Session: Ecosystems

Ecosystem Based Fishery Management

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The primary guidance for ecosystem-based fishery management (EBFM) comes from the EBFM Policy and EBFM Roadmap at the National level, and the NEFSC Strategic Plan at the Center level. There are three broad categories of work delineated by these guiding documents, and undertaken by the Social Sciences Branch (SSB) in support EBFM: Integrated Ecosystem Assessments (IEA), coupled models, and ecosystem service valuations.

Integrated Ecosystem Assessments are designed to provide a quantitative synthesis of an ecosystem, directly tied to management goals and objectives, and ranging from physical processes, through the biota, to the human system. The SSB contributes primarily towards the Northeast Shelf IEA, which is a cross-line office product of several NOAA programs. Within the NEFSC, the Northeast Shelf IEA is led by the Ecosystem Dynamics Assessment Branch. IEA work is also supported by The International Council for the Exploration of the Sea Working Group on the Northwest Atlantic Regional Sea (WGNARS). The SSB is integrated into both facets of this work, with one branch member co-Chairing WGNARS and seven additional members directly engaged in the WGNARS and/or Northeast Shelf IEA work. The work focuses on the development and vetting of indicators to assess system performance, risk assessment to prioritize management strategies and scenarios, and generating best practices in IEA process and communication.

Due to the assimilation of the human dimensions within its work, WGNARS has become the focus of substantial attention within ICES, with the ICES Strategic Initiative on the Human Dimensions utilizing it as a case study, and the Working Group on Maritime Systems (WGMARS) co-hosting a workshop with WGNARS May 23 – 24, 2017. Besides publications co-authored by SSB members (DePiper et al. 2017; Gaichas et al. 2016; Jepson & Colburn 2013; Colburn et al. 2016), results have been presented to both the New England and Mid-Atlantic Fishery Management Councils as Status of the Ecosystem reports since 2012. Primary challenges faced in developing IEAs is the inability to assess full welfare measures, particularly with respect to consumer surplus, a lack of interdisciplinary theory in assessing optimal trade-offs between objectives (i.e. food provision vs. profitability), and short or non-existent time-series from which to assess social objectives (i.e. sense of place, cultural identity). Nevertheless, trade-offs can be assessed by mixing qualitative and quantitative analysis.

The SSB has worked to develop qualitative and quantitative coupled system models in collaboration with ecologists, population biologists, physical oceanographers, and other experts, with the primary goal of developing trade-off analysis across management alternatives. Examples of this work include the SSB's contribution to the herring Management Strategy Evaluation (Lee 2017), a bioeconomic recreational fishing model (Lee et al. 2017), and assessment of joint species/human community vulnerability to climate change (Colburn et. al., 2016) In addition, a portfolio model has been developed to assess risk-reward trade-offs across management alternatives (Jin, DePiper, and Hoagland 2016). The portfolio analysis has been integrated into the MAFMC Ecosystem Approach to Fishery Management and an extension coupling the portfolio model to multispecies biological models has been presented to the NEFMC as a tool for assessing trade-offs of management strategies within a simulated environment. The SSB has collaborated with other branches within the NEFSC to develop coupled conceptual models (Figure 1). These conceptual models have been used to facilitate communication with management councils, by linking management objectives to the dominant system components. Although relatively

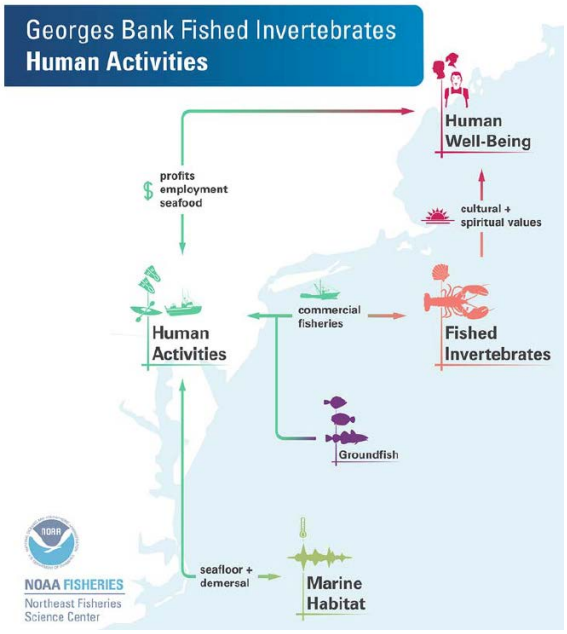

Figure 1 Conceptual model of Georges Bank

general, the conceptual models have been effective in generating a high-level visual representation of the major system components as a departure point for a more technical IEA presentation to stakeholders. The conceptual models have also been developed into qualitative network models, for the primary purposes of gap analysis and strategic insight into system dynamics which can then inform more complex and resource-intensive quantitative models (DePiper et al. 2017). Major challenges remain in fully coupling complex multispecies biological models with equally complex models of fisherman behavior.

In a departure from the programmatic IEA and coupled model work, the SSB's forays into ecosystem service valuation has been opportunistic, primarily due to the lack of data on non-market values and cost of developing such data, clear prioritization from resource managers, and fully described system components (e.g. habitat quantity and suitability metrics at management scales). Assessing the de-nitrification and nutrient sequestration value of oyster reefs within Chesapeake Bay is one recent example in which these ecosystem services have been quantified with existing data (DePiper et al. 2017), and there has been some historical choice experiments aimed at assessing non-market value of marine protected areas in the region (Wallmo and Edwards 2008). Generally, however, cost considerations have severely restricted additional rollout of survey-based analyses. Further, as discussed in the Protected Species session, derived demand estimates of the shadow price for protected resources are being developed.

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