Invasive Catfish Workshop

January 29-30, 2020

VCU Rice Rivers Center
3701 John Tyler Memorial Hwy
Charles City, VA 23030

Workshop Summary

Purpose

To bring together stakeholders to develop collaborative solutions that address workgroup objectives and contribute to a management strategy that will guide state management plans.

Workgroup Objectives

To coordinate, synthesize, and communicate scientific research on the ecological and economic impacts of invasive catfish in Chesapeake Bay, and develop a science-based management strategy that balances the economic interests of commercial and recreational fisheries with Chesapeake Bay ecosystem health.

DAY 1

Invasive Catfish Ecology and Research

- Smaller blue catfish primarily eat bivalves, amphipods, chironomids, plant matter, blue crab, bay anchovy, eels, shad, herrings, and white perch
    - Similar diet to native white catfish (at mid-size, primarily eating bivalves)
    - As blue cats grow, they become more piscivorous
    - Blue crabs are eaten in higher salinity regions of the Bay
    - Larger fish feed on alosines in fresh water during alosine migrations
    - Diet varies by size, season, and location in the Bay
- Flathead catfish diet is dominated by white perch and river herrings
- Salinity and water temperature are the primary environmental factors that affect blue catfish distribution and movement
    - Prefer fresher waters and higher water temperatures
    - Mostly found in tidal fresh areas, but frequently move to other parts of the Bay
        - Lower Bay and other high salinity areas are more accessible during wet years
    - Larger fish tolerate higher salinities better than smaller fish
    - Can survive salinities up to 15.7 ppt for up to 72 hours
- Estimated blue catfish density in the James River = 544 fish/hectare
- Blue catfish spawn in the Bay from May – July
    - Produce large eggs and provide parental care, improves chances of survival
- Contaminant concentrations vary by location and fish size
- Caution: reduced densities might reduce population impacts, but increase growth rates and reproduction (compensation)
- Commercial low-frequency electrofishing (LFE) potentially a great tool for large-scale commercial fishing
    - Experiments suggested it's an effective/efficient, targeted sampling method
        - No other fish species are caught with this methodology
    - VCU using drone technology to rapidly and accurately count blue catfish

        - Training AI to identify and measure catfish in drone images to compare abundance estimates from LFE hand catch
- Blue catfish growth has slowed over time in VA tributaries with increased abundance/density
    - Growth doesn't appear to be slowing for flatheads

Science Needs

- Identification of spawning and other aggregation areas
- Abundance data in MD to track changes over time
- Better understanding of movement and connectivity between tributaries
- Development of population models for each tributary
    - Stock-recruitment relationships
    - Size and age structure
    - Environmental effects on reproduction, recruitment, etc.
- Detection probability and efficiency associated with fishery-independent surveys
    - Identify factors associated with catchability for LFE
- Better understanding of the human dimensions related to invasive catfish

Management Updates

VMRC:

- Approved LFE commercial fishery for blue and flathead catfish w/ strict regulations
    - One license in James, Pamunkey, and Rappahannock
    - Working with VDGIF to conserve the recreational fishery
        - Commercial remove smaller fish, keep larger fish for recreational anglers
- Want to increase harvest but at a sustainable level
- Highest need is increasing market demand
- Removal/revision of USDA inspection process would improve processing abilities

VDGIF:

- Blue catfish angling has become a popular, multimillion dollar industry
- Understanding the human dimensions and having appropriate stakeholder representation in the management strategy is key
- Need to focus on finding common ground and viable, realistic solutions
    - Set a goal/target based on the "ideal ecosystem" and see what we can do to reach that level (e.g., population size in 2002)

PRFC:

- Stakeholders and community are concerned about the high biomass of catfish in the Potomac
    - Particularly the interactions with other important, native species (e.g., blue crab, alosines, striped bass)
- Extirpation doesn't seem possible at this point, we need to focus on suppressing the population

DOEE:

- No commercial fishery for invasive catfish in DC, just focused on research locally
- Interested in addressing the spread of invasive catfish but struggling with the lack of a fishery and lack of jurisdictional pressure
- Greatest concern is developing a control strategy that places value on an invasive species

MDNR:

- Conducting a tagging project to identify spawning areas
- Biggest priority is getting population estimates in MD tributaries
- Currently working on developing an FMP for all catfish populations in MD
- Have used LFE and caught low numbers of other small fishes (e.g., white perch, shad, eels)

DNREC

- Concerned about threats to native species, particularly alosines in the Nanticoke
- Currently illegal for anglers to transport invasive catfish and they are required to report catch
- Highest needs are staffing and funding; need to have a team dedicated to this issue

PFBC:

- Primarily dealing with flathead catfish at this point
- Started developing a monitoring program for invasive catfish populations and conducting other research
- No commercial fishery, primarily focus on recreational angling (liberal harvest limits)
- Adding/adapting management plans to include invasive catfish
    - Want to increase harvest and open up gear options
- Highest priority is to work with dam operators at Conowingo to limit blue catfish introductions while keeping anadromous fish passage high (e.g., alosines)
- Trying to limit the spread of flatheads into other tributaries and regions
    - Spread has slowed but don't know why – trying to figure this out
- Interested in educating anglers and the public about invasive catfish impacts and how they can help keep the population in check

<u>Fisheries Updates</u>

Recreational:

- Anglers are switching to catfish with changes in striped bass regulations
- Working to get more people interested in angling for catfish
- Need to improve marketing
    - East coast is not as interested in catfish consumption as the south
- Should harvest smaller fish for consumption and save the larger fish for angling
- Big money in catfish angling/guides
- Recreational fishing is a good way to maximize use of the resource

Commercial:

- Keeping the population in check is important
- Highest priority is increasing marketing and consumer education
- The more profitable the market, the more watermen will target them

<u>Processing Updates</u>

- Reliant Fishing has worked to improve marketing and increase demand for blue catfish
- Highest priority is keeping the fishery sustainable and continuing to market the product
- Catfish are now under USDA's jurisdiction and inspection (since 2017)
    - Learning the issues around invasive catfish and how to help in terms of processing

Marketing Updates

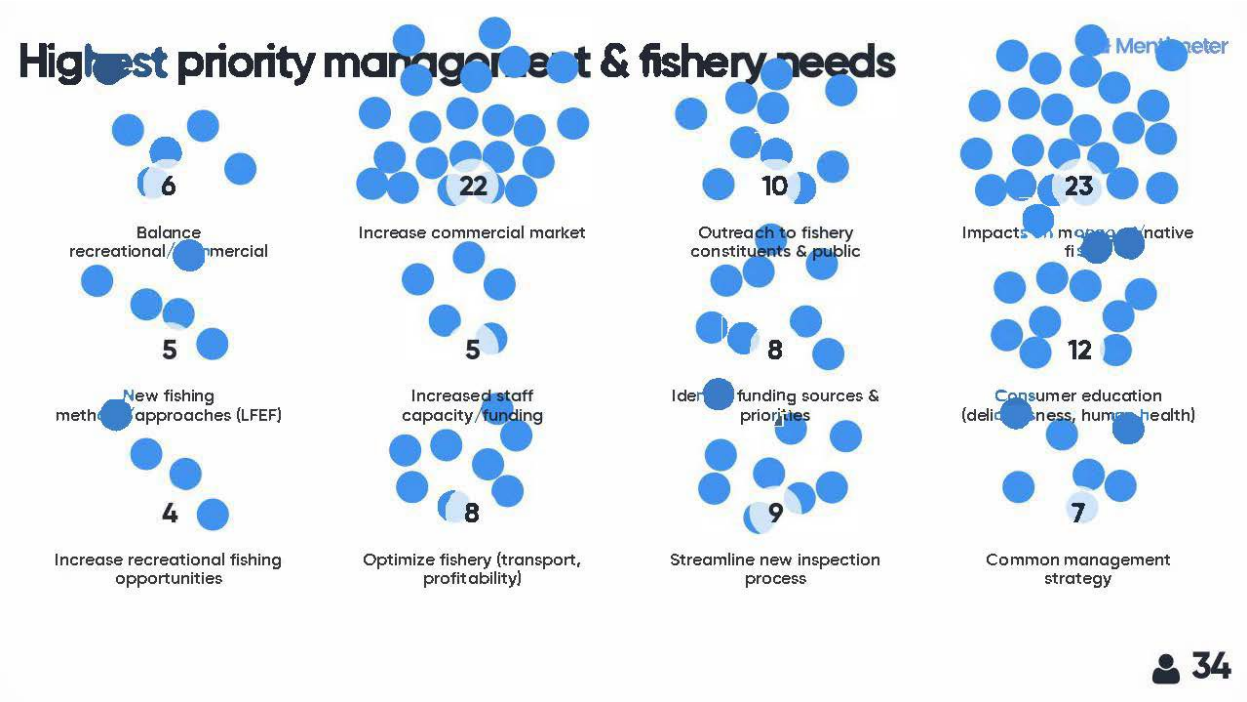
- Wide Net Project has been spreading the word about invasive catfish since 2013
    - Provide food for underserved communities and work in environmental literacy/conservation
    - Focusing on ecologically and economically efficient methods of distribution around the country, and providing locally-sourced fish as opposed to Chinese imports
        - Want to move fresh fish around the coast with other seafood
    - Working with trucking companies to distribute fish
- Blue catfish are readily available, just need to put the fish on the market
- Lost small processors with the new USDA inspection
- Need expand the market and increase the number of processors
- Will be sampling blue catfish fillets at the International Seafood Expo in Boston this year
    - Good way to market and create more demand

Conservation/Other Updates

- Chesapeake Bay Foundation is interested in education programs to bring awareness of the ecosystem impacts of invasive catfish
- Want to provide more economic benefits while reducing impacts on native populations
- Pamunkey Tribe is interested in the impacts on native species, particularly American shad
    - Have a shad hatchery on Pamunkey to promote restoration
    - Want to develop partnerships to conduct studies
        - Federal funding available for Indian tribes, just don't have in-house expertise
        - Planning to hire an environmental/fishery expert
- The Nature Conservancy is interested in impacts on native species and maintaining ecosystem balance
    - Investing in impact solutions and research
- MD Sea Grant interested seafood education and consumption
    - Top priority is consumer education for nutritional benefits and contaminant concerns
- VA Sea Grant doing nutritional studies on the nutritional value of catfish fillets which will be helpful for marketing
    - Soon be able to release results as well as contaminant information
- Invasive species are a priority for PA Sea Grant, focusing on outreach and research to support management decisions
    - Partner with agencies, conservation groups, and private stakeholders
    - Developing invasive species guides, management plans, and rapid response plans
    - Providing funding support for research (40% of budget)
    - Looking at age/growth/diet of flathead catfish
- USGS is interested in investing in the Chesapeake Bay Program and Bay Agreement
    - Particularly interested in biological threats that jeopardize restoration efforts in the Bay
    - Developing science/research plans for the new fiscal year based on priority needs

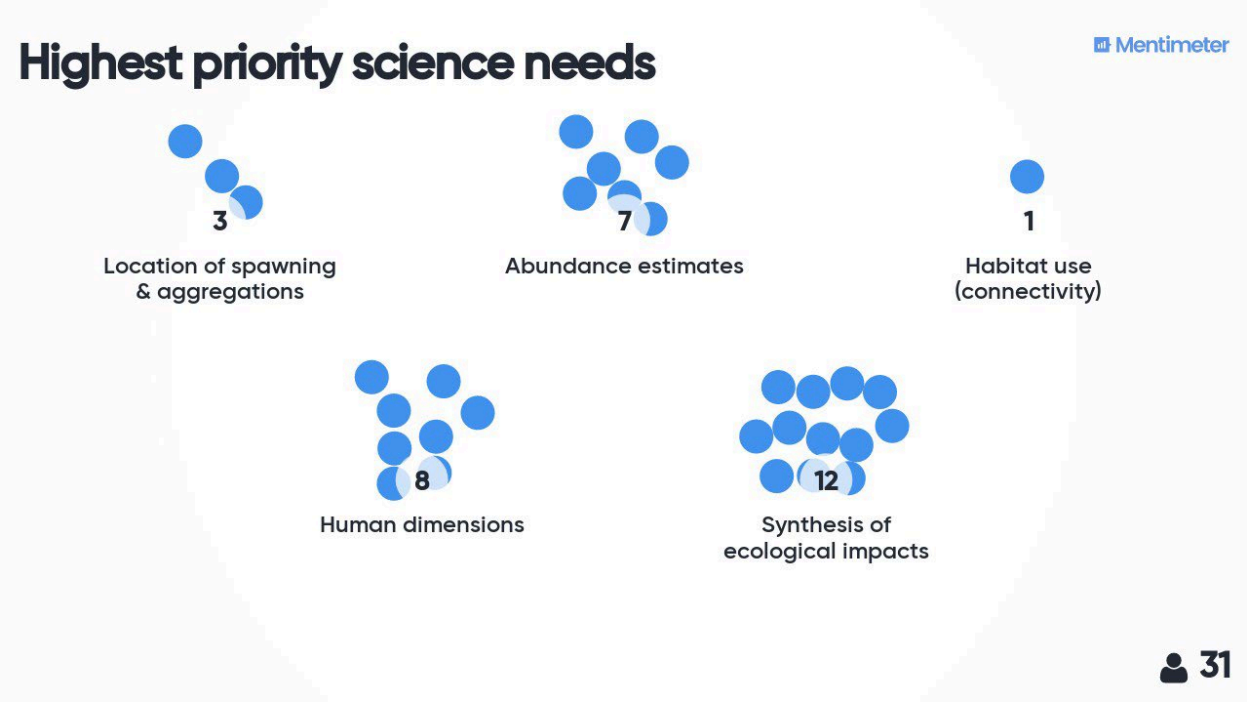
Highest Stakeholder Needs

Fisheries/Marketing:



- Wide Net Project uses fish under 10 lbs based on healthy/safety regulations for consumption
- Important to understand the economic value of larger catfish as a trophy/recreational species even if they are not suitable for consumption
    - VDGIF management strategy protects larger catfish for the trophy fishery
    - **Need to develop a sustainable fishery that benefits both commercial and recreational fisheries**
        - Seems plausible given that commercial industry wants fish 8-10 lbs
        - Would be helpful to have consensus on this goal across the board
        - **Exploit the recreational fishery while taking out as many fish as possible with the commercial fishery**
            - **Reducing high density in tributaries will improve growth benefiting the trophy fishery**
- Bigger fish eat more; need to examine the economic value of large fish and their impact on the ecosystem due to predation
    - Biggest concern is impacts on native, protected alosines; haven't been able to evaluate alosine population trends with blue catfish trends
- Need to increase the volume of commercial harvest on invasive catfish
    - Need to increase commercial market to optimize the fishery
- USDA inspection process is creating a barrier in the market
    - Need to find a more feasible way to provide inspection for processors
    - **Create flexibility in the inspection process for wild-caught invasive catfish**

Science:



- Understanding and sharing contaminant information should be a science/outreach priority
    - Need this science-based information to support marketing strategies that encourage people to eat more blue catfish
- Need population models to optimize fishery removals and understand the extent of ecological impacts
- Corbin Hilling (VT) is currently working on a size-based catch-at-age assessment model
- VMRC is interested in getting funding for sampling catfish

<u>Challenges to Success Breakouts</u>

Science:

- **Need population models and management strategy evaluations for each tributary**
- **Need to keep track of ecological impacts using methods that can be compared**
    - **Develop indicators to track ecosystem response**
        - **Report card every 2-3 years that show major activities/impacts**
- Need good sampling of commercial harvest by age/size
- Lacking clear, objective management goals (i.e., reference points)
- Lacking time series with standardized data
- Sterilization of trophy fish (e.g., Trojan-Y) as a supplement to removal
- Need to identify/evaluate tradeoffs between commercial and recreational fisheries
    - Need better understanding of the economic value of catfish for both commercial and recreational fisheries
- **Synthesize known impacts of blue catfish on native species**
- Collaborate with USGS to determine their research capabilities and coordinate with them based on university capabilities

Management:

- Lacking data on abundance and population structure
- Don't have programs set up to deal with invasive catfish
    - Lack of funding and staff (across the board)
    - VA management is split between VMRC and VDGIF
- Don't fully understand impacts and distribution of flatheads in PA
    - No commercial fishery in PA
    - PA may still have a chance at fending off blue catfish, but priority is now with flatheads
        - Don't want to lose that in developing a management strategy
    - Flatheads will be a problem for VDGIF as they spread
- **Need population models to set reference points that would be useful**
    - Need to know where we stand and where we need to go
- DE needs more information about blue catfish in their tributaries
    - DNREC may partner with Dr. Aaron Carlisle at UDel to conduct diet studies in DE rivers
- CBSAC interested in expanding focus beyond blue crabs – also work on blue catfish?
- Various agencies conducting angler intercept surveys to quantify the economic value of the recreational fishery
- **Need population estimates of native species to determine impacts of invasive catfish**
    - MDNR has information for Patuxent River, but lacking for others
    - VMRC uses VIMS trawl survey data for such comparisons
- Fisheries managers always talk about the problems with invasive catfish; need to be cautious and better understand where the other side is coming from (anglers)
    - **Need to educate anglers about population dynamics and the benefits of harvest to improve the recreational fishery (density-dependent growth)**
- Need to encourage people to eat blue catfish that are caught or find someone who will
- Need to launch an effective invasive species campaign (primarily toward anglers) to prevent people from moving the fish around
    - Currently illegal to transport live invasive species in DE
    - Can't release fish outside of where they were caught in VA
- Some limitations to increasing recreational angling across the jurisdictions
    - PA has hook and line limits for all recreational fisheries
    - VA doesn't allow fish trotlines
    - MDNR has changed regulations to allow bowfishing for snakehead; maybe do the same for invasive catfish
- **Need to develop management plans**
    - VMRC is interested in a regional management plan
    - DE setting up an aquatic species management plan that will include catfish; couple years down the road
    - Long process to develop a management plan and then it has to be approved
        - There could be a political barrier to approval, particularly for VMRC and PFBC

Fisheries/Marketing:

- **Need a stable, sustainable supply of fresh fish**
    - Need population data to set harvest to ensure steady supply
    - Limited by processing capabilities
    - Can't realistically supply fresh fish year round; need for frozen supply
        - Requires education to change behavior on fresh/frozen preference
        - Wide Net Project freezes more; good quality

- **Need nutritional facts for blue catfish**
    - Just getting lab results back; will soon be released by Sea Grant
        - Could be incorporated into USDA sampling
- States are in agreement that we can't eradicate blue catfish, but we can remove biomass through commercial fishing
    - Need to optimize removal while selectively removing smaller fish
    - Reliant Fishing Co. primarily handles fish 2.5-10 lbs, less than 1% are 30 lbs
    - Biggest challenge is getting more people to eat blue catfish
- **Need flexibility with the USDA inspection requirement**
    - Cut catch by 1/3 to abide by regulations
    - Constrains processing time (no weekends, holidays)
    - Lost smaller processors due to the regulation changes
        - Too expensive to bring them up to standard code for USDA approval
    - Can we get an exemption for wild-caught fish?
        - Now have data to show the spread of invasive catfish and their ecological impacts
    - Legislation in the house to return blue catfish to FDA control
    - Could establish a co-op under specific restrictions to establish a common inspection place for processors (something similar done in FL)

Conservation/Other:

- **Need more scientific data to make informed decisions**
    - Want to keep trophy fish, but don't know how ecological impacts change as blue catfish age (i.e., increased predation)
    - What are the reproductive differences between small and large blue catfish?
    - Evaluation of contamination on more market products to understand consumption risk
        - Particularly for different methods of preparation (i.e., fillets vs. whole frying)
        - Lots of funding needed for this effort
    - Understand population dynamics to develop a sustainable fishery
- Struggle to reconcile promoting invasive catfish consumption – how do we determine if a species is labeled invasive vs. non-native?
    - Invasive species cause ecological or economic harm, but those definitions are also loose
    - Not going to be able to eradicate at this point so may as well do what we can to get the population to manageable levels
        - Need to encourage recreational angling for consumption
            - Encourage trophy anglers to keep the smaller fish they catch (under 25cm)
            - Be wary of regulations though; illegal to keep invasives in PA
- **USGS has RFPs for invasive species; blue catfish is becoming a priority issue right now**

Opportunities to Address Challenges

Science & Data	
Challenges to Success	**Opportunities/Actions to Address Challenges**
● Need nutritional information to assess risks for different groups of people ● Lack understanding of population dynamics (size/age structure) ● Need time series of data and abundance estimates for baseline/targets ● Need to quantify the economic value of recreational fishery ● Need flathead catfish data ● Mismatch between sampling in salt vs freshwater areas - challenge to standardize data across the Bay ● Need population models for individual river systems ● Should conduct management strategy evaluations ● Develop a scorecard of where catfish are or could be based on conditions ● Lack understanding of impacts on native species -- can observe prey items, but hard to put an absolute value on declines caused by catfish ● Need scientific data to back up marketing efforts	● Can use eDNA for rapid monitoring ● Inflate population with males to lower reproduction ● VIMS nutritional study ● Opportunity to work with USGS to fund population estimate studies - develop research plan with USGS

Funding	
Challenges to Success	**Opportunities/Actions to Address Challenges**
● Cost to meet USDA specifications ● Lacking money and workforce to collect data needed ● Funding science for population dynamics and nutrition ● Funding toward marketing and outreach	● USGS RFPs ● MAPAIS small grants for invasive species ● TNC interested in investing in solutions/research

Policy and Regulations	
Challenges to Success	**Opportunities/Actions to Address Challenges**
● Harvesters could catch more, but USDA protocols constrain catch ● Facility specifications may limit who can cut fish, limited hours, holidays ● Fishers bound to processors schedule ● Gear and harvest limitations ● Need FMPs and regulations that include invasive catfish ● No clear management objectives to inform what science is needed -- reference levels to target	● Need to be clear about our objectives and what we want; need to have an exit strategy - what do we do if the fishery gets smaller down the road and there's a public outcry (diversification strategy for rec fishery) - state FMPs ● USDA can bring invasive catfish issues to administration to potentially create flexibility in the inspection process for wild caught blue catfish in the Bay ● Engage in discussions with senior leadership in Bay states about carving out invasive catfish from the Farm Bill ● Conduct an economic cost analysis post-inspection to inform legislative processes

Communications	
Challenges to Success	**Opportunities/Actions to Address Challenges**

● Consumer education
  ○ Blue and flathead catfish are delicious - go fishing for catfish
  ○ Limited desire by consumers for frozen catfish product
● Loss of generational fishing knowledge, limited number who can catch fish
● Understanding of contaminant risk vs nutritional value
● More outreach with anglers - awareness of role in keeping population in check
  ○ Open communication about regulations and reasoning
● Messaging impacts on managed native species – why should we be targeting them for consumption
● Prevent moving live invasive species
	● MDA promoting catfish specifically with recipes, consumption/purchase choices
	● CBP work with the VA Marine Products Board on messaging for safe consumption, health, preparation, etc.
	● Agree on branding/messaging (wild-caught Chesapeake Bay blue catfish) between marketing and processing and fishermen (across the industry)
	● "Meet the Fleets" opportunity to hear the stories from captains and see chef preparation demos
	● Promote blue catfish consumption at festivals around the Bay
	● Catfish tournaments or contests - keep in mind, don't want to create a sport fishery that you'll have to manage
	● PRFC Facebook page / social media plugs

Day 1 Key Takeaways

- **Agreement that we can balance benefits for commercial and recreational fisheries**
- **Shared management strategy, with specific objectives (fishery removals)**
- Stable supply and consistent product
- **Bridging existing information on nutrition and consumer perceptions with marketing, outreach, and education strategies**
- Consistent branding across states
- Economic analysis of impact of USDA inspection => conversation with state governors & USDA leadership
- **Synthesize and communicate ecological impact of blue catfish, particularly impact on abundance of other species (Scorecard)**
- Funding for marketing & communications, in addition to science gaps (priorities)
- Building flexibility into USDA inspection process; identifying creative processing solutions
- Population dynamics and models to inform management
- Economic analysis of recreational fishery
- Sustainability model for a commercial fishery

DAY 2

Day 1 Recap Comments

- Foreign investors (mainly China) interested in purchasing blue catfish from MD, but didn't want to start new fishery import unless they knew the population abundance could sustain the investment
    - Investors are in it for the long haul – need to know the resource will last longer than 2 years
- Each tributary's population is different; maybe think about ways to develop a robust population estimate by adding up abundance from each system
    - Come up with other methods to estimate population size
- Commercial data (yield) could be another method for providing information about population sustainability
- Need age and size structure information to conduct stock assessment and estimate productivity ASAP

Incorporating Solutions into Management

MDNR:

- Just starting to put together a catfish management plan that inclusive invasive species
    - Once developed, needs to go through MDNR peer review, sportfish association review, public comment, and then the secretary signs off on it
- Will be meeting in February 2020 to develop a timeline for the management plan
    - Want to incorporate important ideas from this workshop
- Catfish won't be gone in 10 years, but hope that it's a more manageable fishery that benefits both commercial and recreational fishermen

Question: What happens if one system in MD gets fished out? Need to have a plan for access

    - Could initiate short-term management actions based on thresholds that represent the status of the population in a system?

VMRC:

- VMRC doesn't have management plans; management is based off ASMFC/MAFMC plans
- Interested in an inclusive, cooperative, Bay-wide plan (or at least state-wide)
- In 10 years, want to see reduced population size, especially in brackish waters, but still enough to support a recreational fishery
- Want to monitor juveniles and subadults to maintain their levels and sustain the fisheries
- Want to develop fishery targets that will sustain both commercial and recreational fisheries
- Key point: keep it sustainable and work together

VDGIF:

- Committed to working with VMRC to develop a management plan
    - 2-3 years away from getting a plan out
- Workshop has been useful in hearing different perspectives and concerns
- Recognize the need to do something about invasive catfish
- Important to determine where we want to be (reference points) and work toward that goal
- Want to see decreased abundance, a vibrant recreational fishery, and no range expansion

Question: What about flathead catfish?

- No economic value for processors – difficult to process and unattractive color
- Good sportfish due to their size, but that's probably it
- Get processed into catfood if brought to Reliant Fishing Co; no market for them even if they are good to eat
    - You'd have to convince people to choose it over other better options
- Educate consumers about natural coloring so they're not turned off
- Maybe other countries/cultures would have a different viewpoint and would be interested in the product

PRFC:

- Haven't been developing management plans; just following ASMFC/CBSAC plans
- Would advocate for a collaborative management plan for the Potomac River
- Don't get a lot of input from the recreational fishery, but can work with VDGIF on this
- Would to address concerns about the impacts on other resources in the next 10 years
- Would like to see invasive catfish populations suppressed with guidance from science and management
- Want to work with recreational and commercial fishermen to develop the fisheries

DNREC:

- No plans to develop a specific FMP for blue catfish, but developing an aquatic invasive species management plan that will include invasive catfish
    - Planning process will probably take 5 years to complete
- In the next 10 years, want the population to be manageable to reduce impacts on native populations
- Want to expand the recreational fishery in the upper Nanticoke River
- Plans to conduct blue catfish research for better understanding of populations in DE
    - Particularly interested in impacts on shad/herrings

Comment: Also need to be aware of potential impacts on endangered sturgeon; found genetic evidence of sturgeon in blue catfish diets

PFBC:

- Plans to update the state-wide catfish management plan for 2022
    - Workshop will guide recommendations for upcoming management plan
    - Flathead recommendations include alternate gears, creel limits, and increasing angler interest
- Monitoring catfish populations for long-term abundance
- Have a PR campaign to educate the public and anglers about invasive catfish
- Blue catfish have not yet been established, want to keep them out
    - Working with Conowingo dam operators to prevent blue catfish passage
    - Also working with the Susquehanna River Basin Commission
- In 10 years, want to see the flathead population maintained and ideally reduced through angling and consumption, and to prevent further range expansion

<u>Collaborative Solutions and Strategies</u>

Balanced Fisheries:

- **Max size for LFE commercial harvest in VA (25") was determined with input from anglers and processors**
    - Went from being contentious to "we can do this easily and please everyone"
    - Built a lot of trust in the process by being collaborative and inclusive
    - Some concern about LFE affecting other species, but does not appear to be an issue
    - LFE limited to certain seasons and environmental conditions
    - One LFE license per river; can't have tons of people doing LFE in same river, no longer vulnerable to the gear
    - Size cut offs in VA would not be good for processors and commercial fishermen in the Potomac River
        - But we need to compromise on size limits from all sides
- LFE could be a turn off from marketing point of view; concern about not being fresh (lack of understanding about LFE) - MSC certified, tell how fish are caught
    - Need to get an audience with MSC to get LFE on the list for certification to sell to Kroger/WholeFoods
- Commercial fishing is the only viable solution to improve the recreational fishery
    - Removing biomass/density increases growth rates
    - Seafood industry can also make money
- **Need to consider the different priorities, insights, and fishing locations of the commercial and recreational fisheries**
    - Recreational primarily in fresh water; commercial in brackish
    - Need to understand the human dimensions to develop a balanced management strategy
        - Concerns about enforcement and tensions between commercial and recreational watermen
- **Finding trusted voices within the fishery communities is key for sharing information**
    - Recreational anglers are not well-organized or sustained; lots of fragmentation within the community
    - Need an influencer/leader in the recreational community to lead the campaign for recreational interests

- **Need to have tributary-specific management strategies**
- MD has seen decrease in angler engagement, but not VA
    - Largemouth bass may be the most vocal group in MD in terms of conflict of interest
- Need to determine how many fish we need to pull out to have an effect
    - Current harvest levels are not enough to maximize yield or reduce sustainability
    - Research viability of fishery methods and marketability

Management Strategy:

- Invasive has a negative connotation; need to be able to explain why they're bad
    - Don't have the data to back up their impacts on other species
    - Blue catfish grow well in low food conditions (e.g., Patuxent River)
    - Use consumption rates and population estimates to determine ecosystem impact
    - Data from other regions may be useful for answering questions about impacts
        - Ex: Metabolism/growth rate info from VA can be used to justify MD issues
- Need a better understanding of life history (i.e., spawning, maturity, reproduction)
    - Need to plan around spawning grounds, etc.
- Tributary-specific management plans; collaboration is key
    - Each system has its own growth rate/density/abundance
- Get feedback from Midwest managers on how to deal with invasive catfish
- Need the science to set the goals – what is our starting point?
    - **Want populations to sustain commercial and recreational fisheries while decreasing ecological impacts**
    - Managers need to decide on justifiable population targets
        - Ex: 2002 population had reduced abundance but high growth rate, which could support a sustainable fishery
    - Could look at relative abundance of fish communities within a specific interval to determine where we want to be – could work off indices we already have
        - Commercial catch data would be difficult to use due to varying effort
- Need to start collecting catch-at-age information
    - VIMS and VMRC can work together to set up this sampling program
- Need to build trust between managers/scientists and fishermen
- Could use the Chesapeake Bay Program's Fisheries Goal Implementation Team to narrow down management objectives
    - Managers and scientists set reference points?
        - Develop tributary-level population goals and then sum for total target population for the Bay
        - Managers need to work internally to pull together and organize their data/interests/concerns

Science Synthesis:

- **Summarize everything we know about impacts from various studies (6m-1yr)**
    - Not as much known about flathead catfish, focus has been on blue catfish
        - May be harder to fund research for flatheads given interest in blue catfish
    - List species affected by invasive catfish through predation, emphasize managed species
- **Develop multimedia products (storymaps, videos, etc.) to educate stakeholders, the fishing community, and the public (1yr)**
    - Video interviews with commercial and recreational fishermen

- **Develop scorecards to indicate the status of each tributary in terms of blue catfish invasion (2-3yr)**
    - Identify factors to include in scorecard (i.e., habitat, predation, population size)
        - Hold workshop with scientists/managers to determine what's most important and if we have the data to address those factors
            - Competition for forage?
            - Resuspension of contaminants/water quality?
            - Vegetation presence/abundance? (potential seasonal impact)
            - Distribution of native species habitat?
    - Develop criteria/rubric for index scores
        - Need different perspectives to agree on a common scale (economic vs. ecosystem)
    - Target audience for scorecard would be management planners
        - Want to improve ability to manage resources
    - Use scorecard to track changes in tributaries over time
    - Reports for blue catfish and flatheads should be separate
- Educate the public and anglers in uninvaded areas to raise awareness and prevent expansion
- Focus on consistent messaging and communication of research/science
- Collect more data by working with processors (i.e., observe gut dissections)

Marketing/Outreach:

- **Raise consumer awareness to increase demand through a new marketing campaign**
    - Need different messaging formats to target different audiences
    - Need consistent branding; Chesapeake Bay blue catfish; wild-caught, local, sustainable
- USDA inspection could encourage consumers to buy certified products
- Develop nutritional panel for final product labels
    - Sample various sizes/locations to determine variation in product composition
        - Current nutrition/contaminant don't provide the full picture
    - Add location caught to labels?
        - Too difficult to ascertain information from watermen
- USDA inspection process is limiting processors in the market – can we get more interest if we create more demand?
    - Reliant Fish Co. sells to WholeFoods and other independent companies
- Collaborate with organizations on the marketing campaign and other educational programs (i.e., food fairs, samples, booths, etc.)
    - CBF has an assessment on public perception
    - Sea Grant has resources to develop marketing materials

<u>Taking Action</u>

- Putting all the information from the workshop into a CBP management strategy format
    - General consensus that the format will work for everyone
- Management strategy is very high level
    - Build the workshop discussions into the document
    - Has to be put into the context of the ecosystem
- Suggested first draft complete by early March, followed by month of review/feedback, and then final edits
- Want to keep up the momentum by having timely workshop meetings; need to determine how the ICW will move forward/work to complete the goals/objectives in the management strategy

- Maybe create active subgroups of interest (i.e., marketing/branding, science needs, nutrition, communication) linked to management approaches

Use one word to describe how you are feeling leaving this workshop: