

A photograph of two dead salmon lying on a stream bed. The fish are positioned horizontally, one above the other. They have a reddish-pink hue on their upper bodies and silver scales on their lower bodies. The stream bed is composed of dark rocks, twigs, and some green leaves. The text "ASSESSING PRE-SPAWNING MORTALITIES FOR CAUSE OF DEATH" is overlaid in yellow, bold, sans-serif font across the center of the image.

ASSESSING PRE-SPAWNING MORTALITIES FOR CAUSE OF DEATH

Stream Survey Guide

Assessing pre-spawning mortalities for cause of death

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Introduction

The ability to accurately determine the cause of death of an unspawned adult depends primarily on getting to examine the fish in fresh condition shortly after or even before it dies. Fish health practitioners typically are not immediately available to do this so the fish would have to be transported and preserved for them. Fortunately, some of the common causes of pre-spawning mortality can be determined with some confidence by trained visual observation. This guide is intended to instruct stream surveyors in making these observations and in how to preserve samples when appropriate.

Deciding where to place the blame for death is easy if you only find one disease. When a fish is under attack from multiple problems, it's more of a judgment call, and in fact death is probably the result of the combination.

Procedures

1. Record what you see:

- Take photos whenever possible to show your fish health practitioner and others what you found.
- Record the diseases you suspect and use **key words** that are the basis for your suspicion.
- Often two or more problems may work together to kill the fish. Record all suspects you find.

2. Should you take samples?

This is a judgment call and based on a couple of factors including:

- Whether the morts are fresh enough to warrant testing.
- Whether the number of pre-spawning morts is abnormally high, or there's some other reason you need to know why they're dying.
- Whether there's a practical way to get the samples or fish to your fish health practitioner.
- Contact your NWIFC fish health practitioner if you have questions.

Procedures (cont.)

3. Samples to take if they can be obtained and **kept fresh:**

- Place a 1 – 2 gram chunk of kidney into a labeled tube or Whirl Pak bag.
- Store samples on ice but not frozen.
- If suspecting columnaris, cut out an affected gill arch or scrape some of the yellow into a tube or Whirl Pak bag. However, keep columnaris suspect samples cool but not iced.
- Get samples to the fish health lab or fish health practitioner within a day.

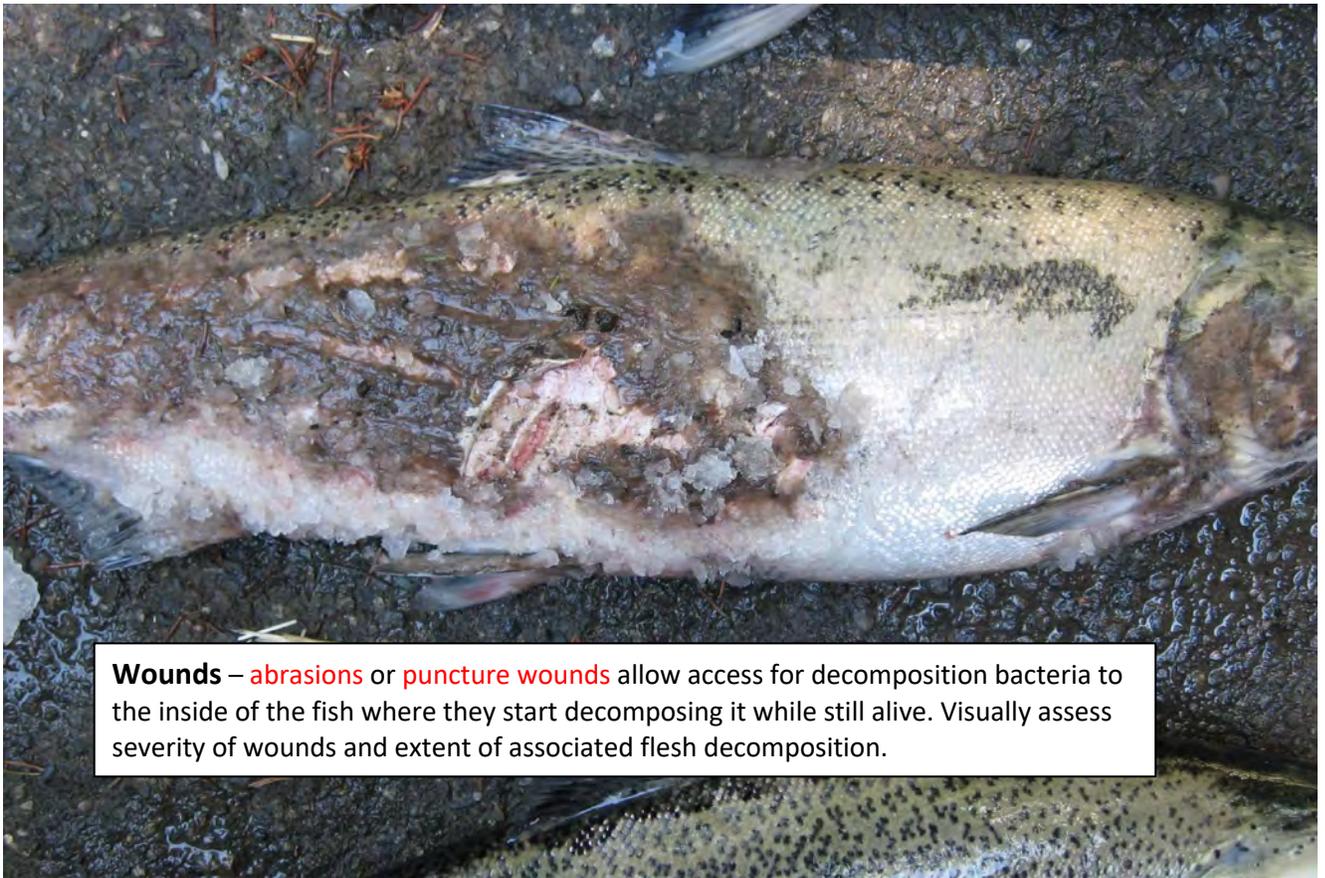
Procedures (cont.)

4. Additional samples to take to confirm your diagnosis:

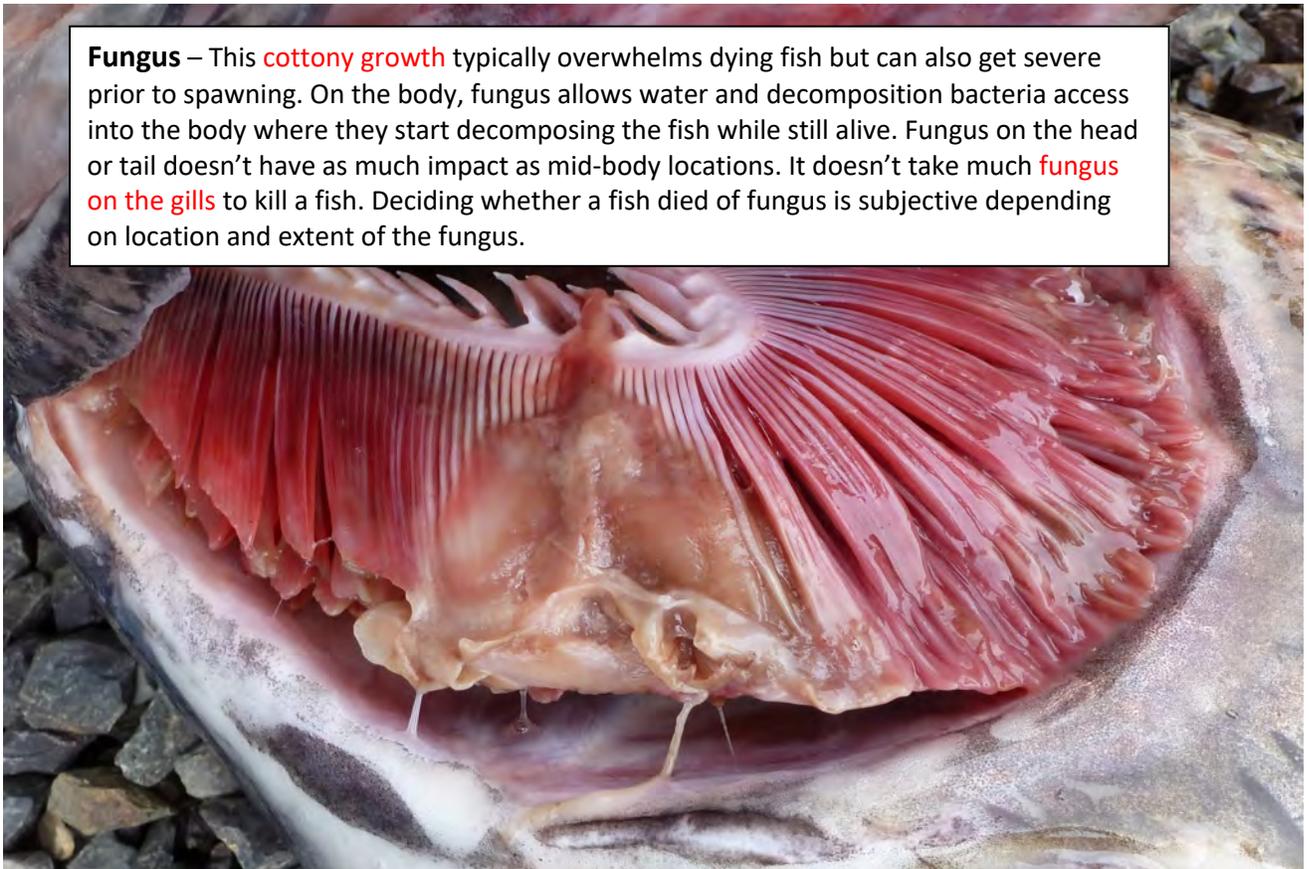
- Photos are very helpful.
- Histology Samples: If mortalities are fresh, excise lesions and fix them in 10% neutral buffered formalin. Label the container with date, species, tissue, and suspected cause. Store at room temperature until it can be transported to lab. Fixative is available upon request to the NWIFC fish health program.
- Cryptobia: Make a thin blood smear on a microscope slide. Label it and store in a slide box.
- BKD and furunculosis: Make a very thin smear on a glass slide from grayish or swollen area of kidney. Label it and store in a slide box.

Diseases/Conditions to look for:

- Wounds
- External Fungus
- Columnaris Disease (Bacterial)
- Furunculosis (Bacterial)
- Bacterial Kidney Disease (Bacterial)
- Ich (Parasite)
- Salmincola (Parasite)
- Nanophyetus (Parasite)
- *Myxobolus squamalis* (Parasite)
- Cryptobia (Parasite)

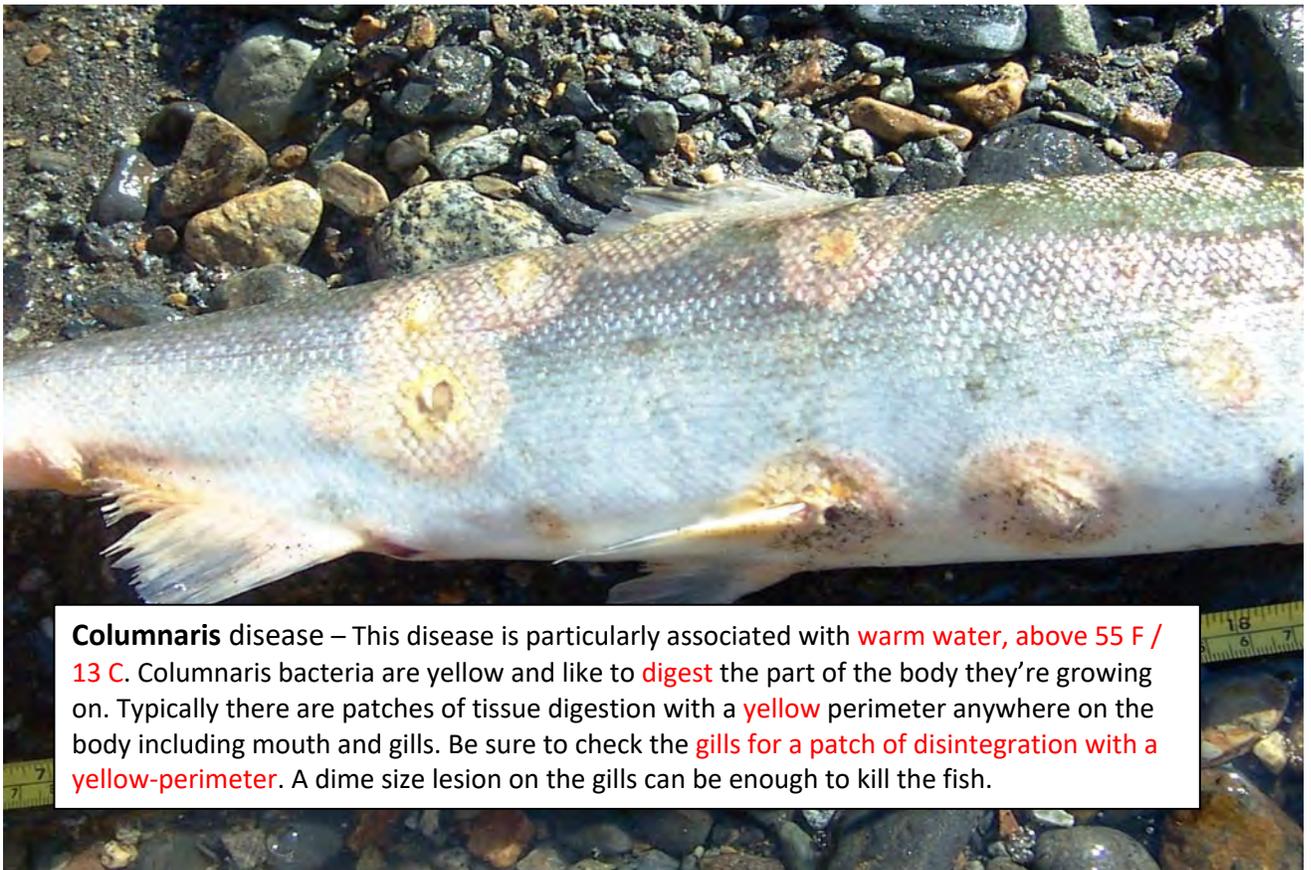


Wounds – **abrasions** or **puncture wounds** allow access for decomposition bacteria to the inside of the fish where they start decomposing it while still alive. Visually assess severity of wounds and extent of associated flesh decomposition.

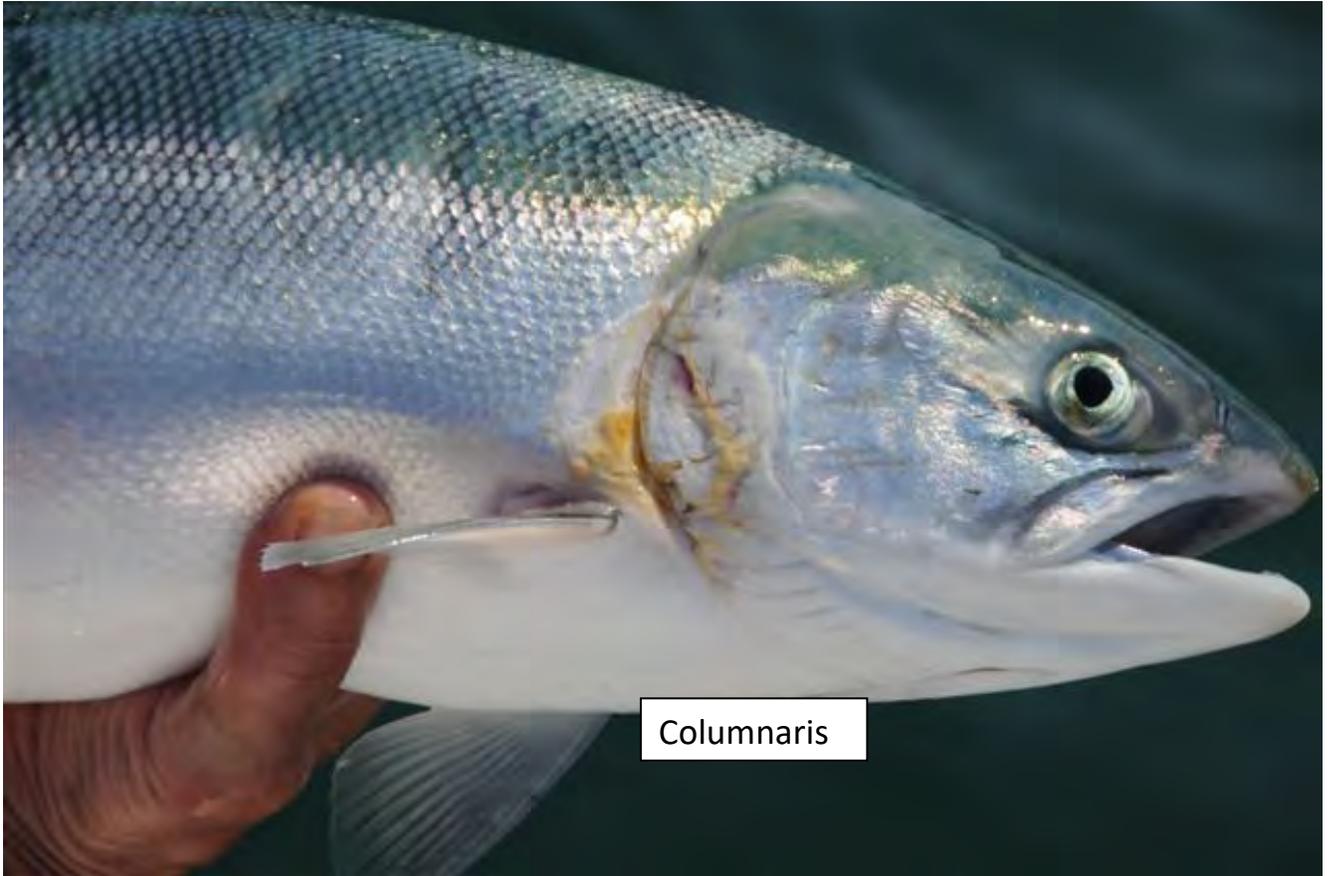


Fungus – This **cottony growth** typically overwhelms dying fish but can also get severe prior to spawning. On the body, fungus allows water and decomposition bacteria access into the body where they start decomposing the fish while still alive. Fungus on the head or tail doesn't have as much impact as mid-body locations. It doesn't take much **fungus on the gills** to kill a fish. Deciding whether a fish died of fungus is subjective depending on location and extent of the fungus.

Gill fungus that has gotten dirty



Columnaris disease – This disease is particularly associated with **warm water, above 55 F / 13 C**. Columnaris bacteria are yellow and like to **digest** the part of the body they're growing on. Typically there are patches of tissue digestion with a **yellow** perimeter anywhere on the body including mouth and gills. Be sure to check the **gills for a patch of disintegration with a yellow-perimeter**. A dime size lesion on the gills can be enough to kill the fish.



Columnaris



Yellow Columnaris digesting tail



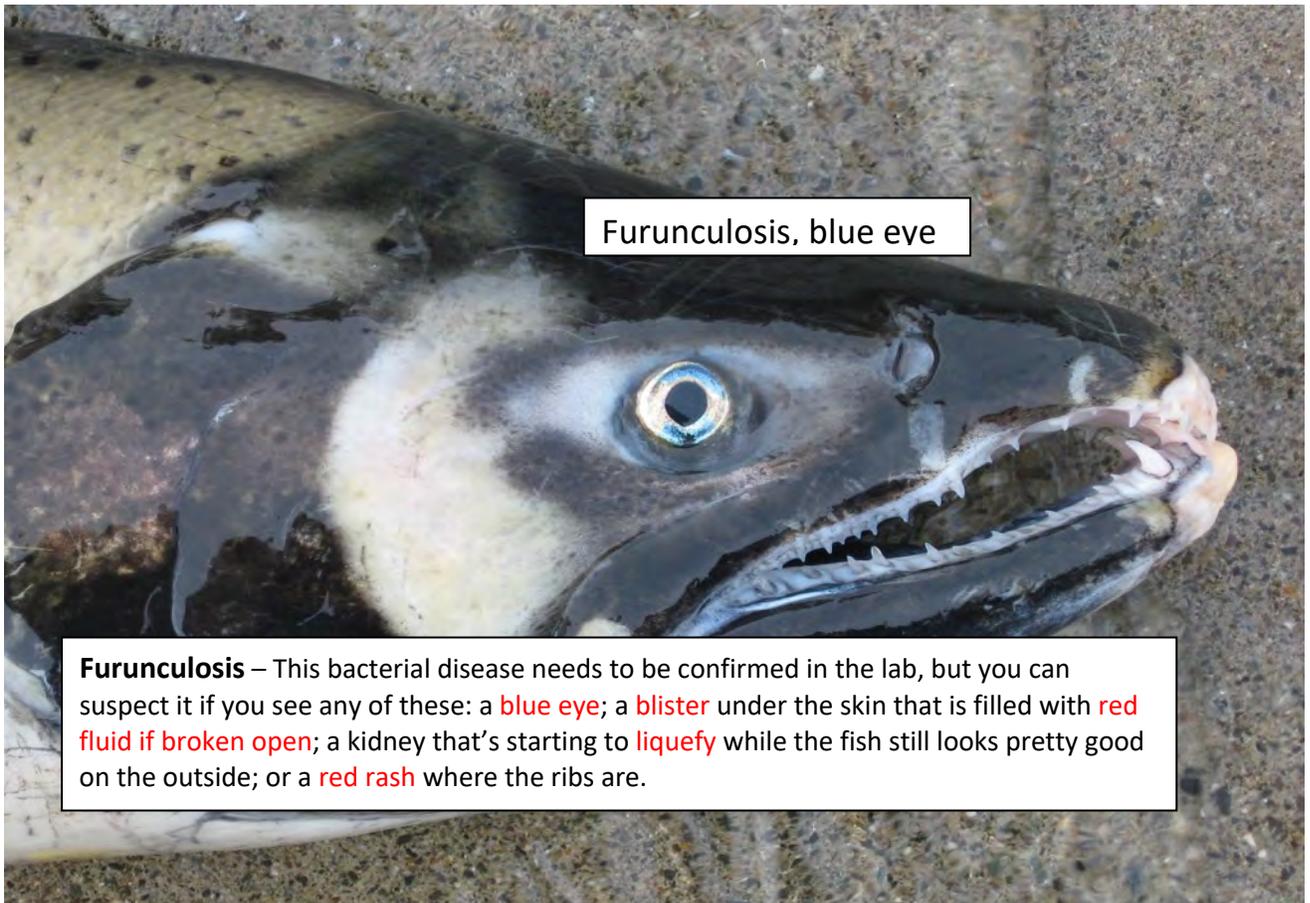
Columnaris on tail, fungus patches on body and fins



Columnaris on gills and gill cover,
fungus patch on gill



Dirty yellow Columnaris digesting gills



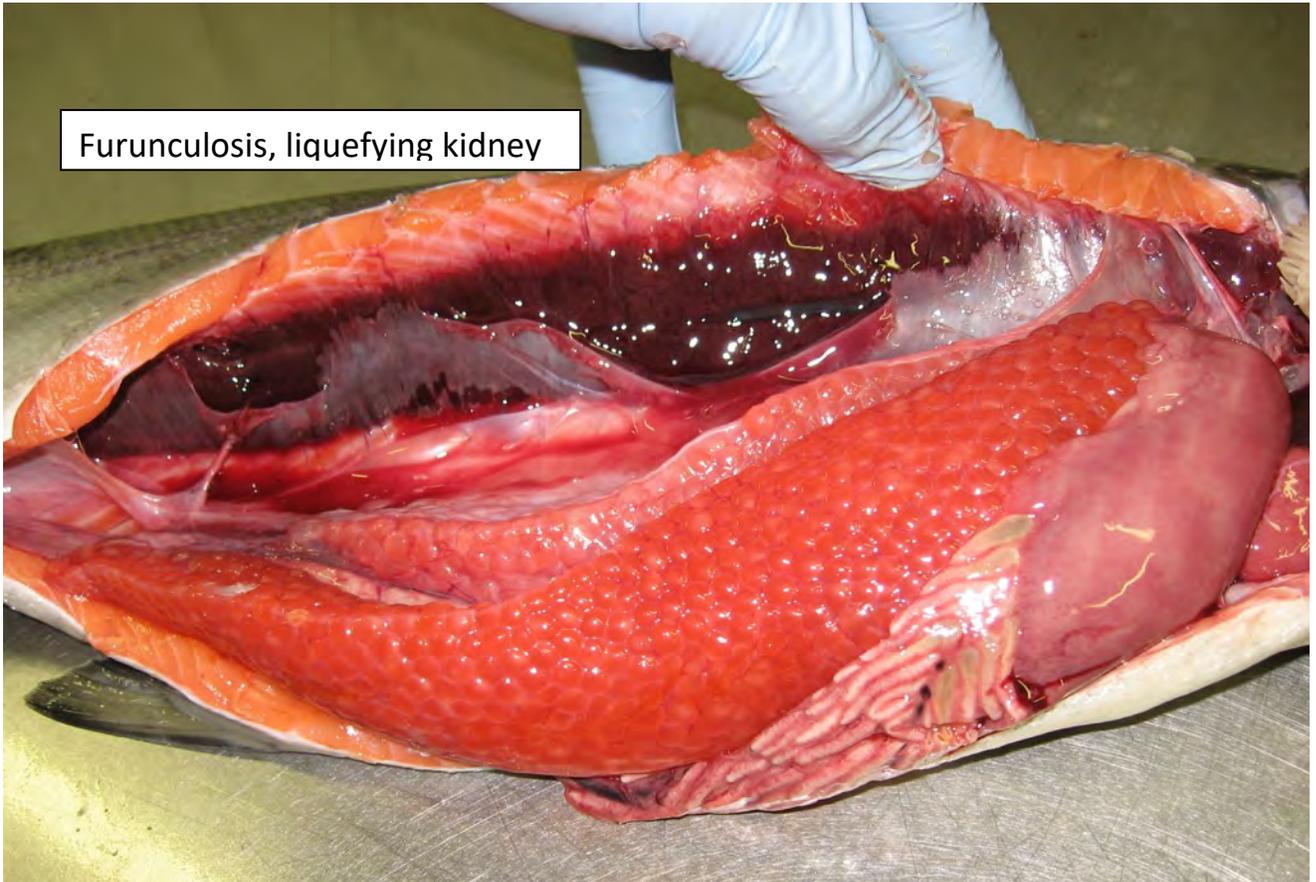
Furunculosis, blue eye

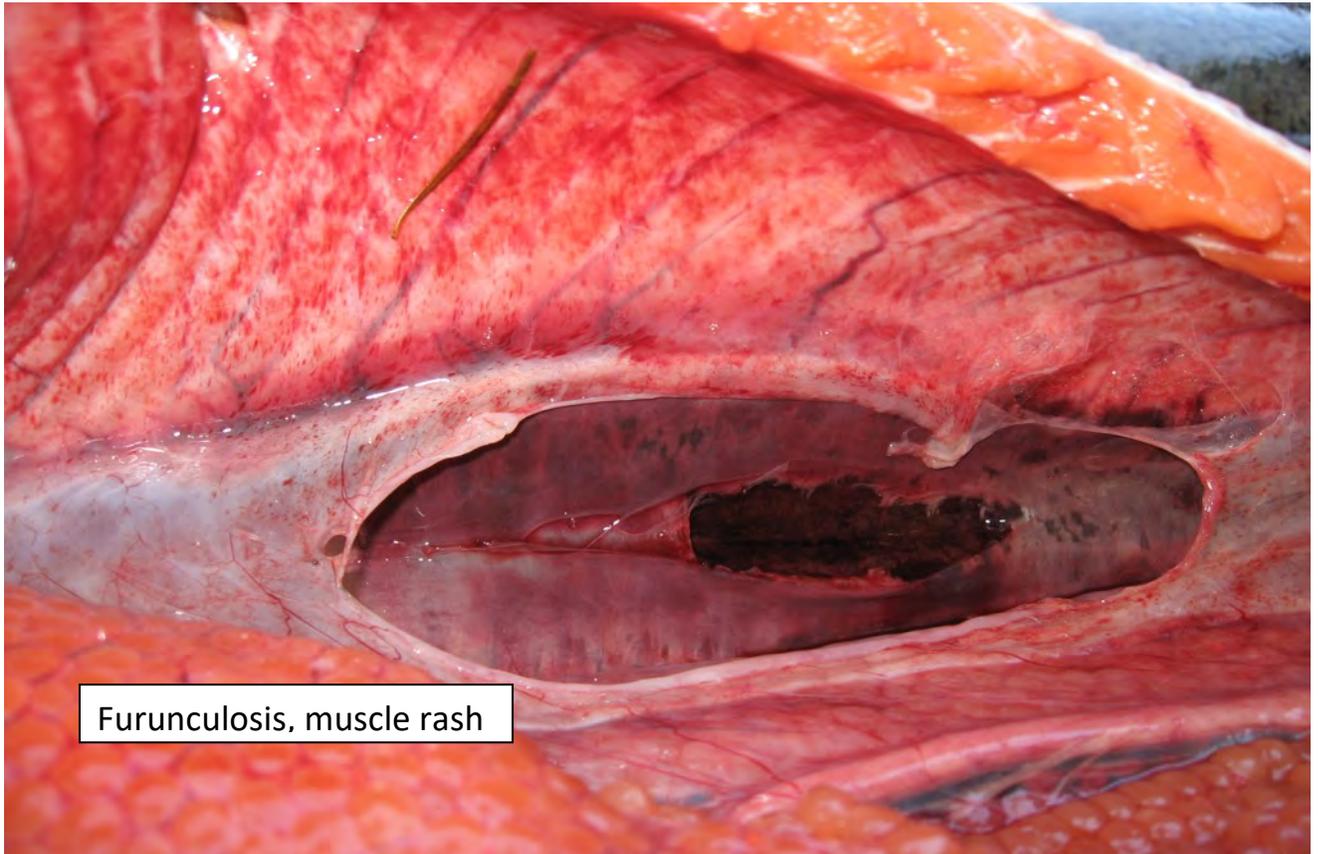
Furunculosis – This bacterial disease needs to be confirmed in the lab, but you can suspect it if you see any of these: a **blue eye**; a **blister** under the skin that is filled with **red fluid if broken open**; a kidney that's starting to **liquefy** while the fish still looks pretty good on the outside; or a **red rash** where the ribs are.

Furunculosis, blister

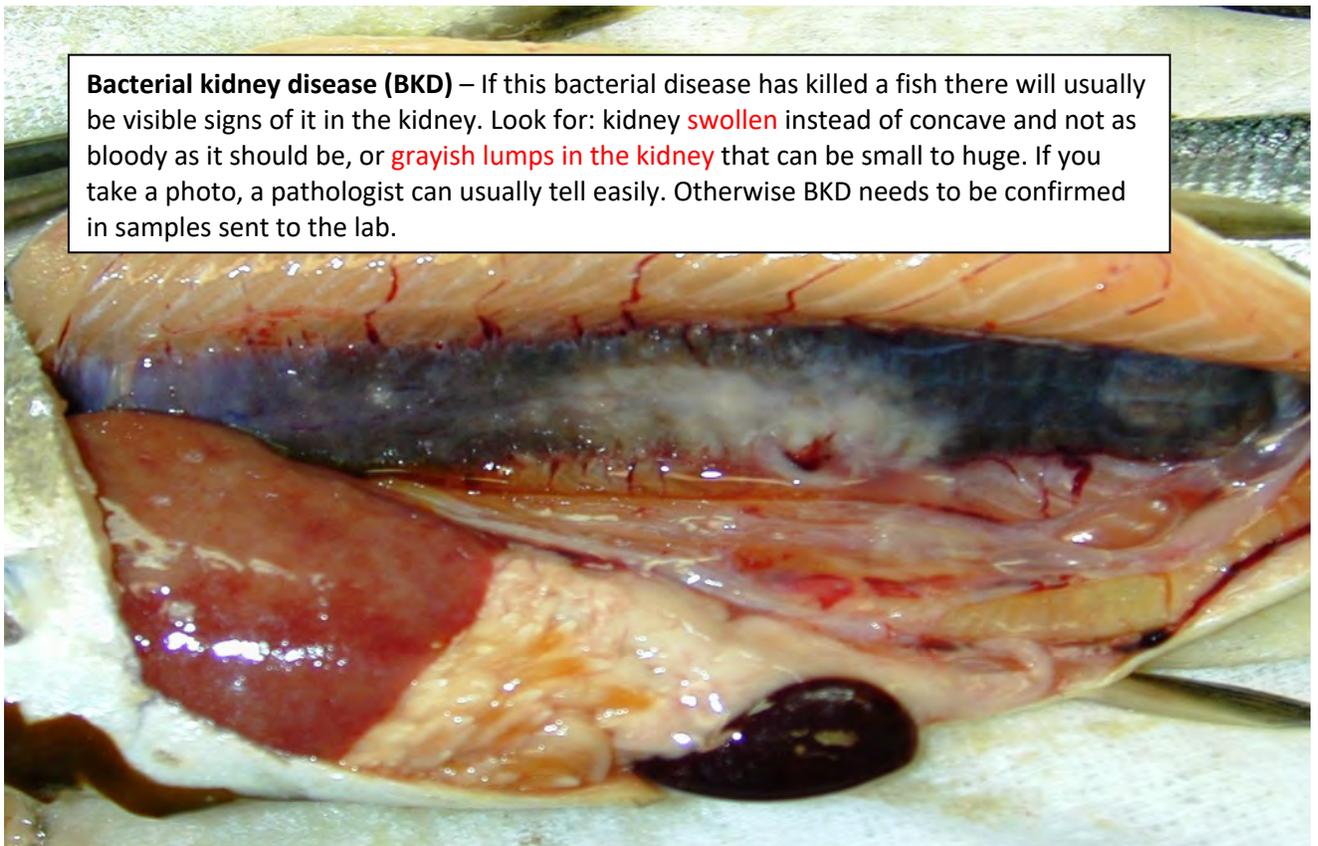


Furunculosis, liquefying kidney

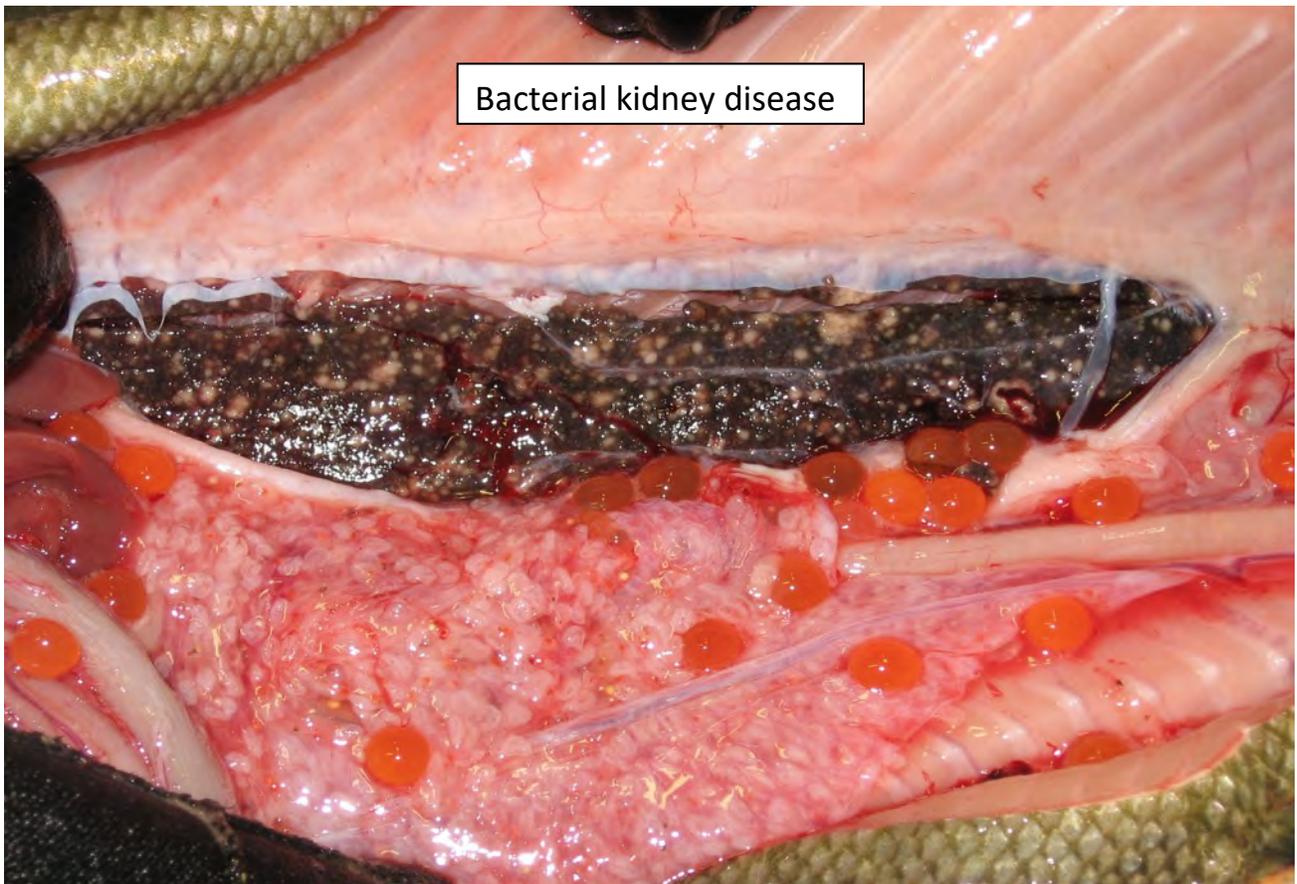




Furunculosis, muscle rash



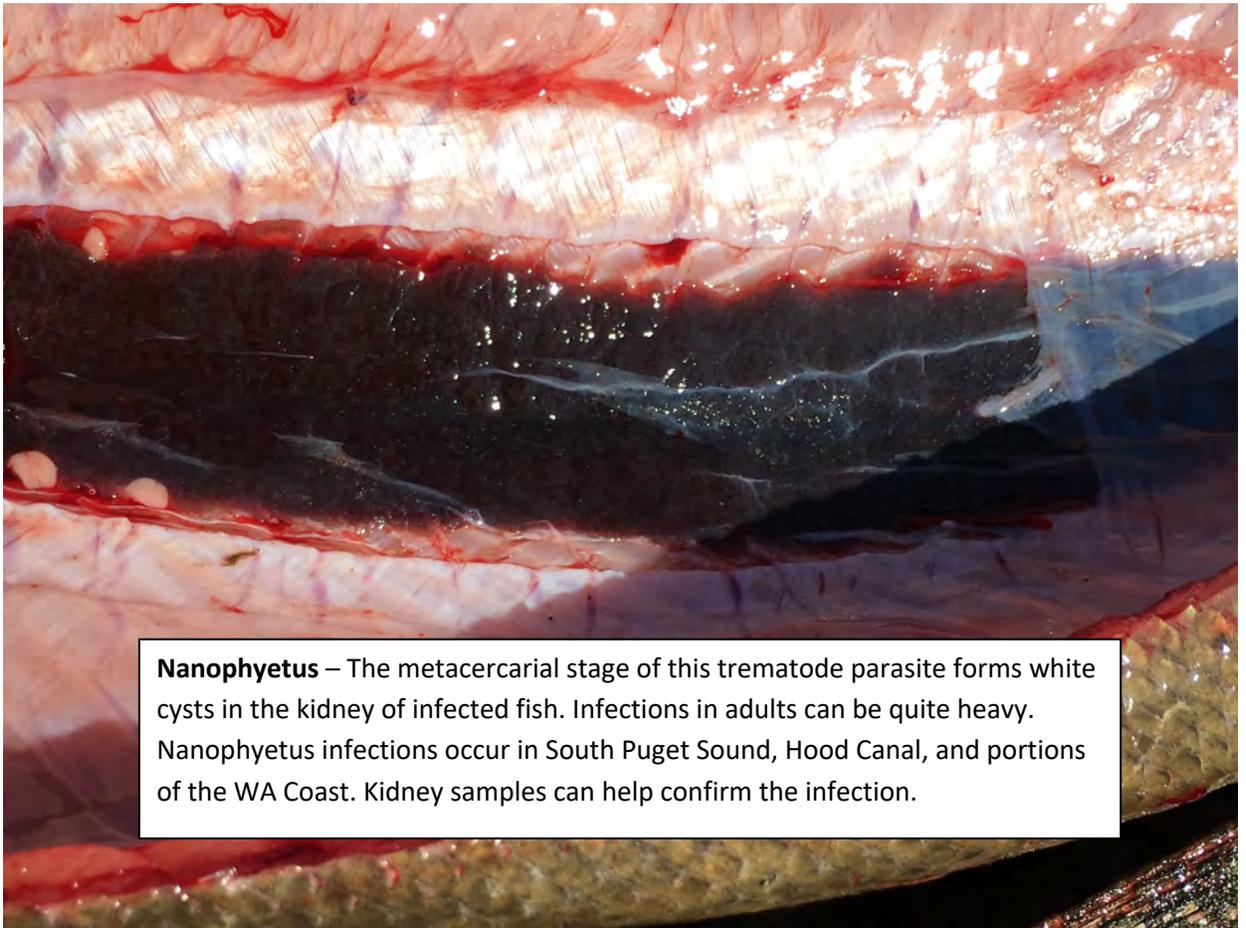
Bacterial kidney disease (BKD) – If this bacterial disease has killed a fish there will usually be visible signs of it in the kidney. Look for: kidney **swollen** instead of concave and not as bloody as it should be, or **grayish lumps in the kidney** that can be small to huge. If you take a photo, a pathologist can usually tell easily. Otherwise BKD needs to be confirmed in samples sent to the lab.



Ichthyophthiriasis (Ich) – Protozoan parasite that infects the epidermal layer of gill and skin. Causes grey-white specks on skin surface as seen in this photo. Serious outbreaks occur when temperatures exceed 65 degrees F. Recommend taking photo for confirmation.

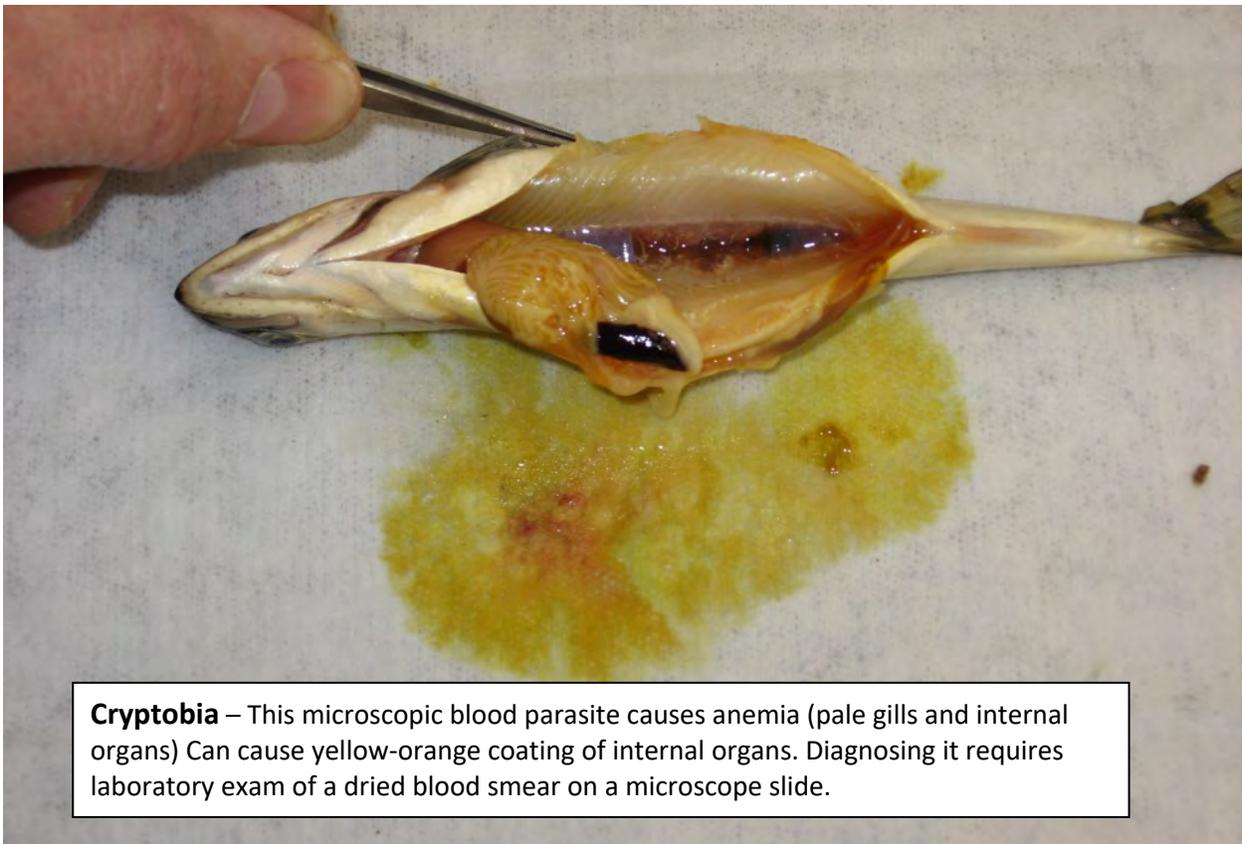


Salmincola – These gill copepods are only an issue if fungus gets going where they attach to the gills. Just note their presence and whether they **seem to have initiated fungus infection**.



Nanophyetus – The metacercarial stage of this trematode parasite forms white cysts in the kidney of infected fish. Infections in adults can be quite heavy. Nanophyetus infections occur in South Puget Sound, Hood Canal, and portions of the WA Coast. Kidney samples can help confirm the infection.

Myxobolus squamalis – Cysts of this Myxosporidian parasite are commonly found in the scale pockets of coho salmon when they return from the ocean. The scales are raised by the cysts given an acne appearance on the skin. Good one to take a photo of if condition suspected.



Cryptobia – This microscopic blood parasite causes anemia (pale gills and internal organs) Can cause yellow-orange coating of internal organs. Diagnosing it requires laboratory exam of a dried blood smear on a microscope slide.