

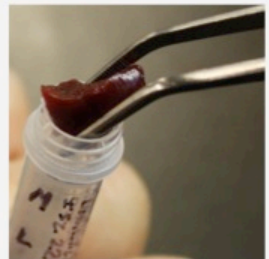
HOW TO



# PREPARE BIRD SPECIMENS

Part 9a – Washing bird skins for  
arthropod ectosymbionts

Part 9b – Drying a washed bird skin

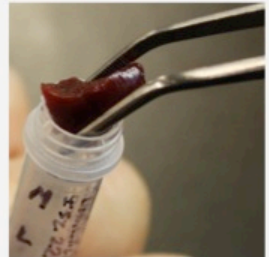


HOW TO



# PREPARE BIRD SPECIMENS

Part 9a – Washing bird skins for  
arthropod ectosymbionts



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.

Always 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>



(Red-tailed Hawk host)

Photo courtesy of Donald Griffiths  
Spencer Entomological Collection



(Trumpeter Swan host)



Taxonomic relationships of arthropod ectosymbionts and their avian hosts are used to study speciation and to determine evolutionary trees of both arthropods and birds.

Record all ectosymbionts found on the avian data sheet.  
Heavy infestation may indicate other health issues.

*Photo courtesy of Donald Griffiths  
Spencer Entomological Collection*





The four major groups of arthropod ectosymbionts are:

- Lice (Mallophaga)
- Fleas (Siphonaptera)
- Mites including ticks (Acarina)
- Flat flies (Hippoboscidae)



Lice (Mallophaga):

- Live between feather shafts
- Feed on feathers or blood
- Females attach eggs to feathers

The Curlew Quill Louse

(*Actornithophilus patellatus*)

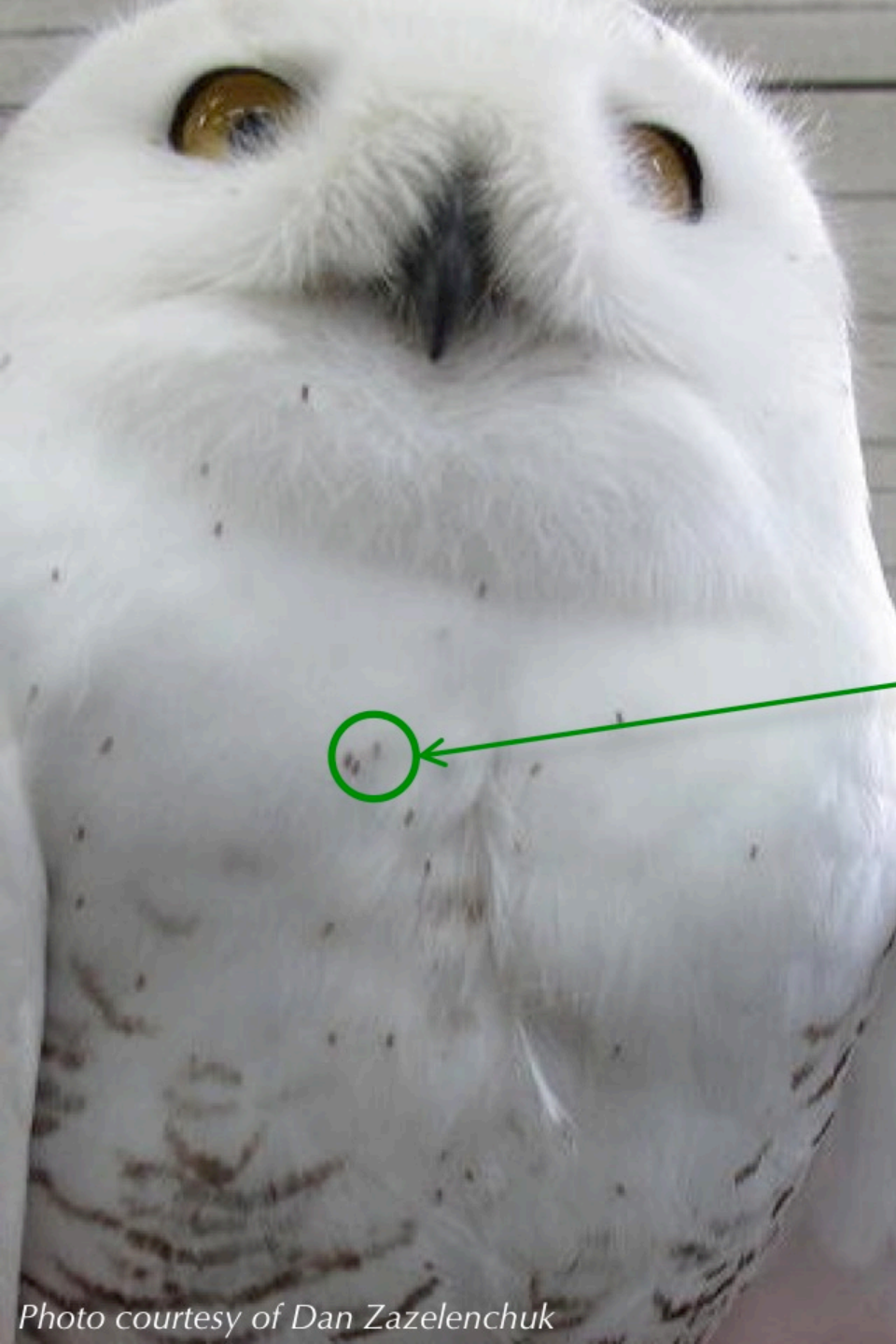
spends part of its life cycle in the quills of its host; this is the only known louse to live inside quills and feed on the pith (pulp) inside feather shafts.



Photo courtesy of Donald Griffiths  
Spencer Entomological Collection







Due to the white plumage,  
the heavy louse infestation is  
easy to see on this Snowy Owl.





Empty lice egg cases  
looks like silver glitter  
on this Snowy Owl  
feather.



*Photo courtesy of Donald Griffiths  
Spencer Entomological Collection*





1 mm



Fleas (Siphonaptera):

- Eggs not laid on host bird but in host's nest
- Early life stages feed on organic debris matter in or around nest
- Adults feed exclusively on blood of avian host

*Photo courtesy of Donald Griffiths  
Spencer Entomological Collection*



Mites (Acarina) are divided into 4 groups:

1. Feather mites (Astigmata: Analgoidea and Pterolichoidea):
  - Most species live on feather surfaces and feed on uropygial (preening) oil
  - A few species live on the skin's surface and feed on skin flakes
  - A few species live inside quills and feed on feather pith



♀ *Analges* (Purple Finch host)



♂ *Analges* (Purple Finch host)

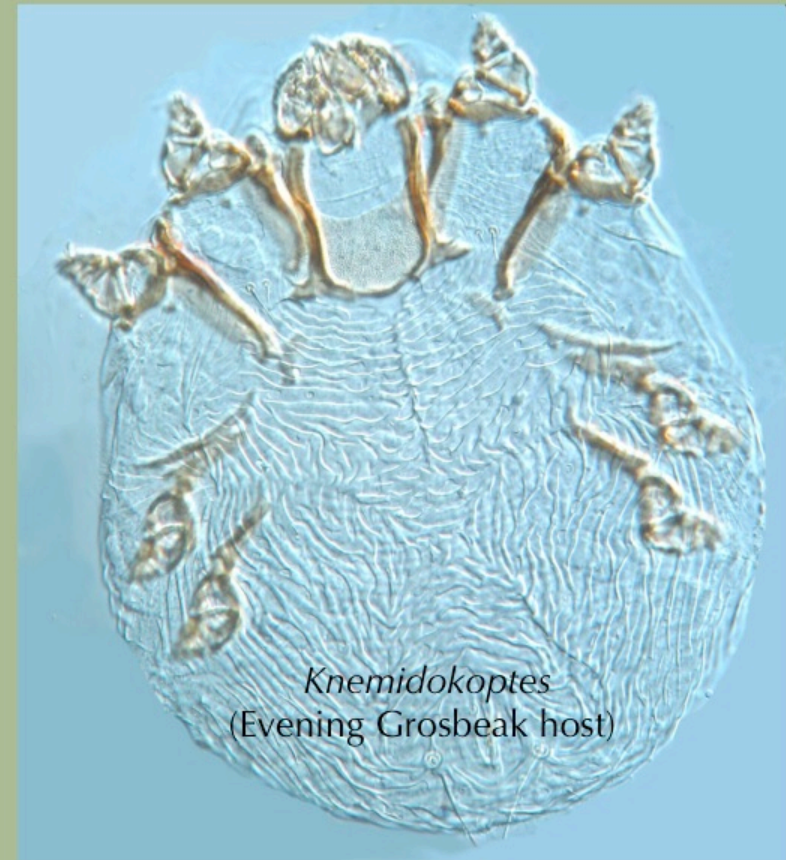
Photo courtesy of Dr. Heather C Proctor





## 2. Quill Mites (Prostigmata: Syringophilidae):

- Live inside quills
- Feed on host body fluids by piercing quill wall into adjacent tissues with their long chelicerae



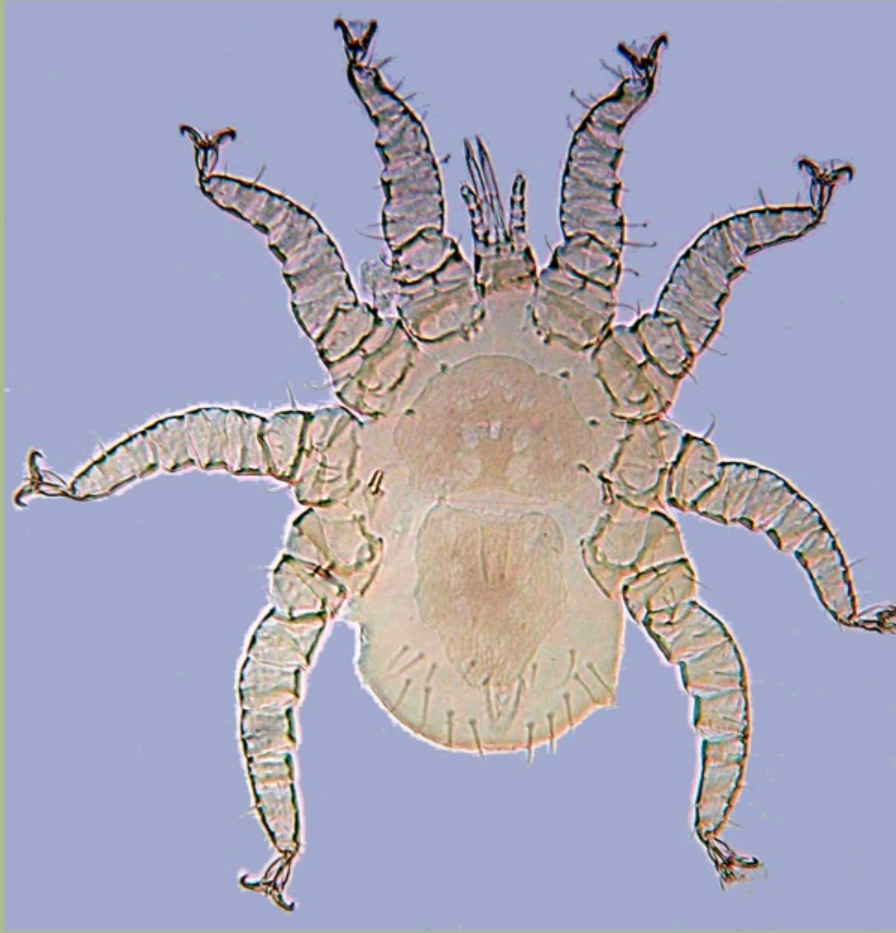
## 3. Scaly-leg mites

(Astigmata: Epidermoptidae  
Knemidokoptinae):

- Feed on keratinous tissues of the skin, particularly legs and beaks



4. Nasal mites (Mesostigmata: Rhinonyssidae):
- Live inside the nasal passages and upper respiratory track
  - Feed on host blood and tissues



♀ *Tinaminyssus melloi* (Rock Pigeon host)

*Dermanyssus quintus*  
(Hairy Woodpecker host)



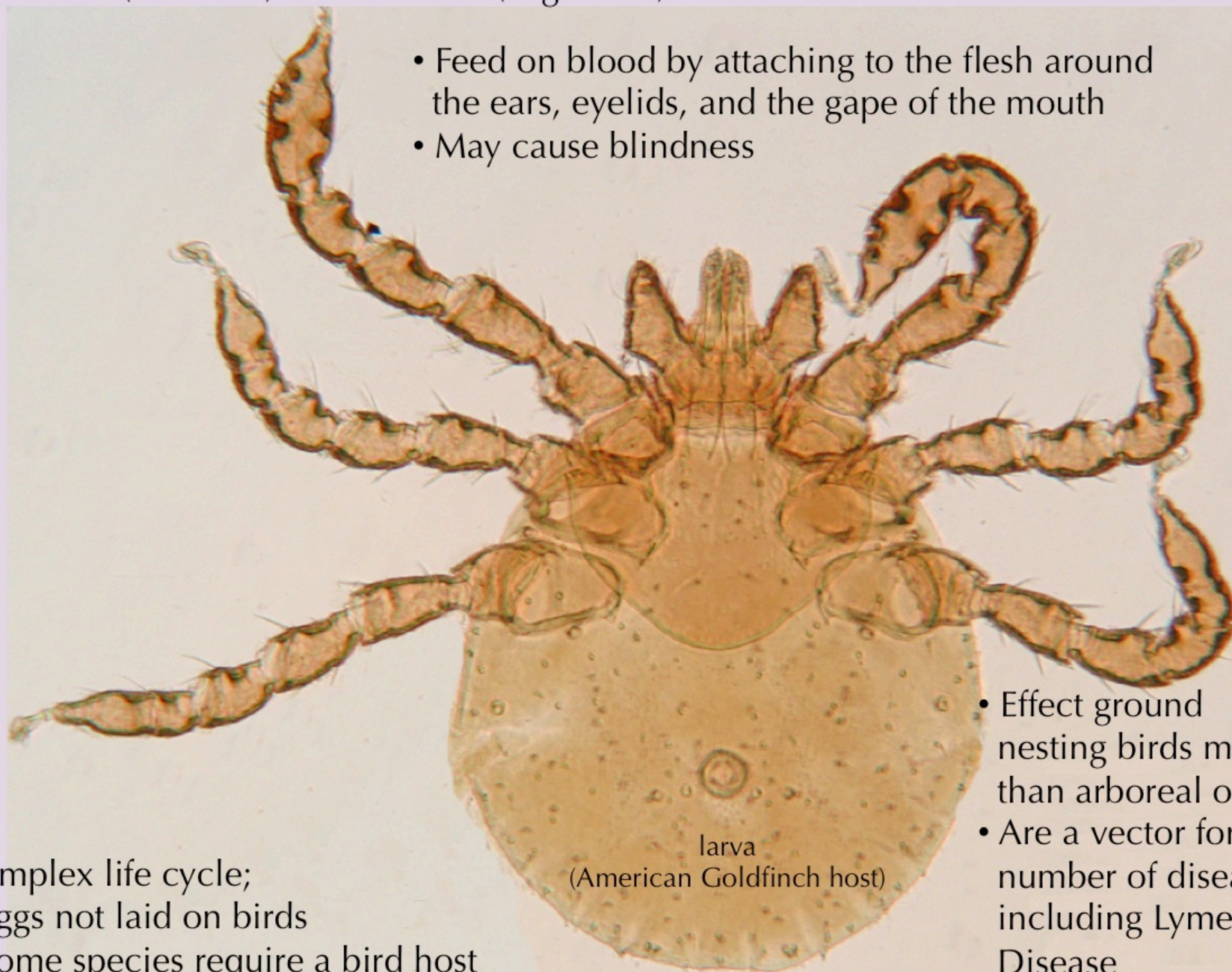
5. Fowl mites (Mesostigmata: Dermanyssidae and Macronyssidae):
- Feed on blood
  - Depending on the species, live either on the bird or in the nest and surrounding area
  - Heavy infestations kill nestlings





# Hard ticks (Ixodidae) and soft ticks (Argasidae):

- Feed on blood by attaching to the flesh around the ears, eyelids, and the gape of the mouth
- May cause blindness



larva  
(American Goldfinch host)

- Effect ground nesting birds more than arboreal ones
- Are a vector for a number of diseases, including Lyme Disease

Complex life cycle;

- Eggs not laid on birds
- Some species require a bird host followed by a mammalian host





Female Rufus  
Hummingbird  
host

Bird Banders often remove ticks  
from around the eye or in the ear.

Include the bird band number  
on the tick collection label.

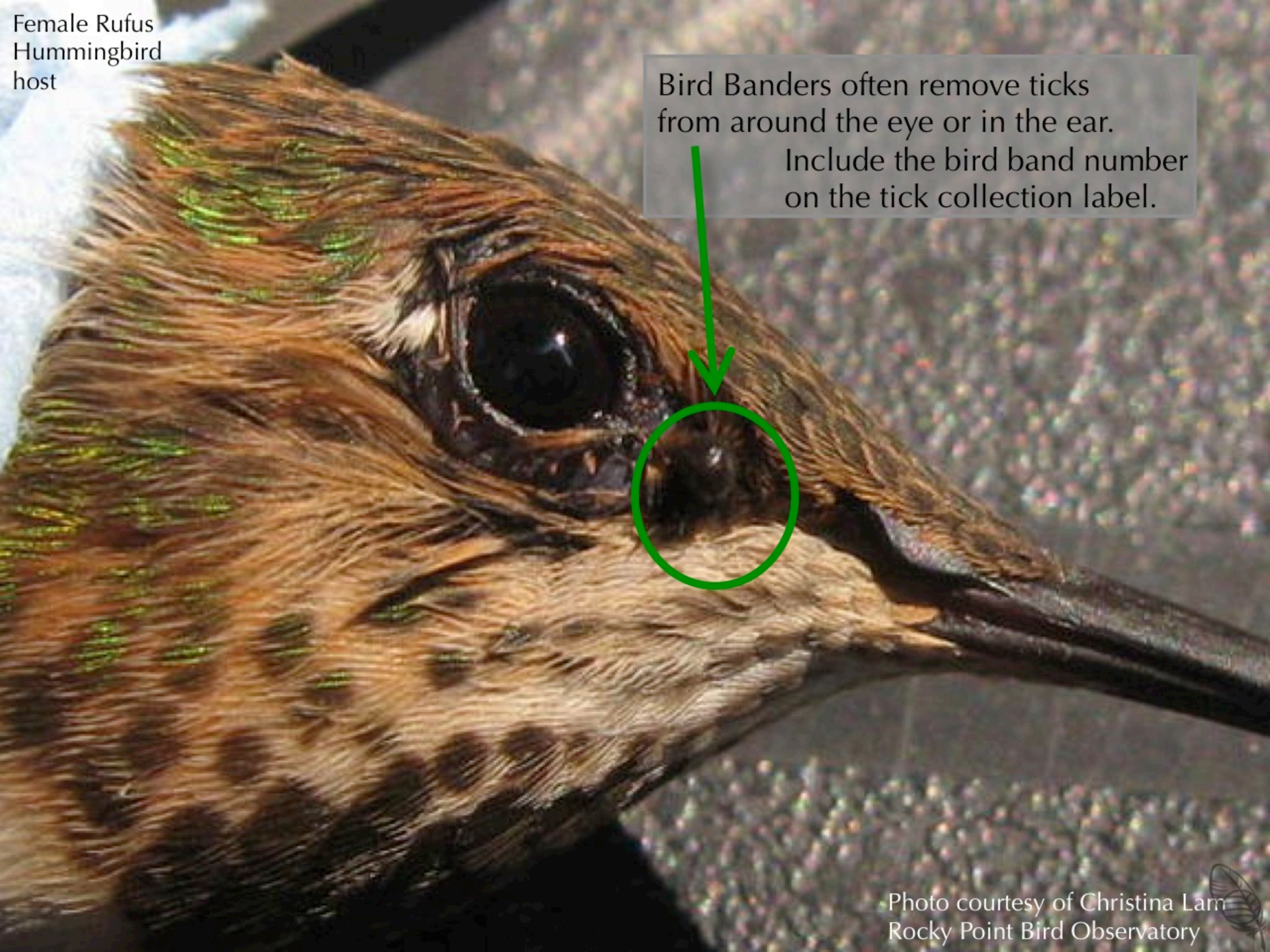


Photo courtesy of Christina Lam  
Rocky Point Bird Observatory







### Flat flies (Hippoboscidae):

- Extremely dorsoventrally flattened
- Found between feathers or on host's skin
- Feed on blood
- Females gives birth to one live offspring per reproductive cycle
- Require no alternate host
- Many generations can live on the same bird
- Highly vagile (transfer readily between birds of the same and different species)

*Photo courtesy of  
Iris I Levin*





Arthropod ectosymbionts may crawl out of the feathers during the freezing process.

When this frozen juvenile Northern Flicker was thawed prior to preparation, two hippoboscids were found. One at the bottom of the Ziploc bag, and another on the paper towel wrapping.

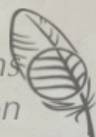




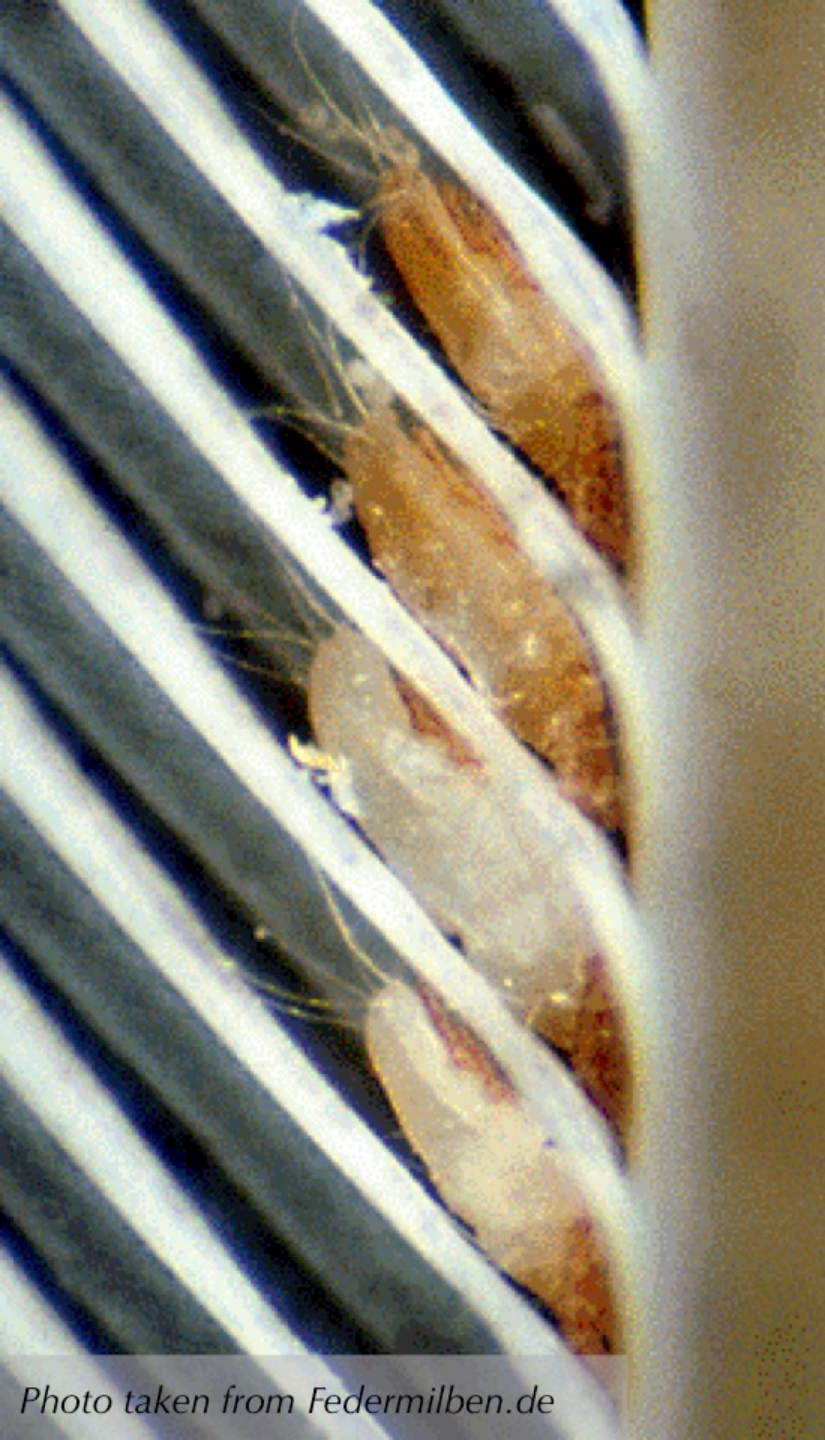
Consider documenting and storing all  
arthropod ectosymbionts you find.  
You might help an entomologist  
discover a new species.

1 mm

Photo courtesy of Donald Griffiths  
Spencer Entomological Collection







For additional information:

Dr. Heather C. Proctor web publication:  
List of Feather Mites and Their Hosts

[http://www.biology.ualberta.ca/faculty/heather\\_proctor/?Page=5626](http://www.biology.ualberta.ca/faculty/heather_proctor/?Page=5626)

The following website does not appear to have been updates since 2007.  
Click on the ♀ and ♂ to view pictures of arthropod ectosymbiont species.

<http://www.federmilben.de/en/gallery.html>





Washing birds in poor heath or with one of the following two conditions will increase your chances of finding arthropod ectosymbionts:

(1) Look for frayed upper wing covers indicating a medium-heavy feather lice infestation





## (2) Avian Keratin Disorder (a.k.a. Long-bill Syndrome)

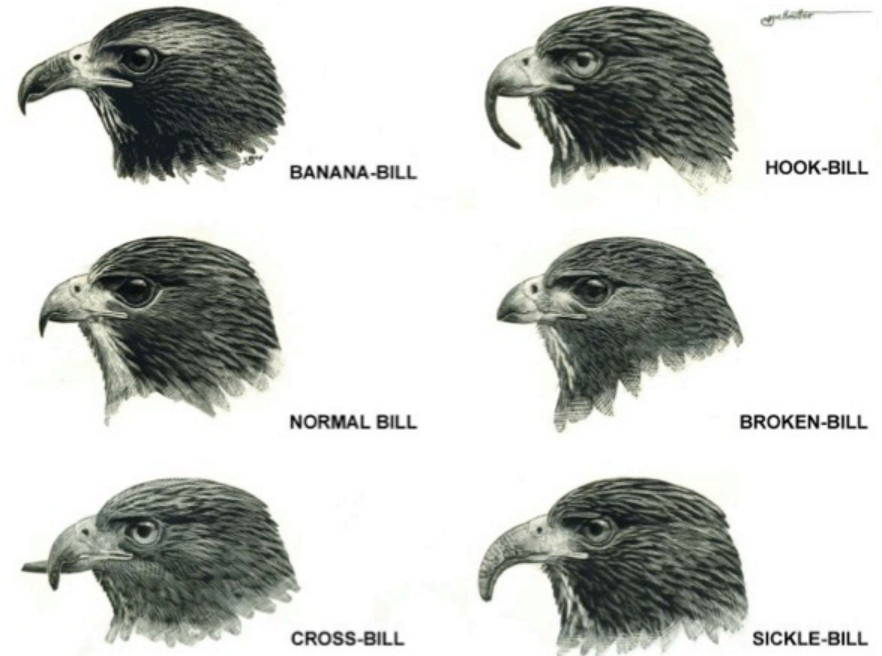
Deformed beaks may decrease grooming efficiency resulting in higher than normal arthropod ectosymbionts loads.

This syndrome occurs in hummingbirds, woodpeckers, raptors, passerines, and probably other orders of birds.

Normal



Avian Keratin Disorder



Original artwork by N. John Schmitt, drawing courtesy of  
Falcon Research Group ([frg.org](http://frg.org))





Gather the following:

1. Washing Tools:

- Sink (not shown)
- Wash basin
- Soap
- Tooth brush



2. Drying Tools:

- Cloth or paper towels
- Tooth brush

Plus one or more of the following:

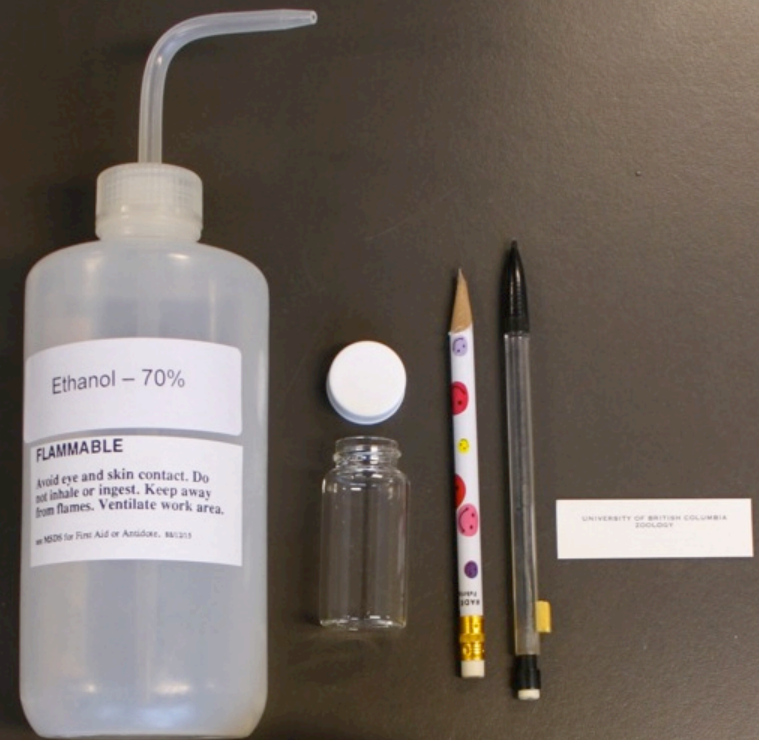
- Hair dryer & chemistry stand
- Compressed air
- Mechanical or manual tumbler with an absorbent (corn meal, corn cob, or fine sawdust)





For arthropod symbionts sampling, these additional tools are required:

- Wash bottle filled with 70 or 95% ethanol
- Wash bottle filled with tap water
- Large container with a tight fitting cover
- Fine mesh sieve
- Vial (s)
- Internal label that is alcohol resistant
- Pencil or alcohol proof pen





U.S.A. STANDARD TESTING SIEVE  
A.S.T.M. E-11 SPECIFICATION

OPENING  
MICROMETER

90

NO. 170

OPENING  
IN INCHES

.003

VWR 

MADE IN U.S.A.

A 90 micrometer mesh sieve is commonly used.  
If available, use a 45 micrometer sieve.  
This is especially important when sampling for mites.



This PowerPoint can only give a quick overview.

Use this link to view a detailed 30 minute step-by-step video titled:

## **Washing Birds for Arthropod Ectosymbionts**

<http://youtu.be/ijZushKix2g>

Watch Dr. Heather C. Proctor demonstrate how to wash a bird for arthropod ectosymbionts, decant and store the avian washings, examine and extract the arthropods, plus learn how to make and label arthropod microscope slides.





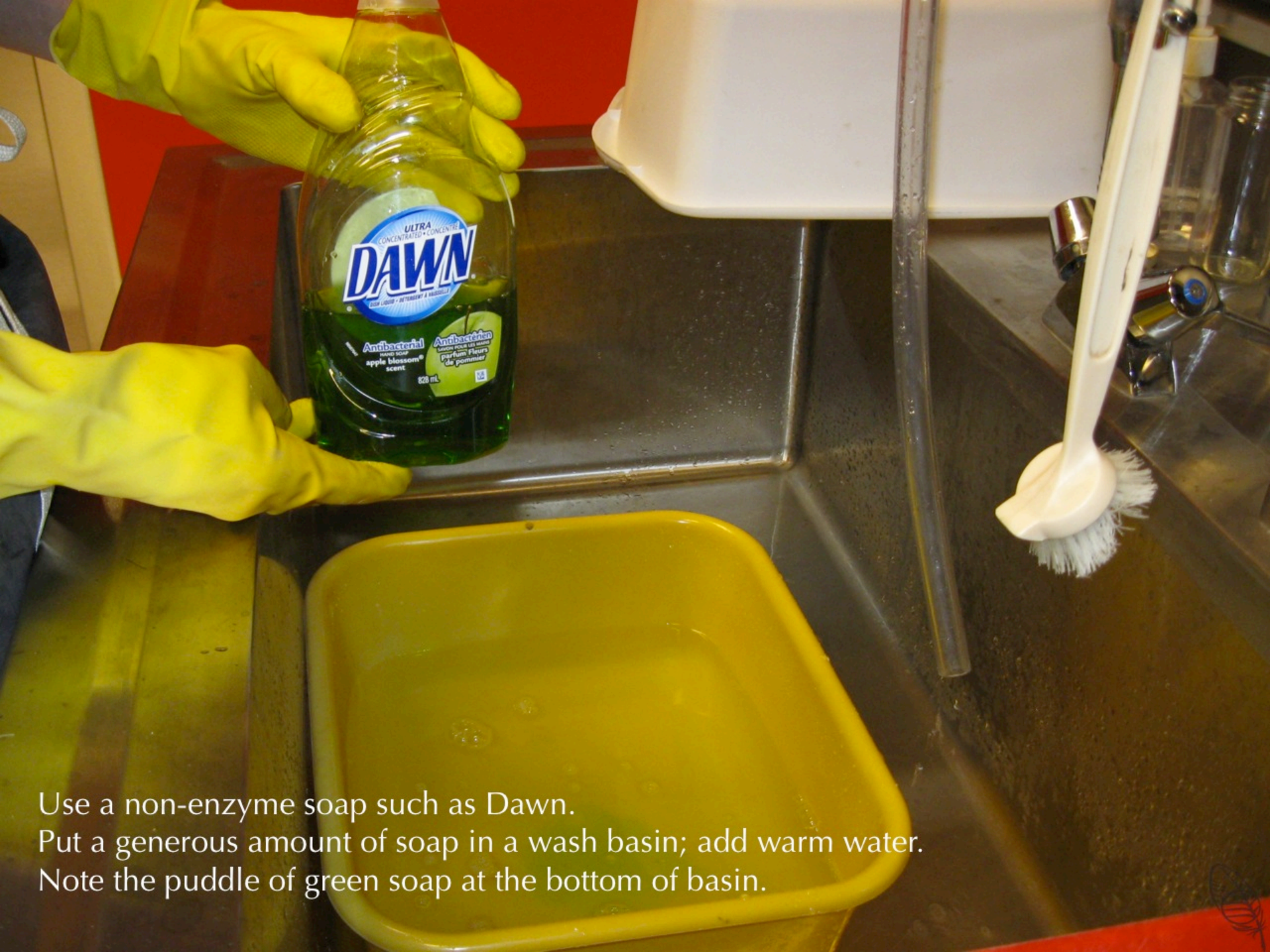
If possible, start with an ethanol pre-wash to help loosen arthropods:

- Using a wash bottle, liberally dose the bird with 70% or 95% ethanol
- Squirt Dawn soap directly on the bird
- Put the bird in a wash basin or bucket, turn the tap water on so the water runs through the feathers
- Soak the bird for 5 minutes
- Open the bird's beak and irrigate the mouth and nasal passages to sample for nasal mites
- Swirl the bird in the basin or, if you are using a container with a lid, shake for 5 minutes

Regardless of if you include an ethanol pre-wash or not, follow the same steps to rinse, sieve, decant the residue, and dry the bird.







Use a non-enzyme soap such as Dawn.  
Put a generous amount of soap in a wash basin; add warm water.  
Note the puddle of green soap at the bottom of basin.



Use this method to wash whole  
and skinned birds.  
Submerge the bird and spread  
the feathers.





Don't rush. Soaking the skin for 5 minutes does no harm.

If preparing a study skin, use additional soap to spot clean bloody feathers, fecal matter, or other dirt.

Note that there is only a small amount of water in the basin.

It is imperative that no water sloshes out of the basin resulting in lost of arthropod ectosymbionts





Hold the bird over the basin.  
Gently squeeze as much water out of the bird as possible  
without breaking any feathers.





Carefully pour the wash water through the sieve.  
Rinse the basin and pour the rinse water through  
the sieve.

Repeat as often as necessary.





Rinse the bird.  
Remember not to  
overfill the basin.



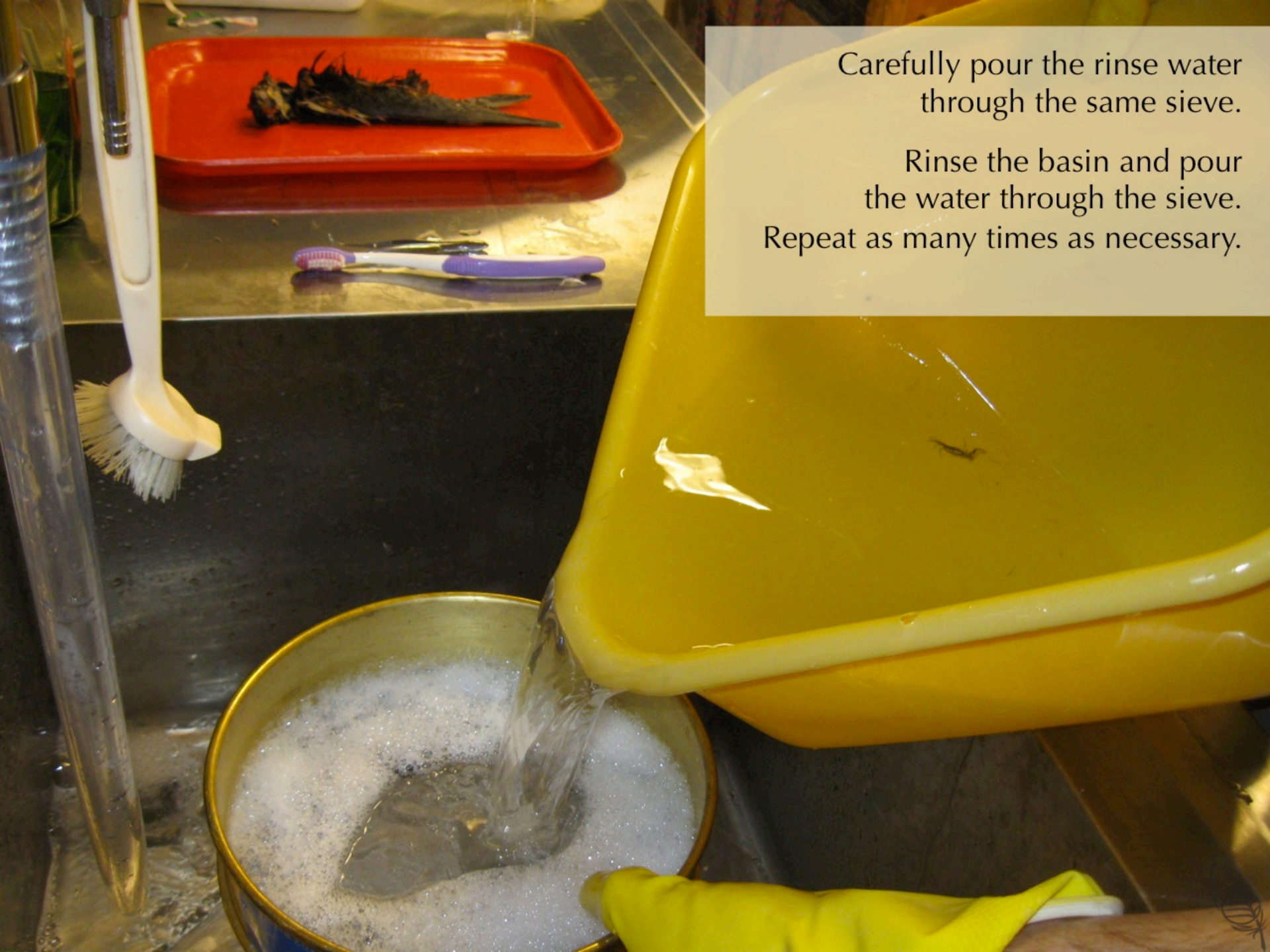


Check the bird for visible arthropods,  
and remove any found with forceps.

If any of the feathers are matted,  
use a tooth brush to spread the feathers.






A close-up photograph of a person's hand, wearing a yellow rubber glove, pouring water from a large yellow plastic basin into a metal bowl. The metal bowl contains white soapy water. In the background, a red plastic tray holds a dark, charred object, and a white brush with a long handle is visible on the left. The scene is set on a stainless steel surface.


Carefully pour the rinse water  
through the same sieve.

Rinse the basin and pour  
the water through the sieve.  
Repeat as many times as necessary.





Work slowly and gently.



Most birds have fairly tough skin.

Bird skin is weak and tears easily if:

- The bird was not salvaged and frozen close to the time of death
- The bird had a thick layer of fat
- Caprimugiformes have exceptionally thin delicate skin



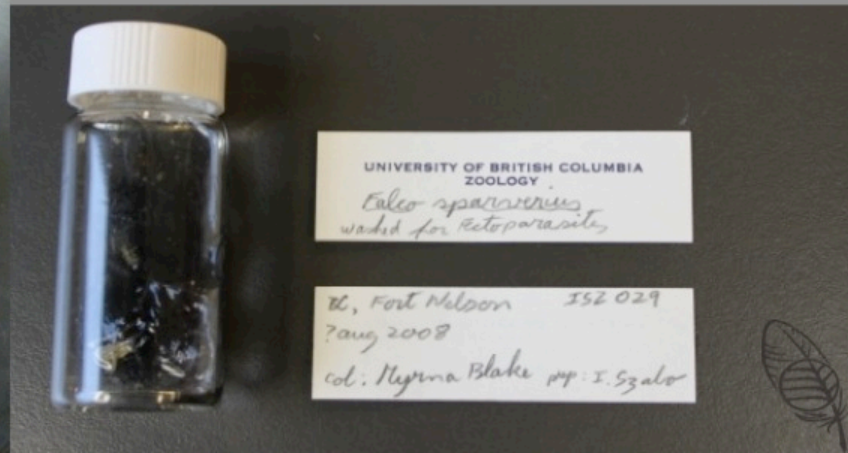





After pouring the final rinse water through the sieve:

- Tip the sieve
- Use a water-filled wash bottle to concentrate the residue in one area of the sieve
- Use a fixative-filled wash bottle to transfer the residue to a vial
- Use a pencil or alcohol resistant pen to write a detailed label on alcohol resistant paper
- Insert label inside the jar
- On the lid, write the prep number, or host species to facilitate vial retrieval

Note: Wet feathers dilute the fixative.  
If possible, use 95% ethanol.







Washing methods can effect other tests.

Record chemicals used on the avian prep label.

*Limnodromus griseus*

Ovary 8x4 mm, largest ova 1.5 mm, Tissue saved.  
No molt, trace fat. found dead on beach.  
Stomach + intestines saved in EtOH.  
Soaked in Stoddard solvent, washed in Dawn

Wt. 80.4g (22 Feb 2011) prep. J. Woods

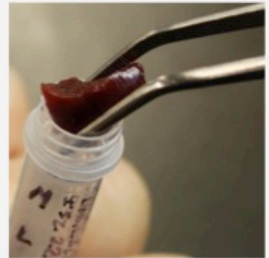


# HOW TO



# PREPARE BIRD SPECIMENS

## Part 9b – Drying a washed bird skin







Remove water by wrapping bird in a towel, sponge, or paper towels.



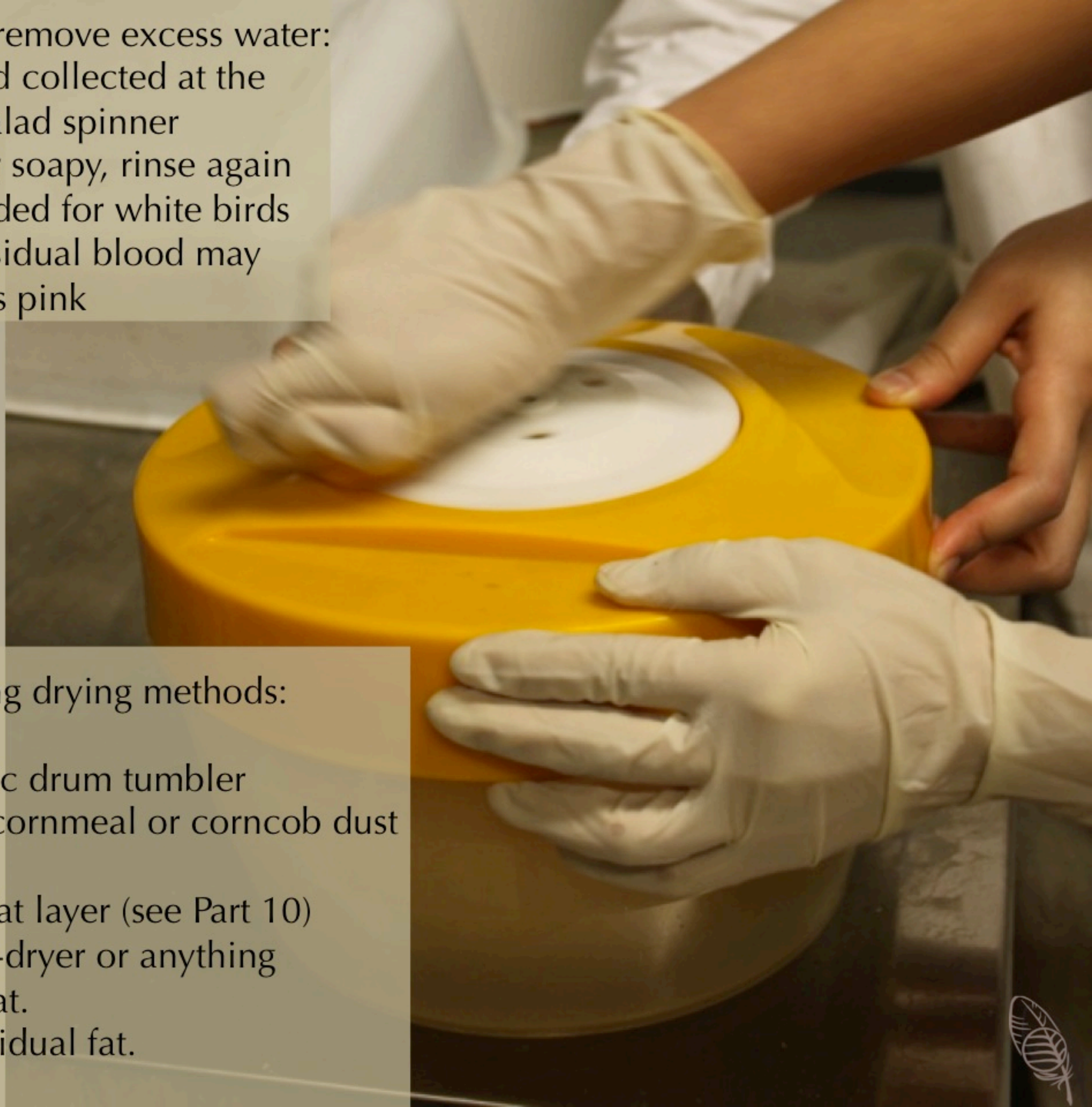
If washing a whole bird that will be prepared later, omit this step. Freeze the bird wet to prevent dehydration.





Use a salad spinner to remove excess water:

- Check the liquid collected at the bottom of the salad spinner
- If it is bloody or soapy, rinse again
- Not recommended for white birds because any residual blood may turn the feathers pink



Use one of the following drying methods:

- Compressed air
- Manual or electric drum tumbler
- Ziploc bag with cornmeal or corncob dust



If the bird had a fat layer (see Part 10) never use a blow-dryer or anything that generates heat. Heat liquefies residual fat.






A washed bird can be a discouraging sight.

This kestrel is typical.

It looks like a scarecrow destined  
for bio-waste disposal.







Position the bird under the dryer(s).

If it is a small bird, place it in a steep sided pan to prevent it skidding off the table.

Using a metal pan is optimum because the dryer heats the metal and speeds up the drying process.





Create a drying station:  
(Having both hands free is a real advantage and time saver.)

- Use chemistry stands or the equivalent to hold a hair dryer, or compressed air nozzle
- Commercial hand dryers found in some public washrooms are excellent for drying birds
- A portable fume hood increases the air flow over the bird





Check frequently constantly  
changing the bird's position.

- If it is a small bird (~20grams)  
check once a minute
- For a 1 kilo bird, check every  
five minutes





When some of the feathers are dry and starting to flutter:

1. Continue changing the position of the bird
2. Separating matted feathers with a toothbrush starting at the feathers tip and backcombing towards the body

For best results, use a combination of these two strategies.







It is important to NOT rush the drying process.  
When the bird is 90-95% dry, turn off the dryer and leave the bird for 5 minutes.



If available, use compressed air instead of a blow drier.

**Warning:**

The interior of the skin will become brittle if it is over dried. Stuff the body cavity with a damp paper towel.



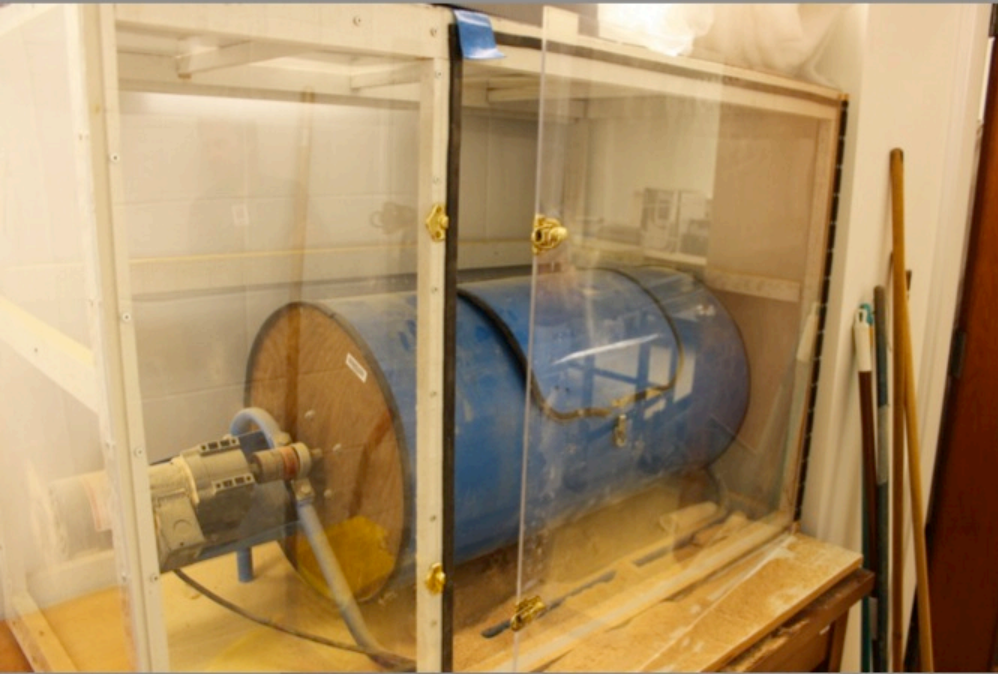


Most birds dry quickly.  
Stuff and pin the bird.





Drum dryers are available at taxidermy supply stores. They come in several sizes and are either top or side loading. Fill the drum 1/3 full with fine sawdust or corncob dust. An engine spins the drum slowly. Drying time depends on bird size, 10-30 minutes is the norm. This is a messy process.



Going clockwise from the top left, photos taken at the Royal British Columbia Museum, University of Washington Burke Museum, and the Smithsonian Natural History Museum





Use a container with a tightly fitting lid to make a manual tumbler.  
Wash, towel dry, and submerge in absorbent material (corncob shown below).







The object is to dry the outside and inside at the same time. If your bird is white, this is the best drying method. Pack the absorbent into the belly and the beak.

Fasten the lid:

- Shake 100 times - up and down not sideways
- Do not crumple or ram the bird against the side walls of the container
- Open, dump the moist absorbent out of the inside of the bird, repack
- Repeat until dry







Be sure to pack the neck from both ends.

In this case, the absorbent is white corn meal and the manual tumbler is a wide mouth white plastic jar with a screw top lid.

In the field,  
a Ziploc bag is  
a good alternative.





When in doubt, wash.  
You have nothing to lose.

Washing this necropsied Bar-headed  
Goose turned a bloody mess into a  
usable specimen.





# IN MEMORIAM



## DR. REX KENNER

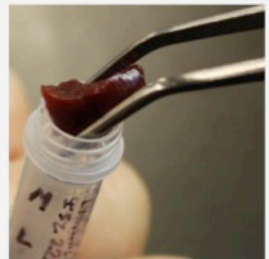
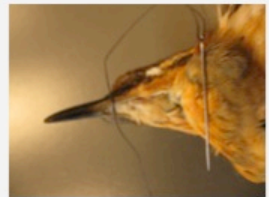
Former Curator of the Cowan Tetrapod Collection who encouraged me to begin this project.

Special thanks to **Dr Heather C Proctor** for helping out with both this PowerPoint Presentation and for agreeing to be the featured presenter for the Beaty Biodiversity Museum video that was created to complements this presentation.

Without the encouragement of the Spencer Entomology Collection staff ((Karen Needham, Don Griffiths, Robert Curtiss III), this arthropod ectosymbiont presentation would not exists. I also wish to thank Eve Szabo, Hans van Brandwijk, N. John Schmitt, Bud Anderson, Jean Woods, 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 arthropod ectosymbionts  
& 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://beatymuseum.ubc.ca/birds>

