

ECOLOGICAL CONSIDERATIONS IN THE ASSESSMENT OF MARINE FISHERIES

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It is important to recognise the relevance of marine ecology to fisheries; and a certain degree of understanding of the ecological context within which a harvesting activity is taking place is essential if adverse impacts of these activities are to be minimized. It is also important to be aware that exploited components of complex biotic systems are linked to other components - not all of which are harvested - but essential to the economic productivity of the system. Wherever possible these linkages need to be understood since one fundamental ecological principle is that "all ecosystem components are interlinked".

It is also relevant to note that a maximum sustainable yield may be postulated for the systems as a whole. But this will vary in time depending on the stability of the system. System stability is a function of a range of extrinsic factors acting through meteorological and hydrographical influences, each modulated in turn by the geographic, bathymetric configuration of the area of interest and expressed through a set of characteristic species which have come to evolve their own mutual checks and balances.

Ideally, the first step towards gaining a degree of understanding of a fishery would be to proceed from the general to the particular: (a) starting with an overall description or "mapping" of the natural system, its geography, hydrography, distribution of the main taxa, their biology, migrations and interrelationships and (b) from a knowledge of fisheries as well as the importance of fishing ground from the point of view of the human activities. The latter step would then consist of focussing the attention on individual components of key interest.

For several important areas of the world oceans, detailed work on mapping and data gathering on the resource and environment has never been carried out. Also, a knowledge on the biology of key components and their interactions is not yet available. The need for basic understanding of fisheries ecosystems and their interactions, especially in the tropics, is an urgent one. The currently important tropical industrial fisheries are as a result of technology transfer from high latitude fisheries. This has led to the lack of proper basis of biological information for their control and management, which may lead to serious consequences. Tropical ecosystems being so complex with multispecies fisheries, broad generalizations on growth and modality based on single species assessment rationales and short-cut methodologies would not work. Hence studies on the ecosystem interactions and biology of commercial fisheries,

on a continuous basis is an integral part of management of our marine fisheries.

Fisheries ecology and assessment of resources:

As already indicated ecological interactions in fisheries are major occupation of marine ecologists. Studies of these interrelationships among commercial species and their physical environment are currently going on in several areas of the world oceans. These studies are likely to have a significant impact on the way the assessment and management is carried out in the future. From the experiences of single species assessments and other consistently well managed fisheries over the last few decades, it is becoming clearer that the development of realistic assessment methods requires greater amounts of detailed information and data collection. Hence larger staffs of fisheries scientists and administrators are to be involved in an efficient assessment, monitoring and management system. To quote May (1984), ".... to date, despite a growing interest in the theme of ecological interrelationships, a generally acceptable stock assessment and management system is not yet available: which means that although species interactions are known to be real, they cannot always be quantified, much less predicted". In such circumstances, a good deal of ecologically informed common sense is required from fisheries administrators as well as fishery biologists.

Biotic and Abiotic factors in marine ecology:

The impact of the environment on marine organisms has been a major preoccupation in marine ecology. It goes without saying that fish populations, their abundance and species compositions are very responsive to changes in key environmental variables that are not under the control of fisheries administrators.

Physicochemical (abiotic) factors such as temperature, salinity, currents, upwelling, light, depth, oxygen, pH, nutrients etc. influence the biological activity of the living components in many ways.

Biotic factors important in relation to fisheries are:

(a) the availability of food: photosynthetic potential of marine environments, (b) the influence of other organisms on the species in question, (c) trophic interactions in which predation is the major factor, (d) non-trophic interactions (such as competition for space) and (e) mutual assistance (parasitism, commensalism, symbiosis).

Besides discussing various ecological parameters and their influences on the marine fisheries, a classification of marine fisheries based on habitats, the idea of the trophic pyramid and the food chain and their relevance in the complex marine ecosystem shall be discussed in the lecture.