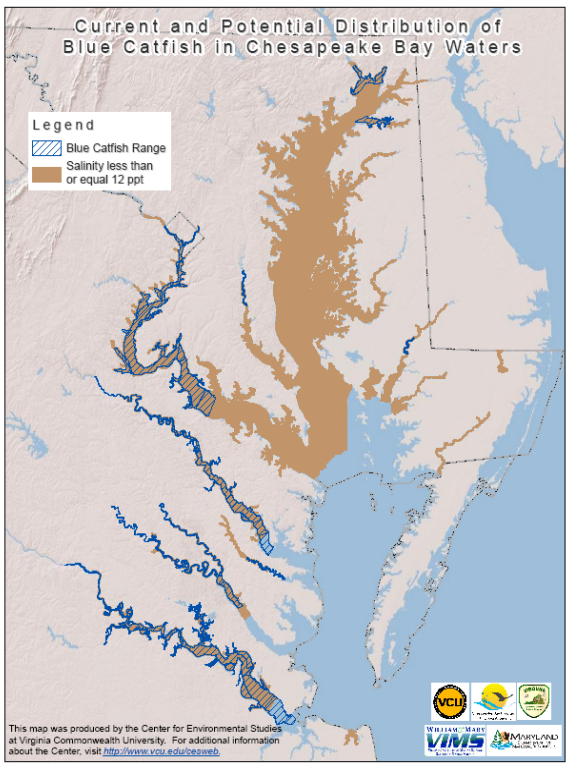
Alternative Management Actions for Limiting the Ecological Effects of Invasive Blue Catfish and Flathead Catfish in Chesapeake Bay Waters

Recommendations of the Catfish Working Group

The establishment and ongoing expansion of non-native, predatory catfishes—specifically blue catfish and flathead catfish—that live for 30+ years, grow to large size, and may represent a novel apex trophic level in Chesapeake Bay waters (MacAvoy, et al. 2009) has been well-document by biologists and commercial and recreational fishers in recent decades. Introduced to Virginia waters in the mid-1970s, blue catfish may eventually occupy the upper Bay and many of its tributaries, based on a relatively high salinity tolerance (Figure 1) and other biological traits that favor dispersal and establishment (Schloesser, et al. 2011). Flathead catfish may have a comparatively lower potential to become established in estuarine habitats but are capable of dispersal into tidal and nontidal freshwater and oligohaline habitats (Bringolf, et al. 2005). The potential ecological effects and economic costs associated with further expansion of both species in Chesapeake Bay will be addressed elsewhere.

However, a Catfish Working Group has been formed in response to concerns about the possible impacts of invasive catfishes. The Working Group has developed a range of policy options for consideration by the Fisheries Management GIT. One of those options—*eradication*—is unlikely to be successful in scenarios that do not meet a well-accepted set of conditions (Policy Option M2; Clout and Veitch 2002). We do not believe that the current situation conforms to any published examples of successful eradication of invasive species and suggest that eradication is not a viable option for tributaries other than those harboring small, recently-established populations. The other end of the policy option continuum—M1: *no action*—may also be untenable, given the potential for harm that invasive catfishes represent to the Chesapeake Bay ecosystem and to the ecosystem services the Bay provides to the region.



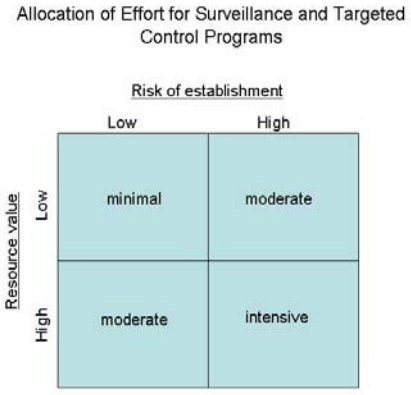
Although eradication of blue catfish and flathead catfish in Chesapeake Bay waters should be considered a highly unlikely and very costly option, surveillance and targeted control (Policy Option M3) of invasive species has been accomplished elsewhere under specific circumstances and may be a reasonable alternative in the present case. Program success would be defined as the demonstrated ability to reduce or mitigate one or more ecological impacts associated with invasive catfishes below thresholds defined *a-priori* for targeted systems. Specific strategies and tactics under Policy Option M3 follow:

1. Forecasting

1.1 Invasive species expansion moves through distinct stages (e.g. transport, establishment, integration) and different biological, environmental, and societal traits are known predictors of a species' success at each stage (Marchetti, et al. 2004). Using published models for other invasive fishes as a guide, develop appropriate (biological, etc.) databases for nonindigenous blue catfish and flathead catfish, and identify relevant geospatial data layers (e.g. stream and river impediments) for the region.

1.2 Use these datasets to develop habitat suitability models and GIS-based predictive models of future catfish establishment and expansion within Chesapeake Bay waters in order to prioritize the potential overall risk (threats assessment) to specific locations and subwatersheds.

1.3 Conduct further geospatial analyses to integrate forecasting outputs (probability of establishment or expansion, 1.2) and known, high-value resources (e.g. river herring spawning locations) into a decision support tool for the region (*sensu* Williams et al., 2008). Economic or contingent valuation should be included in such an analysis.



2. Surveillance

2.1 Evaluate a range of known surveillance methods and tactics for surveillance of invasive species including: DNA 'barcodes' and metagenomics (Armstrong and Ball 2005); integration with monitoring and stock assessment for other resources; targeted low-frequency electrofishing; bounties for fish from 'virgin' systems; public education and outreach.

2.2 Using the results of threat assessment models, above, implement an integrated, pilot surveillance program in the Bay states; use results to improve forecasting models, refine surveillance tactics, and identify candidate locations for targeted control programs.

2.3 Support applied research projects that have a high probability of closing known data gaps and thereby increase the success of adaptive management programs for invasive catfishes in the Bay.

3. Control

3.1 Engage other regions and states involved in control and removal programs for invasive fishes and modify successful approaches to the current situation. Specifically, work with the Southern Division, American Fisheries Society, to benefit from their collective expertise, especially with regard to the application of low-frequency electrofishing to catfish control programs.

3.2 Implement several targeted, research-focused catfish control programs in high-risk/high-value systems using appropriate gears such as low-frequency electrofishing, which has a relatively high efficiency for blue catfish and flathead catfish but only under specific conditions Bonvechio et al. 2011). The systems selected for control should represent a 'best case' scenario for control, on the assumption that if control cannot be achieved in such systems, it may be unachievable elsewhere. "Best-case" here would mean relatively small and local populations of invasives in lower-productivity waters with limited opportunities for re-colonization and a commitment to apply sufficient resources to the problem (Morris and Whitfield 2009).

3.3 Actively explore opportunities to dramatically expand commercial harvest of invasive catfishes, possibly as a supplement to the reduction fishery that is currently dependent on Atlantic menhaden. Alternatively, encourage new or expanded markets for targeted species from systems that are not compromised by contaminants such as PCBs (e.g. James River).

3.4 Human interest in a species is generally a strong predictor of successful expansion (Marchetti et al. 2004) and is, therefore, a source of risk that might be mitigated through enhanced enforcement of existing laws and policies regarding invasive species and by the development of public outreach and education programs that target invasive species.

3.5 Evaluate and test the placement of physical, acoustical, or electrical barriers in high-risk, high-value tributaries to impede colonization or re-colonization by invasive catfishes (Lohmeyer and Garvey 2009).

3.6 Seek constructive input from a wide range of potential stakeholders, including recreational and commercial fishers, through public meetings and other forums.

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