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## Variability and Management of Large Marine Ecosystems, K. Sherman and L. M. Alexander, Eds.

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## VARIABILITY AND MANAGEMENT OF LARGE MARINE ECOSYSTEMS

Kenneth Sherman & L.M. Alexander, Eds.

Boulder: Westview Press. 1986.

Pp. 319. \$31.95.

This collection of papers is taken from the 1984 meeting of the American Association for the Advancement of Science, and is part of the AAAS Selected Symposia Series. The purpose of the symposium was to synthesize current knowledge of Large Marine Ecosystems (LMEs), particularly with regard to measuring ecological changes and developing new, multispecies management options for marine fisheries. The stated objective of the book is "to increase the awareness among resource management organizations, scientists, lawyers, and students, that it is scientifically, technically, and legally feasible to implement holistic conservation and management regimes for LMEs."

Part One investigates the impact of perturbations, both natural and anthropogenic, on the productivity of LMEs. Part Two focuses on measuring variability in LMEs. The two obviously go hand in hand; determination of impacts requires the painstaking processes of counting and tabulating data on oceanographic and biological parameters over large geographic areas, and over significant periods of time.

The papers in these first two sections, which sometimes are heavy going for the non-biologist, leave the reader with the growing realization that marine ecosystems are indeed subtly complex and delicately balanced, sensitive mechanisms. We can imagine Mr. Wizard saying, "That's right, Jimmy, scientists are finding that everything in these LMEs is connected to everything else, and in ways that we are only beginning to understand."

A major contribution of this book is, therefore, that it provides a glimpse of the enormity of the task of attaining comprehensive understanding of just how marine ecosystems work. While the state of knowledge appears to be quite primitive in comparison to what we should like to know before we might effectively "manage" LMEs, the kinds of work described by the various authors are encouraging. Indeed, among the authors of papers in this volume are very many leading scholars of marine science; the book therefore represents the state of the art (in 1984) in the emerging field of LME assessment and management.

The scope of inquiry necessary to attain deep understanding of LMEs is truly staggering. First, there must be understanding of the physical systems; patterns of winds and currents, temperature, salinity, pH, etc.,

must be quantified to determine intra and interannual variations and their interrelationships. Such phenomena as El Niño, which have profound effects on ecosystems, are as yet poorly understood. Eventually, models must be linked to models of human activity, including fishing mortality and all forms of marine pollution.

Second, biological models must be expanded to incorporate an ecosystem view of spawning, larval and juvenile behavior, and eventual recruitment of adults into marine fisheries. To attain such a view, we must isolate stock variations associated with predator-prey relationships, including cannibalism; food competition; fishing mortality; and marine pollution. Work done so far indicates that predator-prey relationships are extremely significant in at least some LMEs, suggesting the possibility, for example, of increasing overall stocks by focusing effort on predator stocks as periodic target species.

Part Three examines the institutional frameworks necessary for effective management of LMEs. If large ecosystems are of themselves subtle and complex, the problem of management is compounded by yet another order of magnitude by institutional intricacies. Conflicts may arise of all shapes and colors: scientists vs. bureaucrats, fishermen vs. managers, nation vs. nation, the present vs. the future, and so on. At first glance, these social, economic, and political constraints seem insurmountable. However, progress in institutional evolution is seen in the Baltic ecosystem, and in the Antarctic. Institutional mechanisms which are evolving in these areas show promise for applicability elsewhere.

Because this is a collection of papers from a symposium, the book lacks the focus and cohesiveness of a work by a single author. Nevertheless, it serves to assess current knowledge of what promises to become the prevailing approach to fisheries management in the future. For this reason, it is suggested reading for marine scholars of all disciplines.

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