Invasive blue catfish in Maryland:
Design of population monitoring and modeling to evaluate potential management actions

Ellen Robertson, USGS Eastern Ecological Science Center

Co-authors: Julien Martin (USGS), Jennifer Moore (Moore Ecological Analysis and Management), Andy Royle (USGS), Branson Williams (MD-DNR)


Photo by Chesapeake Bay Program


Photo by Jay Fleming

USGS science for a changing world

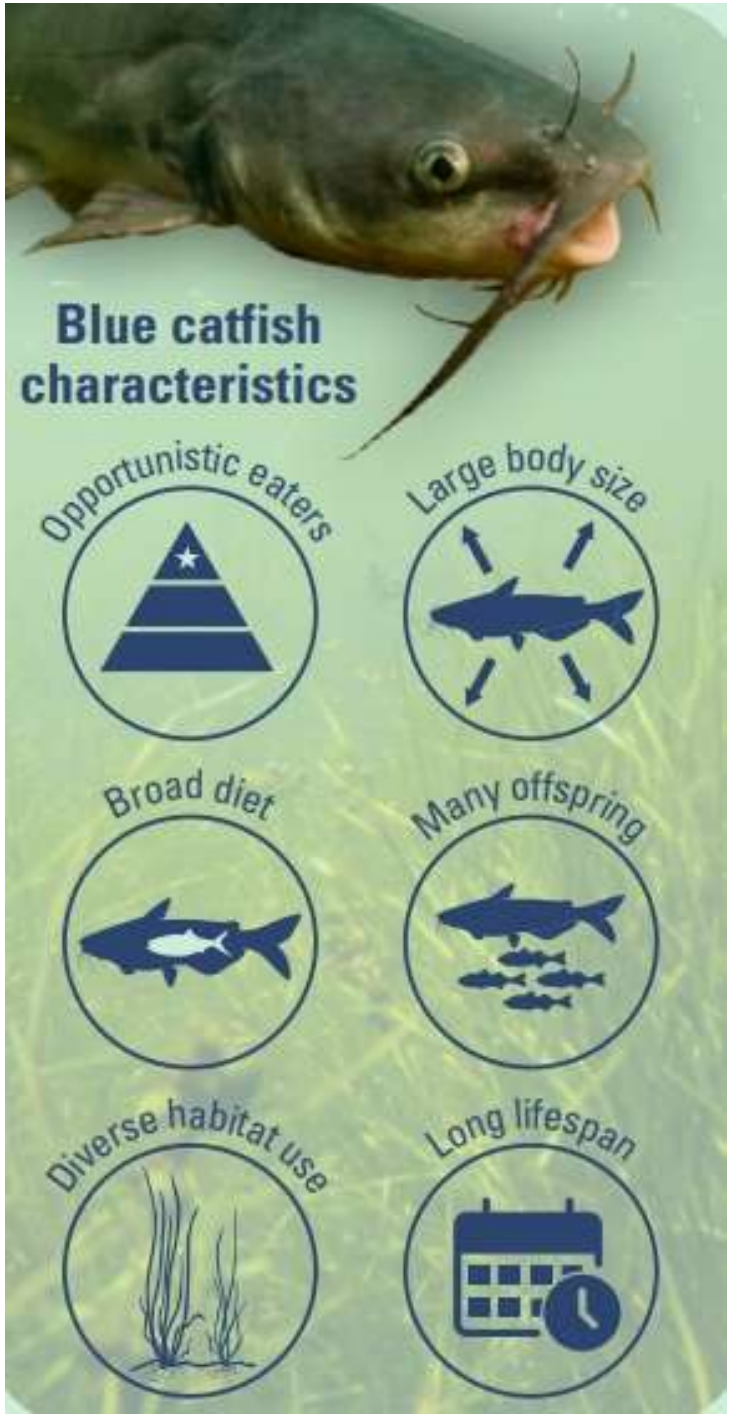
MARYLAND DEPARTMENT OF NATURAL RESOURCES

Chesapeake Bay: the largest estuary in the nation

USGS Landsat image of Chesapeake Bay

- *Billions of dollars spent towards restoration*
  - habitat supporting plants, wildlife, and clean water
  - commercial, trophy, and recreational fishing
  - the seafood market
  - boating and recreation

Photo by Chesapeake Bay Program



Restoration may be impacted by an invasive fish

Blue catfish are native to the Mississippi, Missouri, and Ohio river basins, but are ***invasive in Chesapeake Bay***

Blue catfish are known to eat several important species:

Blue catfish prey on valuable native species:

Vital to the Bay's economy and culture, **blue crabs** support a thriving seafood industry, jobs, tourism, and local traditions

Commercial and recreational fishing of **striped bass** (rockfish) supports $500M in annual Bay economic activity.

Shad and river herring that once supported major fisheries now face population depletion and harvest closures.

Perch (white and yellow) support fisheries, with white perch among Maryland's most valuable commercial fisheries.

Bay anchovies are a crucial food source for larger predators such as striped bass, bluefish, weakfish, and seabirds.

Menhaden are an essential forage fish and serve as a key food source for striped bass, osprey, and dolphins.

Integral to healthy freshwater rivers, **mussels** provide water filtration and enhanced denitrification.

Clams (soft shell and mud) play a key role in Bay fisheries, and juveniles are crucial prey for benthic invertebrates.

Photo by Jay Fleming

The contents of a blue catfish's stomach often include a variety of crabs, clams, mussels, and fish.

Photo by Jay Fleming

Blue catfish have expanded in Chesapeake Bay tributaries over time

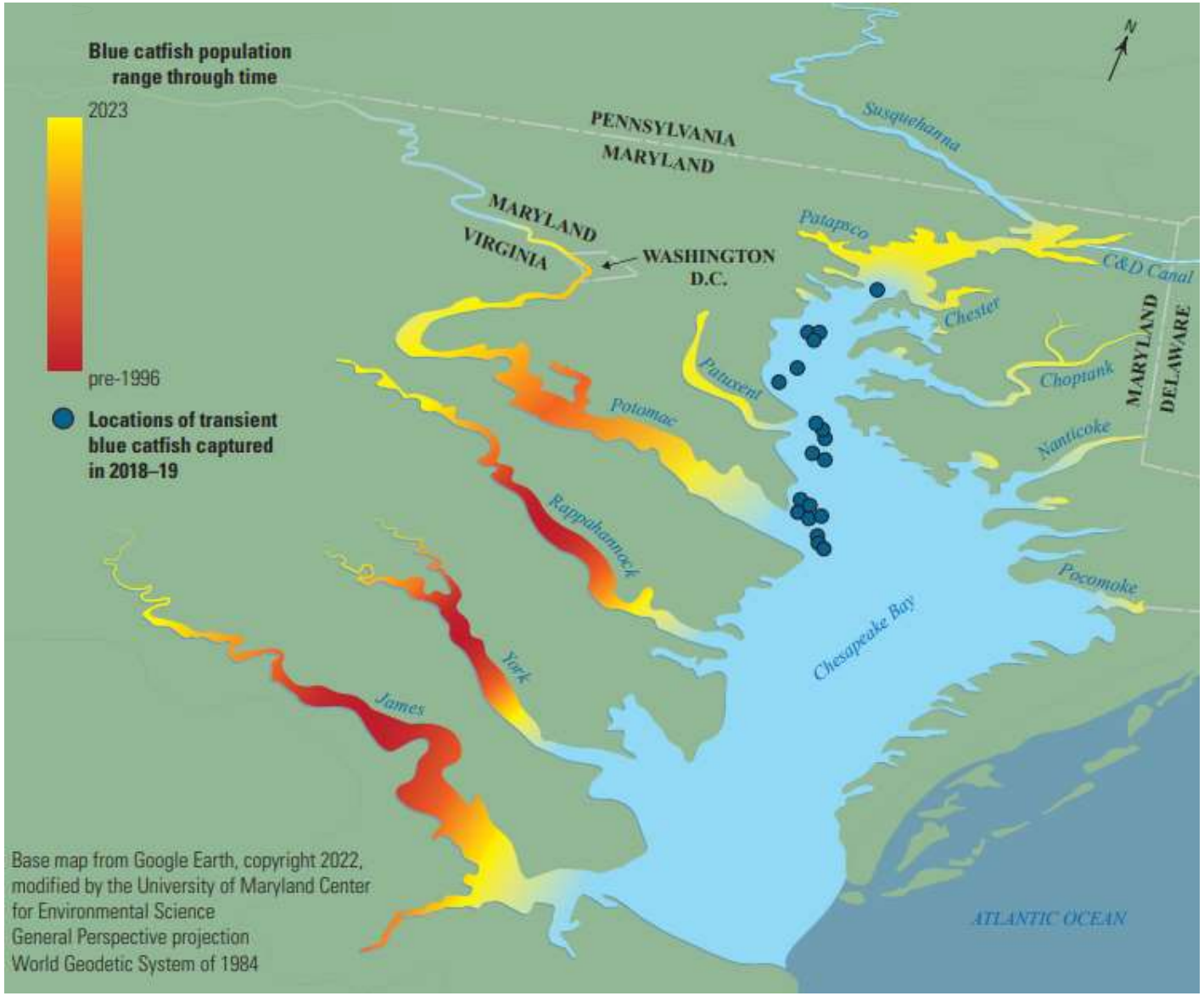



Photo by Jay Fleming

- Rapid population growth and spread in Virginia
- Less known about populations in Maryland
- Less known about how management actions could impact populations

USGS and Maryland DNR are collaborating to:

1) Design population monitoring studies for blue catfish in Maryland
2) Assess management actions for reducing impacts of blue catfish in Maryland

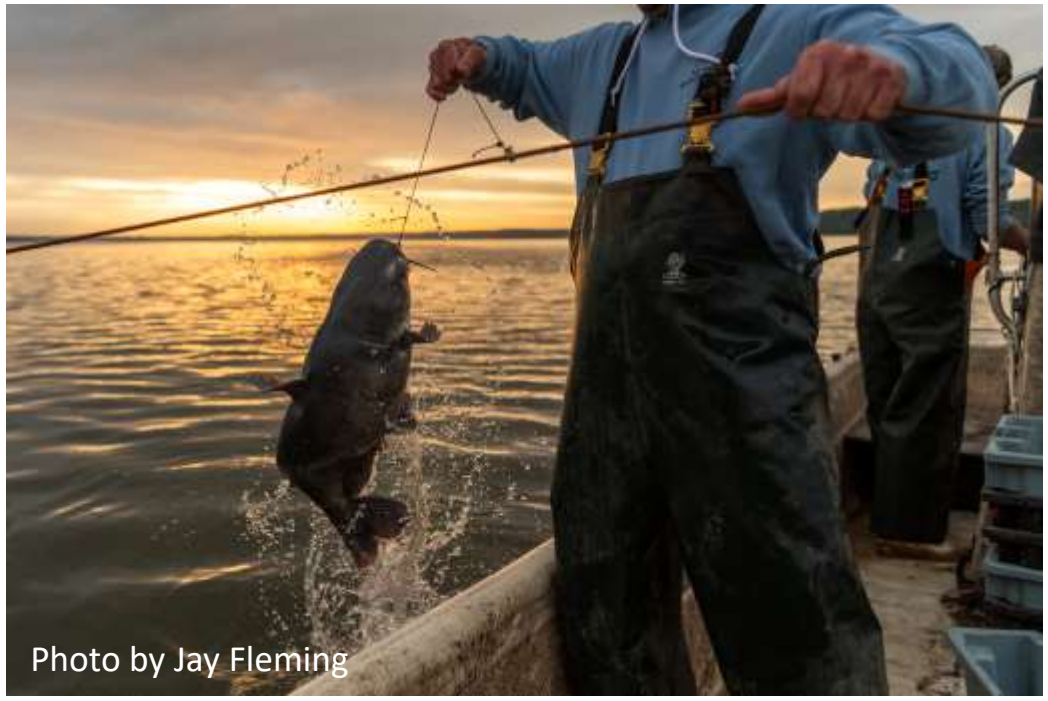


Photo by Jay Fleming

Photo by Chesapeake Bay Program

Population monitoring of blue catfish in Maryland

Design electrofishing surveys to get relative abundance estimates

- Obtain blue catfish counts and sizes
- Build models incorporating covariates such as water depth, salinity, electrofishing settings, tide, and weather.
  - Evaluate effectiveness of management actions

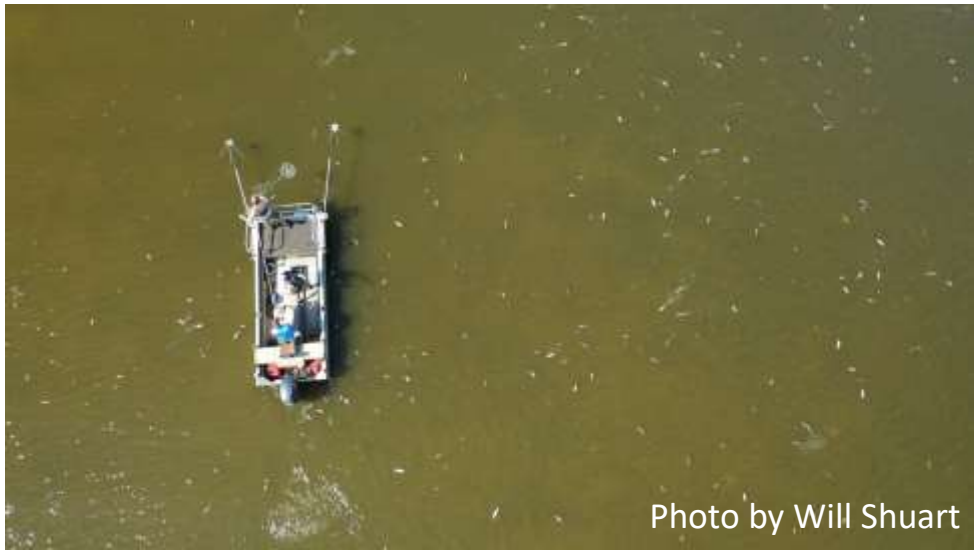
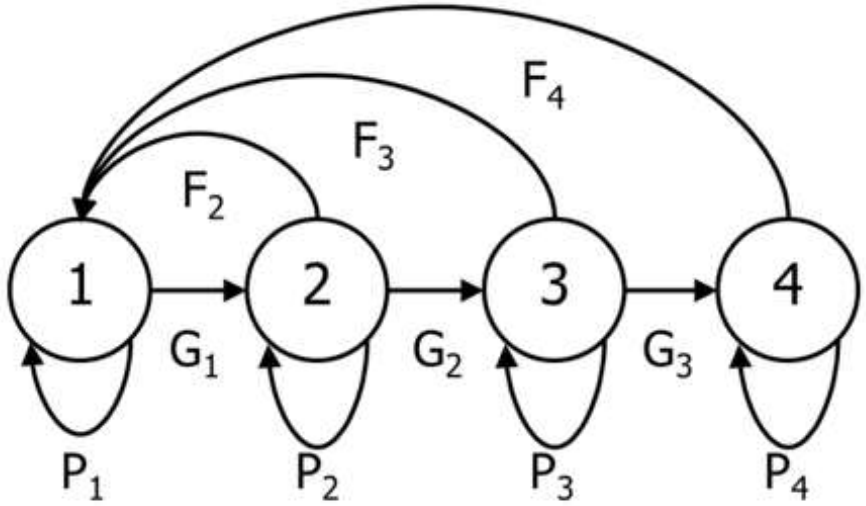


Photo by Will Shuart

Assess potential management actions for blue catfish in Maryland

- Compile blue catfish vital rate estimates from prior studies
- Elicit remaining vital rates from experts
- Build a population projection model
- Assess alternative management actions – e.g., removal scenarios



$$\mathbf{A} = \begin{bmatrix} P_1 & F_2 & F_3 \\ G_1 & P_2 & 0 \\ 0 & G_2 & P_3 \end{bmatrix}$$

Acknowledgements

- ***Ken Hyer and USGS Chesapeake Bay studies*** for seed funding

- Will Shuart, Stephen McIninch, Gregory Garman (***Virginia Commonwealth University, Rice Rivers Center***) as collaborators on these projects

- Corbin Hilling, Brian Healy, and Fred Johnson as collaborators on these projects

- The ***USGS blue catfish fact sheet design team*** for contributing materials used in this presentation including Tom O'Connell, Ken Hyer, Jenn Malpass, Chris Ottinger, John Griffin, and Christine Densmore ***(USGS)*** and with science communication and design concepts developed by Lili Badri, Veronica Malabanan Lucchese, Vanessa Vargas-Nguyen, and Bill Dennison of the University of Maryland Center for Environmental Science ***(UMCES)***

MARYLAND DEPARTMENT OF NATURAL RESOURCES

USGS science for a changing world

University of Maryland CENTER FOR ENVIRONMENTAL SCIENCE

VIRGINIA COMMONWEALTH UNIVERSITY MCV RPI 1838