HOW TO
PREPARE BIRD SPECIMENS

Part 13 – Determining cause of death

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





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 (Part 13a) because many are equally lethal to humans.

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

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

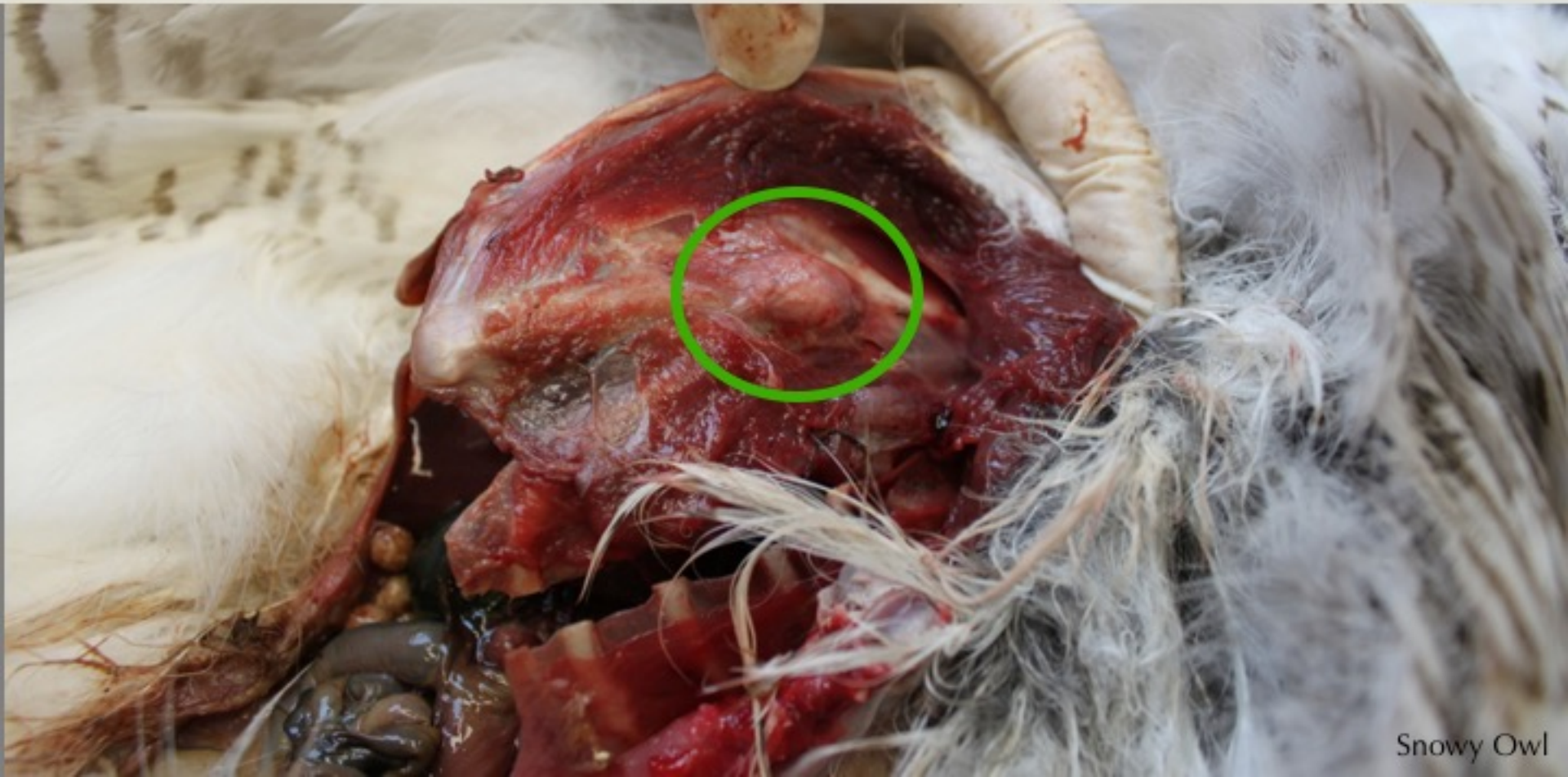
A reference tree, building, etc. is unlikely to move!

This is a hard bone lesion which could be Avian Tuberculosis, **STOP work immediately.**

Put on a face mask:

- Freeze the bird
- Disinfect all surfaces and tools

Contact and arrange transport to a testing facility.
If this is not possible – arrange for the bird to be incinerated.
Only a licensed pathologist should cut into the bone mass checking for a crumbly caseous core. A sub-sample is then sent for testing.



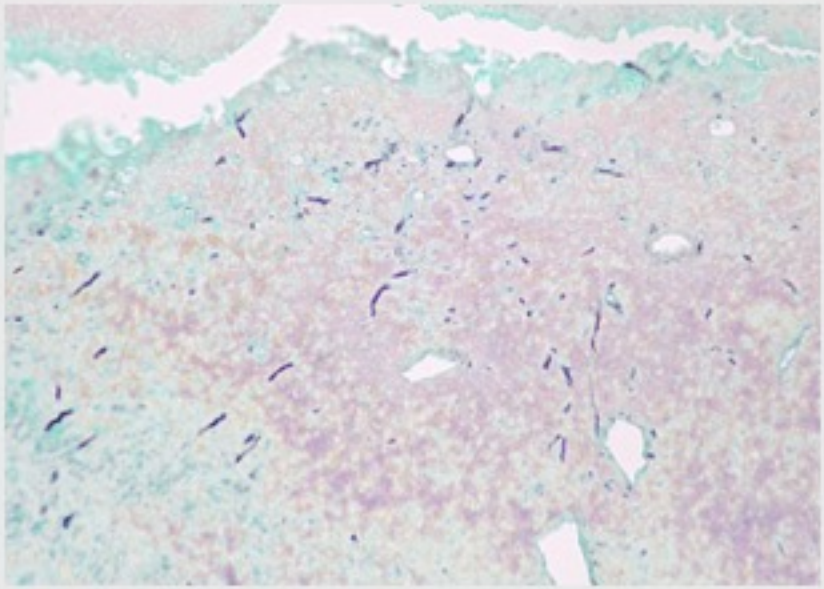
Avian Tuberculosis can manifested as a single or clusters of caseous granulomas produced by the body to combat bacteria. These nodules are also produced to combat fungus infections and non-tubercular bacteria.

Accurate diagnosis only possible after PCR, culture, and/or histopathology testing.

Note the concentric rings visible when the firm nodule comprised of compressed laminated caseous material is cut in half.

Thorax and abdomen of the same Snowy Owl

All Avian Tuberculosis Test run on this Snowy Owl were negative.



These histographs are of the granulomas shown in the previous slide.
Fungal elements were found within the caseous granulomas. Grocott's stain (purple) was applied to enhance the fungus.

If you see white granules in the liver. **STOP work immediately. Put on a face mask.**
Freeze the bird. Disinfect all surfaces and tools. Contact a licensed pathologist.

Based on a sample of two white granules, this crane tested **Positive** for Avian Tuberculosis.
Unless the licensed pathologist wants to necropsy the bird, **INCINERATE IMMEDIATELY**.

Sandhill Crane

Sarcocystis is a parasitic protozoan infection.
(Rice belly or Rice Breast Disease)

Waterfowl affected with *Sarcocystis rileyi* usually do not look or act sick and generally the disease is not fatal. Slice open the breast and look for cream coloured cylindrical cysts running in parallel lines in the breast or thigh muscles. Less commonly occurs in heart or smooth muscles of the digestive tract.

Severe infections may cause muscle loss with resultant lameness or weakness.

Sarcocystis found in waterfowl presents no known hazard to humans.

http://www.dnr.state.md.us/wildlife/Hunt_Trap/waterfowl/sarcocystis.asp

Airsacculitus refers to inflamed air sacs.

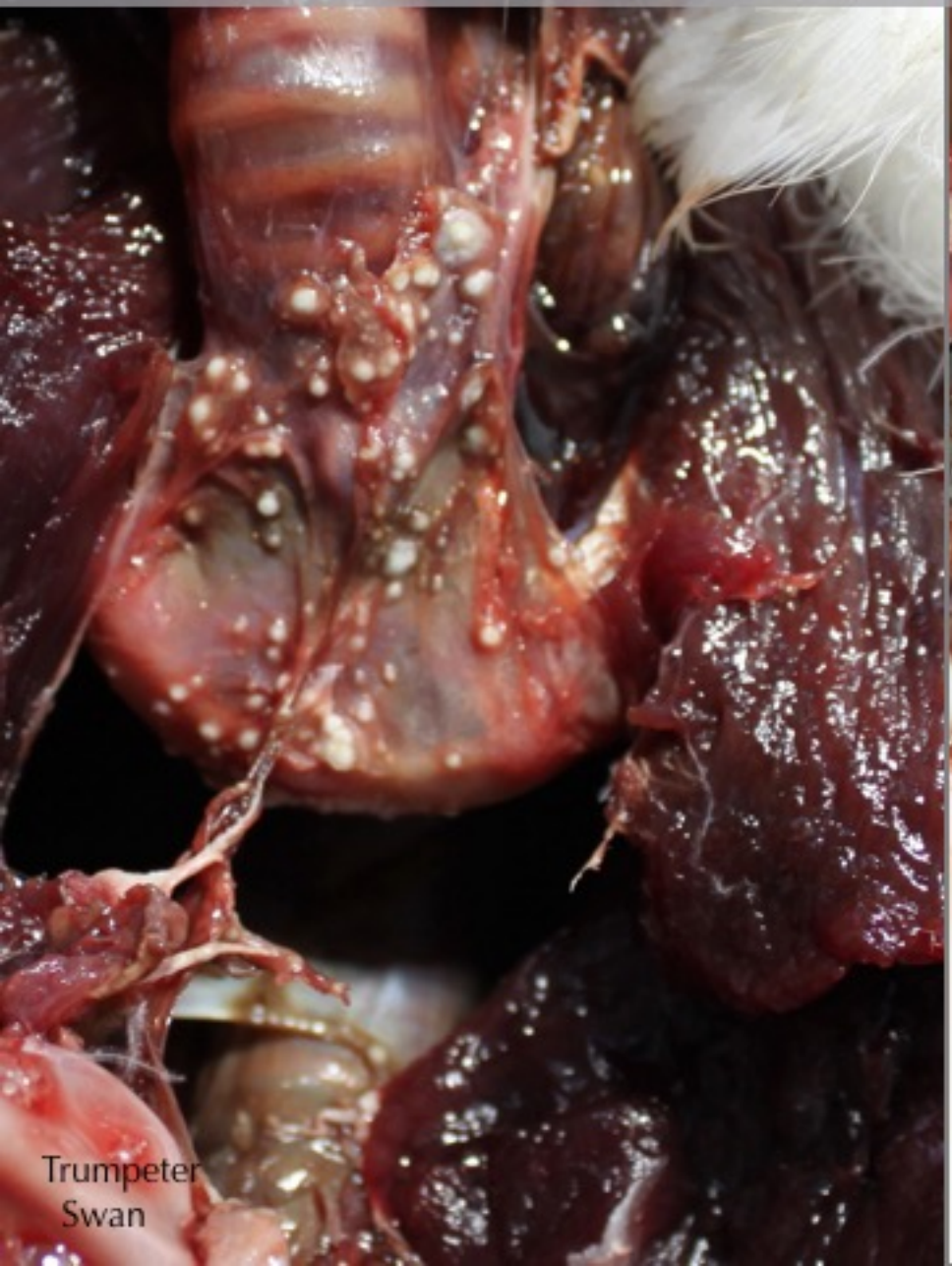
Typically air sacs are thicker than normal, and appear white or opaque rather than transparent. Purulent (pus) or caseous (cheese like) material may accumulate within the air sacs.

Airsacculitus is caused by:

- Aspergillosis
- E. Coli bacteria
- Avian cholera
- Mycoplasmosis
- Orthithobacteriosis
- Other diseases


A health air sac is pseudo-transparent,
stretchy, and pink in colour.
Trumpeter Swan

In the early stages, *Aspergillus* fungus manifests itself as small nodes on the syrinx or air sacs of vegetarian, omnivorous, and carnivorous birds.

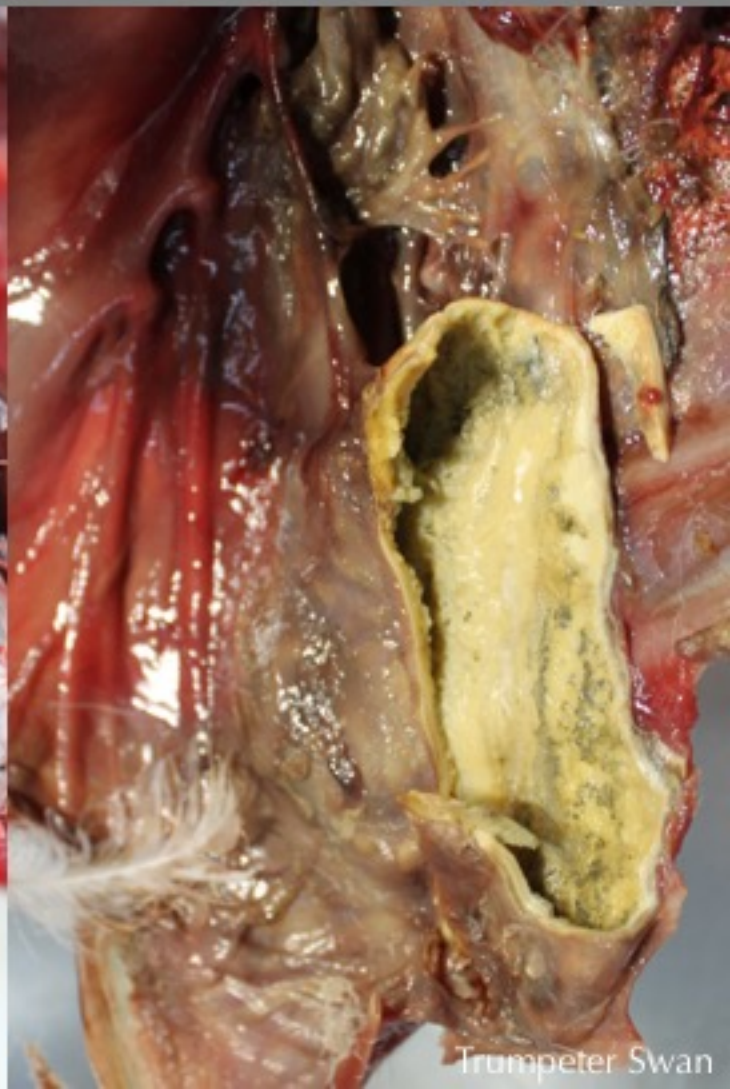


Trumpeter Swan

Snowy Owl

As the *Aspergillus* infection progresses, air sacs become thick, leathery, and often a yellow-green colour. Both these air sacs have been sliced open.

Aspergillus is a large genus of mold (fungus) found on decaying vegetation in damp environments. It is a natural part of the decay process.
Birds become infected when they aspirate the fungus spores.



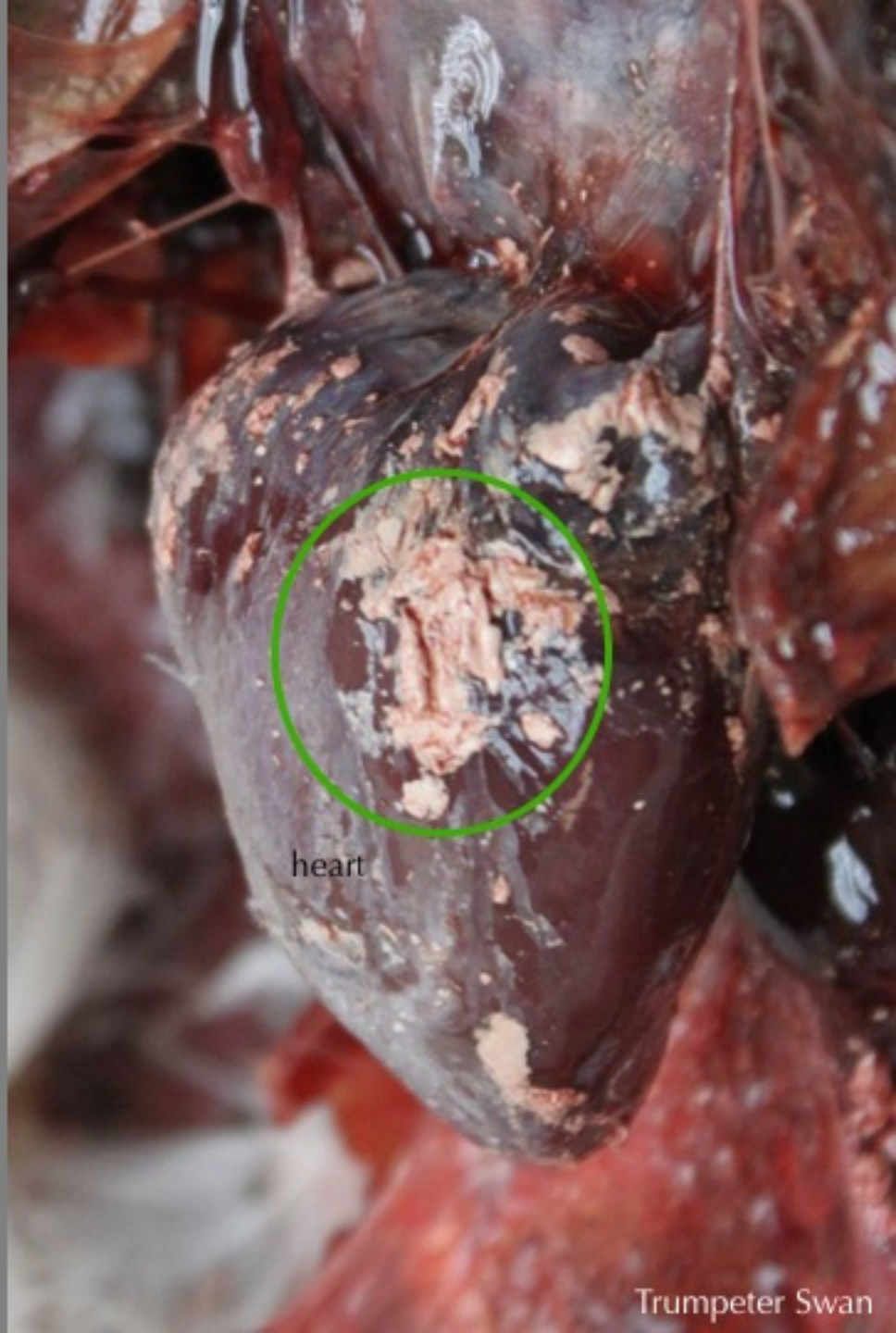
Trumpeter Swan

Birds with severe *Aspergillus* frequently exhibit nodes in the lungs.
Such birds have trouble breathing. Flying takes a huge effort.
Collisions with cars, wires, and electrocutions are often the manner of death.

Trumpeter Swan

Gout is caused by elevated levels of uric acid in the blood.

This wan has uric acid crystals on multiple organs and joints. Arthritic joint pain is caused when uric acid crystals deposited directly on bone or on tissue near a joint.



Birds get internal and external cancers.

Nestling Barred Owl

Budgerigar

This is the crop and esophagus.

This is a growth.

Photo document and measure growths before removing.

http://www.poultryindustrycouncil.ca/pdfs/factsheets/fs_136.pdf

Common Murre

Slice the growth.
Look at its internal structure.

A cancerous growth is a solid mass.
This growth is composed of layers confirming that it is a…..

Preserve in Booor solution will minimize discoloration.

Help ?????

Check the soft palate of young birds with misshaped beaks.

Trichomonas gallinae (a protozoan) causes white or yellow ulceration in the soft palatte and may extend to the top of the digestive and/or respiratory tract. Chicks catch the disease when fed an infected bird or possibly from an infected parent. Adult birds rarely get *Trichomonas*.

This highly infections condition is called canker in pigeons and frounce in raptors.

Trichomonas gallinae is not known to infect humans.

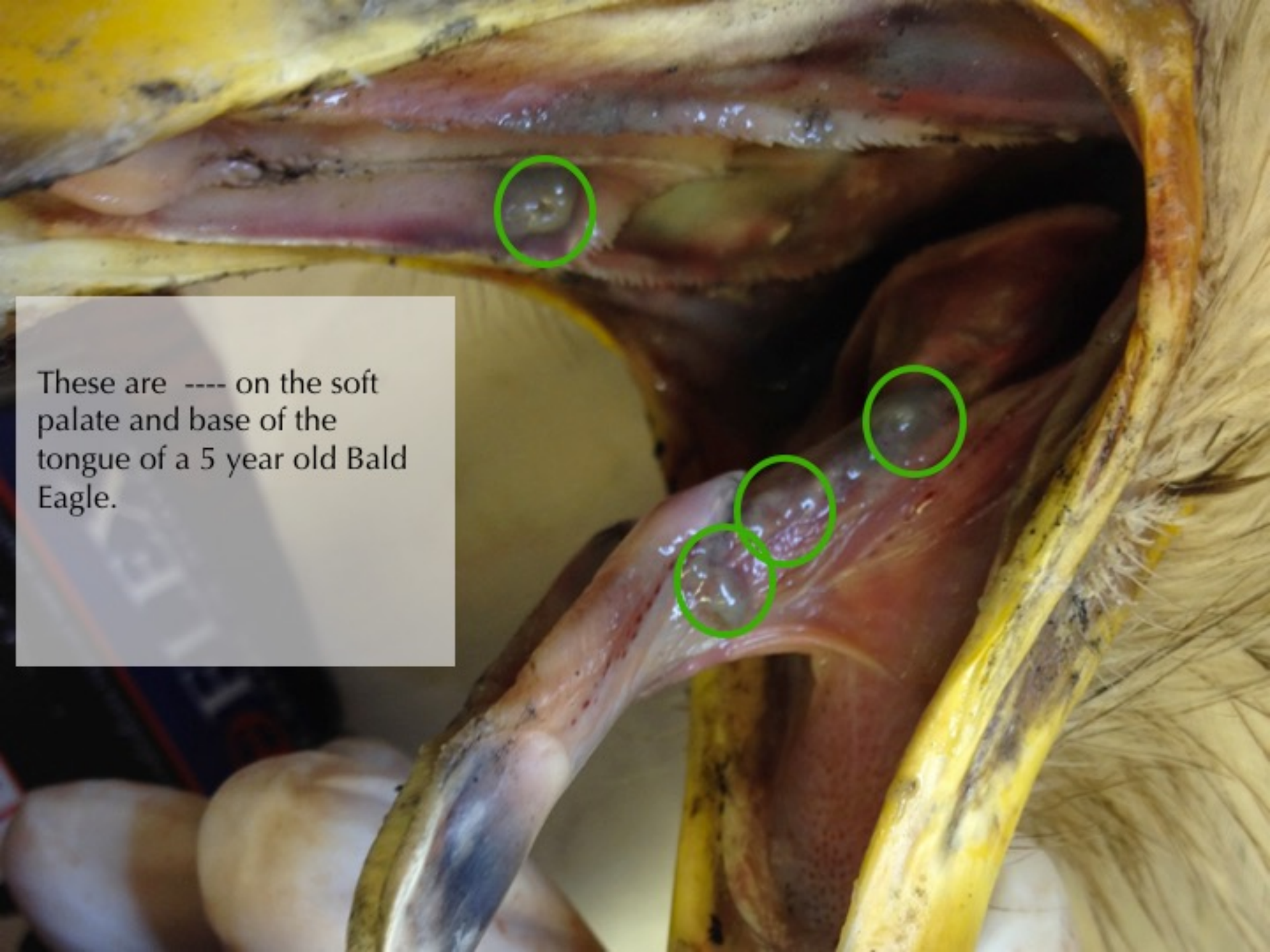

These are ---- on the soft palate and base of the tongue of a 5 year old Bald Eagle.

Photo courtesy of Dr. Helen Schwantje

The Ornithological Council has 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

Avian Pox

(cutaneous or "dry" pox)

Vectors of this virus are blood feeding (hematophagous) arthropods such as fleas, several mosquito genera, and other biting insects.

Common Raven

Photos courtesy of Dr. Victoria Bowes

Van Riper et al proposed the following method for describing pox lesions:

- Light (1 lesion)
- Moderate (2 lesions)
- Heavy (3 or more or 1 large head lesion)

Lesions can coalesce causing partial blindness.
Foot lesions can result in toe loss.

Rock Pigeon

Bald Eagle photo courtesy of Tony Robinson


Avian pox viruses target specific bird families.
It is very unlikely that crow pox would
infect eagles.
There is nothing wrong with this crow's eye.
The camera has captured the blue
nictitating membrane moving
across the eye.
Northwestern Crow
Photo courtesy of Tony Robinson

Skin lesions similar to avian pox virus are caused by:

- Nutritional deficiencies
- Mycotoxis
- *Papilloma* virus
- Scaly leg mites

For a definitive diagnosis, tissue is stained and viewed under a light or electron microscope.

Lesions excised with a sterile scalpel are either frozen at -20 C or preserved in 10% neutral-buffered formalin prior to histopathology assessment.

Northern Mockingbird

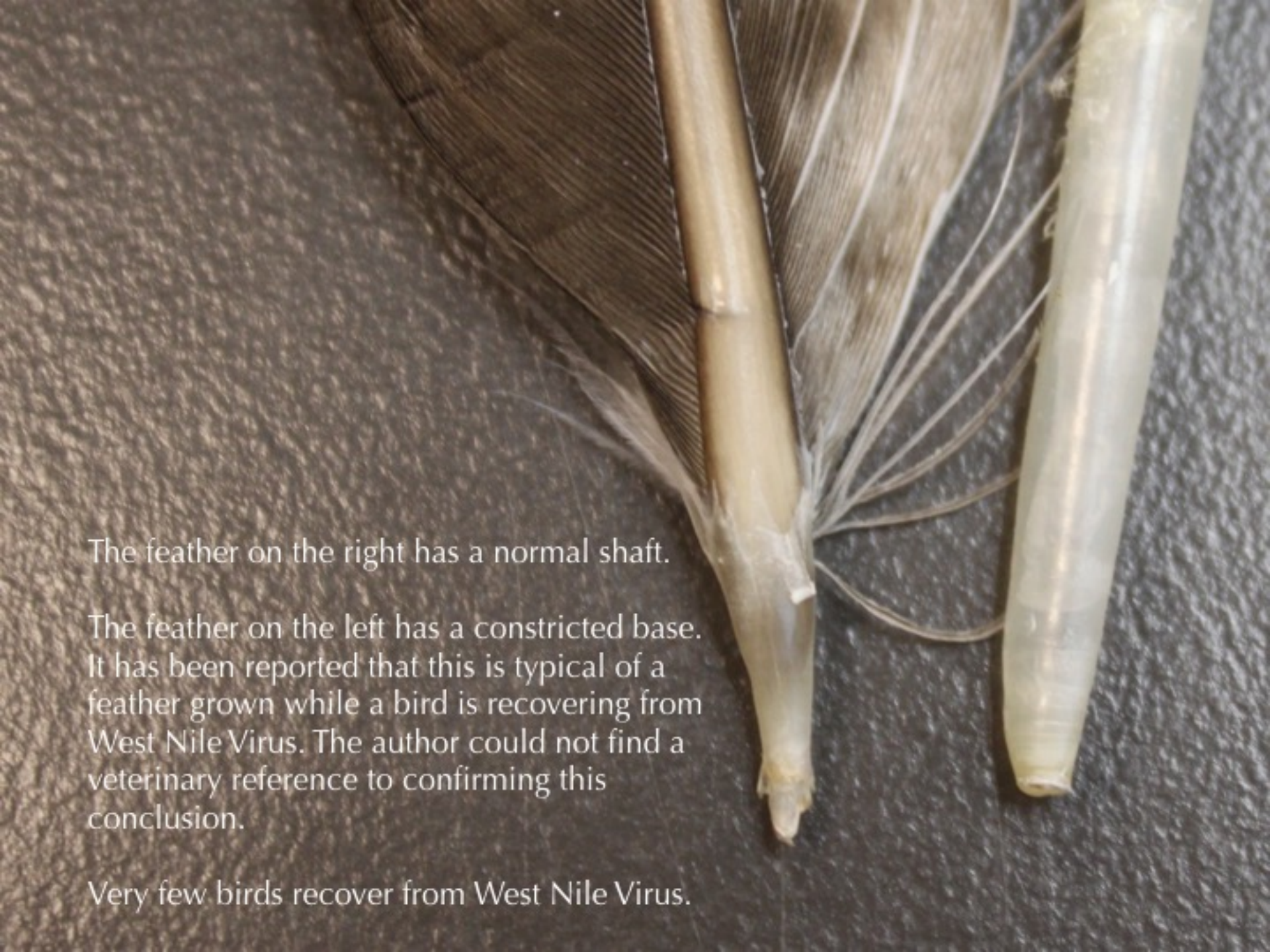
Quinta Mazatlan, McAllen, TX

This Rock Pigeon was found on a road. Massive internal bleeding confirmed that it died due to a vehicle collision, not a foot infection.

DON'T ASSUME EVERY LESION IS AVIAN POX.

The feet of this pigeon became infected after its feet were constricted by a red nylon rope.

Note that only two toes remain on one of the feet.



The feather on the right has a normal shaft.

The feather on the left has a constricted base. It has been reported that this is typical of a feather grown while a bird is recovering from West Nile Virus. The author could not find a veterinary reference to confirming this conclusion.

Very few birds recover from West Nile Virus.

Bumblefoot (ulcerative pododermatitis) is a bacterial infection *(Staphylococcus aureus) which* causes inflammation and sores.

Mild:	Small reddened area or small shiny patch
Moderate:	Some penetration has occurred (as see above)
Severe:	Distortion of the contours of the foot and/or the toes

Found in wild raptors but more common in domestic birds.

Alwaslvetclinic.com via Wiki

Avian Keratin Disorder (Long Bill) results in overgrowth of the rhamphotheca, the outer keratinized layer of the beak.

Beak deformities in birds are typically caused by:

- Infectious agents
- Parasites
- Genetic abnormalities
- Exposure to environmental contaminates
- Nutritional deficiencies

Photo courtesy of J T Schopp

Photo taken at University of Nebraska State Museum

Photo courtesy of Kay & Robert Lookingbill ,Lake Jackson, TX

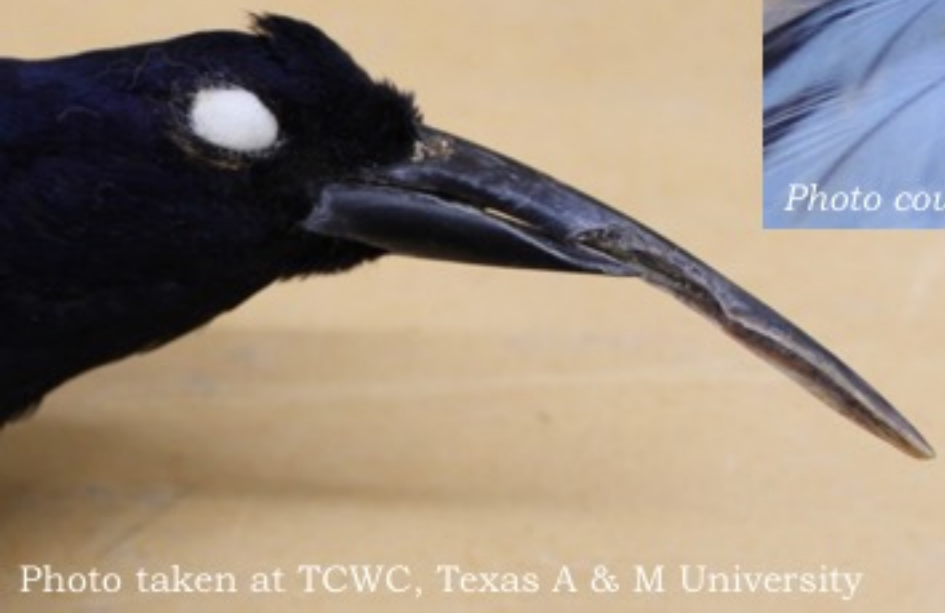


Photo taken at TCWC, Texas A & M University

The cause of Avian Keratin Disorder is unknown. Diurnal raptors, hummingbirds, woodpeckers, and passerines get it.

The Falcon Research Group commissioned this N. John Schmitt drawing to promote discussion and encourage more accurate reporting of Avian Keratin Disorder.

BANANA-BILL

HOOK-BILL

NORMAL BILL

BROKEN-BILL

CROSS-BILL

SICKLE-BILL

Illustration courtesy of Bud Anderson
Falcon Research Group - frg.org

The tomia on the maxilla of these song sparrows is overgrown. It does not appear to have affected their health.

Photo taken at the Louisiana State University Museum of Natural Science

Photos of live bird, courtesy of Dr. Heather York, NE


This adult Indigo Bunting was migrating.
Despite the beak deformity,
her body condition was good.
She had visible fat reserves.
Photo courtesy of Mark Conway
Las Palomas WMA, Arroyo Colorado Unit, TX

No tests were done on this Brown Thrasher.
Scaly leg mites are suspected.
Check the whole bird for affected areas.

Mite image photo courtesy of Dr. Heather C. Proctor

Photos taken at the
Louisiana State University Museum of
Natural Science

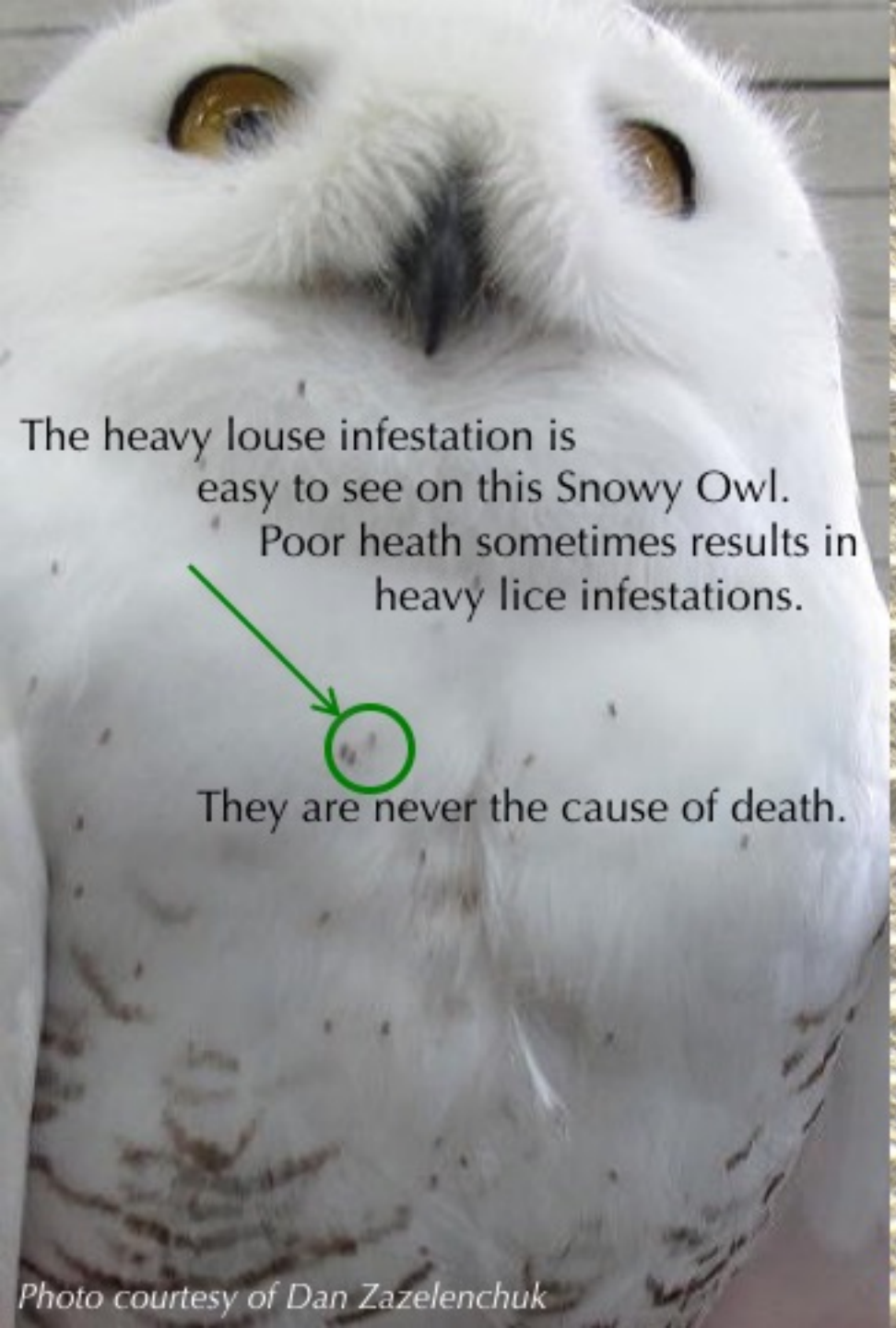

The heavy louse infestation is
easy to see on this Snowy Owl.
Poor heath sometimes results in
heavy lice infestations.
They are never the cause of death.
Photo courtesy of Dan Zazelenchuk


Photo courtesy of Donald Griffiths
Spencer Entomology Collection

Photo taken from Federmilben.de

For more complete information on ectoparasites, please go to:

Part 9 - Washing Birds for Ectoparasites

This section describes and illustrates different types of ectoparasites.
It includes references and website links.

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

SUGGESTED READING FOR PART 13C & PART 13D

Guide to Raptor Remains: A Photographic Guide for Identifying the Remains of Selected Species of California Raptors, 2004. EDM International. 115pp.

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

Methane Burner Impacts on Raptors. 2013. Keeping company with Kestrels, Inc. and EDM International, Inc. 20pp.

Szabo, Ildiko. Preparing Bird Specimens: Part 9-Washing Birds for Ectoparasites. http://www.beatymuseum.ubc.ca/research/birds Accessed 2010.

Van Hemert, C., C. M. Handel, and D. M. O'Brien. 2012. Stable isotopes identify dietary changes associated with beak deformities in Black-capped Chickadees (*Poecile atricapillus*). The Auk 129:460-466.

Van Riper C III, Van Riper SG, Hansen WR: Epizootiogogy and effect of avian pox on Hawaiian forest birds. Auk 119:929-942.

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

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 Heather C. Proctor, Richard Harness, Joanne Mason, Laurie Wilson, Eve Szabo, Don Griffiths, Spencer Entomological Museum, Jack Evans, Felicité S Dodd, Gail Kenner, Bud Anderson, N. John Schmitt, Ellen Paul, and all the wildlife rehabilitators, bird banders, pathologist, 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 creating 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