The biology and economics of overharvest: An example from fisheries

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While sustainable harvest is clearly possible, excessive harvest mortality has been implicated in a variety of environmental catastrophes ranging from the extinction of pre-historical megafauna to the continuing collapse of fisheries around the world. What are the conditions that distinguish systems that support centuries of sustainable harvest from those where population collapse occurs in less than a decade? In this paper, we use the example of a sportfishery involving hundreds of independent population units to demonstrate an essential link between the biological and economic forces that favour population collapse. Biological conditions that favour collapse are those that result in high optimal densities of the target organism. The economic conditions that favour collapse are easy access to a valuable resource. High population abundance of a valued (i.e. "charismatic") species is normally associated with resilience to the extinction process. As a result, we suggest that process of harvest-induced collapse differs fundamentally from collapse due to habitat loss. We also provide evidence that extinction following a harvest-induced collapse is a separate process that involves depensatory mortality in a variety of forms. Restoration of economically important species will not be possible unless management policies are implemented that are effective in countering the very strong forces that favour collapse and extinction.