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An Overview of Myxozoan Parasites Found in Smallmouth Bass (*Micropterus dolomieu*) from Three Tributary Rivers of the Chesapeake Bay, USA

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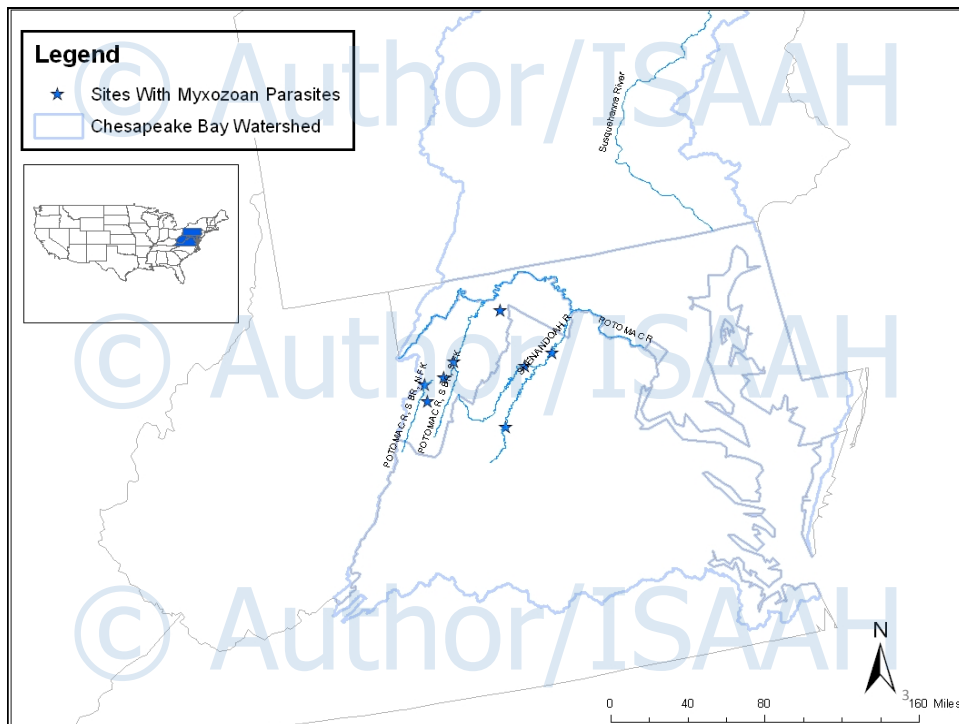
Fish Kills

- Shenandoah and Potomac Rivers
 - Adult smallmouth bass



- Susquehanna and Juniata Rivers
 - Young of the year smallmouth bass





Fish Kill Theories

- Contaminants of emerging concern
- Immunosuppression due to multiple stressors
 - Low dissolved oxygen
 - Fluctuations in pH
 - Agricultural runoff
 - Bacteria
 - Parasites
 - Trematodes, cestodes, nematodes, and myxozoans

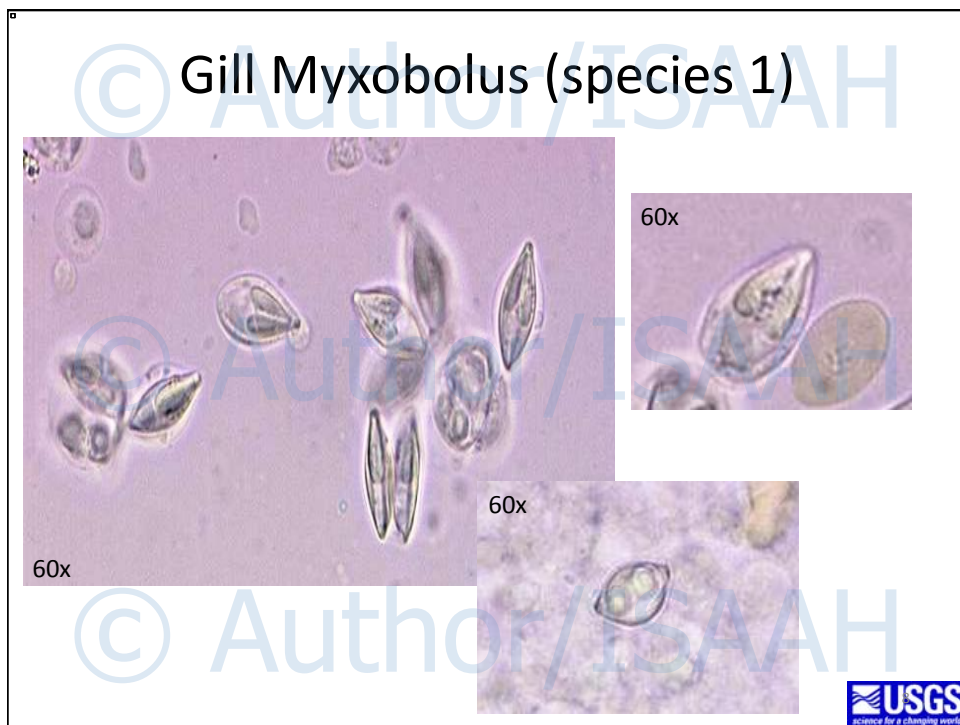
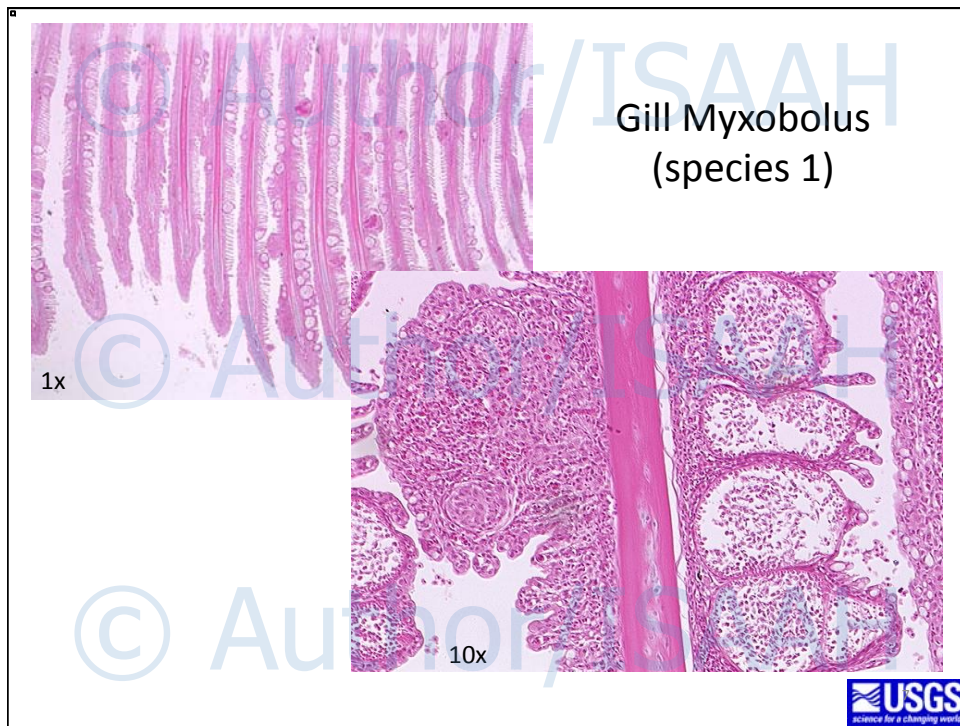
Myxozoan Parasites

- Located in multiple tissues of the bass
 - Gills
 - Skin
 - Bile duct of the liver
 - Macrophage aggregates

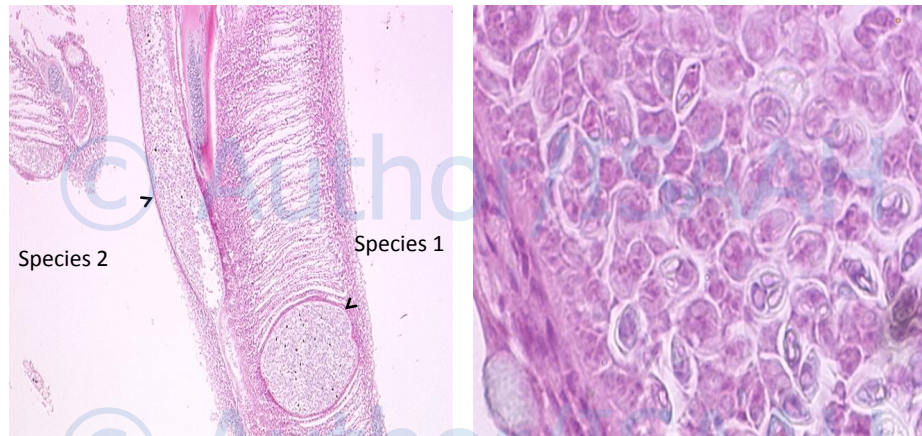


Gill Myxobolus (species 1)





© Author/ISA AH Gill Myxobolus (species 2)



© Author/ISA AH DNA Sequencing and Analysis

- Most closely related to *Henneguya crepilini* and *Henneguya sp.* from yellow perch
- Species 1 morphologically similar to *Myxobolus microcystus* in measurements and shape



GTGTGCCTTGAGTAAATCAGAGTGCTTAAAGCAGG



Myxobolus from Caudal Peduncle

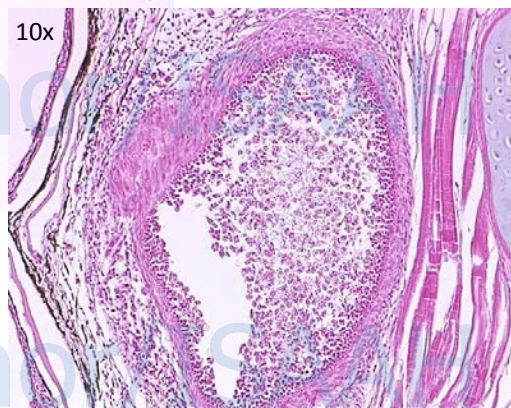


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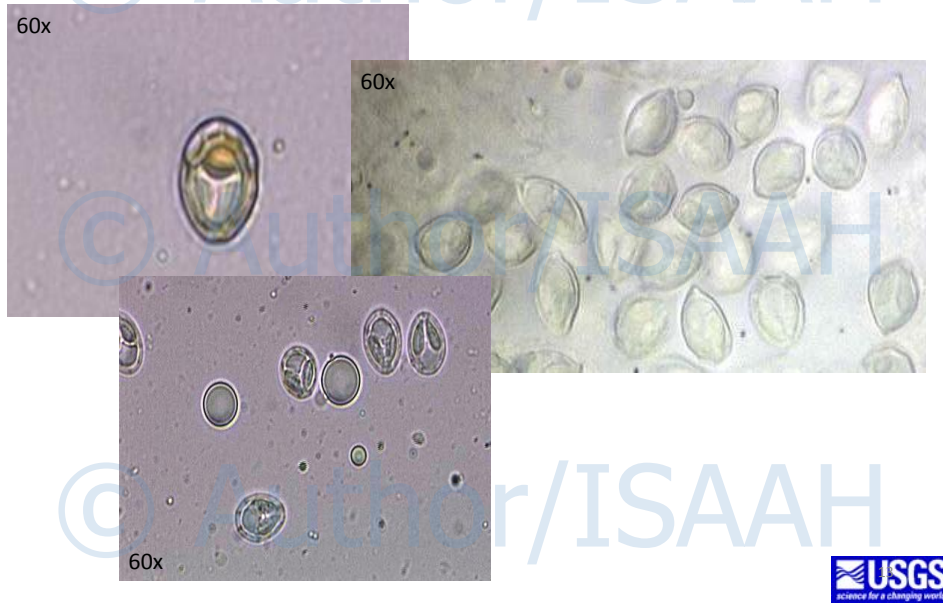


Myxobolus from the Caudal Peduncle of YOY SMB

10x



Myxobolus from YOY SMB



DNA Sequencing and Analysis

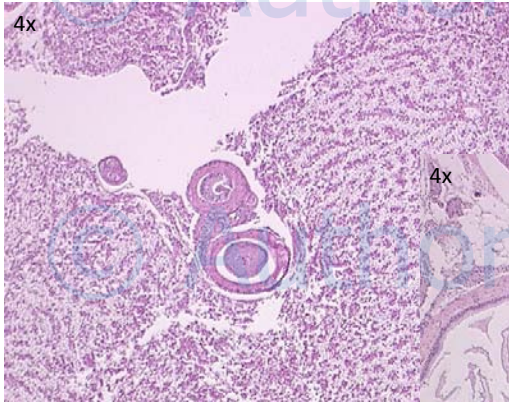
- Most closely related to *Myxobolus osburni*
 - Up to 85% maximum identity match
 - Morphologic measurements were not similar



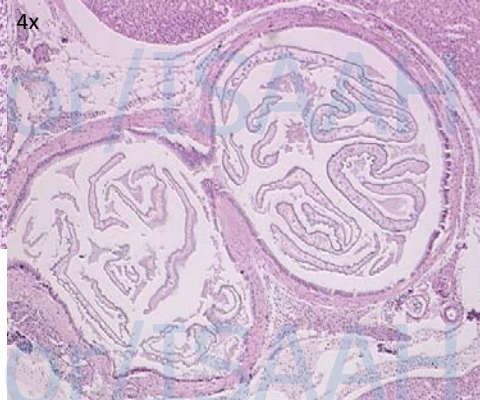
GGGGTCAAATACTAATCTGACCCTATGGGTGAGAGTTTGG



Bile Duct Myxozoan



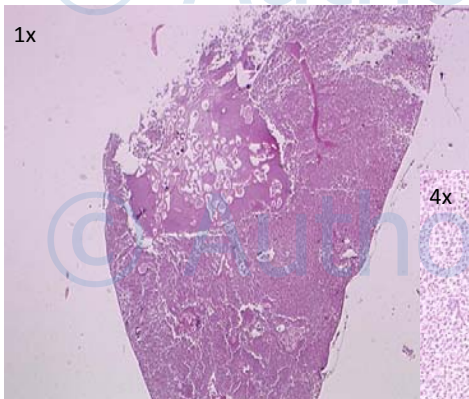
Normal Bile Duct



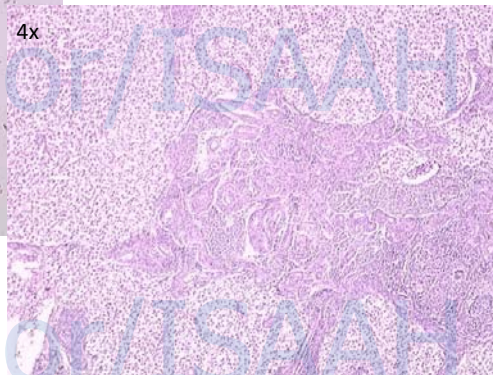
Bile Duct with Cyst



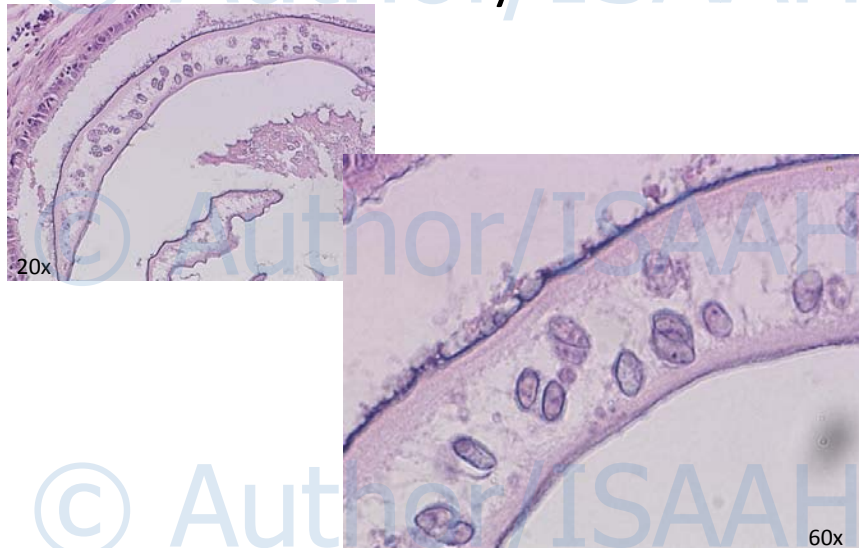
Bile Duct Myxozoan



Severe Proliferation of
Infected Bile Ducts



Bile Duct Myxozoan



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Bile Duct Myxozoan



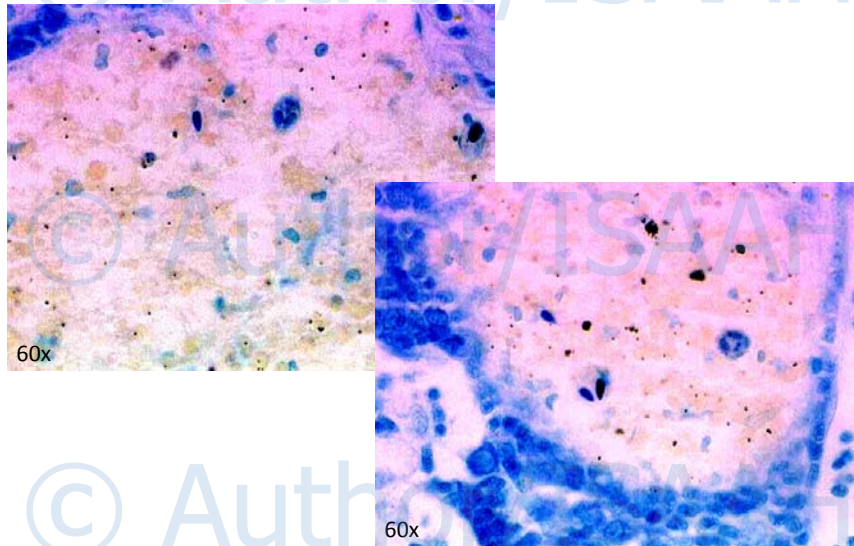
60x

*Picture courtesy of Vicki Blazer

- DNA sequencing and analysis
 - Results are unclear
 - *Zschokkella* sp.
 - *Zschokkella nova* from Brown Bullhead liver (Bucher et al. 1992)
 - *Myxobilatus gasterostei*
 - *Myxidium* sp.

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Macrophage Aggregate Myxozoan



*Pictures courtesy of Vicki Blazer



Remarks

- Gill myxozoans may have an impact on oxygen uptake, particularly during spring
- Caudal peduncle myxozoans may allow opportunistic bacteria and pathogens to invade the skin
- Bile duct myxozoans may block passageway of bile from the gallbladder into intestine or obliterate the bile duct altogether



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- Tim King's Laboratory Staff
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