

Overfishing: Single Species and Ecosystems

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Fisheries management is required to generate measures of overfishing and establish harvest rates that are consistent at the various levels of biological organization. Systemic management meets these requirements by providing goals for sustainable harvest rates that are compatible with measures of overfishing from single-species resources to multi-species groups in the marine environment.

Fisheries management must also regulate catch allocation. Catch may be allocated over alternative resource species, across trophic levels, among various groups of resource species, across age groups, over time (e.g., seasonal quotas or catch limits) and over space (e.g., establishing marine reserves or finding advisable locations to harvest). Such allocations can be established through systemic management by using the observed allocations among other predatory species while simultaneously and consistently setting objectives for total harvests from individual species, species groups, and ecosystems. All such objectives must be part of any complete management plan.

Another objective of management is to account for complexity. This would include, but is not limited to, accounting for evolutionary and co-evolutionary dynamics, physiological processes, predator/prey relationships, the varying physical/chemical nature of the environment, competition, behavior, life history strategies, and allometric relationships involving body size - all factors that are under-represented in conventional management practices. Systemic management automatically accounts for complexity by incorporating all possible factors through looking to nature itself as a guide.

The undefinable complexity of nature is accounted for in systemic management by using emergent empirical patterns for guidance. The guidance provided in systemic management precludes (and solves the problems created by) advice based on incomplete consideration of complexity common in conventional management that is based on partially relevant models, meetings, and the judgment of experts. The manipulation, control, or management of any system always has repercussions and consequences beyond our capacity to consider. The dynamic, complex, and interconnected nature of the biosphere is beyond human prediction, and cannot be controlled to avoid the consequences of our actions. Instead, we can achieve sustainability by regulating human influences or impacts so that they fall within the limits of natural variation observed in natural systems. This results in human influence that mimics the successes of other species in the face of, and products of, complexity – using predation rates by other predators, for example, in managing harvests of fish. Systemic management acknowledges that nature cannot be reconstructed from the incomplete set of parts that have been isolated for study by scientists. Nature can be accurately viewed only in its entirety – as a whole with parts and components directly relevant to specific management questions. As such, realistic guidance is best obtained through empirical information, exemplified by looking to other species as role models for the sustainability sought in management.