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Can we increase haddock yield within the constraints of the Magnuson–Stevens Act?

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ABSTRACT

Georges Bank haddock is a recently recovered fish stock in the New England groundfish fishery. Due to federal constraints under the Magnuson–Steven Act, however, this stock cannot be optimally exploited due to the bycatch of other critical species in the New England groundfishery such as cod and yellowtail flounder which are overfished. The Ruhle trawl and Separator trawl are examples of recent advances in gear technology that have been shown to significantly increase haddock to bycatch ratios. This study models the groundfish fishery through a mixed-stock yield model which incorporates technological interactions. We also develop a socio-economic model that quantifies the amount of employment and producer surplus associated with three trawl types. Our results explore policy situations regarding the use of the new trawls. By bridging the biological and socio-economic models, we are able to view the fishery as a system that more accurately represents stakeholder views. Our model shows that each trawl, when used exclusively, produces different optimum strategies and therefore an optimum management strategy would most likely include a combination of trawl types. Our results also support the logic of using modified trawls for haddock fishing trips in which bycatch is strictly regulated ("B days") as the Ruhle trawl is able to maintain 80% of catches caught by a conventional trawl while reducing bycatch up to over 60%. This paper is a first step towards an aid for policy makers to examine fishery gear trade-offs and the resulting biological and socio-economic consequences of different management actions within the constraints of the Magnuson–Stevens Act.

1. Introduction

Georges Bank, east of Cape Cod (Fig. 1), is an important historical fishing ground and was once among the most productive in the world (Boreman et al., 1997). However, many of the stocks greatly declined due to overfishing which set the stage for the reauthorization of the Magnuson–Stevens Fishery Conservation and Management Act in 1996. This legislation prioritized fisheries conservation in federal law; it prohibits overfishing and mandates rebuilding plans for all of the nation's stocks which are considered as overfished (Anonymous, 2006).

The Northeast Multi-species Fishery Management Plan, adopted in 1986, includes 19 different stocks. The fishery produces important technological interactions, meaning different species are caught with the same fishing gear (Murawski, 1984). The principal groundfish populations off New England are cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and yellowtail flounder (*Limanda ferruginea*). Fishermen have traditionally targeted the demersal stocks using relatively unselective gear. Today, the fishing gear used on Georges Bank is mainly bottom trawl (otter trawl) which represents about 80% of the gear used in the fleet.[1] Longliners and gillnetters make up the remaining percentage. The otter trawl, although equipped with a regulated minimum mesh size, is known for catching a mix of species, because it is dragged on the sea floor, and anything in its way can be caught in the net. As a result, fisheries that use otter trawls have large amounts of bycatch in their tows, forming the basis of Murawski's (1984) empirical foundation of the technological multi-species interactions in the groundfishery.

While yellowtail flounder and cod in the New England groundfishery are assessed to be both 'overfished' (i.e., low stock size)

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[1] Based on data from the National Marine Fisheries Service "dealer weighout database" (landings information provided by federally permitted seafood dealers).

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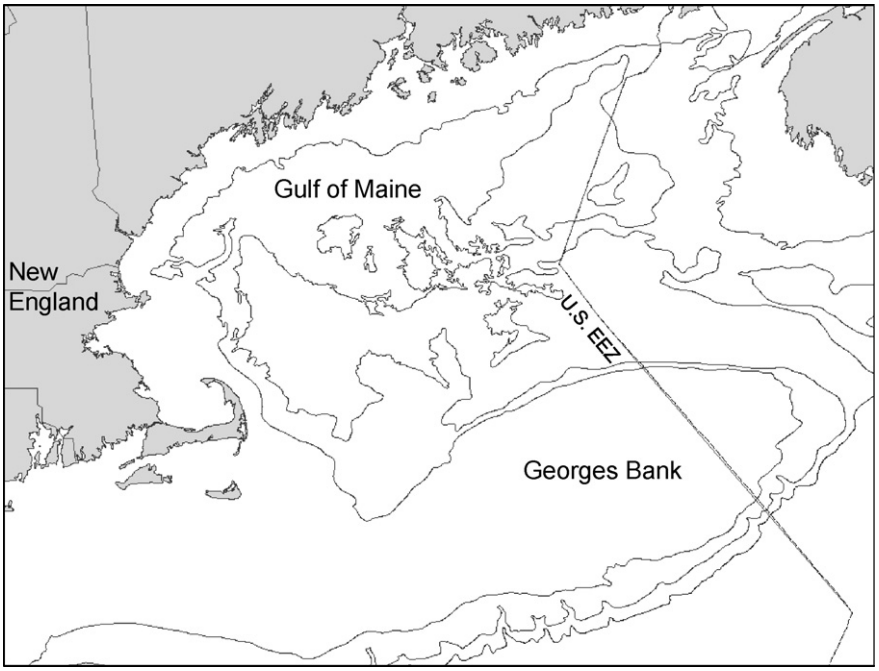

Fig. 1. A map of Georges Bank located east of the Northeastern coast of the United States.

with 'overfishing' still occurring (i.e., excessive fishing mortality), Georges Bank haddock is now considered a rebuilt stock (NEFSC, 2008). Non-selective fishing gears increase the amount of bycatch in the fishery and can hamper conservation and management efforts. Under the Magnuson–Stevens Act, fishermen may not fully target haddock with gear that also catches large amounts of overfished species such as cod and yellowtail flounder. Fishing with the otter trawl off New England led to the paradox of managing by the weakest link, forgoing potentials for employment and profit.

New technological advances in design of bottom trawls have led to two innovations to target haddock while minimizing bycatch of other species (Fig. 2). Since haddock tend to swim up when approached by fishing gear, in contrast to other species in the groundfishery, new modified trawls have succeeded to capitalize on this difference. The Ruhle trawl, formally known as the Eliminator trawl, incorporates a larger mouth design with 8 foot mesh size and a kite used to elevate the trawl in the water column for less bottom contact, thereby avoiding the overexploited cod and flounder

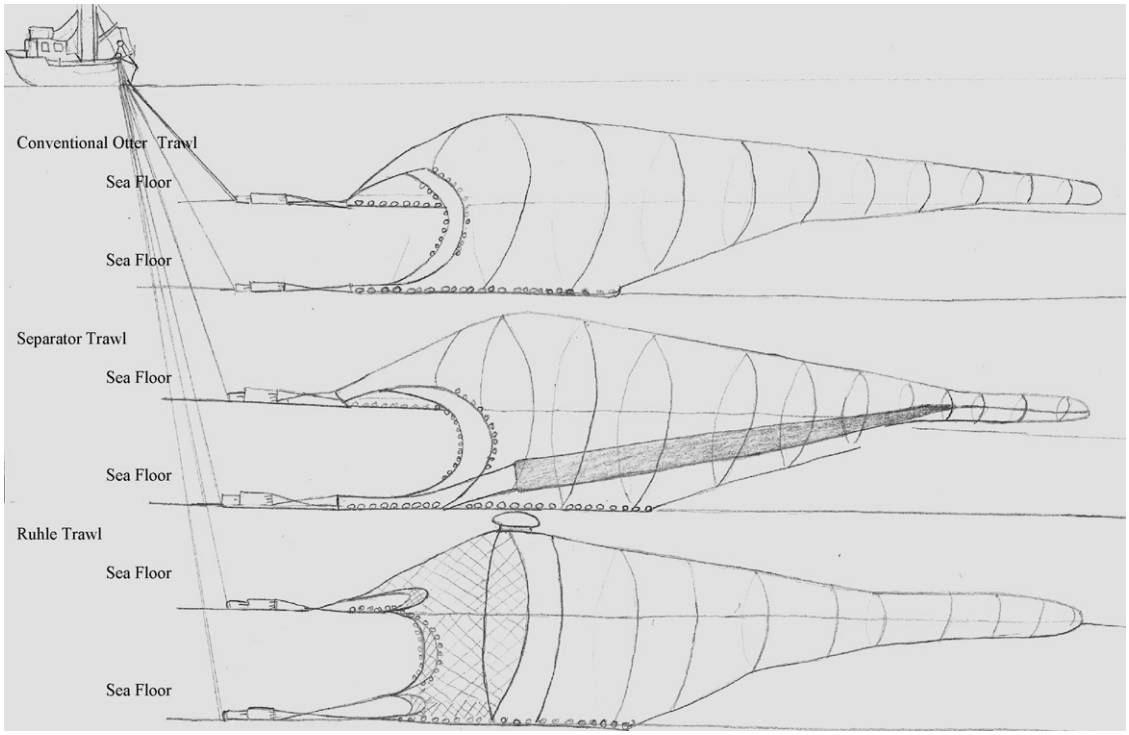

Fig. 2. An illustration of the main characteristics of the three trawls described in this paper. For more detailed information on the Separator and Ruhle trawls, refer to Martins et al. (2006) and Beutel et al. (2006, 2008). Drawing by Rachel DeLeon.