

mydas

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# Tasks

**Develop MSY reference points** or proxies across the spectrum of data-limited stocks.

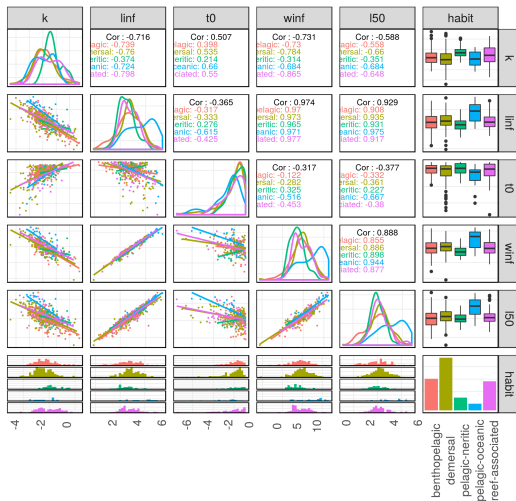
**Simulation Framework**, as a number of data-limited methods already exist implement a common framework to compare their performance

**Diagnostics** to assess sensitivity to assumptions and bias.

**Management Strategy Evaluation** to ensure robustness to uncertainty

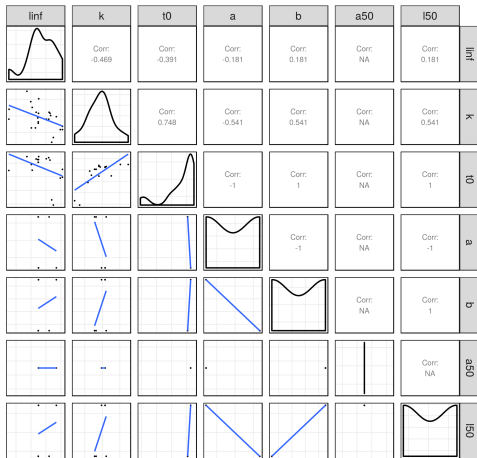
# Simulation Framework

# Life Histories



# Case Studies

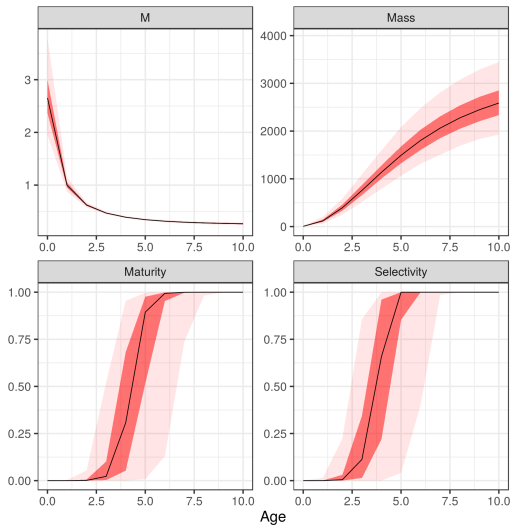
Turbot, Brill, Pollack, Ray, Sprat, Lobster, Razors



# Natural Mortality

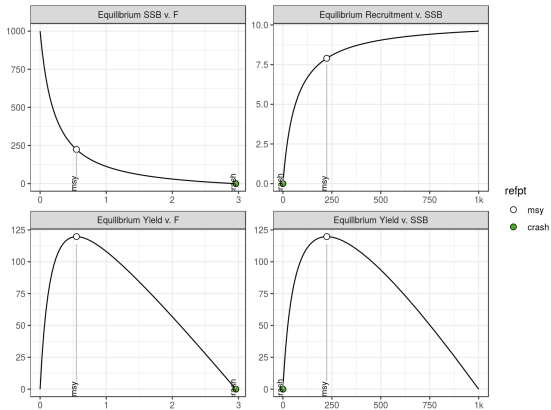
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```

# Biology

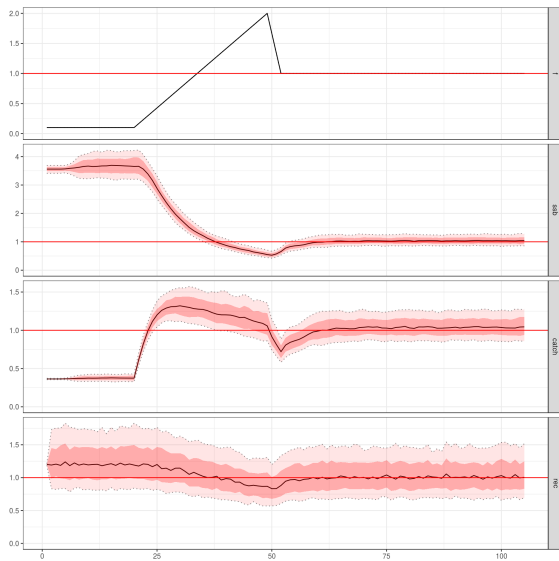




# Equilibrium and Reference Points



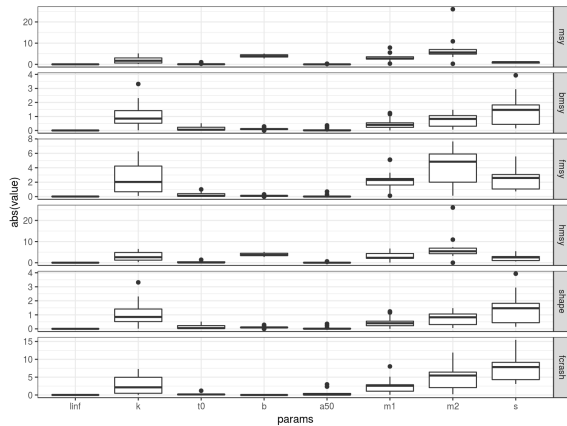
# Operating Model



## Sensitivity Analysis

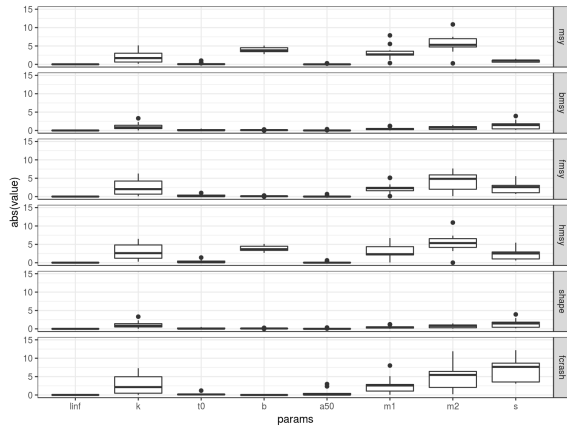
# Elasticity

## Reference Points



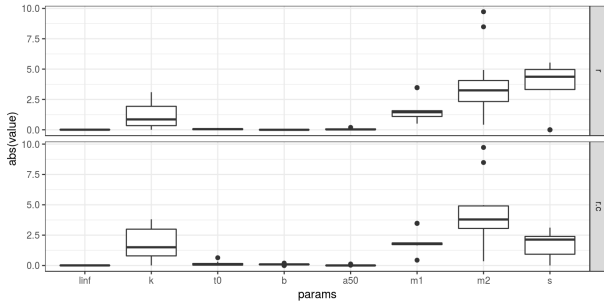
# Elasticity

## Reference Points



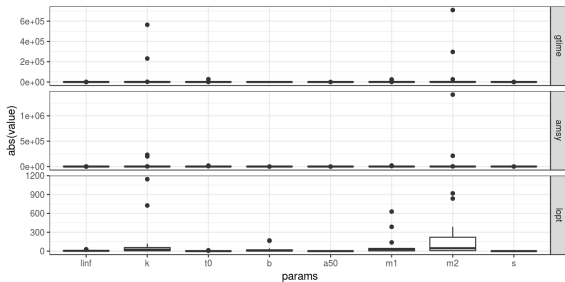
# Elasticity

## Population Growth Rate



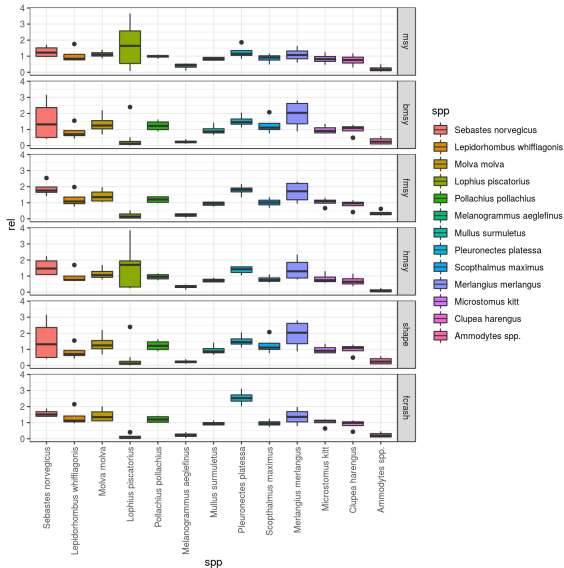
# Elasticity

Mean age at virgin and  $F_{MSY}$ , and  $L_{opt}$



# Elasticity

## Species





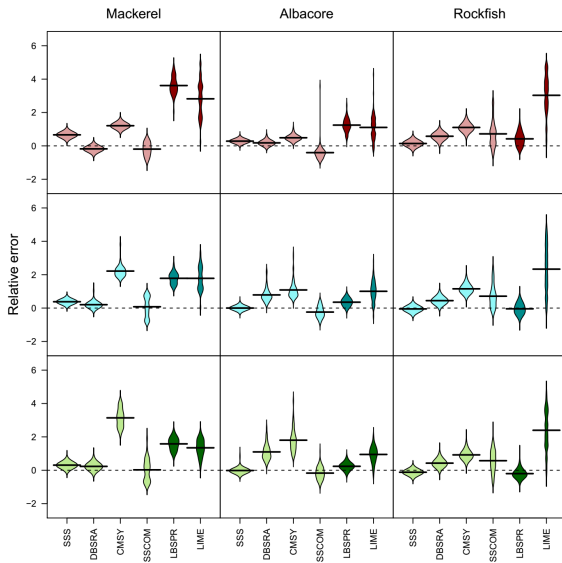
## Length v Catch Methods

# Scenarios

Stock trends

```
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#
```

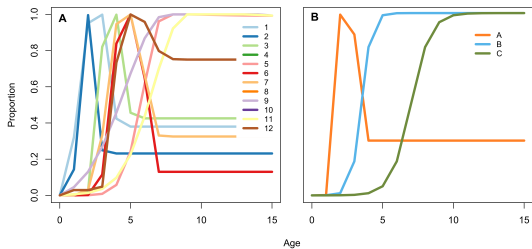
# Evaluation



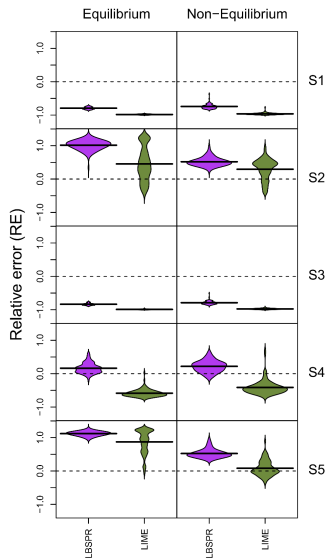
## Length Based Methods

# Observation Error Model

## Selection pattern



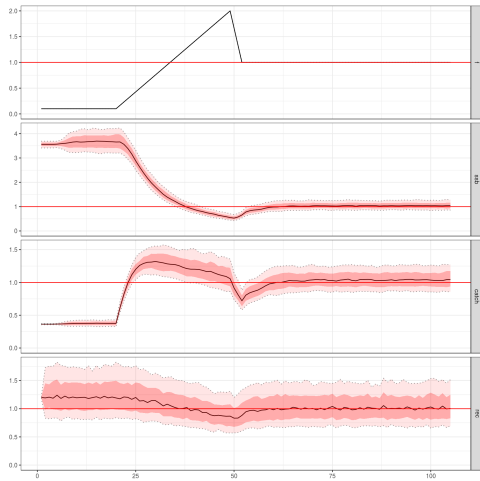
# Evaluation



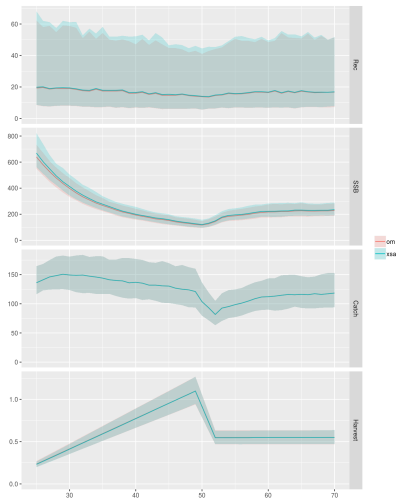
## Turbot Example



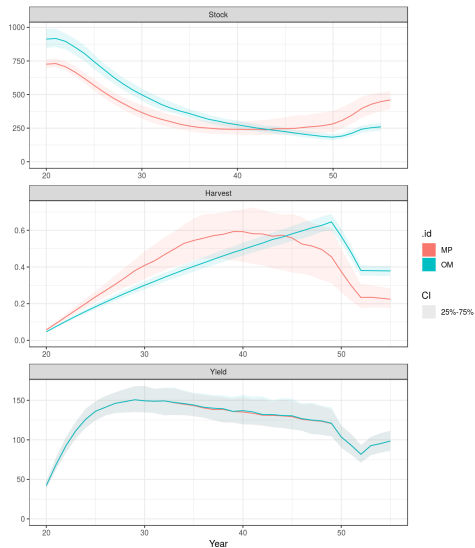
# Operating Model



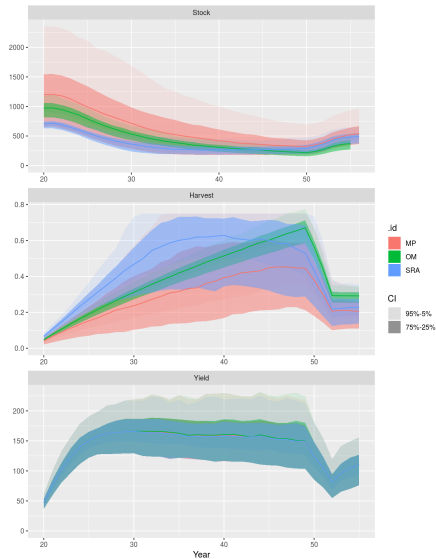
# Category 1: Age based



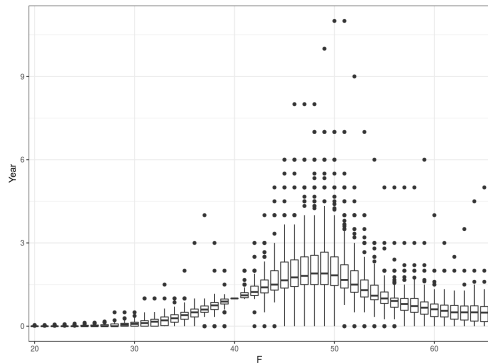
# Category 1: Biomass based

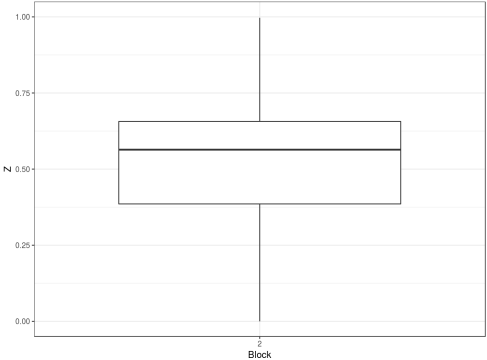


## Category 3: Catch only



## Fishing Mortality





MSE

# Performance Measures

## Safety

- ▶ Probability of avoiding limits

## Status

- ▶ Probability of achieving targets, recovery and long-term

## Yield

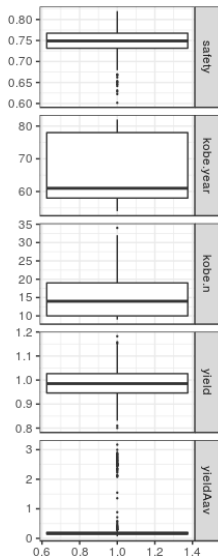
- ▶ MSY

## Variability

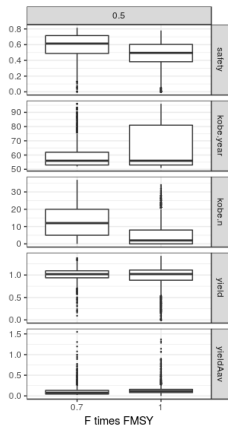
- ▶ Annual variability in yield



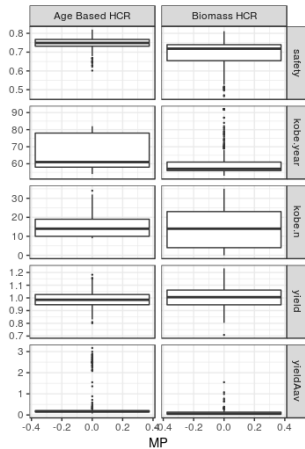
# Cat 1; Aged based ICES AR



# Cat 1; Biomass based ICES AR

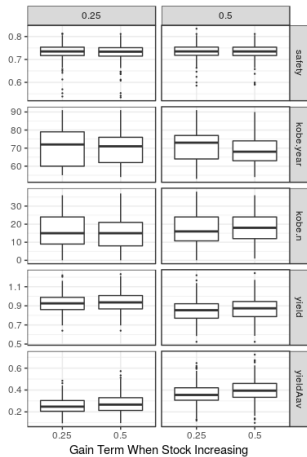


# Cat 1; Comparison



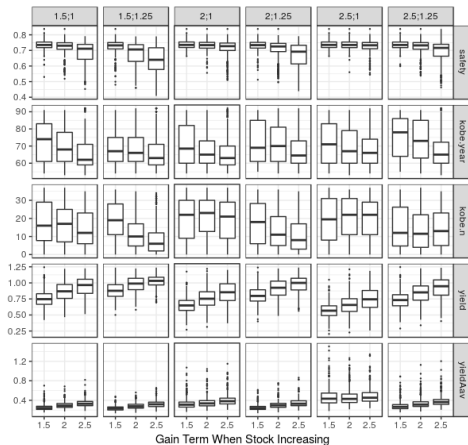
# Empirical HCRs

## Index Relative to Reference

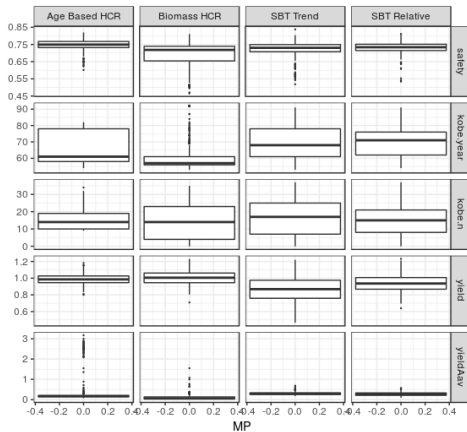


# Empirical HCRs

## Trend in Index



# Compare Performance



## Conclusions

# Conclusions

## **Risk**

An uncertainty that matters, what matters are management objectives

## **Management Procedures**

Consider the data along with the assumptions, estimator and management and feedback between the various elements

## **Value of information**

Models are cheap, but data is expensive

## **Diagnostics**

Compare across species, stocks, fisheries and advice rules



# R Packages

- ▶ FLR
- ▶ FLife
- ▶ mydas
- ▶ mpb
- ▶ R Packages
- ▶ LBSPR
- ▶ MLZ
- ▶ ...