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Using modeling approach and fishermen's knowledge to define suitable habitat for cusk (*Brosme brosme*) and evaluate potential economic impacts of conservation

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Cusk (*Brosme brosme*) is a gadoid groundfish currently under status review for the Endangered Species Act (ESA) in the USA. Cusk are territorial and thought to have complex stock structure of local populations. Increased distance between localized populations and loss of habitat led to the ESA status review. This study addresses knowledge gaps in the understanding of distribution of suitable habitat for cusk in the Gulf of Maine using a habitat suitability index model. Habitat quality is quantified by density of cusk caught at different depths, sediment types, and seasons. The important qualities of the physical environment where cusk are most abundant are elucidated through distribution maps. These maps are produced from imperfect knowledge, but fishermen's local ecological knowledge can fill these data gaps. Fishermen's knowledge regarding important environmental variables for cusk is used to fine-tune habitat model development. Fishermen's knowledge for areas where cusk are likely to be caught can also validate habitat suitability maps produced in modeling. Combining habitat suitability modeling with fishermen's knowledge will provide a better understanding of cusk distribution in the Gulf of Maine as well as potential critical habitat areas for cusk. This research provides information critical for understanding areas where cusk may be bycaught in the Maine lobster fishery and potential economic costs of conservation measures for avoiding cusk bycatch. Based on the final habitat maps for cusk, the economic impact of potential area closures for cusk, if it were classified as endangered species, will be evaluated based on lobster seasonal fishing effort.

Keywords: Habitat mapping, quantifying suitable habitat, fishermen's knowledge, economic impacts

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