Flavobacterial Diseases of Fish

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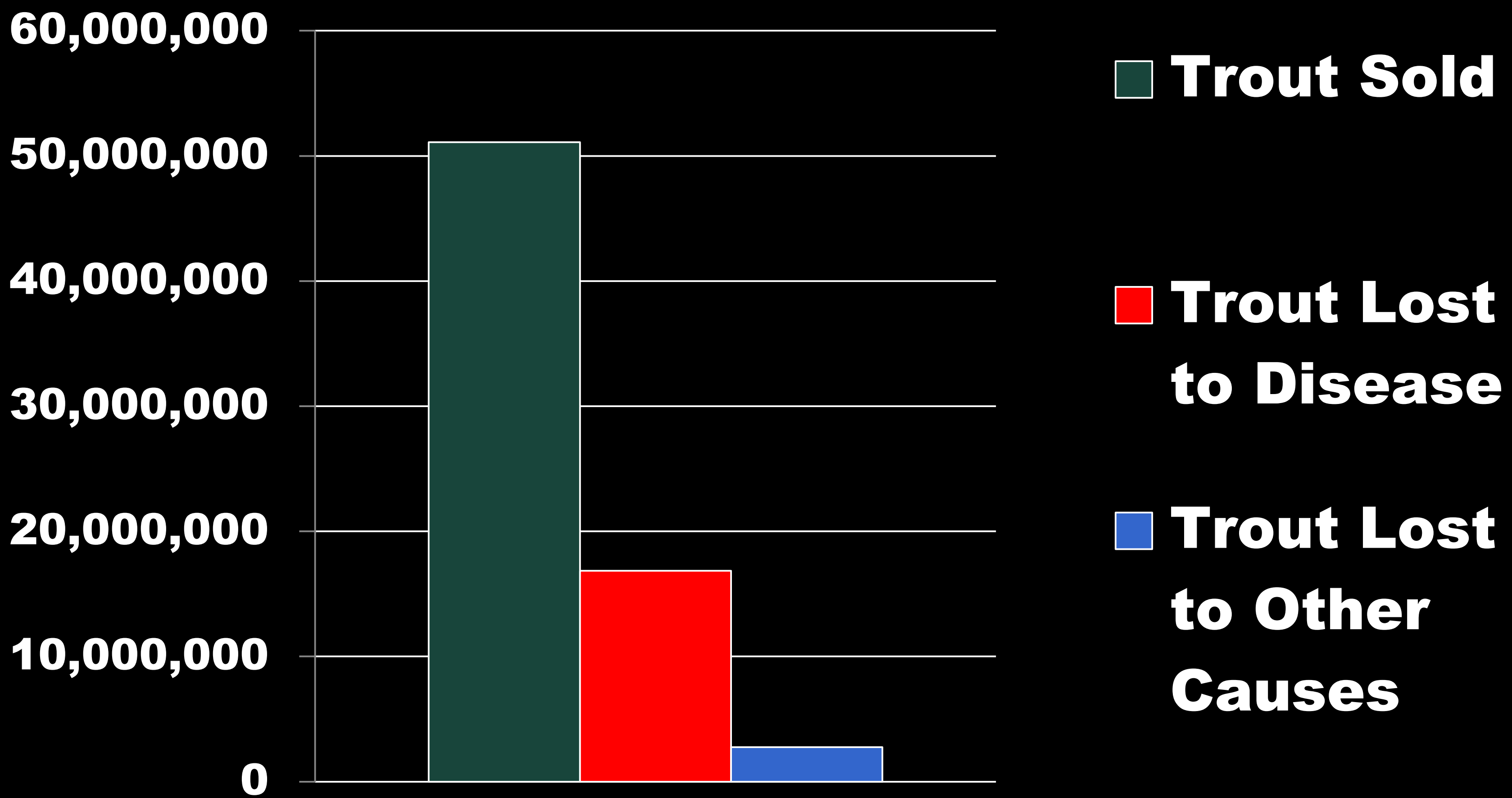
Department of Fisheries and Wildlife • Michigan State University •

Aquaculture & Fish Disease

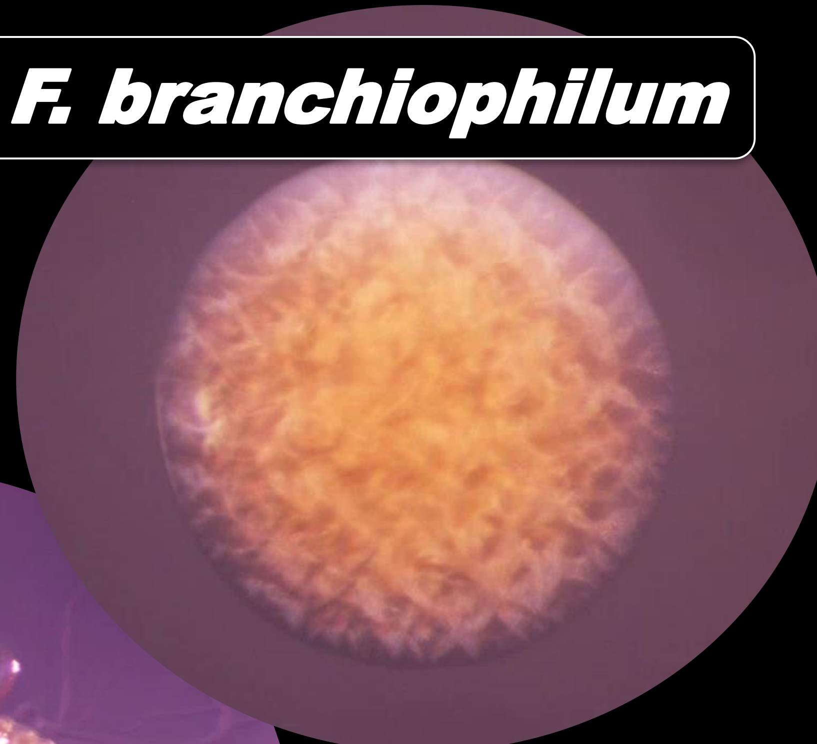
- USDA - National Agricultural Statistics Service Report
  - Total value of trout sales raised in USA (2013) = $96.4 million (51.1 million trout sold)

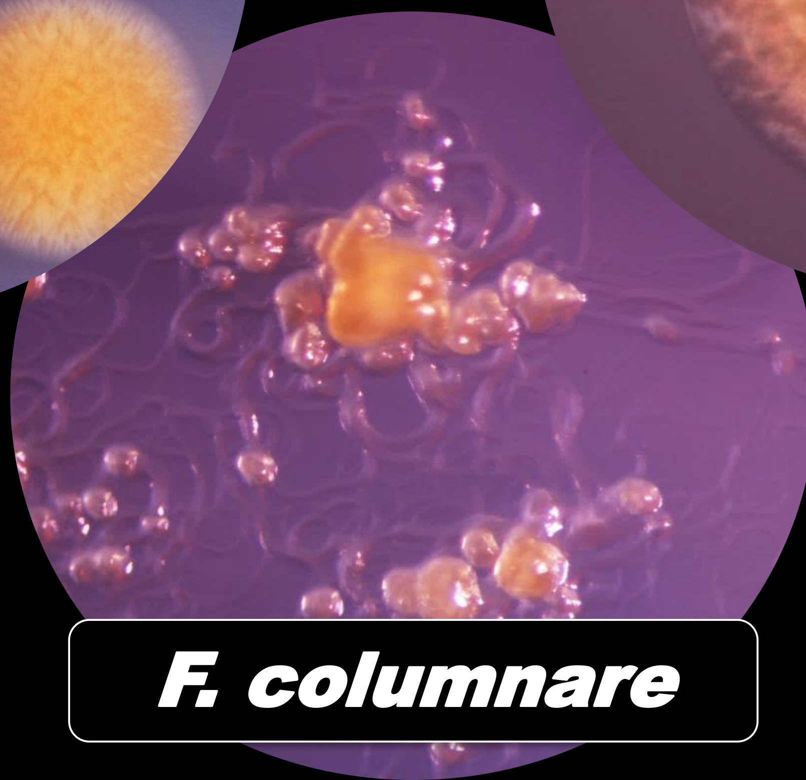


Flavobacterial Diseases in Fish

Leading pathogen-associated impediments to fish culture in MI, USA, globally

The “Big Three” *Flavobacterium* spp.

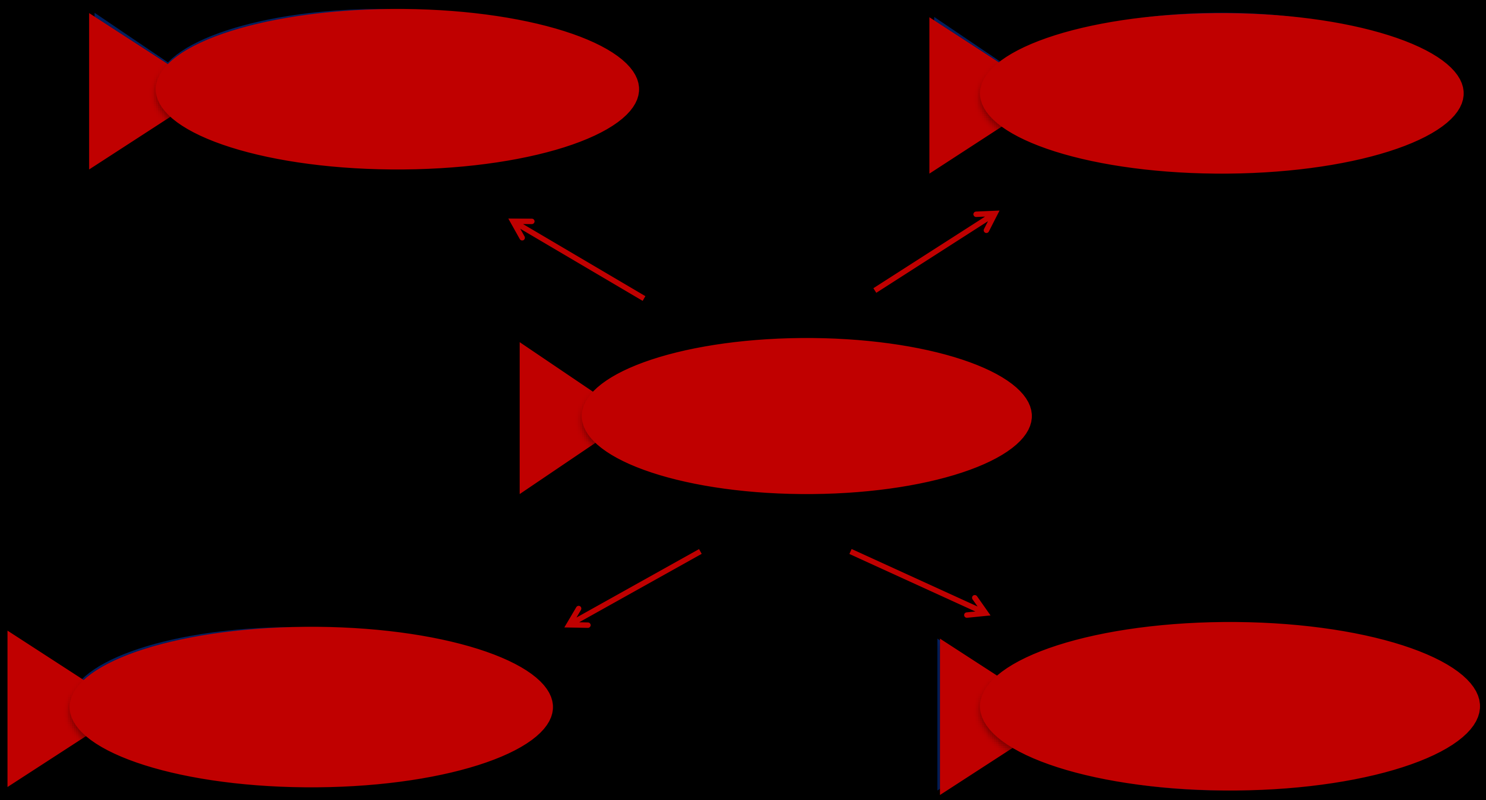




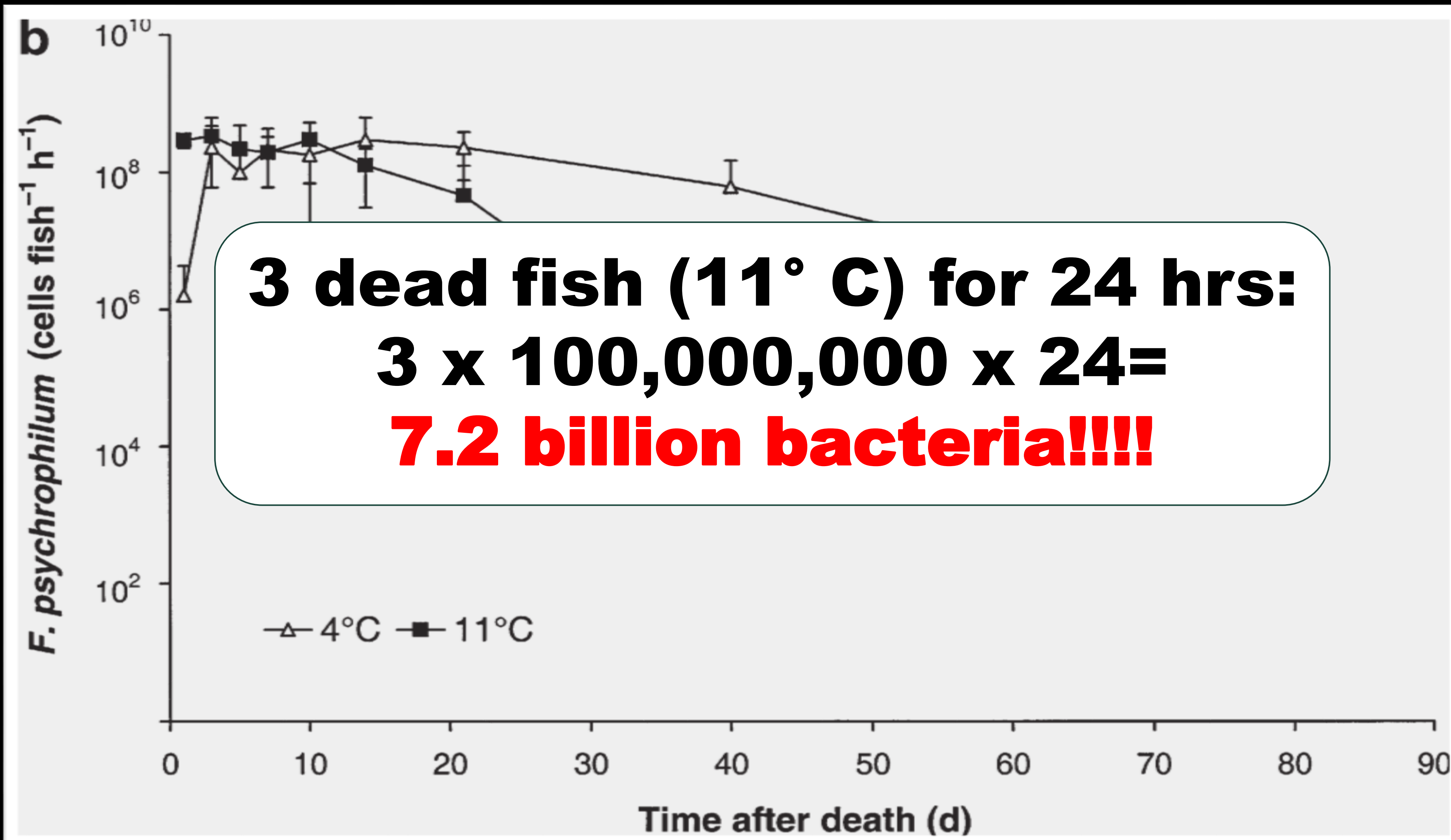
Bacterial Coldwater Disease

- Primarily a disease of salmonids (usually < 15˚C)

Horizontal Transmission of *Flavobacterium psychrophilum*



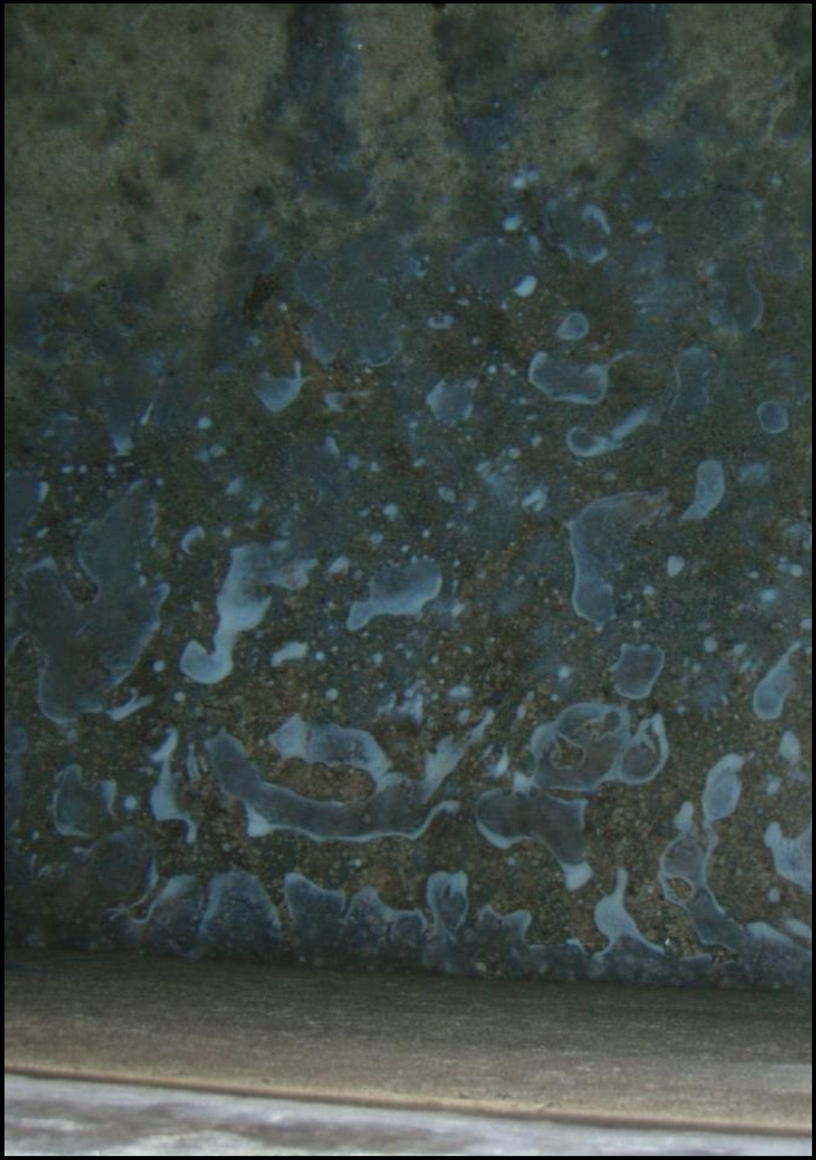
Shedding of *F. psychrophilum*



3 dead fish (11° C) for 24 hrs:
3 x 100,000,000 x 24=
7.2 billion bacteria!!!!

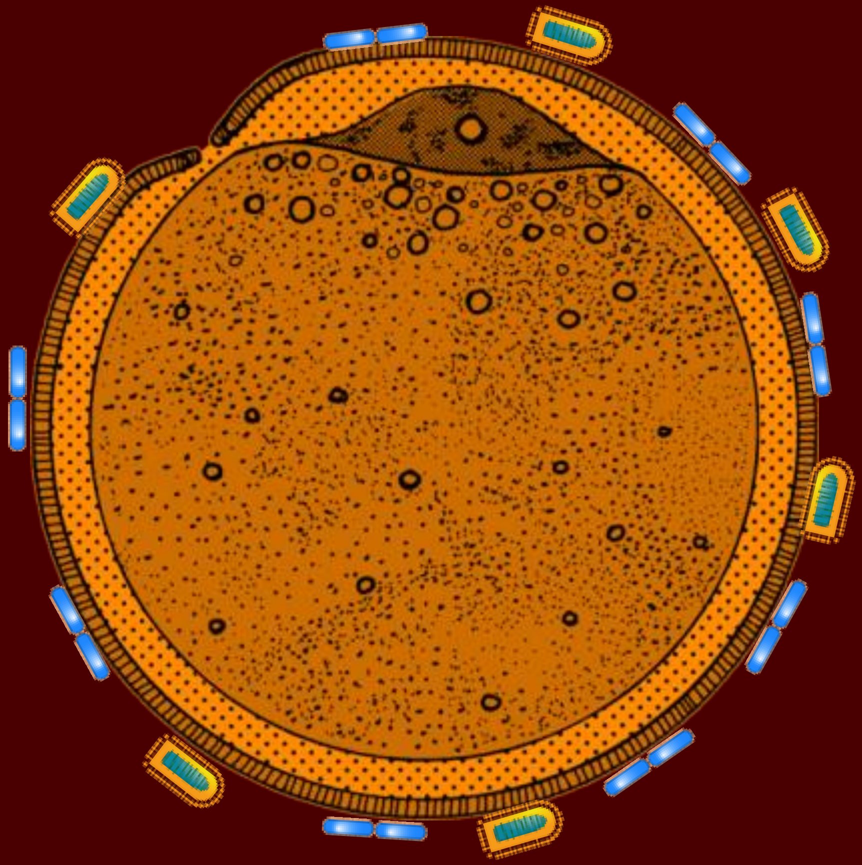
Madetoja et al. 2000

Biofilm & Infrastructure



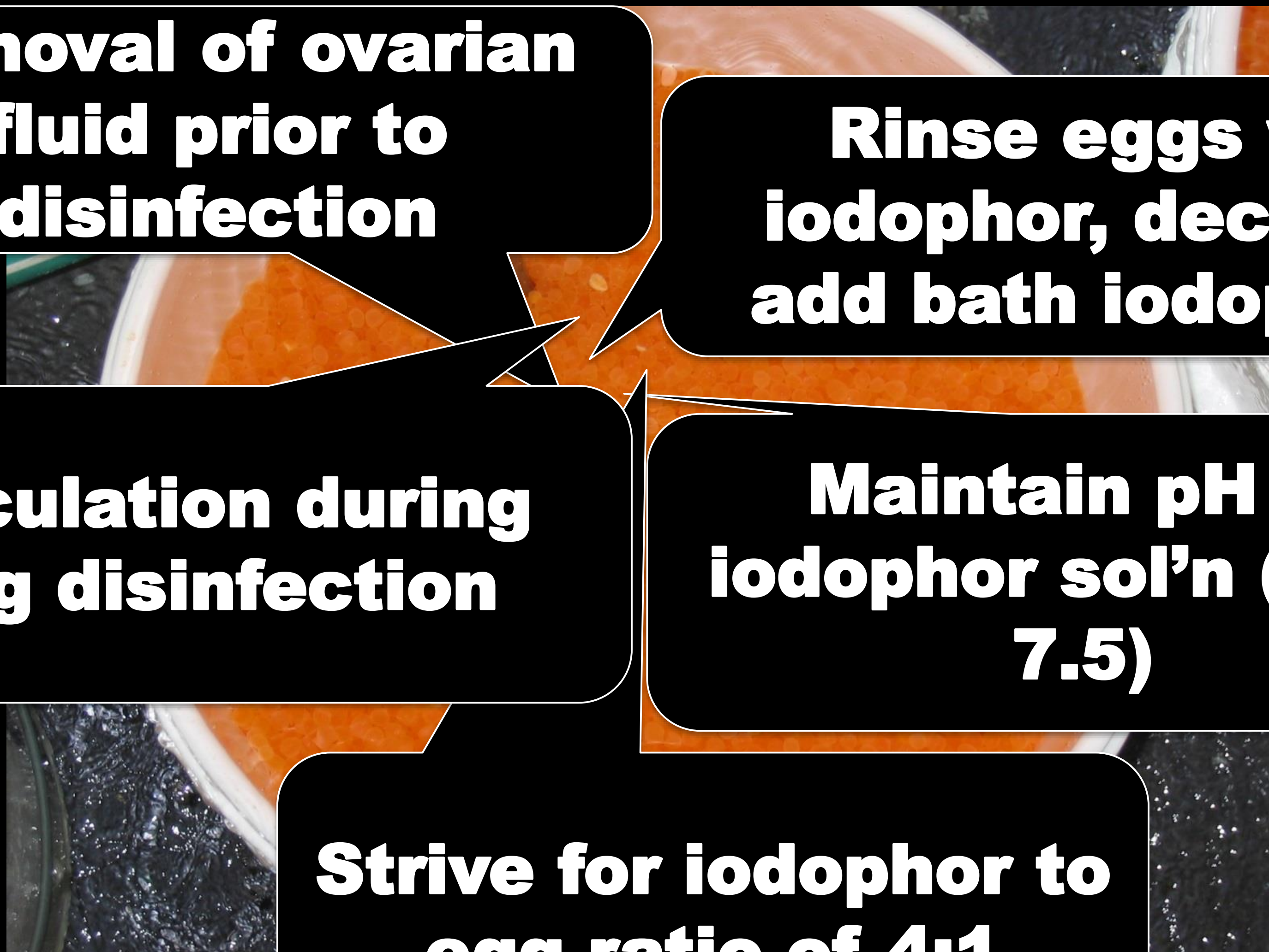
Transmission of *F. psychrophilum*

Surface Disinfection of Fertilized Salmonid Eggs (Iodophor)



Concentration/duration species dependent

To Ensure Maximal Egg-Surface Disinfection Efficacy



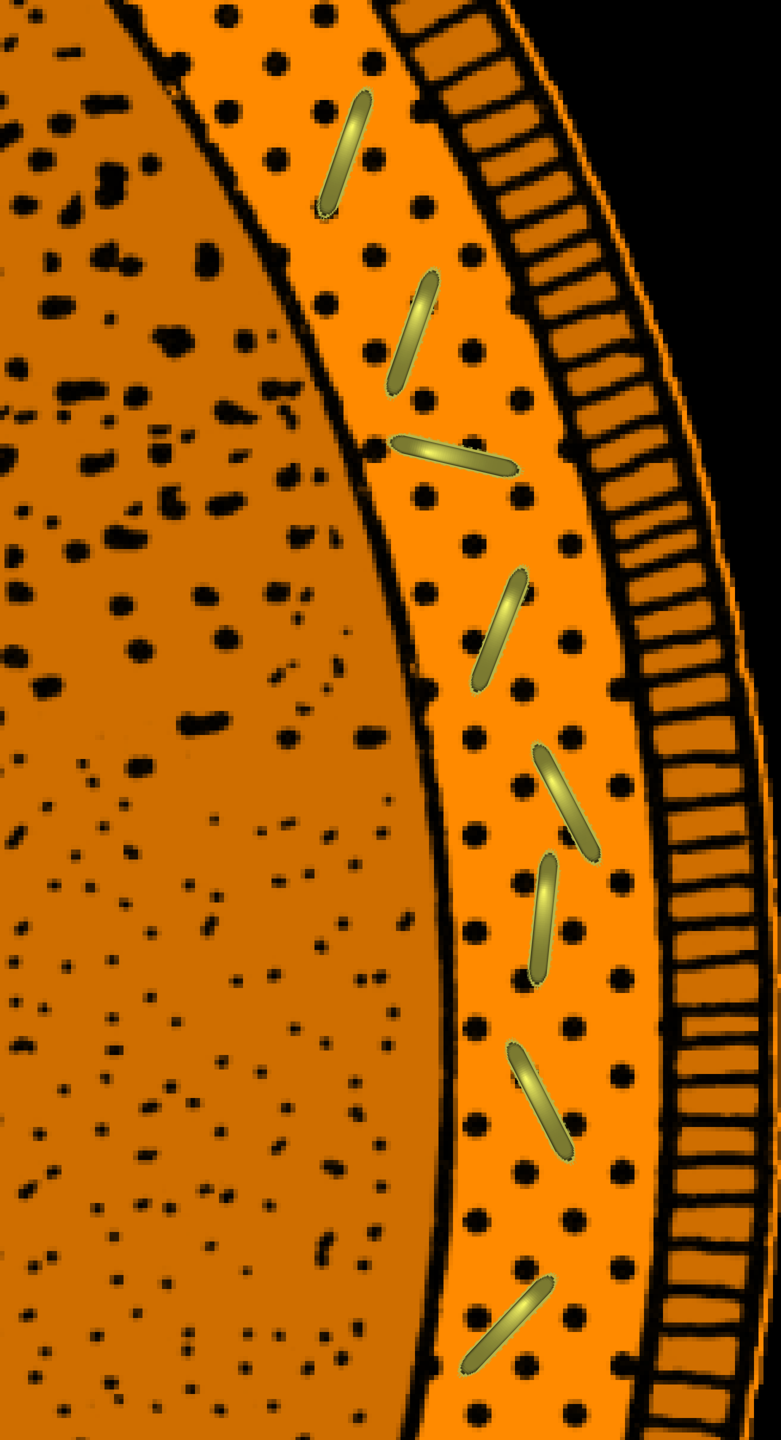
Removal of ovarian fluid prior to disinfection

Rinse eggs w/ iodophor, decant, add bath iodophor

Circulation during egg disinfection

Maintain pH of iodophor sol’n (7.0 – 7.5)

Strive for iodophor to egg ratio of 4:1



Ongoing research aimed at halting or reducing *intra-ova* flavobacterial transmission

USDA

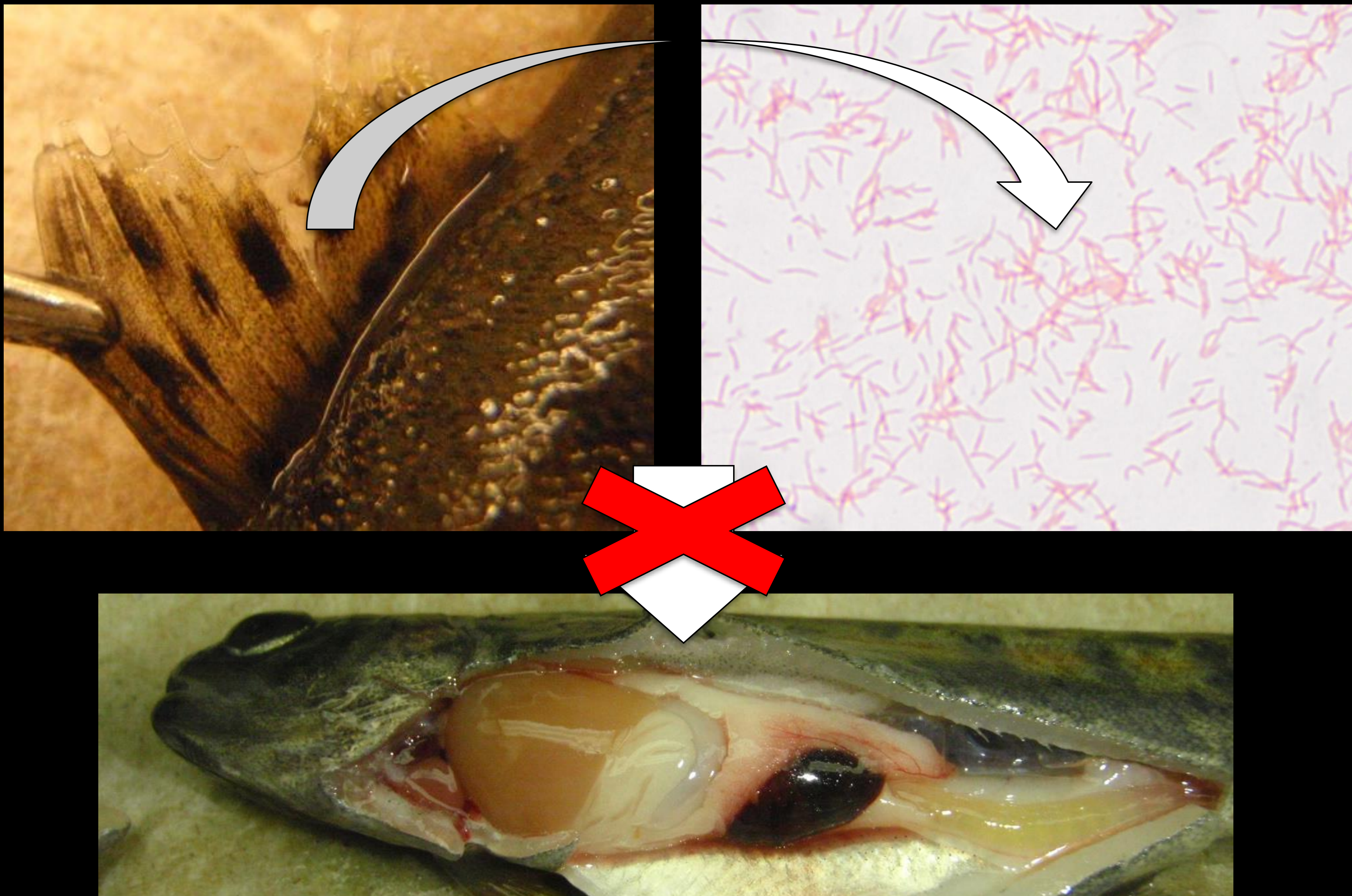
United States Department of Agriculture
National Institute of Food and Agriculture

Disease Prevention

- Biosecurity
  - Egg disinfection
  - Separate rearing unit tools
  - Surface water treatment (i.e., UV disinfection)

- Rearing densities
- Rearing unit hygiene
- Optimal water flows
- Optimal nutrition
- Frequent removal of morts (even more during outbreak)
- Culling of moribund fish when possible

Early Diagnosis & Intervention



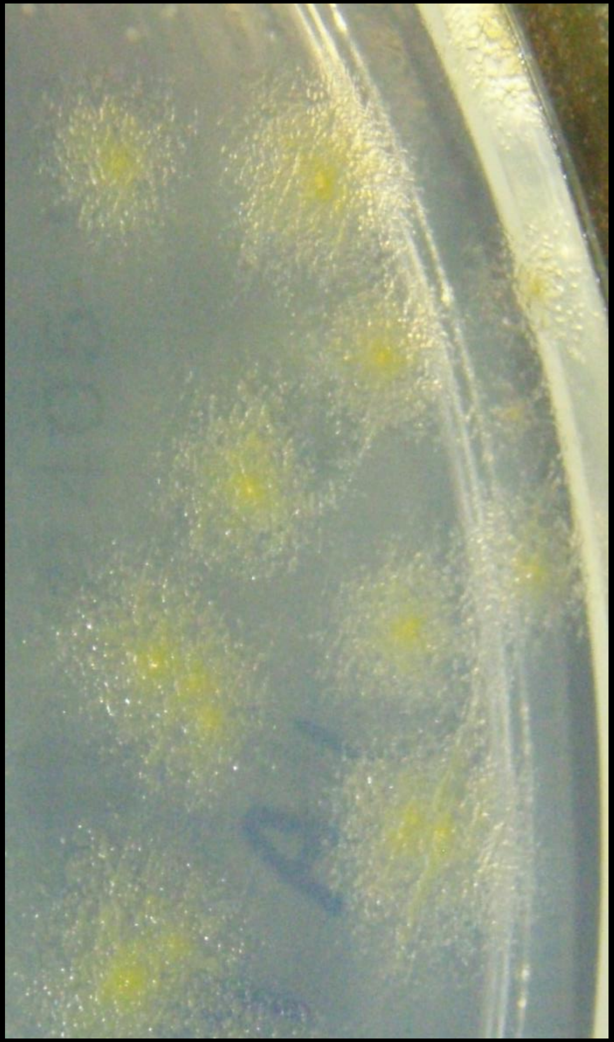
Columnaris Disease

- *Flavobacterium columnare*

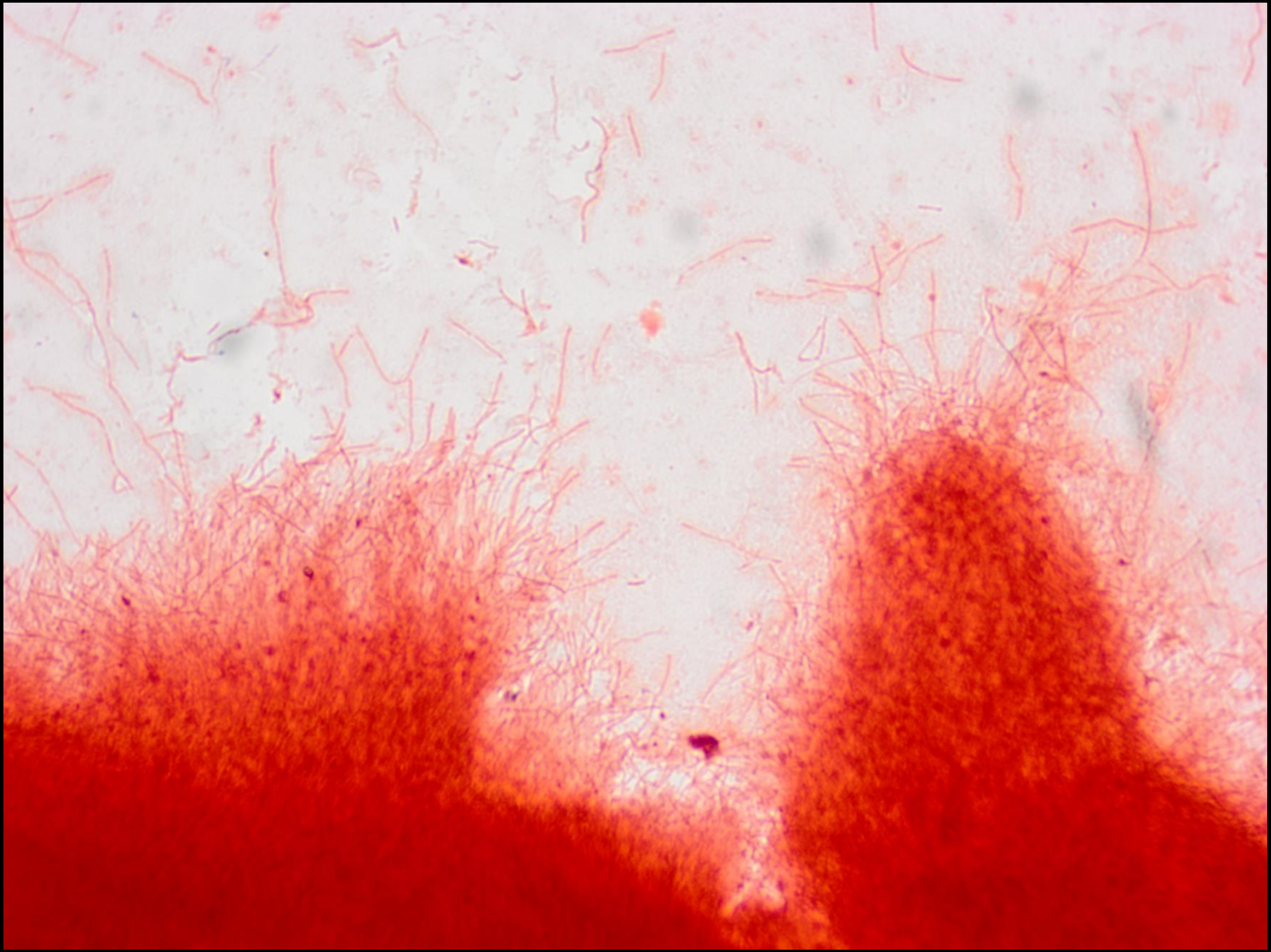
- A leading cause of losses in US catfish aquaculture

- “Warm-water” disease (>18-20°C), but emerging in coldwater aquaculture (~ 12-15°C, rainbow trout)

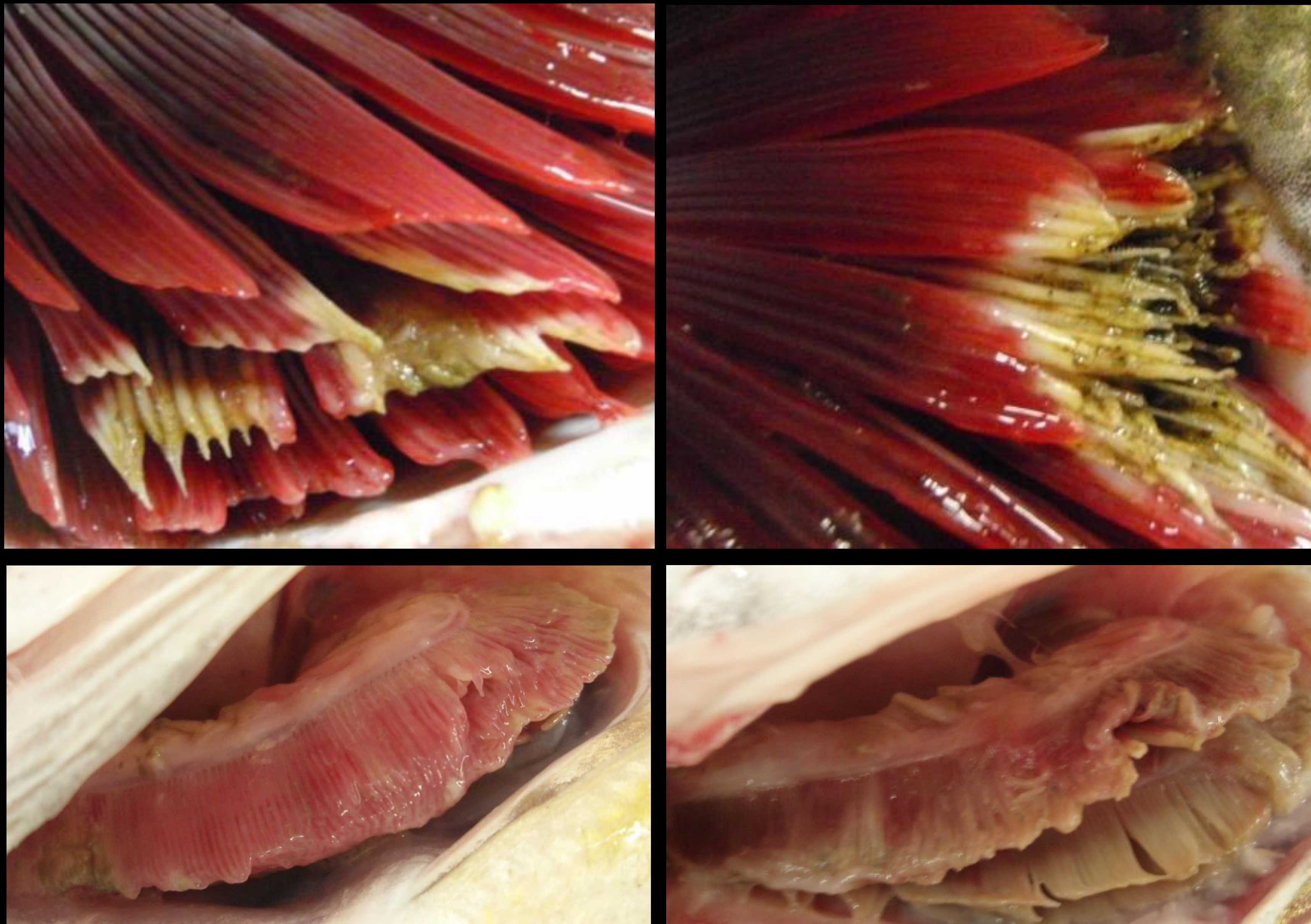
- Extremely wide host-range

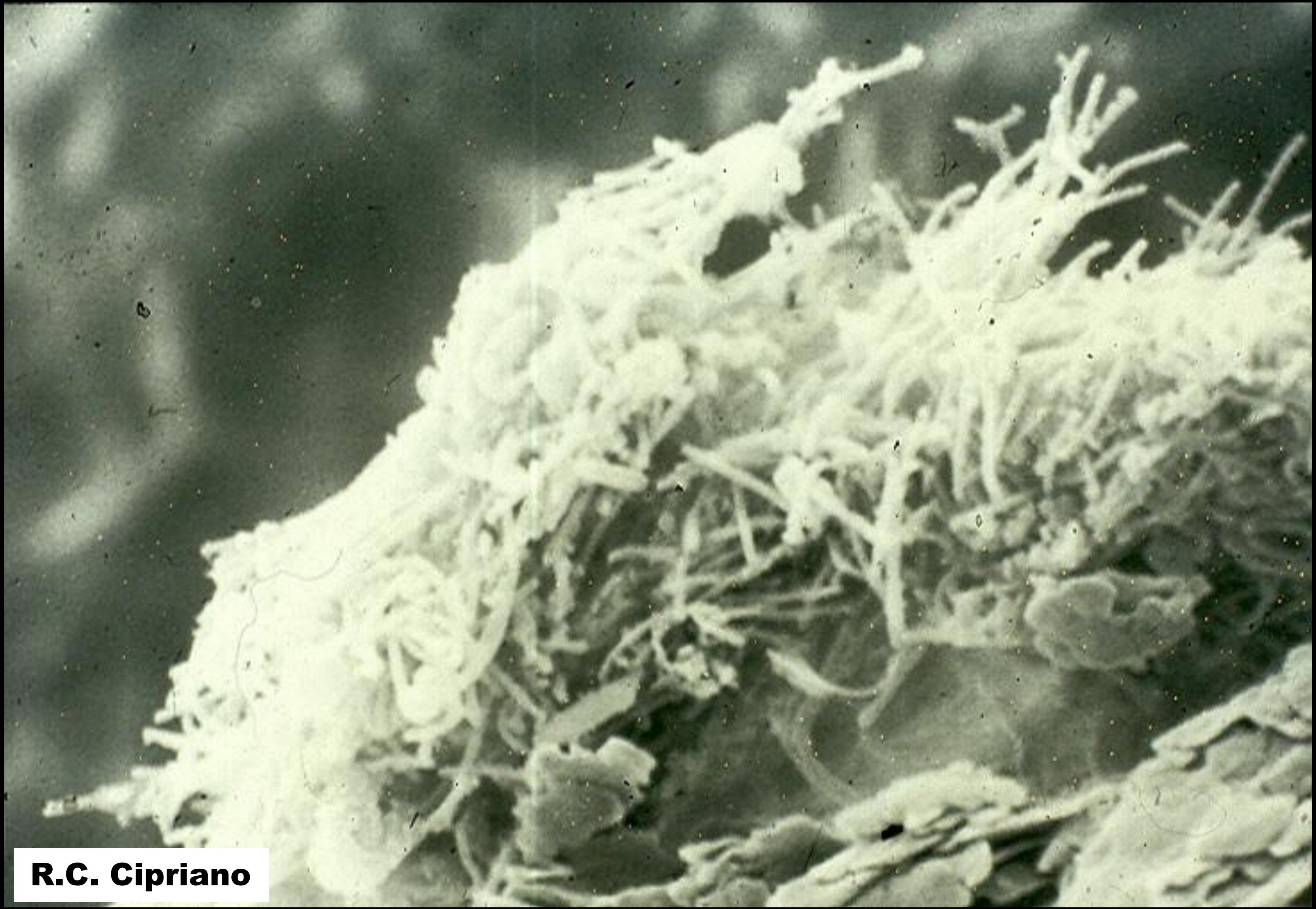


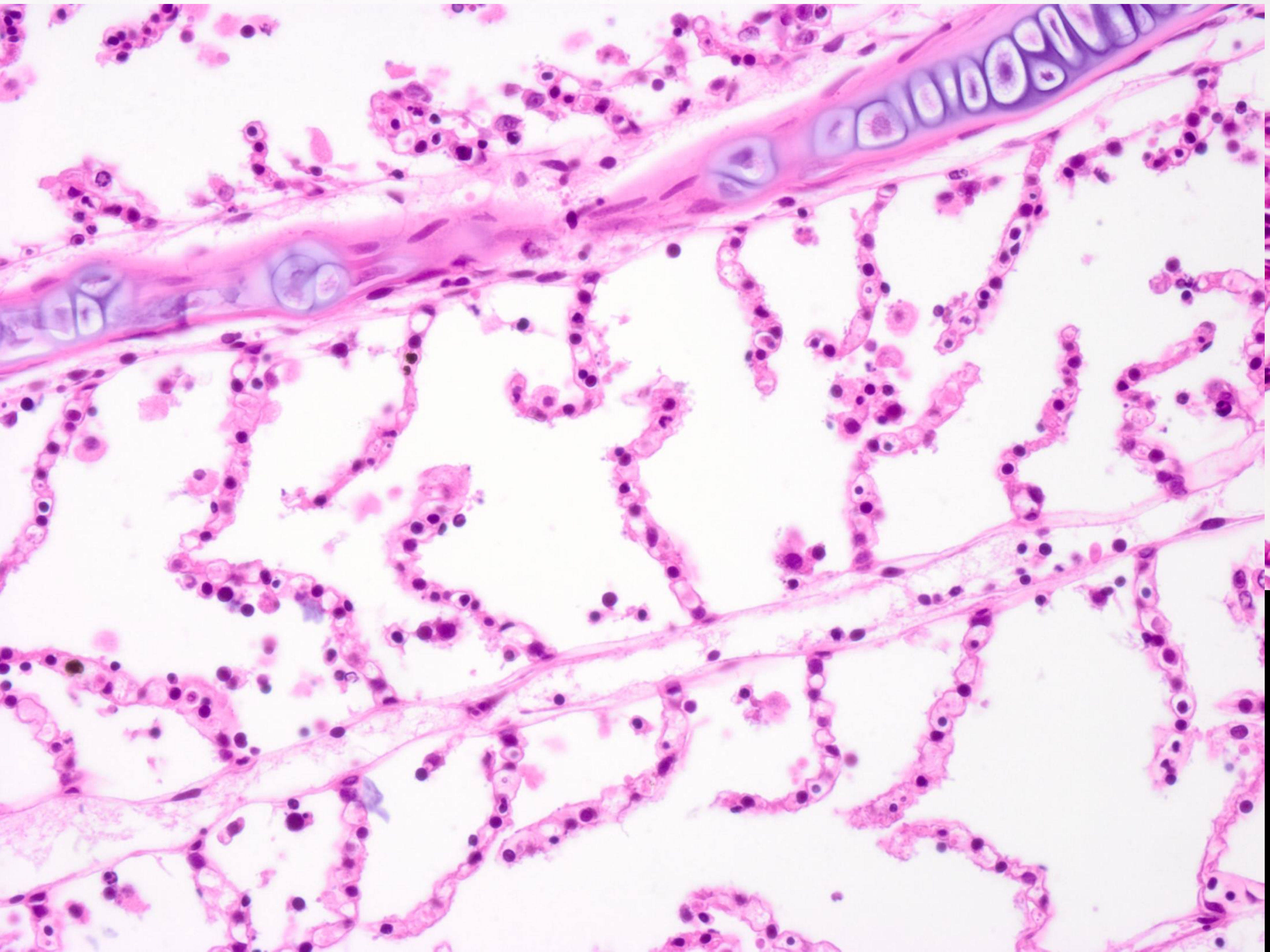
Columnaris Disease



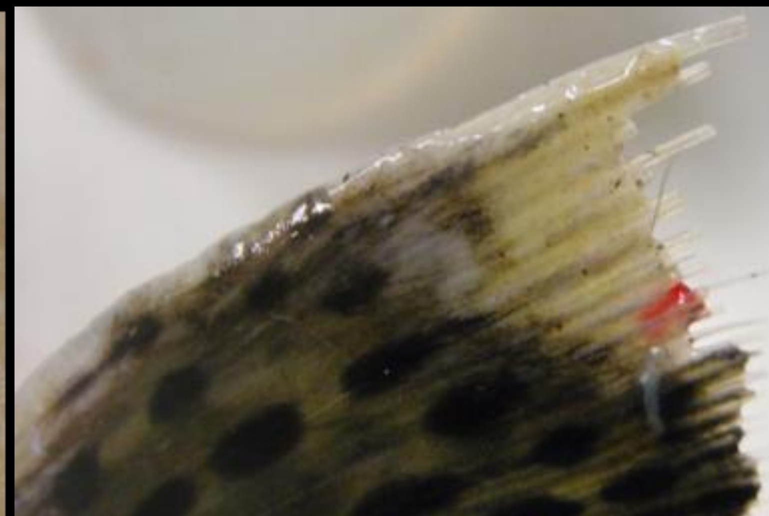
Columnaris: Disease Signs

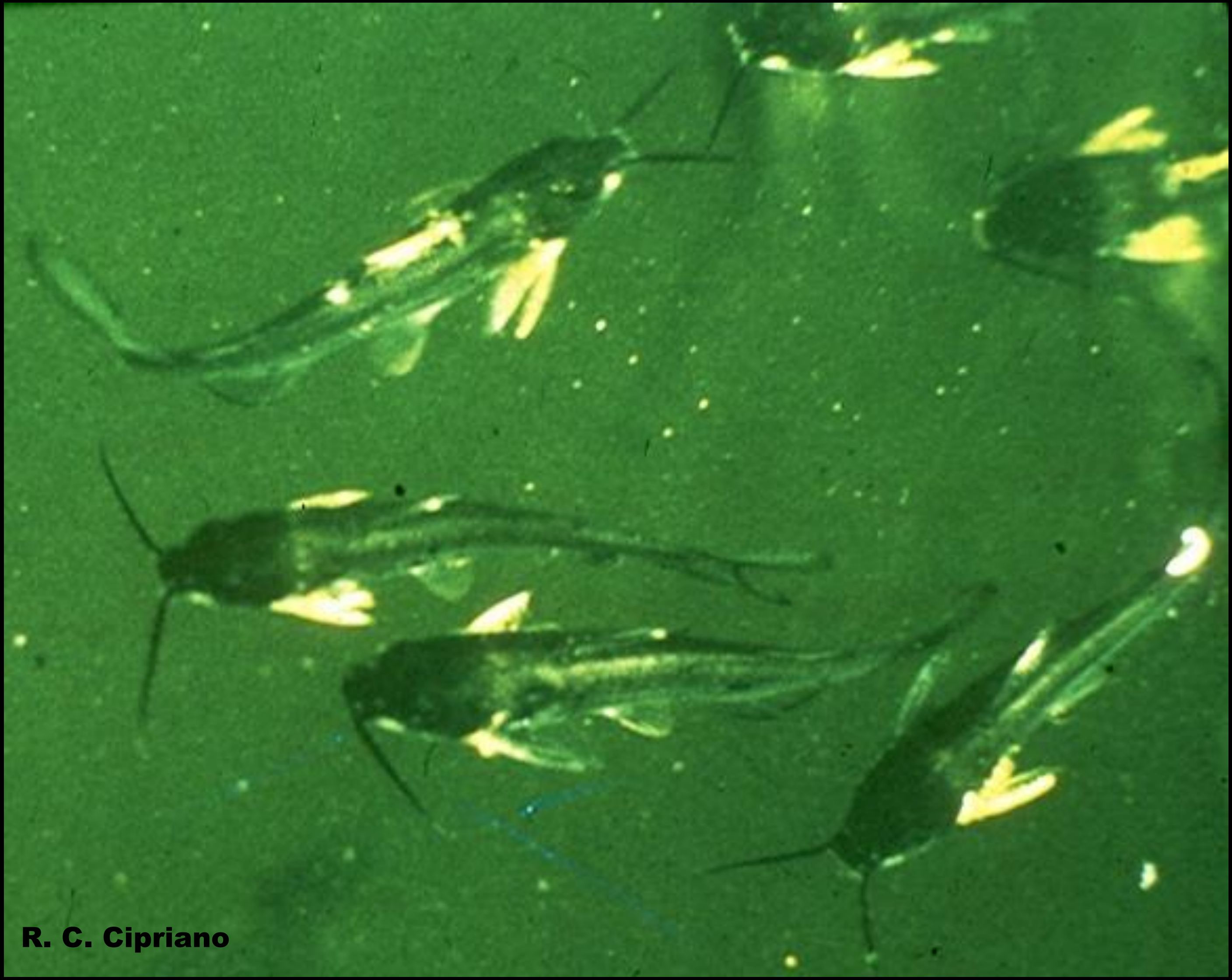



R.C. Cipriano



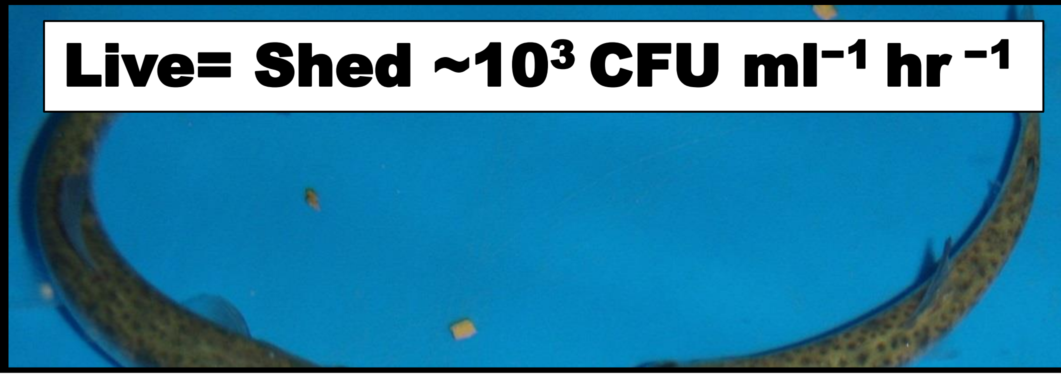
Columnaris: Disease Signs




R. C. Cipriano

Columnaris: Disease Signs

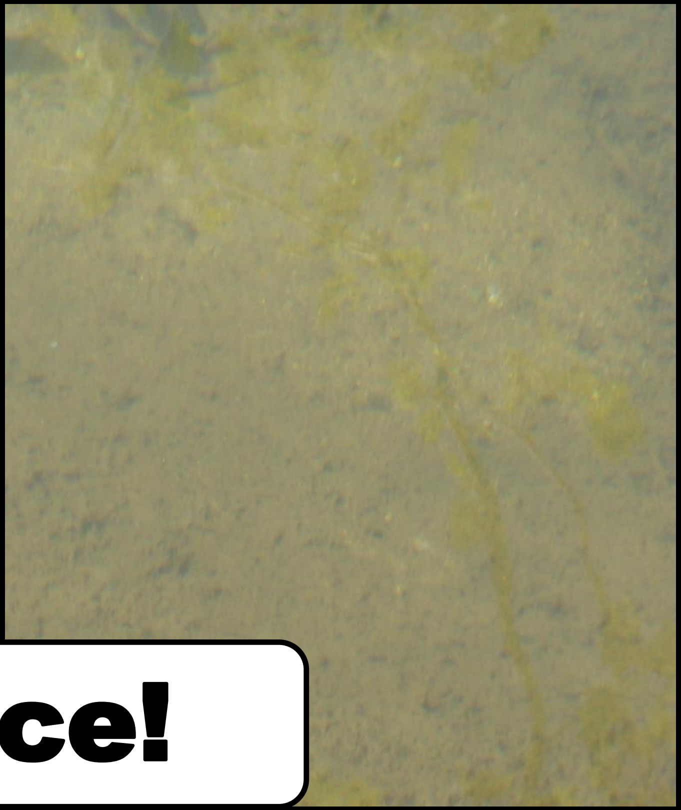
Transmission of *F. columnare*



Removal of Dead Fish Extremely Important!

F. columnare & the Environment

- Infectious in distilled (lab conditions) for at least 5 months
- Survives in lake water for > 2 years
- Grows well on particulate fish food



Avoidance!

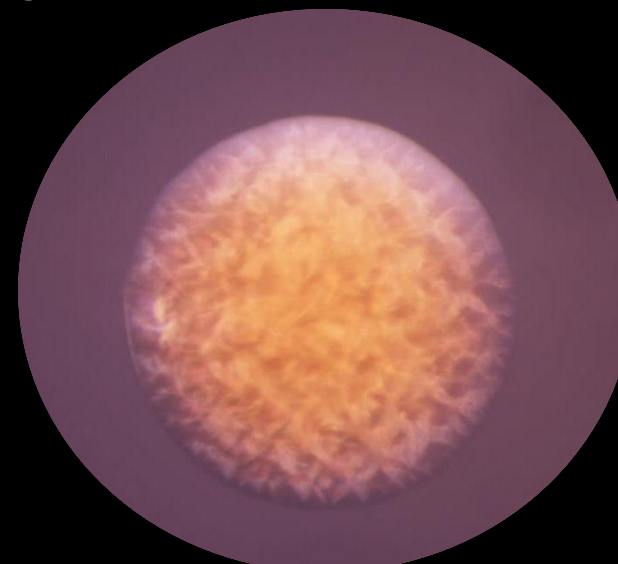
Prevention of Columnaris Disease

- **Management is paramount!**
  - Biosecurity
  - Reduce rearing densities
  - Rearing unit hygiene
  - Optimal water flows & water quality
  - Optimal nutrition
  - Frequent removal of morts
  - Culling of moribund fish
- Licensed vaccines are available
- Genetically resistant fish stocks
- Vigilance for disease signs
  - Rapid Dx/intervention w/ aquatic Vet/Fish Health Prof.

Bacterial Gill Disease (BGD)

- *Flavobacterium branchiophilum*

- A disease of cultured fish, risk factors include:
  - High rearing densities
  - Low H_2O exchange rates
  - High feeding rates
  - Source water contains fish



- All FW fish susceptible
  - Most reports in cool/cold water fish

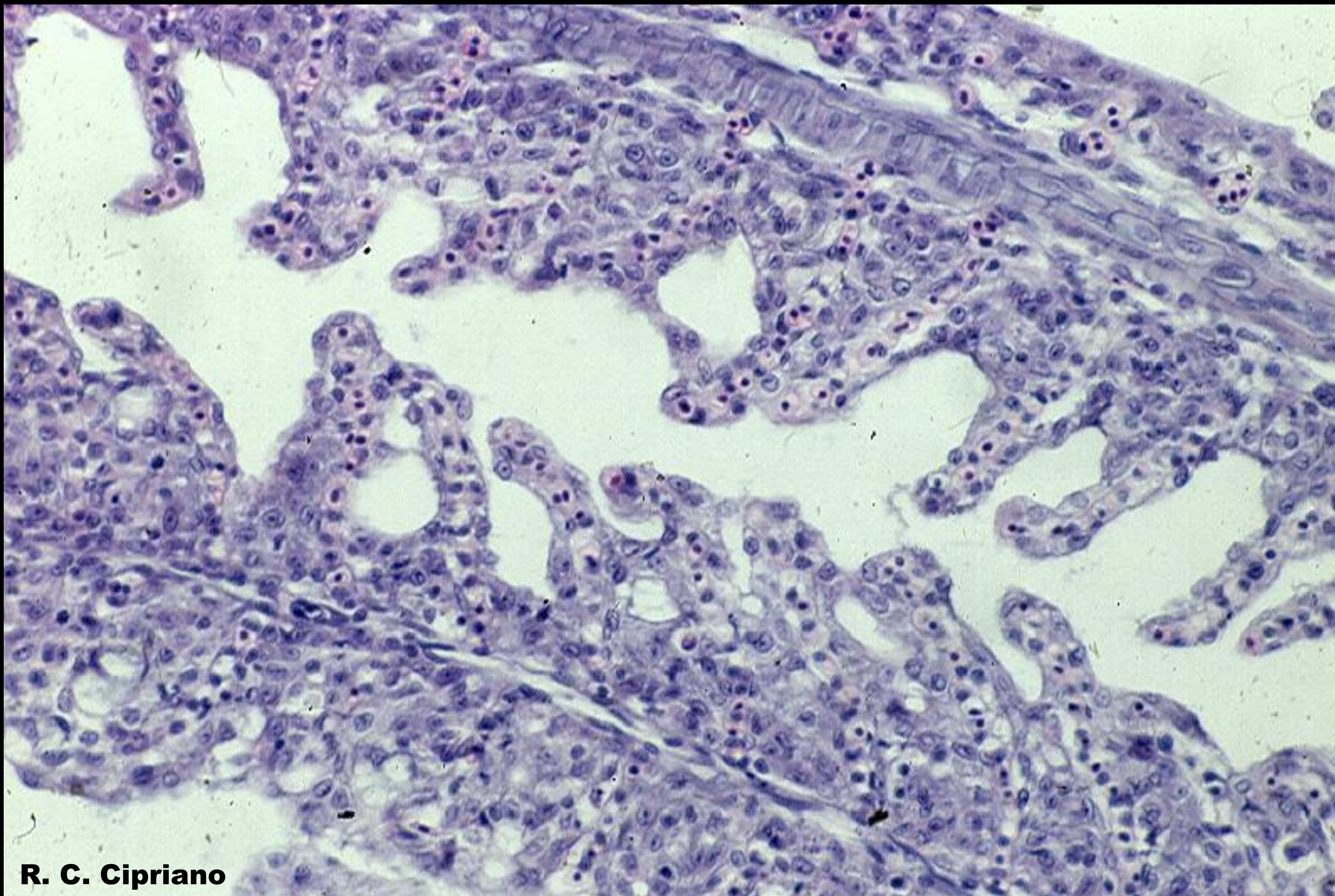
BGD- Behavioral Changes

- Inappetence, then…

Bacterial Gill Disease (BGD)

BGD- Gill Biopsy

BGD- Gill "Clubbing"



Prevention of BGD

- **Maintain optimal culture conditions**
  - Avoid high rearing densities
  - Optimal water quality
  - Avoid organic accumulations

- No vaccines

- Vigilance for abnormal behavior of fish

- When needed, early detection!

Acknowledgements

- MI Dept. of Natural Resources
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