Simple Simulation Demo: Projections, HCR and Kobe plot

Management Strategies for Tuna Industry Stakeholders in the Eastern Pacific Ocean (EPO)
San Diego, August 12, 2019
Evaluating Strategies

Using computer models, in this case a very simple population model with no error or uncertainties.
Catch and Population Size Trajectories

Constant Catch

40:10 HCR

Constant HR
Extending to a Model with uncertainties

- Same model, adding random errors
- Run the model 100 times
Catch and Population Size Trajectories

Constant Catch

40:10 HCR

Constant HR
Kobe plot

- Overfishing & overfished
- Overfishing & not yet overfished
- No overfishing but still overfished (recovery?)
- No overfishing and not overfished
Kobe plot, simple model

Constant Catch

![Graph showing constant catch over time with a linear decrease in biomass and corresponding F/Fmsy and B/Bmsy values.](image)
Kobe plot, simple model

Constant Catch with Implementation error
Kobe plot, simple model

Constant HR (Fmsy) with Stock Assessment error

- Graph showing changes in Catch and Biomass from 1961 to 1995.
- Scatter plot showing F/Fmsy and B/Bmsy with data points.
Kobe plot, simple model

40:10 HCR, HR target (Fmsy) with Stock Assessment error
Kobe plot, simple model

50:20 HCR, HR target (Fmsy) with Stock Assessment error
Kobe plot, simple model

40:10 HCR, HR target (0.7*Fmsy) with Stock Assessment error
Going Beyond the Simple Case

- Rather than assume assessment random errors, simulate the process of conducting annual assessments (this is highly computationally intensive).
- Examine strategies designed to achieve specific management objectives (e.g. select catch limits so that the probability of recovery equals a desired level).
Thank you!

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