MICHIGAN STATE UNIVERSITY

Quantitative Fisheries Center (QFC) Ongoing Project Briefing

Evaluating Fishery Allocation Tradeoffs in Double-Crested Cormorant Management

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Caption: Image of double-crested cormorant colony. Credit: Sarah Meadows (USFWS)

Goal: Provide a quantitative framework for determining when and to what extent double-crested cormorant (DCCO) management may be warranted, by predicting the ecological consequences and tradeoffs of different allocation and management scenarios.

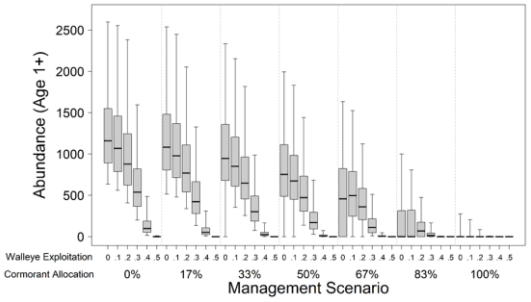
Objectives:

1. Develop a simulation-based decision support tool that quantifies how surplus fish production can be allocated among double-crested cormorant (DCCO) consumption and competing fisheries uses while maintaining fishery sustainability.
2. Evaluate the ecological consequences and tradeoffs of alternative management scenarios, including varying levels of DCCO control and fishery harvest, under uncertainty in fish population dynamics.

Management Implications: This research will provide fisheries and wildlife managers with a quantitative, allocation-based decision tool to evaluate when DCCO predation exceeds sustainable levels of fish production and may warrant management action. By explicitly accounting for uncertainty, tradeoffs among competing users, and spatial impacts across lake systems, the framework supports transparent, defensible, and risk-informed management decisions.

Methods:

- Using R, program a stochastic, age-structured simulation model that integrates fish population dynamics (including predator-prey interactions), DCCO population dynamics, and bioenergetics-based feeding processes.
- Simulate a range of management scenarios by varying allocations of surplus fish production to DCCO consumption and fishery harvest, incorporating uncertainty in recruitment, growth, and mortality.
- Evaluate long-term outcomes and tradeoffs by running repeated simulations across multiple lakes using walleye and yellow perch as the fish community to assess effects on abundance, biomass, harvest yield, and DCCO colony size.



Caption: Wallee abundance across different allocation and exploitation scenarios.

Prelim. Findings/Next Steps:

- High levels of both DCCO predation and fishery harvest reduces fish abundance and sustainability.
- Maximum fishery yield and sustainable extraction occurs at intermediate exploitation rates and low-to-moderate allocations to DCCO consumption, indicating clear tradeoffs between DCCO and fishing.
- Uncertainty in recruitment and population dynamics strongly influences outcomes, highlighting the importance of risk-based evaluation rather than fixed thresholds for management decisions.
- Model will be expanded to include an additional prey fish species to make results less reliant on productivity of a single prey fish species. Final simulations will then be run to complete the project.

QFC Supporting Partners

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