MICHIGAN STATE UNIVERSITY

Quantitative Fisheries Center (QFC) Completed Project Briefing

Indirect Estimation of Contact Selectivity for Gillnets Using Hierarchical Models

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Caption: Gill-net captured Lake Erie walleye. Credit: Ohio Division of Wildlife

Goal: Evaluate the feasibility of using a hierarchical modeling framework to account for net-specific deviations in indirect estimation of contact selectivity

Objectives:

1. Compare selectivity estimates resulting from pooled and hierarchical approaches with data from two standardized experimental gill net configurations
2. Quantify the extent that selectivity parameters for experimental gill nets were spatially correlated using the best fitting models from Objective 1

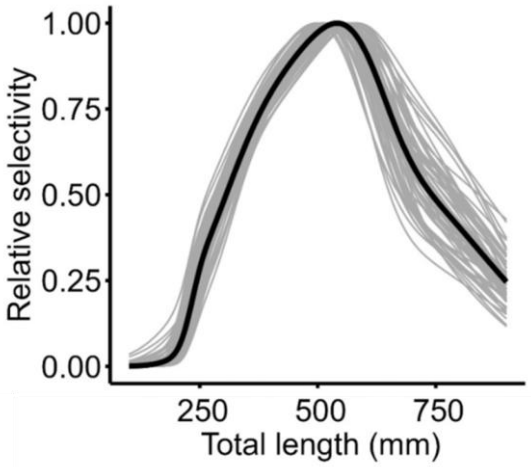
Management Implications: Contact selectivity is traditionally estimated by pooling catches among multiple net sets and/or years, which may obscure mask variation in among-set selectivity. Hierarchical models allow such variation to be explicitly accounted for during model estimation and explore possible drivers (e.g. spatial autocorrelation) in among-set contact selectivities

Methods:

- Fit pooled and hierarchical contact selectivity models to walleye catch data from two gillnet configurations used on Lake Erie
- Hierarchical models differed in the assumed underlying selectivity function as well as what parameters were modeled as random effects
- After identifying best-performing models, spatial autocorrelation in net-specific random effects was assessed

Key Findings:

- Hierarchical models were more supported than traditional pooled approaches for both gillnet configurations.
- Binormal selectivity functions were more supported than other evaluated functions
- Hierarchical models that accounted for spatial autocorrelation were difficult to estimate, but models that converged has low spatial range suggesting weak autocorrelation



Caption: Example of contact selectivities estimated from walleye gillnet catch data using hierarchical models. Black line is the population-averaged aggregate selectivity. Gray lines are net-specific aggregate selectivities from gillnets deployed over a 5-year period.

Deliverables: Faust, M.D., C.L. Cahill, and T.O. Brenden. 2025. Indirect estimation of contact selectivity for gillnets using hierarchical models. Canadian Journal of Fisheries and Aquatic Sciences 82:1-14. Download manuscript

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