



## PERSPECTIVE

# Hyperbole, Simile, Metaphor, and Invasivore: Messaging About Non-native Blue Catfish Expansion

A large blue catfish is being held by a person on a boat. The catfish is dark blue with a lighter underbelly and has its mouth open, showing its pinkish-red interior. The person holding it is wearing a tan shirt and a red life vest. The background shows the boat's railing and the water.

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AFS student member, Hae Kim, examines a large Blue Catfish *Ictalurus furcatus*  
Photo Credit: Virginia Sea Grant

In this paper, we explore the news messaging surrounding the introduction and expansion of Blue Catfish *Ictalurus furcatus* in mid-Atlantic tidal waters. In the early news reports surrounding the non-native catfish controversy, the species was described with hyperboles and terms that evoked threats, danger, and the need for caution, all of which make science-based debate difficult. Three evidence-based models of invasion effects refer to introduced species as passengers, back-seat drivers, and drivers of ecosystem degradation. Like other non-native species introduced and supported by humans, the Blue Catfish story should shift from the invasiveness metaphor to one of collaborative problem solving to conserve elements of our natural heritage in the face of growing pressures from urbanizing watersheds. We recommend that scientists and managers, in all their communications, avoid value-laden language and focus on exploration of evidence to support alternative management interventions, rather than promoting automatic management positions without considering all aspects of the problem.

## INTRODUCTION

Invasiveness is a metaphor that connotes the invasion of a hostile enemy (Verbrugge et al. 2016). The adjective “invasive” often implies a *guilty until proven innocent* rule. Literature from biological, social sciences, and humanities continues the debate about non-native species introductions (Boltovskoy et al. 2018) and identifies three problems. First, definitions of invasive are inconsistent even among invasion scientists (Heger et al. 2013). Second, published studies focus almost entirely (92%) on ecological questions (Vaz et al. 2017), although conflicts over and opposition to management actions arise from clashes in perceptions between different stakeholder groups (Shackleton et al. 2019). Third, metaphors, hyperbole, and anchoring and confirmation biases (Chew 2015) often replace science in informing policy.

As invasion biology grew since the 1990s, mainstreamers and denialists have emerged (Thomaz et al. 2015). Debates between the camps continue over whether non-native species present no real threat to biodiversity (or ecosystems) and are no more likely than natives to cause environmental damage or that most, if not all, non-native organisms threaten biodiversity and ecological stability (Ricciardi and Ryan 2018). Introductions of non-native organisms have negative, neutral, and positive effects (Chew 2015; Briggs 2017) and species should not be labeled invasive based entirely on origin (Davis et al. 2011). Definitions vary, but the U.S. policy defines invasive species as “a non-native species that causes harm to the economy, to the environment, or to human health” (ISAC 2006). Conclusions about non-native species should be based on “quantifiable empirical evidence” and not speculation (Gozlan 2008). Furthermore, “inaccurate, unsubstantiated, deceiving and manipulated results and conclusions in academic and non-academic media must be confronted” (Boltovskoy et al. 2018). Although the media has been criticized for alarmist metaphors and hyperbolic language in stories about non-native introductions (Kueffer and Larson 2014), reporters are often adapting language used by experts.

More than half of the river basins in the world currently host at least one non-native fish species (Leprieur et al. 2008). Generalizations about non-native effects are often influenced by certain highly invasive fishes, whose spread was facilitated by human activities and caused dramatic shifts in community characteristics (Thomaz et al. 2015; Toussaint et al. 2016). Human activities facilitate the establishment of non-native species by disturbing natural landscapes and by increasing propagule pressure (Leprieur et al. 2008). Widespread use of emotional and manipulative language and nativism bias in the field of invasion biology may hinder effective management at local levels. This is primarily due to unproductive debate without resolutions on how to move forward (Kueffer and Larson 2014). One bias, nativism, i.e., that non-indigenous species are inherently evil, is built into measures such as indices of biotic

integrity. Yet they do not always demonstrate that non-native species cause negative biological effects (Parker et al. 1999). In some cases, non-native fishes provide forage for native fishes (e.g., American Shad *Alosa sapidissima* and Pacific salmonids; Petersen et al. 2003) and invasive plants may create refuge for fish prey (Figueiredo et al. 2015). Framing of media coverage on invasive fish may influence the public interpretation and negative events may amplify perceived threats of alternative future scenarios. The amplification of risk model posits that seemingly minor risks or risk events often produce extraordinary public concern due to a combination of psychological, social, institutional, and cultural processes (Kasperson et al. 1988).

Blue Catfish *Ictalurus furcatus* were purposefully introduced to many rivers and reservoirs in the Atlantic slope drainages of the USA (Fuller and Neilson 2019). Introductions to Virginia’s tidal rivers in the 1970s and 1980s were intended to enhance recreational fishing opportunities for catfish at a time when many Chesapeake Bay fishes were in decline. At the time there were no laws, such as the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (P.L. 101–646), or even conservative guidance on risk assessments associated with fish stocking. Blue Catfish were known to be as palatable as Channel Catfish *I. punctatus*, but more likely to attain large sizes. Populations of Blue Catfish expanded slowly at first and it took over 2 decades before densities dramatically increased, trophy fisheries developed, and individuals spread to other drainages (Greenlee and Lim 2011; Schloesser et al. 2011). Concurrently, concern about the negative impacts of non-native catfish through predation ultimately resulted in the Chesapeake Bay Program’s Sustainable Fisheries Goal Implementation Team’s resolution on invasive catfish to address the predatory impact of Blue Catfish and, to a lesser degree, Flathead Catfish *Pylodictis olivaris* (ICTF 2014).

In this paper, we establish a narrative from analysis of media reports and suggest that (1) the Blue Catfish storyline has been socially constructed via news reports that routinely adopted the language of invasion biology, which often has a militaristic tone; and (2) metaphors and hyperboles, seldom used in scientific writing, arise from interviews with experts and amplify risk before scientific investigations are conclusive.

## MEDIA ANALYSIS

We conducted a content analysis of articles in magazines, newspapers, and online media with a library search from 1990 through May 2019 during the time when Blue Catfish were routinely collected from Virginia waters in long-running fish surveys (Tuckey and Fabrizio 2017). We searched for articles using keyword “blue catfish” in Academic Search Complete database (EBSCOhost), in addition to google.com. Only non-primary literature articles that dealt with Blue Catfish in their non-native range were analyzed to summarize the





language used therein. For each article, we counted whether sources were mentioned or quoted, and counted and documented each occurrence of metaphors, similes, and hyperboles. We also counted the mention of key issues, specifically population expansion, dominant fish, apex predator, trophy fishing, state records, voracious feeding, invasiveness, U.S. Department of Agriculture food safety inspections, predation, and competition. Themes in these articles were qualitatively examined to understand and explore the narrative that was developed by the media reporting on Blue Catfish in its non-native range. Consequently, we did not apply any quantitative statistical analyses of the qualitative data. Rather, we attempt to develop the storyline as it relates to issues of managing a non-native fish that has expanded into multiple management jurisdictions.

A total of 74 news articles were reviewed for qualitative analysis. These articles were published from 1997 through 2019; no articles were located for earlier years. Most of the articles focused specifically on Maryland and/or Virginia waters (57 of 74, 77%) and approximately half of the articles included quotes or interviews of scientists or local fishers (36 of 74). Of those journalists who interviewed others, the number interviewed averaged 3.3 and ranged from 1 to 8. Hyperboles, metaphors, and similes were used infrequently in news articles, yet one hyperbole used repeatedly maintained that “The wild blue catfish is one of the greatest environmental threats the Chesapeake Bay has ever faced” (Table 1). This quote echoes sentiment popular since the late 1990s that “alien species were the second greatest threat to biodiversity” (Chew 2015). The

most frequent themes mentioned in news articles were the predatory habits of Blue Catfish, invasive species, rapid expansion, trophy fishing, and invasiveness (Table 2). Some of the news articles were simply reporting the most recent state or water body record. Conflict emerged as sport anglers were beginning to view Blue Catfish as a new target for trophy fishing. Statements like “Maryland’s DNR is urging catfish enthusiasts to do something that goes against their angling sensibility: kill every blue catfish they haul in” created controversy for trophy catch-and-release anglers. Few news articles made mention of the other threats that native species were facing in addition to Blue Catfish (3 of 74) or that other non-native fishes were introduced, and still managed, in support of popular sport fisheries (2 of 74). Media reports in 2016 and 2017 reported on newly required U.S. Department of Agriculture (USDA) catfish inspections stating, “the inspections could take us off that track. The USDA has never really dealt with a fish before, a wild-caught fish, let alone an invasive species.” The media portrayals of Blue Catfish outside its native range provided equal treatments with both positive (22) and negative (26) and sometimes provided both perceptions, which supports a lack of media bias (Table 3).

#### THE BLUE CATFISH NARRATIVE

The Blue Catfish narrative played out in the press and social media far ahead of the first investigations of ecological effects (Schloesser et al. 2011). The Blue Catfish have been reviled in much of the public discourse. For example, two statements in headlines—“Behind pollution, blue catfish are the biggest

Table 1. Hyperboles, metaphors, and similes used in 74 news articles analyzed. The *N* indicates the frequency of occurrence of different figures of speech or quotes in articles.

Figure of speech	Quote from news media sources and year
Hyperboles ( <i>N</i> = 9)	<p>“Blue catfish are destroying the Chesapeake Bay.” 2017</p> <p>“A real time environmental catastrophe happening in the Chesapeake Bay right under our noses.” 2016</p> <p>“The wild blue catfish is one of the greatest environmental threats the Chesapeake Bay has ever faced.” (<i>N</i> = 3, 2015)</p> <p>“It’s a predator on par with a shark.” 2009</p> <p>“Everybody loves them.” 2018</p> <p>“The top predator has been described as the Bengal tiger of local rivers.” (<i>N</i> = 2, 2011, 2015)</p>
Metaphors ( <i>N</i> = 4)	<p>“underwater vacuums” (<i>N</i> = 2, 2010)</p> <p>“...the tastiest ways to save the bay.” 2015</p> <p>“...vacuumed their way through local flora and fauna — even some precious Maryland blue crabs.” 2013</p>
Similes ( <i>N</i> = 3)	<p>“They croak like pigs.” 2010</p> <p>“...reproduce like mad dogs.” 2008</p> <p>“Like a creature from a Hollywood B-movie, it has grown fat from conditions created by pollution.” 2011</p>

Table 2. Frequency of occurrence of themes that were directly mentioned in media articles reviewed (*N* = 74). If a theme was mentioned several times in one article, it was only counted one time.

Themes	Frequency of Occurrence
Predation	38
Invasive	30
Population expansion	29
Trophy fishing	22
Invasivorism	20
Fishing records	14
Voracious feeder	12
Dominant fish	12
USDA inspections	7
Competition	6
Apex predator	5
Fishing guides	4
Native fish face other threats	3
Other non-native fishes	2

Table 3. Subjective description of the overall orientation expressed with respect to Blue Catfish *Ictalurus furcatus* in new environment in news articles (*N* = 74).

Orientation	Frequency
Neutral	4
Negative	26
Positive	22
Both	10

threat to the Chesapeake Bay,” and “The wild blue catfish is one of the greatest environmental threats the Chesapeake Bay has ever faced” (Springston 2015)—have never been examined in any scientific manner. The uncertainty regarding Blue Catfish feeding habits was repeatedly mentioned by scientists, conservationists, and the news media “Also troubling is their food, which includes some of the same species that wildlife managers are trying to save and restore—the Blue Crab, American Shad, American Eel, river herring, Menhaden” (Harper 2010). However, the uncertainty was accompanied with negative language, such as “Up close and in person, Blue

Catfish are gruesome creatures. They grow big and ugly and gray. They croak like pigs. And because they have no scales, they are especially slimy, even as fish go” (Harper 2010). At a time when the population was growing, “Blue Catfish boom threatens region’s river ecosystems. Predator accounts for 75 percent of all fish biomass in some places, scientists say” (Blankenship 2011). This statement was repeated in 12 of 74 media articles, although the basis for this statement is data of limited spatiotemporal scope that was never published (Schloesser et al. 2011).

Concerns were expressed that invasive catfish would control abundance of species at lower trophic levels and have dramatic effects on mussels, crabs, and migratory fishes. In particular, some scientists interviewed used hyperboles, such as “this isn’t just at the top of the food chain, this is a whole new trophic level.” and “It’s a predator on par with a shark.” Disruption of the Chesapeake Bay food web depends on the feeding behavior and abundance of the Blue Catfish. Yet, estimating the true abundance of a new species in the system required developing new field tagging studies, which produced estimates for relatively small spatial areas (Fabrizio et al. 2017; Bunch et al. 2018).

Preliminary and unpublished estimates of abundance, which were admittedly highly uncertain, were spread through the media before any scientific vetting of procedures or publication of findings with appropriate caveats. The “100 million hungry Blue Catfish” could now be compared to iconic species, such as 308 million blue crabs *Callinectes sapidus* and 215 million Striped Bass *Morone saxatilis*. Headlines focused on expected effects via predation on other valued fish “Experts from Virginia and Maryland agree their growing presence in local waters spells likely trouble for other fish species, like shad and bass.” Although subsequent work has shown that most Blue Catfish are opportunistic omnivores that may function as herbivores, benthic invertivores, or piscivores depending on size, season, and location (Schmitt et al. 2017, 2019a, 2019b), many claimed that Blue Catfish were apex predators in these systems without supporting scientific evidence (e.g., “It’s a predator on par with a shark”). “Blue Catfish are destroying the Chesapeake Bay” and “their black-hole-like mouths vacuum up whatever marine life gets in their way.” Also “Due to their large size and predatory habits, blue catfish are consuming many native fish species at an enormous rate, and they have few natural predators to prevent them

from out-competing native species.” Tim Sughrue, owner of Congressional Seafood, which processes and distributes Blue Catfish, called the Blue Catfish “a real time environmental catastrophe happening in the Chesapeake Bay right under our noses” that threatens to “100 percent change the dynamic in the Chesapeake over the next 2 decades.”

Our natural response to a differing position is to resort to identity-protecting reasoning (Kahan 2010) that protects our values and beliefs without scientific basis. Pauwels (2013) maintains that “although metaphors are essential in enabling science and in communicating research to the rest of the world, their use can also mislead the public, and even scientists themselves.” In summary, the public discourse regarding Blue Catfish in the Chesapeake Bay region was characterized by terms that evoke threats, danger, and the need for caution, all of which make debate and discourse difficult (Ernwein and Fall 2015). During the same timeframe, the James and Potomac rivers made the list of the 10 best rivers for catching monster catfish in 2015 (Hamper 2015). Bay Catfish Advocates (2017) promoted the development of trophy fishing destinations and claimed that “the media is the primary entity responsible for painting catfish as villains.” In some cases the media may have overstated or misstated the severity or nature of the impacts without acknowledging the scientific uncertainty present. Our findings also showed several instances of reasonably balanced coverage by the media.

Governments and industries are overwhelmed with the pace of change in appearance of non-native species. Chesapeake Bay supports reproducing populations of nearly 150 non-native aquatic species, including 27 non-native fishes (Ruiz and Reid 2007), and this estimate is likely outdated. Metaphors, such as invasional meltdown and nativeness, may give a stronger voice for change and create a sense of urgency (Verbrugge et al. 2016). Increasingly ecologists are questioning the nativism assumption (Kueffer and Larson 2014). However, the media reports often portrayed Blue Catfish as ultimate predators, or villains. Labeling a fish invasive automatically means they are something to battle, not a resource to manage.

Metaphors are useful linguistic expressions as long as they help us conceptualize the unfamiliar in terms that are more familiar to us. Two opposite metaphors we often use with respect to species like Blue Catfish, are nativism and cosmopolitanism. These terms reflect our normative beliefs about good and bad (Callicott et al. 1999). Nativism is considered as pure and in harmony where numbers remain roughly constant, although this ideal condition is seldom present. Cosmopolitanism is the view that humans are part of nature and considers the reality of adapting to altered ecosystems.

In framing the language, invasive species may be viewed as “passengers” that spread in response to environmental changes rather than “drivers” of ecological impacts (Hart and Lawson 2014). Bauer (2012) proposed “back-seat drivers,” as those species that “require or benefit from disruptions of ecosystem processes or properties that lead to declines of native species but also contribute to changes in ecosystem properties and further declines of native species.” This use of language is important because it affects the public’s willingness to take action (Hart and Lawson 2014). The driver model emphasizes the characteristics of the species that cause ecological change, whereas the passenger model focuses on characteristics that allow species to thrive under conditions of ecological change. If the driver model is correct, then the reduction of the invasive species should result in proportional change in the system.

However, if the back-seat driver or passenger models are more accurate, then efforts to reduce the abundance of the invasive species without concurrent ecosystem restoration actions will not result in the significant changes expected (Prior et al. 2018). The driver, back-seat driver, and passenger metaphors were never encountered in our review of news media, yet these metaphors seem to be especially important in these highly degraded tidal rivers.

As Kueffer and Larsen (2014) recommend for scientific writings, “when a metaphor is used, it should be introduced as such, and its connection with specific aspects of a scientific concept should be illustrated.” If we adopt the back-seat driver metaphor we need to admit that dams, human population density, development, and nutrient loading were also driving ecosystem change in Chesapeake Bay and its tributaries (Kemp et al. 2005; Limburg et al. 2011; Jordan et al. 2018). The James and Rappahannock rivers have total maximum daily load prescriptions for nutrients that are indicative of long-standing impairments (Linker et al. 2013). Consequently, the back-seat driver model appears to be the most parsimonious hypothesis to describe the Blue Catfish case. The Chesapeake Bay is far from pristine, and most of its tidal tributaries have changed dramatically since European colonization in 1605. In summary, these rivers were once free flowing, relatively clear, and supported vast beds of aquatic vegetation, yet are now characterized by erosion, increased turbidity, excessive nutrients, and dams that block migratory corridors. These altered conditions are ideal for Blue Catfish because they possess enhanced mechanoreceptory, gustatory, and olfactory senses, allowing them to thrive in the naturally productive and turbid waters of the Mississippi, Missouri, and Ohio rivers for thousands of years.

However, the storyline suggests that the many hyperboles reflecting negative impacts of non-native catfish through predation may have influenced the resolution to address the predatory impact of Blue Catfish and not other interactions (ICTF 2014). Context and criteria are critically important to judging impact of the non-native species. Since Blue Catfish first appeared in standardized surveys in the 1980s (Tuckey and Fabrizio 2017), White Catfish *Amieurus catus* have declined. Describing the early history of catfish fisheries in Virginia, Menzel (1945) reported that the catch in pots in the James River was made up almost entirely of the non-native Channel Catfish, whereas native White Catfish and bullheads predominated in the Potomac River. Recent research demonstrates that Blue Catfish eat blue crab and river herring (Schmitt et al. 2017, 2019a), as did non-native Channel Catfish and native White Catfish (Menzel 1945). Blue Catfish have replaced non-native Channel Catfish and native White Catfish in most of Virginia’s tidal rivers (Tuckey and Fabrizio 2017).

Although native White Catfish have clearly been affected by the expansion of Blue Catfish (Schloesser et al. 2011), most media concerns continued to be focused on American Shad, America Eel *Anguilla rostrata*, river herring, Atlantic Sturgeon *Acipenser oxyrinchus*, and blue crabs. One news story relayed the concern that Blue Catfish “are following American Shad up the river and eating their eggs,” which was never evident from examination of Blue Catfish diets (Schmitt et al. 2017; Schmitt et al. 2019a). Declines of American Shad, river herrings, and sturgeon, as well as fluctuations in blue crab are not fully understood, especially with respect to the appearance of Blue Catfish (Hilton et al. 2016, 2018; Schmitt et al. 2017, 2019a; Wilberg et al. 2019). However, the high abundance and



continuing spread of Blue Catfish calls for integration of all fishery management plans in the region (Nepal and Fabrizio 2019).

Jurisdictions and management agencies took varying positions on Blue Catfish, resulting in angler–agency conflicts. Blue Catfish were purposefully introduced in Virginia tidal rivers and spread to Maryland tributaries in the less saline middle and upper Chesapeake Bay (Nepal and Fabrizio 2019). Consequently, the full effects of Blue Catfish are unknown. In Maryland waters, catch and release is discouraged. Furthermore, Blue Catfish have become a profitable commodity for commercial fishermen and a desirable product for chefs, wholesalers, and retailers. Bay Catfish Advocates (2017) and Virginia Catfish Anglers Association have pressed for recreational fishing regulations that would promote sustainable catch of large Blue Catfish, though the Maryland Department of Natural Resources had no interest in supporting trophy catfish and continues to encourage anglers to keep all Blue Catfish and Flathead Catfish caught. Reduction in angler-reported trophy-size fish and declines in growth are evident (Hilling et al. 2018; Hilling et al. in review). Despite the decades of controversy, no management jurisdiction has developed a performance-based fishery management plan.

Invasivorism is the only solution actively pursued in the Chesapeake Bay region, with the approach of literally eating our way out of the problem. One manager said “the best way to deal with a Chesapeake Bay menace is to let fishermen take as many as they can, with minimal red tape, while offering consumers a healthy, plentiful, and relatively inexpensive protein source.” One problem with invasivorism is that when a species has high value that becomes an incentive to increase or tolerate its spread (Nuñez et al. 2012; Nepal and Fabrizio 2019). Bilkovic and Ihde (2014) suggested that invasivorism would have limited potential for Chesapeake Bay Blue Catfish because: “(i) the threat posed to the public by contamination of the fillets with bioaccumulated toxins; (ii) the lack of desire to kill the largest, most fecund fish for the sake of the trophy fishery; (iii) the predicted population response to being fished; (iv) the perverse incentivization of the preservation of these populations to maintain the fishery; and (v) the potential negative consequences to native populations of catfish (through bycatch and misidentification).”

### CONCLUSIONS

Marketing strategies and strong metaphors or dominant news frames assist in getting the messages across via social media networks, even if the message is wrong (Liang et al. 2014). Was the Blue Catfish story line accurate? No, it was misleading. Blue Catfish are opportunistic omnivores, therefore, a long list of fishes in their diet is no surprise and inferring predation impact requires more evidence than a diet description (Schmitt et al. 2017, 2019a). Examination of spatial variation in Blue Catfish diets suggests that consumption of blue crabs is the greatest potential for conflict in lower James River, especially during times of reduced freshwater inflow (Schmitt et al. 2019b). Furthermore, the combination of Blue Catfish, Flathead Catfish, complex fall zone habitats, and Boshers Dam in the freshwater section of the James River creates additional concern for at-risk alosine fishes (Schmitt et al. 2017, 2019b, 2019c). A lack of abundance data on alosine fishes and rapidly changing distribution of Blue Catfish will continue to make it difficult to infer a predation impact on a spatial or temporal basis.

Scientists can corrupt the management processes when they present findings with hidden policy preferences (Lackey 2007). Simply using the term invasive or hyperboles illustrates a policy preference for removal. Similarly, terms often used such as ginormous fish, giant, monster, huge, megafish, or trophy (Hamper 2015; Francis et al. 2019) creates a news buzz, but may mislead the public. Scientists must get involved in policy deliberations, but play the appropriate role to provide facts, probabilities, and analysis, but avoid normative science (Parke and Russell 2018; Salafsky et al. 2019). Scientists have much to lose when they unthinkingly adopt leading language, such as “alien” or “invasive” and thereby practice stealth policy advocacy. When approached by journalists, scientists should act as honest brokers of policy alternatives rather than advocates (Kueffer and Larson 2014). Journalists are often on deadlines, but it is advisable to ask them about their questions or topic, and do not answer immediately. Rather, ask for a reasonable time to think about the questions and prepare a few key messages for the general public. While you should request to review stories, you typically have no control in the final media story.

We present the narrative as a way of revealing the potential effects of media coverage and issue framing on media consumers. The Blue Catfish storyline suggests an “amplification of risk” where the media helped build a buzz while communicating emotionally loaded issues (Leiserowitz et al. 2012; Opperhuizen et al. 2019). Understanding the plural views and values of stakeholders toward Blue Catfish management is a prerequisite to anticipate and then minimize conflict as management programs are implemented (Evans et al. 2008; Pasko et al. 2014; Estévez et al. 2015). Education initiatives build understanding and capacity for citizen science and collaborative problem solving in order to develop alternative future storylines (Lenzner et al. 2019). Because value-laden messaging hinders communication and action, we must ensure that a message draws on scientific evidence to make itself persuasive and legitimate, no matter what the level of uncertainty is (Kendall-Taylor et al. 2013). That message may sometimes be the possibility of being wrong (i.e., Cromwell’s Law), variability in quantities measured, ignorance of underlying processes, or disagreement among experts (van der Bles et al. 2019).

The issues surrounding Blue Catfish in the Chesapeake Bay region highlight the shortcomings of managing in a single-species manner when the drivers of ecosystem change support an integrated management approach (Chaffin et al. 2016). Local stakeholders and enthusiasts can certainly support a focus on ecosystem restoration and reduction in nutrient loading if they are convinced of the relationship with protection of flagship species, such as American Shad, American Eel, Atlantic Sturgeon, river herring, and blue crabs. Analyses of these species identified many threats in riverine and marine environments keeping stocks from recovery (Cote et al. 2013; Hilton et al. 2016; Turner et al. 2017; Hilton et al. 2018; Kahn 2019; Wilberg et al. 2019).




Differing human values associated with Blue Catfish are similar to those seen in other contexts where non-native sport fish are widely stocked. Brook Trout *Salvelinus fontinalis*, Brown Trout *Salmo trutta*, and Rainbow Trout *Oncorhynchus mykiss*, have been widely stocked outside their native range for 150 years (Karas 2002; Halverson 2010; Newton 2013). Similarly, black bass *Micropterus* spp. were widely stocked outside their native range long before scientists realized effects on native species, including conservation concerns of up to 19

recognized forms (Taylor et al. 2019). Anglers have adapted and actively pursued non-native sport fish and eradication is virtually impossible without harming native fauna. Yet, the long history of stocking black basses and trouts has coincided with a recent paradigm shift and changes in conservation ethics to protect native fishes. In such cases, the logical path forward takes a conflict resolution approach via societal discourse and balancing of tradeoffs (Evans et al. 2008; Jeschke et al. 2014; Woodford et al. 2016; Crowley et al. 2017). The perceptions, beliefs, attitudes, and motivations related to introduced trouts, black bass, and Blue Catfish were shaped largely by media, such that conflict is intractable, unless and until beliefs change over time. The Black Bass Conservation Committee initiated outreach efforts to enhance awareness of anglers and scientists about newly described or endemic black bass species (Taylor and Sammons 2019). Divergent values among stakeholders, sparse historical records, and changing goals remain future challenges (Schlaepfer et al. 2011). In the future, the narrative should shift away from inadequate metaphors to focus on participant dialogue and collaborative decision-making to alleviate multiple complex interacting threats in Chesapeake Bay tidal rivers (Dana et al. 2014; Jackson et al. 2016).

#### ACKNOWLEDGMENTS

Research was supported by a grant from the Virginia Department of Game and Inland Fisheries through a Federal Aid in Sport Fish Restoration Grant from the U.S. Fish and Wildlife Service. D.J.O. was supported in part by the U.S. Department of Agriculture through the National Institute of Food and Agriculture Program and Virginia Tech University. J.D.S. and C.D.H. were supported through fellowships from Virginia Sea Grant. Mention of trade names or commercial products does not imply endorsement by the U.S. Government. We thank Aaron J. Bunch, Mary C. Fabrizio, Yan Jiao, and Robert S. Greenlee for advice and insights during the course of this study. We thank many journalists and reviewers for interviews, writings, and thoughts about issues in this paper. The final manuscript was improved by comments and suggestions made by Tim Bonvechio, Aaron J. Bunch, Robert S. Greenlee, Clifford Hutt, John S. Odenkirk, Rob O'Reilly, and anonymous reviewers and editors.

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### SUPPORTING INFORMATION

Additional supplemental material may be found online in the Supporting Information section at the end of the article.

**Supplementary Material.** News articles reviewed for qualitative analysis. Available: <https://tinyurl.com/OrthBlueCatfishNews> 