

Managing Uncertainty in Fisheries

Law, Data, Science, and Incentives



Why Worry About Uncertainty?

- Very few humans, lots of fish
 - Lower risk, mistakes are not costly
- Lots of humans, fewer fish...and trying to maximize yield
 - Higher risks, costlier mistakes



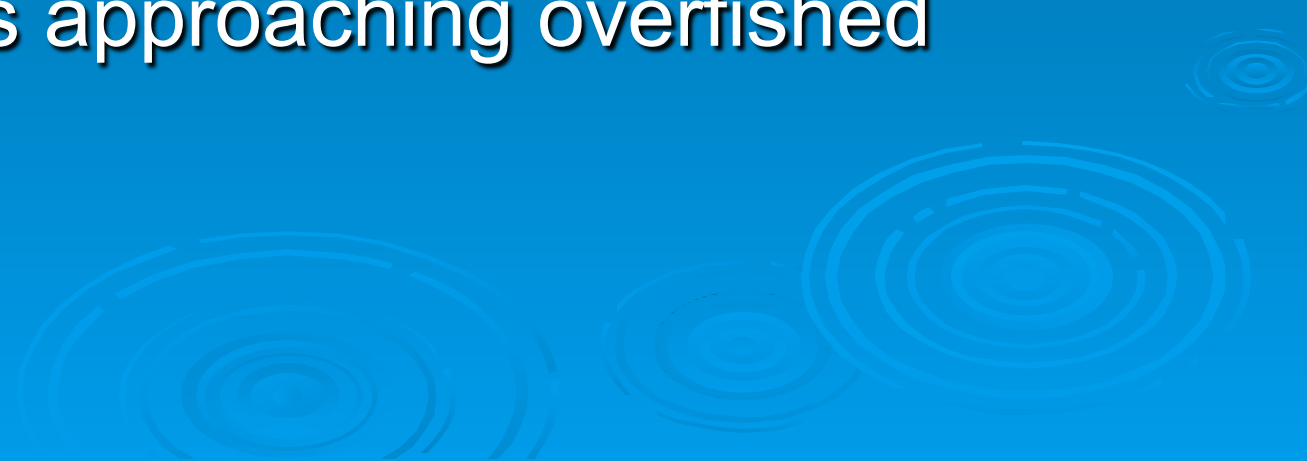
Poll: Risk Factors

Low

High

	Low	High
Fishing effort	Low risk	High risk
Stock vulnerability	Low risk	High risk
Uncertainty	Low risk	High risk
Central governance	High risk	Low risk
Social capital	High risk	Low risk

Status of Caribbean Fisheries

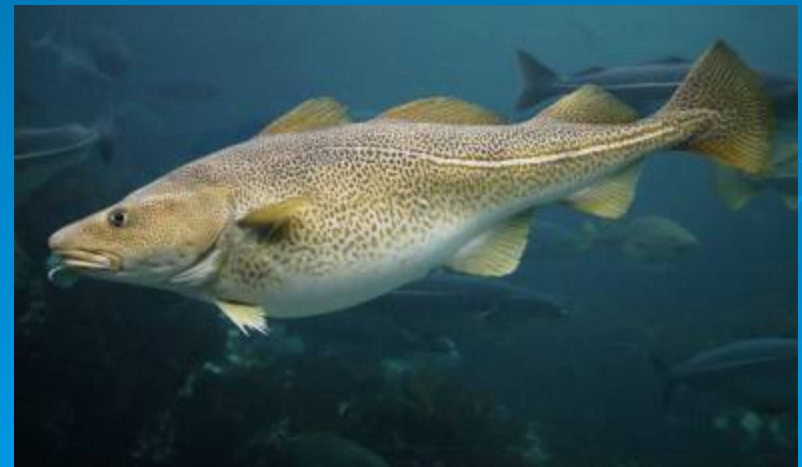
- Mixed Bag
 - Very high uncertainty
 - Queen conch, several grouper species overfished
 - 20 species experiencing overfishing
 - 14 species approaching overfished condition
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- The bottom right corner of the slide features a decorative graphic consisting of several sets of concentric circles, resembling ripples in water, rendered in a lighter blue shade against the background.

Uncertainty and Collapse

- US west coast rockfish
 - Scientific uncertainty, overfishing
 - Fishery disaster, collapse of \$100 M/yr fishery



- US New England groundfish
 - High management uncertainty, effort control
 - Overfishing of cod and other species
 - Very limited fishing opportunity, economic decline



Sources of Uncertainty

➤ Scientific

- Data quantity and quality
- Knowledge and model structure
- Others?

➤ Management

- Precision of management measures
- External factors that affect outcomes
- Others?

Scientific Uncertainty

Uncertain data	Perfect model	Uncertain outcomes
		
Precise data	Wrong model	Inaccurate outcomes

ACCURACY

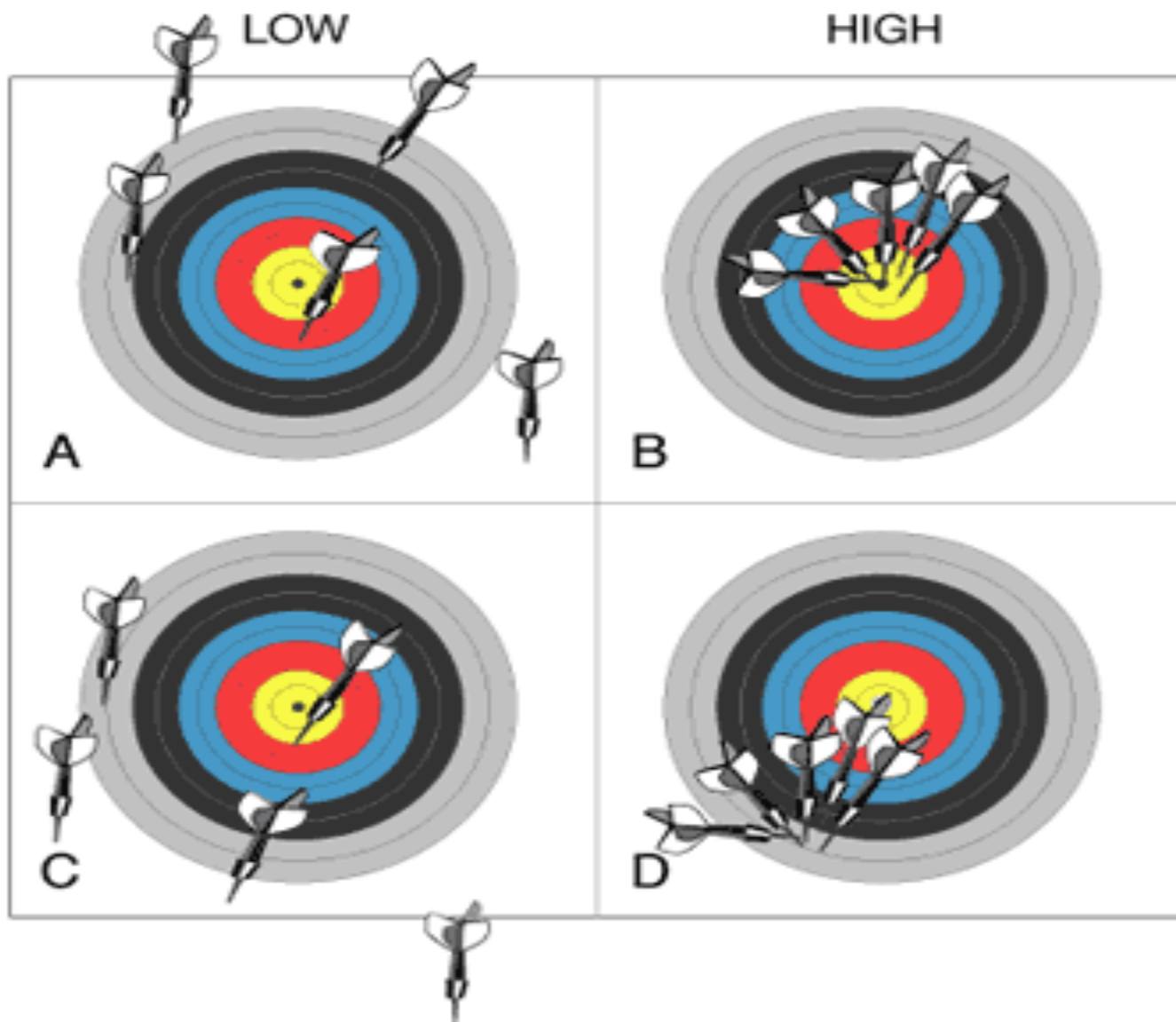
LOW

HIGH

PRECISION

LOW

HIGH



Improving Precision AND Accuracy to Reduce Uncertainty AND Risk

- Accuracy: Fishery independent data and research to understand state of nature and inform model structure
- Precision: Richer fishery dependent data



Optimize Data Collection

- Use management goals and data availability to find right model
- Design monitoring programs to achieve goals and fuel models



OR



Management Uncertainty

- How certain are we that management measures will actually work?
 - Directness of relationship to desired outcomes
 - Ease of monitoring and enforcement
- Effort controls
- Catch limits
- Area restrictions

Mandate

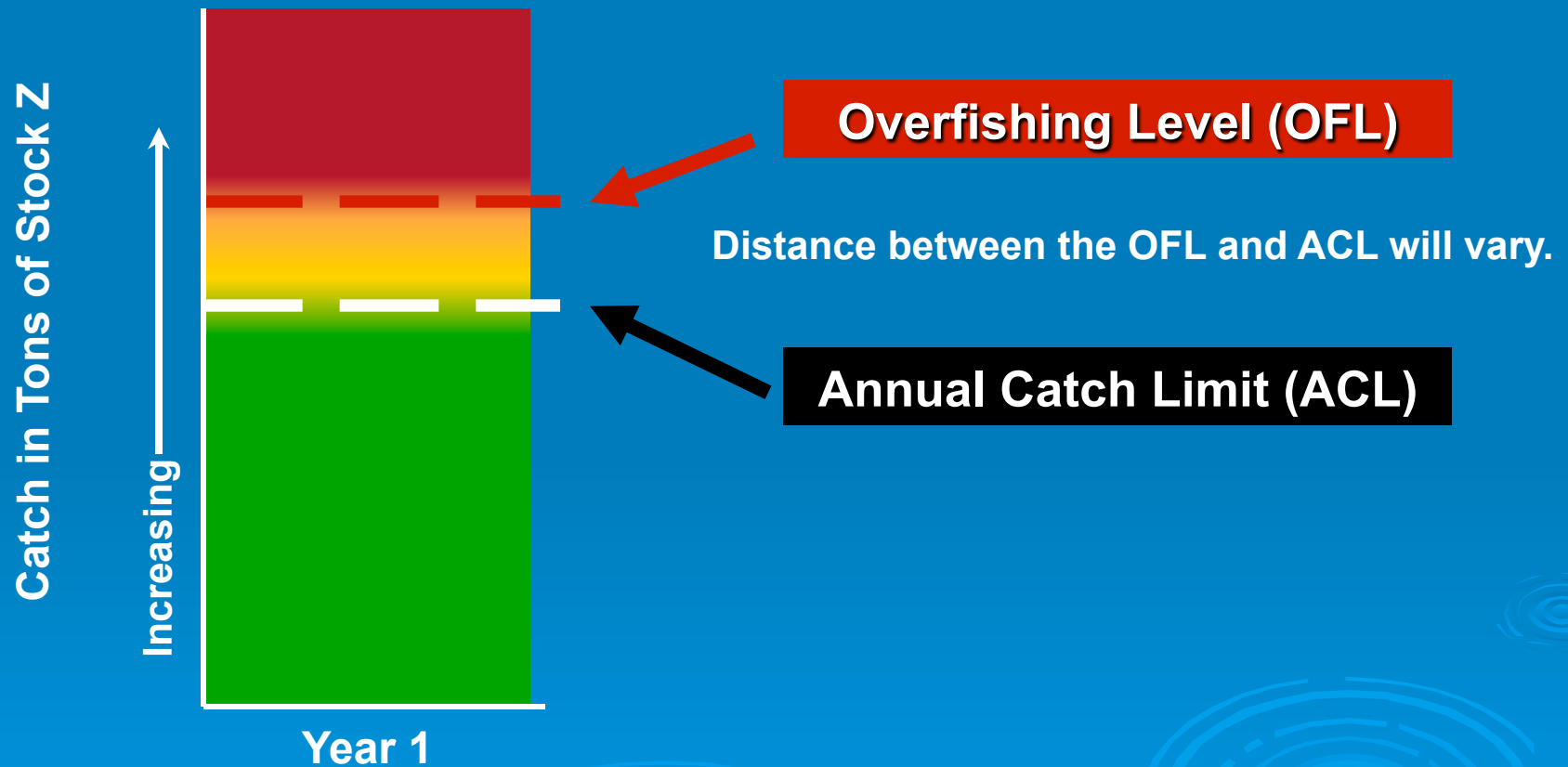
- Annual Catch Limits required for all stocks by end of 2011(MSA Section 104 (b)(1)(B))
- ACLs must be buffered to account for uncertainty



Process

- Establish Overfishing Level (OFL)
- Establish Annual Catch Limit (ACL) - Set below the OFL to ensure that overfishing does not occur

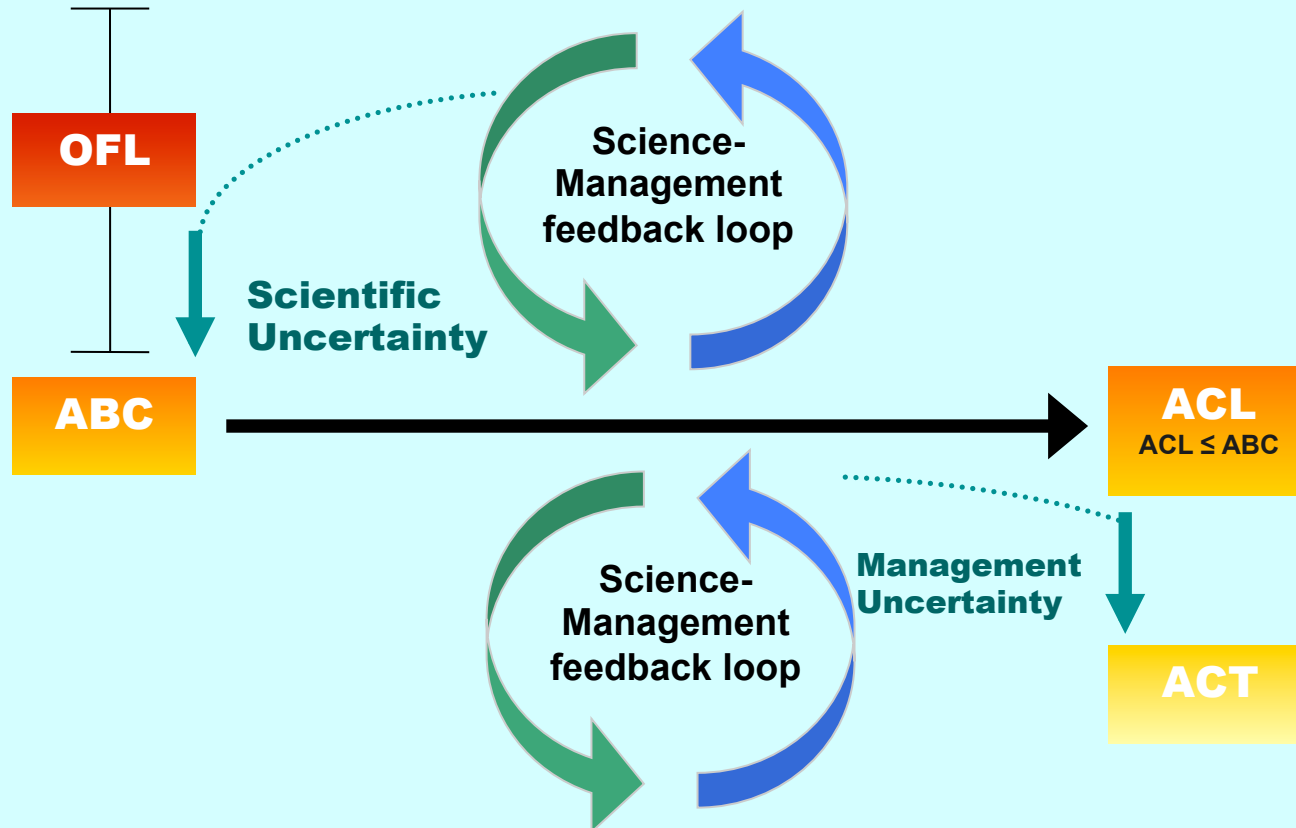
Relationship between ACL & OFL



NS 1 Guidelines for Setting ACLs

SSC

Council



Dealing with Scientific Uncertainty

- Lots of stocks, little time and resources
- Data poor methods available
- More information from scarce data



ATTITUDE

WHEN LIFE HANDS YOU LEMONS, MAKE LEMONADE.

Dealing with Management Uncertainty

- Improved understanding of external factors that affect catch
- More monitoring and enforcement
- Management systems - data richness, accountability, direct connection to goal
- Management regime and F and B convergence on management goals: incentives

The Fishery of the Future

- Increased understanding of factors that influence distribution and abundance of fish
- Better assessment models provide good basis for setting ACLs
- Good monitoring programs to feed models
- Management regime creates incentives for stewardship, rich data, lower uncertainty
- ACL buffers are reduced accordingly and ACLs go up