A coupled model of the Gulf of Maine lobster, herring and groundfish fisheries

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Abstract

The productivity and resilience of fisheries are subject to a multitude of dynamic and interrelated influences that arise from complex coupling of fish populations with the natural and human systems of which they are a part. With few exceptions, fisheries are managed independently, ignoring important natural and human linkages among them. The biological productivity, sustainability and consequently human benefits of ostensibly separate fisheries may be substantially increased if these linkages are better understood and if this understanding can be applied to management. The American lobster, Atlantic herring and Northeast multispecies groundfish fisheries in the Gulf of Maine are subject to an array of natural and human linkages, but these linkages have not been systematically studied. We use a range of bioeconomic models of varying complexity and realism to explore the implications that the linkages amongst these fisheries have for joint management. Our approach to studying and modeling the coupled system of fisheries is to build up from the knowledge base and models that are a legacy of the single-species approach to fisheries management that has prevailed to date, rather than attempt to construct original complex ecosystem models. While ecosystem models that attempt to characterize and quantify the overall food web in the ecosystem are useful in developing a qualitative understanding of the overall ecosystem, they are limited by major gaps in information and computational constraints. A fruitful middle ground is to build multi-fishery models incorporating single-species models that are connected by the important natural and human linkages