

GREAT LAKES FISHERY COMMISSION

2021 Winter Meeting
Virtually
February 3, 2021

Minutes

Submitted By:

Erin Bertram

Great Lakes Fishery Commission

The data, results, and discussion herein are considered provisional;
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GREAT LAKES FISHERY COMMISSION
2200 Commonwealth Blvd, Suite 100
Ann Arbor, Michigan 48105
Great Lakes Fish Health Committee

List of Attendees

Kerry Hobden	Ontario Ministry of Natural Resources and Forestry
Danielle Godard	Wisconsin Department of Natural Resources
Nicole Nietlisbach	Wisconsin Department of Natural Resources
Ken Phillips	U.S. Fish and Wildlife Service, Lacrosse
John Coll	U.S. Fish and Wildlife Service, Lamar
Andrew Noyes	New York State Department of Environmental Conservation
Coja Yamashita	Pennsylvania Fish and Boat Commission
Kevin Irons	Illinois Department of Natural Resources
Scott Shasteen	Illinois Department of Natural Resources
Diane Shasteen	Illinois Department of Natural Resources
Kevin Kayle	Ohio Department of Natural Resources
Gary Whelan	Michigan Department of Natural Resources
Tom Loch	Michigan State University
Paula Phelps	Minnesota Department of Natural Resources
Ling Shen	Minnesota Department of Natural Resources
Sunita Khatkar	Department of Fisheries and Oceans
Dave Meuninck	Indiana Department of Natural Resources
Mitch Marcus	Indiana Department of Natural Resources
Kevin Loftus	Ontario Ministry of Natural Resources and Forestry
<i>Invited Guests:</i>	
Don Tillitt	U.S. Geological Survey
Owen Gorman	U.S. Fish and Wildlife Service
Tim Johnson	Ontario Ministry of Natural Resources and Forestry

Great Lakes Fish Health Committee

Virtual Meeting Agenda

February 3, 2021

9-12pm & 2-5pm Eastern

Session 1

- | | |
|------------------|--|
| 9:00 – 9:15 am | 1. Welcome & Introductions (Hobden) |
| 9:15 – 9:30 am | 2. Updates on Thiamine Levels in Lake Trout Eggs (Tillet) |
| 9:30 – 9:45 am | 3. Blue Book Revision Updates & Discussion (Loch) |
| 9:45 – 10:15 am | 4. Baitfish Testing – subcommittee & survey progress (Whalen) |
| 10:15 – 10:35 am | 5. Cutthroat Disease in Wisconsin Hatchery (Godard) |
| | BREAK |
| 10:45 – 11:05 am | 6. Barotrauma (Dr. Tim Johnson – MNRF & Dr. Owen Gorman – USFWS) |
| 11:05 – 11:50 am | 7. Agency Egg Disinfecting Protocols Share and Tell (All) |

Session 2

- | | |
|----------------|---|
| 2:00 – 2:45 pm | 8. MSU Research Updates (Loch) |
| 2:45 – 3:05 pm | 9. Virtual Facility Tour – Tom Loch’s Lab at MSU |
| | BREAK |
| 3:15 – 4:00 pm | 10. Agency Updates (All) |
| 4:00 – 4:30 pm | 11. Interesting Cases (All) |
| 4:30 – 4:40 pm | 12. New Chair and Vice Chair nomination |
| 4:40 – 4:50 pm | 13. Determine Summer 2021 Meeting Location & Time |
| 5:00 pm | AJOURN |

Summary of Action Items & Decisions

ACTION ITEM: Committee members to answer Gary Whelan's questions surrounding their state's baitfish industry and feasibility to sample and test baitfish supplies in their state or region by April 1, 2021.

ACTION ITEM: Ken Phillips can reach out to Lacey Hopper who presented on work on Cutthroat Trout Virus (CTv) to provide to Godard/Neitlisbach.

ACTION ITEM: The GLFC will create a Summary Table of all egg disinfection protocols from each committee member agency/group as a reference document for the committee.

ACTION ITEM: Committee members should reply ASAP to Kevin Kayle's email regarding suggestions on how to handle rent costs for staff positions living on site.

ACTION ITEM: Kevin Kayle will create a draft document to summarize details on agency staff living on site and associated rent costs to send to the committee to comment and add to for their agency as a reference document.

ACTION ITEM: Committee members should send annual reports to Kerry Hobden and Erin Bertram ASAP but by March 15.

SESSION 1

Updates on Thiamine Levels in Lake Trout Eggs

The goal was to present new data on this work, but due to delays this past field season, it was not possible. However, Don Tillitt with USGS presented an overview of what has been done so far and next steps in understanding Thiamine levels in lake trout eggs.

Tillitt provided an overview of 2020 sampling for lake trout throughout Lake Michigan within the northern refuge, Little Traverse Bay, Milwaukee region, and throughout Lake Huron near Drummond Island and Thunder Bay. Although the southern Lake Michigan locations had some of the lowest thiamine concentrations, recruitment appeared to be stronger in the southern areas compared to the northern locations. An ongoing research question asks if the microbial community influences dissolved thiamine and consequently the survival of fry and juvenile salmonids?

Discussion

There are more thiamine concentration issues on the North American west coast with a correlation of extremely low anchovy recruitment. Has this issue been brought to your attention, Don?

Yes, there is an article in the New York Times and other sources on this issue in California. Don and others are involved and have been asked to help. There could be disruption of thiamine synthesis at the base of the food web similar to what is happening in the Great Lakes. The first idea we are looking at is movement of anchovies moving north in the feeding areas of Chinook salmon that eventually spawn in the central valley of California where they are seeing thiamine deficiency occurring. They are also doing prophylactic treatments for thiamine right now with some success. NOAA is providing data on oceanic food webs, others are asking if thiamine treatments are providing higher success of fish migrating back out to the ocean. There is a lot of work being done on this on the west coast.

Lake Erie is working on lake trout management plan changes that include thiamine monitoring of lake trout in Lake Erie. As the Lake Erie revisions proceed, we likely would want to get more lake trout samples from Lake Erie to Don.

Don encourages this committee to encourage those that do the thiamine sampling in the Great Lakes to communicate their efforts and data to Don and his team to expand on this effort.

We typically measure thiamine concentrations in free-flowing unfertilized eggs. Homeostasis of thiamine is a long-term thing. If you get ovaries instead of eggs, or eggs that are not as developed we can still do these analyses with valid thiamine information.

Don Tillitt has sent via email a copy of their sampling request letter for committee members to send to their agencies/partners to be involved.

Blue Book Revision Updates & Discussion

Tom Loch is the AFS Fish Health Section President. In 2018, there was consensus on the need to overhaul the Blue Book and make major revisions. The Fish Health Section Executive

Committee created an ad hoc committee to take this on. Colleagues from numerous entities (including Tom Loch and Gary Whelan) submitted a proposal to the multi state conservation grant opportunity for AFWA to support these revisions. The funds included funding a project manager to lead this effort, as well as meeting support. COVID19 delayed some of these efforts. The goal was to have the Project Manager in place as of January 2021. In October 2020 a call was put out asking for applications. Dr. Jan Lovy and Dr. Ken Cain were selected as top candidates. Given the COVID19 delays and travel restrictions, there was a request for an extension of the grant due to the delays. The extension is pending but will likely be approved. The plan is to request to reallocate the funds that would have been used for travel towards restructuring work. Dr. Lovy will lead this effort as the Project Manager and Ken Kane will provide a supporting role. A steering committee is in the process of being put in place to guide what will be done in the revision process. It will likely be finalized in the next month. The goal of these revisions is to capture all different perspectives for those that are invested in health of aquatic animals.

Baitfish Testing – subcommittee & survey progress

Gary Whelan provided background on a variety of baitfish supplies such as wild-caught, frozen, or wholesale and the issue of known and unknown pathogens that exist in these baitfish supplies. To limit the spread of these pathogens, common sampling and testing protocols for a set of baitfish species and target pathogens across the Great Lakes basin are needed.

Michigan collected minnows from 78 baitfish suppliers or about 10% of Michigan Baitfish shops, using a blind test. Baitfish were not collected throughout all seasons. These fish were tested for VHSV, SVCV, GOSRV, FHMNv, FHMPv, and CWSBv. The total cost to do this was \$50K but it is estimated to take around \$75K to do this effectively. The baitfish delivery system is a “spider web” making it very difficult to determine where the fish in these shops came from. The next step is to continue working on determining how many fish are moving in the industry per state. It is estimated that between 20-30 million fish are moving throughout Michigan. The other question is how to logistically conduct this basin wide?

Whelan requests the committee think about how each agency would go about implementing sampling 10% of baitfish shops in their state for a variety of viruses and what would it take to be done in a year or two?

Discussion

Minnesota did do some of this work a few years ago and not sure if it was followed up upon but MN DNR would be interested in getting funding to do this.

You noted bottle necks in supply chain at wholesale level. Should this be done at local bait fish shop level or also wholesalers?

It would be best to include sampling of both source types.

Indiana has experience sampling baitfish shops from about 5 or 10 years ago and did viral testing on those fish. Only one virus was found. Indiana has a little bit of experience but needs more planning on the larger scale.

How did MDNR pitch this to GLRI for funding?

It was pitched as looking at pathogens as invasive species. Invasive species money might be available for work on invasives along with pathogens/viruses that are considered invasive.

If there is interest in this committee in doing this work across the basin, getting support from the CLC or the fish chiefs could be a powerful tool in asking for funding through the GLRI with their support.

Minnesota would appreciate a collective decision on what it is we are looking for and how we would target finding a specific virus or pathogen as well as more defined direction on what we do with this information. Minnesota has found pathogens and not knowing what they were and not knowing the implications of what we find is important to address.

Whelan would request a pathogen list, as well as how agencies would use the information.

In the past the committee has discussed what pathogens it would want on the list. Some viruses have implications for the bait industry. Some viruses induce mortality, which should be on the list. The initial focus could be on a few most important viruses/pathogens and how to detect for them.

There is also the issue of who is going to analyze these samples, will it be multiple labs that will need consistent protocols? These are important details to think about.

It is surprising that pathogens are not considered invasive species across the board. The angle of treating viruses as invasive species, might leverage funding. Is there a way to get some of the infectious disease work to get them considered as invasive species to increase the sources of funding we could request?

What to look for first might be what pathogens are most likely in hatcheries. What pathogens are harmful to rivers and lakes that these fish might be illegally disposed of live in?

As a committee we could look at the available information and create a list of pathogens as we did in the model program. Developing guidance for minnows, we could have a list of pathogens to target and test for. Fathead minnows are on the VHSV susceptible list in the Blue Book – how are agencies handling this? Are agencies testing fathead minnows or not? Minnesota has questions on that.

Are we looking just within the basin across our states?

Committee members should look at both inside and outside the basin because a large amount of imported bait is brought in from Arkansas and the plains region and in the east from West Virginia. We will need to look at imported bait in addition to what is harvested locally.

Illinois will require FHMv testing from all except Missouri and Arkansas. These were exempt by rule in 2005 VHS regulatory considerations

Think about "grocery store" bait when drafting language for potential regulations

If it is illegal to use bait from a grocery store, and a Conservation Officer finds someone doing this do they have to request a proof of purchase to see what bait shop sold it to them?

In Michigan, it is required that bait shops provide receipts. COs will ask this but anglers can also just lie about where they got their bait.

Gary Whelan requests this information from the committee for future conversation:

- Within each state, how would sampling 10% of each state's wholesale and retail baitfish sources be implemented and what would the sampling design look like?
- How many bait fish are moving in each state's baitfish industry (if applicable)
- What pathogens should be examined and how would the information gained be used
- What lab and testing analysis capacity does each agency or state have for about 30K fish across the basin.

ACTION ITEM: Committee members to answer Gary Whelan's questions surrounding each state's baitfish industry and feasibility to sample and test baitfish supplies by April 1, 2021.

5. Cutthroat Trout Virus in Wisconsin Hatchery (Godard) 20 min

Wisconsin has been experiencing cutthroat virus (CTv) in Wisconsin hatcheries for nearly a decade and is looking for information about any experiences with CTv in other states or agencies that are having issues with this virus.

The virus was first isolated from cutthroat trout in California in 1988. It has since been documented in Canada and the western US. It also has been isolated in a variety of salmonid species. It is an RNA virus of the *Hepevirus* genus. It is not associated with clinical disease. There is the potential for vertical transmission.

CTv was first detected in Wisconsin in 2012 in captive brown trout broodstock tissues and ovarian fluids at Nevin and St. Croix State Fish Hatcheries (SFH). It was then detected (2012) in Lake Michigan Seeforellen brown trout tissues and ovarian fluids, followed by detection at Wild Rose State Fish Hatchery in domestic brown trout ovarian fluids in 2013. Testing, research, and regular surveillance was conducted. CTv showed up again in 2015, 2017, and 2020 in captive brown trout broodstock, detected in the ovarian fluid as well as in kidney and spleen tissues.

Questions from Godard/Nietlisbach to the Committee:

- Do members have experience with the virus?
- If detected what was done?
- Is there need to manage it?
- What is the level of concern?

Discussion

PFBC detected CTv around the same time as Wisconsin in almost all brown trout hatcheries. It is taking the same approach as Wisconsin has in testing and monitoring. PA sees it when mortality occurs in hatchery race ways but a lot of the time there is something else going on and it might be a secondary infection causing mortalities and increasing it to a level that is detectable through qPCR, cell cultures etc.

In terms of Wisconsin's Biosecurity practices, is that in relation to determining possibility of vertical transmission? Bozeman Fish Health Center was looking into this and conducting work on this.

There were questions within the hatcheries about the possibility of transmission via shared nets, people acting as vectors. These precautions were put in place to deal with vertical transmission as well as horizontal transmission.

ACTION ITEM: Ken Phillips can reach out to Lacey Hopper who presented on work on CTV to provide to Godard/Nietlisbach.

Barotrauma

Guests: Dr. Tim Johnson – OMNRF & Dr. Owen Gorman – USFWS

Acoustic telemetry is used in eastern Lake Ontario using the GLATOS e to learn about fish movements, habitat use, and survival, as well as predation interactions.

When bloaters are tagged and released, they disperse rapidly and they dive very quickly to the bottom of the lake with little evidence of schooling. Their aggregate home range is large with strong diel vertical migration. Bloater moved throughout the whole lake, being detected on receivers in larger quantities in the eastern end of the lake but they also were detected in the western portion of the lake. Bloater were also detected by USGS and OMNRF trawling surveys. Two-thirds of the tagged bloater released in the lake died within two weeks. The first assumption was predation and was investigated using predation tag analyses. All predation occurred within two weeks of the bloater being stocked. Approximately 60% of predation tagged fish were consumed; 40% were not eaten. Thus, other issues were investigated.

The goal of this research is to determine if barotrauma is a factor for survival of stocked bloater? Bloater juveniles are stocked at about 100mm as fall yearlings during daylight. They are stocked over deep water (50-100 m) to reduce predation mortality. Acoustics show that fish swim downward to the lake bottom after release, reaching 100 m within seven minutes. Decompression barotrauma is widely recognized as a cause of death in fish, whereas compression barotrauma is undocumented in fish.

The GLFC provided some travel funds to investigate the possibility that compression barotrauma is causing mortality in hatchery-reared bloaters. Research began in November 2020 at the Jordan River National Fish Hatchery (JRNFH). A hyperbaric chamber was used to simulate bloater diving to the lake bottom. Surviving fish were held for 30 days at the JRNFH. Bloater exhibited acute stress when compressed. Decompression alleviated symptoms of stress. Nineteen percent of fish died within 48 hours; mortalities increased to 25% within seven days. Six of seven mortalities (85%) had ruptured swim bladders, which is evidence of compression barotrauma. Symptoms of decompression barotrauma were absent. No control fish died. Video footage was also used to compare compression vs control fish where over 40% of fish were eventually seen on the bottom over 5 hours of recording.

Compression barotrauma may affect fish stocked over deep water. Current stocking practices may need to change with interest in restoring kiyi. Next steps are to bring 500 yearling and fingerling bloaters back to the Lake Superior Biological Station for further research, and expand the scope to include ciscoes.

Discussion

Should managers consider stocking in shallow areas instead of deep waters?

That could be an example of changes to stocking practices to limit compression barotrauma. Another option is to consider stocking at night to avoid the quick depth gain to avoid predators.

Did the fish that were laying on their side in the pressurized chamber have perforated swim bladders?

These fish lay on the bottom, and then swim up and then lay on the bottom again. Even if their swim bladders are not ruptured they are compressed and negatively buoyant.

Do you suspect mortality is not from diving down but from swimming coming back up?

A sign of decompression is an over filled swim bladder but these fish were not bloated or did not exhibit decompression symptoms from coming back up. They did have some tears in their swim bladder attachment/ligaments which could indicate bloating or rupturing at some point. We plan to do post trial dissections to investigate this. Whether the rupture happened during compression or decompression, there is clearly negative experience fish are experiencing during diving down behavior.

Did you notice the same symptoms in all four trials or were fish more symptomatic in the trials where fish were lowered down to depth the quickest?

There are not any differences between the trials. Compression no matter how fast or slow, showed similar results. We want to ask at what level do fish not show these symptoms or what is the threshold for causing morbidity and mortality?

Have you considered using deeper production tanks in terms of rearing bloaters? They exist in the East coast commercial hatcheries. Could start out using one as experimental.

We can consider rearing changes but need to look at capacity and feasibility of this. There have been conversations with staff at the White Lake Hatchery and it would be very expensive. Without knowing if it would make a difference or not is a barrier to looking into this option.

Agency Egg Disinfecting Protocols Share and Tell

New York

For Chinook, coho, and steelhead, eggs are first fertilized, then treated with thiamine for 2 hours, then treated with iodophor, then put into incubators. Wild-caught rainbow trout are treated with iodophor first then thiamine, which also has success.

Indiana

Green summer-run steelhead eggs are in 50 ppm iodine for 30-50 minutes before they are put under the manifold and freshwater displaces the iodine over 30 min. After two hours the eggs get 100 ppm iodine treatment for 10 minutes and are then loaded into the incubators. For musky and walleye, because they are spawned in the field, staff are limited to using lake water so there's no water hardening in iodine but they do get iodine back at the hatchery, as well as formalin treatments due to coming from zebra mussel positive waters. Panfish and channel catfish are allowed to spawn naturally in the ponds so there is no egg disinfection.

Minnesota

There are a variety of methods used throughout the agency such as using different forms of iodine. The procedure for coldwater spawners uses iodine and then rinsing with clean water after water hardening. For warm water fishes, staff use argentine for 10 min after water hardening.

PFBC

For salmonids across the board all hatcheries use ovidine for 30 minutes. Some use salt water rinses but some don't. One hatchery has soft water; as a result, they don't do water hardening and use surface disinfection. For walleye, eggs are water hardened. For yellow perch egg transfers, we use standard iodine treatment and the eggs are already water hardened. Any time eggs are transferred, the standard disinfection at 100 ppm for 15 min is used. There is a newer protocol being developed that uses pre-fertilization egg disinfection to help with cold water disease for implementation next year, but a few places have been trying this method already.

ACTION ITEM: GLFC will take the lead in creating a Summary Table of all egg disinfection protocols from each committee member agency/group as a reference document for the committee.

SESSION 2

Virtual Facility Tour & Research Updates– Tom Loch's Lab at MSU

MSU-AAHL Research Updates - Knupp, Harrison, Johnston, Lennox, Shavalier, Van Deuren, & Loch

The lab can house and experiment with live fish, conduct tissue sampling and genetic analyses within close proximity among various specialized labs.

The lab uses flow-through as well as a few recirculating tanks that are all fed by deep well water that is sterilized and controlled. Four species are housed here for several ongoing projects.

Lake trout from the Marquette State Fish Hatchery are being used for a GLFC-funded study to understand the spread of EEDV.

Rainbow trout hatched by student Chris Knupp are being used for several *Flavobacterium* studies.

Juvenile lake sturgeon spawned from the Black River are part of a study funded by USFWS to identify pathogens that can affect Great Lakes lake sturgeon. These fish are 9 months old.

Lake whitefish are being used for a study funded by GLFT to identify whether or not infectious diseases are playing a role in low recruitment of lake whitefish.

A new master's student, Sean Lennox is working on a USDA-funded grant to find ways to interrupt vertical transmission of *Flavobacterium psychrophilum*.

The lab currently houses a 2010-year class of lake trout from the original resurgence of epizootic epithelial disease from Marquette SFH in 2011. It also houses 2015-year class lake trout that are survivors of a natural EEDV outbreak at Marquette SFH. They are being used to study long-term latency of EEDV and the ability to shed the virus. As this virus can't be cultured, these fish are very valuable.

PhD student, Chris Knupp, is continuing his MS work at MSU on *Flavobacterium* looking at disease ecology of *Flavobacterium psychrophilum* and also more effective means to diagnose it. He is also looking at why some of the different strains of *Flavobacterium* are so successful in

hatcheries and aquaculture facilities. Chris has 10 tanks of rainbow trout that were hatched in the lab that are now one year old and were vaccinated with 4 different genetic groups (and one negative control) of *Flavobacterium columnare* as part of testing whether or not individual vaccines per strain or a general vaccine could work on these different genetic groups of *F. columnare*.

Question

The two age classes of lake trout that are survivors of EEDv, what activities are they experiencing? Can you detect it at any time post recovery and are you investigating vertical transmission?

Yes, we can detect it subsequent to past detections. As the fish continue to grow and get denser there was a natural reoccurrence of the virus associated with mortality. The original event occurred in 2011, in the 2010-year class. We have been maintaining these fish for 10 years. This work was not directly funded but we are exploring ways to look at virus shedding, where the virus localizes in tissues in chronically infected fish, etc. We are using qPCR to detect the virus in the water once the flow-through has been shut off. Looking at reproductive fluids for transmission, we have not stripped these fish yet. But we plan to look at the reproductive tissues in a parallel study that is funded by the GLFC.

Live lab tour of the bacteriology, serology, virology, and molecular biology spaces of the MSU-AAHL in the Food Safety and Toxicology Building.

An MS student, Courtney Harrison is working on investigating infectious disease as a bottleneck to lake whitefish recruitment. In assessing health status of adult and juvenile whitefish, she has found a variety of fish pathogens in both groups. The next steps are to test what effects they have on the health and survivability of lake whitefish *in vivo* under laboratory conditions. She has also discovered *Carnobacterium* in lake whitefish. In other species, it will be transmitted from adult to offspring but it was found only in adults and reproductive tissues of adults. She is investigating the potential connection of transmission in whitefish.

In the tissue culture laboratory, an MS student, Amber Johnston is working on cell culture operation with day-to-day maintenance of tissue culture lines. For her thesis research, she is investigating endemic and emerging fish pathogens in Great Lakes lake sturgeon. It is one of the largest fish disease surveillance studies in Great Lakes lake sturgeon to date. A field season on the Black River was possible this year for a total of three weeks of field sampling. She has made some exciting discoveries that will be presented in future meeting!

In the molecular biology laboratory, Dr. Shavalier is a veterinarian and post doc. Her main interest and experience is in virology and cell culture. For the last 13 years she has done a lot of screening for and diagnosing of many different viruses. She is currently working on herpesviruses that infect lake trout and lake sturgeon in the Great Lakes. She is looking at salmonid herpes virus 3 that caused losses in lake trout during the past 30 years, to understand the pathogenesis of the virus and it looking at optimizing diagnostic assays to prevent future losses of lake trout from this virus, as well as developing a vaccine to prevent the disease it causes

General tissue processing area and nucleic acid extractions room as well as ability to do histology in house.

Question

Do you do any cryo work in liquid nitrogen? Yes, we have one set up right now. For long-term storage, liquid nitrogen Dewar containers work best

More MSU Research Updates

Flavobacterium psychrophilum transmission is possible both vertically and horizontally. When fish are infected, they are a prime source of infection for other fish by regularly shedding the bacterium in large concentrations. What is more problematic is that this bacterium is not done spreading after it kills its host. After fish die, they are shedding more than 10^8 bacteria per fish per hour for days after death and at different water temperatures.

Tom is collaborating with Dr. Travis Brenden and Dr. Lori Ivan from the MSU Quantitative Fisheries Center on a project modeling hatchery management practices for reducing losses from bacterial cold-water disease (BCWD). They are investigating what happens if water flows at a hatchery are increased to flush out the bacterium as well as remove dead fish more frequently i.e. more than once a day. According to their model, by simply removing fish three times a day as opposed to once a day significantly decreases the daily mortality associated with BCWD.

Loch's lab is also seeking to further reduce the risk of horizontal transmission of *Flavobacterium psychrophilum* using ultraviolet treatment. It is not well documented what ultraviolet zap dose (millijoules per cm^2) is needed for it to be effective. *F. psychrophilum* is very genetically diverse so there is an interest to understand if some of these strains are going to survive UV treatment more than others. This question was tested using a Collimating Beam Apparatus that can be set to different zap doses; 25 and 125 mJ/cm^2 . When comparing isolates at both levels, you get reduction in *Flavobacterium* but every single one was reduced at least 90-99% at 125 mJ/cm^2 . One isolate was easily reduced at 25 mJ/cm^2 but a few others were barely reduced at 25 mJ/cm^2 . Some MLST variants are a frequent culprit causing disease, but vary in their susceptibility to UV exposure. When increasing the UV dose to 125, some variants are better suited at surviving UV than others. All this variation has real-world implications for how agencies and researchers deploy prevention and control strategies. In general, to control or decrease *Flavobacterium* in hatcheries or aquatic facilities, managers will likely need to use higher than 25 mJ/cm^2 of UV and potentially even higher than 125 mJ/cm^2 for some of the more resilient strains.

Discussion

Do you know what might be the specific gene loci that are responsible for the variation in response to UV that you are seeing? You might look very carefully at differences in dose rates to see what gets down regulated vs upregulated in those sequences as a response. Targeted resistance might show up more as it is being stressed.

We don't know yet but we are planning on doing genomic sequencing. The one sequence type that was more resistant has two isolates that were exceptionally bright yellow compared to the other strains so there is even a phenotypic difference and we hypothesize that the hyper yellow pigmentation (i.e., flexirubin) may contribute to this resistance, but remains to be determined.

Agency Updates & Interesting Cases

MDNR

There is an addition to this year's annual report. There was a case at White Lake for bluegill which has just come back negative for viruses. Michigan's Fish Health Order is getting revised to add more species to the VHS list, mostly marine species in areas that are VHS positive. MDNR will continue to focus on frozen bait and regulating far more stringently along with eliminating grocery stores as a baitfish source. There has been increased testing for spring and summer wild-caught bait. Department of Agriculture and Rural Development wants to take whirling disease off of the emergency disease list that would normally require the state to act immediately to eliminate it or control it. MDNR has opposed this decision.

Barotrauma has been seen below Belleville Dam on the Huron River near Detroit. The cause remains unclear. The dam is only 30 feet deep and symptoms appear in the winter when the water is isothermal. Dissolved oxygen and temperature are not a problem but all of the barotrauma symptoms such as embolisms have been documented, predominantly in white perch. Loch mentions that fish may be passing through high pressure spots near the dam due to turbines and the torque. This particular dam doesn't run at very high rpm's though. Godard has some information from a thesis on barotrauma that can be shared.

Illinois

Illinois conducted surveillance of VHS statewide as well as in state hatcheries. No VHS was detected. Most other obvious viruses are tested for. SVCv and LMBv were found in smallmouth and largemouth in rivers and a reservoir. There was a large crappie kill in White Lake during the heat of COVID19 shutdowns and we were not able to resolve what caused it but will follow up this spring. Illinois does not have a pathologist within the agency but the state is talking with University of Illinois vet school and have someone that is interested in doing some additional work with us and to potentially join this group. Will know in the next 6 months.

Scott Shasteen provided an update on the hatcheries. There were bacterial gill disease outbreaks last winter with rainbow and brown trout. In March 2020, we were one of the only hatcheries that got Chinook salmon tagged by the USFWS but then had an outbreak and had to treat two race ways. Otherwise no other problems with viruses/pathogens.

Ohio

VHS samples were completed last year without issue however we did not get into the Maumee River, where we typically see some positives for VHS. We are planning on getting to it this year to get more gametes for percid production. Golden Shiner virus was found in fathead minnows at the St. Mary's hatchery. However, nothing else was detected. There are five-year review cycles to list species that came up this past fall, with minor changes to VHS list of susceptible species for testing including more salmonids. Ohio closed a regulatory loophole for fathead minnows to match up with OIE and Blue Book listings. Wild fish are being tested at collection sites for percids starting in March. Production cycles in hatcheries are planned as normal for this year. There was one instance of a positive COVID19 test for hatchery staff. Operating procedures are in place to keep staff safe from COVID19 to limit any further outbreaks. Ohio has a new aquaculture person working with Ohio vet school about fisheries and the aquatic side of things, maybe will see someone join this group in the near future.

Discussion

In regard to rent, maybe compare salaries of the positions. Minnesota's staff living on site do not pay rent but they make less than those in similar positions in different states. A comprehensive document for all of us to add to and use as reference when it comes up in our agencies would be helpful.

The economic value of each hatchery in Michigan is \$3-6M a year. It is affordable to provide rent to those that live on site especially, if thinking about it like an insurance policy. Those people living on site respond to any needs or emergencies at our facilities that avoid major losses. Martha Wohlgemood says they require maintenance and managers of facilities to be on call and they have a housing policy where most facilities have two houses, one maintenance staff and one fish culture staff and don't charge rent. They pay for their own utilities but the passive security is huge. When things were shut down these folks can still be in the facility to take care of the fish.

PFBC used to have people on site, but that ended 10 years ago. The issue now is there are empty buildings that are still needing to be maintained and are historical buildings that can't be taken down but are not being used for anything.

ACTION ITEM: Reply to Kevin Kayle's email regarding suggestions about how your agency handles rent costs for staff positions living on site.

ACTION ITEM: Kevin Kayle will create a draft document to summarize details on agency staff living on site and associated rent costs to send to the committee to comment and add to for their agency as a reference document.

DFO

DFO has not had any fish die offs reported, not sure if it was COVID19 related with reduced staff in the field or testing. All agency staff work from home, and labs were not functional during shut downs.

New York

Two surveillance programs are continuing as detailed in New York's annual report. Hatchery health is sufficient. Some hatcheries are struggling with nitrogen gas saturation. Radon abatement was going to be done at our hatcheries/facilities last year but COVID19 hit and operations were cut short. Hatcheries on surface water are seeing water temperatures increasing up to 70 F this year. There was one instance when water temperatures were at 76 F for several weeks with a loss a lot of fish. Many species of fish were moved to avoid additional loss. The Romeiskany strain fish are now in the F2 generation to produce eggs in 2024 as a brood stock program.

Indiana

There was lack of aeration at some of our ponds as they were filled with well water. One instance of detecting LMBv in a hatchery open water supply but all production fish were negative. No fish kills. We saw reduced handling mortality of steelhead after harvesting from the wild and there has been good survival with them since. We aimed to have at least 700 fish by the end of July, and we went into spawning with just under 700 fish. 1.2M eggs from these fish were collected. Some will go to Wisconsin and Illinois. Hamilton Lake had a large kill of bluegill

and other species like crappie. These were sent to Purdue for testing. Heavy bacterial infection was found but no viruses were detected. Trematodes and nematodes were also found in these fish but mortality was likely due to environmental conditions as a winter kill. Dave sent out an email inquiring about committee members experience with "Trout in the Classroom" programs. Indiana does not have this program in place, but inquiries keep coming in. Dave requested any policy or procedure documents and how much personnel time is spent on it. Of particular interest will be fish health, biosecurity, permitting and stocking site selection. Several committee members responded to Dave via email before the meeting.

USFWS LaCrosse

There was a minor detection of *Vagococcus salmoninarum* at the Genoa SFH. This is the first time it was found there, at very low levels. This did not impact the trout program due to each of the facilities at Genoa using independent water sources. Iron River SFH had *Carnobacterium* issues that were worse than last year likely, stemming from excessive handling during spawning due to a project going on at the hatchery to move the brook trout to their own separate room at the hatchery. This also caused a fungal outbreak that compounded the *Carnobacterium* infection. There were no mortalities in the brook trout and fish recovered but are lethargic. There were hemorrhages in the testes and 8 out of 10 of these fish tested positive for *Carnobacterium* but no *Vagococcus* was detected. The new brook trout room will be functional early this summer and we will move the brood stock in there and vaccinate them to help take care of the infection problem.

USFWS Lamar

Two hatcheries in the Great Lakes program had issues this year. The Allegheny NFH had epitheliocystis presented for lake trout several times after a flush of sediment a few years ago. We set up a study to see if flows or densities could be a factor. The hatchery thought it was based on fish strain. It wasn't strain of fish. It was the density and flows. Only 1% mortality in the hatchery since then by decreasing density and increasing flows. Staff are not sure what happened this year as opposed to other years due to many other variables such as moving fish for grow out. The organism likely remains in the raceways even after depopulating and disinfecting. Brookshire NFH is our lake trout brood station. After spawning this year, two-year classes of fish; 8-year olds and 6-year olds were losing up to four individuals a week. The 8-year-old year class were heavily consuming the feed. They couldn't find any pathogens in these fish. We asked the acting manager about *Vagococcus*, and we found one *Vagococcus* isolate. USFWS notified the state and they were not happy that the brook trout were being held below the lake trout. There were 102 cultures from 15 fish tested and resulted in 7 gram-positive bacteria only. *Vagococcus salmoninarum* was not detected. These fish were compromised due to COVID19 restrictions.

Wisconsin DNR

Wisconsin conducted 19 fish health certification inspections this year, which was fewer than normal. There were no significant findings from fish health certification inspections. Fathead minnows used as feed were tested for viral pathogens. Seven lots of fathead minnows were randomly chosen for testing. No viral pathogens were isolated in cell culture. Standard procedure is to sample from delivery trucks and process the fish immediately, however with COVID19 restrictions sample processing was delayed, possibly resulting in false negatives as it is unusual to not isolate any viruses during forage fish surveillance. Walleye and musky are

normally tested after grow-out to see if they contracted anything from forage fish, however with no musky spawning this year, samples were not collected. Typically, no pathogens are detected in walleye and that was consistent this year. Broodstock surveillance detected the cutthroat trout virus in captive brown trout broodstock in one of our hatcheries while EEDv was detected in wild lake trout populations which is consistent with the last few years. Sampling was conducted by crew members this year, unlike most years. There was an unknown replicating agent isolated from one tube of ovarian fluids collected from wild Seeforellen brown trout broodstock from Lake Michigan. Lacrosse may ID this for us but no associated mortality events or clinical signs were associated with this broodstock population nor with their progeny, which are housed at two of our hatcheries. There were not many disease cases reported or investigated this year. No VHS surveillance of waterbodies supplying three of our state hatcheries was conducted due to COVID19 restrictions, though one wild fish transfer of cisco was able to be completed following visual inspection and evaluation for *myxobolus cerebralis*. There was a black crappie kill but the fish were dead for a day before collected and frozen, so there was no conclusion to be made. There were reports of skin lesions seen on small mouth bass caught during fishing tournaments on Lake Michigan during the summer, but we could not attend these tournaments this year due to COVID-19 related restrictions. The reported skin lesions were similar to historical reports of lesions seen in tournament caught small mouth bass. They also seem to be similar to small mouth bass skin lesions reported to and seen by other agencies in recent years. We hope to collaborate with other agencies to investigate the etiology of these skin lesions in the future.

PFBC

Wild brood sampling was not possible this year, but we went back to sample the progeny and nothing was detected. PFBC is planning to conduct work this spring as normal. *Yersinia ruckeri* (ERM) was detected at a state fish hatchery that is not within the Great Lakes, but it was the first time detecting it at this facility. It was detected at a different facility in 2019 and seems to be showing up more frequently. Likely due to recirculating water and the facility being short staffed. They treated the fish and it seemed to resolve the infection with minimal mortalities. There was an issue with IPNV in steelhead from the 2019-2020 spawn. Staff are reducing the amount of time the brood are in the hatchery and reducing the amount of biomass in the raceways. Freshwater mussel production facility is up and running but we are still lacking protocols on culture. The goal is to come up with protocols before stocking and transferring any pathogens around from mussel stocking.

Minnesota

Fish health has been pretty quiet this year no major fish health issues. Still getting legislative approval that is highly delayed. Fathead minnows are now on the VHS susceptible list, which may have some impact for MN DNR if we need to get these fish tested. Minnesota is free of VHS in inland waters so far. Fish contaminant issues are of interest. MN DNR hosted a PCP testing workshop for 2020 and is resuming 2021 with half funding due to the pandemic. There has been a lot of interest in PFAS testing. A grant from the EPA was issued to test for PFAS in the Lake Superior basin. Wisconsin found that Lake Superior smelt have a much higher concentration of PFAS than was thought, which caused them to change their consumption advisory. Minnesota also plans to collect smelt from the MN side of Lake Superior. Similar results are expected and will see if MN will also need to change the consumption advisory as well. Lanesboro Hatchery has identified *Renibacterium salmoninarum* that shows up every four years, and this year was one of them. There is now a second-year class of wild brook trout for

the new strain of brook trout called the Minnesota Driftless Strain. The fish are doing well in the hatchery. There are now 4 to 5 strains of brook trout but this will get down to two, the cross strain and a native strain. MN did not get to do a musky spawn egg takes this spring. Protocols are being developed to do musky egg takes this spring. The agency has to request permission as to what will be done or how protocols are adapting and changing to be COVID19 safe. The plan is to simply not spend a lot of time in close proximity to each other and to wear masks. Are other agencies taking this same approach?

Many have said they have written protocols already in place to conduct field work this spring and summer that isn't much different than what MN proposes to do.

OMNRF

No fish kills were reported, likely due to less field work and thus less reporting of fish kills. No new detections in wild fish sampling. Spring collections did not occur. Fall collections were done. Very few detections of anything other than the repeat *Yesrinia ruckeri* at North Bay. Furunculosis was detected at Blue Jay Creek. Most program sampling efforts were not complete and only short bouts of fish die offs. Bacterial gill disease and cold-water disease were detected as normal. OMNRF is requesting any words of wisdom on a Tetracotlye species parasite. Gary Whelan had some insight on this parasite.

New Chair and Vice Chair nomination 10 min

Nicole Nietlisbach was unanimously chosen for vice chair and Danielle Godard will assume Chair

Determine Summer 2021 Meeting Location & Time 10 min

Virtual meeting on Wednesday August 4, 2021

ACTION ITEM: Send all annual reports to Kerry by March 15, 2021.

GREAT LAKES FISH HEALTH COMMITTEE
TECHNICAL ADVISORS

February 2021

Bacteriology

Diane Elliot (U.S. Geological Survey)
Hui-Min Hsu (Wisconsin Veterinary Diagnostic Laboratory)
Thomas Loch (Michigan State University)

Virology

James Winton (U.S. Geological Survey)
Tom Waltzek (University of Florida)

Molecular

Nick Phelps (University of Minnesota)
Sharon Clouthier (Fisheries and Oceans Canada)

Nutrition

Wendy Sealey (U.S. Fish and Wildlife Service)
Ann Gannam (U.S. Fish and Wildlife Service)

Quantitative Fish Health Data Analysis

Dominic Travis (University of Minnesota)
Travis Brenden (Michigan State University)

Epidemiology

Lori Gustafson (U.S. Department of Agriculture)

Parasitology

David J. Marcogliese (Environment Canada)

Thiamine Deficiency

Jacques Rinchar (SUNY Brockport)
Don Tillitt (USGS)