Develop recovery planning tools incorporating biology and economics

Problem Statement

Risk analyses identify biological populations in dire need of protection, as well as the amount of improvement required to insure a high likelihood of their persistence. Given these data, management actions must then address specific reductions in mortality or increases in reproduction that will result in reduced risks of extinction. However, for species conservation to be successful, management actions that achieve the greatest biological benefit per unit of economic cost must be readily identifiable because funding is limited.

Critical Factors

- Develop statistical methods that offer a biological measure for how well a population is doing and which, in turn, can be associated with an economic cost. This measure will be referred to as "lambda" or the annual rate of population growth.
- Simultaneously develop statistical methods for relating management actions to improvements in lambda and the economic costs of those management actions.
- Combine economic costs and increases in lambda to produce a "percent increase in population performance per unit dollar cost".
- Apply the above research to real-world management actions and federal expenditures aimed at recovering salmonids. Ask if we are indeed getting "*the biggest bang for the buck*".

Status of Research

The Cumulative Risk Initiative (CRI) Team is developing statistical tools that meld economic costs with biological benefits so that conservation planning is not blind to economic considerations when it is responsive to biological needs. The team has developed methods that relate changes in fish survival to changes in annual rates of population growth for salmon (in press in *Science*). Because biological and economic data inevitably have gaps, a variety of approaches are being explored for handling those gaps and representing degrees of uncertainty in the results of statistical analyses. Although the need to be sensible about the economic costs of conservation is widely appreciated, this is the first time that a solution to this problem has been attempted for any species or any conservation issue. Unlike many widely cited papers in "ecological economics", the focus of this research does not involve establishing a "value" for biodiversity. Instead, the value of salmon is assumed and the objective is to determine how salmon productivity can be maximized with minimal economic cost.

Future Considerations

The melding of economics and biology is a rich new field and should be broadly applied in fisheries biology and resource management. Our initial research will focus on salmon, but may well consider other species where data are permitting.

Key Players

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