HOW TO
PREPARE BIRD SPECIMENS

Part 13 – Determining cause of death

- Part 13A – Poisons
- Part 13B – What is wildlife forensic pathology & Fishing, hunting, and trauma wound analysis
- Part 13C – Collision with man-made structures
- Part 13D – Diseases & Ectoparasites

The Migratory Bird Conventions Act regulates the take and possession of birds in Canada. The Migratory Bird Treaty Act regulates the take and possession of birds in the United States. In addition, the provinces (in Canada) and the states (in the United States) also require permits. For some species SARA, ESA, or CITES permits may be required.

Check the laws of your country and obtain the proper permits; failure to do so may result in civil and/or criminal penalties.

When handling dead birds, it is probably impossible to tell if a bird is infected with a pathogen that may cause human illness even if you know the cause of death to be a wound or an injury. Take reasonable precautions to protect yourself. The Ornithological Council offers a peer-reviewed fact sheet on avian zoonotic disease and safety precautions for those who handle birds in the field and in the lab.

http://www.nmnh.si.edu/BIRDNET/documents/WNV&H5N1-FactSheet.pdf

Report All Suspected Poisonings to the Proper Authorities

Reviewing this PowerPoint does not replace the need to consult a certified avian pathologist.

•In many museums, the majority of new museum specimens are salvaged birds. This presentation will aid novice preparators to more accurately identify and record cause of death.

•It is hoped that this cell phone accessible reference will aid individuals who find dead birds to better describe what they have found. It is stressed that dead wildlife and related evidence must not be compromised before wildlife enforcement personal arrive. Poisons are dealt with first because many are equally lethal to humans.

Take a reference photograph containing a landmark. Something that is visually incontrovertible.

Photo courtesy of Science and advice for Scottish Agriculture

Photo courtesy of Iñigo Fajardo

A minor error in recording GPS coordinates can lead to a case being dismissed.

A reference tree, building, etc. is unlikely to move!

When in doubt – take photos.

Photographs are either:

"ILLUSTRATIVE"
Support the testimony of the investigator.

The investigator can testify that they are a true and accurate representation of what he saw.

Authorities may request all photos taken that day.
Delete NONE from the sequence.
Missing photographs are suspect.

or:

"EVIDENTIARY"
The photographs become the evidence.

Silent Witness Theory

Under the silent witness theory, when an adequate foundation is provided to assure the accuracy of the process producing a photograph, the photograph can be admitted to speak for itself, even though no witness has vouched for its accuracy.

This theory is based on the notion that a photograph is reliable enough to be admitted into evidence.

To be accepted as court evidence, digital images must NOT be renamed, cropped, or altered. Ideally the camera was preset to date and time stamp each digital file.

Photo courtesy of Álvaro F. de Almeida

Pathology:

The study of the nature of disease, and its causes, processes, development, and consequences.

Pathology addresses four components:

1. Causes (etiology)
2. Mechanisms of development (pathogenesis)
3. Structural alterations of cells (morphologic changes)
4. Consequences of change (clinical manifestations)

Photo courtesy of Kim Walters, Hemmera

Forensic:

Of, relating to, or denoting the application of scientific methods and techniques to the investigation of crime.

What does a forensic pathologist do:

- Collects evidence
- Performs necropsies
- Documents findings
- Determines:
    1. Cause of death
    2. Mechanism of death
    3. Manner of death
- Acts as expert witness

Techniques:

Photography
External examination
Internal examination
Whole body x-rays
UV light inspection
Laboratory testing of tissues

LET THE BODY SPEAK
Don't jump to conclusions.

Case No.1:

<u>Owl preys on slow moving rodents (anticoagulant poisoned).</u>

- Owl lands on shoulder of highway to drink from a water puddle
- Downdraft from an18-wheel truck flips owl

Case No. 2:

<u>Owl preys on rodents in a flooded field</u>

- Owl inhales fungus spores from rotting vegetation
- Fungus (*Aspergillus*) spores colonize air sacks
- Flying ability compromised by low blood oxygen level
- Owl collides with utility wires and is electrocuted

Solve these cases by describing:

1. Cause of death
2. Mechanism of death
3. Manner of death

Submission history:

- On 17 May 2010, a loon was caught at ___ Lake.
- The loon was already dead when the fisherpersons became aware that the fish they were trying to land was a bird.

Determine:

1. **Cause**
2. **Mechanism**
3. **Manner**

Photo by Doug Connell via Flickr Commons

CAUSE of death was a baited fish hook.

It is rare to find a fish hook lodged in the trachea.

Being towed by a boat was the MECHANISM of death.

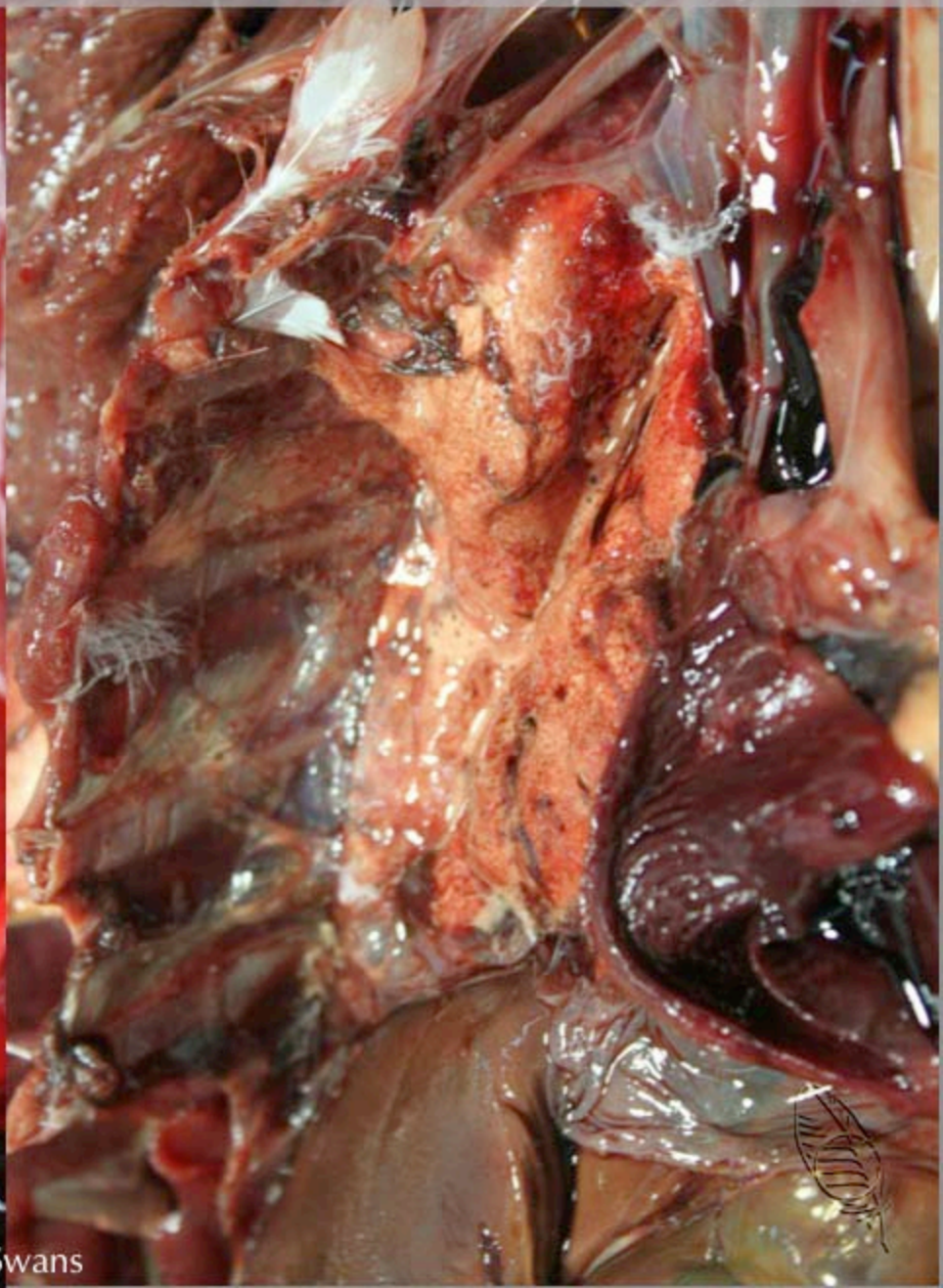
The necropsy confirmed that the MANNER of death was drowning.

Drowned lungs are:
- Paler (salmon pink)
- Appear to be coated with froth or soapy bubbles
- A removed lung generates a froth puddle around itself

Normal lungs are:
- Redder
- The bubbles are less slimy
- A removed lung does not generate a frothy puddle around itself

Healthy lung

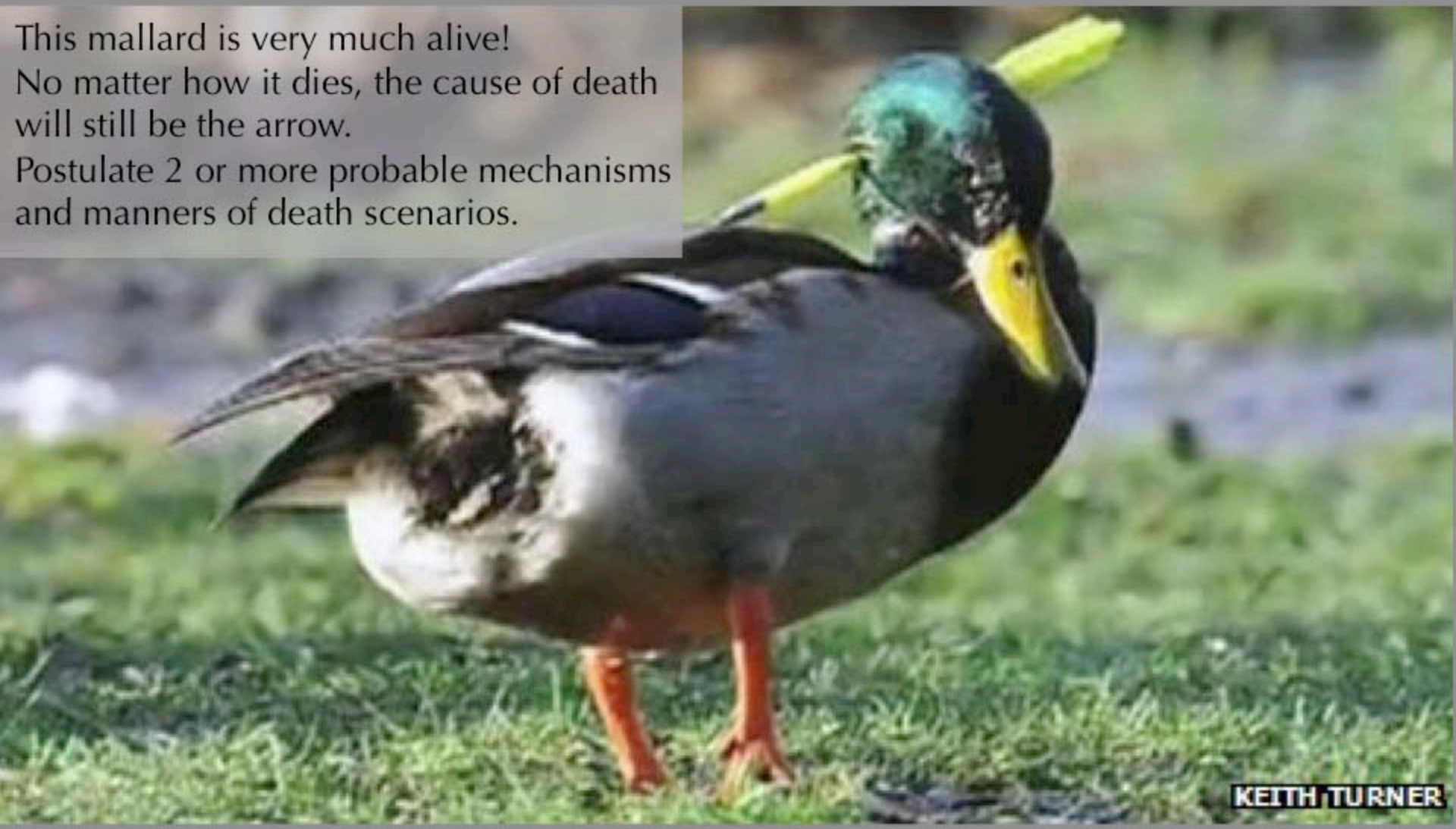
Drowned lung



Trumpeter Swans

Hunting wounds

This mallard is very much alive!
No matter how it dies, the cause of death will still be the arrow.
Postulate 2 or more probable mechanisms and manners of death scenarios.



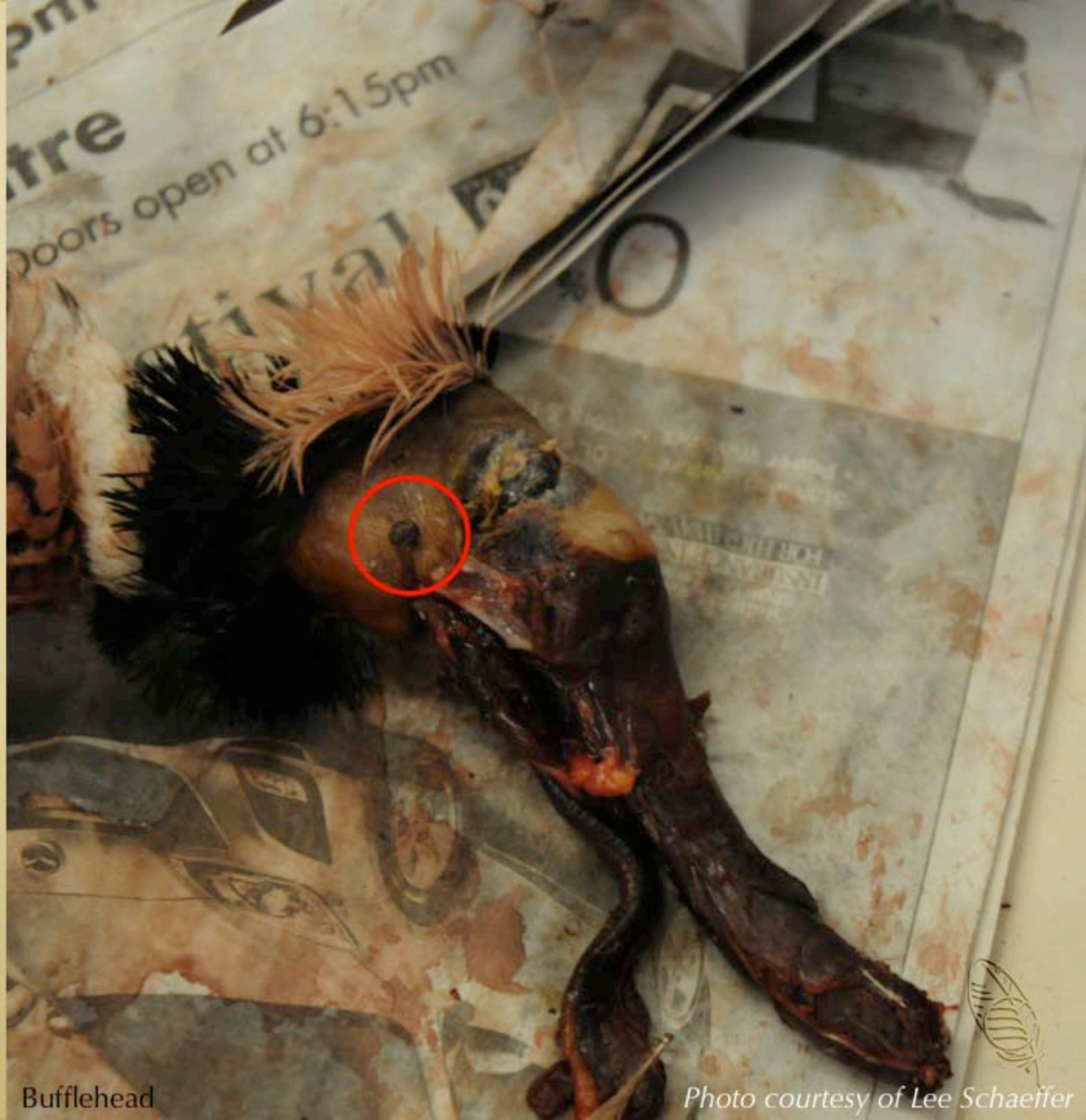
BBC World News - 29 January 2013
This injured duck shot with a crossbow is still able to fly and feed itself, the RSPCA said. The Mallard was spotted at Dearne Valley Country Park in Barnsley. Anyone convicted of shooting the animal could face a six-month prison sentence and a £ 5,000 fine.


Air gun pellets do not
cause lead poisoning.
Shoulder joint of Northwestern Crow


These air gun bullets and plastic pieces were consumed as food (not grit) by a Northern Fulmar.
Check for emaciation. A full stomach reduces the urge to eat.
Photo courtesy of Stephanie Avery-Gomm

Waterfowl and game birds are rarely shot with bullets. The spray pattern of shotgun shells containing bird pellets (shot) is more effective.

Look for pellets in multiple locations inside the bird.



Bufflehead

Photo courtesy of Lee Schaeffer

Shotgun pellets damage feathers by either raking (scoring) or…

Photo courtesy of Dr. Tabitha Viner
US National Fish & Wildlife Forensic Lab

… destroying feather shafts leaving ragged gaps.

Photo courtesy of Chad Olson, from Guide to Raptor Remains, 2004. EDM International, Inc.

Not all shot birds die.
Look for shotgun pellets in odd places.

This swan has a pellet lodged in the beak from a previous encounter with hunters.

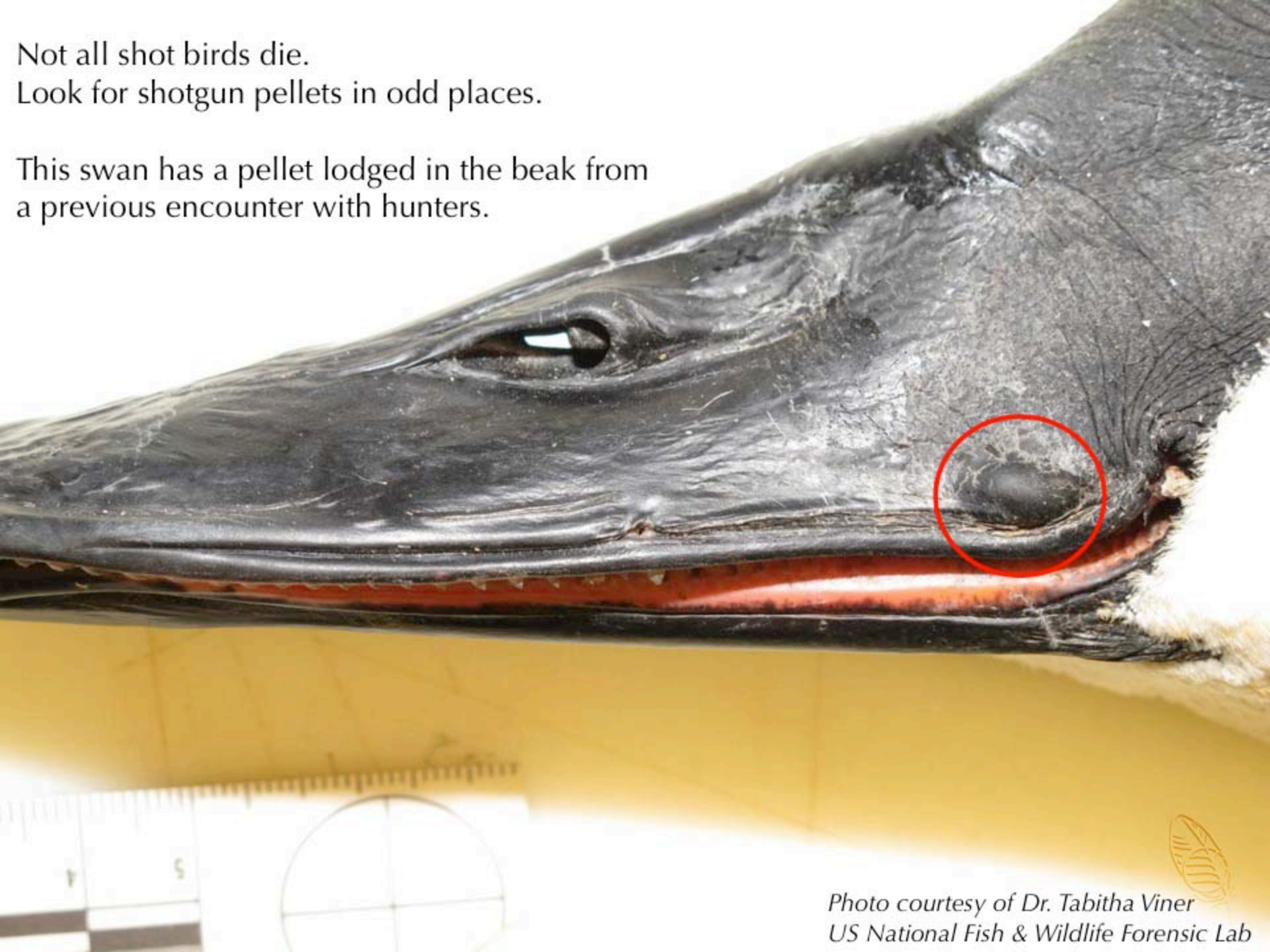


Photo courtesy of Dr. Tabitha Viner
US National Fish & Wildlife Forensic Lab

Make it a practice to never use metal tools when handling spent ammunition. Use either your hands or plastic forceps so as NOT to add, or damage any marks. It is crucial to not alter bullet profiles fired from rifled-barrelled guns.

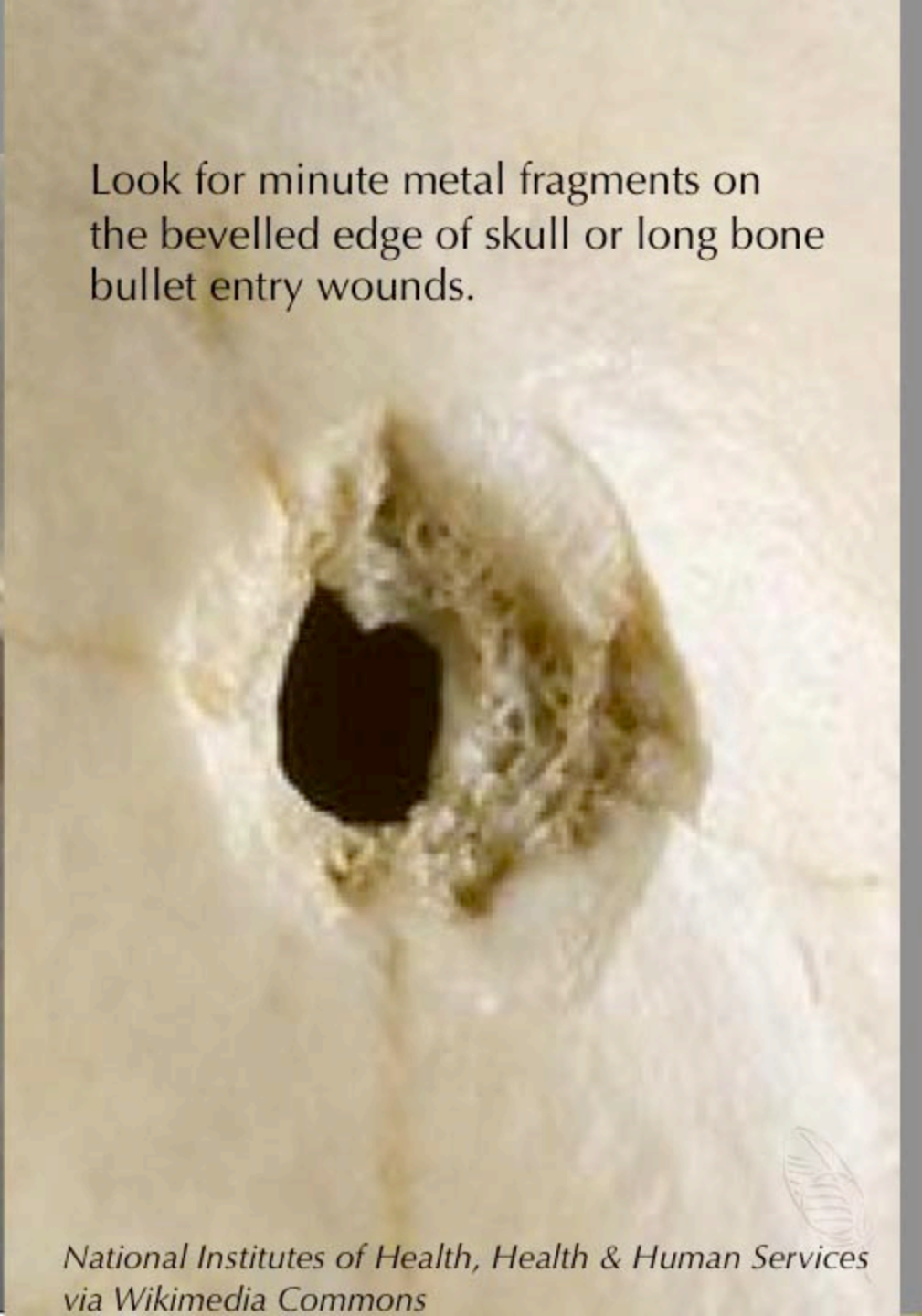
Bird shot is typically fired from smooth barrelled guns making this precaution not necessary for shotgun slugs or pellets.

Bevelling or key-holing is typical of bullet entry holes.

Bottlenose Dolphin

 3 Dec 2012

Look for minute metal fragments on the bevelled edge of skull or long bone bullet entry wounds.



National Institutes of Health, Health & Human Services via Wikimedia Commons

Bullet entry holes drag hairs or feathers inside the body. Bullet exit holes explode outwards.

Photos courtesy of Dr. Tabitha Viner
US National Fish & Wildlife Forensic Lab

For densely feathered birds, skinning the bird is the best way to document if feathers have been forced into the interior of the bird.

Photo courtesy of Dr. Tabitha Viner
US National Fish & Wildlife Forensic Lab

Run your hand over the area where the exit hole should be.
Shot and bullets lose momentum traversing an animal.
They may not have enough force to punch a hole through the skin.
Feel for a lump.

This is easier to see during the skinning process.

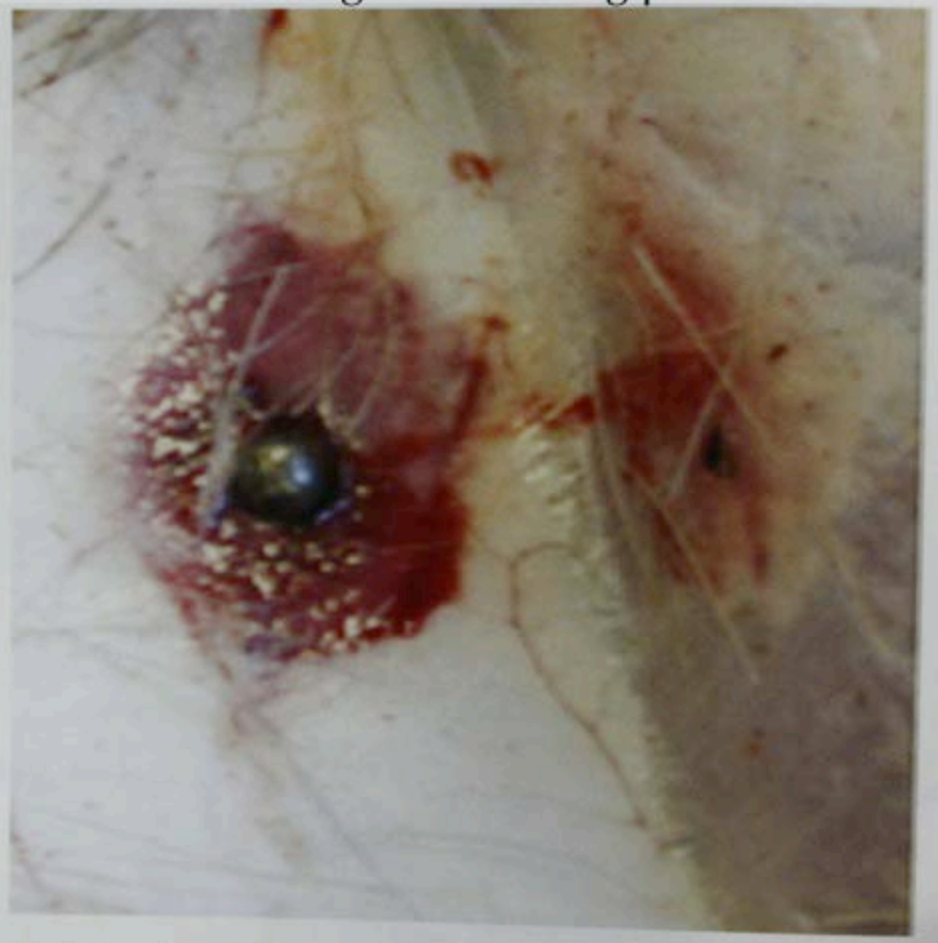
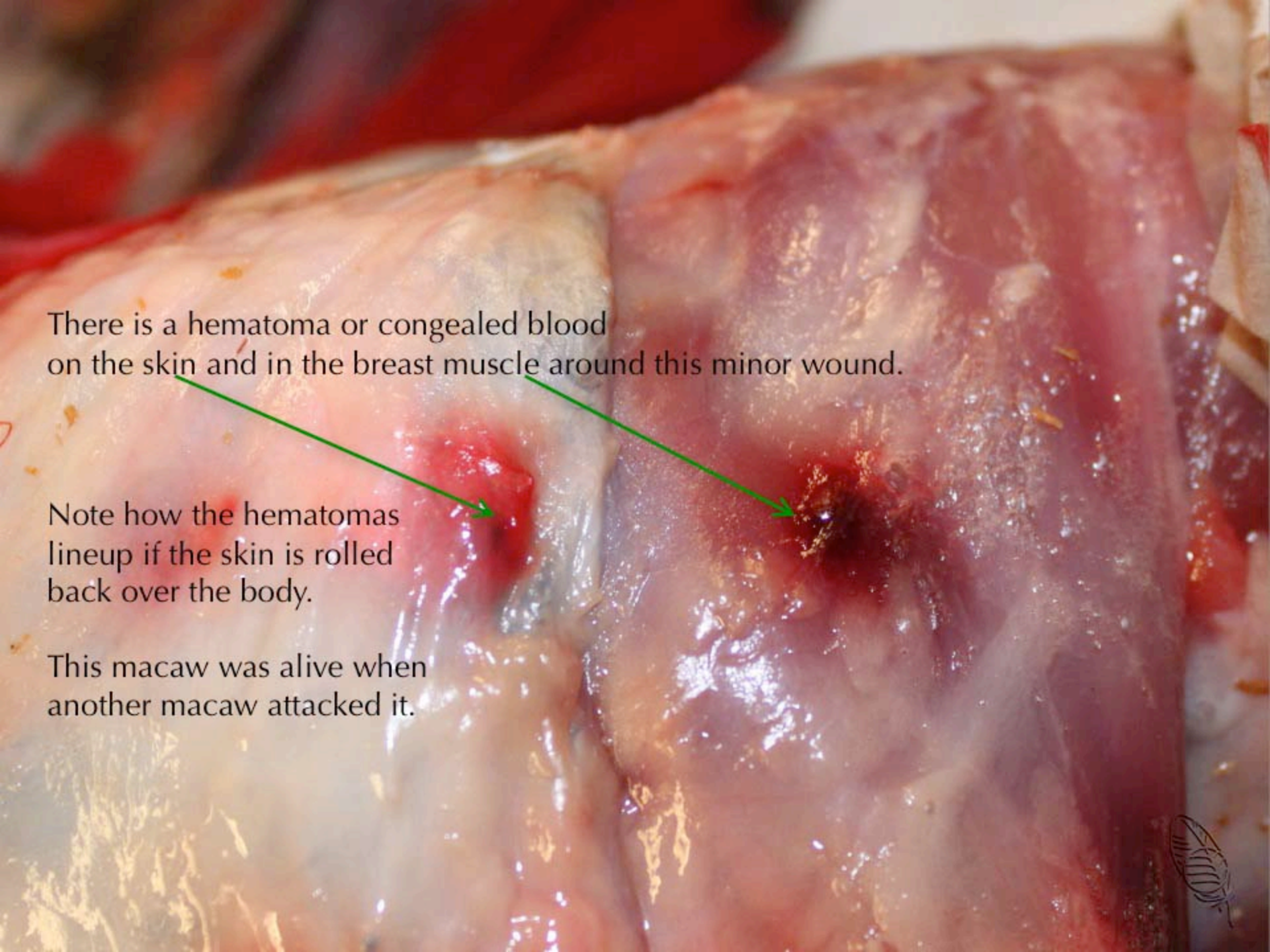


Plate 7.13 Buckshot pellets and other projectiles are often captured just under the tough hide on the side of the animal opposite the entrance wound.

Photo from Huffman and Wallace, Wildlife Forensics, 2012


There is a hematoma or congealed blood
on the skin and in the breast muscle around this minor wound.
Note how the hematomas
lineup if the skin is rolled
back over the body.
This macaw was alive when
another macaw attacked it.

This picture shows the same thing. If there is no hematoma or congealed blood on the skin and in the surrounding muscle of an arrow wound, then it is a fake.
It was inflicted after the animal was dead.

Photo courtesy of Dr. Tabitha Viner, US National Fish & Wildlife Forensic Lab

These are knife wounds.

Plate 7.2 Cut hair typifies incised entrance wounds.

Photo from Huffman and Wallace, Wildlife Forensics, 2012

Do not assume all even, straight cuts are inflicted with a knife.

This is a bear claw wound.

Photo from Huffman and Wallace, Wildlife Forensics, 2012

Trauma is an injury to living tissue caused by an exterior agent.

Barn Owls and other birds are often found dead on roadsides.
Look for signs of abrasion. Tail and other feathers are frequently missing or broken.
Some vehicle collision bird deaths are due to air turbulence …

.. and the bird looks perfect.

Family flocks crossing a busy road can result in isolated group mortalities.

If it has "rained" birds, check if fireworks, or another large scale disturbances is responsible.

This is more likely to happen with communally roosting species that are not adapted for night flight. Panic and fright can result in collisions with roads, houses, and trees.

Photo courtesy of Axel Rouvin via Wiki Commons

Check the weather. Microburst, tornadoes, hurricanes, or unseasonal cold snaps can cause avian mortality events.

Microburst schematic commissioned by NASA drawn by Thegreatdr, via Wikimedia Commons


The Smithsonian Feather Lab has coined a word to describe birds after they collide with planes.
Snarge = snot + garbage
Rough-winged Hawk
& 2 Northern Harriers

Snarge comes in all shapes and sizes.

Slide courtesy of the Smithsonian Feather Lab

The opposite, trauma without an exterior wound, is a contusion (bruise).

Internal lacerations occur when the elastic property of skin, muscle, liver, etc. is exceeded.

On the exterior, this Barn Owl looks perfect. Internal examination reveals breast muscle lacerations.

The lack of internal hematomas indicates that these lacerations occurred after death.

If you find a canine bite, determine if it the result of scavenging, or of the manner of death as was the case with this duck. Check the bird for previous injury, disease, or other conditions which made it susceptible to being caught. Bites from coyotes or similar sized domestic dogs look the same.


A vehicle collision probably caused these transverse fractures. The resulting hematoma became infected.
On large birds and mammals, look for vehicle paint chips.
Band-tailed Pigeon

The bizarre shapes of these healed bones could be felt under the skin.
After this Peregrine died, her handlers were curious to see how her bones had healed.

Normal ulna-radius bones

Mended ulna-radius bones

After a vehicle collision, this Peregrine could not fly.
She loved crowds and participated in thousands of educational demonstrations.


New bone has grown between the
displaced ends of these malunion fractures.
These tibiotarsus are from
different Bald Eagles.


Broken bones infected with *Staphylococcus aureus* or *Salmonella* may develop osteomyelitis.
The amount of extra bone growth is variable and depends on the severity of the infection.
Bald Eagle

PLEASE DOWNLOAD

PART 13C & PART 13D

Part 13 – Determining cause of death

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Fishing, hunting, and trauma wound analysis
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Suggested reading is on the next slide.

If you have photos, or additional information you wish to contribute to this presentation, please email:
ildiko@zoology.ubc.ca





SUGGESTED READING

Huffman, J.E. and J.R. Wallace. 2012. Wildlife Forensics: Methods and Applications. Wiley-Blackwell. 370pp.

Ornithological Council (2005, revised June 2010). West Nile Virus, Highly Pathogenic Avian Influenza H5N1, and other zoonotic diseases: what ornithologists and bird banders should know. 13pp. http://www.nmnh.si.edu/BIRDNET/documents/WNV&H5N1-FactSheet.pdf

http://beatymuseum.ubc.ca/research/birds

IN MEMORIUM

DR. REX KENNER

Former Curator of the Cowan Tetrapod Collection who encouraged me to begin this project.

At the 2012 Society for Wildlife Forensic Science Conference:

LUCY WEBSTER and NGAIO RICHARDS

independently informed me that this series was incomplete without a "Determining Cause of Death" presentation. Without their prodding and encouragement, I would not have tackled this topic.

If it was not for the tutelage of Dr. Victoria Bowes, Diagnostic Avian Pathologist for the British Columbia Ministry of Agriculture, and her toleration of my many questions while she was busy doing necropsies, I would still be struggling to compile this presentation.

Special thanks to Tabatha Viners, Laurie Wilson, Jack Evans, Eve Szabo, Rick Harness, Owain McKibbin, Ellen Paul, and all the wildlife rehabilitators, bird banders, museum curators and collection managers who have helped and encouraged me to complete this project. I take full responsibility for any remaining mistakes.

Without the technical assistance of Derek Tan, this project would never have gotten off the drawing board. Dr. Darren Irwin kindly suggested and made the arrangements for this series to be posted on the Beaty Biodiversity Museum website. A huge thank you to the staff and volunteers at the Cowan Tetrapod Collection for providing space and a terrific work environment.

Unless otherwise indicted, all pictures were taken by the author at the Cowan Tetrapod Collection, University of British Columbia Beaty Biodiversity Museum.

OTHER PRESENTATIONS IN THIS SERIES

Introduction: The look of the bird & A few things to look for
- Part 1 - Spread wings, a good way to start
- Part 2 - Skinning your first bird
- Part 3 - Other skinning methods
- Part 4 - Stuffing your first bird
- Part 5 - Other stuffing and pinning methods & Bird parts
- Part 6 - Sexing birds using gonads (includes 2 quizzes with answer sheets)
- Part 7 - Determining skull pneumatization & Skeleton preparation
- Part 8 - DNA tissue sampling & Gut analysis
- Part 9 - Washing skins for ectoparasites & Drying washed skins
- Part 10 - Recording fat levels & Cleaning fatty or stinky skins
- Part 11 - Flat skins, shmoos, and other types of study skins
- Part 12 - Preserving eggs and shell fragments (in prep)
- Part 13 - Determining cause of death
- Part 14 - Labelling: the most important step

To download another PowerPoint presentation in this series go to:
http://www.beatymuseum.ubc.ca/research/birds