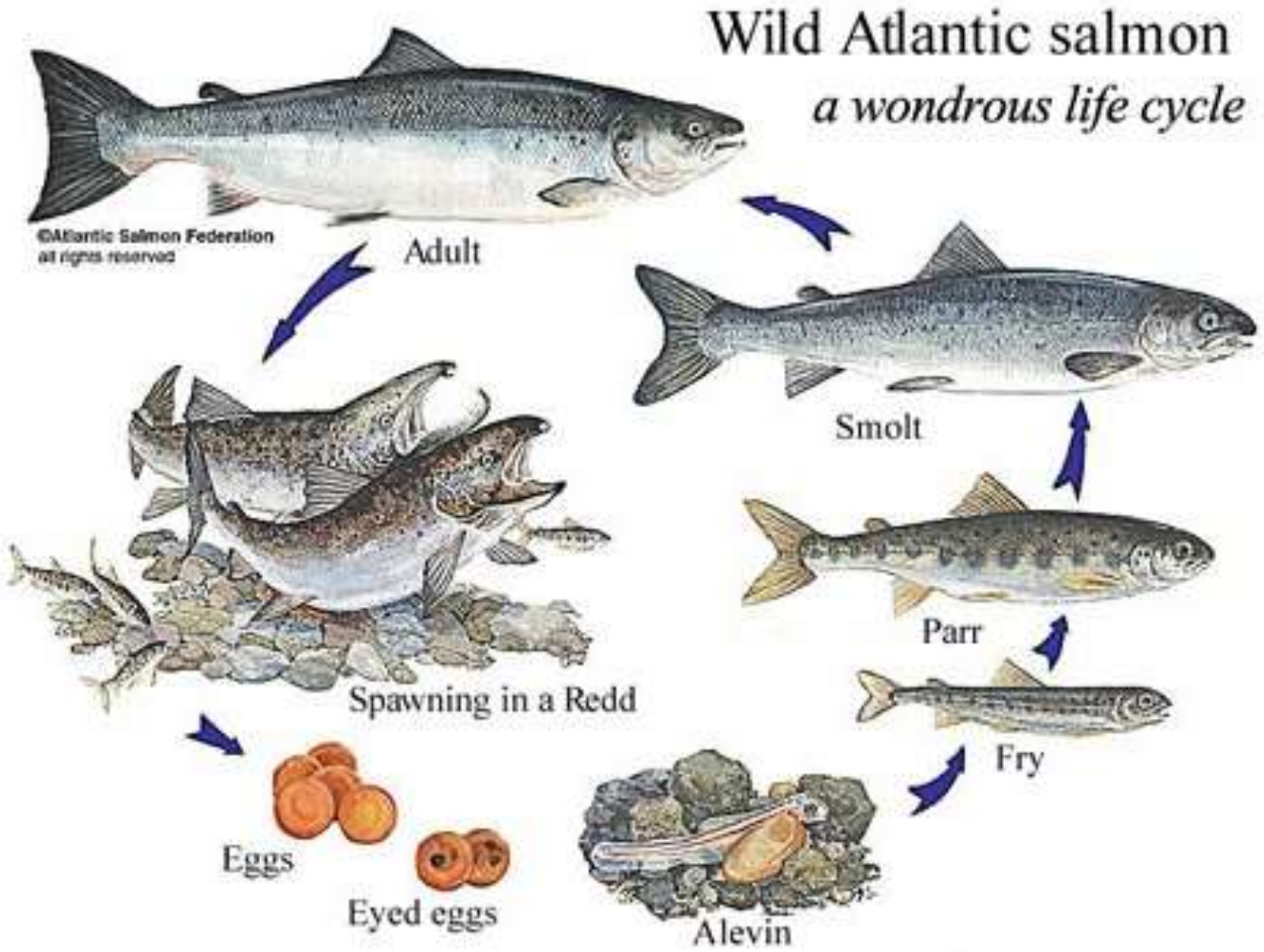
MEMORIAL UNIVERSITY

# Factors that affect early salmonid development

Heather D. Penney

# Salmonid life cycle

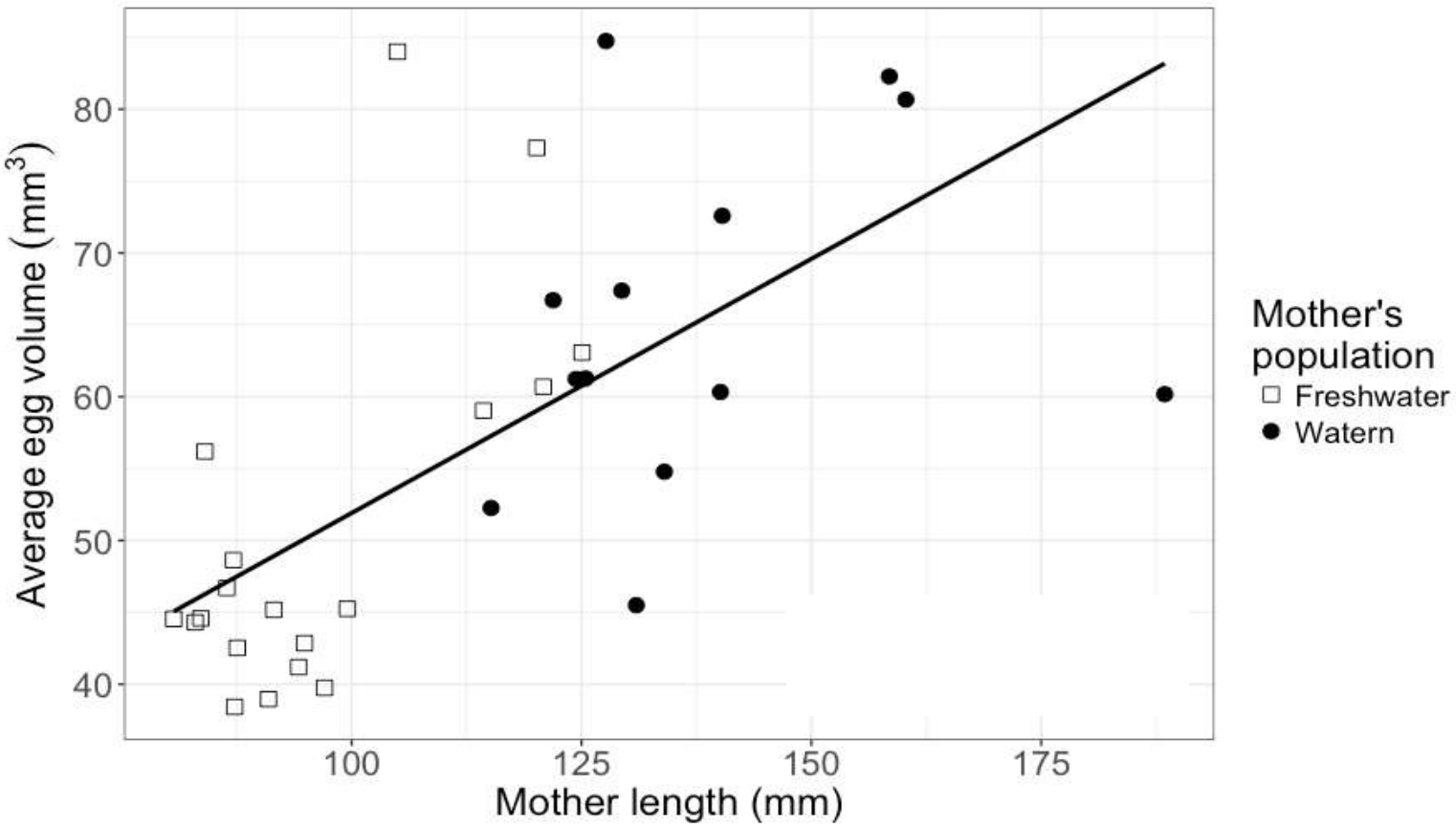


# Maternal effects

- Mother condition affects offspring's condition

- Can impact hatch size, hatch time, and ultimately chances of survival

# Mother length affects egg size



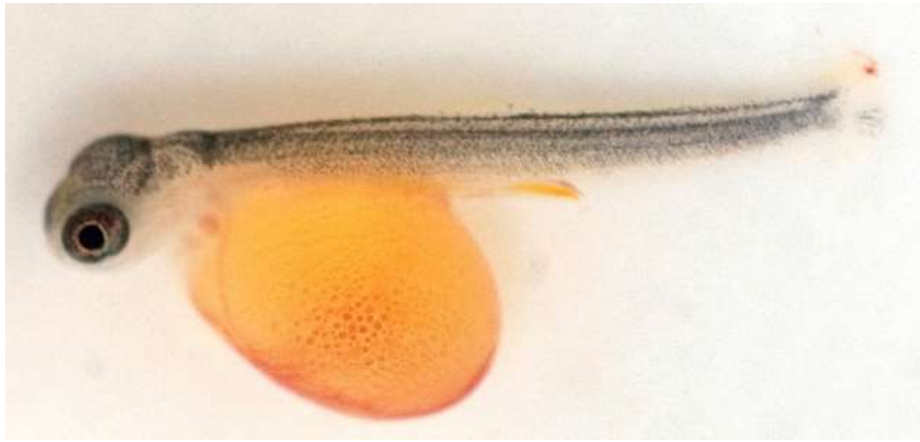
# Salmonid redds

- Salmonids dig holes in the river bed
- Bury their eggs
  - Safe from predators
  - Don’t wash downstream
- Often in groundwater seeps
  - More stable temperatures
  - Less likely to freeze in the winter

http://fishbio.com/field-notes/population-dynamics/fishbio-fall-run-chino

# Factors affecting hatch

- Temperature
- Water chemistry
- Parental factors
  - Egg size
  - Spawning time



http://vacapitaltu.org/tic/trout-in-the-classroom-photos/

# Importance of emergence

- Will hatch and then wait in the redd until they're ready

- Emerging from the nest after hatching

- Important to time that correctly

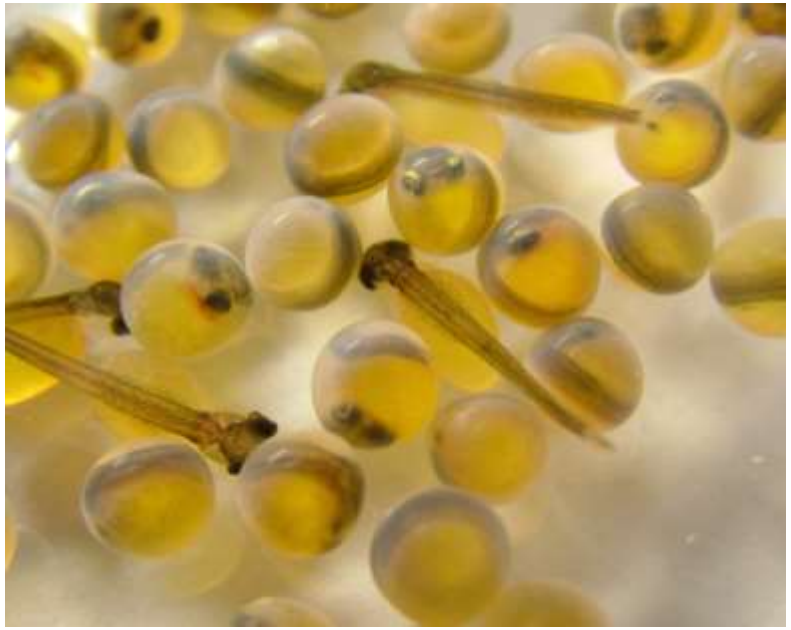
Photo: Heather Penney

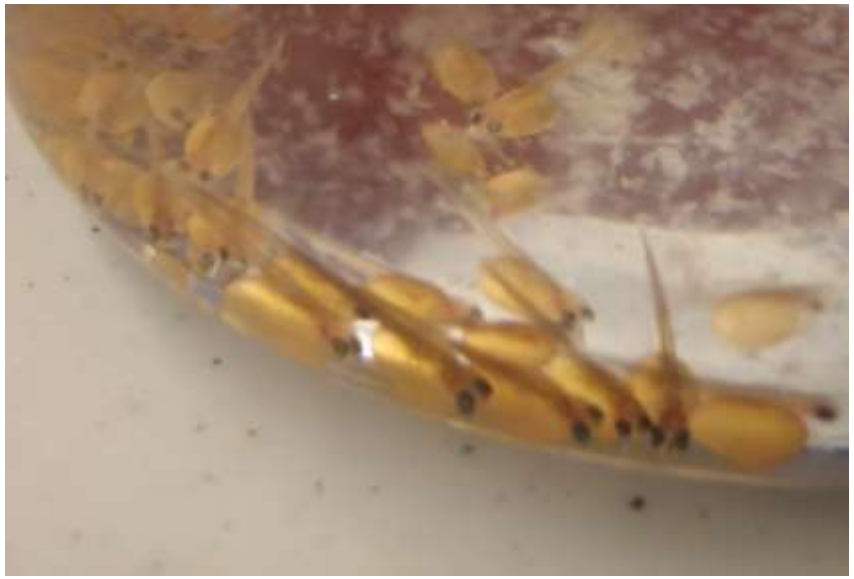
Photo: Craig Purchase

# Importance of timing

- Emerging at an optimal time can be beneficial

- Important:
  - Environment
  - Food
  - Predators





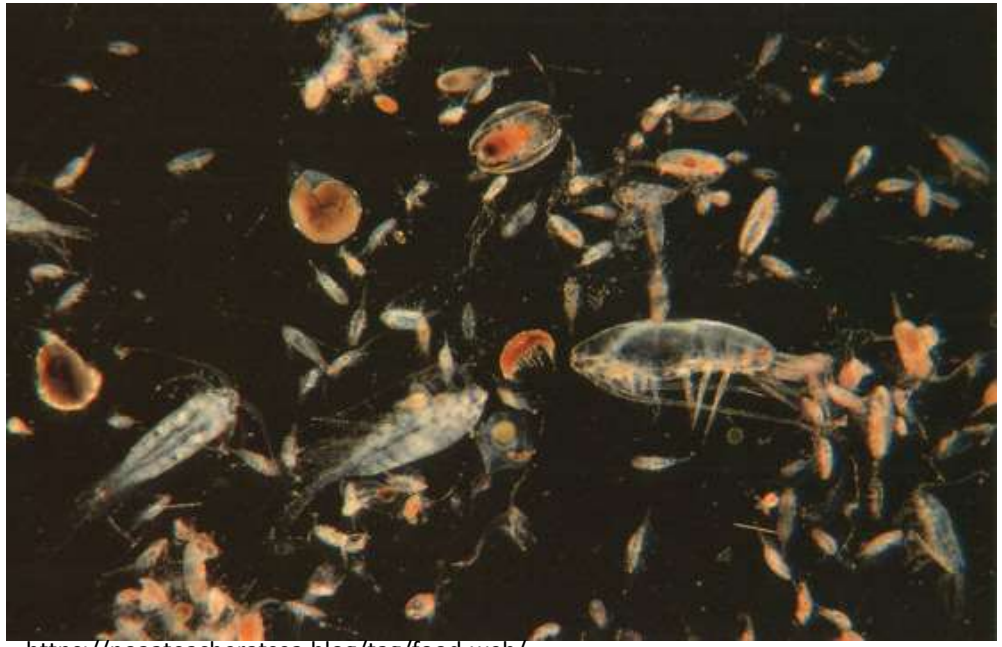
# Timing - Environment

- Low temperatures
- Fast flow rate

- Wait for more ideal conditions

# Timing – Food availability

- Can’t leave too early
  - May starve
- If leave too late –
  - Miss optimal feeding
- Competition between young salmonids can be very strong
  - Miss opportunity to establish a feeding territory if leave late



https://noaateacheratsea.blog/tag/food-web/

http://fishbio.com/field-notes/fish-biology-behavoir/fishy-food-chain

# Timing - Predators

- When first emerge they are small and can't swim very well

- Either:
  - All emerge at once (synchrony) to confuse the predator
  - Time emergence to low when few predators around

https://awbateman.wordpress.com/2015/12/18/paper-on-salmon-food-we

http://www.fredmiranda.com/forum/topic/1392727

Arthur Morris/BIRDS AS ART

# What I do:

- Focus on early life history stages in salmonids
  - Arctic char
  - Brook trout
- Look at how maternal effects and environmental conditions impact young salmonids
- Look at how hatch timing affects growth rate

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11
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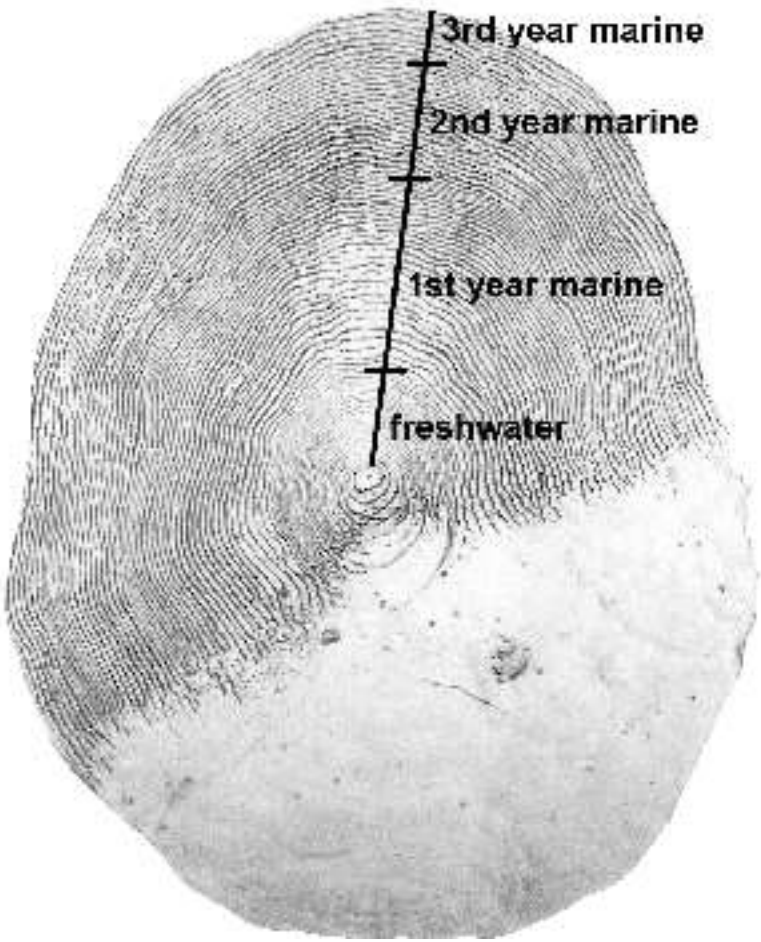
15

# How do you age a fish?

- To learn about growth rates, we need to know how old fish are.

# Determining age:

- Aging fish often uses hard structures:
  - Scales
  - Vertebrae
    - Sharks and rays
  - Otoliths
    - ‘Ear bones’ of fish



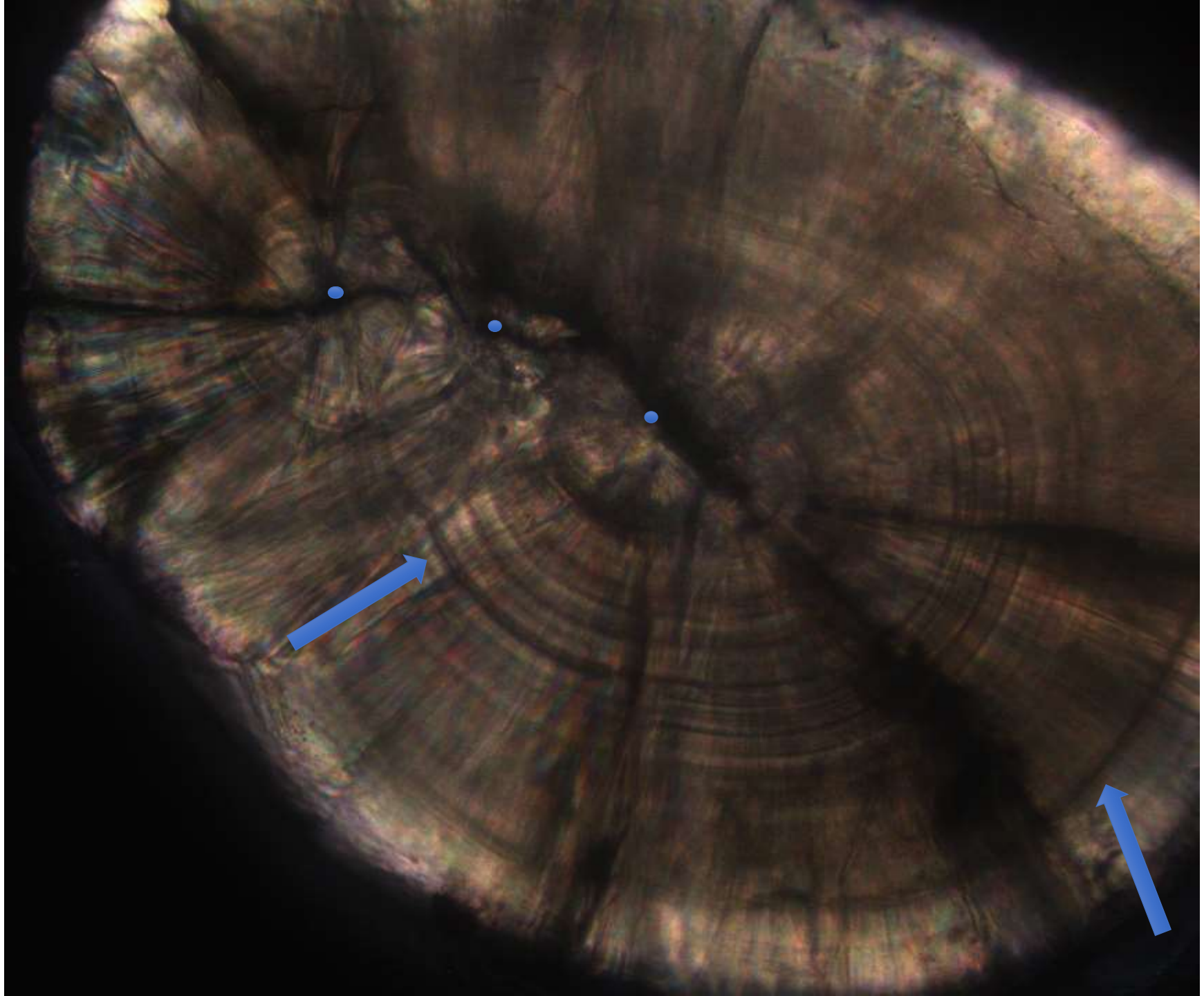
# Otoliths

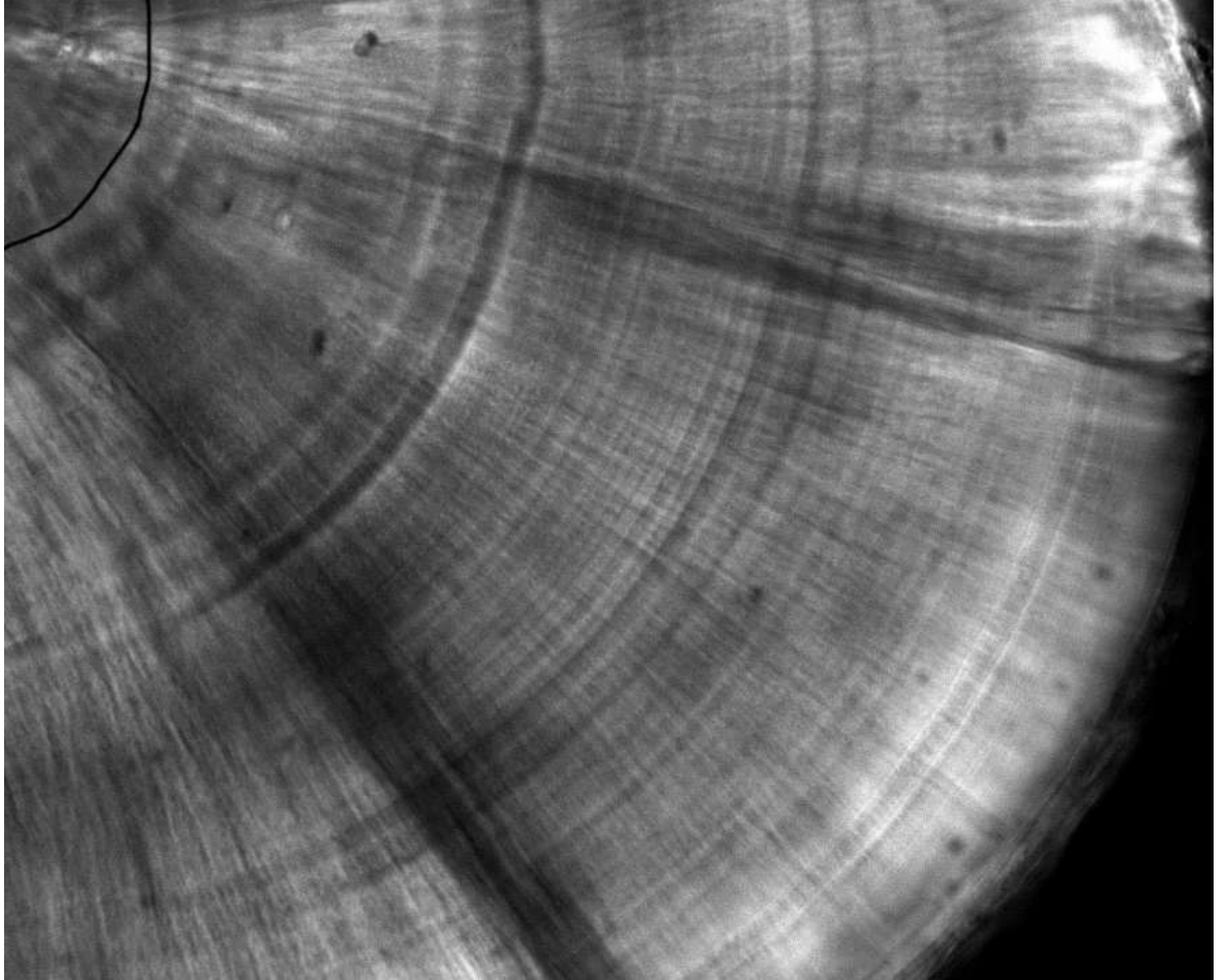
- Calcium carbonate structure
  - Put down on the otolith as they grow

- Fish have 3 pairs:
  - Sagittae
  - Lapilli
  - Asterisci

https://en.wikipedia.org/wiki/Otolith#/media/File:Otoliths2.jpg

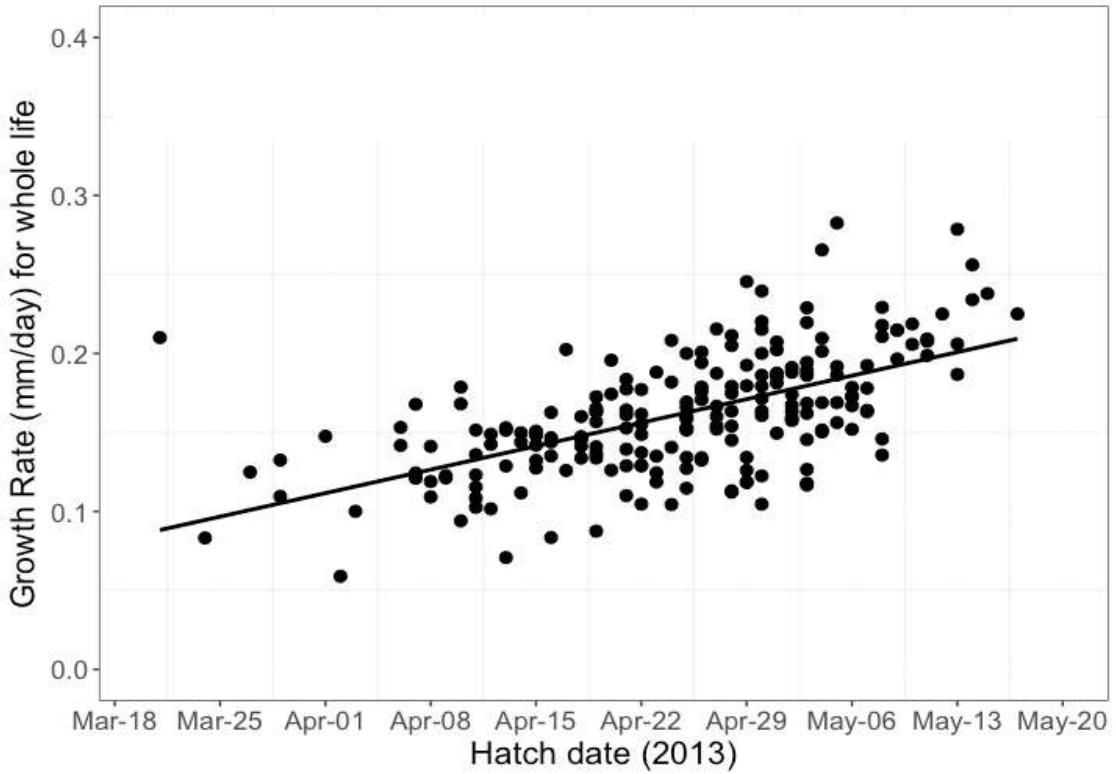
Gafftopsail Catfish
Hardhead Catfish
Sand Seatrout
White Mullet
Striped Mullet
Tarpon
Florida Pompano
Sheepshead
Swordspine Snook
Fat Snook
Common Snook
Tarpon Snook
Black Drum
Sand Drum
Red Drum





# What have we found?

- Hatch date itself can affect growth rate



# Summary

- Mother size affects hatch size
- Hatch and emergence timing is really important in salmonids
- We use lab experiments to track hatch time and subsequent growth rates
- When we use wild fish, we use otoliths to get an age and growth rates

http://www.northallegheny.org/Page/10600

# Acknowledgements


- Purchase Lab
- Dr. Ian Bradbury
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- Aline Litt
- Violaine Shikon
- Kyle Millar

# Questions?

http://theconversation.com/magnetic-maps-guide-young-salmon-from-river-to-sea-22813