Detecting Anadromy in *Oncorhynchus mykiss* and *Salvelinus confluentus* by Non Lethal Sampling Techniques

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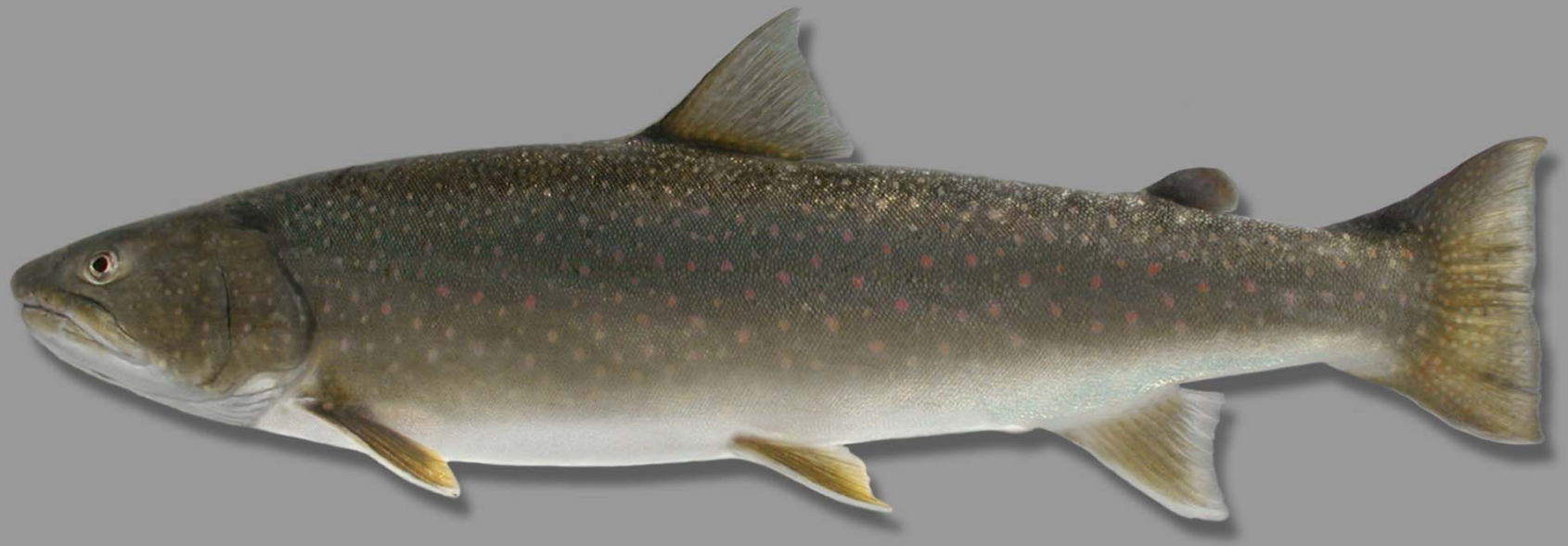

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Bull Trout
Salvelinus confluentus

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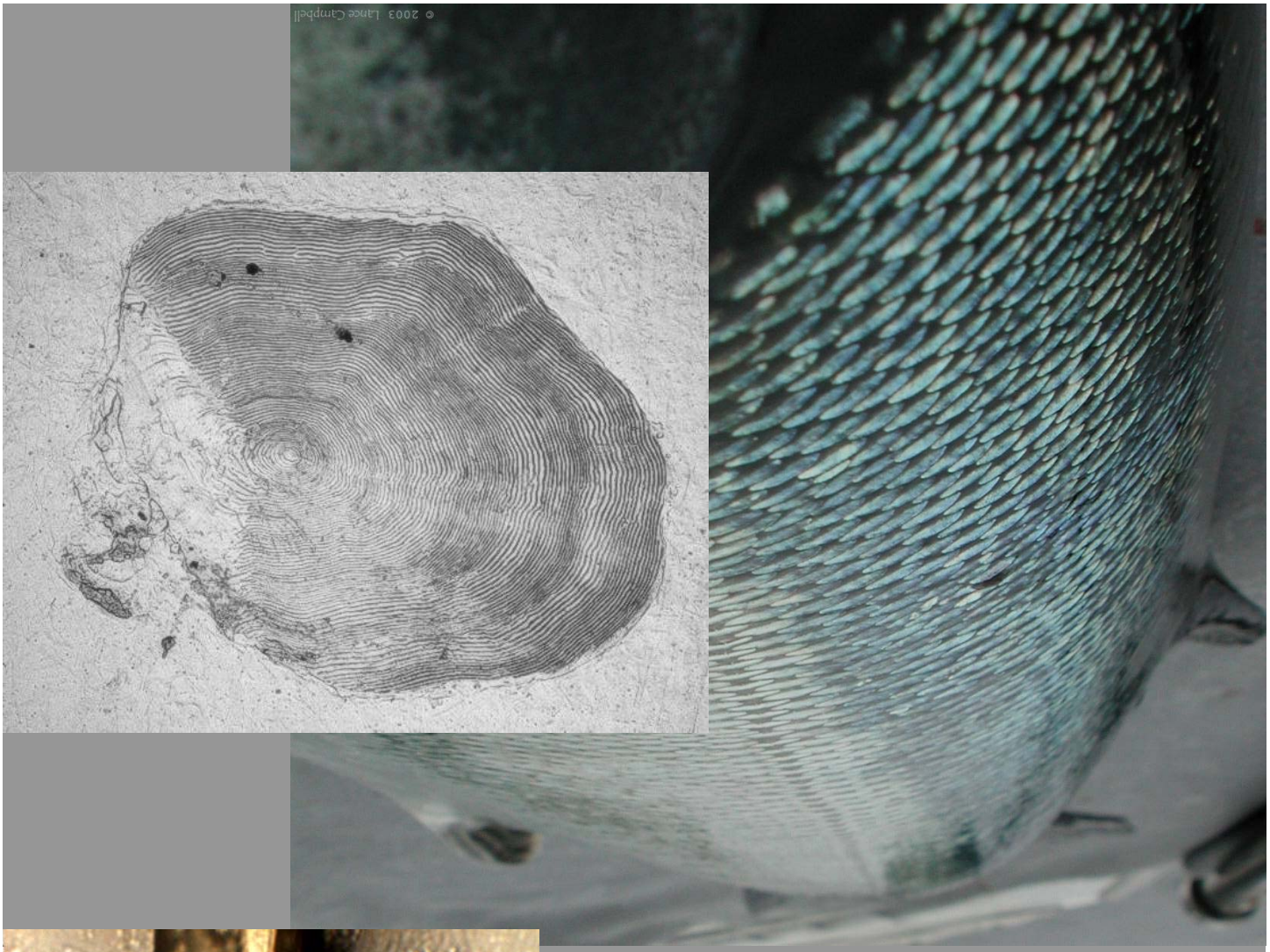
Sockeye Salmon
Oncorhynchus nerka

Bull Trout
Salvelinus confluentus

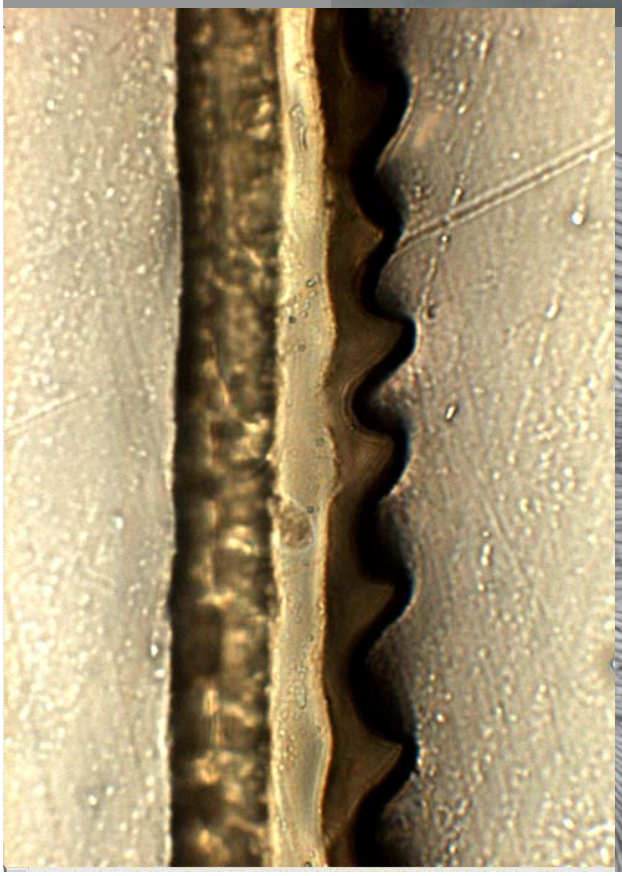
Coastal Cutthroat Trout
Oncorhynchus clarki clarki

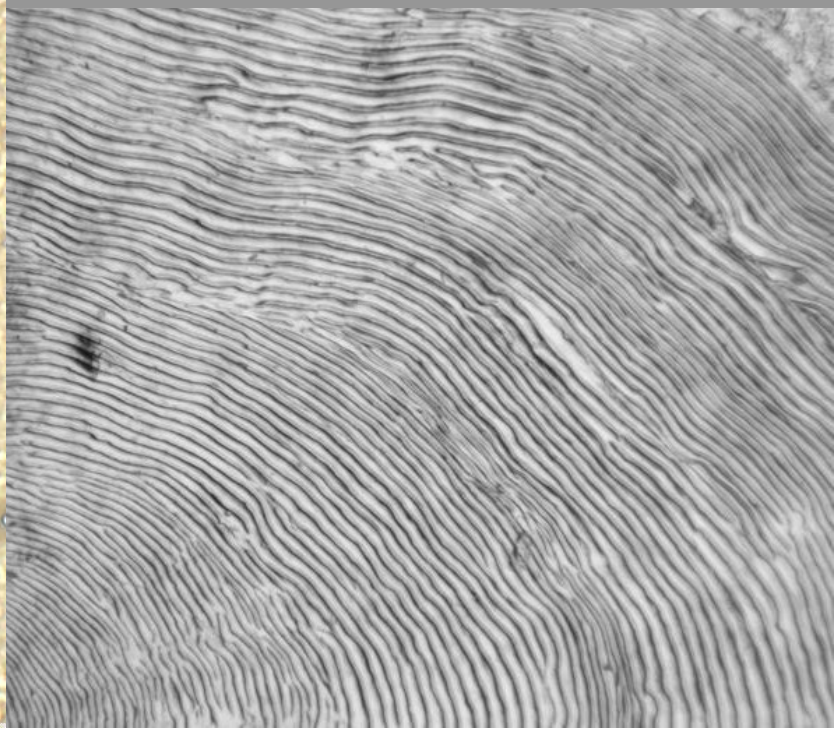
Objectives

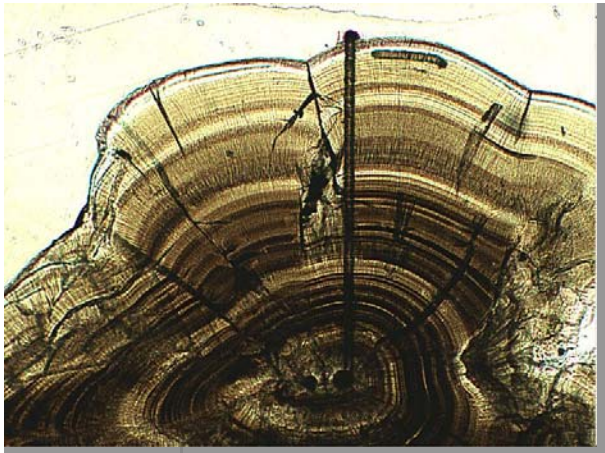
1. Use LA-ICPMS to determine strontium/calcium (Sr/Ca) ratios as an indicator of anadromy
2. Test the correspondence between otoliths, fin rays, and scales.
3. Understand the microchemical incorporation and stability of strontium (Sr) in salmonid scales and fin rays.

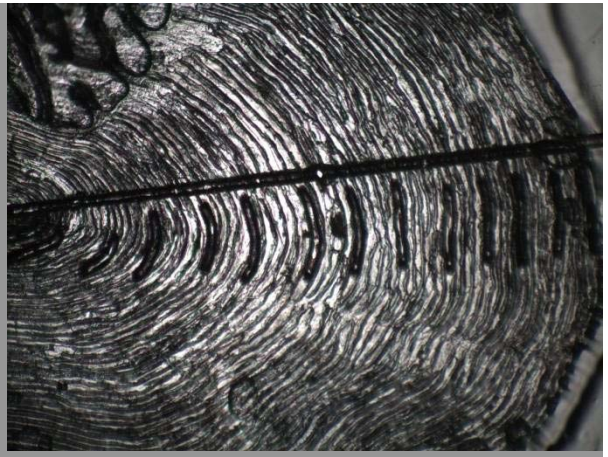


Scale Chemistry



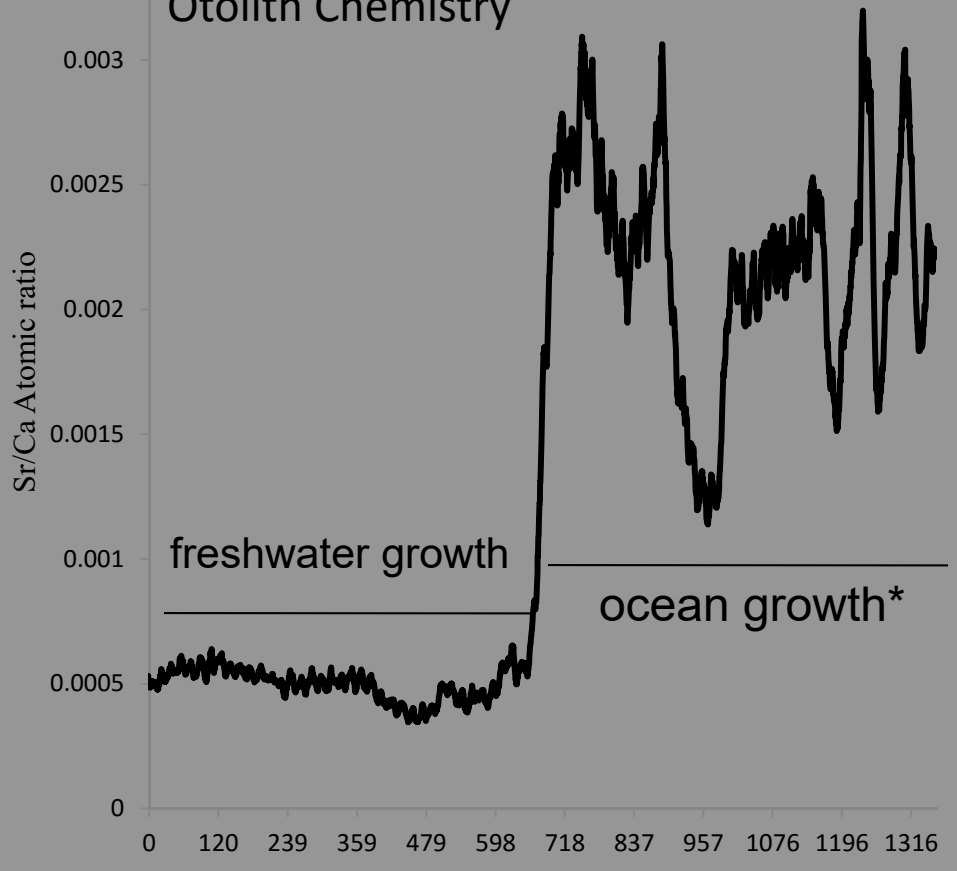


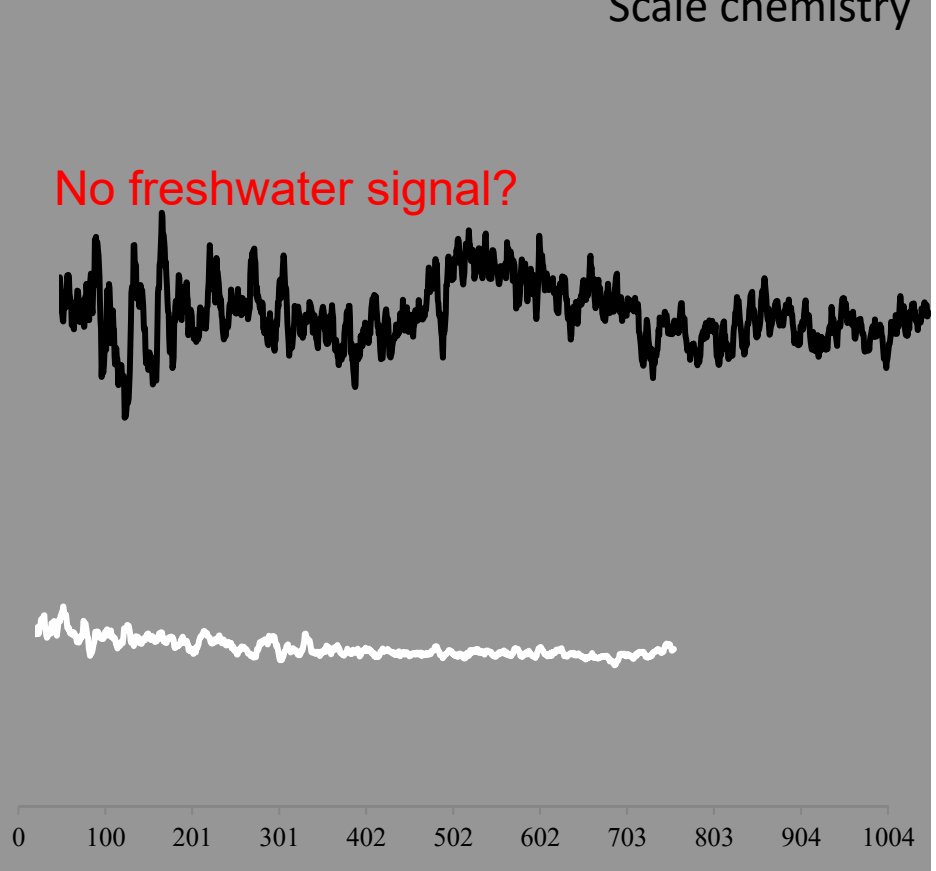


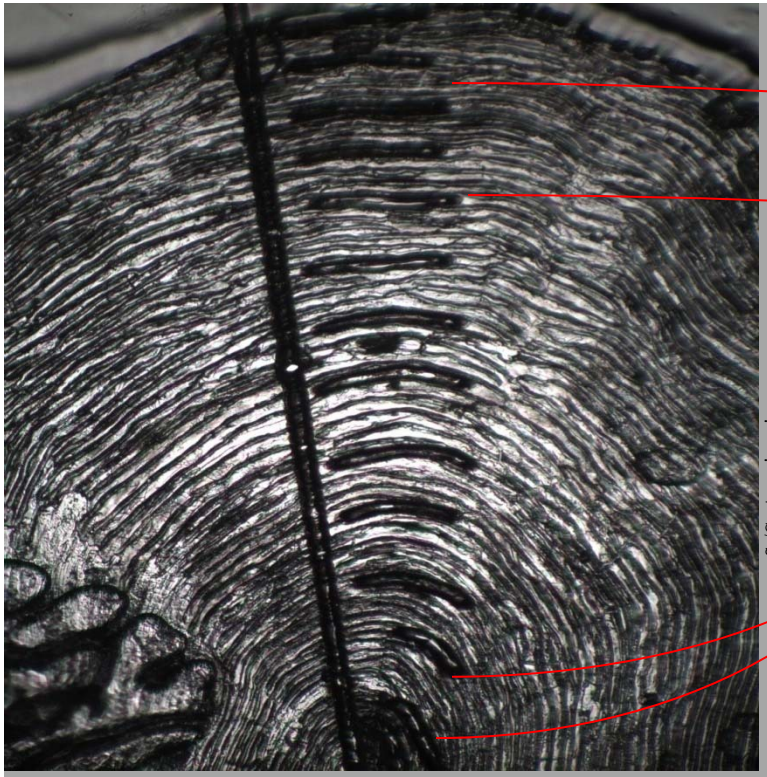


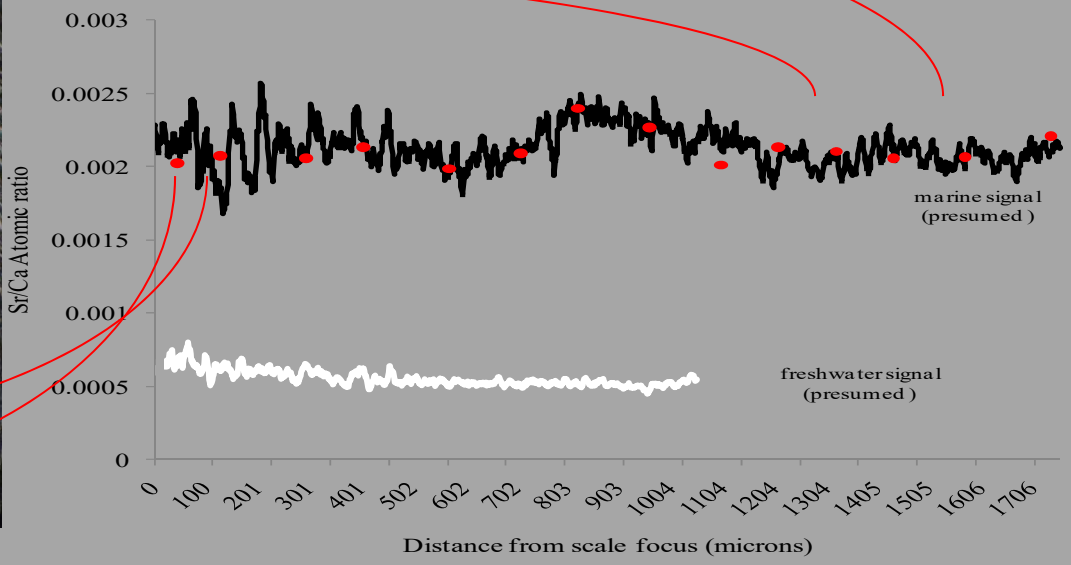
Otolith Chemistry

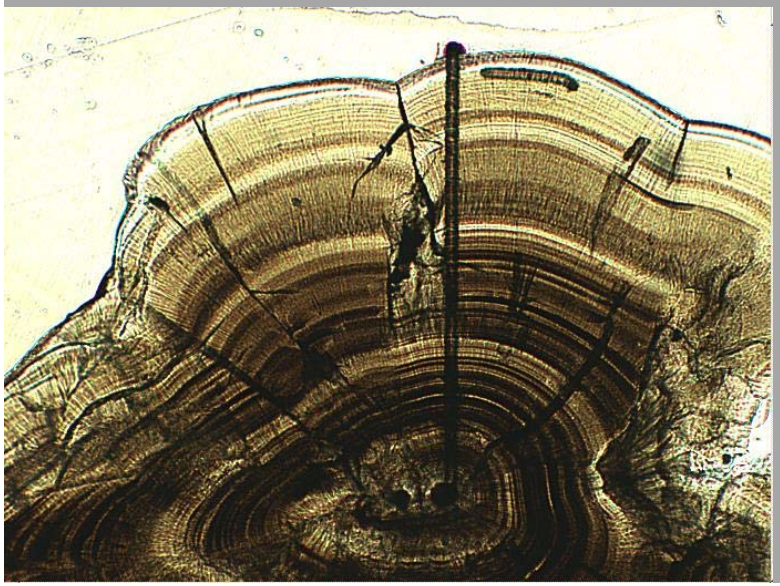
Scale chemistry

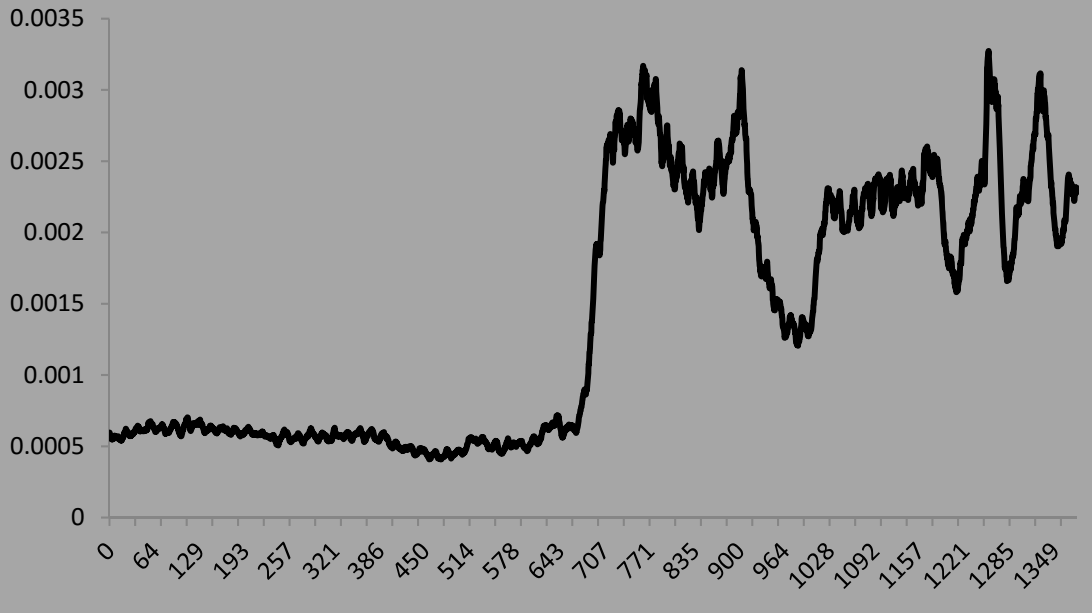


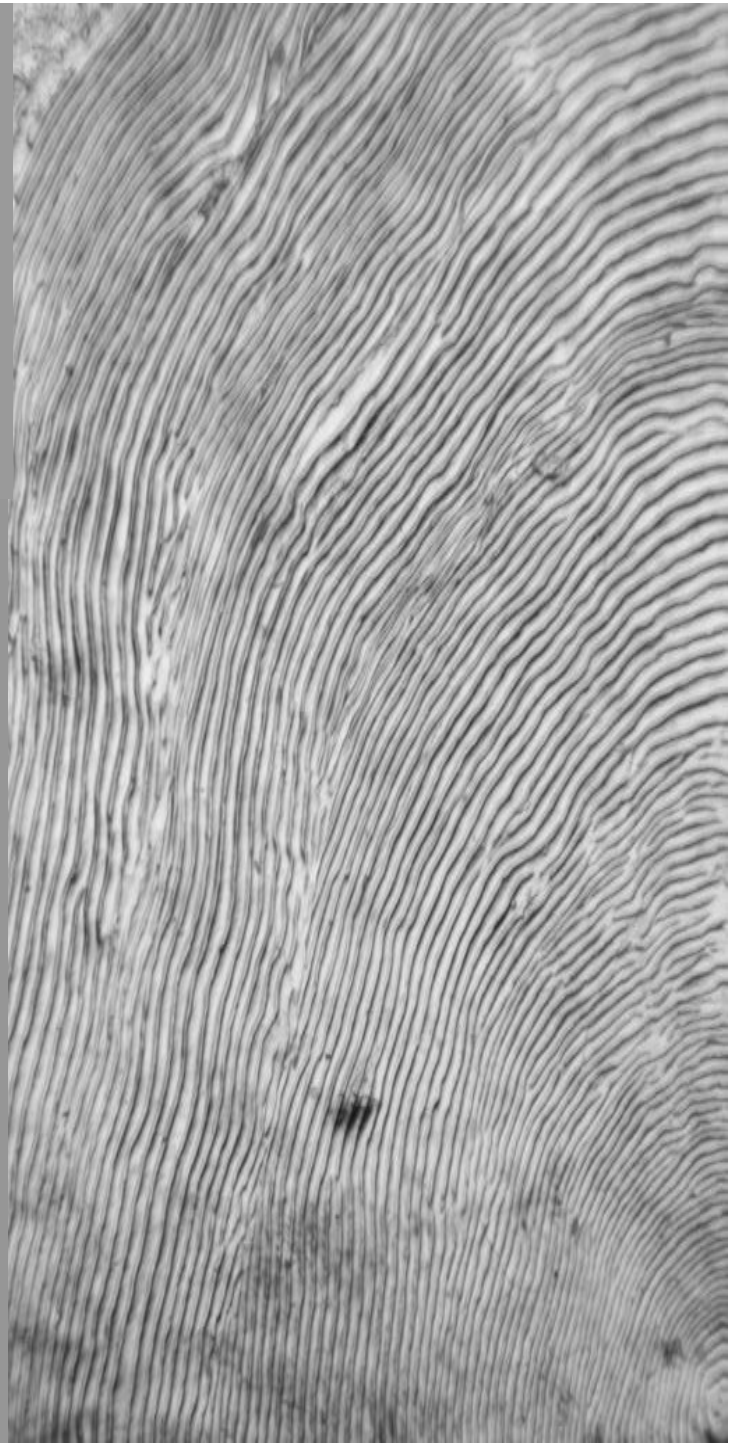





0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Sr/Ca Atomic ratio
marine signal
(presumed)
freshwater signal
(presumed)
0
100
201
301
401
502
602
702
803
903
1004
1104
1204
1304
1405
1505
1606
1706
Distance from scale focus (microns)



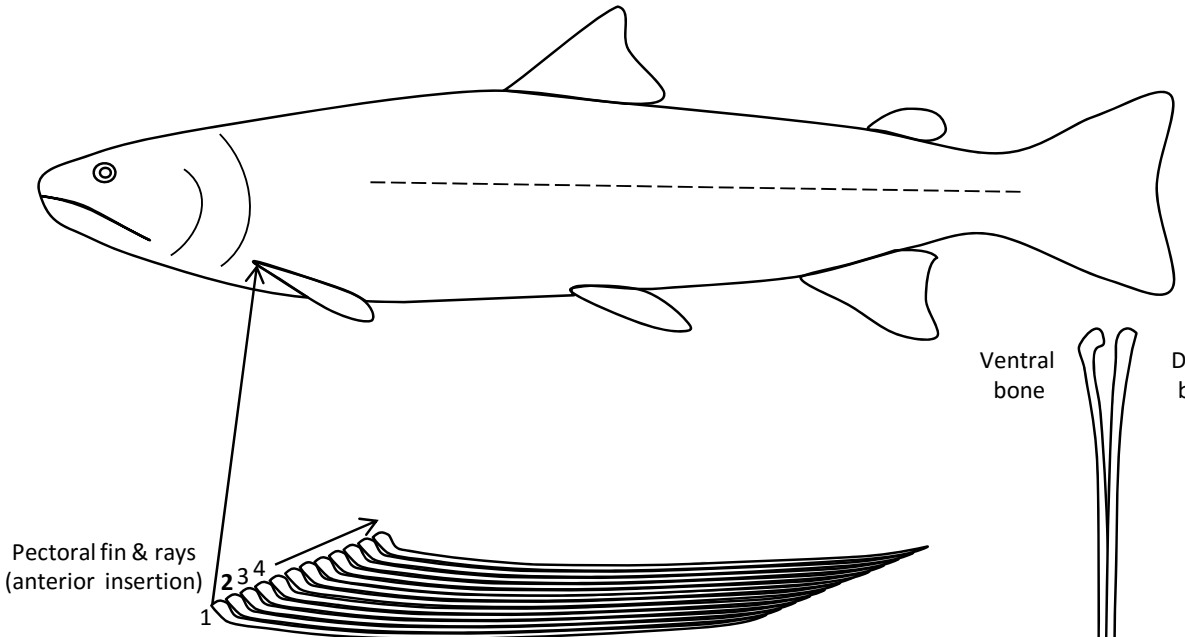

0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
0
64
129
193
257
321
386
450
514
578
643
707
771
835
900
964
1028
1092
1157
1221
1285
1349

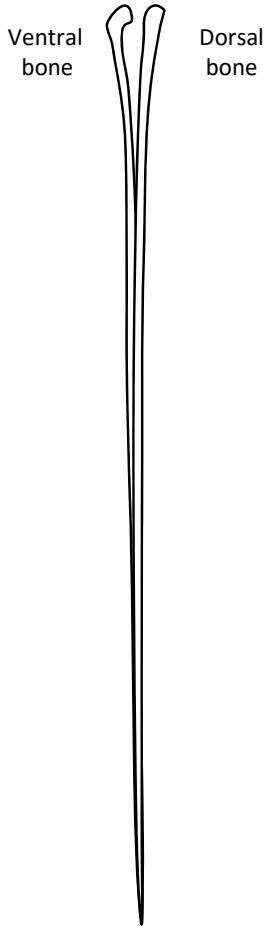


- Scale chemistry does appear to indicate migratory or resident forms by way of low or high concentrations of Sr.
- However the portion of the scale formed during freshwater residency also appears high, suggesting a "contamination" effect (also found in brook trout, Courtemanche et al 2006, juvenile Chinook salmon, Campbell 2010).

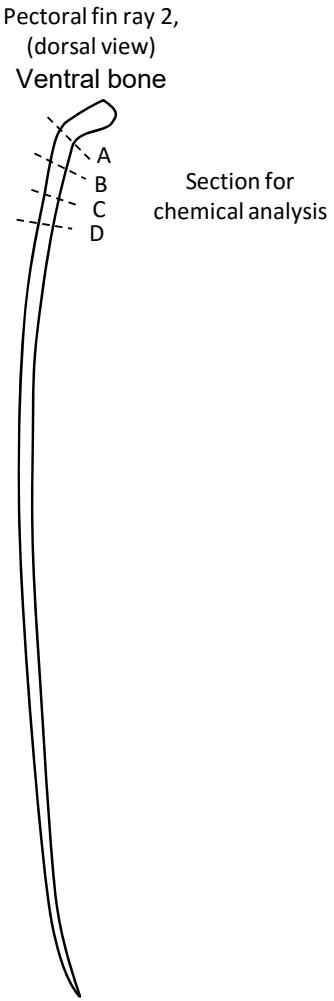
Pectoral fin ray chemistry

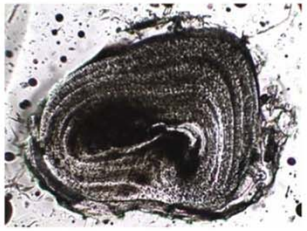
Pectoral fin ray chemistry





Pectoral fin ray 2
(anterior view)



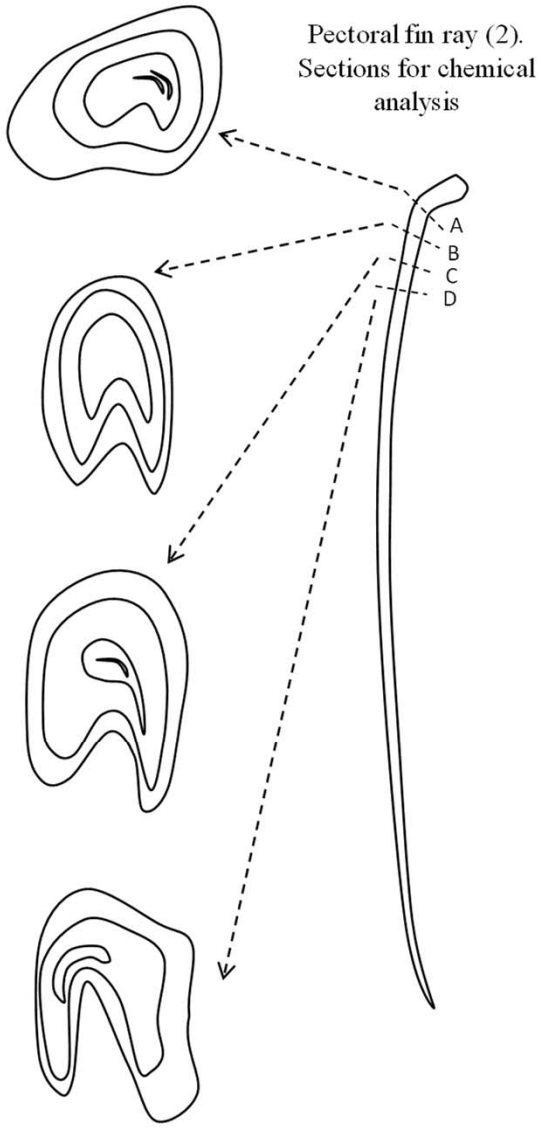


A

B

C

D



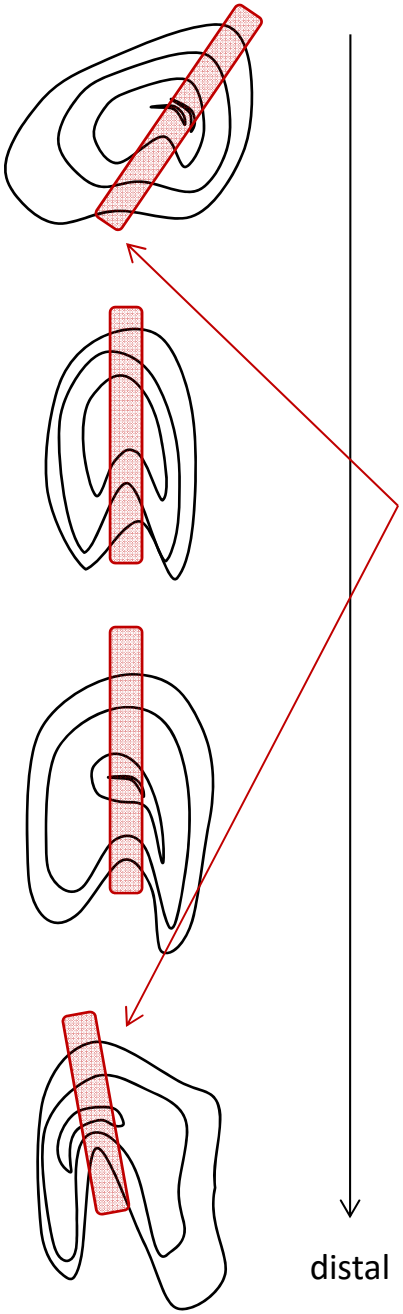
Pectoral Fin Ray Sections

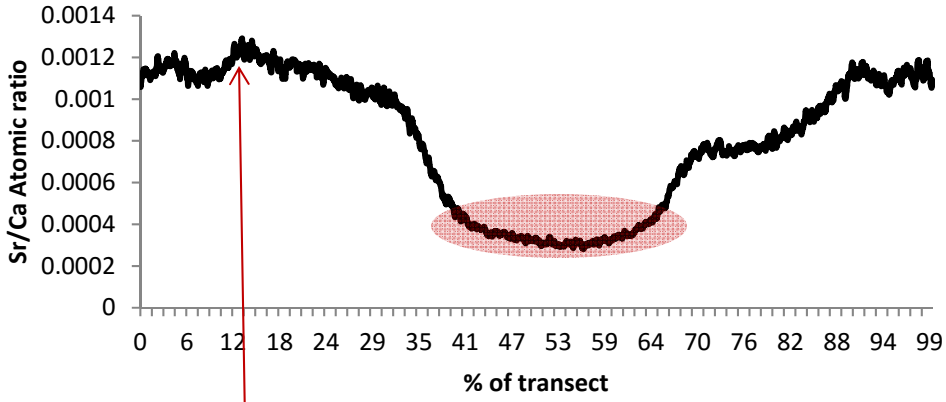
A

B

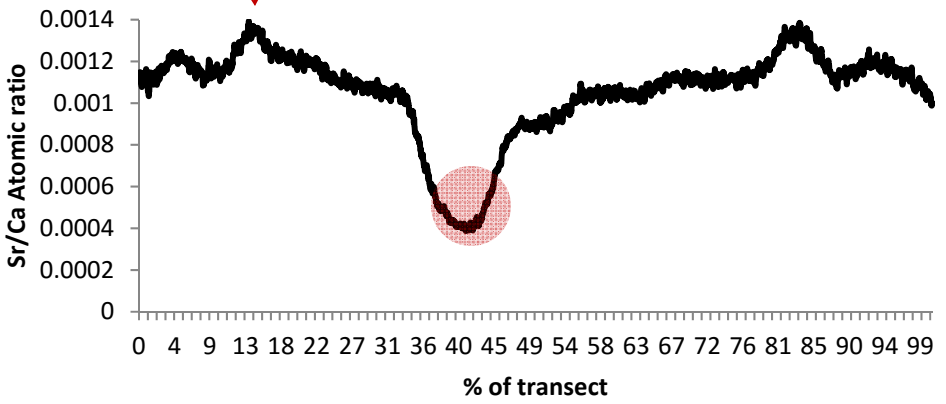
C

D

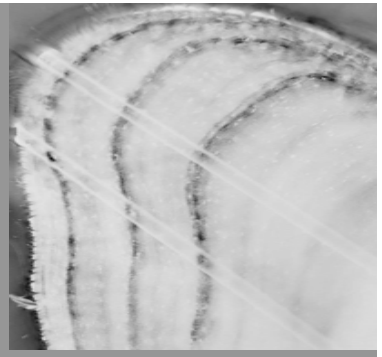




Laser transect/chemical output



* loss of freshwater growth due to sectioning location



Multiple anadromous migrations

Single anadromous migration

Otolith Chemistry

Pectoral Fin Ray Chemistry

Sr/Ca Atomic ratio

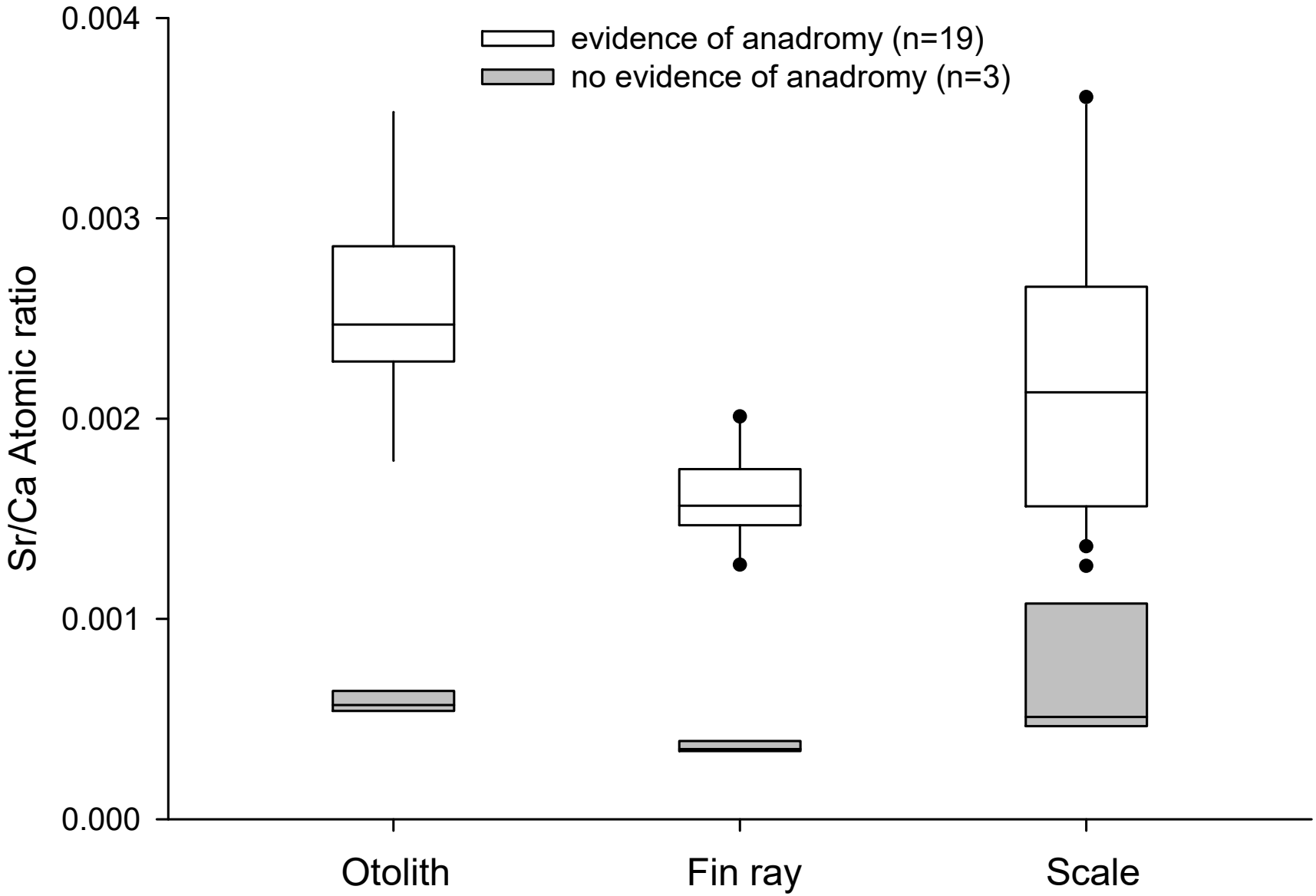
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0

0 120 239 359 479 598 718 837 957 1076 1196 1316

Distance from core (microns)

0 100 201 301 402 502 602 703 803 904 1004

Distance from focus (microns)

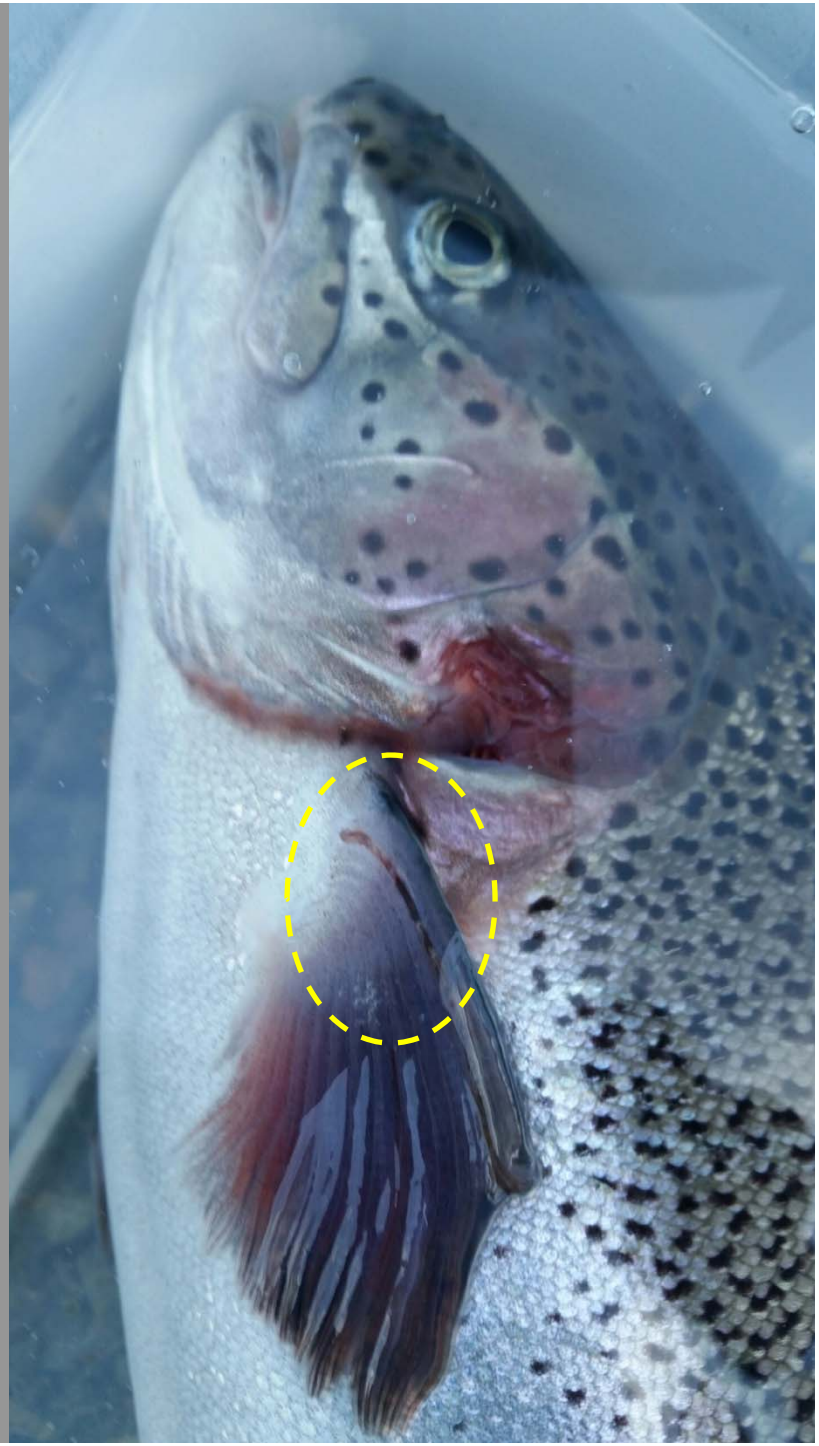

evidence of anadromy (n=19)
no evidence of anadromy (n=3)
Sr/Ca Atomic ratio
0.004
0.003
0.002
0.001
0.000
Otolith
Fin ray
Scale

Conclusions:

- Otoliths, fin rays and scales all appear to indicate anadromy
- The stability of a Sr signal appears relatively consistent between otoliths and fin rays, but not for scales (sampling/contamination effect?).
- Sectioning location within a fin ray plays a significant role in elemental detection.

Where now?

- Survival study (in progress)
- Refine surgery procedure (1-1.5min per surgery)
- Document calcification of fin ray through fish development
- Refine sample preparation methods to maximize age, growth and chemistry information



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