

# Chapter 13

## Bioeconomic Fishery Management: Changing Paradigms towards Eco-System Based Management

Anita Chattopadhyay Gupta  
Muralidhar Girls' College, India

### ABSTRACT

*Coastal areas are also important ecologically, as they provide a number of environmental goods and services. Potentially, if managed sustainably, they can provide continuing returns without any decrease in their productivity. But, the unfolding state of coastal ecosystems, from the standpoint of fisheries production, is causing concern. A move towards fishing management that conserves biodiversity, permits sustainable utilization and recognizes the importance of species interaction is worthwhile. Recent recognition of such interactions in fishing has resulted in calls for adoption of ecosystem approaches to fishery management to rebuild and sustain populations, species and biological communities at high levels of productivity and biological diversity. The coupling of fishery management issues more directly with the issues of marine pollution, and biodiversity represents an increasing understanding of the linkages among them. This calls for changing fishery management paradigms towards a more coherent ecosystem approach.*

### 1. COASTAL ECOSYSTEM AND FISHERY LINKAGES: THE GLOBAL SCENARIO

Ecosystems are complex, linked, interactive systems in which organisms, habitats and external forces (e.g., ocean currents, weather) act together to shape communities and regulate population abundances. Humans are components of the eco-

systems they inhabit and use. Their actions on land and in the oceans measurably affect ecosystems, and changes in ecosystems affect humans<sup>11</sup>.

Coastal area<sup>2</sup> is commonly defined as the interface or transition area between land and sea. The potential for economic opportunities in coastal cities is a strong attractive force, fuelling immigration, often from economically depressed rural areas. Thus, coastal areas are extremely

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important for the social and economic welfare of current and future generations, as coastal resources support key economic and subsistence activities. Coastal areas are also important ecologically, as they provide a number of environmental goods and services. Marine and estuarine areas often benefit from flow of nutrients from the land and also from ocean upwelling that brings up nutrient-rich water to the surface. They thus tend to have particularly high biological productivity and also support a rich biological diversity. Five main zones can be identified in the coastal-marine spectrum: *inland areas*, which affect the oceans mainly via rivers and non-point sources of pollution; *coastal water*, generally estuaries where the effects of land-based activities are dominant; *coastal lands*, where human activity is concentrated and directly affects adjacent waters; *offshore waters*, mainly out to the edge of national jurisdiction (200 nautical-miles offshore) and *high seas*, beyond the limit of national jurisdiction. The ecosystem has tremendous pressure from its varied uses. The major activities in the ecosystem include fisheries and tourism. With multifarious use there is bound to be conflict among the different users.

Coastal ecosystems (including marine fisheries) cover approximately 22% of the total land area in a 100-km band along continental and island coastlines; as well as the ocean area above the continental shelf. According to the 1994 distribution of population in relation to the distance from the nearest coastline, 20.6% of the world's population lives within 30 km of the coast, and 37% within 100 km (Gommès, 1997). About one-half of the world's population lives within 100 km of the coast, the part of the sea most accessible to man. The coastal zone is home to roughly 2.2 billion people or 39% of the world's population and yields as much as 95% of the marine fish catch (World Resources 2000-2001, 2002). Marine fish generates around 1% of the visible global economy and supports the livelihoods of some 200 million people. Fisheries are a large international business. They also provide direct and indirect employment

for about 200 million people (Garcia and Newton, 1997). Marine capture fisheries usually yield near about 84 million metric tons of fish and are by far the largest contributor to the 14 kg of fish available as food per person (FAO, 1997). Out of these global fishery products, approximately 28% are used for animal feed and other products that do not contribute directly to human food. So its importance in terms of providing nutritious food cannot be denied. This is especially true for developing countries.

Fisheries development is essential, both as a means of increasing levels of food production and as a means of improving the quality of diet in developing countries. As a source of protein, vitamins and essential minerals, fish provides an ideal supplement to the poor and monotonous diet which is the daily fare of the inhabitants of many tropical and sub-tropical countries (Bailey, 1988). Indeed, the natural resources of the sea are extremely valuable and renewable. Potentially, if managed sustainably, they can provide continuing returns without any decrease in their productivity.

But, the unfolding state of coastal ecosystems, from the standpoint of fisheries production, is causing concern. Many marine fisheries are in decline and globally it has reached a plateau of about 84 million metric tons. Reported landings have leveled off at approximately 85 million tons since 1989. An evaluation of the global status of fishery resource species in 1994 has listed 31% as lightly to moderately exploited, 44% as fully to intensively exploited, 16% as overexploited, 6% as depleted and 3% as recovering (Garcia and Newton, 1997). Yields of 35% of the most important commercial fish stocks have declined between 1950 and 1994 (Grainger and Garcia, 1996)<sup>33</sup>. Estimates of the production capacity of the oceans give limits to catch at 100-200 million ton. General patterns are of declining yields for 35% of all species, with 25% showing relatively stable yields at high exploitation levels, and 40% with some development potential (FAO, 1997). Therefore the recent global trends suggest that

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