



# Reference Points

## Measuring success in fisheries management

### Overview

Fisheries managers are responsible for ensuring the health of both fisheries and fish populations. How is health defined, and how can success be measured? Through biological reference points, such as the biomass needed to provide maximum sustainable yield ( $B_{MSY}$ ). Scientists have used reference points for over 50 years to evaluate stock status and now are applying them more broadly. In fact, reference points are emerging as one of the most widespread and effective bases for modern fisheries management.

Setting reference points is a critical step in the development of harvest strategies, because reference points are closely tied to several other strategy components. Reference points are the benchmarks that scientists and managers use to compare the current status of a stock or fishery to a desirable (or undesirable) state, and hence help to determine the success of the harvest strategy. For fisheries with clear management objectives, reference points can be used to assess progress toward meeting those objectives. In some cases, the reference points are set at the beginning of the harvest strategy process, functioning as de facto management objectives.

Managers should choose reference points based on scientific advice, which ideally should be informed by management strategy evaluation (MSE) analyses that assess how well the candidate reference points are likely to perform in the context of the broader harvest strategy. Reference points might not reflect the full suite of trade-offs encompassed within a fishery's management objectives but can be used to guide development of the harvest control rule (HCR)—the harvest strategy's operational component—by providing concrete anchor points for the HCR's management action.

### Limit, target, and trigger reference points

In fisheries management, there are three main types of reference points: limit reference points ( $LRP$ , or  $B_{lim}$  and  $F_{lim}$ ), target reference points ( $TRP$ , or  $B_{MSY}$  and  $F_{MSY}$ ), and trigger reference points.

Limit reference points should define the danger zone, the point beyond which fishing is no longer considered sustainable. In a well-managed fishery, managers avoid this zone with a very high degree of certainty and if