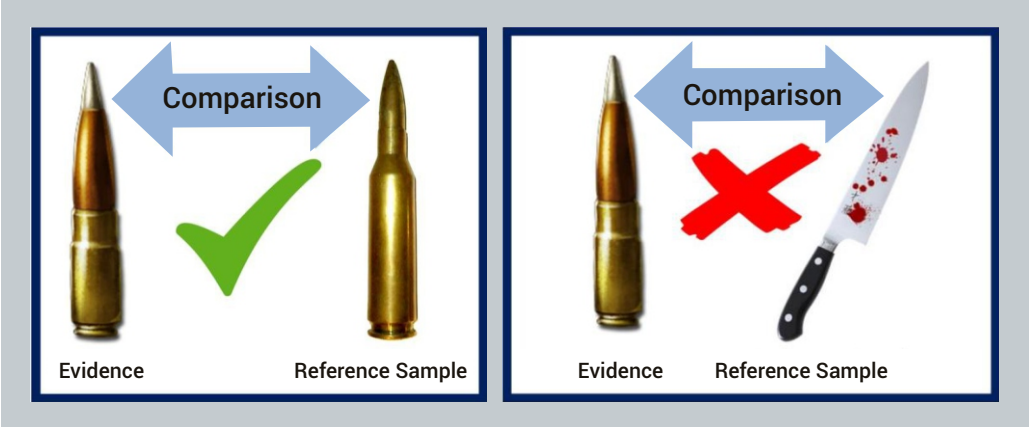


Fig 2.4. Principle of Comparison
(Source: http://insertmedia.office.microsoft.com)

c) Principle of analysis:

The analysis is as good as the sample being analyzed. This principle accentuates the importance of proper sample collection, packaging, storage and avoiding contamination for proper results. Contamination may render the analysis susceptible to an imprecise outcome.

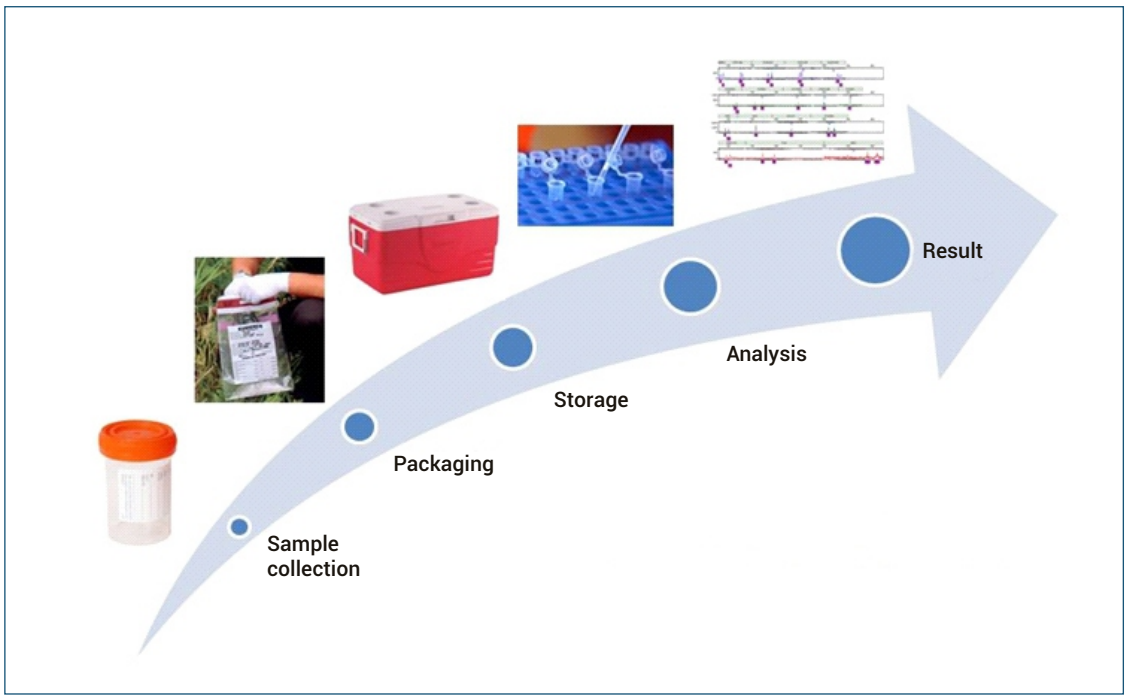


Fig 2.5. Principle of analysis with an example
(Source: http://insertmedia.office.microsoft.com)

a) Law of progressive change:

Every object, living or not changes with time and these changes can be detected and must be taken into consideration for their role in altering an object.
For example: Aging, decay, and wearing are among the form of changes that occur in objects which can be analyzed as evidence.

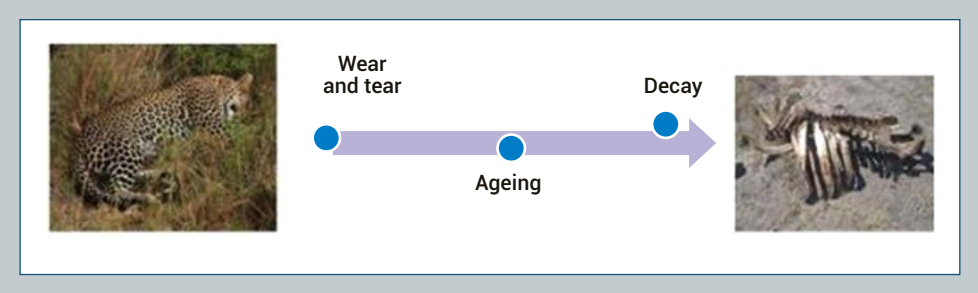


Fig 2.6. Law of progressive change with an example
(Source: http://insertmedia.office.microsoft.com)

Forensic Science in India

Forensic science in India was initiated in the 19th and early 20th century with the establishment of laboratories dedicated to various disciplines in major cities. The first chemical examiner's laboratory was set up in 1849 in Madras (Chennai), the first anthropometric bureau for individual identification (1892), first fingerprint bureau (1897), first department for questioned document analysis (1904), first serology department (1910) and first ballistic laboratory (1930) were all established in Calcutta (Kolkata). The first department of explosives was established in Nagpur (1898). All these departments were later modified under the Government of India with additional state and central forensic science laboratories and educational institutes to impart education and conduct researches in the field of forensic. The list of Wildlife forensics labs in India are given in Appendix I.

The potential of forensic science in wildlife crime investigation

The use of the present technology has been seen in:

i. Biological analysis: It can be through: -

a. Morphological analysis by using bones, tooth, hair, skin, feather, scales, claws, flowers, fruits, stem, root etc.,

b. Molecular analysis by using meat, blood, body fluid, timber, processed or value added products, finely cut plant parts or powder format.

The morphological examination involves observing the physical characteristics of the species to identify them. Example: Ivory samples are traced to their species level to determine their legal status since mammoth ivory is legal whereas elephant ivory is illegal in trade.
Establishing the identity of the species involved in crime is essential for legal proceedings to ascertain the schedule listing for the species as per the WPA-1972, EXIM policy or CITES.

ii. Toxicological analysis:

The toxicological analysis to understand cases involving poisons to kill animals either as retaliation or for poaching. The analysis allows testing the presence of poison, type of poison and the effect it had on the individual animal. The analysis of poison begins with the collection, preservation, and storage of the visceral samples from the animal; different samples are stored as per the protocols for the analysis.

iii. Ballistic (Firearms), snares, traps analysis:

Firearms are one of the tools used in hunting apart from snares and traps. Firearms along with bullets, ammunition, cartridges and their components, gunshot residue, and surfaces they meet are physical evidence that can be analyzed to link suspect, and weapon of offence to the crime. It is much harder to link it for snares.

iv. Other analysis:

Fingerprints present on evidences such as traps, snares, weapons, natural surface found on the crime scene can be collected by dusting, taping and lifting to generate prints that can then be matched with reference build up to establish a link with the scene of the crime. These also include various other evidences such as impression marks from human footwear and vehicle tires, material used to prepare snares and traps including soil, glass, accelerant residue.

Cause of death:

Forensic pathologists perform a physical examination and/or autopsy to establish the time, cause and mode of death of the animal. Similarly, analyses of poisons, chemicals, tools, firearms, snares, vehicles and other objects can be analyzed to recreate the scene of crime.

Case study

1. **Asiatic Lion Poaching case**

   In the year 2007, Gir National Park witnessed the poaching of 10 Asiatic lions in three different incidences. The state government assigned the case to CID crime and they used forensic DNA analysis to link the weapons used by the perpetrators and their nails to the recovered remains of the lions near their residence. The forensic evidence in this case aided to apprehend the group of accused.

2. **Identification of species from cooked meat**

   In 2017 West Bengal state forest department brought half cooked meat as evidence to Zoological Survey of India for species identification. ZSI succeeded in species identification for an evidence of half cooked meat. They conducted DNA analysis on the recovered sample and identified the species to be Asian Palm Civet, a protected Schedule II species under the Wildlife Protection Act. For a similar case involving cooked meat as evidence, West Bengal state forest department suspected the meat to be of the Greater Short-toed Lark but the DNA analysis revealed it to belong to the common quail and helped exonerate the individuals since the meat was not sourced from a protected species.

Session 3: Wildlife Crime Scene Management

Session Objectives: By the end of the session the participants will develop a basic understanding regarding:

- Approaching wildlife crime scene
- Securing and protecting the crime scene
- Crime scene search and management

Guiding Resource:

- Investigation Manual (TRAFFIC and WCCB)
- SoPs by NTCA

Lesson plans:

Wildlife Crime Scene:

Wildlife crime can be defined as the illegal taking, possession, trade or movement of animals and plants or their derivatives in contravention of international, regional, or national legislation (Cooper & Cooper 2007, Lawton & Cooper 2009).

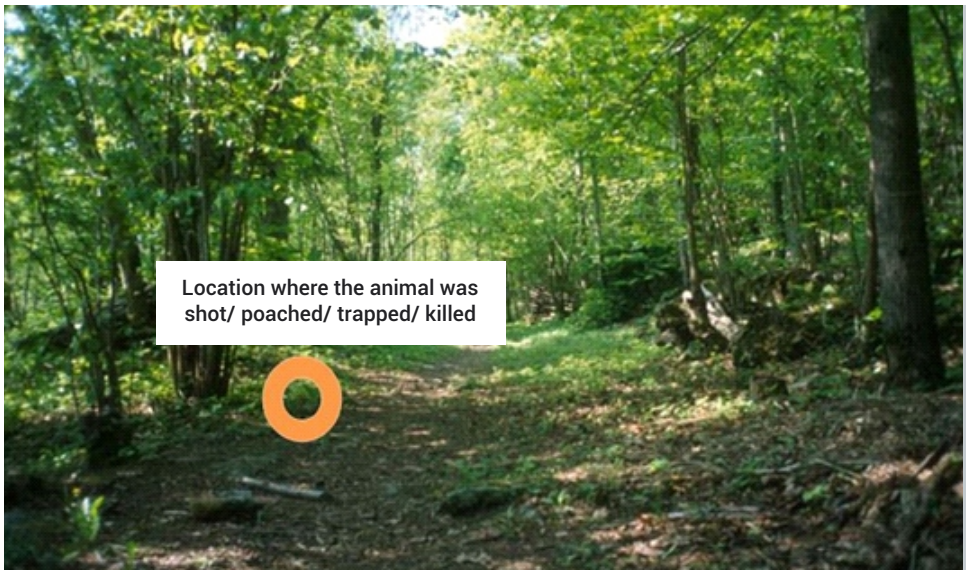
The place where any wildlife crime is committed is designated as a wildlife crime scene and its proper management and investigation is of crucial importance in reaching the criminal. Wildlife crime scene presents many challenges as it involves evidences from animal/plant origin as well as humans hence it becomes challenging to solve the case because of nature of evidences available.

While, attending a wildlife crime scene, investigators should always be alert to the potential value of forensic evidence and therefore careful planning, proper team, use of calibrated and correct equipment and proper management of the crime scene and examination, will lead to fruitful results where links can be made with the suspect and wildlife crime scene.

Locating a wildlife crime scene:

There are different types of wildlife crime scene, which may influence the value of different types of forensic evidence. For example:

The carcass of dead animal may be found at the location where it was shot/ poached/ snared/ trapped/ killed.



Types of evidence

- Carcass/Remains
- Snare/Trap
- Ammunition
- Containers of pesticides/poison
- Foot impression
- .....among others

Fig 3.1 a Locating a wildlife crime scene: one location
(Source: http://insertmedia.office.microsoft.com)

- The inflicted animal could have died immediately at the same spot or might move to another place before dying.

Fig 3.1 b (i). Locating a wildlife crime scene: more than one location in the forest
(Source: http://insertmedia.office.microsoft.com)

- The targeted animal could have been shot and killed then transported by the suspect(s) to another location where it is found/ seized. Also, when the targeted species (animal/ plant) is in possession of a person within a confined space such as house, shop, godown, or if the species is being displayed or traded using digital medium. Then the space becomes a wildlife crime scene.

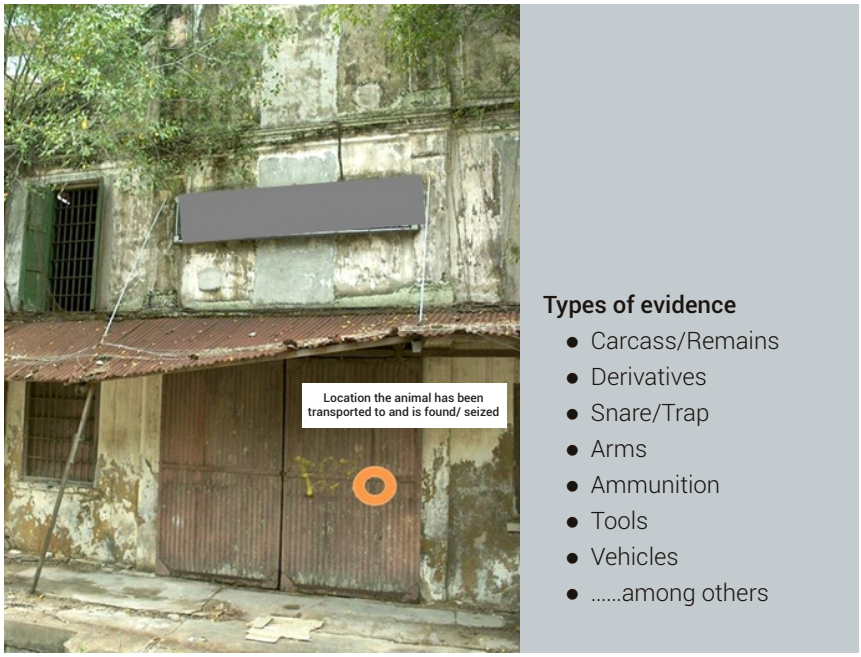


Fig 3.1 b (ii). Locating a wildlife crime scene: more than one location moved to trader/seller
(Source: http://insertmedia.office.microsoft.com)

The perception of the Investigating Officer (I.O.), in charge of the crime scene, is to understand what kind of crime scene it is. Assessing whether a criminal offence has taken place, may not always be straight forward, other possibilities such as natural deaths, predation should also be considered.

In most instances of serious crimes or crime involving major species, a Crime Scene Investigator (CSI) i.e. the Investigating Officer (I.O.) is the Assistant Conservator of Forest (ACF) in the Forest Department. The IO leads the investigation and undertake (or guide) the collection of evidences. They also assign roles to the team to perform various tasks at the scene of crime (SOC).

What to do when a wildlife crime is detected.

Once the Range Forest Officer has informed the I.O. about a wildlife crime, the I.O. must undertake following activities:

- Arrive at the wildlife crime scene as soon as possible and inform the Field Director/ Conservator/Chief Conservator of Forests having the jurisdiction over the area of crime.
- Call for an investigation team at the SoC at the earliest. It must be necessary for the team to arrive at SoC with a proper Investigation Kit/Evidence collection kit/Forensic kit.
- Deliver structured commands and take the responsibility at the SoC.
- Demarcate the SoC, common approach path (CAP) and the search boundaries to keep the evidences safe and undisturbed using standard crime scene marking items.
- CAP should recognise entry and exit of the crime scene and route to be followed by everyone to avoid damage and cross contamination. This must be identified initially by first responders and then relayed to the investigation team and SIO. And recorded.
- Make partitions of SoC into grids/circles for the investigation and collection of the evidences. Search for evidences shall be at least in about 500 meters surrounding the SoC (as per NTCA guidelines). It has been noticed that in many cases the animal moves some distance after being hit by bullet or consumption of poison. Also, sometimes the poachers for their convenience in de-skinning move the animal carcass to certain distance such as near to a river or water body, clear area etc.
- Keep a record of person's entry into the demarcated SoC area. Also, there shall be no unnecessary admittance or movement within the SoC.
- Record the SoC with photography/videography of an undisturbed SoC. Close and distant photography from various angels using reference and a reference point, usually a fixed object, should be undertaken.
- Take care that the evidence shall not be manipulated including any over-writing or corrections on the labels of the evidence.
- Take a note of all the basic details such as date, time, GPS location, weather etc. should be precisely documented.
- Maintain a case diary as suggested under section 172 CrPC and report it to the supervisor daily.
- Prepare a seizure/arrest memo on the spot.
- Take a note, at least two independent witnesses shall be associated in search, seizures, and arrest.
- Must survey the entire SoC and areas surrounding it. If there is a suspected infighting of animals, search for trails of other injured animals.

Fig 3.2. Schematic step wise procedure to be undertaken after detecting a wildlife crime scene.

Wildlife Crime Scene safety

Assurance about crime scene safety is the first consideration for a successful crime scene investigation. The responding I.O. has responsibility to secure the investigating team, who will be exposed to various elements at a wildlife crime scene. The potential hazards especially chemical and pathogenic may be fatal even after hours, weeks, months also years later from the date of crime scene processing. Hence always adequate personal protective equipment and safety considerations are necessary.

Fig 3.3. A wildlife crime scene with (a) adequate protection (a) and demarcated areas of safe passage (b) to avoid spoilage of a wildlife crime scene
(Source: (a) http://insertmedia.office.microsoft.com, (b) Getty images)

I.O. needs to take caution when entering a potential crime scene or extensions of the crime scene area. High awareness and going along with the clues help to make sure the first responders enter the area safely. As the vastness of the area of scene of crime is initially unknown, hence the safe boundaries shall be assessed. Also, roles and responsibilities must be assigning to the team prior reaching the wildlife crime scene while taking into consideration physical fitness and pre-existing ailments or injuries of each team member.

Hazards at wildlife crime scene

a. **Wild animals:** Care must be taken to keep the area safe from wild animals as they are attracted to the carrion as a source of food.
b. **Environmental condition:** Extreme weather conditions such as flash flood, forest fire, excess fog, etc. can limit time for which evidence can be collected.

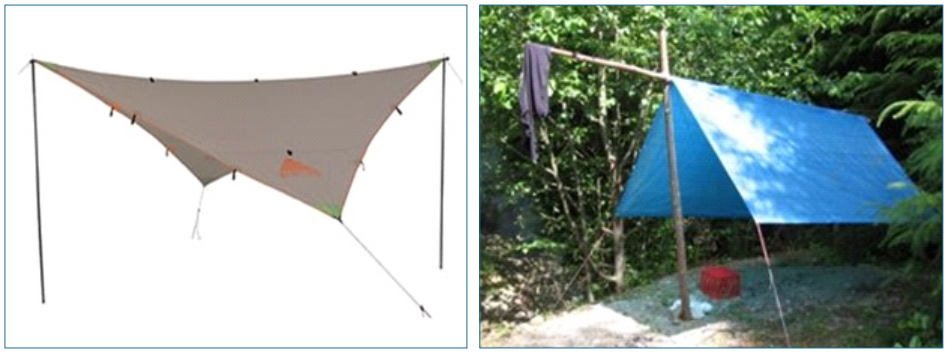


Fig 3.4. Protective measures undertaken to protect a wildlife crime scene.
(Source: http://insertmedia.office.microsoft.com)

c. **Location:** Care must be undertaken especially when the wildlife crime scene is at an area near landslide, avalanche, bodies of water, high wind areas, melting snow, precipices, etc.
d. **Pathogens:** Care must be taken to check there is no direct contact with blood-borne pathogens, fungus/mould, body fluids, and bloated cadavers as these are indicator of bacterial and viral presence.
e. **Chemical:** Care must be taken when pesticides/herbicides, poisonous bait areas, unused explosives, etc are used by the criminal, as they can cause harm to the investigating team. These should be packed in safe material depending upon the explosive.

Fig 3.5. Evidences to be labeled appropriated (a) especially hazardous material
(Source: http://insertmedia.office.microsoft.com)

Crime scene Management

The search for evidence for first responders must include possibilities beyond the secure site. Depending on the location and nature of the crime scene, this could include witnesses and CCTV (the 'Golden Hour'). This will assist in identifying investigative strategies by the I.O. and selecting the team with adequate strength. The I.O. must ensure adequate control and coordination in the team, to reach meaningful conclusions from the evidence at the crime scene or after the results are obtained from designated labs.

All wildlife crime scenes are important, but it becomes of utmost importance when the crime scene is large in area and there are several members in the team involved and processing in different extensions far from the preliminary crime scene. Hence proper communication of information back and forth between the I.O. and Forest Officials is important.

APPROACHES TO CRIME SCENE

The examination of a crime scene is best conducted by using scientific methods hence a scientific evaluation can be carried out to collect and preserve the evidences, which are very crucial in reconstructing the crime scene, establish links or exclude the suspects to a victim or the crime scenes hence giving major clues in solving of crime.

If we talk about a proper scientific method for crime scene investigation, we can say that it is a process which puts any observation and theory to test as a scientific hypothesis. Some of its components can be explained as:

i. Hypothesis formulation
ii. Hypothesis testing
iii. Proofs to support the hypothesis or failure to disprove it.
iv. Validate the hypothesis with inductive or deductive reasoning.

A wildlife crime scene investigation method derived from the scientific method can pose certain questions which will look like:

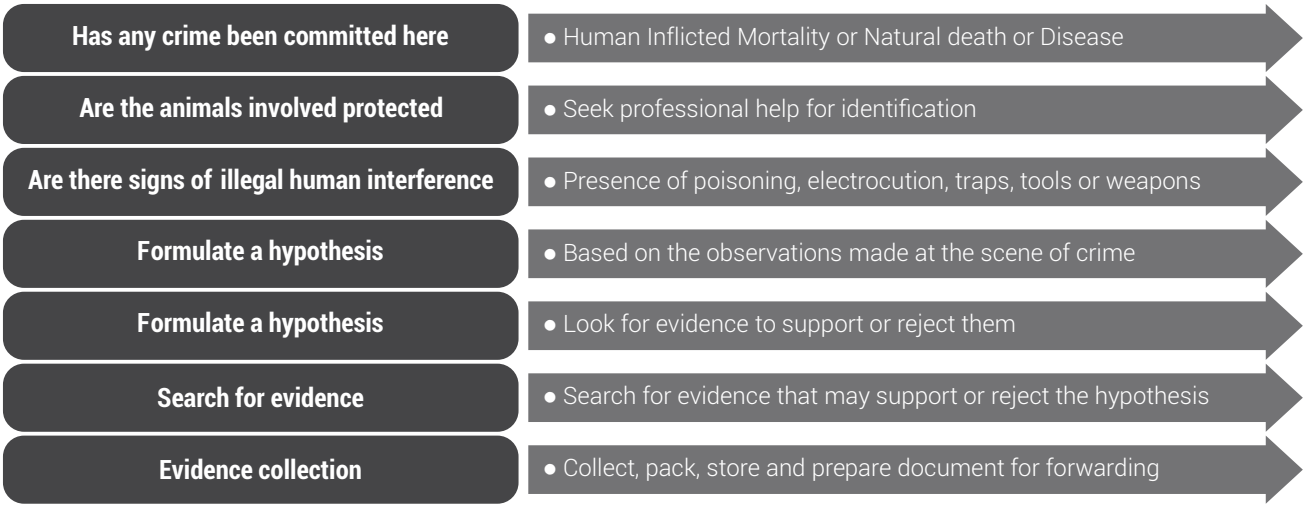


Fig 3.6. Schematic representation of formulating a hypothesis for a wildlife crime scene.

After all the initial investigation, collect, tag, document and preserve the evidence for further analysis and documentation required in the forensic lab or during the judicial proceedings in the court of law. It should be kept in mind that these evidences are relevant and useful to test the crime scene investigation hypothesis. In some complex cases where it is difficult to give comments only based on hypothesis testing, it is must to go for confirmatory laboratory investigative work to support the evidences initial crime hypothesis.

SECURING AND PROTECTING THE WILDLIFE CRIME SCENE

Based on available resources and human resources available the officer first reporting the crime should try to secure it even before relaying the message to the senior officers.

The Investigation officer (I.O.), generally a senior member of the crime scene investigation team, shall attend the SoC to make sure everything goes proper and in the order. The size and the nature of crime scene will determine the amount of the resources and size of investigation team to be allocated for the incident. It is of vital importance that the crime scene manager shall have the authority to allocate the amount of resources required to carry out proper investigation.
There shall be a formal protocol and paper trail for handing over a crime scene and collected evidences to ensure that the chain of custody is duly maintained. It is very crucial element for any prosecution where there is involvement of forensic evidence to prove that the integrity of crime scene was maintained throughout the initial subsequent investigation.

The major objectives of securing the crime scene are :-

- To prevent contamination or destruction of evidence.
- To ensure the integrity/confidentiality of information (release of information only by a senior investigating officer or concerned officer to media).
- To maintain chain of custody at the crime scene and deal with utmost attention with any potential physical evidence.
- To vacate/ remove all the unnecessary people including police officers, media, onlookers etc. it must be kept in mind the more people gather at or around the crime scene the more will be chances of crime scene contamination which inhibits proper investigation.
- To make sure all the potential physical/chemical/biological evidences are recorded and recovered. The crime scene shall be secured until the results of post-mortem or scientific laboratory analysis are handed over.

The general methods for securing the SoC are given in Appendix II.

WILDLIFE CRIME SCENE SEARCH

Before setting foot to the crime scene, the I.O. or investigator in charge must gather as much details about crime scene as possible to identify the scope and value of any potential evidence to be found at SoC for e.g. statements of witnesses, happening of the crime, nature of terrain, weather conditions, any possible extensions to preliminary crime scene, surrounding water bodies etc.

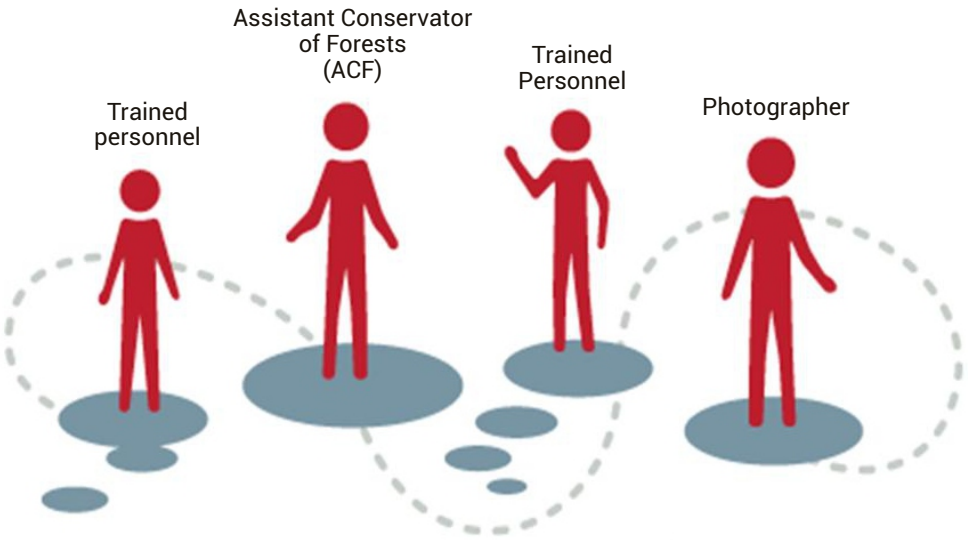
The I.O. who oversees the SoC shall be responsible for assigning individual tasks to the team according to their performance potential. Before assigning wherever wildlife sniffer dogs are deputed the wildlife crime scene, the sniffer dog squad must be allowed prior to any person of the wildlife crime scene team starts to cordon off the area. After the sniffer dog has finished its search and sniff routing then the search team after establishing the safe walk areas shall proceed after person in charge, one sketcher and photographer, searchers (one or two person) to spot, take and record measurements. Then all information shall be passed on to the I.O. in charge, who will be also the liaison officer to media, news, and legal proceedings.

Care shall be taken to not contaminate the crime scene by outside factors or by the investigation team itself. The investigation team shall not eat, drink, or smoke at the crime scene. The items such as casting materials, tags, paper/plastic bags, containers, documents introduced by the search team should be removed at the end of examination.

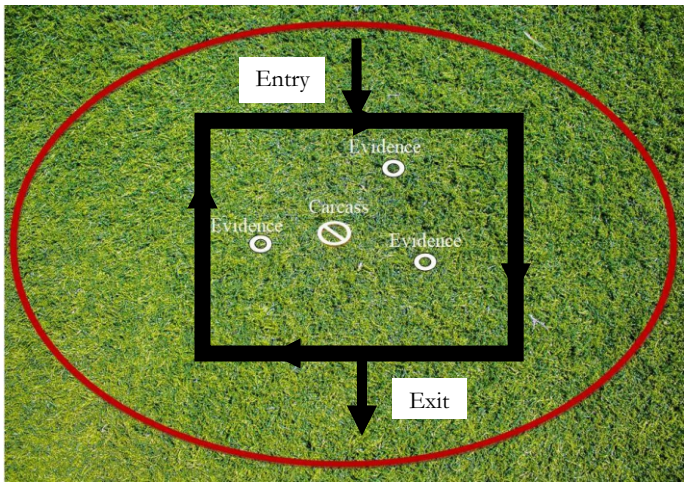
Natural light is best for search and hence it is often advised to postpone the search until daylight or stop the partially completed search until better natural light conditions are available. Sufficient security measures should be arranged during the off hours to protect the crime scene from any damage until the search is completely conducted. However, if bad weather conditions are anticipated then the collection and documentation of evidences should be finished as early as possible. Plastic sheets or tarpaulins can be used to cover the fragile evidences to avoid the loss of integrity of the sample.

A good search is always planned. There are different search styles that can be used depending on the type of crime scene (Appendix III).

CRIME SCENE INVESTIGATION



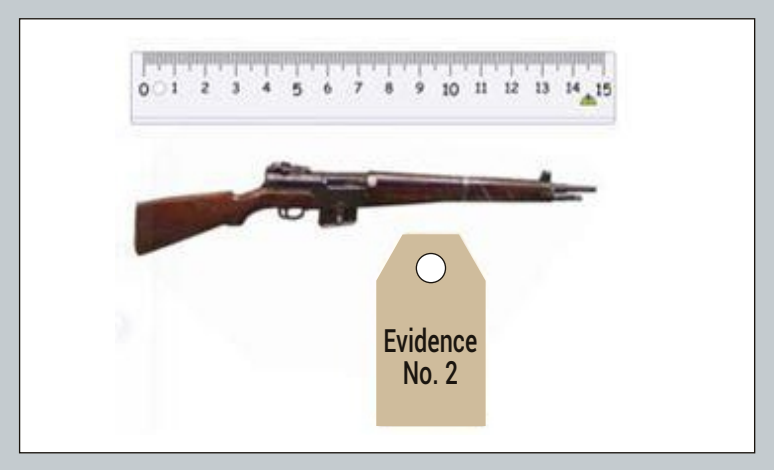
i) Establish roles and responsibilities of the team



ii) Demarcate and secure the scene of crime and establish a safe walk area (CAP)

- Crime scene notes: Date, Time, Location (GPS), Weather details, etc.
- Crime scene photography
- Crime scene sketch

iii) Record the scene of crime



iv) Record, label and photograph the evidence prior to collecting

v) Collect, pack, and store the evidence with proper labeling and method for forwarding to ensure the integrity and chain of custody of the evidence

Fig 3.7. Various facets of wildlife crime scene investigation (i to v)
(Source: http://insertmedia.office.microsoft.com)

Investigator's Role

The role of an investigator at crime scene is very crucial. Always an immediate response is required for a successful investigation or the delay can lead to contamination of the crime scene by unwanted visitors such as curious media, any common man unaware of the SoC, other animals running or entering the crime scene, weather conditions or even by forest officers visiting the SoC. As the advancement of transportation and communication has happened it has helped to reduce the response time. Also, awareness of forensic science and crime scenes proves to be helpful for protection of crime scene, so the first responding person who approaches the SoC is always the suitable one for the job. Hence, effective way to handle crime scene is to reduce the response time.
The crime scene investigation shall always necessarily be done by a trained and efficient person who can handle the complexities of a crime scene along with the legal knowledge to provide better proof against criminal beyond reasonable doubt. Hence, considering the role of forensic expert strict advisory, the protection of SoC, collection, preservation, packaging, sealing, and dispatching of physical and biological evidences shall be performed by the assigned I.O. and his team only. The forensic expert shall be called upon to carry out preliminary scientific examinations to deduce the irreverent or unwanted information. The forensic expert must guide the I.O. for the followings:

- Establishing ***corpus delicti*.**
- Discover the real or false nature of crime.
- Recognize the latent, minute, and potential hidden clues.
- To identify the nature of the event and establish the ***modus operandi*.**
- To highlight potential leads in locating the criminal and connecting evidences.
- To associate or dissociate the crime with others.
- To produce a line of investigation and help in developing a crime scene hypothesis.
- To produce a baseline for reconstruction of possible events occurred at SoC.

Methods for documentation of SoC: Photography

"A picture is worth a thousand words" a well captured photograph speaks out many details about the crime scene which could have been possibly not noticed at the time of on-going investigation. Hence, photography is an essential part of documentation of SoC. It is inseparable component of a crime scene investigation as it amongst the most efficient ways of documenting and keeps permanent record of the crime scene, these facts and records can be used later for reconstruction of the crime scene at different stages. Before photographing the crime scene, the investigating officer shall take note of the following : -

- What is to be photographed?
- Why it should be photographed?
- What is to be presented through photographs?
- How it can be recorded as seen?

A complete record of a photograph taken at SoC shall be maintained as following :-

- Details of photographer.
- Date, time, weather observations (e.g.20°C with wind from north) and place of photography.
- Documentation of crime scene as first perceived, without any cordoning, flags or rulers or any disturbance in crime scene which includes a panoramic view of the crime scene depicting a general overview. Where the crime scene is very large or has secondary extensions, sequential photographs can be taken.
- After which the photographer should take a note of description of crime scene by the lead investigator and his team, which can help in photographing the important details and unnoticed evidences which could later be used for reconstructing the crime scene.

- Coverage of possible largest area (including distant, midrange and close-up shots of the crime scene) with reference to positions described by witnesses.
- Complete view of carcass to be taken from each side. In cases where the carcass has already been removed, then original location is to be photographed with proper markings.
- Objects in close vicinity of the carcass such as bloodstains, footprints, weapon, traps, shoes, clothing etc. should also be recorded in photograph.
- Close-up photographs of the physical evidences as indicated by placards. Preferably three photographs shall be taken for each evidence amongst which the first photo depicts the physical evidence next to the numbered placard. Second one is the close-up of the physical evidence with just a portion of placard and the third one will be just the close-up of the physical evidence with a scale or ruler adjacent to it.
- The same should be done in case of carcass found on the crime scene also taking close ups of injuries, signs of struggle marks on the body, abrasions, contusions, burning marks, ligature marks, bite marks should be covered in color photography.
- Moreover, the bloodstains nearby the carcass, flow of blood, pattern of scattered blood, signs of poisoning on the body should be recorded carefully.
- Color photographs to be preferred over black and white as they present more details except in cases of photography of evidences such as pug marks, footprints, fingerprints, tire marks, skid marks which are always taken black and white (with a scale or ruler essentially placed besides them).
- Photographs which require a high level of expertise are:
  Latent prints; Tire marks or trails; Evidence partially concealed by shadows having other portion in bright sun light; dark condition photography; animal tracks left in soil or snow.
- Entry and exit route of the offender, moreover the area where force was likely used shall also be covered.
- After the entire crime scene photography is done it is important to image the entire photographs so that the original files are not disturbed while analysis. It is of utmost importance that investigator does not delete any photograph of crime scene as numerical continuity of digital files is sometimes more important than just the quality of photograph.
- Always use a new memory card, while undertaking photography of a wildlife crime scene and treat the card as digital evidence (refer section on digital evidence).

Videography

- It is an excellent way of presenting realistic graphics of crime scene in movement. It should be always performed under the direct guidance of the investigating officer who oversees the crime scene and aware about the potential evidences at crime scene.
- Videography is done in critical and crimes of serious nature along with photography to provide exact proceedings of the crime scene in the court of law. It is always advisable to take the videos without sound and later the audience can be guided by a voice-over in the court. Videography has proved to provide essential details in court proceedings in typical cases.

Sketching

- Documenting the crime scene by sketching is an inseparable part of crime scene investigation.
- A diagram is a simple illustrative outline of any object capable of linear projection, which is not necessarily intended to be perfectly accurate. It is an approximation and hence can be indifferent by whom it is prepared. The point is it shall serve the purpose of a witness when expanding lines and localities of the exhibits.
- Need of sketch arises as photographs have limitation as they are two-dimensional illustration of three-dimensional space and cannot capture the entire crime scene in one photograph to get an idea of the position and location in the SoC. Sketches combine features of both notes and photographs, we can say that lies somewhere between oral or written description and photographs.

Requirements for sketching:
Drawing paper, preferably graph paper or paper with square lines of various kinds having 4, 8, 12, 16 lines to the inch which simplifies the scale drawing and provides automatic line measures.
Drawing boards or clip boards.
Measurement tape of at least 50-100 feet.
Soft lead and sketching color pencils, eraser and sharpener.
The 6 feet ruler or tape is useful for short measurements and drawing lines.
Mathematics drawing box.
Magnetic compass for marking of true north.

Important points to consider while making sketches

- Must have a Reference points in sketches for the better understating of the crime scene in the court.
- Reference point must be permanent such as a checkpoint/chowki/ anti-poaching camp/ range office/panchayat house/hospital/school etc. It brings the possibility of bringing the crime scene to a real picture for the interested people
- Descriptions must be easy to comprehend, useful with references for the same.
- Use conventional legends, letters, symbols, and digits to avoid chances of overcrowding.
- The true "North" should be marked on the map along with the words "not to scale". Care should be taken that the crime scene should not be disturbed while undertaking the sketch. For the final sketch, the scale should be mentioned at the bottom right corner along with the legend/key above the title of the sketch.
- Symbols such as rectangle, squares or circles, small figures, or points with either letters or numbers can be used to locate various physical exhibits at the SoC. The legends or key for them should be clearly mentioned with the sketch.
- Always the title of the sketch shall be put in a box at lower right side of the sheet containing case no., booked under the section, police station of jurisdiction, address, date of sketching and name of sketcher etc.
- Boundaries and outdoor walls shall be thick for clarity and emphasis.

Other considerations while sketching the SoC:

- Any person who does not have any official task to be performed shall be excluded like media, neighbors, on lookers, relatives, and even senior police personals.
- Never change the position of any object at the crime scene until it is properly recorded by photographs, notes/sketches so that relationship of various objects is not disturbed.
- Keep all the pictures of crime scene at the back of mind.
- Decide if the sketch is needed? If yes, by whom and for what purpose.
- Choose the type of sketch according to the crime scene.

Types of sketches

Elevation sketch	Bird's eye view	Exploded view	Perspective drawings
In this type of sketch, a vertical plane is portrayed rather than a horizontal.	Commonly used for both outdoor and indoor crime scenes, also known as floor plan.	It is combined form of elevation sketch and bird's eye view. Walls being laid out are flat and various objects shown at their relative positions. Bullet holes, bloodstains, dent marks on the walls can be shown.	This type of sketch needs high artistic skills and abilities. These are difficult to draw on scale, hence require assistance of a draftsman.

The methods of sketching and procedures of sketching are listed in Appendix IV.

III. Wildlife Forensic Evidence Collection

Session 4: Wildlife Forensic Evidence Collection

Session Objectives:
By the end of the session the participants will develop a working knowledge about:

- The utility of sample collection
- Types of samples for analysis: Histopathological, Toxicological, Molecular (DNA analysis)
- Techniques of sample collection and basic tools used
- Do's and Don'ts of sample collection

Guiding Resource:

- TRAFFIC's guide of sample collection

Lesson plans:
Evidences: Movable and Immovable, along with examples of each,
Types of evidence:
Biological including DNA and serology,
Physical for Toxicology, Ballistics, and others
Sample Collection:
Tools required
Collection methods
Preserving samples for forensic analysis: dry and wet samples
Sealing marking and labeling
Chain of Custody

EVIDENCE

Any object that establishes that a crime has been committed through its examination or scientific analysis and which works as a link between the offender and the weapon of offence is called an evidence. Moreover, the victim(s) and objects at the scene of crime are considered as evidence. The evidence evaluated by an expert with an understanding of forensic science is free from human failings. It withholds the potential of giving optimum results in the investigation of a crime.

There are two types of evidences: movable and immovable

i. **Movable evidence:** Found in a loose condition at the SoC on the victim (Carcass or live animal) and offender. These can be recovered and sent for further investigation to forensic labs eg., Fibre fragment, bullet, soil, miscellaneous.

Fig 4.1 a. Examples of movable evidences
(Source: http://insertmedia.office.microsoft.com)

ii. Immovable evidence: Because of their nature, size, structure, and various other physical properties they cannot be removed from a SoC. These are examined on the wildlife crime scene itself or lifted by special methods and then sent for examination for eg., Fingerprints.

Fig 4.1 b. Examples of non-movable evidences
(Source: http://insertmedia.office.microsoft.com)

Sources of Evidence:

Crime scene	Suspect	Plant/Animal live/sample/carcass
Most abundant source of Physical evidence. Provides trace evidences by culprit and from the victim animal as well. Entry/exit points are most susceptible areas for physical evidences.	Trace evidences can be found on every object which has come in contact of the offender like weapon of crime, clothing, fingerprints on tools used, vehicle used, GSR on victim's hands etc.	The victim animal/carcass (bullet marks, struggle marks etc.) and the objects surrounding the carcass carry trace evidences which gets transferred whenever there is a contact made by the offender.

Types of samples

The possible evidences can be endless, since it would completely depend upon the location and the nature of the crime scene and the manner of crime commission, the topography, and many other factors. The most found evidences at the SoC are as follows :-

Sample	Types of samples
Animal material	Carcass/corpses: - The body parts, bones, teeth, skin, hair, viscera, feathers, claws. Body fluids: - Blood, bloodstains, scat/pellet sample, urine, saliva, sweat, stomach washing, semen etc.
Plant material	Plant, wood, leaves, pollen, fibres, sawdust, roots, stem, flower, fruit etc.
Chemical substances	Explosive and the residues. Inorganic substances such as soil, sand, stone, glass, snares, metal wires, acid etc. Organic substances such as oil, alcoholic products (liquor), ink, pesticides, poisons etc. Narcotics and other narcotic drugs. Petroleum products like diesel, kerosene, motor oil, grease, petrol etc.
Weapons including traps and snares	Firearms like pistol, rifles, semi-automatic/automatic guns, muzzle loader, country made firearms. Cartridge shells, bullets, pellets, wads, cushion wads, gun-shot residue, and live cartridges. Axe, rob, knife, axe, swords, spears, razor blades, shovel, snares, poisoned arrows, sharp stones, bricks, lathi, iron rod, metal snares, nylon ropes, fishing nets etc.
Tools	Hammer, screwdriver, chisel, drill, marking gauge, heck-saw, fuel powered saw etc.

Sample	Types of samples
Impressions	Paw marks, footprints, fingerprints, shoeprints, tyre marks, tool-marks, track-marks, skid marks, stick marks, drag marks, teeth marks, palm prints etc.
Fibres	Jute, cloth, string, thread, animal hair, feather, human hair, ropes, rags etc.
Documents	Charred documents, concealed handwritten messages, currency notes, sealing wax, erasers, handwritten notes, license, signature, travel tickets, bills, pen, photographs etc.
Fire materials	Lighter, stove, fire debris, inflammables, match boxes, explosive substances etc.
Poisons and their empty containers	Capsules, pills, powder, wrapper, seeds, liquor, skin from bite region, drugs, pesticides, insecticides, bottles, containers etc.
Vehicle and their parts	Car, jeep, truck, van, motorcycle, broken or separated parts of bumper, tyre, broken window glass, broken headlights, number plate, grease, engine and chassis no. etc.
Miscellaneous	Objects which can be potential evidences belonging to the offender like comb, shoes, sleepers, vehicle, id cards, cell phone, buttons, clips, broken pieces of ornaments, cigarette butts, bidis, pan masala wrapper, torn pieces of cloth etc.

Nature of samples and their analysis

Biological samples

Forensic sample	Type of analytical information
Dry: Animal part (skin, hair, bone, tooth, skeletal remains, feather, horns, antlers, shell) Plant part: wood fragments, chips, timber, wooded logs	Animal origin or not? Which species? Comparison and matching with reference sample. Feather whether it is plucked or shed for peacock. Age and sex from skeletal, mandible, horns, antlers. Samples need to be collected for identification through molecular analysis for species identification, and from human specimens to establish or reject origin to the culprits.
Wet: Animal parts (meat, blood, saliva, any organ part, bile, musk pods, scats, pellets) Plant parts: leaves, flowers, fruits, roots, seeds	Animal/plant origin or not? Whether inference is possible or not sample needs to be collected for molecular analysis where species identification can be undertaken.
Fibres (loose fibres found at SoC, nearby carcass, suspect's clothes, adhering to vehicles)	If natural or man-made? Fibre used for poaching or extraction? If the fibre in question belong to the crime scene or not?
Tobacco *(beedies, zarda,* cigarettes)	Identification of tobacco leaves. Saliva on articles used by culprits can be used for molecular analysis to establish or reject the common source of origin and to link it within the culprit.
Pollen grains (adhering to cloths of suspect, floor, surrounding flora)	Identification of source of pollen. Comparison to confirm the common source of origin.
Live or dead insects and larvae (maggots)	Identification to determine time since death.
Liquid (poisons, oils)	Collection in vials and sealed, for identification of origin, animal/plant or synthetic.

Toxicological

Forensic sample	Type of analytical information
Viscera, body fluid, blood, stomach wash	Detect presence of any poison/drug/other toxic substances and nature of poison: natural or synthetic.
Bone's ash	Origin of bone ash? If any metallic poison is detected? And nature of metallic toxin/poison?
Vessels/utensils/containers/ Wrappers/empty bottle	If any poison/drug/ other toxin is detected? If yes, nature of poison/toxin.
Poisoned arrows, weapons	Possible origin (makers, keepers) of such weapons? Origin of poison: natural or synthetic?
Plant materials (leaves, bark, roots, seeds, latex, sap)	If plant poison is detected?

Weapon/Firearm samples:

Forensic sample	Type of analytical information
Firearms	If it is country made or company made? If so, what bore or calibre? Make and model? And comes under arms act or not? If it is prone to accidental discharge? What is its effective range? Gunpowder used? Presence of any erased markings to manipulate the original markings?
Bullets, pellet, and wads	Of what calibre? If the bullet was really fired? Fired from a country made or company made firearm? How many were fired? Type of gunpowder used to propel pellets and wads? Shot size number?
Ammunition cartridge/ empty cartridge	What calibre or bore? Shot size number? Live or not? Through which weapon can it be fired? If reloaded or not? Is this type of weapon recorded in the nearby villages? If company or country made? What could be the source of the weapon? Type of gunpowder used?
Skin pieces containing holes	Number of firearm used? Number of shots fired? Range of firing? If the holes are entry/exit/ricochet by one bullet or not?
Post-mortem report	Range of fire? Angle of fire? Number of fired shots/bullets? Angle of fire? Causation of death, poisoning, electrocution etc.
Traps and snares	What could be the weapon? Local made or company? Material used to make the same, traditional knowledge of making the same

Physical

Forensic sample	Type of analytical information
Soil, mud, dust, debris	If the soil sample has origin from the same location of SoC?
Manipulated or erased on vehicles, firearms etc.	To decipher the original numbers.
Tool marks on SoC (bark of trees, carcass etc.)	To examine type of tool used and investigate if questioned tool marks match the suspected?
Footprints, shoe print, Tyre marks, Drag marks, skid marks, struggle marks on the carcass, Animal foot marks	If long trails of suspected footprints/shoeprints are available and can match to the SoC? If crime was committed with the use of a vehicle, then the pattern of tyre print can be used for matches with the suspected print? Animal footprints to confirm species.
Seals, counterfeit currency, paper, ink, documents torn, charred, scribbling, etc.	If the suspected/questioned documents are counterfeit? To establish the authorship with the suspect. To decipher the original ones.

DIGITAL EVIDENCE

Digital evidence certificate

The section 65B of Indian Evidence Act deals with the admissibility of electronic records as evidence in the court of law. The act defines a certificate for any proceedings where it is desired to give a statement in evidence by virtue of this section. The certificate involves identifying the electronic record containing the statement and describing the manner in which it was produced; giving such particulars of any device involved in the production of that electronic record as may be appropriate for the purpose of showing that the electronic record was produced by a computer; dealing with any of the matters to which the conditions mentioned in sub-section (2) of the act relate, and purporting to be signed by a person occupying a responsible official position in relation to the operation of the relevant device or the management of the relevant activities (whichever is appropriate) shall be evidence of any matter stated in the certificate; and for the purposes of this sub-section it shall be sufficient for a matter to be stated to the best of the knowledge and belief of the person stating it.

Collection and handling of digital evidences

Types of digital evidence:

Section 2(1)(t) in The Information Technology Act, 2000 defines "electronic record" as data, record or data generated, image or sound stored, received, or sent in an electronic form or microfilm or computer generated micro fiche.

The IT act defines section 5 has the following definition for digital evidences:

1. Section 5 (ha): "Communication device": Cell phones, personal digital assistance or combination of both or any other device used to communicate, send or transmit any text, video, audio or image.
2. Section 5(i): "Computer": Electronic, magnetic, optical or other high-speed data processing device or system which performs logical, arithmetic and memory functions by manipulations of electronic, magnetic or optical impulses, and includes all input, output, processing, storage, computer software or communication facilities which are connected or related to the computer in a computer system or computer network;
3. Section 5(k): "Computer resource": Computer, computer system, computer network, data, computer data base or software.

4. Section 5(l): "Computer system": A device or collection of devices, including input and output support devices and excluding calculators which are not programmable and capable of being used in conjunction with external files which contain computer programmes, electronic instructions, input data and output data that performs logic, arithmetic, data storage and retrieval, communication control and other functions.

Example: Computers, CD's, DVD's, hard drives, digital cameras, memory cards, SIM cards, communication devices like cell phones, tablets, laptops, cordless phones, fax machines and others like answering machines, caller-ID, scanners, printers and photo copiers, CCTV devices.

Requirements: CD/DVD cases, Faraday bag for communication and wireless devices, box for pen drives and storage drive, Antistatic bags, Non-magnetic tools for securing evidences, packaging supply.

Points to remember

1. Digital evidences should be subjected to limited handling and to prevent contamination, since some evidence material would possibly be analyzed for non-digital evidence material, such as fingerprints and DNA evidence.
2. Digital evidence should be documented, labelled, photographed, and sealed through the standard operative procedures of most non-digital evidences.
3. Digital evidences should be stored in antistatic bags for safe keeping evidence material.
4. Photograph and document the evidence at their current state at the scene, whether on or off, unless there is a risk of loss of data.
5. Make sure all open documents and work on the device is secures, documented, and photographed prior to turning off the device.
6. Do not start a switched off device at the scene.
7. Do not place digital evidences near excess heat or exposed to sunlight, as it can damage them
8. Evidences should not be placed near magnetic devices to prevent damage to the evidence.

Digital evidence collection

1. Ensuring no evidence is lost on the running device, turn off the network connections and modem at the scene of crime at the earliest.
2. Ensuring no evidence is lost on the running device, like printer, fax, open screen, disconnect the switched off devices from power supply and remove batteries from laptop, mobile devices, and other battery operated devices.
3. Photograph the display screen of open mobile devices and try to ensure it remains charged until analyzed by an expert.
4. Collect chargers of the seized devices, if possible.
5. Remove the power cord from the device first and not the socket.
6. Remove the hard disk from the device and document, tag and photograph the evidence record information on the company, model, and serial number.
7. Document, tag and photograph the identified digital evidence, separately document, and photograph the components connected to a system.
8. Place wireless devices in the faraday bag.
9. Label each component of the computer system and wires/cables and related outlets with details of their connection ports and attachment points to the system.
10. Photograph the attachment points and back of the system prior to detaching or dismantling the device to assist in recreating the device during analysis.
11. Secure the CD/DVD outlets of the system.
12. In case of multiple systems, all the components of a single system collected as evidence should be grouped together through marking or placing them together.
13. Ensure the evidences are packed securely to prevent any damage or loss of data during transport.

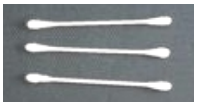
COLLECTION OF EVIDENCE

Collection of evidence is very important step in CSI, as a sample not collected appropriately loses its analytical integrity and does not gives satisfactory results in lab analysis due to possible contamination, degradation, or spoilage. Hence it should be carried out responsibly and in an organized manner. Efforts should be made to be careful about not leaving any individual traces by investigating team at the SoC, as it disturbs the integrity and contaminates the SoC. Wherever wildlife sniffer dogs are in near proximity effort should be made to use the wildlife sniffer dogs.

A field forensic kit can be used to collect evidences at a scene of the crime (Appendix V), while at the division level a full forensic kit is needed for more detailed evidence collection, packaging, and storage.

Requirements

A forensic evidence kit consists of the following equipment's for collection of forensic samples :-

Equipment		Physical evidence	
Brush		Micro traces, dust, fragments of glass, saw dust, wood particles, soil, vegetation etc.	
Paint brush		To weep the constricted area for trace material.	
Sterile Gloves, Mask		To eliminate contamination and ensure safety from crime scene hazards.	
EDTA coated vials and tubes, FTA Whatman paper, syringes		For preserving blood samples (4°C). For blood collection.	
Absolute/ rectified spirit		To keep the equipment free from contamination.	
Scalpel/scissors		Scrape off dried blood, vegetations and visible fibers.	
Spatula		To collect solid mud, partly dried blood, residue of explosive materials, micro traces etc.	
Metal tweezers		To lift hairs, fibers, vegetation, skin pieces etc.	
Plastic tweezers		To lift empty cartridges, bullets, & fragments etc.	

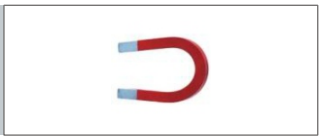
Equipment		Physical evidence	
Magnets		To lift minute iron or steel particles.	
Zip lock pouches/ plastics vials		For packaging various evidences.	
Measuring scales and tapes		For measurement at SoC (distances and photography of evidence).	

Fig 4.2. Tools in a forensic kit
(Source: http://insertmedia.office.microsoft.com)

There are also other necessary equipments needed to document, collect and preserve evidences at the scene of crime that should be provided to the investigating officer.

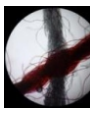
Equipment		Physical evidence	
	Market	To label evidences.	
	Ice-box	For storing collected samples prone to degradation.	
	Magnifying Glass	To magnify minute objects to naked eye.	
	GPS and physical maps	To locate and document SoC, and location of different evidences.	
	Rope/ tape	Cordon-off the crime scene.	
	Tarpaulin	To protect the trace evidences in case of bad weather.	
	Metal detectors	To detect presence of bullet inside the carcass or at the SoC.	

Fig 4.3. Other essential equipments necessary for evidence collection.
(Source: http://insertmedia.office.microsoft.com)

Some of the techniques developed to eliminate potential contamination or damage to evidences and widely used for collection of potential evidences are :-

A. Handpicking:

It is the simplest and widely adapted method of evidence collection and has the advantage of establishing the exact location of evidence and needs no further course of searching for evidences visible from naked eyes. During examination of carcass at SoC the primary focus should be on the collection of gross and microscopic evidences that can be collected by hand with gloves or ideally, tweezers. Large evidences (portable) shall also be collected. Utmost caution shall be given to avoid contamination by human error or cross contamination by lack of proper packaging of potential evidences.

(Source: http://insertmedia.office.microsoft.com)

B. Swabbing:

Mostly minute particles which cannot be handpicked are collected with dry swabs and fibrous swabs collect the particulate matters very effectively. Generally, body fluids are collected by distilled/injection water moist swabs. Cotton threads/ small cotton gauge are preferred to collect the body fluids by medical officer, as dilution and separation becomes easy at later stages. Collected material can be easily separated by the swab on the microscopic slides in the laboratory.

(Source: http://insertmedia.office.microsoft.com)

C. Tape lifting:

One of the most reliable technique for collection of micro traces from surfaces like garments, carpets, furniture, floor surface, motor vehicle etc. It should be performed before removing the carcass. In this technique a transparent, adhesive tape is applied on the surface with possible micro traces (eg. latent fingerprints). Evidence material gets attached to the adhesive of tape surface. Now, it is placed over a clean transparent glass or slide, which is further packed with proper labels for lab analysis. Limited evidentiary material shall be placed on the tape to avoid any overlapping of evidences. Any clothing, larger objects, animal skins shall always be examined in parts such as front, rear, side portions tapering ends etc. The collected evidences are microscopically examined in the lab.

(Source: http://insertmedia.office.microsoft.com)

D. Sweeping:

This technique is used for collection of evidence from large or open area where it can be found from one place to other. It is very useful for examination of an open SoC, car, bus, garage, shop where high amount of debris may be found on the floor, nearby vicinity of the evidence. To avoid cross contamination different brushes can be used for different places. Also, brooms, dust pans are required along with paint brushes. The swept matter is likely to contain trace materials, which can be analyzed for their identification and source. Generally, it should be done after the handpicking and other sample collection has been completed.

(Source: http://insertmedia.office.microsoft.com)

E. Vacuuming:

Sometimes the potential micro evidences are not visible to naked eyes and found at hidden spots (under the bushes, under the seat of vehicle etc.) hence, collection of micro traces from difficult to reach or hidden spots can be done by vacuuming. A special nozzle is attached to a normal vacuum cleaner, so the deposited material can be easily collected from the perforated plates in the vacuum cleaner. The nozzle and the suction ends shall be always cleaned and washed with warm water, let dry or in the case of remote areas cleaned with bottle brush before and after every use. Also, as a control sample, a blank vacuuming shall be done on filter paper before the actual sampling to be used in the examination.

(Source: http://insertmedia.office.microsoft.com)

Do's and Don'ts of sample collection

- Evidences which are likely to degrade faster by weather, wind, rain, animals, human vehicle movements shall be collected prior.
- Bloodstains and other microscopic trace evidences shall be collected before the scene is powered for fingerprint search to avoid contamination.
- Polished surfaces shall be examined first in case of indoor crime scene to locate footprints/shoe-prints in oblique light source.
- All the visible fibers, hairs, and other trace material visible by naked eyes shall be collected before sweeping, vacuuming, swabbing or tape lifting to avoid contamination.
- It is always better to collect little excess quantity of samples than originally required for examination where chances of sample degradation are more.
- The I.O. and team shall enter the SoC after wearing all the personal protective clothing (PPE) only, to avoid possible human contamination.
- Micro traces like hair, fibers, paper bits, glass pieces, documents, empty cartridges shall always be lifted by rubber tipped forceps
- Clean spatula, probe shall be used each time to handle a different evidence or biological material like blood, semen, body fluids, etc.
- Glass containers are suitable for collection of corrosive liquids like acid or alkali or any chemicals.
- Glasses, bottles, utensils may have latent fingerprints on them. Hence, shall be only handled after wearing gloves by touching fingers at top and bottom only.
- Firearms shall be lifted with the finger held at the tip of the butt and barrel and not be picked up by putting objects into the barrel; it can alter markings on the inner surface of barrel.
- Weapon with sharp edges like knife, axe, and arrows shall be handled with the tip of index finger to maintain the integrity of evidence.
- Wet or fresh bloodstains or blood shall not be packaged in airtight container to avoid spoilage due to putrefaction.
- Fired bullets, empty cartridges, wads, pellets shall be lifted by rubber tip forceps.
- The micro trace evidences which are very little and difficult to spot such as pollen, saw-dust, metal dust, GSR shall be collected with a soft tip brush on a clean white paper to enhance the visibility.
- Explosives and live bombs shall never be handled until clearance of bomb disposal squad (BDS) is received.

PRESERVATION OF EVIDENCES

While collecting, packaging, or transporting the physical evidences there are always chances for contamination of potential evidences, which may affect the scientific analysis negatively. The officer in charge of the crime scene shall take all precautionary measures to preserve the potential physical evidences from:

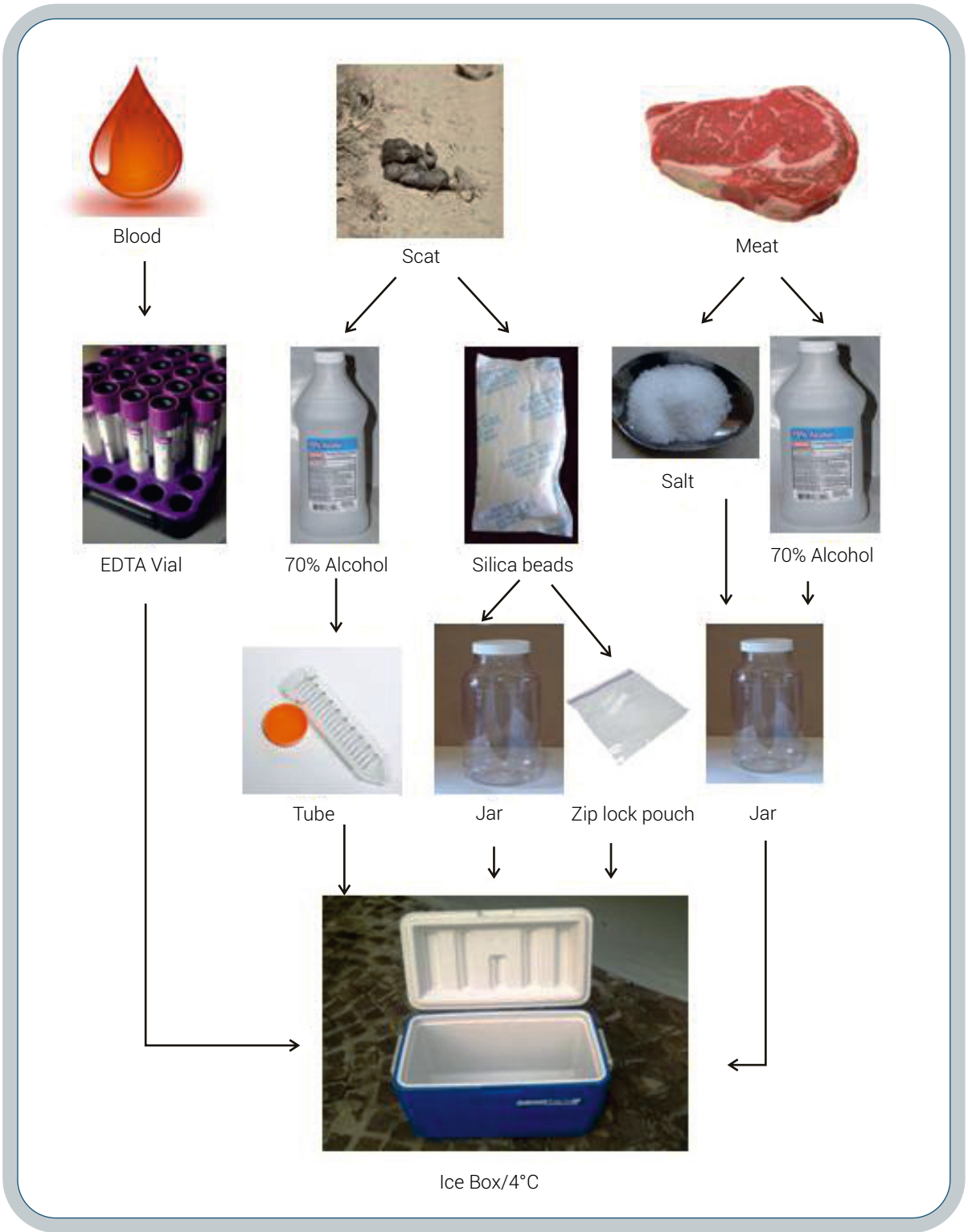


Fig 4.4. Preservation of evidences
(Source: http://insertmedia.office.microsoft.com)

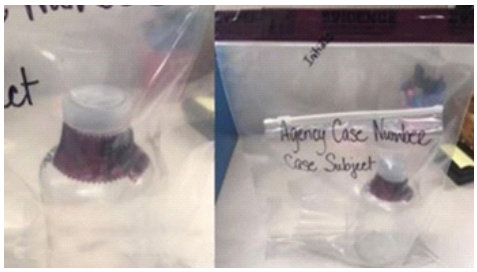
Loss: Micro traces like small hairs, vegetations, paint flakes, trace evidences may be lost during lifting or packaging. Even after proper packaging there are chances that such fine micro traces can slip through the corners of envelopes. Also, in case of volatile liquids like petrol, kerosene, diesel, alcohol may evaporate easily if the containers are not airtight and impermeable.

i. Place trace evidence in a paper bindle

ii. Fold bindle & secure with tape.

iii. Place bindle in envelope, Seal with tape

iv. Use small and sealable packages for storing trace evidence to prevent loss



v. Liquid evidence are packed in a spill-proof containers, the cap is sealed, and the container is placed in leak proof packaging to prevent spillage

Fig 4.5. Preventing loss of evidence
(Source: Evidence Packaging Manual, South Dakota Forensic Laboratory)

Contamination: Even a small distraction at SoC while collecting or packaging can lead to contamination of evidences. If the evidences are not properly packed in appropriate packaging, then it may get contaminated by invasion of foreign matter into it. The level of contamination and its risks are somewhere related to the nature of crime scene and number of individuals having access to it, the more people enter the crime scene the more are chances for contamination. Also, in outdoor crime scenes wind and rain can be the factors for evidence contamination.

Fig 4.6. Various measures (i-vi) to prevent contamination of evidence
(Source: i-iii, v-viEvidence Packaging Manual, South Dakota Forensic Laboratory. iv http://insertmedia.office.microsoft.com)

Tampering:

If the investigating officers fail to pack the potential evidences securely, there are chances of it getting destroyed. Hence, they shall not be left unattended. There should be proper wax seals to avoid any chances of tampering during chain of custody.

Packaging of evidences

Packaging, Sealing, labeling and signatures of I.O. shall be done at the crime scene to avoid tampering and contamination of evidence. A single individual officer can be identified before the search for undertaking the same. While, packaging any evidence it shall be taken care that the investigating team shall not contaminate the evidence, hence personal protective clothing at a crime scene is important. Use new and sterilized containers to prevent contamination and preserve evidential value. Details of packaging instructions are given in Appendix VI.

Table: A summarized table for packing and preservation of evidences based on their state of matter

Evidence	Examples	Preserving	Packaging
Solid: dry	Bones, canines/tooth, tusks, claws, nails, hair feather, and antler/horn	Preserve in a dry cloth	Pack in a clean cloth after labelling. And transport in a cotton padded wooden box
	Firearms/weapon used, cartridges, traps, snares, nets, clothing, and shoes	Holding with a clean cloth or paper	
	Small fragments of glass, metal, dried lumps of soil, wood	Preserve by lifting with metal tweezers to avoid contamination	Pack each evidence separately in zip lock pouches, rigid containers, phials.
	Scraped off dried bloodstains, cigarette butts and other articles	Holding with a clean cloth or paper	
Solid: Wet	Fresh sample of scat, pellets	Lift the fresh scat sample by tweezers carefully, avoiding damage to epithelial tissue lining.	Pack after air drying in a zip lock pouch along with perforated packet of a silica gel into it.
	Skin tissues, soft bone tissues, viscera samples, fibres, leaves, roots	Preserve the sample completely covered in common normal saline (0.85% of NaCl)/ ethanol/ alcohol/ silica gel/common salt.	Pack in a vials or transparent container.
	Any solid physical evidence which is moist	Preserve by air drying in order to avoid microbial growth.	Pack after air drying in zip lock pouches or paper bags according to the nature of evidences
Liquid	Blood/body fluid	Preservation by collection in EDTA coated vials and store at 4°C if need to preserve further during long transportations. OR FTA Whatman Filter paper the sample can be taken directly.	Pack in rigid plastic EDTA coated vials after labelling. After drying the FTA Whatman card, label the card and put it in a zip lock bag.
	Saliva	Preserve the saliva sample by air drying before packaging	Pack the Q-tips in a rigid plastic vial or tube and label it.
	Oils, poison, raisins	Preserve it in a leak proof container and seal it from any contamination	If container is found at SoC with or without contents in it, will be packaged in its original condition and labelled.

SEALING, MARKING AND LABELING

It is of utmost importance to seal all the containers, packets, bags, boxes, envelops, vials and phials with proper marking and labels, after that sealed with a wax stamp by I.O. followed by his signatures.

Date:	Time:	Collectors Name:
Place of collection: details, as that written in the Offense report Name of the sample collected: (e.g.: blood, tissue, hair, feather, and tooth) Description: (for e.g.: blood from carcass; tissue from skin, blood stain cloth) **I.O. Sign**		

i. Packaging of evidence with safety labels to prevent accident

ii. Sealing of all open ends of the package to prevent tampering

iii. Labelling along with seal of investigator is place on the evidence package

Fig 4.6. Packaging (i), sealing (ii) and labelling (iii) of evidences
(Source: i Guidelines for the collection, packaging and submission of forensic evidence, Onondaga County Health Department (2014);iiSirchie Fingerprint Laboratories, Inc., Youngsville, NC, www.sirchie.com; iii http://insertmedia.office.microsoft.com)

Evidence stained with body fluid such as blood, saliva etc. shall be marked as "biological hazard" label and items that are dangerous such as poisons shall be marked with "chemical hazard" label. Boxes containing delicate items shall be marked "handle with care".

All the items shall be packed in a manner that it is not possible to open the item without breaking its seal to avoid tampering. All the knots and possible openings shall be sealed with legible impressions.

The seal can be official or individual to mention chain of custody, should not be impression of common objects such as key, coin or button etc. the sample of seal used shall always be sent with both sealing wax and stamp pad ink impressions along with the forwarding letter.

Hence, all the potential samples should be collected, packaged, preserved, marked, and sealed with appropriate labels and then sent to the laboratory without delay.

REPURCUSSION OF INCORRECT PACKAGING, LABELLING

There are two types of repercussion

i. Legal

Evidence if not packed properly will not be admissible in the court of law, while defense can use this to raise suspicion of tampering and have a negative bearing on the case/judgement.

Evidence if not correctly labelled may arise doubt and have a negative bearing on the case/judgement.

ii. Forensic

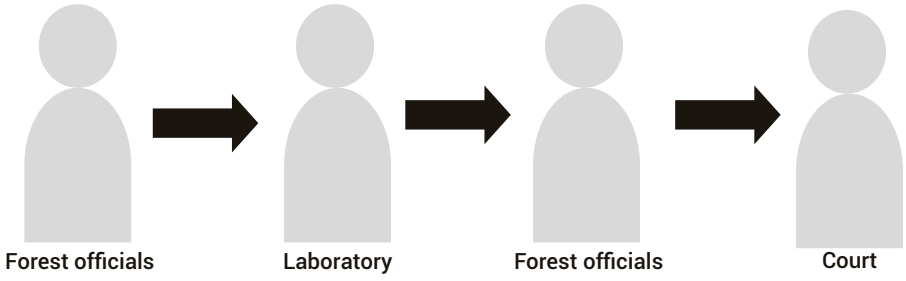
Samples if not packed carefully and with precaution may become putrid and not be suitable for undertaking the DNA analysis.

Care must be taken while collecting the samples to avoid contamination which can cause the sample unsuitable for forensic analysis.

Evidence collected such as fingerprints may be lost inside the plastic.

CHAIN OF CUSTODY

"The chain of custody at a crime scene is both a process and a document". Process as in, while performing the crime scene examination every step needs to be taken so that chain of custody does not break. Hence, chain of custody starts before crime scene examination itself. After the happening of crime every step taken determines if the chain of custody was maintained, because apart from authenticity and identity of the evidence, through its movement from crime scene till the court, it shows how the chain of custody was maintained as every step is documented such as, description of evidence including submitting agency and case witnesses, sign and dates of receiving and dispatch of document and by whom? Signifying the possession and control of the evidence, set of signatures of person giving up and accepting chain of custody. This record provides help in tracing information of who has custody of evidence during a said amount of time.



Forest officials	Laboratory	Forest officials	Court
✓ Initials and sign of every one that handles the evidence			
✓ Identification number			
✓ Forwarding letter			
✓ Packaging integrity with seals			

Fig 4.7. Maintaining Chain of Custody of evidences

Documentations required for a proper chain of custody are as follows

- Recovered evidence labeled with name (initials) and signature of the I.O. with date, time and place of recovery.
- Proper packaging of evidence with authorized seal and impressions, depending upon the nature of evidence and requirement to preserve it.
- It should be evident from the way of packaging that the evidence cannot be opened without tampering the seal from any corner of the packaging. Only then it will be accepted by the laboratory personnel.
- Transportation of the evidence to the laboratory accompanied by a forwarding letter which has description of the evidence, number of evidences submitted, case description and nature of analysis required with date, time and place on which evidence was recovered along with the name and signature of the I.O. associated with the evidence.
- Then the laboratory assigns its own case and item number for each submitted evidence mostly this is done through physical writing.
- When a container is opened and evidence is examined by the laboratory personnel, each piece of evidence is marked with laboratory's case and item number with date and time the container was opened with the initials or signatures by whom.
- After the examination is complete, the evidence is resealed in a tamper-evident manner and the personnel who analyzed it puts her/is initials with date and time on the package in such a way that it will be difficult to reopen or tamper the evidence without leaving evidences of tampering.
- If the same evidence is examined by more than one analyst, then each person who handles the evidence shall use proper markings to identify it.

DISPATCHING OF EXHIBITS

Before dispatching the evidences to the concerned laboratory for forensic examination, the I.O. along with the letter must include the followings:

i. Memo number and date, case number and under section.
ii. Brief history of the case.
iii. Details of exhibits, how, when, where they were recovered and by whom.
iv. Marking and labeling on exhibits and Number of seals on each package. Packaging should be done in transparent packaging material.
v. Details about content of the package.
vi. Name and nature of preservative, if used.
vii. Control or reference sample if sent.
viii. Dangerous and fragile items marked with potential hazard markings, biological or chemical hazards and handle with care markings.
ix. Provide clear questions for answers e.g.: if you want to know the species just ask what species is this?
x. Always send the sample seals and markings of stamp pad used or any other markings.
xi. Mention legal time frame for production of reports in the court.
xii. Mention name and rank of the messenger.
xiii. Attach an authority letter for opening, cutting, and breaking of exhibits for examination and analysis.
xiv. Attach all the documents related with the case such as offense report, panchnama, seizure reports, and post-mortem reports.

Session 5: Field setup: Investigating a wildlife crime scene

Session Objectives:
By the end of the session the participants will develop

- A hands-on knowledge about wildlife crime scene management and investigation.

Guiding Resource: Based on the expertise of the trainer. For virtual sessions: Special slides/movie clips.

Lesson plans:

- Based on the number of participants two to three wildlife crime scenes scenarios will be created before the start of the session.
- Likely scenario can be:
  - Animal poaching case
  - Electrocution/poisoning case
  - Wildlife specimen being traded/ sold
- Participants will be provided the field investigation kit which will include following.
  - Field forensic kit
  - Notepad and pen
- Participants will need to locate the wildlife crime scene and they will be asked to investigate crime scene, prepare necessary document as per legal conformity for submission and presentation.

Session 6: Presentation and evaluation of the field findings

Session Objectives:
By the end of the session the participants will develop a hands-on expertise on filling a Wildlife Offense Report, cataloging, and maintaining chain of custody of evidence and forensic sample.
Guiding Resource: Based on the tutelage in the earlier sessions.

Lesson plans:

- Based on the number of the number of groups each group will have to present the case to a panel of experts. The evidence and wildlife offense report (WLOR) needs to be presented by a member of the group.
- Participants will be provided investigation manual where drafts of the wildlife offense report are available.
- Participants will need to present the documents as per the legal conformity.
- Participants will be evaluated based on the documents and presentation of the case.

Session 7: Identification and differentiation of important wildlife products in trade

Objectives:

By the end of the session the participants will be able to differentiate the following:

- Claws from different species like tigers, leopards, small cats,
- Canines of different species like Tigers, Leopards, Lions,
- Tusks (African and Asian Elephants, Walrus, Wild boar etc.)
- Horns, Antlers,
- Skins, Fur, Hair
- Timber, Shells, Corals, etc
- Counterfeit products of ivory, canine, claw, skin, hair, horn

Guiding Resource:

- WCCB species in trade manual
- Samples used by WCCB for training purpose.

Lesson plans:

- Participants will be presented with the articles/ presentation and be given important clues on how to differentiate species and to identify genuine or counterfeit value-added products, for ivory, canine, claws, skins, horns, and marine species.
- For virtual sessions specialized PPTs will be prepared.

POST TRAINING ASSESSMENT:

Post training assessments will be conducted to check the level of change in the knowledge and skill of the participation. This can be in the form of a verbal Q&A session or a written assessment. This will help to understand the outcome of the training.

Appendix I:

Wildlife forensics labs in India

There are many dedicated institutions and laboratories working on wildlife forensic in India. They have been established to facilitate the knowledge and science to the enforcement agencies.

Wildlife Institute of India (WII) a premier institute under the MoEFCC started the Forensic cell in early 1990's. Located in Dehradun, the institute forayed and established the Forensic cell with morphological identification and then later developed molecular techniques to identify animal seizures. They have worked towards development of wildlife forensic protocols; identifications of derivatives encountered in wildlife trade and established a collection of wildlife reference samples. The cell also organizes training and workshops on wildlife crime investigation and evidence collection for wildlife crime related enforcement agencies. They are also involved in research focused on conservation and evolutionary genetics of many Indian wildlife species.

Contact: Post Box #18, Chandrabani, Dehradun – 248001, Uttarakhand
E-mail: wii@wii.gov.in, Telephone: +91 135 2640114 - 15, 2646100, Fax: +91 135 2640117

Laboratory for the Conservation of Endangered Species (LaCONES), Centre for Cellular and Molecular Biology in Hyderabad, Telangana; established in 2007 uses biotechnological tools and techniques with the aim of species protection, in situ habitat preservation, and ex situ conservation. LaCONES have developed universal DNA based markers for identification of wild animals from parts and remains of their derivatives. It has a DNA bank of more than 250 wildlife using molecular marker derived data. LaCONES had played an important role in identification of species involved in illegal wildlife trade and have provided reports to law enforcement agencies especially for tigers. They have a SOP for DNA techniques in Wildlife Forensics.

Contact: 162 Pillar, PVNR Expressway, Attapur Ring Road, Hyderguda, Hyderabad 500 048
Office: +91-40-24006441/43/40, Fax: +91-40-24006441, Email: lacones@ccmb.res.in

Zoological Survey of India (ZSI), Kolkata was established in 1916 and has aided in identifying wildlife species for law enforcement agencies. ZSI is one of the government authorized organization for species identification of derivatives seized in wildlife crimes. ZSI has provided services of species identification to law enforcement officials in wildlife crime cases. ZSI has organized workshops for officials to learn about latest tools and techniques

Contact: Zoological Survey of India, Prani Vigyan Bhawan, M-Block, New Alipore, Kolkata - 700053 (India),
Tel: Director - 033-24986820 / FAX: 033-24006893,

Sálim Ali Centre for Ornithology and Natural History (SACON) established the National Avian Forensic Laboratory in 2018 to work with wildlife forensics evidence belonging to avian species. The laboratory deals with samples of blood, tissue, meat, skin, eggs, claws, bones, and feather encountered as evidences in illegal trade and trafficking. The laboratory performs DNA analysis and analysis of structure of feathers to identify species for law enforcement officials. They have facilities for species identification, sex identification and individual identification as well as training in sample collection.

Contact: Anaikatty (POST), Coimbatore-641108, Tamil Nadu, India. Phone: 0422-2203100, 109
Email: salimalicentre@gmail.com

List of WCCB Offices

- **Wildlife Crime Control Bureau**
  Trikoot-1, Second floor, Bhikaji Cama Place,
  New Delhi-110066
  Tel: 011-26182484; Fax: 011- 26160751;
  Email: addldir-wccb@gov.in; Website: www.wccb.gov.in

- **Regional Dy. Director**
  Northern Region (NR)
  Wildlife Crime Control Bureau
  Second Floor, Trikoot-1
  Bhikaji Cama Place
  New Delhi- 110066
  Email: rddnr@wccb.gov.in; Tel: 011-26713181

- **Regional Dy. Director**
  Eastern Region (ER)
  Wildlife Crime Control Bureau
  Nizam Palace, 2nd MSO Building
  6th Floor, A.J.C. Bose Road
  Kolkata- 700020
  Email: rdder@wccb.gov.in; Tel: 033- 22878698

- **Regional Dy. Director**
  Central Region (CR)
  Wildlife Crime Control Bureau
  T.F.R.I Campus, R.F.R.C Mandala Road
  Jabalpur-482021
  Email: rddcr@wccb.gov.in; Tel: +91-7612840689

- **Regional Dy. Director**
  Western Region (WR)
  Wildlife Crime Control Bureau
  Room no. A-501, Kendriya Sadan,
  Sector-10, CBD Belapur, Navi Mumbai, Maharashtra
  Email: rddwr@wccb.gov.in; Tel: 022-27561888

- **Regional Dy. Director**
  Southern Region (SR)
  Wildlife Crime Control Bureau
  C2A, Rajaji Bhaban, Besant Nagar,
  Chennai- 600090
  Email: rddsr@wccb.gov.in; Tel: 044-24916747

Appendix II:

General methods for securing the Scene of Crime

- Posting guards around, at the entry and exit points, at extensions of the preliminary crime scene and keep at track of entry/exit of all people/officials at the crime scene.
- Printed tape/rope cordons around the crime scene.
- The strategic placing of vehicles.
- The use of markers, flags, signs to locate potential evidences as these might be hard to spot later especially if the area is affected by light changes (dusk/ mountain shadows). For indoor crime scene, locking rooms or areas within buildings or use external walls of building as barrier to protect SoC and keep a check of entry/exit.
- To establish safe walk areas i.e., a common approach path which will least disturbs the evidences with tape or purposely built raised stepping for entry and exit.
- To avoid the possible route taken by perpetrators as it will have maximum amount of evidences. (If possible, take a circular route rather than rushing towards carcass).
- Re -evaluate the SoC after the preliminary walk through and examination if there is need of additional resources such as metal detector, wildlife sniffer dog additional investigation personnel or special safety equipment for collection of hazardous evidences.
- While, processing the crime scene keep a track of weather conditions. Changing weather can affect the evidence processing priorities. (The shoe prints, paw marks, tyre tracks, wet biological evidences, fingerprints are rapidly destroyed by rain, snow, wind, sunlight). Plastic sheets or tarpaulins shall be used to cover the fragile evidences to avoid the loss of integrity of the sample.

Appendix III:

Various methods to search a wildlife crime scene

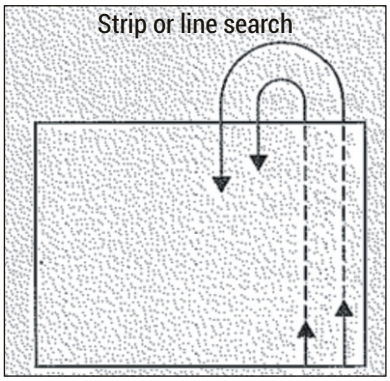
A good search is always planned. Different search styles can be used depending on the type of crime scene.

- In case of indoor crime, the search must be conducted in a definite order i.e. clockwise or anticlockwise movement. In such scenarios the Door is always considered as the starting point, subsequently, movement is done in clockwise or anticlockwise manner around the centre point, at the same time searching the floor, walls, roof, furniture, and windows very carefully.
- When searching indoors and progressing in one direction, the highest point of each wall, furniture etc should be the starting point and best practice is to work from top to down (downward direction). This ensures that if something is dislodged, it is eventually found at a lower point.
- In case of an outdoor crime scene, with a vast and open area, different search techniques can be adopted according to the nature of crime scene. Few of which are as follows-
  i. Lane or strip search
  ii. Spiral search
  iii. Zonal search
  iv. Wheel or radial search
  v. Grid or crosshatch search.

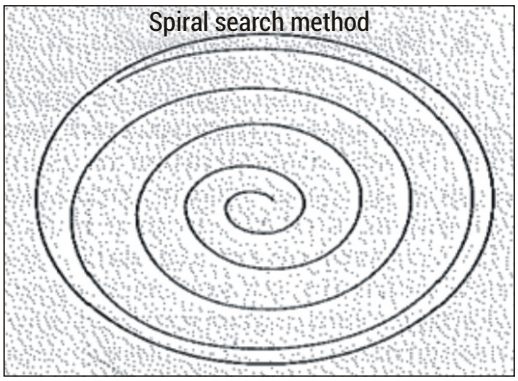
General points to consider :-

- The size of the lane of search shall be approx. the arm's length of the searcher.
- When the search of an area is completed, a marking shall be put as sign indicating completion of search in that area.
- A proper mechanism shall be prepared and discussed for the situations when prioritised potential evidence is found (e.g. Who will collect the evidence, which path will be taken, if other searches shall be put to halt till findings of the particular search?)

Lane or strip search :- in this search pattern whole crime scene is marked into a large rectangle then divided into convenient rectangular or vertical strips/ segments. The search is started from one end of first strip with utmost attention going through each strip till the last point of strip at end.



Source: 2019 Quizlet Inc

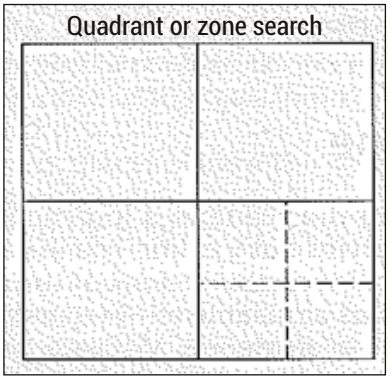


Source: 2019 Quizlet Inc

Spiral search is a spiral pattern of searching crime scene. The SoC is marked as a circle with its central or focal point at the centre. The search is started from the focal point going along the spiral pattern up till the end point of the periphery of the circle. The search can also be done vice versa as per demand of crime scene. The search can be conducted by the investigation in charge alone as well in this method.

Quadrant or Zonal search is the method in which the entire crime scene is marked as a large square and sub divided into adjacent zones as per convenience. Each zone is thoroughly searched by a team member.

Wheel or radial search islike spiral method, where the crime scene is marked in circle but here it is divided into four or eight segments depending upon the size of crime scene. Here, the search starts from the centre to periphery along the radius and can go vice versa as well. This method is suitable for both indoor as well as outdoor crime scenes.



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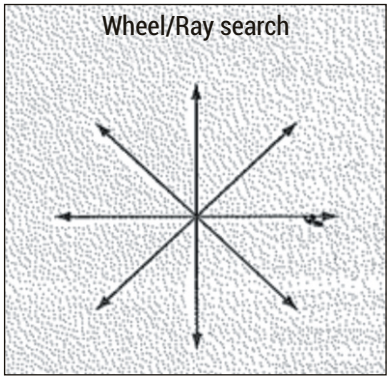
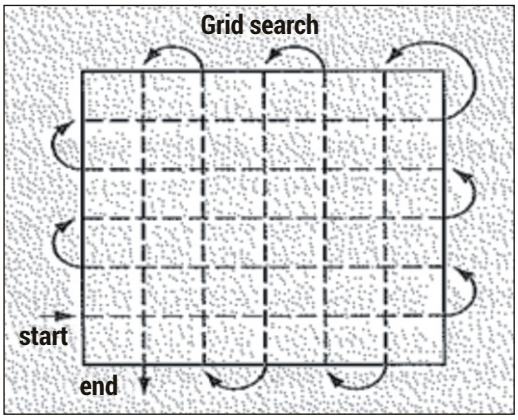


Source: 2019 Quizlet Inc

Grid or crosshatch search is a modified and improvised version of strip method where whole crime scene is marked as a rectangle then divided into horizontal and vertical grids. Every square is examined thoroughly twice at right angle. It is said to be an intensive and effective method of searching.



Source: 2019 Quizlet Inc

Appendix IV:

Various methods of sketching

Coordinate or baseline method:

In this method an object's distance is measured such as the carcass from two fixed points. A baseline is drawn between two fixed points which are known. The baseline can also be a wall or drawn as a mathematical center of a room of which exact dimensions are known. Then measurements of the exhibit are taken from left to right along the item to be plotted. In the figure we can see two fixed objects A, B and 1 and 2 are the evidences which are marked about the transecting baseline. The relative position of various objects is then filled by identifying their positions with reference to their coordinate. When the object is on the baseline, measurements are taken from one of the fixed endpoints to the object. It is to be taken care if the object is on the baseline, measurement shall be done from one of the fixed endpoints to the object. The object is not on the baseline, a straight is to be drawn from the object at a 90-degree angle to the baseline.

When the sketch is ready, mention to write "Not to Scale" prominently outside of the sketch, then update related documentation, such as the legend and notes.

Note: Although accurate measurements were taken, potential courtroom controversies related to those measurements may be avoided by placing the "Not to Scale" disclaimer on the rough sketch.

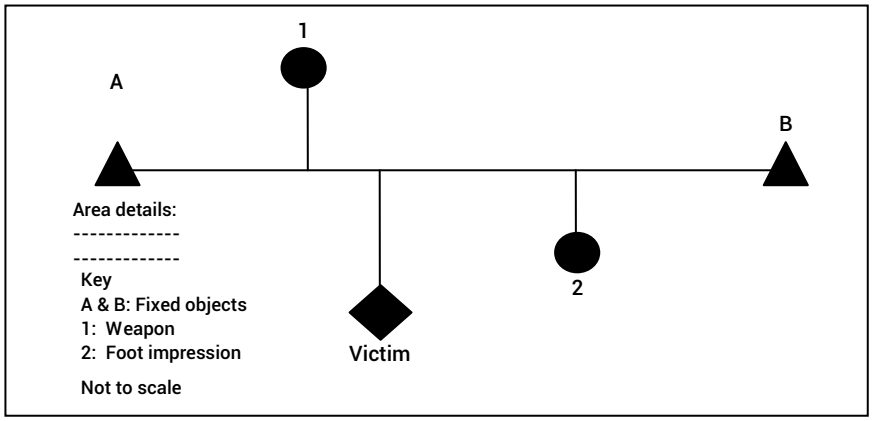


Figure IV a: Coordinated or baseline method

Triangulation method

It is used for outdoor crime scene sketching like forest crime scene, crime scenes around open water bodies like pond, river etc. It is an effective method to be used in the areas where the straight line is lacking. Moreover, it can be used for both indoor and outdoor crime scenes. The measurements required are:

- Base or fixed objects such as a mature tree, fixed pole, heavy rock, side of a wall etc.
- Shortest side of triangle.
- Longest side of triangle.

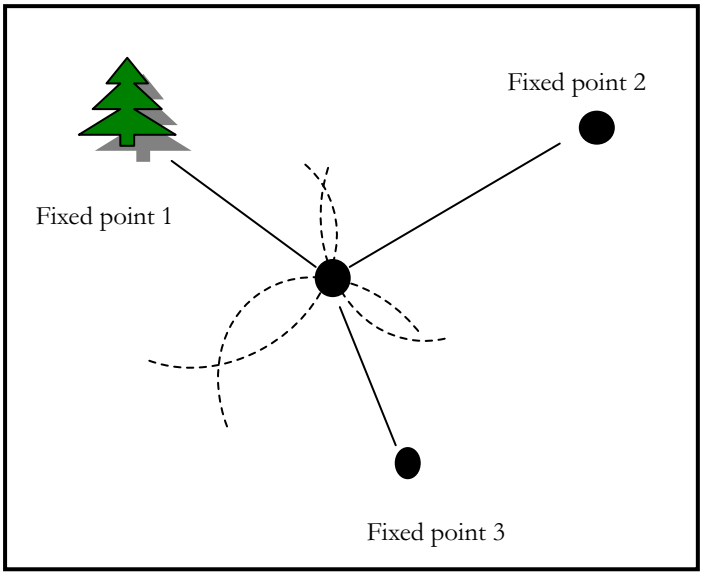


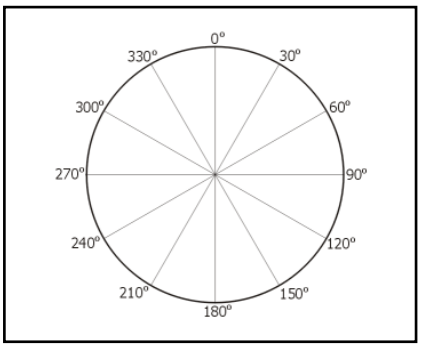
Figure IV b: Accurate map of using triangulation measurements.

Data table for documenting and triangulating location of evidences.

Evidence item	Fixed point 1	Fixed point 2	Fixed point 3
1	x	y	z
2	x2	y2	z2
3	x3	y3	z3

Polar method:

This method is useful in outdoor crime scenes where area is large. Firstly, a focal point is selected which can be a tree, electric pole, heavy rock, pond etc. We can say that it is a mathematical equation where the central point is called the focal point. From this focal point distances and the angle of physical evidences are noted down in a fixed direction. In this way after the processing of the scene a record of traceable data is maintained from where different evidences can also be related or linked to each other.



Also, the mathematical equation can be expressed as:-

$$H1.H2 = S1.S2 \times \frac{D1}{D2}$$

Where H1= S1= shorter stick of one meter
S2=long stick of two meters.
D1= distance between S1 and S2
D2= distance between S1 and the object.

(Source: http://insertmedia.office.microsoft.com)

In this method, shorter stick is fixed at a reasonable distance from the selected focal point (of which height is determined). The longer stick is placed three meters ahead from shorter stick towards the object. Now the object is seen from the top view across the longer stick and the point is demarcated. Now the height of object will be=D1.D2+S1.

Procedure of sketching

It is suggested to prepare a rough or free hand sketch at the crime scene itself which is neat enough to interpret a scale drawing of the final sketch. It is done before making a finalized sketch for the crime scene to avoid any mistakes as it is to be presented in the courtroom. This initial rough sketch serves as an outlined guide for the final sketch.

Next step is to start taking measurements and lay them out on the sketch. For an outdoor crime scene, a line is to be drawn from the fixed objects for taking relative measurements of the evidences in relation to it. The measurements of periphery of SoC shall be added to the baseline with proper directional and angular relationships. The proper position of the carcass and various evidences shall be relatively included within the outer boundaries.

Measurements

- Determine true north with the help of magnetic compass and mention on the top of the plan.
- Excessive precision of the carcass with respect to fixed objects at the SoC shall be skipped to avoid complexities.
- Measurements which are crucial such as tyre marks, skid marks, footprints, pug marks etc. shall be taken twice.

- In the case where long distances are to be measured, Odometer shall be used on an automobile vehicle.
- A reduced area of the crime scene shall be plotted so that it fits on paper.
- If correct relationship of the exhibits present at SoC is desired, then along with the reduced area the measurements shall also be in reduced proportion.
- For convenience of the area used on paper, scale shall be selected by lifting longest dimension with largest as well as convenient scale and units.
- Proper explanation of legends and title shall be given.

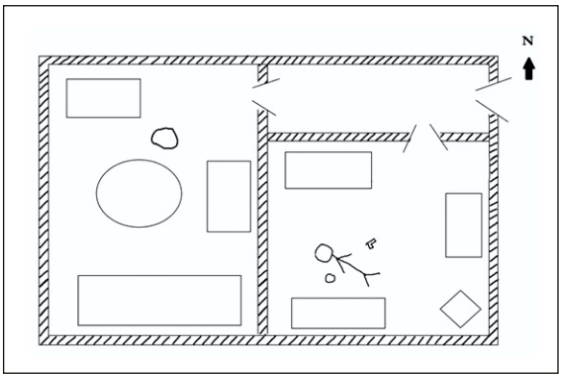


Figure IV c: A free-hand sketch of crime scene

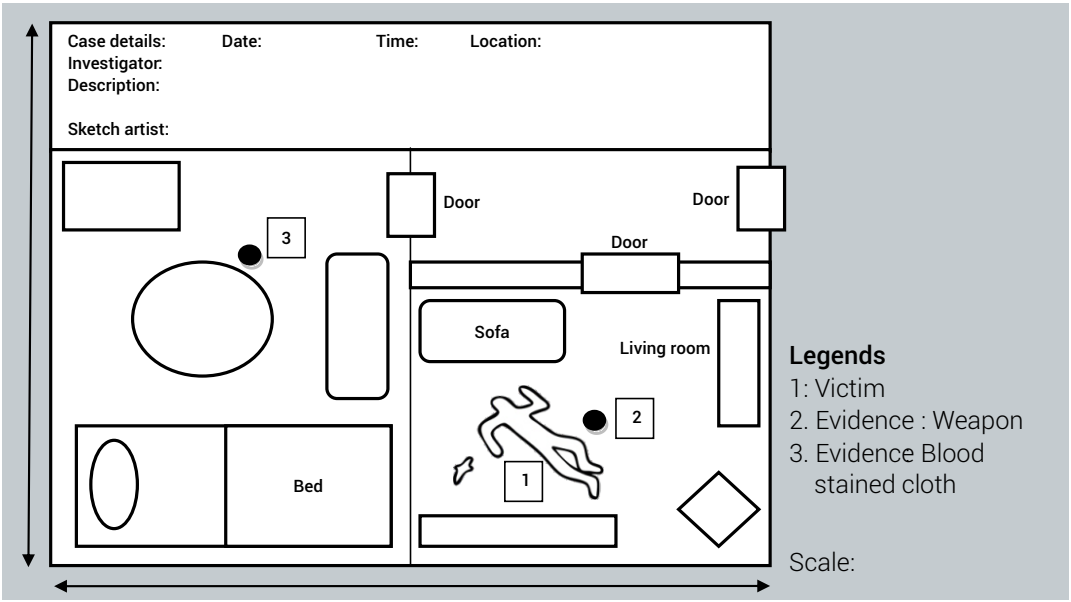


Figure IV d: Rough v/s final sketch of crime scene.

Locating points on the sketch

Points are located on the sketch in following ways:

a) **Rectangular coordinate.** It is most common way of locating points on the sketch. In this, the point is located at right angle from north and west walls of a set imaginary rectangle. This method is useful for indoor crime scene sketching in the case of rectangular or square rooms and inside the right-angle measurements from the fixed points or walls.

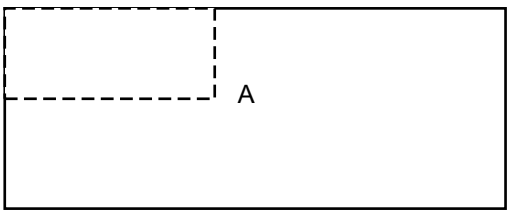


Figure IV e i: Rectangle coordinate

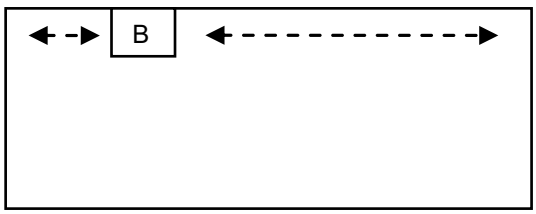


Figure IV e ii: Measuring with straight line

b) **Straight line measurements :-** Such kinds of measurements are used to locate the objects at the crime scene taken from the set fixed points from either side of the exhibits to be located on the sketch.

c) **Transect coordinate:** In this method the entire crime scene is divided by a cross line from convenient points such as A to B and distance of the cross line is measured and noted from the base line. Now various exhibits at the crime scene will be plotted by measuring their distance from cross line. The distance from base line to points a, b, c will be now automatically shown by the cross line and the distances from points 1,2 and 3 will be measured at a right angle to the baseline.

In the cases of outdoor crime scene which are irregular and large in area, where it is difficult to locate a proper baseline due to challenging terrains such as hilly areas and dense forests, this method proves to be useful. Also, it is helpful in the cases of mass disasters such as plane crashes on challenging terrains, crime scenes in dense forest areas where it is difficult to locate the carcass or in the cases of secondary extensions of the crime scene.

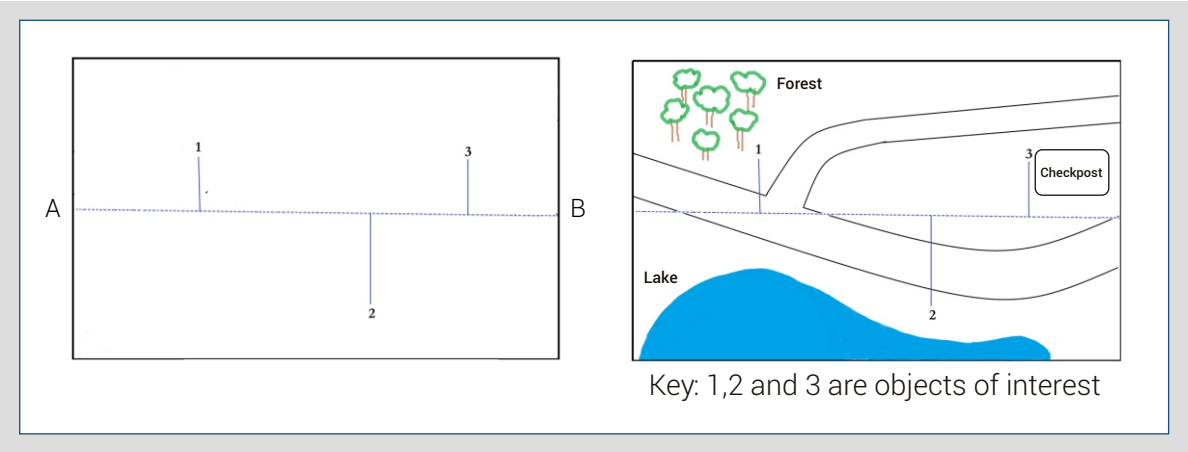


Figure IV f. Coordinates plotted on a transecting baseline

d) **Triangulation:** In this method the measurements are taken from two fixed points to the exhibits of the evidences, hence an imaginary triangle can be projected. It is an accurate method used for both indoor and outdoor crime scenes, especially in the terrains where it is difficult to locate straight lines.

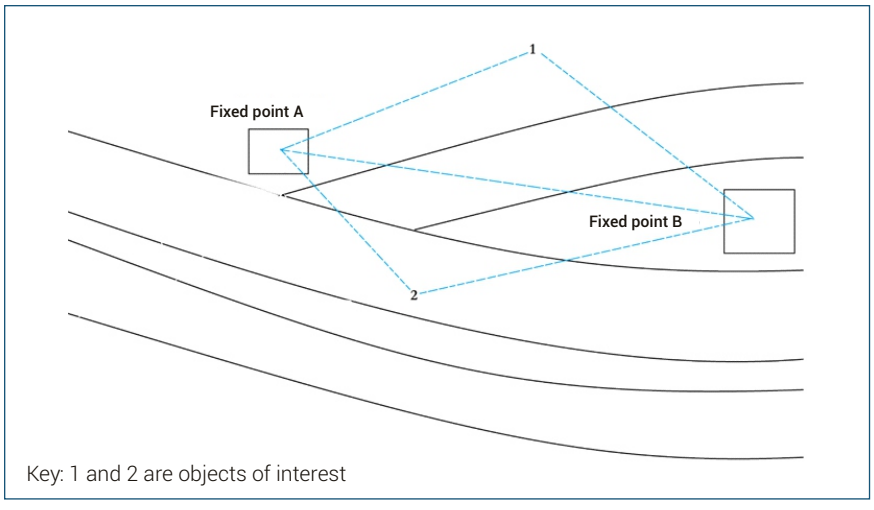


Figure IV g. Plotting coordinates by triangulation method

Appendix V:

Field Forensic Kit

S. No.	Items in one kit	Quantity	Units
1	Surgical Gloves	2	Pairs
2	EDTA vial (5 ml) with labels	5	Piece
3	Screw capped vial (50 ml) with labels	5	Piece
4	Scalpel Handle	1	Piece
5	Surgical Blade	4	Piece
6	Injection syringe with needle (5 ml)	1	Piece
7	Forceps: pointed tips	1	Piece
8	Forceps: blunt tips	1	Piece
9	Scissors (4 inch)	1	Piece
10	Spatula	1	Piece
11	Silica Gel	40	grams
12	Filter Paper	5	Piece
13	Cello Tape (1inch)	1	Piece
14	Marker Pen	1	Piece
15	Measuring tape (60 inches)-	1	Piece
16	Sanitiser or ethyl alcohol 100 ml	1	Bottle
17	Mask	1	Piece
18	Plastic ziplock bags	5	Piece

Appendix VI:

Evidence at the crime scene: preservation and packaging

Some general encountered evidences at the crime scene and the guidelines for their packaging.

Blood

On absorbent objects

- Air dry in shade cut out the stained part carefully.
- Cut out a control sample.
- Pack all the materials in separate bags.
- Large bloodstained items (clothes, shoes, weapons such as axe, knife etc.) shall be packaged after air drying in clean bag or take a swab of blood with saline moistened cotton where it is difficult to transport heavy objects.
- Small samples shall be placed in small plastic vials.

In case of blood-stained soil, plant parts

Place few particles of blood-stained soil in a clean and dry test tube.
Wrap the blood-stained parts of plants or clumps of soil in a paper and then pack in plastic zip lock pouch or alternatively place in a petri dish.

Importance :- DNA profiling and blood grouping and comparison of results with the control samples.

On non-absorbent objects

- If it is a pool of blood, collect some amount with disposable pipette/syringe and then pack in EDTA coated vials or absorb on filter paper.
- For blood in small amount which cannot be collected by pipetting/or by syringe, rub a moistened cotton bud or piece on the blood or bloodstain. A control sample can be obtained by rubbing the moistened cotton on an unstained surface.
- In case of dry blood when the amount is large, scrape off the blood carefully from the surface using a scalpel then pack in a plastic container.
- All the samples shall be packaged only after air drying if wet, in the plastic or glass vials.

Importance :- DNA profiling, blood grouping and comparison of results with control samples.

Whole blood

- Better if collected by a veterinarian.
- Some amount of sample shall be collected with anticoagulants like K3-EDTA coated plastic vials or EDTA seeded pink on top.
  The blood Sample which is collected on Whatman FTA card, care should be taken in a manner that the cards are not soiled or touched with the naked hand. While, handling the cards they must be held at the sides while the earmarked portion on the cards is used for sample collection. These cards shall be then air dried and placed in a zip lock bag for safe transfer.

Saliva

- Collect saliva on a clean gauze or with the help of cotton Q-tips thoroughly from the mouth (cheek swabs) making sure the transfer of epithelial tissues.
- Allow to air dry and pack in a rigid plastic container.

Importance :- Reference samples for blood grouping or DNA profiling and for the comparison of results with the stains found at the crime scene.

Hair and feather

Plucked from the carcass:-

- Pluck the hairs/feathers with tweezers or forceps making sure not to touch the basal part (root of hair shaft and calamus of feather shall remain intact as DNA can only be isolated from root tissues).
- After air drying, store the sample with folded paper (dried)/ phial.
- Samples collected from different specimens/location to be kept separately.

Collected from the crime scene or any object:-

- Lift with plastic tweezers or by brushing method.

Note:-Hair/feather sample from different areas are to be stored separately in folded paper and stored in separate zip lock pouches.

Importance :- To identify race of the carcass, species of origin and DNA isolation.

Soft tissue/meat/skin or any wet viscera material

- Cut out a slice of flesh (1x1 cm) with sterile blade or scalpel and place the sample completely covered in salt, ethanol, alcohol, normal saline (0.85% of NaCl) in a jar.
  Never use formalin for preservation of biological samples.
- Or take the vial, 1/3rd filled with silica gel, then filter paper then sample then again filter paper and silica gel and stack up to the top then seal. Make sure the vials are dried and new.
- In the case of skin seizure for the unidentified skin, pack the whole skin wrapped and folded in paper, pack in a zip lock pouch and if moist, pack after air drying, for identification place a piece (5x5 cm) in the above technique for species identification.
- Provide description of specimen whether cooked, partially cooked or raw meat.
- If the sample has to travel long distance to reach the lab, then it should be stored in an ice box at 4°C.

Importance :- DNA isolation, species identification.

Bone/ tooth/ horn/ antler/ timber any other dried part

- Wipe the bone with a dry cloth first to remove the external impurities and after that wipe again with alcohol to sterilize it. Then pack the bone wrapped in a paper or clean cloth after labeling.
- Bones with soft tissues, tissue should be removed and stored as mentioned above.

Importance :- Species identification and DNA isolation.

Fresh Scat:

- Collect feces with sterilized dry spatula, intact and without disturbing the outer epithelial tissue lining of the feces.
- Pack in a zip lock pouch consisting of silica gel beads which will absorb the moisture, the silica beads shall not be mixed in the sample, rather placed in a perforated pouch and packed with sample.
- If the sample has to travel long to reach the lab, and then preserve the sample at 4°C placed in an ice-box.
- Importantly, the scat shall not be older than 72 hours.

Importance :- Species identification, DNA isolation from the epithelial tissue lining the scat.

Plant material:

- Take a portion of a twig with flowers or fruit, root, stem, in a High Definition color photographs of various kinds of vegetations.
- Try collecting whole plants with roots where portability is convenient.
- Look for pollen grains on the carcass or on any evidences at the SoC and pack them carefully in plastic containers after air drying.

- Pack the plant material a paper bag along with cardboard to avoid any kind of damage.

Importance :- Identification of species and for the comparison with the trace evidences found at SoC or on the carcass.

Insect, flies or maggots :-

- Highly useful in entomological studies and DNA extraction from maggots found on the carcass.
- Their life cycle has four stages: eggs, maggots, pupae and adults which can help in estimation of the time of death of the animal.
- Collect 60-70 individuals from the above, beneath and within the carcass.
- Collect possible number of the same from surrounding and hidden areas beneath leaves, in soil etc.
- Store all the above specimen in 70% ethyl alcohol mixed in distilled water.
- Collect the above both in ethyl alcohol as well as live specimens.

Importance :- Estimation of time since death, leads in poisoning cases.

Fingerprints:-

- If fingerprint is located on a flat object which is difficult to port, lifting of fingerprints by tape lifting and power lifting methods shall be applied.
- If the objects are portable then pack the article bearing fingerprint in a plywood box keeping the surface untouched.

Importance :- To identify the offender.

Footprints, shoeprints, pug marks tyre mark, tool mark:

- Take black and white photo with proper scale.
- Take plaster of Paris (POP) cast.
- Pack the cast in a box with thick cotton pad.

Importance: - Comparison of print found at SoC with the suspects foot, shoe type, vehicle involved and match the pug mark with that of the carcass or tools used to commit the crime.

Soil and dust:-

- Collect traces from the suspected vehicle or footwear and pack in a rigid plastic container.
- Collect clothing of the suspect which has soil and pack in a paper bag after air drying.
- Collect reference sample from crime scene nearby the carcass and pack in plastic container.
- Brush the minute dust particles on the objects and collect in a paper.

Importance :- Establish the link between the inflicted animal and offender; establish the victim and crime scene by geographical origin of the samples.

Cigarette/bidi butts, tabocco powder.

- Collect with plastic tweezers, air dry and then pack in plastic or glass phials separately.
- Look for possible traces of fingerprints or lipsticks on them.

Importance :- Identification of cigarette or bidi, if smoked by more than one person, DNA examination by saliva on the butts.

Firearm, ammunition and weapons:

- Wrap the firearm with tissue paper and pack in a plastic bag.
- Wrap live cartridges, cartridge shells, bullets and distorted projectile or its fragments such as poison arrows, needles etc. in a clean cotton by lifting with plastic tweezers and pack each evidence in small plastic bags separately.
- Never put any marks on firearm, ammunition or weapon. Label the container.
- Bullets, arrows, needles or projectiles recovers from the dead body should be air dried before packaging.

Importance :- To identify make, model, caliber, working condition of the firearm, projectile or the weapon. Identify type of ammunition and its origin.

Gun-shot residue:-
On hands (of offender):

- Take color photographs of the visible evidence by naked eyes.
- Collect possible residues using adhesive SEM stubs.
- Collect reference sample as well.

Importance :- To establish if the firearm has been fired by the suspected offender or other person.

On clothing:

- Take color photograph of visible evidences.
- Pack the whole evidence folded (only if large in size) in a paper bag.

Importance :- To establish if the firearm has been fired by the suspect to whom the clothing belongs.

Animal Skin with bullet hole:

- Take color photograph of bullet hole identifying the entry and the exit holes.
- It is advised that a veterinarian shall cut the skin beyond the blackened area around the hole, taking a note of blacking, singing and contusions of the wound.
- Store the skin in a glass jar submerged in ethanol.

Importance :- To establish range and direction of fire.

Post mortem samples :- *Suggested to be collected by autopsy surgeon
For serological examination

- 10ml of clean atrial blood.
- Preserve in a glass or plastic tube.

Importance :- As control sample for comparison with bloodstains found at the SoC or on the suspects clothing or weapon.

For toxicological examination (poisoning cases) :-

- 10 ml of clean atrial blood.
- Stomach linings and its contents.
- Visceral samples of lungs, liver, kidney and spleen.
- Part of brain.
- 10ml of vitreous humor.
- Store all the samples in separate plastic containers with normal saline as preservative.

Importance :- Establish if the animal died due to poisoning or a natural death.

Fire debris:-
In the cases of forest fire, to determine if it was arson or a naturally induced fire, or a small fire lit up by offenders at the crime scene

- Collect small and large debris from the place of fire or arson.
- Cut up a large object into small and pack in PVC bags.
- Collect control sample from SoC and pack separately in plastic bag.
- Also, collect the materials having smell of inflammables into an airtight plastic bag and further in airtight container to avoid vaporization.
- In case of petroleum products recovered at the SoC, store such liquids in unbreakable air tight plastic containers while noting down characteristic odor of the liquid.

Importance :- To examine presence of inflammable material, its identification and distribution of fire at the crime scene.

TRAFFIC is a leading non-governmental organisation working globally on trade in wild animals and plants in the context of both biodiversity conservation and sustainable development.

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