The pathology of *Salmincola californiensis* gill infestations: Are we missing the big picture?

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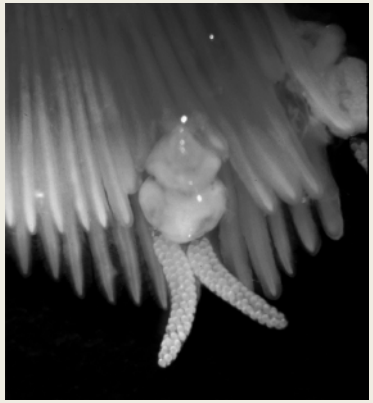
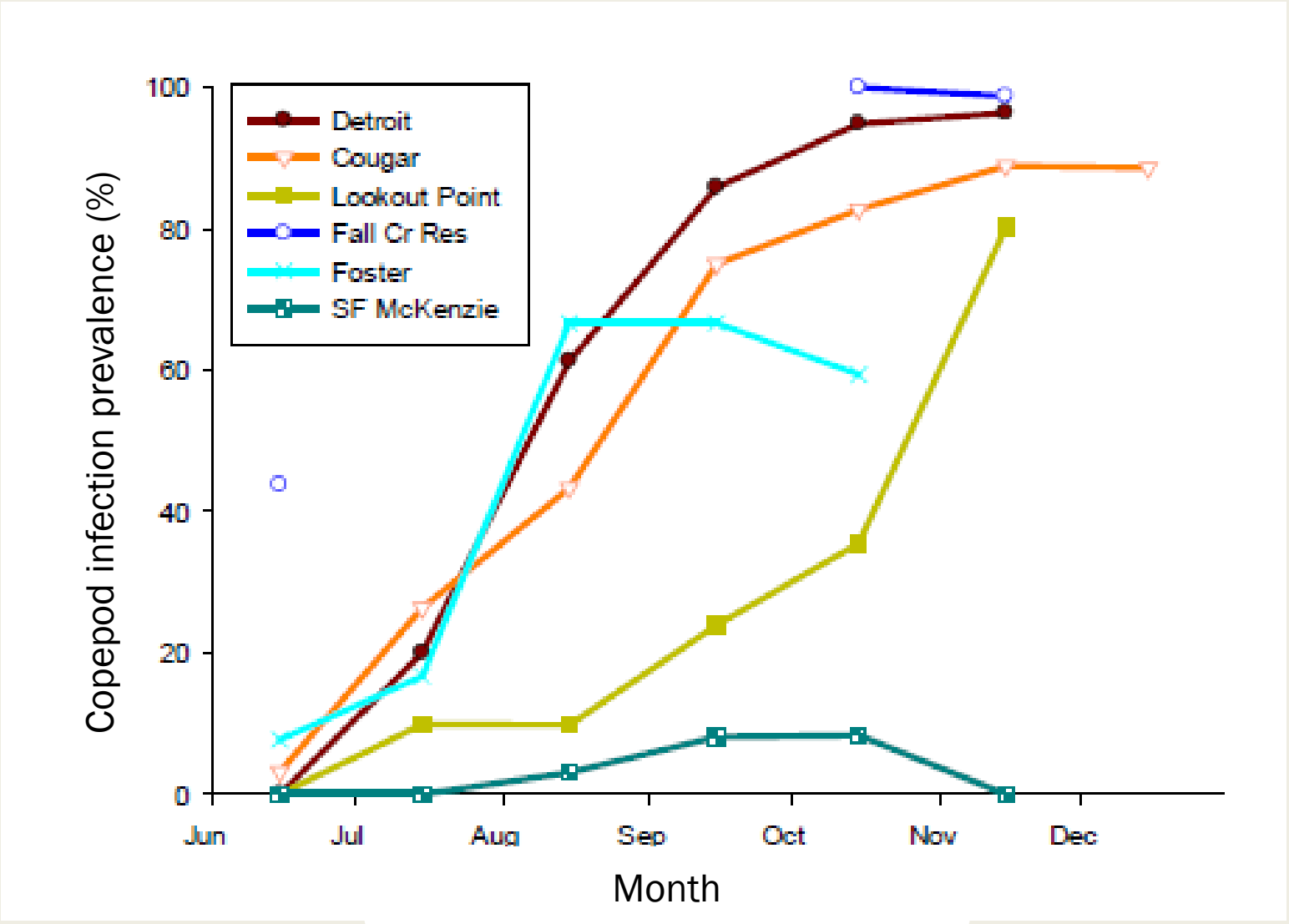
S. californiensis



- Attaches to gills, operculum, other surface tissues
- Disease associated gill damage from adults
  - Anemia
- Focal damage is primarily mechanical
  - Feeding on tissues
  - Pressure atrophy of surrounding tissues

Prevalence in subyearling Chinook salmon in reservoirs

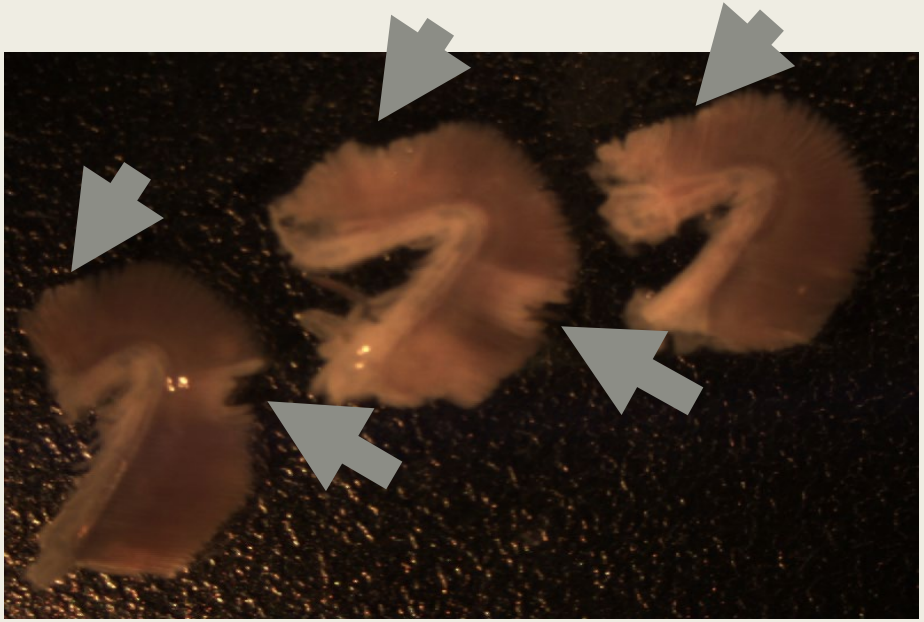


Monzyk et al. 2012

Gill damage associated with copepod infestation

Presence of copepods reduces swimming ability

Not all fish with gill damage had copepods



Herron, Crystal L., M. L. Kent, and C. B. Schreck. “Swimming Endurance in Juvenile Chinook Salmon Infected with *Salmincola Californiensis*.” *Journal of Aquatic Animal Health* 30, no. 1 (2018): 81–89.

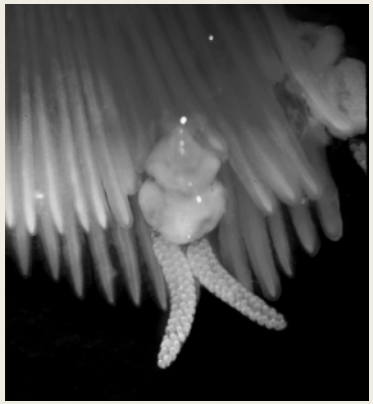
S. californiensis life cycle

Free-living copepodid

Attaches to host

Several molts

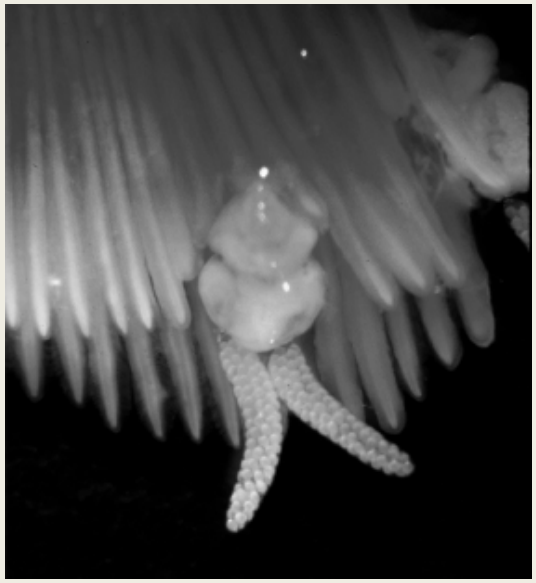
~ 30 Days



Journal of Fish Diseases
Volume 24, Issue 4, pages 197-203, 21 DEC 2001 DOI: 10.1046/j.1365-2761.2001.00279.x

S. californiensis

- Prevalence is based on the number of adult female copepods only
- Do other stages of the parasite impact gill function?
- Is anemia the primary cause of reduced swimming ability?



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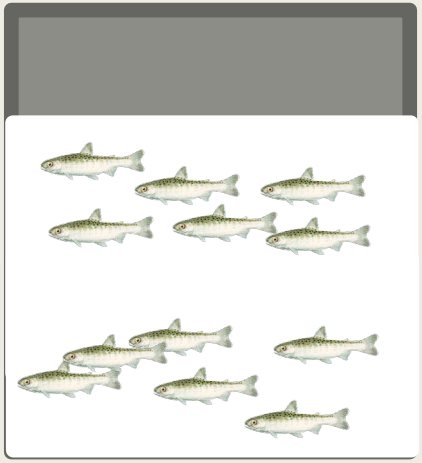
http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2761.2001.00279.x/full#f1

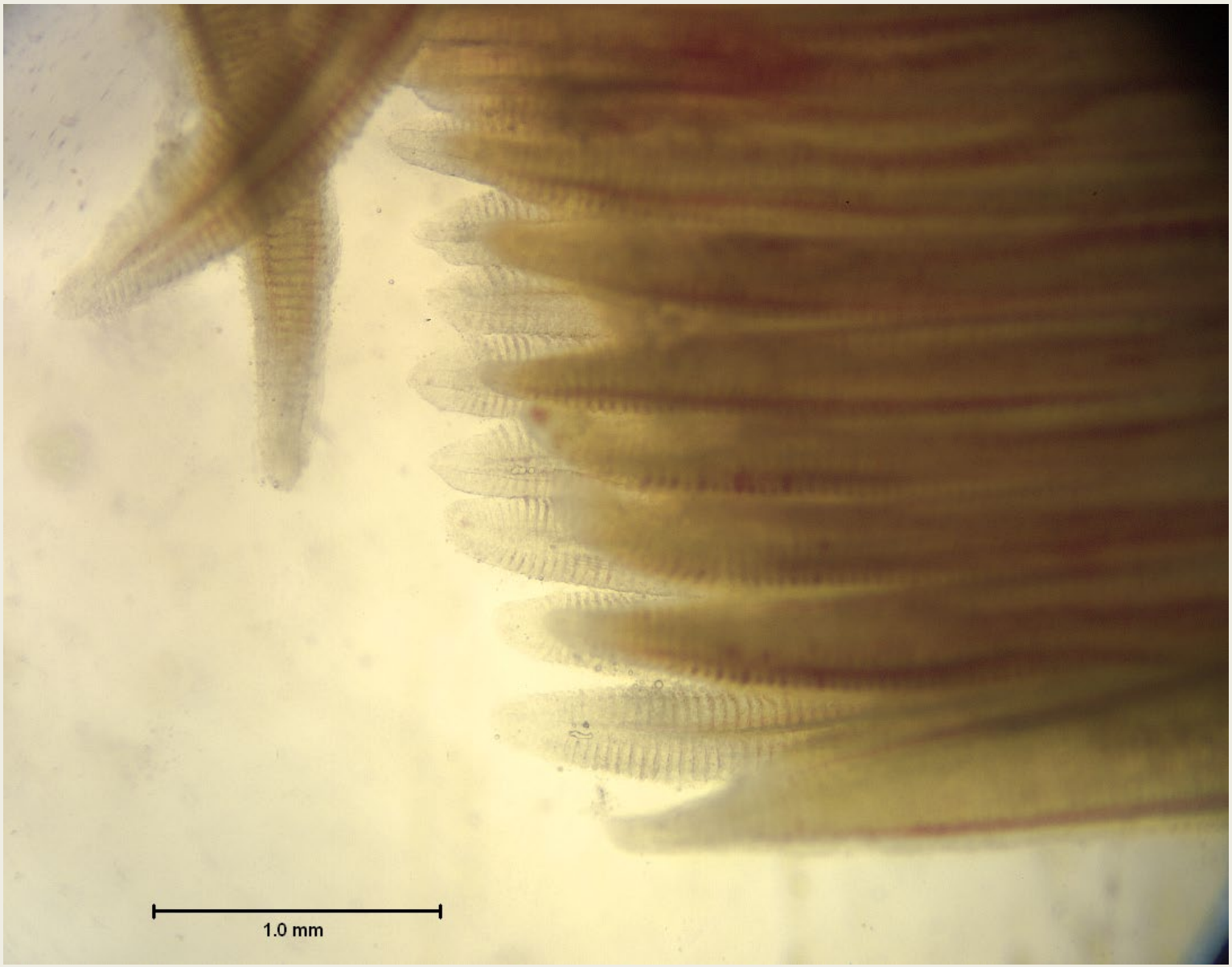
PILOT Infection experiments

20 exposure events over 3 wks

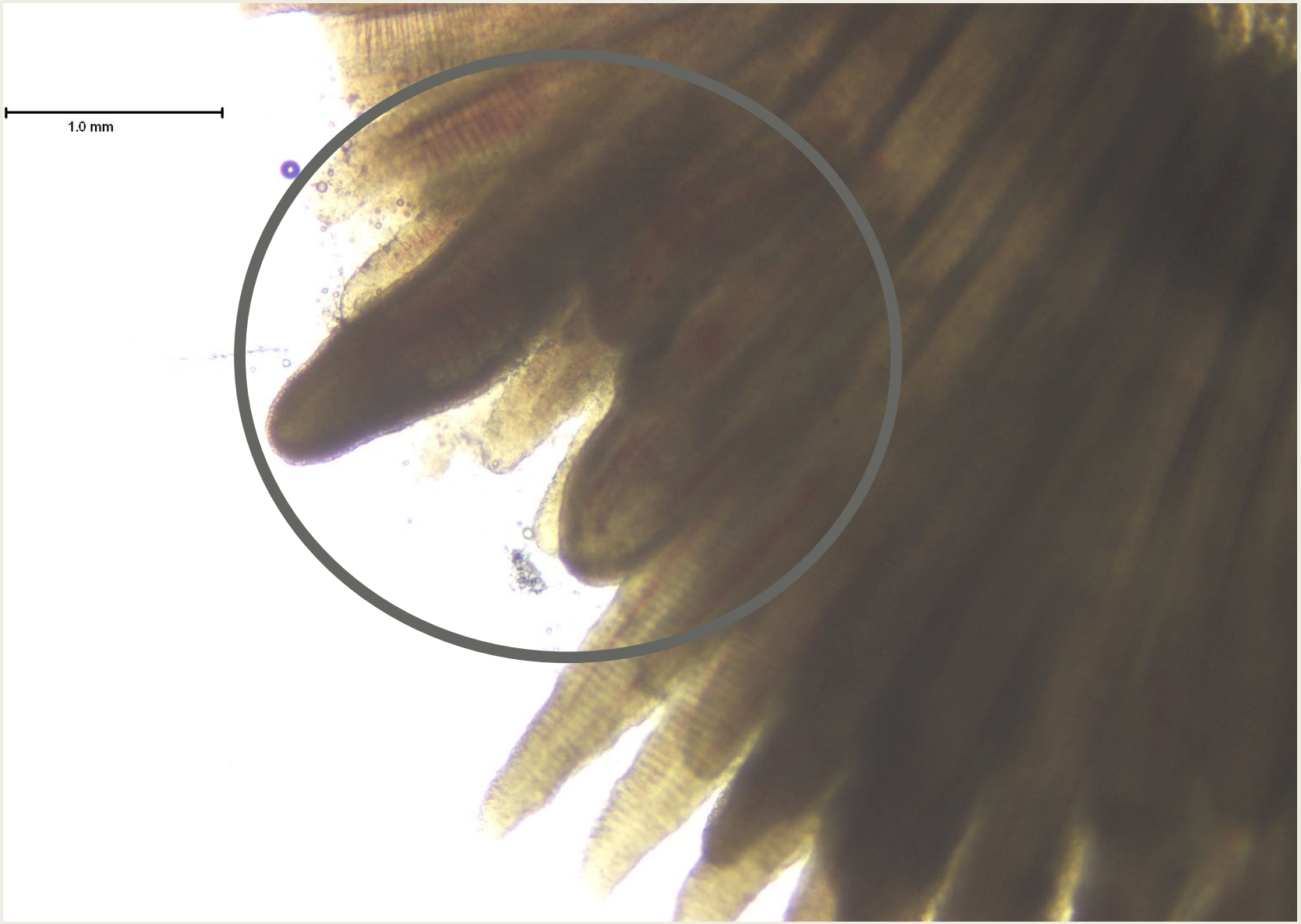
Examined fish 1 week after last exposure



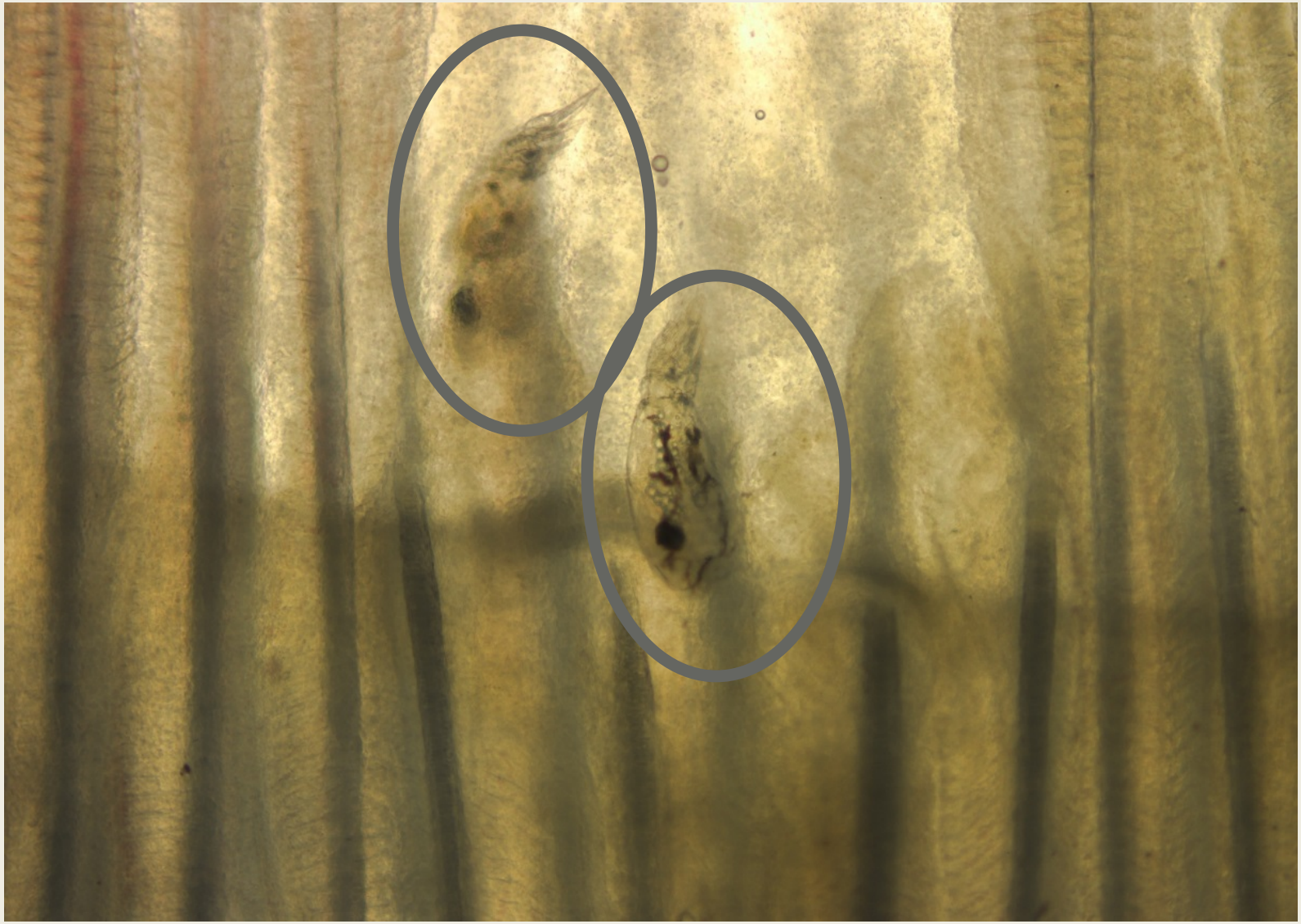
Healthy gills



Pathology before adults

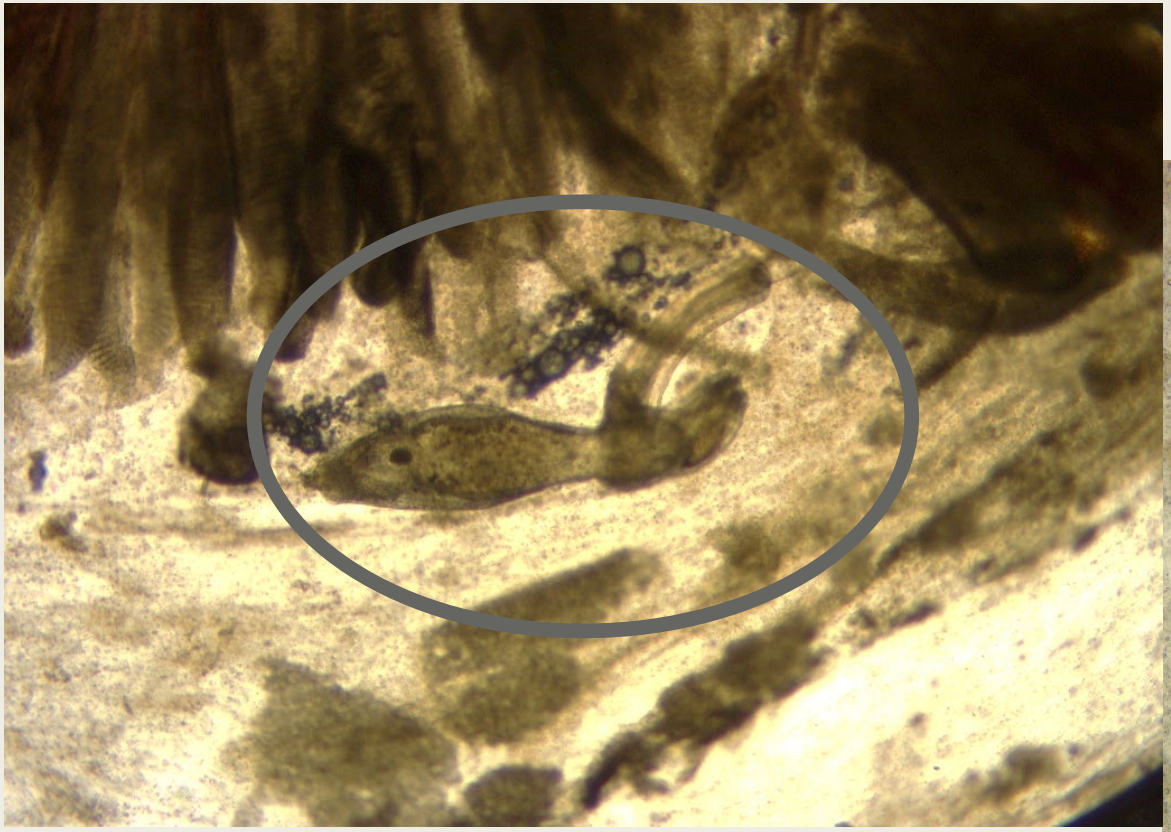


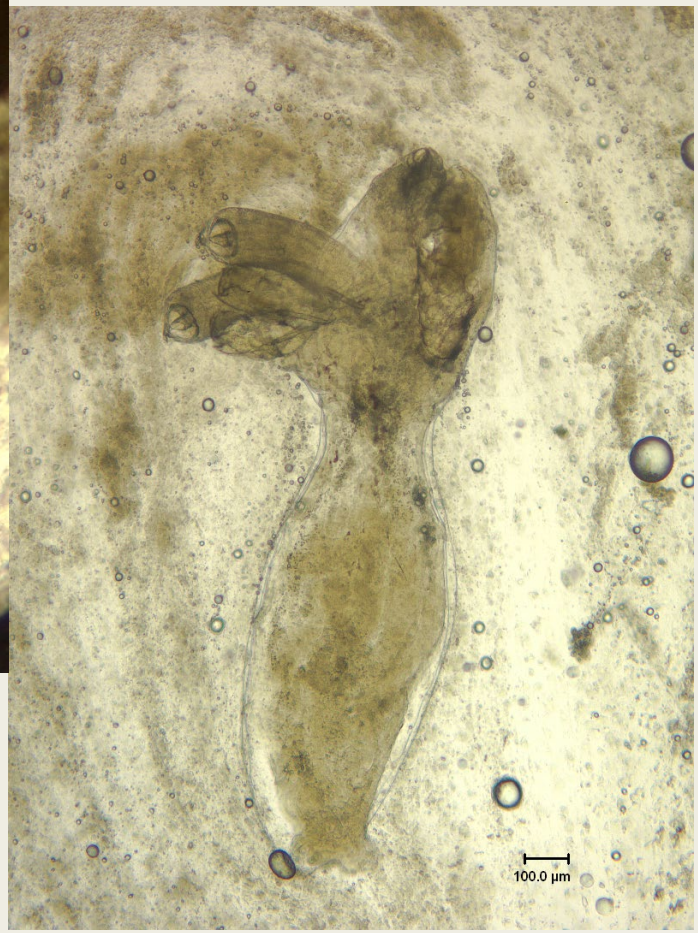
Preadults: Copepodids

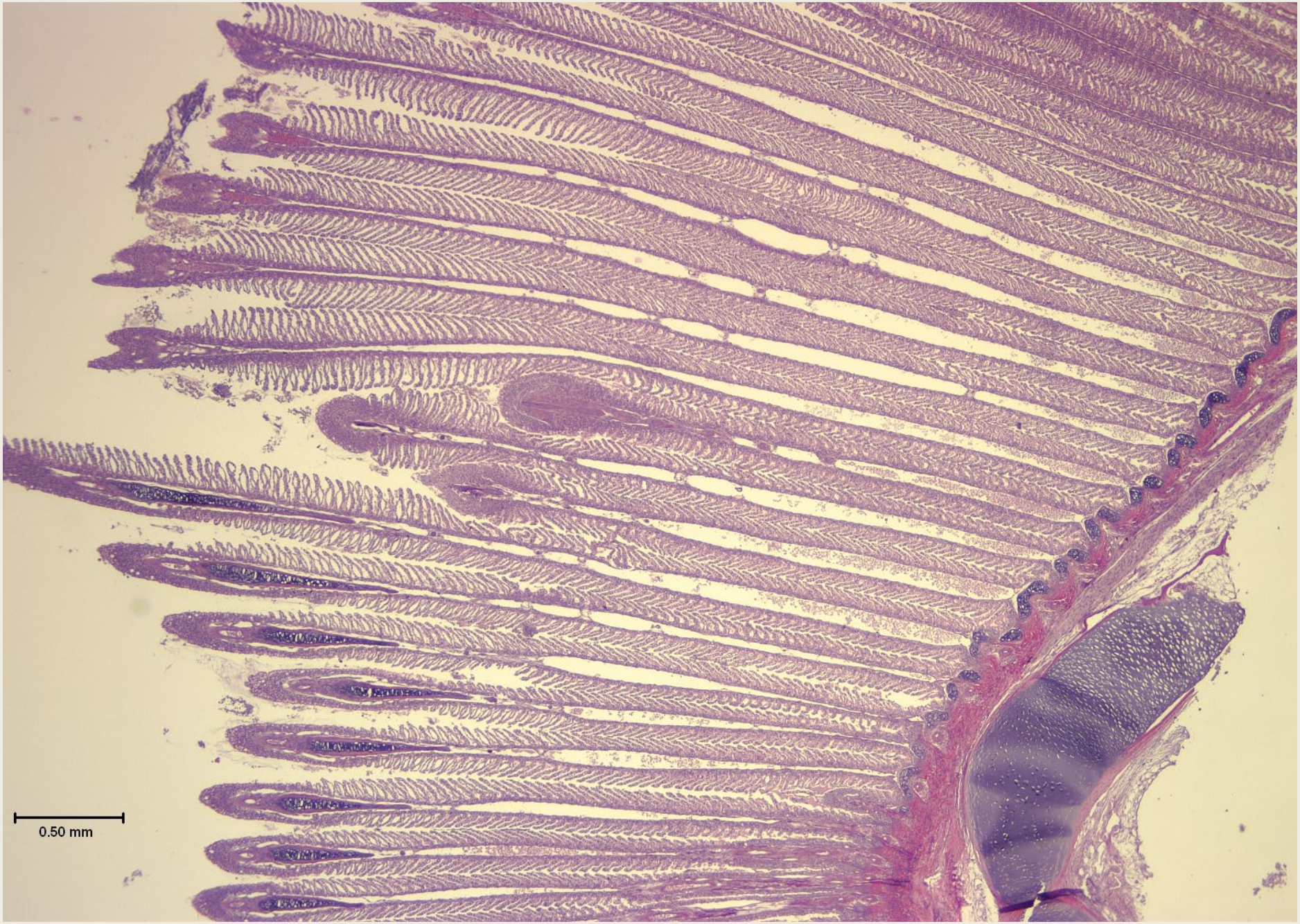



0.50 mm

Preadults: chalimus



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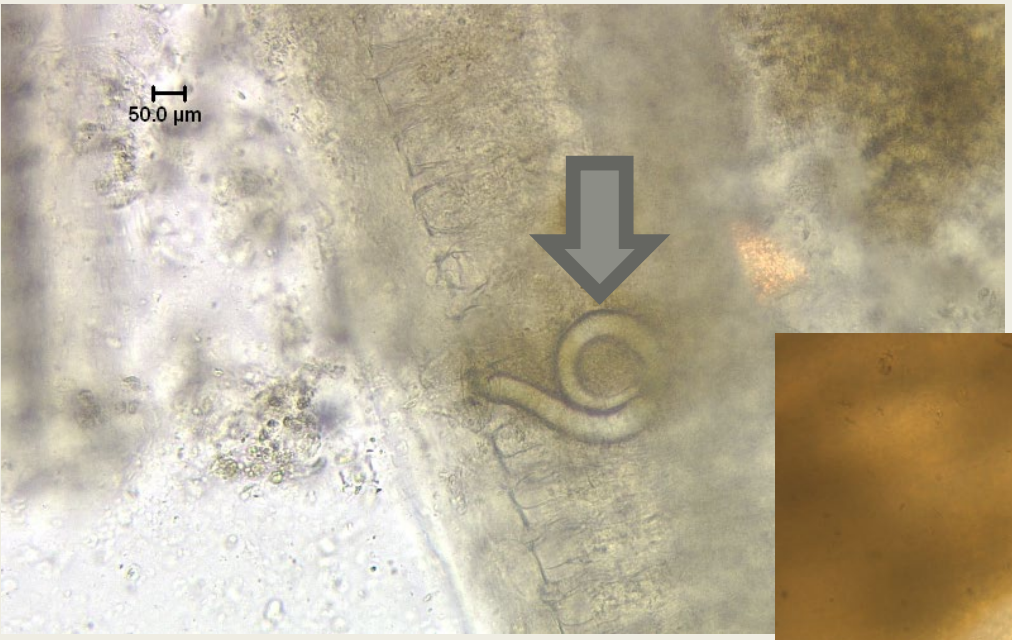
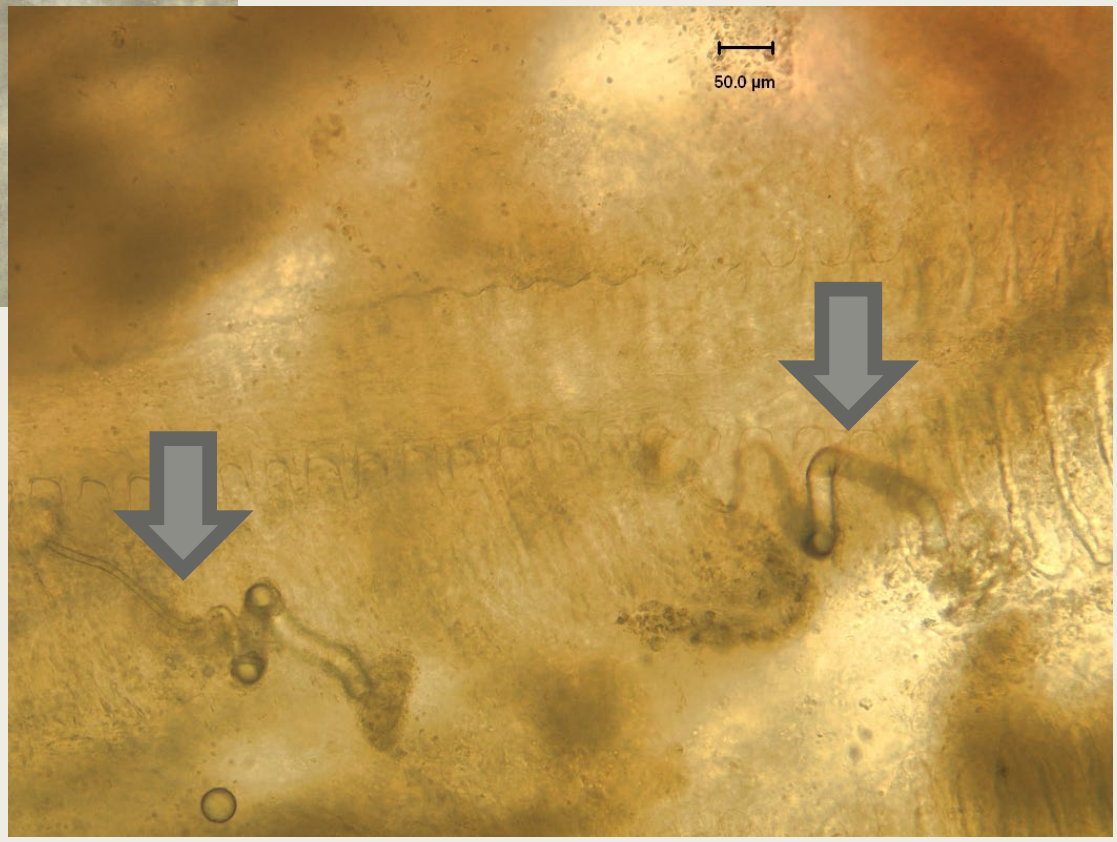
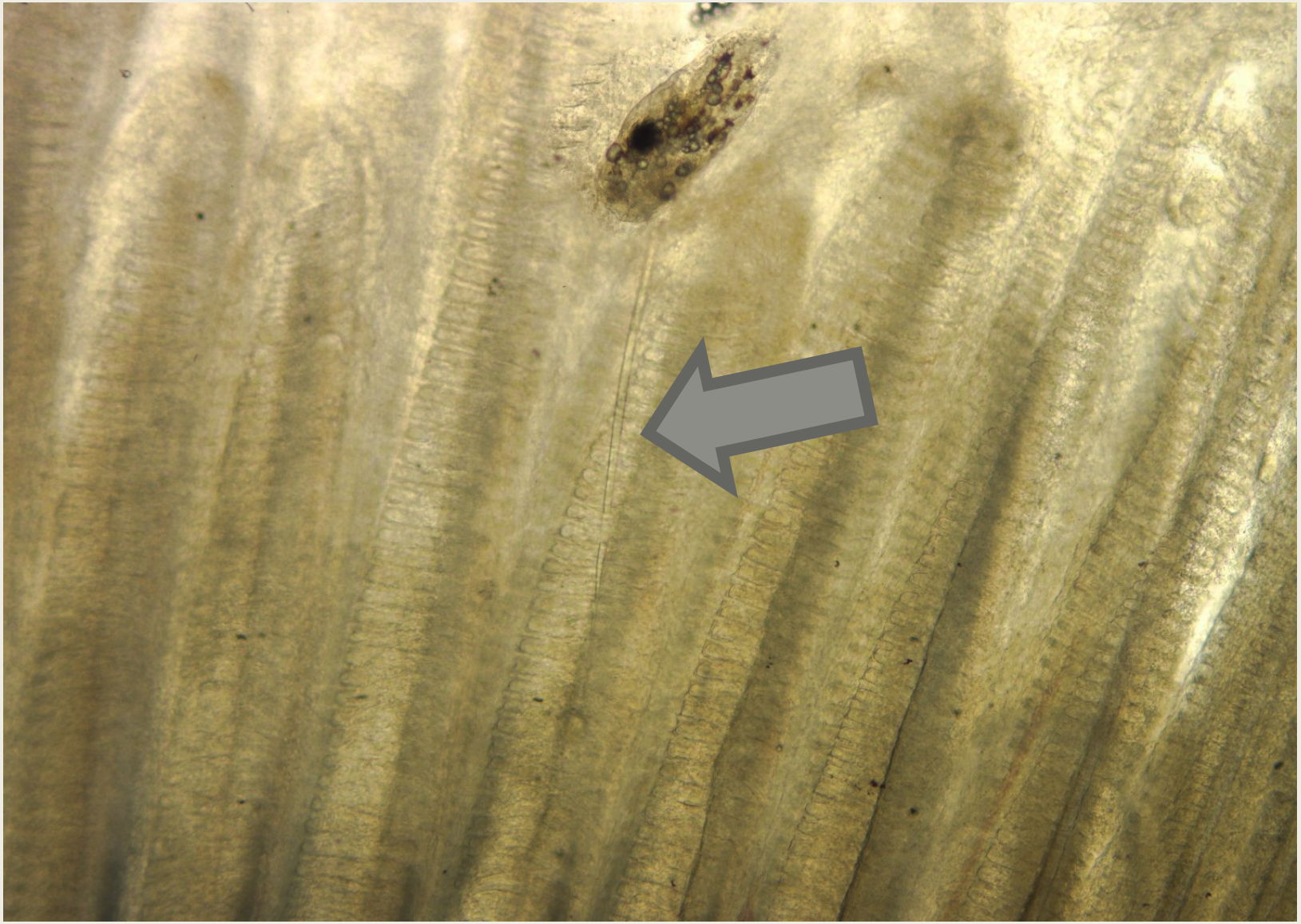
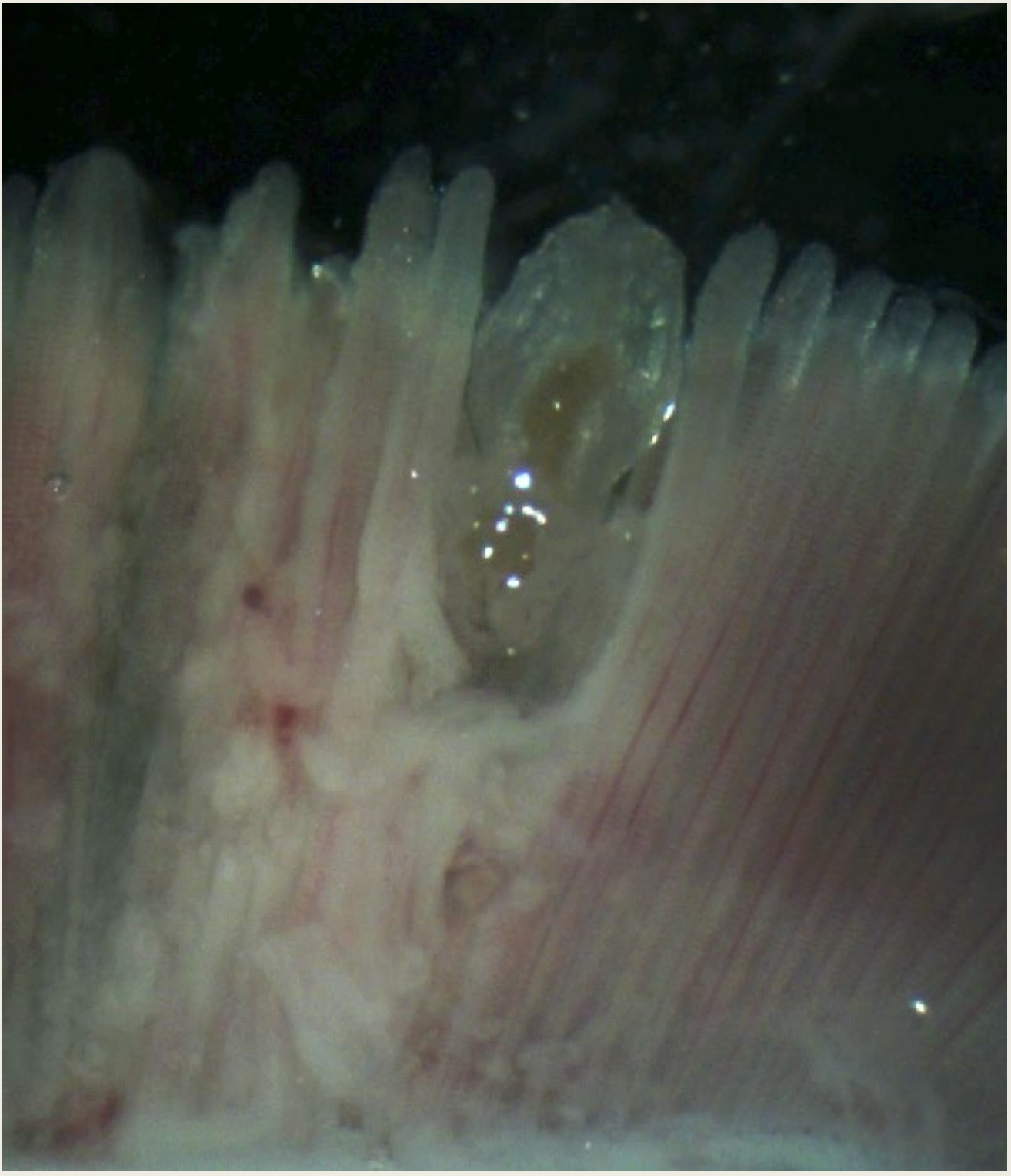
Attachment filament

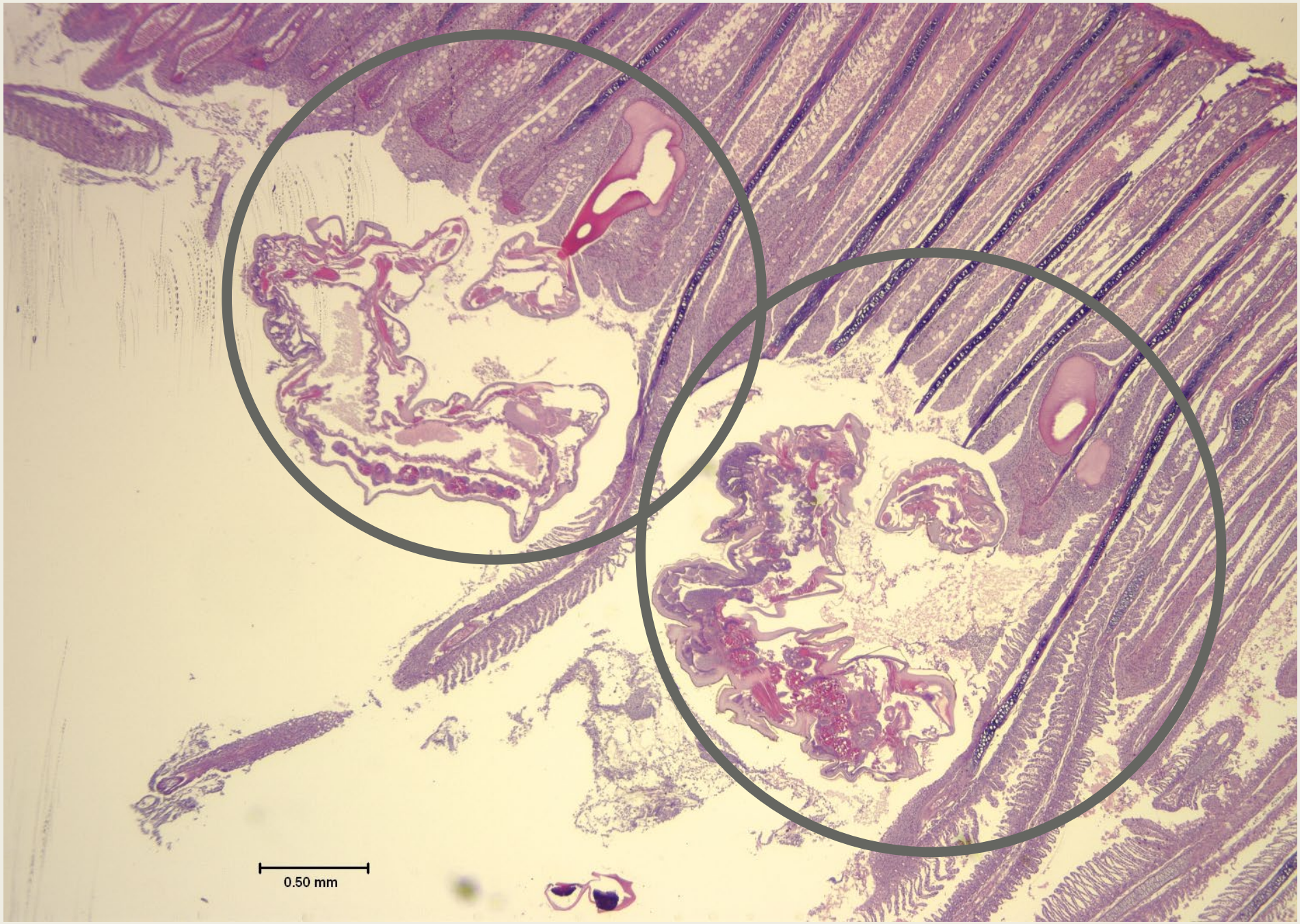




Copepodid with attachment filament



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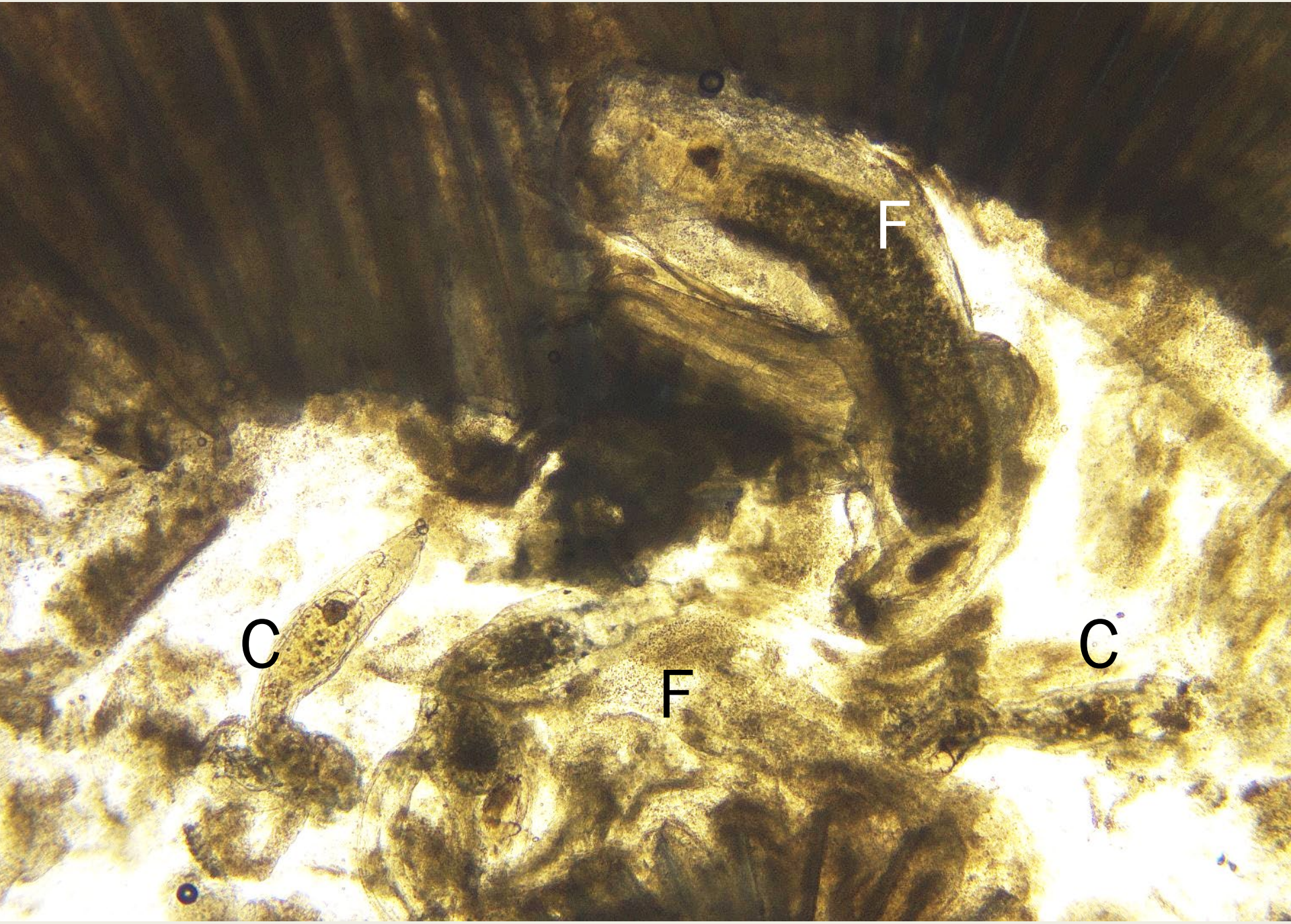
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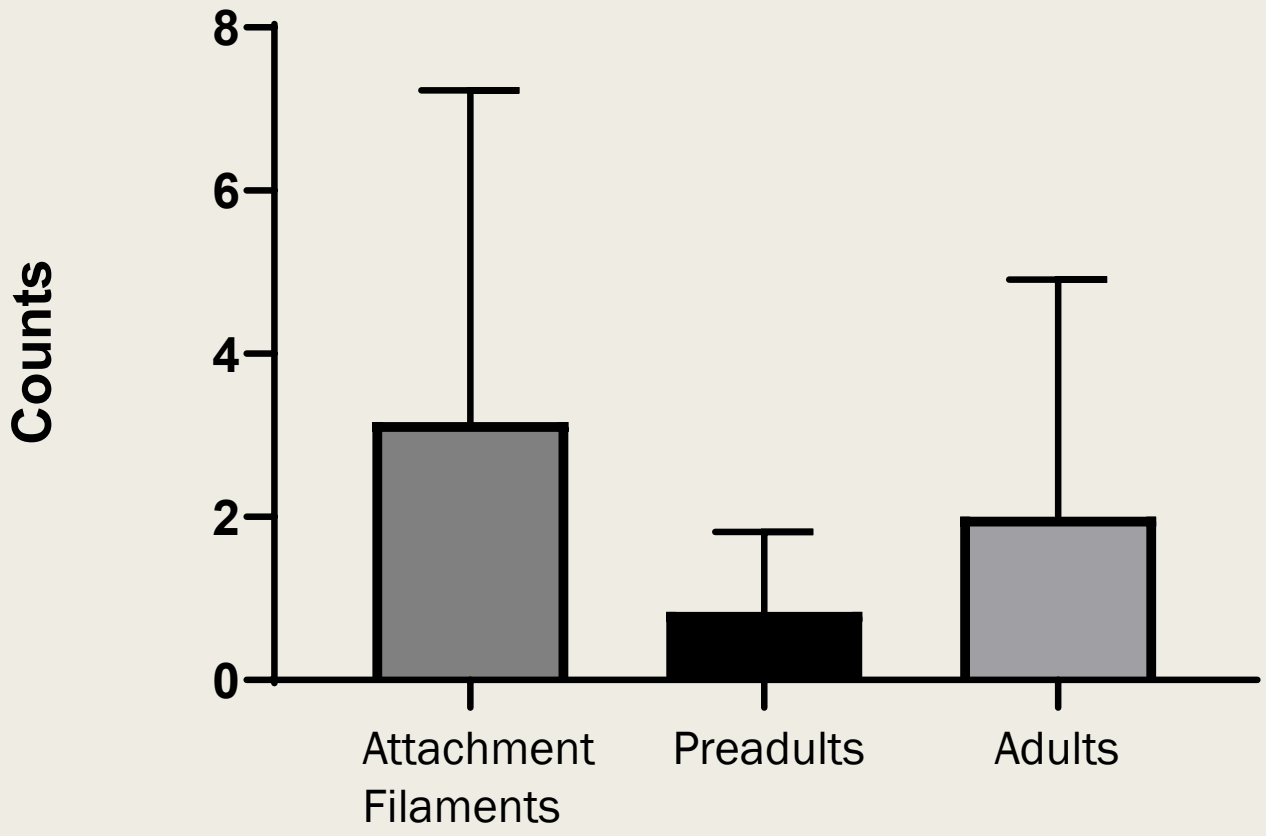
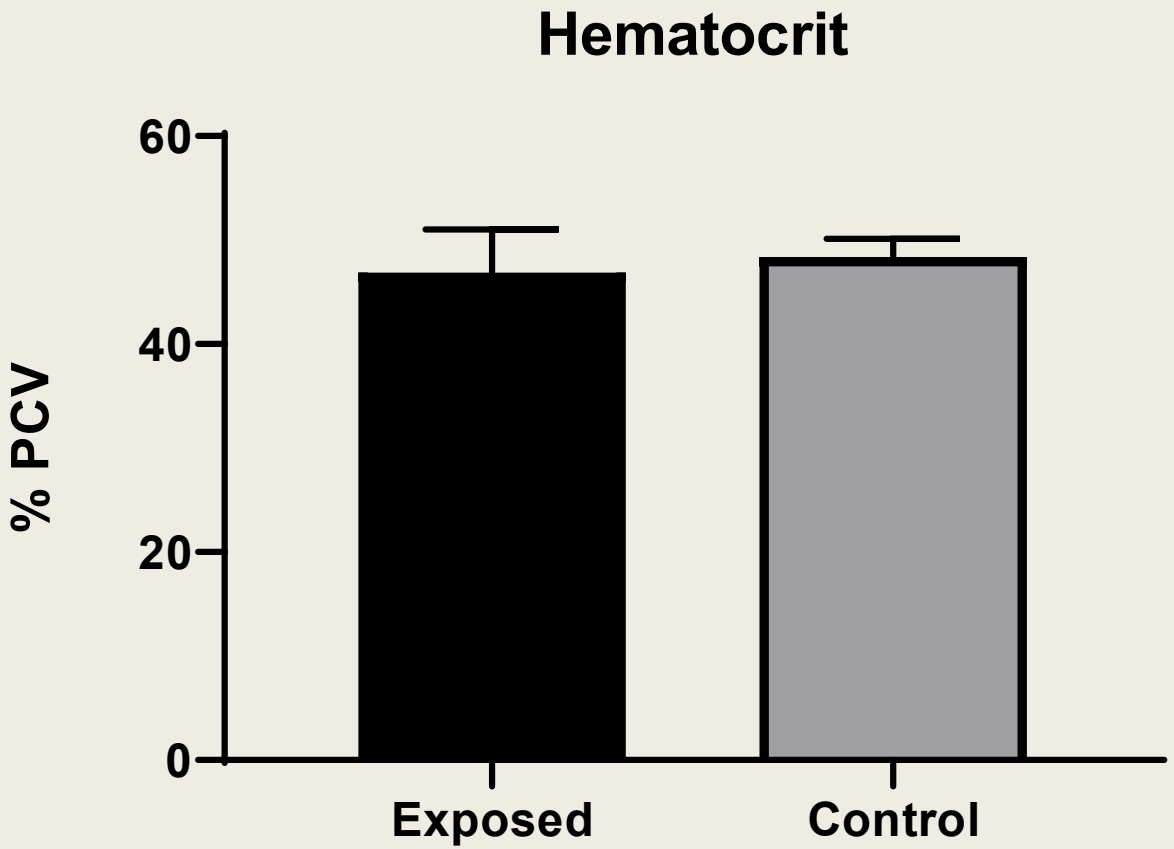
Average copepod stages per fish



Are infected fish anemic?



Mortalities from Fall Creek screw trap

- Swollen kidneys
- Possible compensatory change due to chronic anemia
- No other pathogens by histology

Conclusions

- Immature copepodid stages cause severe damage to gills
- Anemia is not observed after 1 mo
- Few copepodids appear to survive to maturity
- Counting adult female copepods may underestimate impact on individual fish
- Disease occurs before adult development of copepod

Future work

- Ongoing performance testing in laboratory
- Monthly (June-December) sampling of juvenile Chinook from reservoir
  - *Microscopic examination and assessment of gill damage*

Acknowledgements

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ODFW

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