Wildlife Forensic & Evidence Collection

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It is necessary to mention "that mind is like a parachute and it is only function when it is open. Eyes see those things when your mind knows it."

Lucard’s Principle
OF EXCHANGE OF EVIDENCES.

Evidences are always exchanged within Culprit and Victim.
BRANCHES OF FORENSIC SCIENCE

- TOXICOLOGY
- SEROLOGY
- ENTOMOLOGY
- BALLISTICS
- ODONTOLOGY
- PHOTOGRAPHY
- FINGER PRINTING
- QUESTIONED DOCUMENT--
- EXPLOSIVES
- RADIOLOGY
- ANTHROPOLOGY--
- CHEMISTRY
- DIATOMOLOGY
- BIOLOGY
- ENGINEERING--
- CYBER CRIME--
- OSTEOLOGY
- DNA FINGER PRINTING

Useful disciplines in Wildlife crime investigation
Forensic toxicology is the study of the effect of drugs and poisons on the human/animal body. Poisioning caracass, poisoning waterholes, spreading poisonous grains, poisoned arrow head, poisonous needles are common practice of wildlife crime. All such cases of poisoning can be analysed in forensic labs.
Poison commonly used in killing of wild animals

1. Arsenic (*Sankhya*).
2. Oleander (Yellow one).
3. Abrus precatorius, (*Gomchi* or *Ratti*).
4. Nux Vomica. (*Kuchala*).
5. Aconite (*Meetha Jahar*).
6. Calotropis (Madar).
7. Castor seeds (*Arandi*).
8. Copper Sulphate (*Neela thotha*).
11. Lead.
12. Organo-phosphorous/ Aldrin (Insecticide/ pesticides) etc.
13. Fishing poison (waterhole poisoning by any poison).
14. Zinc phosphoid (Rat poison).
Serology is literally the "scientific study of the blood serum." In practice, however, it usually refers to the diagnostic identification of antibodies in the serum, when an infection is suspected.

Some serological tests are not limited to blood serum, but can also be performed on other bodily fluids such as semen, saliva, vomit, urine etc have (roughly) similar properties to serum. There are several serology techniques that can be used depending on the antibodies being studied.

All such anti-bodies present in serum can be analysed in forensic labs for investigation of cause of death.
Detection of antibodies can be used to either diagnose an active or previous infection, or to determine if the individual is immune to re-infection by an organism. Some of the different diseases that can be detected include:

- rubella
- anthrax
- hepatitis various types
- brucellosis
- Amebiasis
- fungal infection
- RSV (Respiratory Syncytial Virus)
- tularemia.
FOREGNISC ENTOMOLOGY

Forensic entomology deals with the examination of insects in, on, and around wild animal remains to assist in determination of time or location of death. It is also possible to determine if the body was moved after death.

Study of insect on carcass gives details of time of death (TOD), location of death, by study of stages of larva, pupa, and maggots. TOD gives many evidences in investigation of the crime.
FORENSIC ENTOMOLOGY
House flies and Blue flies

- Lay their eggs in open wound & natural orifices.
- Eggs turn in to larvae or maggot within 8 to 24 hrs in hot weather.
- Maggot crawl in to external and internal part of the body and destroy sub-tissues.
- Maggot become pupae in 4 to 5 days.
- Pupae become adult in 3 to 5 days.
- Whole life cycle takes about 11 to 14 days
FORENSIC BALLISTICS

Forensic Ballistics is the science dealing with the investigation of use of firearms and ammunition.

When arms and ammunition seized, it is the forensic ballistics which can reveal the arm and ammunition used in the crime by detailed analysis of arm and fired ammunition.
**Weapon and Injuries**

Injuries and type of weapon/object used/cause/to impose injuries are as follows;

<table>
<thead>
<tr>
<th>Object</th>
<th>Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blunt object, <em>Lathi</em>, Blunt force,</td>
<td>Bruise, contusion, abrasion, crushed lacerated</td>
</tr>
<tr>
<td>vehicle etc.</td>
<td>wound.</td>
</tr>
<tr>
<td>Sharp weapon like <em>farsa</em>, axe, knife,</td>
<td>Incised wound, stab, penetrating wounds,</td>
</tr>
<tr>
<td>perforating, arrow etc.</td>
<td></td>
</tr>
<tr>
<td>Trapping / snaring</td>
<td>Ligature, friction cut deep mark.</td>
</tr>
<tr>
<td>Gun shot</td>
<td>Fire arm injuries.</td>
</tr>
<tr>
<td>Electrocution and burn</td>
<td>Charring</td>
</tr>
</tbody>
</table>
FORENSIC BALLISTICS
Arms and Ammunition

Identification of every arm & ammunition is possible today...
A shotgun shell (shotshell) is a self-contained cartridge loaded with shot or a slug designed to be fired from a shotgun. Most shotgun shells are designed to be fired from a smoothbore barrel.
A shotgun is called 12 gauge because twelve lead spheres, each of which just fits the inside diameter of the barrel, weigh one pound. Each gauge is the count of the number of lead spheres that weigh a pound and which just fit into the barrel.

<table>
<thead>
<tr>
<th>Shotgun gauge</th>
<th>Bore diameter</th>
<th>No. of lead balls in one pound</th>
<th>Diameter of lead balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.76&quot; (19.7 mm)</td>
<td>10</td>
<td>0.76&quot; (19.7 mm)</td>
</tr>
<tr>
<td>12</td>
<td>0.73&quot; (18.5 mm)</td>
<td>12</td>
<td>0.73&quot; (18.5 mm)</td>
</tr>
<tr>
<td>16</td>
<td>0.66&quot; (16.8 mm)</td>
<td>16</td>
<td>0.66&quot; (16.8 mm)</td>
</tr>
<tr>
<td>20</td>
<td>0.62&quot; (15.6 mm)</td>
<td>20</td>
<td>0.62&quot; (15.6 mm)</td>
</tr>
<tr>
<td>28</td>
<td>0.55&quot; (14.0 mm)</td>
<td>28</td>
<td>0.55&quot; (14.0 mm)</td>
</tr>
</tbody>
</table>
Ballistic fingerprinting

Ballistic fingerprinting is the matching controlled fired bullet with bullet seized. Every arm have its own pattern of marks in the fired bullet.

Example -one

Example -two
Forensic odontology is the study of the uniqueness of dentition. (study of teeth) and osteology is study of bones.

Every animal have different dentition & bones. Tiger bones, leopard bone, bear bone are all different. Deontology & Osteology can explain name of species and age of the animal by study of bones and teeth.
Forensic Odontology & Osteology

Forensic dentistry or forensic odontology, the proper handling, examination and evaluation of dental evidence, which will be then presented in the interest of justice.

Forensic Osteology is the science of examination and evaluation of bone of the animals,
FORENSIC OSTEOLOGY
Study of Bones, skeleton.

Skull morphology changes with age in Spotted Hyenas
Forensic photography is the art of producing an accurate photographic reproduction of a crime scene for the benefit of a court.
FORENSIC PHOTOGRAPHY

100 pages written document.
or
50 photographs,
or
5 Minuets Video film

on

Animal slaughter
Impact always be in reverse order.

Our ultimate aim is to convince Judiciary
FORENSIC PHOTOGRAPHY

Use of Photography at the scene of crime.

Photographs serve as permanent record of the facts at the scene of the crime.
Records facts for future use.
Help to reconstruct the scene of the crime.
Supplements other records.
Records the details of the scene.
Provides pictorial presentation of the appearance and position of the objects.
Serves as important evidence in the court of law and supports testimony of the investigator.
Important Tips
ALWAYS
Use film camera not a digital one.
Carry film role and cell or battery.
Use scale or any measurable article (black & white inch strip) while shoot the scene.
Take pictures from all possible angle.
You will get only one chance to shoot SOC.
Try to use color film, evidence like blood, color of cloth or animal skin will be prominent in color photographs.
Use black and white arrow strips to point out important evidences.
Write down importance of the photographs overleaf.
Serves as important evidence in the court of law and supports testimony of the investigator.
Enlarge photographs to show important features.
Suspect may be in photographs of mob or onlookers.
Important Tips

ALWAYS

Draw a base map first.

Include every possible item you observe at SOC.

Ask people (Panch) if they observed any special evidence at SOC.

Make sketch on the spot, it may be rough, investigating officer can make smooth one afterward.

North should be on the top as far as possible.

Sketch identification article/material of permanent nature from SOC.

Must obtain signature of sketcher, verifier, and Panch with date and time.

Do not stuck on one sketch, sketch more than one if possible and as per circumstance.
Sketch of poached black-buck: Entry wound and exit wound indicate that bullet was fired from lower angle.
Sketch/ mapping of scene of crime

Sketch of poached black-buck:
Wound like *HALAL*, and lacerated wound of shot gun shows that animal was shot first and then anti-mortem throat cut down to kill the animal.
Fingerprinting was not used in investigation of wildlife & forest crime so far. It is the technique we forester can use. We can easily lift the fingerprints and send it for further analysis to an expert to get expert opinion.
A fingerprint is an impression of the friction ridges of all or any part of the finger.
A friction ridge is a raised portion of the epidermis on the palmar (palm and fingers) or plantar (sole & toes) skin, consisting of one or more connected ridge units of friction ridge skin. These ridges are sometimes known as "dermal ridges" or "dermal papillae".
DNA FINGERPRINTING

Two kinds of fingerprints

a) Conventional fingerprint
b) DNA fingerprint

a) Zipper
b) DNA
Detection of case
And
success of the Investigation depends on

**EVIDENCES**

Search Evidences first at

*Scene of Crime (SOC)*

**SOC may be Primary,**
Secondary,
tertiary and so on

............depending on case.
Preservation of SOC

Preserve SOC by Crime scene tape to avoid destruction of evidence from:
- Onlookers.
- Mob.
- Unauthorized persons.
- Unnecessary movement may destroy evidences.
According to Indian Evidence Act 1872
Evidence are
Direct Evidence and
Indirect, circumstantial or physical Evidence.

In Forensic Science we are dealing with Physical Evidences.

Physical Evidences

Marks (finger print, tyre/ foot/ shoe marks etc).
Biological Fluids (Blood, Smear, saliva, vomit, urine etc).
Fibers (natural and artificial fibers).
Hairs (victim or accused/ co-accused).
Weapon (projectiles or handheld).
Fire Arm (including bullet, gun powder, cartridge, lead etc).
Material/ article/ metal/ non-metal/ paper etc found on SOC.
Vehicle/ packing material/ other miscellaneous articles....
Trace evidence is evidence that is found at a crime scene in small but measurable amounts.

Examples of typical trace evidence include hairs, fibers, soils, botanical materials, gunshot residue, explosives residue, and volatile hydrocarbons etc.
An investigation officer should---

- Reach the spot soonest possible with relevant material or Kit.
- See with open mind without prejudice.
- Preserve/ Seal SOC by Crime Scene tape.
- Search evidences.
- Photograph SOC, Sketch.
- Record, collect, seize the evidences.
- Record *Panchanama*.
- Inform higher officer & expert if available.
- Seal and send collected evidences if available.
Forensic Science is the science which interpret evidence to get proper direction.

Evidences on spot.
Evidences on body of victim & accused.
Circumstantial evidence.

Try to get answer of all W’s
Interpretation of evidence

Try to get answer of all 5 W’s

W What ........
W When ........
W Who ..........
W Where ..........
W Why ............
Interpretation of Evidence

Electrocution Marks – Skin charred like corn flacks.
Predominant mark to identify electrocution-
Reddishness (ecchymosis) inside skin while post-mortem confirm it.
Interpretation of Evidence

Bullet Entry Wound – measure size, diameter and test for bullet wound before post-mortem to confirm.

Distance, direction of bullet, range of the arm, bullet should be preserved to identify weapon.
Interpretation of Evidence

Neck of animal cut down, wound is ante-mortem.

Blood of live animal and dead animal can also reveal that animal was injured/ killed when alive.
Cutting wound after death (post-mortem) will never show Reddishness (ecchymosis).
Interpretation of Evidence

An post-mortem wound:
whitish wound, without reddishness in the tissues
Confirm that it is wound after death.
## Interpretation of Evidence

### Difference between Anti-Mortem and Post Mortem Injuries

<table>
<thead>
<tr>
<th>Anti-mortem</th>
<th>Post-mortem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecchymosis present</td>
<td>Ecchymosis absent.</td>
</tr>
<tr>
<td>Haemorrhage spurting (jet like)</td>
<td>Haemorrhage in drops.</td>
</tr>
<tr>
<td>Edges of the wounds are swollen.</td>
<td>Absent.</td>
</tr>
<tr>
<td>Edges red, averted with gapping.</td>
<td>Absent.</td>
</tr>
<tr>
<td>Clot- jelly like threads seen</td>
<td>Absent.</td>
</tr>
</tbody>
</table>

Anti-mortem and post-mortem injuries can also be judged in cases of Burns, electrocutions, drowning and snaring.
Interpretation of Evidence

Description of the injuries or wounds is also important as these descriptions may reveal a story the way crime was committed.

Followings points should not be ignored during investigation or post mortem examination;

1. Type (type of injuries/ wounds/ simple/ multiple etc.).
2. Site (on which part of the body).
3. Size (measurements/ length, widths/ depth/ etc.).
4. Shape (round/ oval/ circular etc.).
5. Plain (horizontal/ vertical/ oblique/ parallel etc.).
6. Ends (sharp/ blunt/ pointed/ circular/ etc.).
7. Edges (plain/ sharp/ etc.).
8. Condition (bleeding/ clott/ wet/ dry /infested/ healing/ etc.).
9. Margin (Plain/ serrated/ zig-zag etc).
10. Depth (reach up to centimetres/ or up cavity/ cage/ bones etc.).
11. Direction (direction of object).
Recently fired gun: A blackness found in the barrel:
An instant test to catch suspect.
Interpretation of Evidence

Shot gun fire - Direction of the fire can also detected. This direction will help to search the evidences.
Microscopic Study of hairs

Microscopic Hair Identification of different species of wild animals.

Always keep control sample to convince the Judiciary.

Tiger

Panther

Lion

Black-buck

Cheetal

Sambar

Neelgai

Barking deer

Hyena
Interpretation of Evidence

Scene of Crime: Primary

Blood stains on bullock cart: An Important Evidence
Interpretation of Evidence

Scene of Crime: Secondary

Suspects indicating towards a bore-well where they dumped meat and skin.

Fortunately bore-well was blocked at 1.20 Mt. Bore-well digging done to recover.
Interpretation of Evidence

Scene of Crime: Secondary

Bore-well digging completed.

Finally meat and skin was found and seized from the spot shown by suspect (accused).
DIFFERENT TYPE OF INJURIES AND WOUNDS

Injuries
1 - Contusion
2 - Abrasion

Wounds
3 - Incised Wound
4 - Stab or Punctured Wound
5 - Lacerated Wound
6 - Chopping Wound
7 - Fire arm Wound
8 - Burn
9 – Electrocution
It is very important to estimate the probable time of death to link with the crime. However this subject belongs to veterinarian and he will estimate the TOD. But as an investigating officer it is also important to have a rough knowledge of this. This knowledge will help him for a quick and scientific investigation.

For example, if the suspect have entered the vicinity within 24 hrs and animal has died 48 hrs earlier, than there is no link between suspect and death of the animal.
**TIME OF DEATH (TOD)**

Change after death can be categorized in:

<table>
<thead>
<tr>
<th>(A) Early</th>
<th>(B) Moderate and</th>
<th>(C) Delayed changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in the eye</td>
<td>Changes in muscles</td>
<td>Autolysis</td>
</tr>
<tr>
<td>Changes in the skin</td>
<td>Primary relaxation</td>
<td>Colour changes</td>
</tr>
<tr>
<td>Cooling of the body</td>
<td>Rigor mortis</td>
<td>Fowl smell</td>
</tr>
<tr>
<td></td>
<td>Secondary relaxation</td>
<td>After 48 Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Five to ten days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More than ten days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flies (Insects)</td>
</tr>
</tbody>
</table>
TIME OF DEATH (TOD)
Early (up to 1 hrs)

- Changes in the muscles.
  - Reflexes of eyes.
  - Luster of cornea lost.
  - Opacity (clarity) reduced.
  - Sunken eyes.

- Changes in the skin
  - Losses elasticity.
  - Color of skin become pale.

- Cooling of the body
  - Body temperature goes down.
Typical changes occur in deer eyes at various time after death. Time in hrs and pupil diameter in mm.
TIME OF DEATH (TOD)

Interpretation of Evidence

Moderate (after 1 to 3 hrs)

- Changes in muscular tissue (Cadaveric changes).
  - Muscles come to relax.
  - Lower Jaw fall down.
  - Eye fixed.

- Rigor Mortis
  - Death stiffening, muscle lost power of contractibility due to irreversible changes.
  - Developed from anterior to posterior within 12 hrs.
  - Next 12 hrs remain in the body then disappear in next 12 hrs.

- Secondary Relaxation
  After disappearance of rigor mortis muscles become soft & flaccid and there is no response for electric stimuli.
Interpretation of Evidence

**TIME OF DEATH (TOD)**

Delayed Changes (after 12 to 24 hrs).

- Autolysis.
  - Putrefaction.
  - Decomposition begin.
  - Softening & liquidification due to digestive action of enzymes.

- Color Changes (18 to 48 hrs)
  - Greening coloration of abdominal skin & distention of abdomen.
  - Eyeball milky and collapse.
  - Superficial vein become prominent & give appearance like marble.
  - Fowl smell.

- After 48 Hrs
  - After disappearance of rigor mortis muscles become soft & flaccid and there is no response for electric stimuli.
Interpretation of Evidence

Delayed Changes (48 hrs).
Hairs become loose and easy to pluck.
Post mortem blisters appear on the skin.
Whole feature become blotted & distorted.
Tongue protruded, eye forced out, frothy reddish fluid oozed out from mouth and nostril.

Delayed Changes (after 48 hrs, within 2 to 5 days).
Whole hairs fall down.
Body become sunken, abdomen burst, flies and beetle attack the body.

Delayed Changes (5 to 10 days & more).
Sever putrefaction or colliquitive putrefaction.
Muscles separated from bones.
After 10 days: Feature of injuries etc masked & TOD estimation is difficult
Which evidence to collect?

An investigation officer should collect maximum possible evidences from primary SOC, secondary and so on.

If more evidences (of no use) collected........

It is better than leaving evidences at SOC .....................

Try and search
Blood dry, pool, clot, meat, article, trophy, skin, bone, vomit, urine, fecal, leftover, glass bottle, water, Weapon, arm, ammunition, Dead or injured animal, hairs, fibers, finger print, vehicle, clothing, packing material, vehicle marks, foot print, shoe print, paper, knife, wire, tools, poison, and so on ......

Seize maximum possible or sweep every thing from scene of crime ..............

Ensure that no evidence left on the spot ......
Evidence preservation

In 10% formaline
Or 70% alcohol - histopathology
In 50% buffered glycerine - virology.
In ice - microbiology.
Use EDTA vials - blood sampling.
Hairs & dry bone - air dried.
Dry samples - silica gel
Wildlife Forensic

Thanks..............