

THEME SECTION

'Evolution' of fisheries science

Idea and coordination: Howard I. Browman

Application of evolutionary theory to fisheries science and stock assessment-management

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In addition to the often contradictory demands of industry, politicians, economists, and environmental/wildlife protection organizations, there are currently several sub-disciplines of marine science making persuasive cases for inclusion in the development of fisheries ecology, and in stock management practices. These include physical oceanography, reproductive biology, community ecology and—the focus of this Theme Section (TS)—evolutionary ecology. The essays (it is essential that they be viewed as such) that follow address several different aspects of this theme.

Jeffrey Hutchings' essay provides a somewhat historical perspective on the theme and represents a rationalization for the inclusion of evolutionary ecology in fish stock assessments and management practices. David Conover presents and discusses consequences of ignoring evolutionary ecology in the study and management of fishery resources. He focusses on evolutionary aspects of local adaptations in fish populations. Kevin Stokes and Richard Law consider commercial fishing as a massive, uncontrolled, experiment in evolutionary selection and discuss the effects of intense fishing pressure on several adaptive traits. Since Hutchings identifies the ecological models developed by Carl Walters and his colleagues (Pauly et al. 2000, Walters et al. 2000a,b) as potentially useful tools that will allow incorporation of evolutionary ecology into fishery science and fish stock assessment-management, the TS concludes with a contribution from Walters in which the conceptual basis for these models is presented, along with examples of their potential utility.

In all these essays it is argued that the application of theory from evolutionary ecology will improve the success of fishery resource management in the long term.

While this may be true, assessment scientists can often not afford to think in terms of ecological time scales: the population dynamics of heavily exploited fish stocks change over proximate rather than ultimate time-scales. The challenge is to bridge time scales and to develop routine approaches and methods (sampling, data analysis, interpretative frameworks) for incorporating evolutionary theory more directly into fishery science and, thereby, support the sustainable management of the World's fish resources.

LITERATURE CITED

- Pauly D, Christensen V, Walters C (2000) Ecopath, ecosim and ecospace as tools for evaluating ecosystem impacts on marine ecosystems. *ICES J Mar Sci* 57:697–706
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- Walters CJ, Pauly D, Christensen V (2000b) Ecospace: prediction of mesoscale spatial patterns in trophic relationships of exploited ecosystems, with emphasis on the impacts of marine protected areas. *Ecosystems* 2:539–554

Numerical assessment in the front seat, ecology and evolution in the back seat: time to change drivers in fisheries and aquatic sciences?

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Systems must be stressed before their strengths and weaknesses can be fully known. This seems true whether one is building a bridge or applying a set of analytical and research protocols in aid of the management of a natural resource. There can be little argument that the collapse of fish stocks worldwide has effected a level of stress sufficient to warrant critical examination of the palette of scientific contributions