

# GREAT LAKES FISH HEALTH COMMITTEE

2017 Summer Meeting  
Guelph, ON

August 2-3, 2017

Minutes

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Great Lakes Fish Health Committee

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**Great Lakes Fish Health Committee Meeting**  
**Guelph, ON**

**Wednesday August 2, 2017**

- 8:00-8:10**      **Welcome & Introductions (A. Noyes)**
- 8:10-8:30**      **GLFHC Website (J. Dettmers)**
- 8:30-9:30**      **VHS Update/Lake St. Clair (G. Whelan)**
- 9:30-9:45**      **VHS Update/Cayuga Lake (A. Noyes)**
- 10:00-10:30**    **MI Bait Industry - Fish Pathogens Study (G. Whelan)**
- 10:30-11:00**    **NAAHP – National Aquatic Animal Health Program  
(E. Creighton, M. Guirguis, CFIA)**
- 11:00-11:30**    **OAHN - Ontario Animal Health Network (M. Chiasson, OMAFRA)**
- 1:00-1:30**      **Epitheliocystis Update (J. Lumsden, U of G)**
- 1:30-2:00**      **Review of Fish Pathogenic Bacteria and Viruses Identified in ON Fish Health  
Monitoring (R. Stevenson, U of G)**
- 2:00-2:15**      **Baitfish and Net Pen Culture Update (G. Whelan)**
- 2:15-2:45**      **Industry Overview, Pathogens of Concern and Interesting Cases (V. LePage)**
- 3:00-3:30**      **OMNRF Bloater Culture (R. Zheng)**
- 3:30-4:00**      **OMNRF At-Risk Mussel Culture (C. Wilson)**

**Thursday, August 3, 2017**

- 8:00-9:00**      **EDC's in Grand River, Guelph (M. Servos, U of Waterloo)**
- 9:00-9:30**      **Revitalizing Rome Strain Trout (A. Noyes)**
- 9:30-10:00**    **Cage Culture in Ontario (B. Burdick, OMNRF)**
- 10:15-11:50**    **Agency Updates**
- 11:50-12:00**    **Upcoming Meetings**
- 1:00-4:00**      **Tour – OMNRF Normandale Fish Culture Station**

## 1. Welcome & Introductions (A. Noyes)

## 2. GLFHC Website (J. Dettmers)

- New commission website review.
- There was a lack of organization on the previous website; therefore the goal was to create a more user and viewer friendly website. The site was designed primarily for those with interest such as the public but not of those with vast knowledge.
- On the main page, you will find headings such as “Sea Lamprey”, “The Fishery”, “Science and Research”, “Partners” (where you will find the link for the Fish Health Committee, as well as the link to all other committees), and “About”.
- On the main page you will also find information on globally important topics (press releases), and program spotlights.
- The Fish Health Committee page has the following: an overview, members and their affiliation, and the most recent/relevant publications and press releases. Older publications are available through the “Publication Search”.
- Under “Document Search” you have the ability to search documents and publications using various filters – to post documents, send them to John Dettmers.
- There’s database hosting on the site (public and private), as well as task force pages with secure login.
- Nothing has been removed from the website, it’s all still available through the Document Search.
- *Comments:*
  - Gary – all meeting material posted under Task Force must be secure with a login and password and updated. Presentations could also be posted prior to meetings.
  - Andy – need some way to navigate through old meeting minutes.
  - A list of all committee members and press releases with a hyperlink to the State Agency that each member is associated with is needed.
  - A link to OIE publications and products is needed.
  - May have a task force page for GLFHC or an advisors forum?

## 3. VHS Update/Lake St. Clair (G. Whelan)

- VHS re-appeared in March 2017. There was a large fish kill in Lake St. Clair, in which lots of public calls were received for high Gizzard Shad numbers.
- A press release was released in late March requesting public observation of greater than 50 fish, in which 100 responses were received. By April, there were many fish kill reports in both US and Canadian waters.
- The affected area ranged from the Black River to the Detroit River. Gary was fortunate to have a research station located in the middle of the affected area, which facilitated sampling.
- A very broad range of species were affected:
  - 19 species tested, 9 tested positive
  - >100,00 fish total
  - 52 of 110 wild pools tested positive for VHS
  - 10 of 78 baitfish pools tested positive for VHS
  - Many Pumpkin Seeds, Blue Gills, Round Gobies tested positive – carriers?
- It seems as though if cool and warm water species get affected in cool waters, their ability to fight off VHS goes down. When fish were sampled in late March, water temperatures were 5-6°C, most samples came back positive. Whereas by the end of May, when water temperatures were 10-14°C, there were fewer reports of dead fish and fewer fish testing positive.

- Management Actions:
  - Didn't take musky eggs from the Detroit River
  - Public observation of >25 fish (ideally >50 fish)
  - Bait industry to not harvest in affected corridor
- Lessons:
  - VHS is distributed broadly in the system (find it in most species)
  - It affects fish most in cold waters
  - Gizzard shads key indicator species and a vector of any other species that comes into contact with them
  - Collect fish in the fall – Blue Gills, Gizzards, Shiners (early warning system)
  - Involve the press and public (early warning system)

#### **4. VHS Update/Cayuga Lake (A. Noyes)**

- Initial detections in 2006 and 2007 in Lake Erie, Lake Ontario, and the St. Lawrence in New York State.
- There were no inland detections from 2008-2016 (only in Great Lakes).
- May 17<sup>th</sup>, 2017 there were reports of Round Goby dying in Cayuga Lake.
- Thinking that the Goby is a vector/indicator species, Gobies in Lake Erie, Lake Ontario and the St. Lawrence were sampled using PCR and targeting the brain. Results indicated very low levels of VHS and was assumed to be a latent carrier location.
- In May of 2017, there was a kill of Small Mouth Bass in Seneca Lake. These fish had high levels of chilodonella but low levels of VHS (in the brain).

#### **5. MI Bait Industry - Fish Pathogens Study (G. Whelan)**

- The objective of the study was to determine and document the extent of invasive pathogens in MI bait shops.
- Randomly sampled 10% of bait shops (78 bait shops sampled), looking for Asian tapeworm and other key viruses.
- 90-60 fish lots (5400 fish) were collected and sampled from September, 2015 to June 2016.
- Asian Tapeworm:
  - Everywhere in bait supply, broadly distributed
  - Almost all Emerald and Golden Shiners tested positive
  - Fathead minnows were free of asian tapeworm
  - More positive samples in wild caught minnows
- Minnow Viruses:
  - One of the most prevalent viruses found was the golden shiner virus
  - Emerald Shiner tested positive for VHS (1 case), but was out of the system by the time it was back traced
  - 18/90 lots had pathogens in it
- Most bait is wild caught.
- Going forward, another round of testing should be done to include more bait shops and over the course of a whole year.
- Paper do be put on GLFHC website.

## 6. NAAHP – National Aquatic Animal Health Program (E. Creighton, M. Guirguis, CFIA)

- The NAAHP was formed in 2005 and is designed to help protect Canadian Aquatic Resources (modelled after Canada's terrestrial animal health program).
- The CFIA is the lead regulatory and admin authority for NAAHP.
- Prior to 2005, CFIA had no role with aquatic animals, their only role was to inspect fish processing plants (up until 2005 DFO did the animal health testing).
- The Health of Animals Act addresses disease and toxic substance oversight. It's a powerful tool, used to prevent the introduction and spread of disease (allowing investigations and inspections at any facility). It was applied to terrestrial animals, and has since been applied to aquatic animals as well. Multiple disease reporting levels, i.e. immediate, annual. It also allows for compensation for destroyed animals.
- CFIA is responsible for the import, export and disease control of fin fish, molluscs and crustaceans (only concerned with the most serious diseases).
- CFIA requires import permits of certain aquatic species – species, origin and end use are key. CFIA however, is no longer responsible for providing export certificates of fin fish (this is now done by a Title 50 Officer).
- In January of 2016, the Domestic Movement Control Program was initiated, which regulates the movement of aquatic species susceptible to serious diseases. Schedule 3 list of susceptible species, approximately 300 listed currently.
- Ontario is divided into two watersheds: the Hudson Bay and the Atlantic Ocean. The difference between the watersheds is presence of VHS, and hatcheries in the Great Lakes watershed must get permits from CFIA to move/stock fish in VHS-negative areas. All of Ontario is designated positive for IPN.
- Watersheds in Alberta recently designated as positive for Whirling Disease.
- Current surveillance includes:
  - VHS in Ontario and Quebec
  - Wild fish in BC for ISA
  - Eastern shellfish
  - Alberta for WD
- Issues with compliance by Provinces as CFIA can only use accredited labs
  - Hopefully in future aquatic species can use accredited private or provincial labs
- CFIA Contacts and Email
  - [Magda.guirguis@inspection.gc.ca](mailto:Magda.guirguis@inspection.gc.ca)
  - [Ed.creighton@inspection.gc.ca](mailto:Ed.creighton@inspection.gc.ca)

## 7. OAHN - Ontario Animal Health Network (M. Chiasson, OMAFRA)

- The Disease Surveillance Plan started in 2013 with the vision of gaining public trust – agreement between OMAFRA and UofG
- The mission of the plan is to coordinate early detection, preparedness and response of animal disease through cross-sector networks.
- Pillars of disease surveillance:
  - Environmental scan and engage with stakeholders
  - Enhance Ontario surveillance with network groups
  - Integrate with national level surveillance (network of networks across Canada)
  - Develop better tools for managing risk
- Have 9 sectors with sector-specific networks
- Aquatic Animal Health Network
  - 1 Vet in Province to do aquatic work
  - University of Guelph - AHL
  - OMNRF
    - License aquaculture

- Industry groups – Net pens and land-based groups
- What OAHN does:
  - Quarterly lab conferences (lab findings, field observations, industry concerns)
  - Passive surveillance of disease surveillance (results from lab)
  - Assist in industry focused research
  - Work with AHL to develop diagnostic tests (WD and VHS)
  - Act as a forum for industry to bring concerns forward
- Goals for 2017:
  - Grow the network
  - Improve communication and connect with associated groups
  - Create tools for the industry ie. Fact sheets
  - Initiate emergency planning and preparedness
    - Specify procedures for handling sudden/unexpected situations (prevent→reduce damages→protect)
    - Federally reported disease
      - CFIA
      - Health of Animals Act
      - Foreign Animal Disease Emergency Response Plan
    - Notifiable hazard – falls under OMAFRA Animal Health Act (recognized for a provincial aquatic emergency response plan)
- OAHN Project – Antimicrobial Resistance:
  - Key concern
  - Amendments to Food and Drug regulations
  - Move all antimicrobials to prescription drug list from over the counter
  - Growing resistance to antibiotics, global threat
  - Methods: screen for common bacterial pathogens, develop and inventory of aquatic pathogens prevalent in Ontario farms, and evaluate the degree of antimicrobial resistance
  - Samples – Commercial fish farms and hatcheries
    - Culture isolates and examine resistance
    - About 65 samples at this time
      - RBT and archived isolates – 67%
  - Preliminary results: starting to see some resistance to oxytetracycline and aquafloxacin, most things tested, fell between intermediate sensitive and resistant
    - Aeromonas – 32% - I/R and Sensitive
    - Flavobacterium – 34%
      - F. aquiductum R and I
        - Increasing resistance over a year seen too
      - C. columnaris – I and I
      - C. columnaris – S and I
    - Yersinia – 16% - I/R
  - Summary
    - Disease monitoring and vet contact
    - Improve fish health
    - Reduce drug use
    - Decrease resistance
  - [www.oahn.ca](http://www.oahn.ca)
  - Contact - Marcia.chiasson@ontario.ca

## 8. Epitheliocystis Update (J. Lumsden, U of G)

- Two Masters students have concentrated their work on looking at the Epitheliocystis outbreaks at MNRF Blue Jay Creek Fish Culture Station
- The outbreaks, which are usually between December to February, are associated with dirty water events from high precipitation
- Epitheliocystis was first described in 1969, and although it's not a new disease, we still have lots to learn about it
- Background
  - Yearly mortalities in winter from heavy rains
  - Fish spread out, poor feeding, and chronic morts
  - Disease ran from 3 – 6 weeks
  - Epithelial hyperplasia from bacteria
  - Described in late 1980s from WI
  - Seen in 90 species – Marine and FW
  - Worldwide
  - Lethargy
  - Variable mortality from 0-100% - up to 42% in Ontario
  - No treatment but ends in 4-6 weeks
- Lesions – White nodule or white plaques on gills – Highly variable
  - Hyperplasia
  - Gill fusion
  - Branchitis
  - Mucus metaplasia
  - Single cell necrosis
- Causative Agents
  - Chlamydiae
  - Y-proteobacteria
  - B-proteobacteria – Blue Jay Creek OMNR Hatchery – four identified to date with more coming
- Burkholderiales
  - Dominant in gills
  - Find them on many tissues on RBT
  - Some pathogenic – *Branchiomonas cysticola*
  - Studies in zebrafish examined virulence
- Histology is the primary method to identify this disease
- Results
  - Gills have severe hyperplasia
    - LAT had mortality
    - SPL nearby had no effects but same signs
  - Often at the end of gill they are abnormal
  - Granular cells often seen
  - Also seen in RBT aquaculture facilities
  - Signs show up about 3 weeks after high water event
  - Sequences – 90% CBc – 90-97% - BK-BJC
    - Seen in ATS in Norway/Ireland and similar
      - Similar to one in Ontario
    - Not a good match for Chlamydiales
  - Electron microscopy – Not chlamydiales
  - Cannot be cultured at this time
  - Concentration of organism was closely aligned with mortality
- Likely a novel bacteria
- Will try to culture using RBTW1 cell line



## **9. Review of Fish Pathogenic Bacteria and Viruses Identified in ON Fish Health Monitoring (R. Stevenson, U of G)**

- Their role has been surveillance, monitoring and diagnosis of brood, spawning fish, fluids, and production fish for the MNRF
- They use tissue culture in order to detect viruses
- Must maintain cell line: RTG-2, CHSE-214 and FHM are the three cell lines which are currently used
- Since they've started testing for the MNRF, not a lot has been found disease/virus wise
- Up to 1999, not much had been found, a few cases of IPN and aquareovirus
- Since 2005
  - VHS
  - KHV
  - SVC
- Bacilliform virus from CHS in 2008
  - RTG2 only
  - RNA virus
  - Enveloped
  - But no effect
- VHS RT PCR primers – Found an odd CHS virus – Bafinivirus – Kept showing up – Bacilliform
  - Similar to FHM and White Bream Virus but only a distinct isolate
- Bacteria
  - Enriched plates
  - Asal – 14 isolations from 2005-2016
  - Yruc – 18 isolations from 2006-2017
- Strains not uncommon in Ontario and can could BKT mortalities
- BKD
- Culture is possible
- Antiserum development possible
- BGD and CWD – Culturing allows studying and checking
- Used colonies on charcoal salts from frozen gill samples with 4 days at 15C
- Sequencing isolates at this time
- Working on LAMP (Loop Mediated Isothermal Amplification) analysis at this time for a field test
- Overall over the years, there have been very few cases

## **10. Baitfish and Net Pen Culture Update (G. Whelan)**

- There has been a push to have net pens in the Great Lakes, but at the same time there has been a lot of opposition (both sides aren't going anywhere)
- Baitfish regulation changing coming as a result of VHSv outbreak
- Discussed a bit about continuing legal issues at Grayling Fish Hatchery
- Aqua Bounty was looking to make facilities in Detroit to raise Atlantics. Aqua Bounty has since "disappeared"; there has been no word from them. That proposal is also going nowhere

## **11. Industry Overview, Pathogens of Concern and Interesting Cases (V. LePage)**

- Veronique provides vet care to the Ontario aquaculture private sector through the OAHN project, with a focus of preventative medicine
- She provides site visits, consultations, vet diagnostics, staff training, and disease information sessions
- Some of the types of operations that she provides services to are: flow through, cage pens, ponds, RAS, aquaponics (mostly tilapia), organic aquaculture

- Aquaponics – Tilapia primary fish and growing lettuce to medical marijuana
- Organic Aquaculture
  - Meekers on Manitoulin with organic compost
- Species – RBT, BKT, LAT, BNT, ATS, YEP, Tilapia, shrimp and Barramundi
- The most common disease encountered in the private sector are:
  - Ich
  - Costia – Common with surface water issues
  - Monogenes – Common with surface water issues
  - Branchial copepods – Maybe Ergasilus species – 5 inland systems from 2012-2017
    - Open water and adult or broodstock fish
    - Increased respiratory rate
    - Lesions on gills
    - SLICE is the only thing available – Resistance is possible in future
    - Cannot be sold for sportfish stocking
  - Bacteria
    - CWD – Doing sensitivity testing - Aquaflor
    - BGD – Bigger problem this year
    - Columnaris – Seeing more systemic disease
  - Viruses
    - Looking for VHSV and IPNV
    - But none thus far
  - Others
    - Nodular amoeba gill disease – Severe effects
      - Trending down right now
    - Diatoms
      - Gill lesions – hyperplasia
      - Predispose fish to 2ndary infections
    - Concentrations were extremely high were seen

## 12. OMNRF Bloater Culture (R. Zheng)

- Lake Ontario was home to 4 Bloater species until the 1950s
- Today, only the Lake Herring (cisco) remain
- Why back
  - Empty niche
  - Restore food web
  - Reduce invasive effects
  - Support LAT and ATS effects
- Bi-national agreement to re-establish native deep water ciscoes in Lake Ontario, with the goal of being self-sustaining in 25 years
- Restore the predators, by restoring the prey (re-introduction of the bloater will fill this empty niche, and restore the historical food web)
- The wild gamete collection takes place in January Lake Michigan, which presents challenges in itself (cold water temperatures/rough conditions, long distance to transport gametes to the fish culture stations)
- Using Whitefish (Bloater are closely related to Whitefish) practices as a guideline, fish husbandry practices were developed
- Diet and temperature trials have been conducted to determine the optimal feed and growing temperature

- As Otohime diet can't be imported into Canada, an alternative diet had to be found. Through trials, it was determined that Gemma is a suitable replacement diet
    - Through temperature trials, it was determined that increased rearing temperatures led to higher growth but lower survival (further trials will have to be done to find an optimum)
- Following the early rearing stage (1-12 weeks post hatch), survival goes up to 85-90%
  - Learn to grow and maximize production
    - Hatching
      - 2.4 million produced per year in 2016
      - Start at 9 mm
      - Pelagic zooplanktonivore
      - Using LWF manual
      - Small yolk sacks
      - Incubate in individual jars
      - 100K/liter
      - Thermal regime from 3-6C
      - Increased survival to 50% now
    - Rearing
      - Studied diet, temperature, and density
      - Survival from 39-68% last year
      - Diet studies showed – Otohime is banned in Canada
        - Aglomorse
        - Gemma – Decide to go with Gemma which was similar
        - Aglomorse and Artemia
        - Gemma and Artemia
      - 12C used for bloater at first
      - 10C – Slower growth and survival up
      - 14C – Faster growth and survival down
      - Fall fingerlings – 170 mm and 36 g by November
      - Summary
        - Reliably produce fish
        - Good performance in hatchery
        - Studies
          - Enhance post stocking survival
      - Stocking in 2016 – 190K F Yearling Ontario and 149.K Fall Fingerlings NY
      - Fingerlings stocked and went right to bottom
- In Ontario fall yearling are stocked, and in New York fall fingerlings are stocked – binational target is 500,000/year
- Post stocking behaviour and survival has been assessed using acoustic telemetry, many detections with highest in November and May
- Currently in the MNR, a Broodstock line is being developed – started in 2011, 6 year classes have been created and recent findings are showing that they will produce as well as the wild
- Some of the challenges being encountered are the males and females are not coming online at the same time. Hormone induction research and cryopreservation work are currently being looked at as possible solutions

### 13. OMNRF At-Risk Mussel Culture (C. Wilson)

- Normandale and White Lake
- Mussels are one of the most at risk species in Canada. Experts have said to initiate culture and stocking now
- 30-35 species in Ontario
- Develop some ark populations for the future and develop techniques now
- Nothing being stocked at this time as policy
- Steps for culturing mussels:
  - Host fish (mostly darters) with gravid females must be obtained
  - Glochidia must be manually extracted, tested for viability, and then enumerated
  - Manually remove glochidia from marsupia and flush them out
  - Those that have conglomerates and pick them out individually
    - Break open glochidia packages
  - Viability testing and enumeration
    - Will it work or not and timing is everything
    - Most glochidia are 30-600 um
  - Host fish are then infested with 4,000 glochidia/fish, Glochidia go in first then fish then keep suspended
  - Infestation rate is then assessed – aiming for 100-300 glochidia/fish
    - Viability declines rapidly with time
  - Mussels are reared in a “mucket bucket” during the early rearing stage, and then in an upwelling system for the advanced rearing stage. Finally they are moved outside in a pond setting where they are able to benefit from natural food (increased survival when moved outside)
- Progress
  - 2012 – Did not work
  - 2013 – Wavy-rayed Lampmussel success with 200 still there
  - 2014 – WRL, Kidneyshell, Northern Riffleshell and Snuffbox
    - No success
  - 2015
    - WRL, Kidneyshell but issues with rest
    - 1500 WRL and 1200 KS
  - 2016
    - Have 8000 WRL and good success with Kidneyshell but issues with others
  - 2017
    - Focus on Snuffbox
    - Smaller river fish species
- Challenges:
  - Reliable source of host species and issues with species at risk
    - Biosecurity is an issue
    - SMB have fish lice issues which causes issues for glochidia attachment from mucus
    - Need better biosecurity
  - Microfauna
    - Zooplankton pest cause high mortality rates as they are missing feeding efforts
    - Redesign filter system to include UV and 1 um bag filter
    - Highly stringent drop off collection
  - Infestation Rates
    - Low numbers an issue

- Test inoculations, decrease times
- Long Term Nutrition
  - Persistent mortality
  - Trend similar between in and outdoor groups
  - Fertilize ponds and experiment with new feeds
  - pond buckets may be the solution
- Will sell some of their mussels to Environment Canada for testing
- RGB cause issues as there is no maturation but become a sink
- Can reuse hosts as long as hosts in good shape
  - Resistance can occur in hosts and immune responses

#### 14. EDC's in Grand River, Guelph (M. Servos, U of Waterloo)

- First reports in England of fish with oocytes in testes. Later intersex bass found across the United States
- Hormone mimics are binding to hormone receptors, making those receptors functional
- Estrone, estriol and BPA are being found in sewage treatment plants
- Likely anywhere where there are treatment plants
- Both the natural and synthetic hormones create the issue and are similar in shape
- Very low concentrations can cause the changes – 1 ng
- Whole lake exposure by Kidd et al 2007 caused the whole system to be turned on at 5 ng with population collapse
  - Is reversible
- The Grand River watershed is growing rapidly, lots of agriculture (runoff), urbanization, wastewater treatment and flood/flow control
  - 30 treatment plants
  - Some are 2<sup>nd</sup> and Guelph is 3<sup>rd</sup>
    - Kitchener is moving to 3<sup>rd</sup> with \$800 million upgrade from 2 days to 10 day solid retention
  - Drinking water intake
- High estrogenic equivalents found in wastewater effluents in the Grand watershed, with birth control being the biggest contributor
  - High estrogen levels in system
    - 16-20 ng at Kitchener
  - Complete sex reversals at 20 ng
- For the study, Rainbow Darters were used. They are a sentinel species for the Grand River watershed, abundant, rapidly growing, have a small home range and only live for 4-5 years
  - Tagged 3000 fish – 85% show no movement with a very few moving 100s of meters
  - Asynchronous spring spawners
  - Test by fractions – A lot of the contribution is from birth control pills
  - Examined gene expression
  - 20-30% of fish to 80-100% are intersex with viable eggs downstream of Kitchener
    - 7-10% of the males had eggs with many deformities
    - Secondary sex expression declines below Kitchener
    - Behavior in males aggressiveness is also seen
  - Community changes seen with some reduction in darters
  - Isotope signatures are clear from fish in system
  - Estrogens rapidly decline – DO increased and ammonia drops at Kitchener
    - With changes see dropping intersex

- It was found that the further downstream you go of the waste water treatment plant, the higher the occurrence of intersex in the Rainbow Darters (seeing eggs in male testes, and other gonadal deformities). The threshold for intersex has been determined to be 0.2 ng/L
- Gene expression of intersex is between that of a male and female, with secondary sex characteristics changing (color, reproductive behavior)
- Upgrades are now being implemented at the wastewater treatment plant in Kitchener and there have been noticeable changes. There has been a decline in estrogenicity in the effluent, gene expression has improved, and there have been lower levels of incidence and severity of intersex.
- Upgrades at the facility in Waterloo have been delayed, and as a result there are still high concentrations of estrogen in the effluent, gene expression has gotten worse and no decline in intersex

#### 15. Revitalizing Rome Strain Trout (A. Noyes)

- Asal – 1933 discovered
- In 1952, Rome trout strains were created for resistance to furunculosis
- Ehlinger completes strain comparisons in 1962
- Challenge fish in the spring of each year
- BNT – NJ Stream from 1962
- BKT – MD cross from 1962
- The Rome Lab maintains RL F1 stock of Broodstock. There are 3 strains before the fish are actually stocked out, which creates genetic bottlenecks (how long until domestication?)
- Imported fish from the south brought in an new isolate that created issues in 2014
- 2014 stocked fish study
  - Poor survival in wild
- Rome is primary broodstock location with highly domesticated stock
  - Highly inbred
  - Looked for wild Rome BNT fish – Found a local source – Oriskany Creek
    - Crossed wild males vs. domestic BNT females
  - Good resistance with cross over two generations
  - Holding fish for stream survival
- The main goal is to increase heterozygosity to increase disease resistance
- Feral Rome Lab Brook Trout still exist, could cross feral strain with domestic Brook Trout
  - Will furunculosis resistance still be there?
  - How will they survive in the wild?

#### 16. Cage Culture in Ontario (B. Burdick, OMNRF)

- The MNRF is the lead for aquaculture, and is responsible for issuing aquaculture licenses (Public Lands Act, Fish and Wildlife Conservation Act)
- Licenses:
  - can only be issued for species on Schedule B of the Regulations
  - With a license, you can buy, sell and transport fish
  - In order to culture species, you must complete a risk analysis
  - Mandatory disease and escape reporting
- Many Players
  - OMNRF does licensing
  - MECC does permitting
  - OMAFRA promotes the industry
  - NDM supports the industry
  - DFO works on Fisheries Act
- Land Based – 10% - 500 tons – 150 licenses

- Aquaculture in Ontario today is 90% cage based, producing 5,000 tons/year vs. 500 tons/year that is produced by land based aquaculture in Ontario
  - Most of the cage based aquaculture occurs in the North Channel of Georgian Bay, potential for industry growth
  - Net Pen – 90% - 5000 tons (\$28.8 mil) – 6 licensed (3 operators) / 3 First Nations with 5 new applications
    - RBT focus
    - Some experimental work with WAE (failed) and LWF (likely a success) at this time
    - 30 ha total maybe go to 45 ha
    - Mostly North Channel
    - Reviewing first new applications
    - First Nations
      - Treaty right to raise fish
      - Buzwah (2) on east Manitoulin Island
      - Bedford Harbor
      - No land lease permit at this time
      - Some consideration of sustainability
      - Processing is a bottleneck
        - Costco is biggest customer
          - HAACP for cages being pushed and BMP being required
          - Market driving First Nations
      - Lake Superior First Nations looking at it
      - Limited opportunities currently on Lake Huron at this time
    - Has economic growth potential
    - Eco-certification through Monterey Bay
    - New policies will be place in 9 months – Application Guidelines
    - Proper siting is the key
    - One site has been closed
      - Site rehab occurred over a 10 year period naturally
      - Another is likely to be moved because of water quality, particularly blue green issues
  - Requirements
    - Fish Health Mgt Plan
      - Minimize disease in the facility
      - No issues known at this time
      - MNR has disposal oversight at this time
      - Reporting – Reportable diseases and a few others
    - Fish Containment
      - Fully submersible designs from Norway being considered
      - Reporting escapes mandatory
  - Looking for long-term leases from MNR instead of LUPs usually 10 years
- There is lots of interest from First Nations groups. They currently operate 3 cage sites in the North Channel. They operate without a license, however the buyer is now requesting licensing from the processor and the cage sites
- There is a push from OMAFRA and the Ministry of Mines and Northern Development to develop and grow the industry. Application guidelines must be followed however in order to minimize environmental issues associated with expansion by ensuring cages are located in the right site
- Messages
  - Ontario supports environmentally, socially and economic sustainability for net pens
  - Guidelines are key
  - Collaboration needed to include First Nations

- One Facility in very deep water shown
  - Camera monitoring of feeding
    - Feed costs pushing efficiency
  - 100' net pens in 300' of water

## 17. Agency Updates

### Dave Meuninck (Indiana):

- Everything on track hatchery production wise
- LMBv in one water supply – Driftwood State Fish Hatchery – Starved Hollow
- Unknown morts of Walleye when trying to habituate on diet, losing 3% daily of 10,000 fish. Fish samples were sent to Purdue, no bacteria were recovered
- There have been a number of wild Carp kills on Rouch Lake in July. Seven fish were sent to Purdue, some gill lesions were found. No bacteria. KHV being evaluated.
- the first mass marking of fish at Dave's hatchery took place and went well, 60,000 Coho were adipose clipped
- Aqua Bounty bought Bell Aquaculture and wants to raise Atlantics which are genetically altered with Chinook gene from Canada

### Gary Whelan (Michigan):

- Updates were provided during the previous days presentations
  - Hatcheries' quiet
  - VHSv
- Will try to put in a central fish health site with yearly sampling – 10 sites/year: 5 inland, Great Lakes, and Lake St. Clair

### Kevin Kayle (Ohio):

- Fish health testing on all coldwater species was good
- 2 of 30 lots of Maumee River Walleye tested positive for VHS by qPCR, which is the same river in which the eggs are collected from. The eggs were isolated and the iodophor protocol was followed. The gametes tested negative for VHS
- Had a fish kill in lower Huron River (Gizzard Shads and Sunfish)

### Ken Phillips (USFWS):

- LaCrosse: future Lake Herring Broodstock brought into quarantine, doing well
  - Wild gametes to start production at JRFFH – Maybe ready this fall
  - Collecting more broodstock this year and did some testing with extra transporting fish to Hammond Bay from Genoa – 24 hours on truck
    - Extra fry will go to production
  - Some kind of flavobacterium causing lesions on the dorsal fin of Lake Trout in Jordan River (mortality has been minimal so far). Seems to happen a short time after going through the tagging trailer
    - Going to do some genetics work to see what it is
- Pendalls Creek NFH
  - Beaver removals with USDA
    - Reduced water flows with the creek
    - Low water flow last year and water temperature issue – Up 60s and 70s that brought on columnaris
- Lewis Lake Strain is moving to Iron River NFH from Saratoga NFH – Moved some future broodstock lines already

### Ling Shen (Minnesota):

- All coldwater hatcheries are good
- Vaccinated Brook Trout with Asal at the Crystal Spring Hatchery, went well



- The French River Hatchery is closed. There will be one more egg take from the steelhead Broodstock, and then those fish will be stocked
- First case of KHV fish kill (50-100) of Carp. They were able to send samples to Nick Phelps (even though samples were decomposed), and it was determined that KHV was the primary cause, and columnaris was the secondary cause of death
  - Nick Phelps can handle decomposed fish with his national CAR work
  - High titers found in CAR
  - Likely totals in the 1000s
- Fish kill manual has been finalized
- Currently, they are working on a bait importation issues (you can't import minnows into Minnesota). There was a push to import minnows from Arkansas; however that legislation did not go through. A risk assessment now must be completed (concerns are pathogens and invasive species)

#### **Kerry Hobden (Ontario):**

- There was a Gizzard Shad kill in Lake Huron (near some power plants), they were tested multiple times and came back negative for VHS (communicated with Gary regularly, nothing on the Canadian side)
- It's been quiet at the stations, until this past Thursday (July 27, 2017). The North Bay Station had their 5<sup>th</sup> case in 16 months of what looks like *Y. ruckeri* in the Brook Trout. Mortality remained lower this time, fish were treated with halamid, and the case has now been deferred to Veronique
- Normandale Fish Culture Station had a coldwater disease outbreak in their Atlantics when they moved them from early rearing to advanced rearing (temperature difference was 4°C). They worked with Veronique and had to treat with florfenicol. May look to prophylactic treatments in the future, hydrogen peroxide (100ppm for 60 minutes for 6 weeks, what's used and seems to work for Brook Trout)
- Possibly sending Brook Trout to Minnesota (Title 50)
- Imports
  - LAT-Seneca Lake - NY
  - Sebago Lake ATS – NY

#### **Andy Noyes (New York):**

- The Muskie population has not recovered since VHS in St. Mary's River, either due to VHS or from over testing
  - Sampling may have hurt population
  - 10% of population size now
  - May try to collect wild fish then move fish to Bath SFH
  - Cytopathic effect seen early in multiple cell lines then disappeared – Nothing known
  - During EM
  - Risk assessment was 790 and holding them on the island in SLR
- Essex County Hatchery, which has been an A-class hatchery, got furunculosis. Fish were treated, and recovered well
- DHS storage of hydrogen peroxide

#### **18. Upcoming Meetings**

- Pennsylvania to host Summer 2018 meeting August 1<sup>st</sup> and 2<sup>nd</sup>, 2018
- Winter 2018 meeting to take place in Ohio on February 6<sup>th</sup> and 7<sup>th</sup>, 2018

#### **19. Tour – OMNRF Normandale Fish Culture Station**