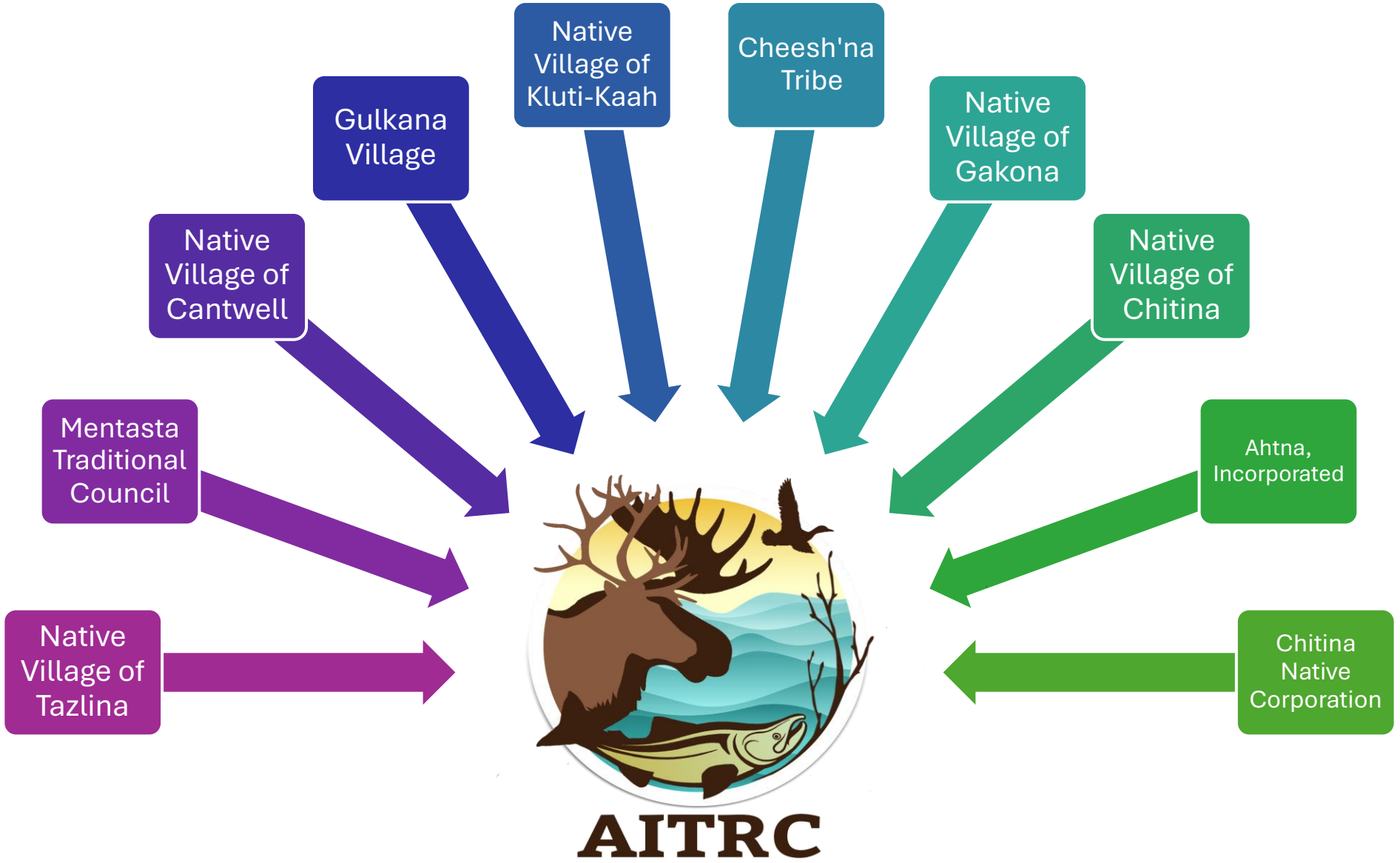
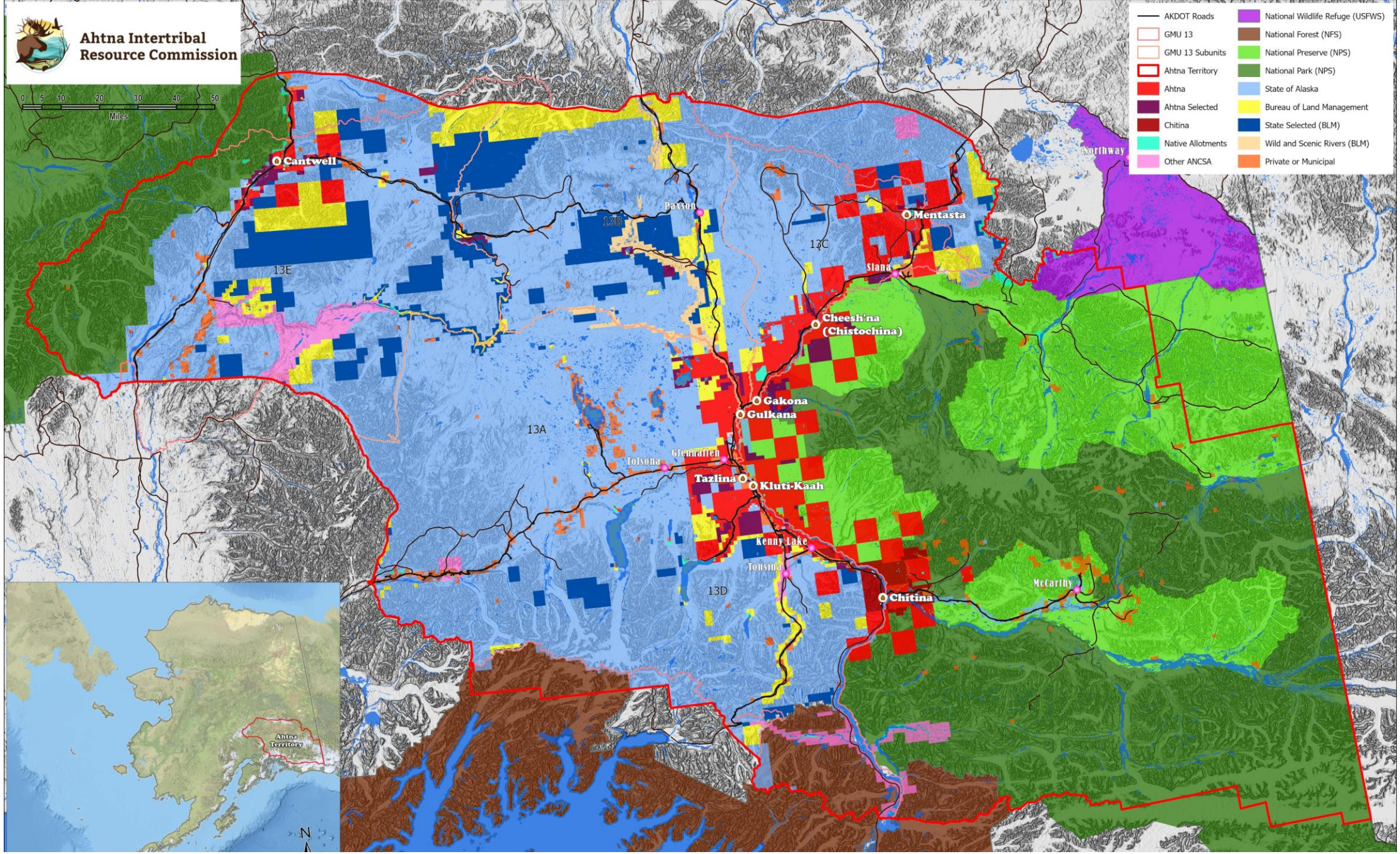
Integrating Histology in Fisheries Research

Microscopic anatomy and pathogen screening to establish population health baselines and identify emerging challenges.

Kelsey Stanbro, Ecologist AITRC
Morag Clinton, BVMS PhD Fish Pathologist



Mission: 'Atna' hwt'aene - Honoring and integrating traditional knowledge and values through stewardship that is innovative and respectful of the land for all generations.



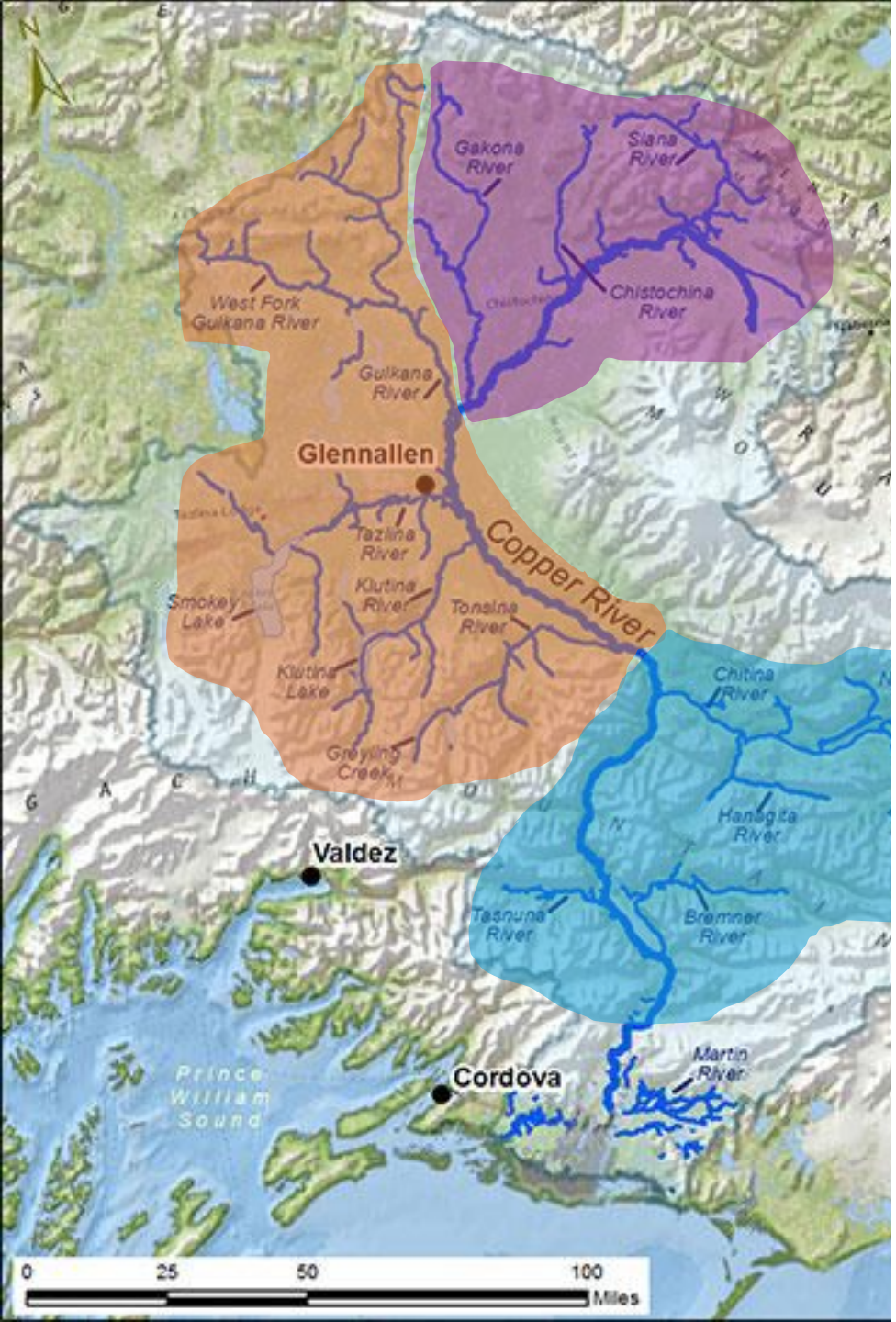
I am proud to live and work on the land of the *Atnahwt'aene* who have stewarded this land since time immemorial

2023 Project Begins!

- Concerns by tribal citizens
- Assessing parasite burden
- Funded by EPA IGAP

Creating Partnerships

Community Involvement



June 2024

SUN	MON	TUE	WED	THU	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

July 2024

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August 2024

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Sample Collection

By location…

- 20 Samples Chitina
- 20 samples Tonsina to Gulkana
- 20 samples Gakona to Slana

By time of run…

- Appx 10-12 weeks of fishing
- 6 sockeye and 6 Chinook each week

(ADFG N.D.)

Kidney
Spleen
Heart

Genetics

Age

Stable
Isotopes
OR ICP-MS

Species
Length
Weight

GIT
Quantify parasite burden (how many)
qPCR (what species)

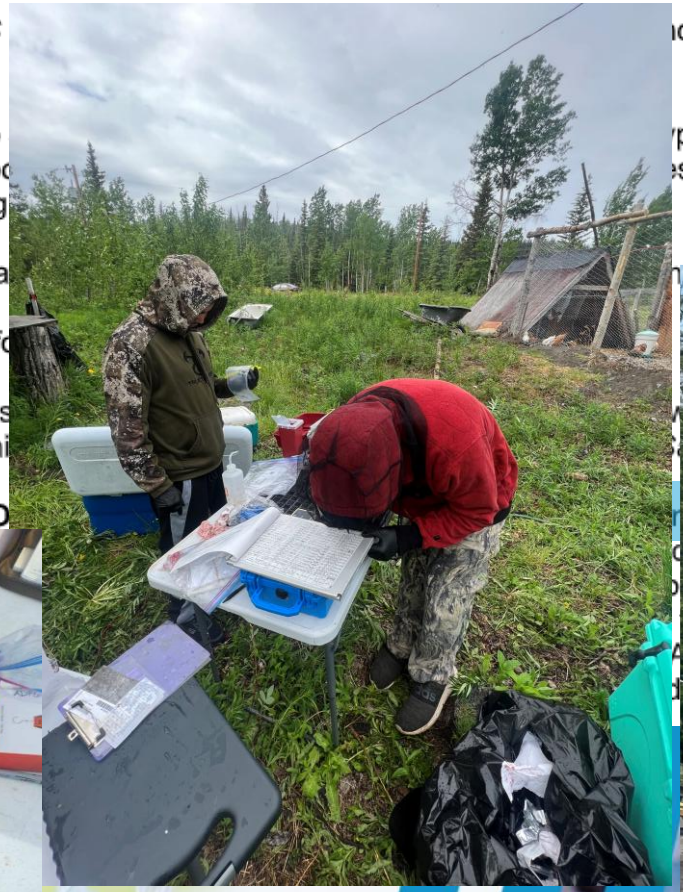
2023 Sample Collection

75 samples submitted to ADFG Pathology lab for culture (64 sockeye and 11 Chinook salmon)

148 samples for histology (processed WA Animal Disease Diagnostic Lab, interpreted M Clinton)

148 being assessed at UAF to determine species of parasite (plans for determining parasite burdens)

Cultures to qPCR



CLINICAL FINDINGS

ICHTHYOPHONUS

0/75 heart tissue
1/75 equivoc
subculturing

50/75 (66.7%) hea

See Table 1 below fo

DIAGNOSIS: Mos
schi

COMMENTS/RECO

ıcubated in MEM-5 w/3X antibiotics

ypical of *Ichthyophonus*, but
esence of *Saprolegnia*, but lost on

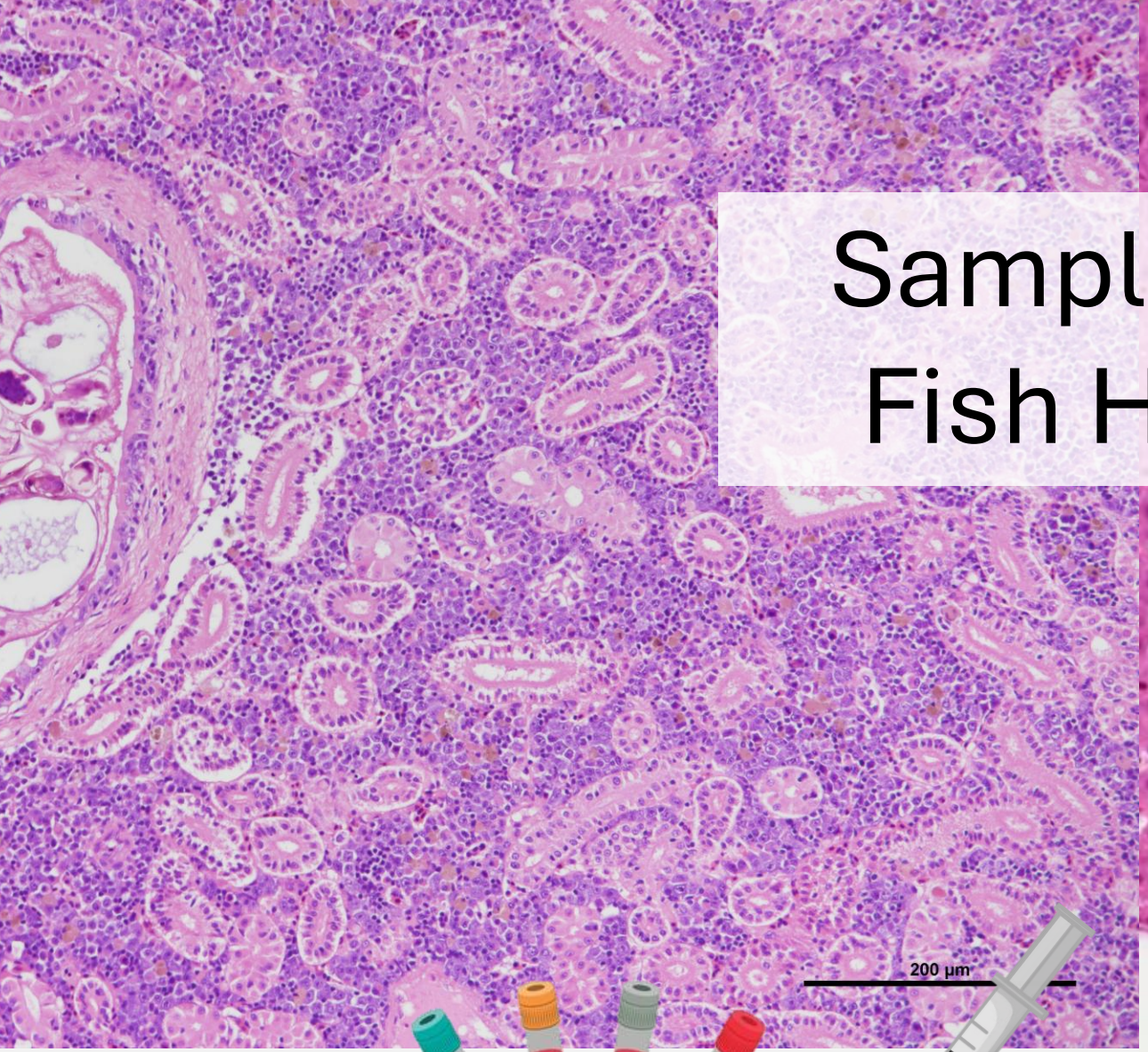
2024 Sample Collection

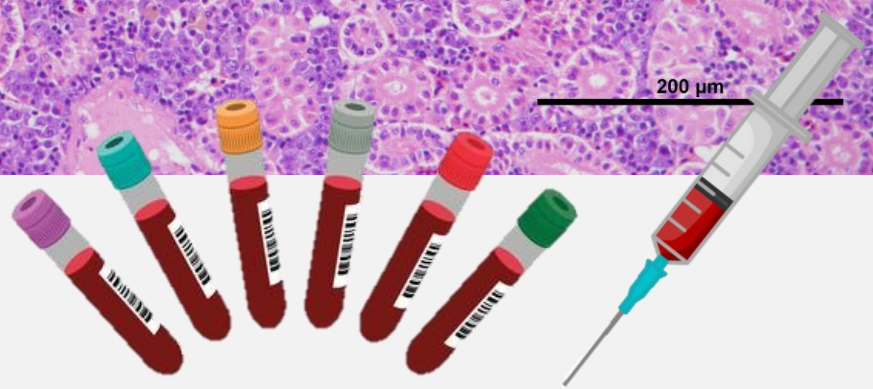
84 samples submitted to ADFG Pathology lab for qPCR

84 samples for histology (processed TAMU, interpreted M Clinton)

(73 Sockeye and 11 Chinook salmon)

Sampling for Fish Health



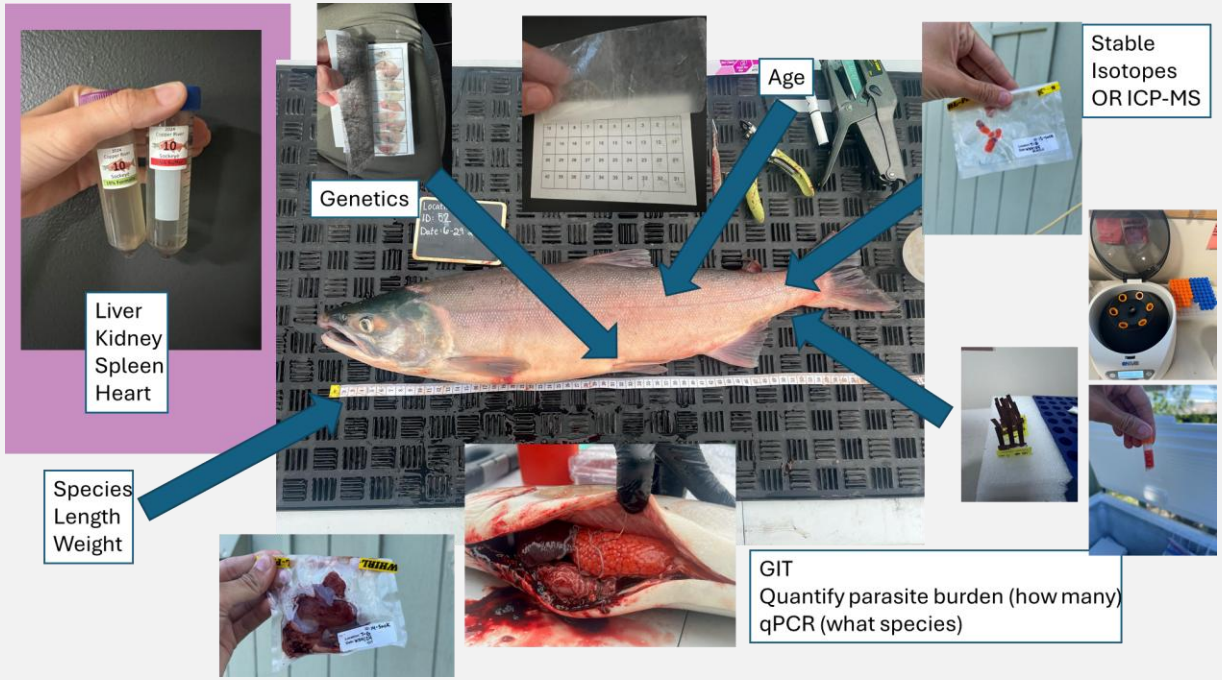


Morag Clinton, BVMS PhD

Refresher on Sampling Goals

Wide array of sample types and fish health information gained:

1. Tissue integrity (Histopathology)
2. Cardiac and general health (Blood-based biomarkers)
3. Infection (Parasite ID’s and Molecular identification of any additional pathogenic agents)



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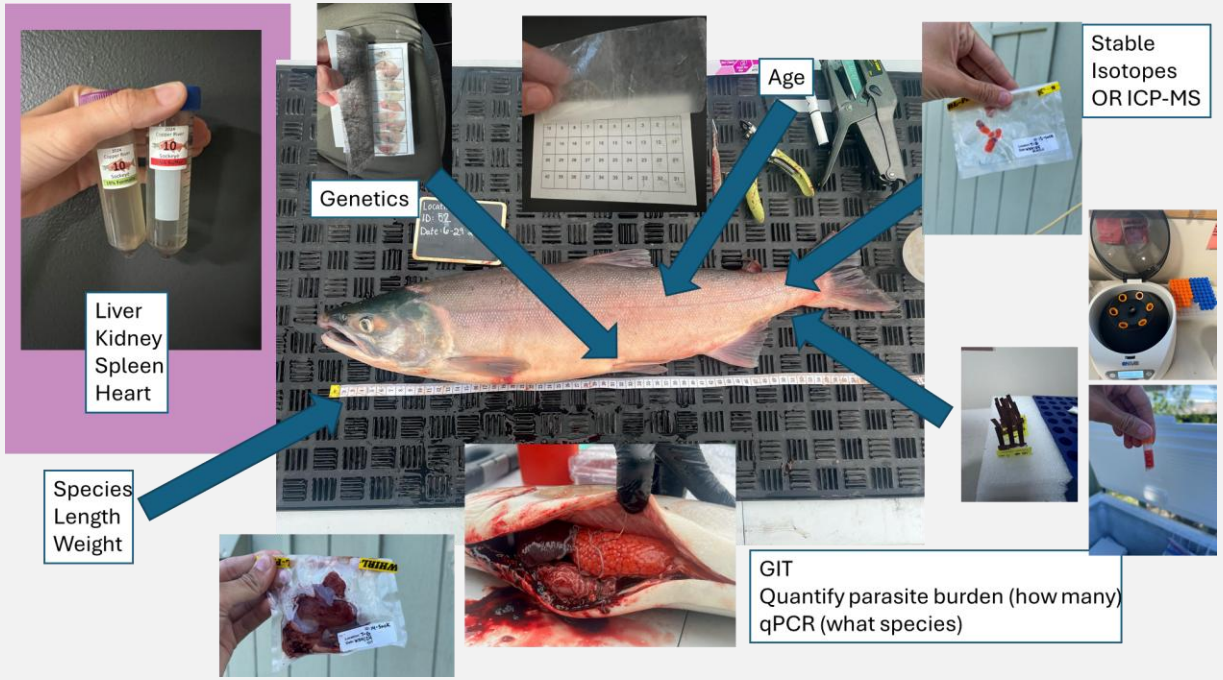
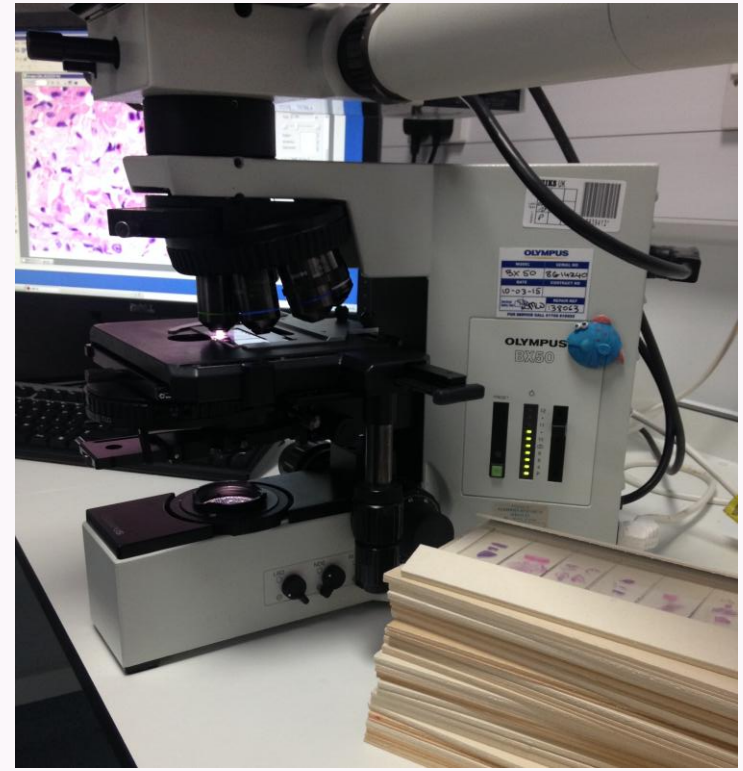
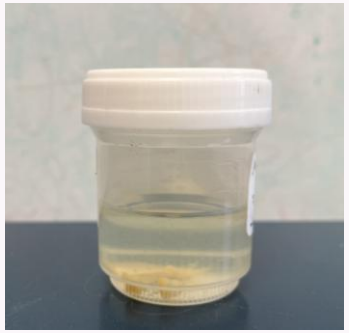


What is Histology/Histopathology

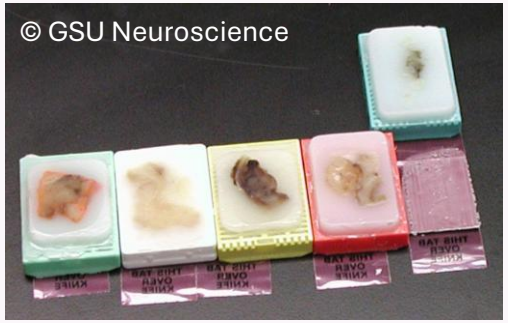
Histology is the preparation of tissues and organs through processing, sectioning, and staining, to allow microscopic examination (using brightfield compound microscope).

Histopathology is the study of tissue change by examining histological samples under a microscope.





Fixed tissue sample



Dehydration, clearing, and wax infiltration (TAMU/WADDL)

Sectioning + staining.

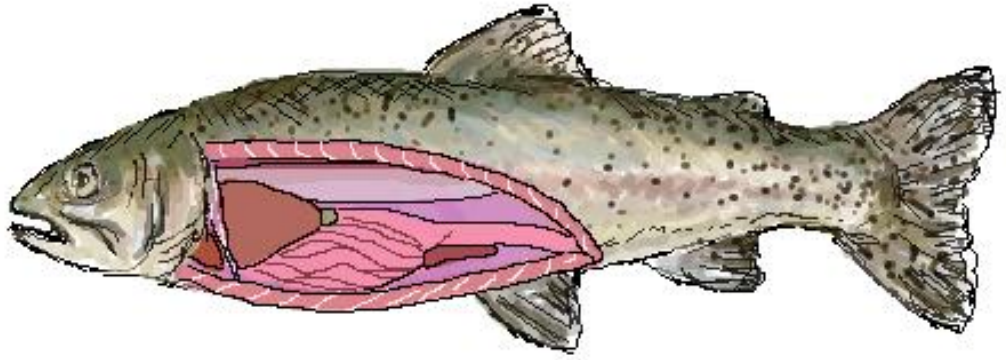
Minimal tools and equipment for sample preservation

Tissue dissection

Fresh is best

Sampling plan + experience (1cm^3 pieces)

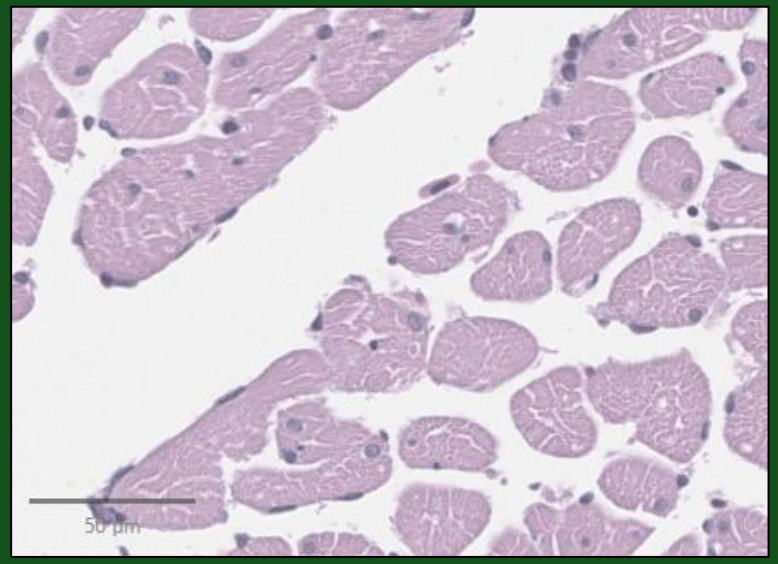
Frozen tissue can be used for histology but ideally should not be used (cell detail is lost)



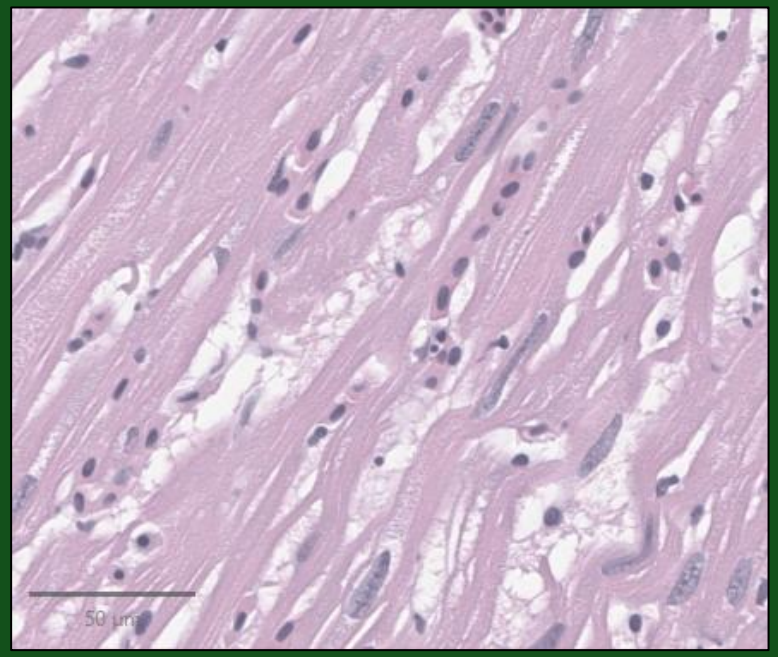
Full ‘suite’ of organs

Vs

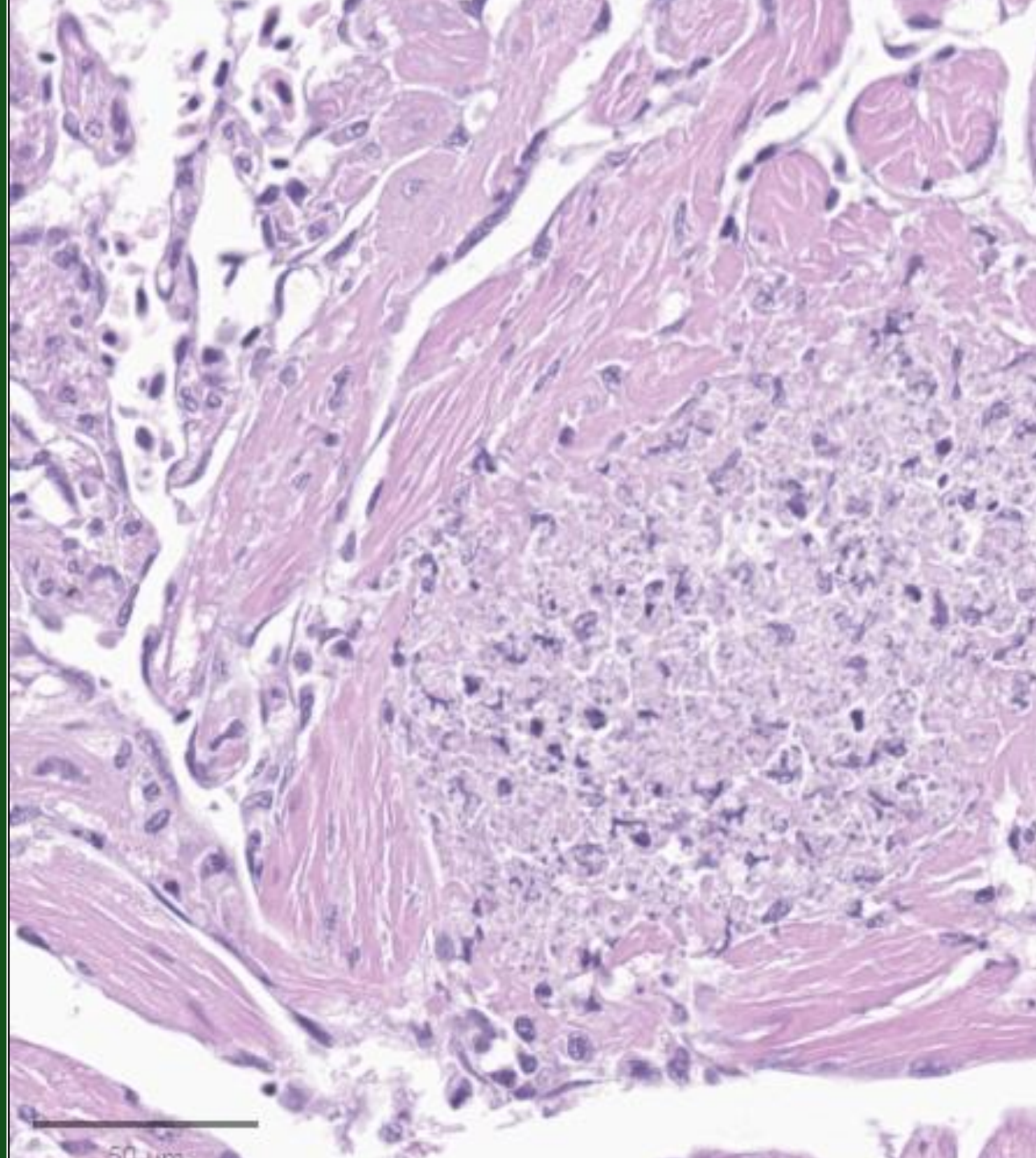
Targeted sampling (consider goals)



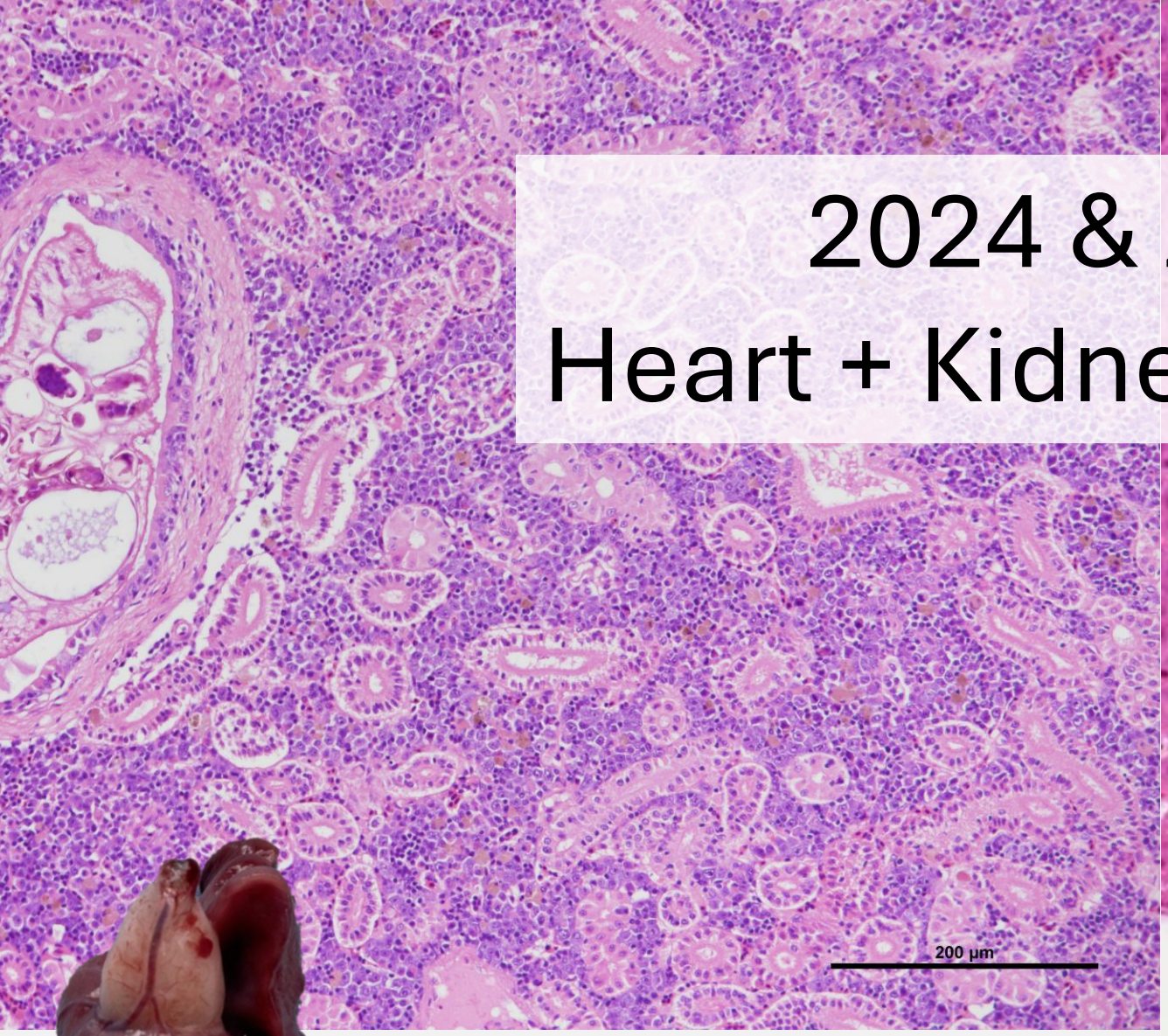
Cardiac tissue from 2023 Copper River Fish

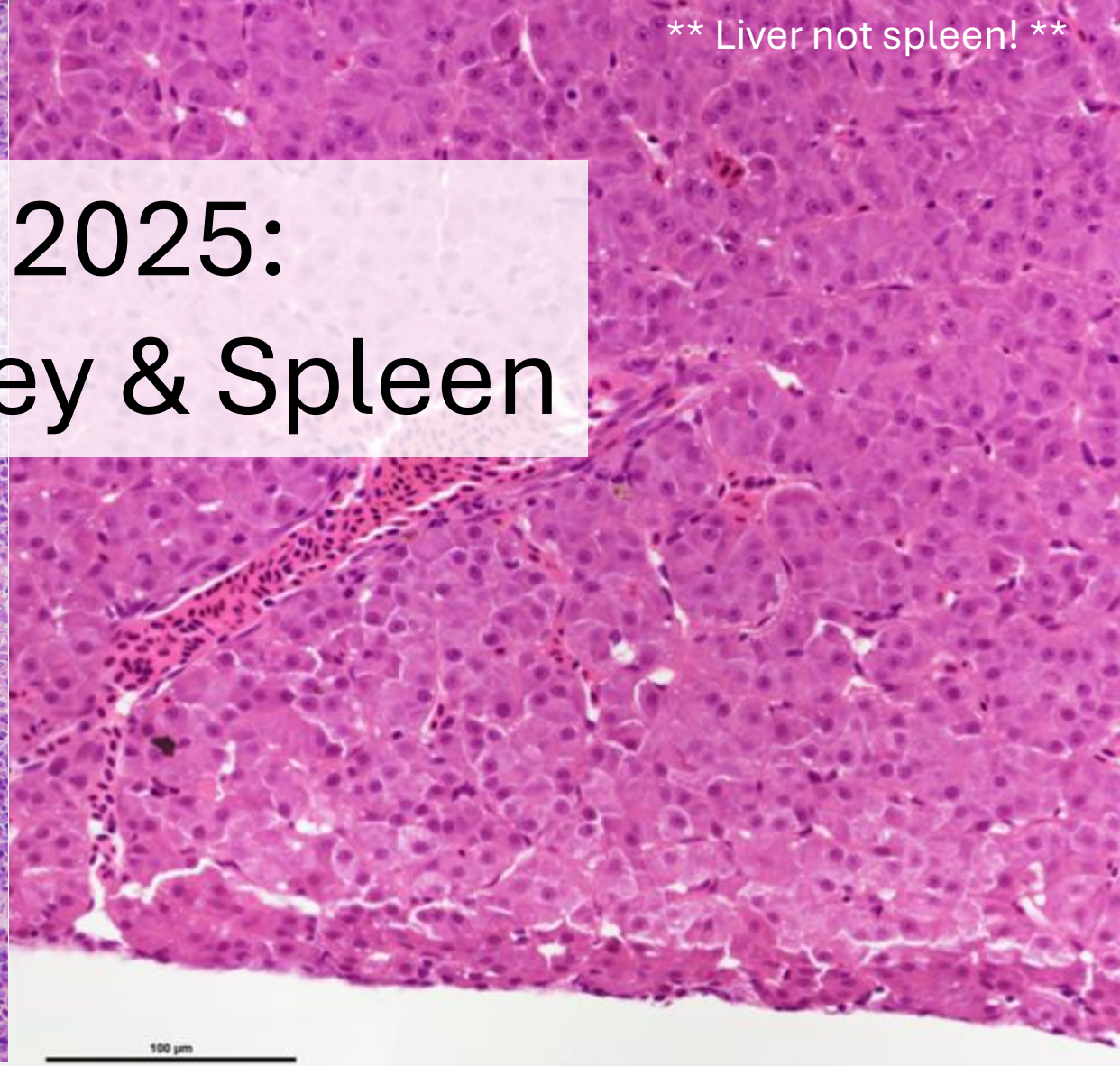


Healthy tissue vs pathology (and potential causes + impacts...)



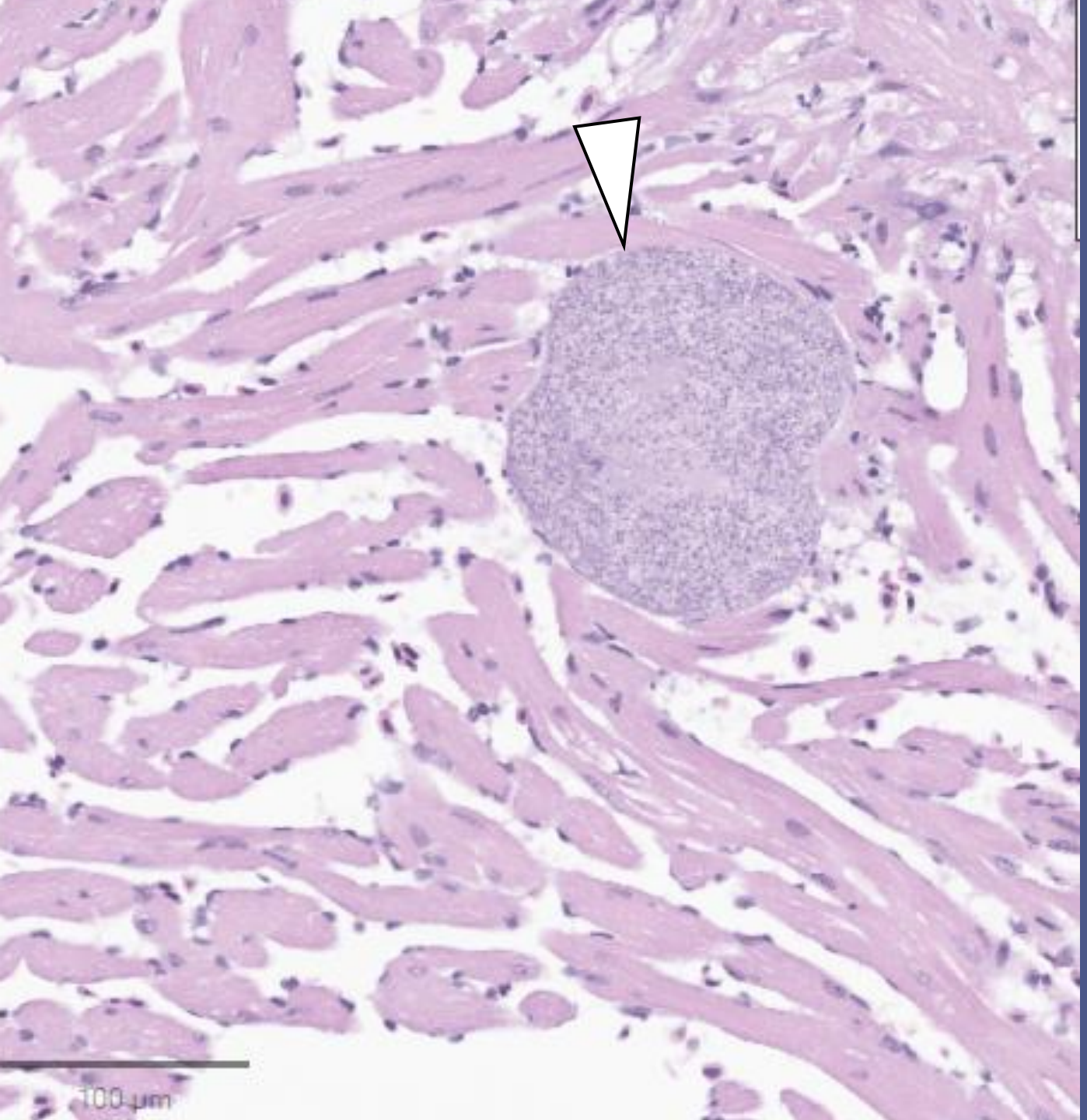
2024 & 2025:
Heart + Kidney & Spleen





** Liver not spleen! **

Examples not from the Copper River because I have not read those slides yet…



Usefulness of Histopathology

Understanding the health of fish populations

- → Growth + reproductive performance of different fish stocks
- → Tracking fish health seasonally
- → Assessment of disease incident in fish stocks (what proportion of the population is impacted by disease that might reduce their survival or performance?)
- → Endemic and emerging diseases

Other Fish Health Sample Types

- Blood samples
  - Protein biomarkers of organ function (heart, liver, kidney…)
  - Biomarkers of immune status
  - Indicators of nutritional status

Other Fish Health Sample Types

- Pathogen screening
  - Parasite counts and identification
  - Molecular screening for pathogenic agents (ADF&G)

Looking to the future

- Baseline of sockeye and Chinook salmon health in Copper River
- Data gathering, archiving, and information on population health (refinement of target organs/fish)

Tsin’aen / Thank you!

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Scan me!

Fish Health & Pathology LLC

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EPA United States Environmental Protection Agency