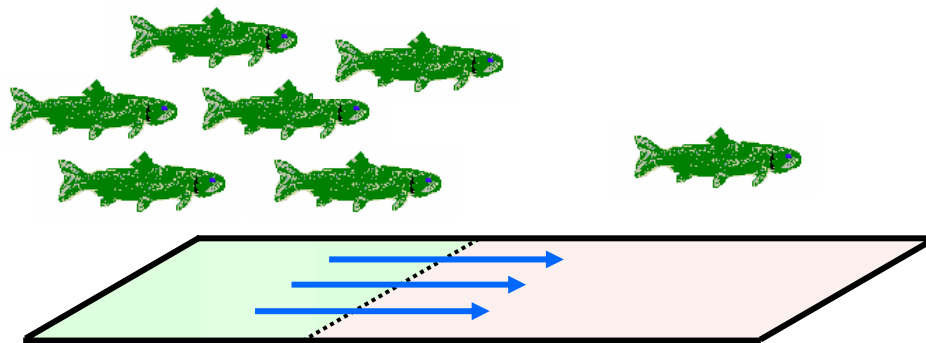


Optimal Management of a Spillover Fishery

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The twentieth century saw the spectacular collapse of many large pelagic and coastal fisheries, some of which had been profitably harvested for centuries. The fact that many of these fisheries were being heavily managed at the time of their collapse has fuelled the perception that traditional fisheries management techniques cannot ensure the persistence of commercially attractive marine organisms. The rapid decline of smaller, artisanal fisheries in developing nations is perhaps of greater concern, as over 1 billion people depend on fish as their primary protein source. A solution to both these problems that has gained much support is the use marine protected areas (MPAs) to guard against overfishing, and also to increase fisheries yield. Central to the ability of MPAs to perform these two functions is the phenomenon of "spillover".



Most commonly understood to be the net export of individuals from an unfished area into a fished area, the existence of spillover is crucial if MPAs are to achieve their conservation and fisheries goals. Its existence is certain, and has been observed in numerous species and places, but the quantity of spillover will depend on two main factors: the size and shape of the MPA, and specific characteristics of the protected organism.

Addressing such specific ecological details will lead to more optimal MPA-spillover systems, and we have devised a flexible method for their inclusion. However, it will be the ability of management authorities to *set up* such MPAs that will ultimately decide whether they are accepted as a valid method for management. These protected areas must be established despite considerable uncertainty about the ecosystem – the behaviour of the fish, and their potential reaction to protected areas and harvesting.

We have formulated this MPA-spillover problem in an *optimal monitoring* framework, allowing managers to set up protected areas in acknowledgement of this uncertainty, allowing for them to learn about the ecosystem, and decrease this uncertainty. It is only if we adequately incorporate pragmatic concerns such as ignorance that the ecological theory of marine reserves will be successfully applied.