Dynamics and Role of Blue Catfish (*Ictalurus furcatus*) in Tidal Rivers of Virginia

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Dynamics and Role of Blue Catfish in Tidal Rivers of Virginia

- *PIs*: Don Orth, Yan Jiao, Andrew Rypel (Virginia Tech)
- *Partners*:
  - Research Partners: Mary Fabrizio (VIMS); Bob Greenlee (VDGIF); Others? (MD DNR, VCU, NOAA, …)
- *End Users*:
  - Modelers and other researchers
    - Howard Townsend's group (NOAA) and others
  - Fisheries managers and policy makers
    - VDGIF, GIT, NOAA, VMRC,….

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- *Rationale*: Blue catfish food diet is highly variable and has not been adequately characterized spatially and temporally
  - VIMS Trawl excellent temporal coverage, but limited spatially
    - Size selective and limited to deep water habitat
  - VCU NOAA-funded project limited spatially and temporally
    - limited to target prey items
  - Others

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Diet Assessment

- *Objectives*:
  - Quantify diet and relative importance of diet items
  - Analyze spatial and temporal variation in diet composition
  - Estimate trophic level and omnivory index
  - Evaluate extent of opportunistic versus selective feeding
  - Estimate production-biomass ratio (P:B) and consumption-biomass ratio (Q:B) which will be linked demographic model to assess potential impacts on prey

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Bayesian (hierarchical) Modeling

- *Objectives*:
  - Estimate spatial and temporal variation in life history parameters (growth, morality, recruitment,…)
  - Explore spatial and temporal population growth via Bayesian growth model
  - Explore potential impact factors affecting these population parameters
  - Assess utility of various management options in the control of blue catfish

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Approach:

- Diet will be assessed using a seasonal multi-year, multi-river assessment with river segment and habitat strata

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Approach:

- Temporal and spatial variation of life history traits will be modeled through Bayesian hierarchical models
- For example, growth rates (individual) and spatiotemporal variability in growth rates will be described
  - Hierarchical models accommodate temporal and spatial differences/variability whereas the traditional von Bertalanffy model cannot accommodate temporal changes in growth even when multi-year data are included in the analysis (Clark 2003; Jiao et al. 2010)

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Approach:

- Population growth models will be developed which treat population growth rate as hierarchically structured
  - Spatial and temporal variation of population growth rates will be incorporated into the models

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Approach:

- Estimated traits from the previous steps will then be used to construct a hierarchical demographic model
  - Hierarchical demographic models are ideal for the assessment of non-indigenous species
    - knowledge of non-indigenous populations is usually limited
    - data on these traits vary among populations, and
    - traits are likely to vary considerably over time as species adapt to new environments
  - Hierarchical models readily incorporate this spatiotemporal variation in species' demographic traits

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- *Potential relevance/impacts*:
  - Describe spatiotemporal patterns in BCF predation
    - Shifts in prey selection based on prey availability
    - Ecosystem stability implications

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- *Potential relevance/impacts*:
  - Characterize BCF populations
    - Describe changes through time, and differences among rivers
    - Identify factors influencing these
  - Influences on other species given BCF management strategies
    - Identify which size to target for harvest to decrease the influence of BCF on other species of concern
    - Identify harvest levels required to achieve desired outcomes

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