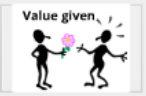
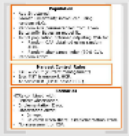
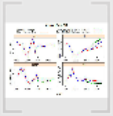


FLBEIA
A toolbox for Bio-Economic Impact Assessment of Management Strategies in deep-water fisheries

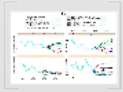
Dorleta García, Guzmán Díez, Eider Andonegi, Agurtzane Urtizberea, Sonia Sanchez, Marina Santurtún, Juan Gil, Fernando González, Benjamín Planque, Paul Marchal, Phil Large, Pascal Lorance

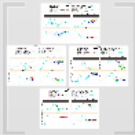
Red (black spot) Seabream in the Strait of Gibraltar (ICES Division IXa)

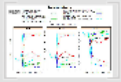




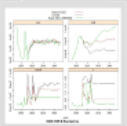
Blue ling (French Deepwater Mixed Fisheries) (ICES Divisions Vb, VI, VII and XIIb)





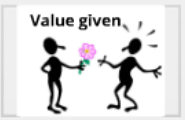


Red Fish (ICES Subareas I, II)



Thanks !

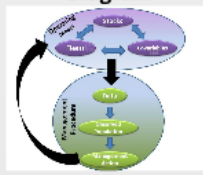
azti tecnalia



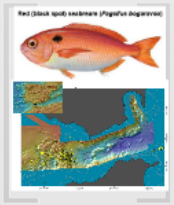
FLBEIA
A toolbox for Bio-Economic Impact Assessment of Management Strategies in deep-water fisheries

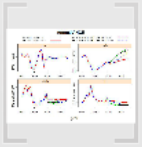
Dorleta Garcia, Guzmán Díez, Eider Andonegi, Agurtzane Urtizberea, Sonia Sanchez, Marina Santurtún, Juan Gil, Fernando González, Benjamin Planque, Paul Marchal, Phil Large, Pascal Lorance

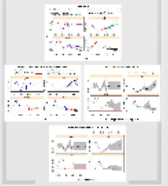
Diagram



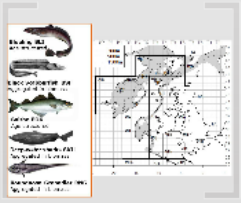
Red (black spot) Seabream in the Strait of Gibraltar (ICES Division IXa)

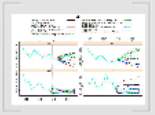


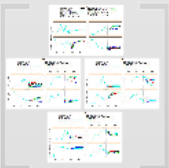


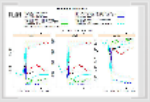


Blue ling (French Deepwater Mixed Fisheries) (ICES Divisions Vb, VI, VII and XIIb)

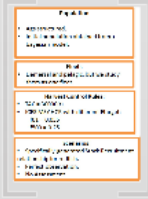


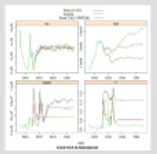


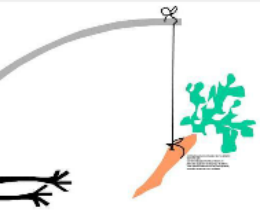




Red Fish (ICES Subareas I, II)







lotivation

How is it built up?

Valu

FLBEIA
A toolbox for Bio-Economic Impact Assessment of Management Strategies in deep-water fisheries

Dorleta Garcia, Guzmán Díez, Eider Andonegi, Agurtzane Urtizberea, Sonia Sanchez, Marina Santurtún, Juan Gil, Fernando González, Benjamin Planque, Paul Marchal, Phil Large, Pascal Lorance

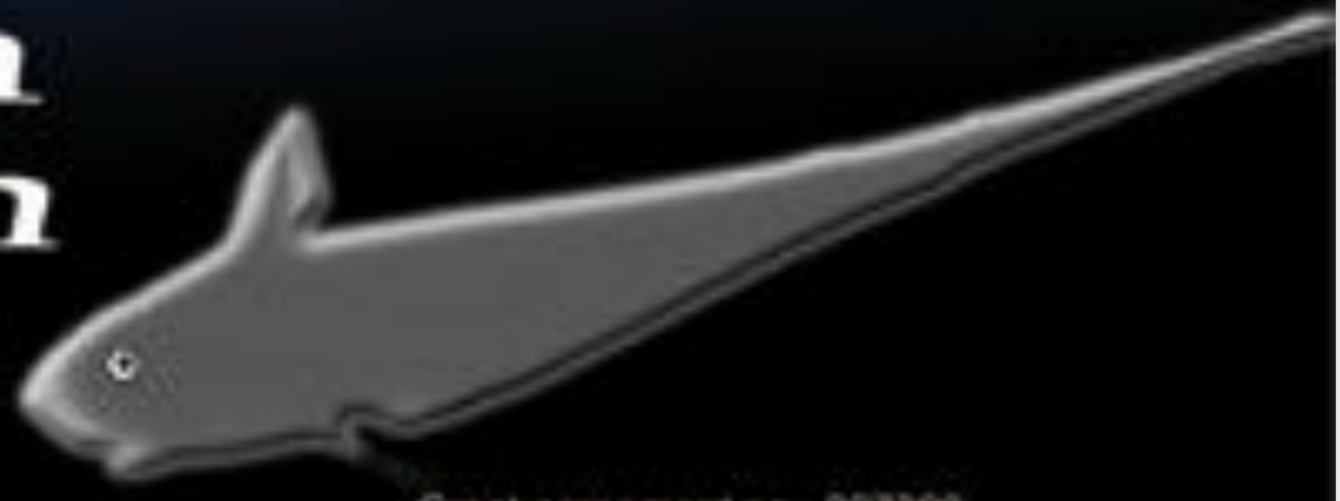
Red (black spot) Seabream in the Strait of Gibraltar (ICES Division IXa)

DeepFishman

DEEPISHMAN WP7 objectives:

.- To define case study management strategies, both in the short and long term, in order to evaluate the biological, bioeconomic and ecosystem implications of these strategies.

.- To develop a prototype short and long-term management and monitoring framework for deep-water fisheries/stocks, using FLR.



Grant agreement no.: 227390

DEEPISHMAN WP7 objectives:

.- To define case study management strategies, both in the short and long term, in order to evaluate the biological, bioeconomic and ecosystem implications of these strategies.

.- To develop a prototype short and long-term management and monitoring framework for deep-water fisheries/stocks, using FLR.

What is it?

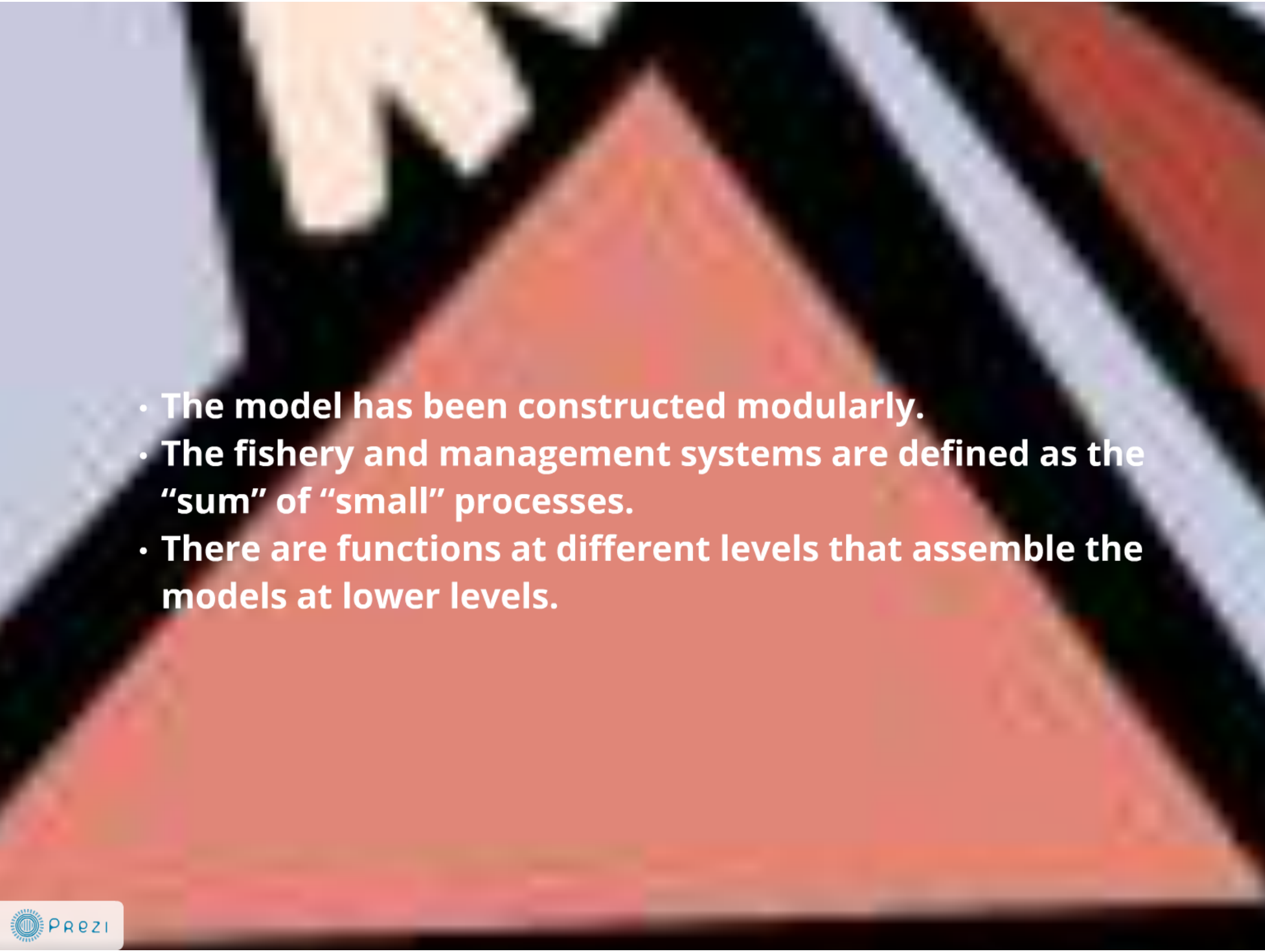
- A Bio-Economic simulation toolbox oriented to conduct impact assessment of multiannual management plans.
- Follows MSE framework.
- Multi-stock and multi-fleet.
- Seasonal.
- Built using R-FLR.

- **A Bio-Economic simulation toolbox oriented to conduct impact assessment of multiannual management plans.**
- **Follows MSE framework.**
- **Multi-stock and multi-fleet.**
- **Seasonal.**
- **Built using R-FLR.**

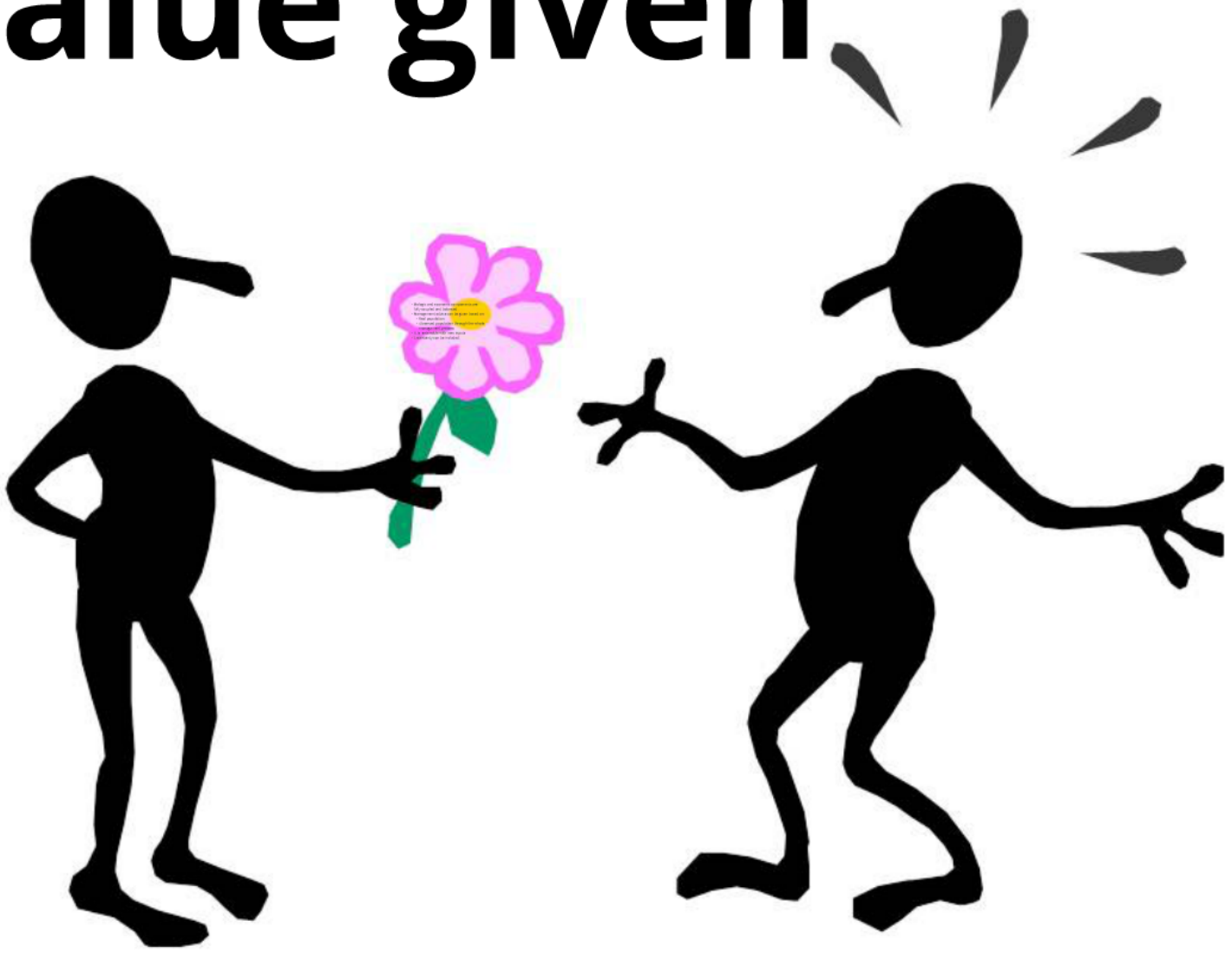
Motivation

- **Existing bio-oriented models tend to simplify economic part.**
- **Current biological models are built on generally accepted models (less flexibility).**
- **Fleet dynamic models are very case specific, standard models are not available.**

How is it built up?

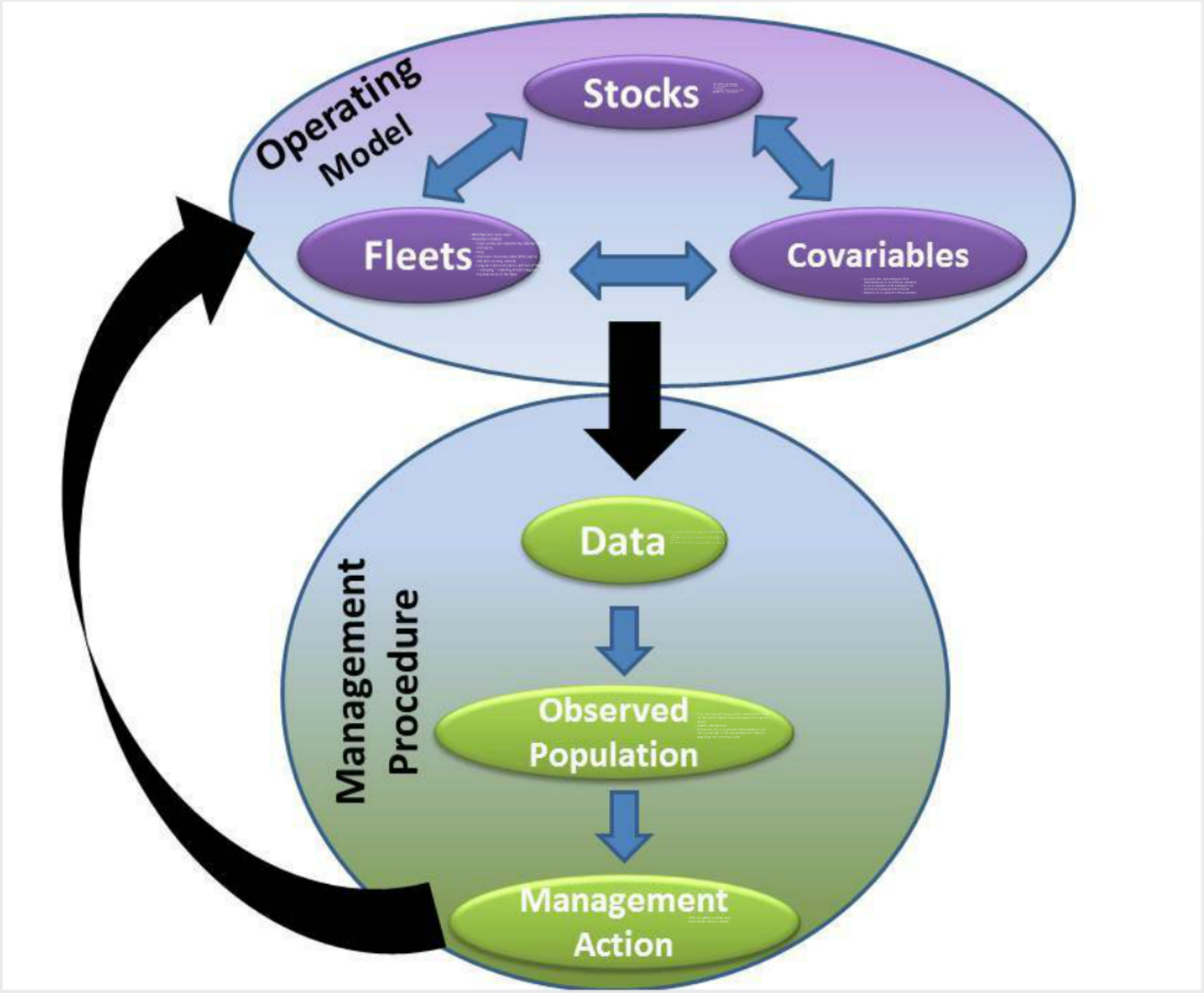

• The model has been constructed modularly.
• The fishery and management systems are defined as the "sum" of "small" processes.
• There are functions at different levels that assemble the models at lower levels.

Value given



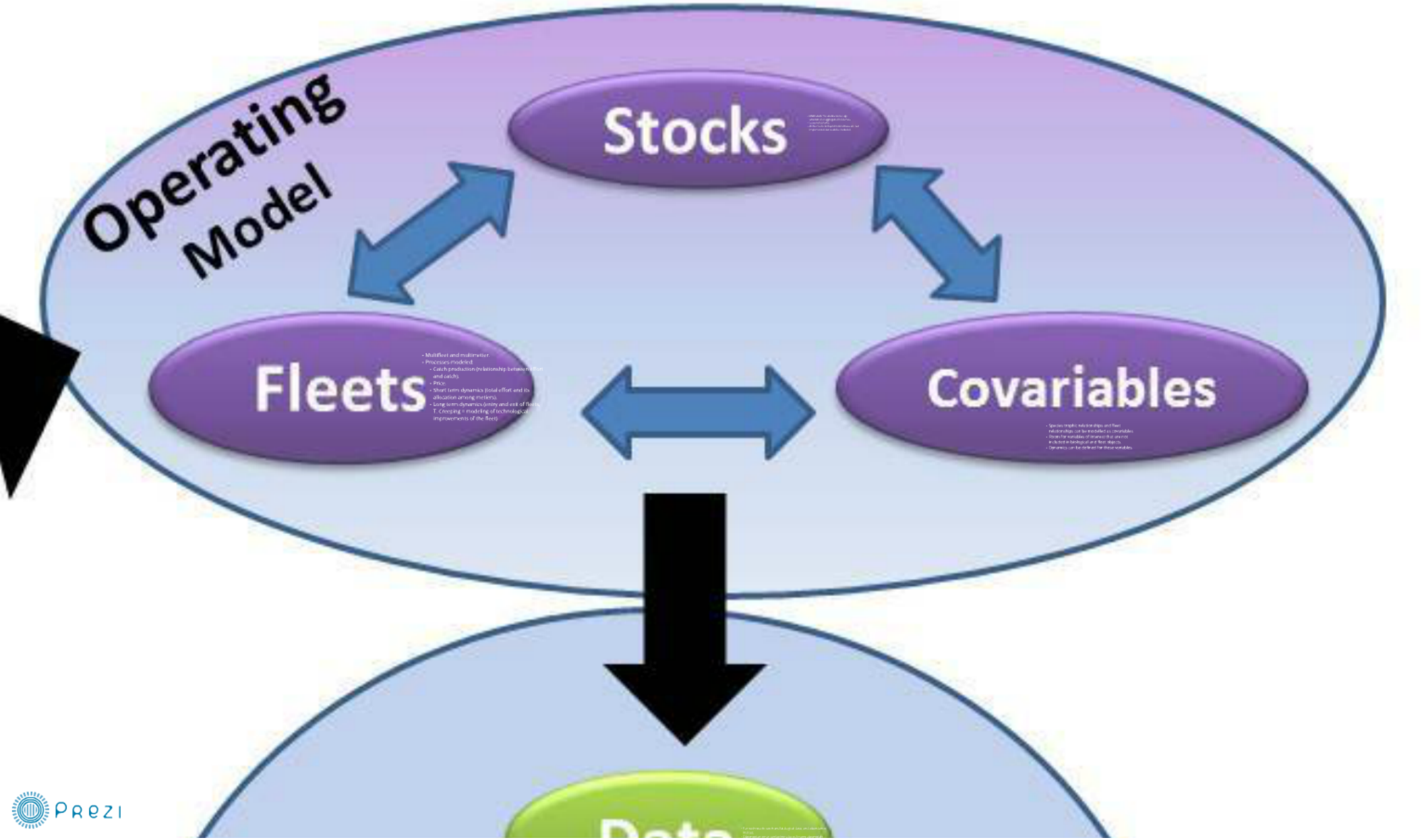
- Biologic and economic components are fully coupled and balanced .
- Management advice can be given based on:
  - Real population.
  - Observed population through the whole management process
- It Is extensible with new inputs
- Uncertainty can be included.

Diagram



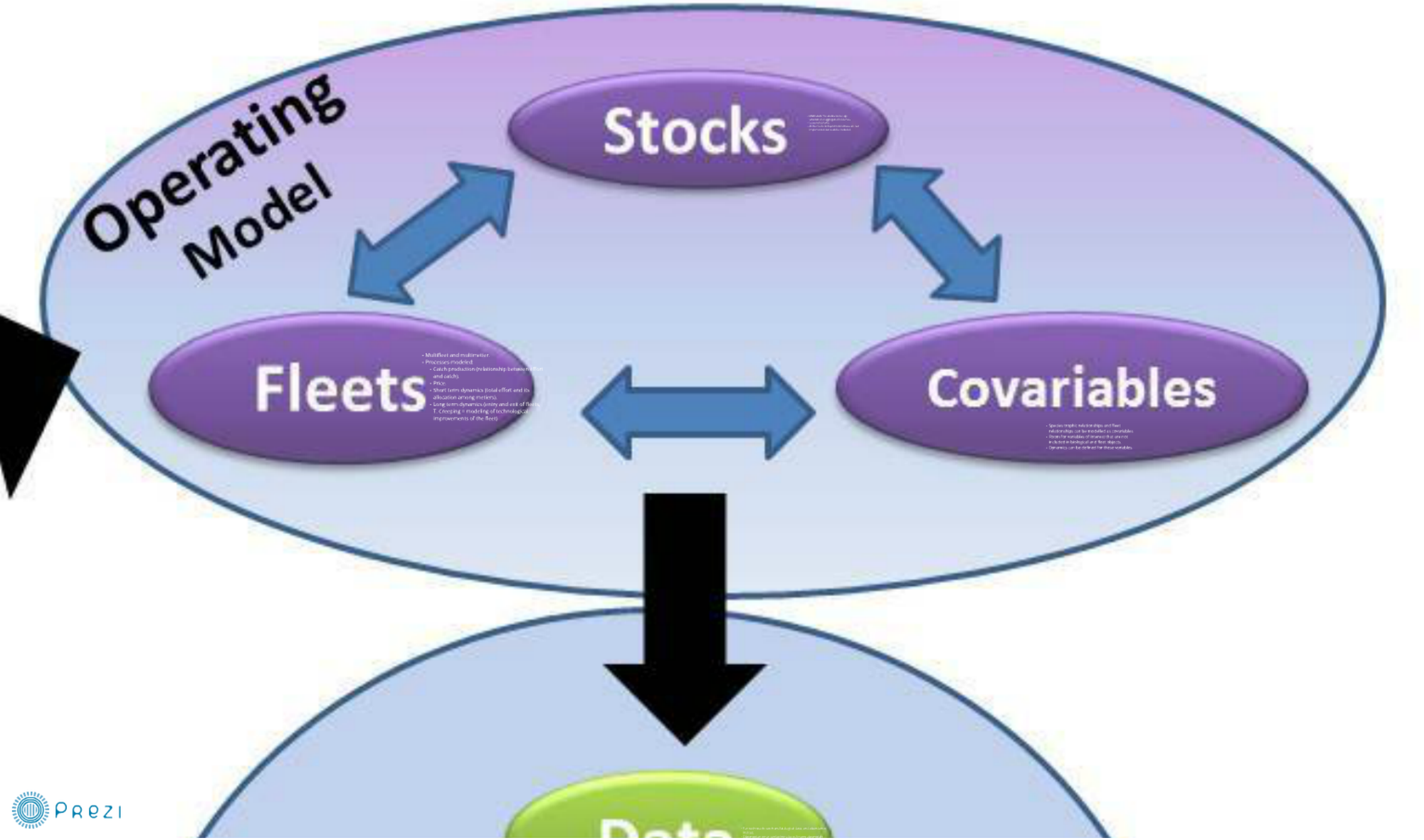
- Multi stock.The stocks can be age structured or aggregated in biomas.
- Seasonal cohorts.
- At the moment trophic interactions are not implemented but could be included.

Diagram



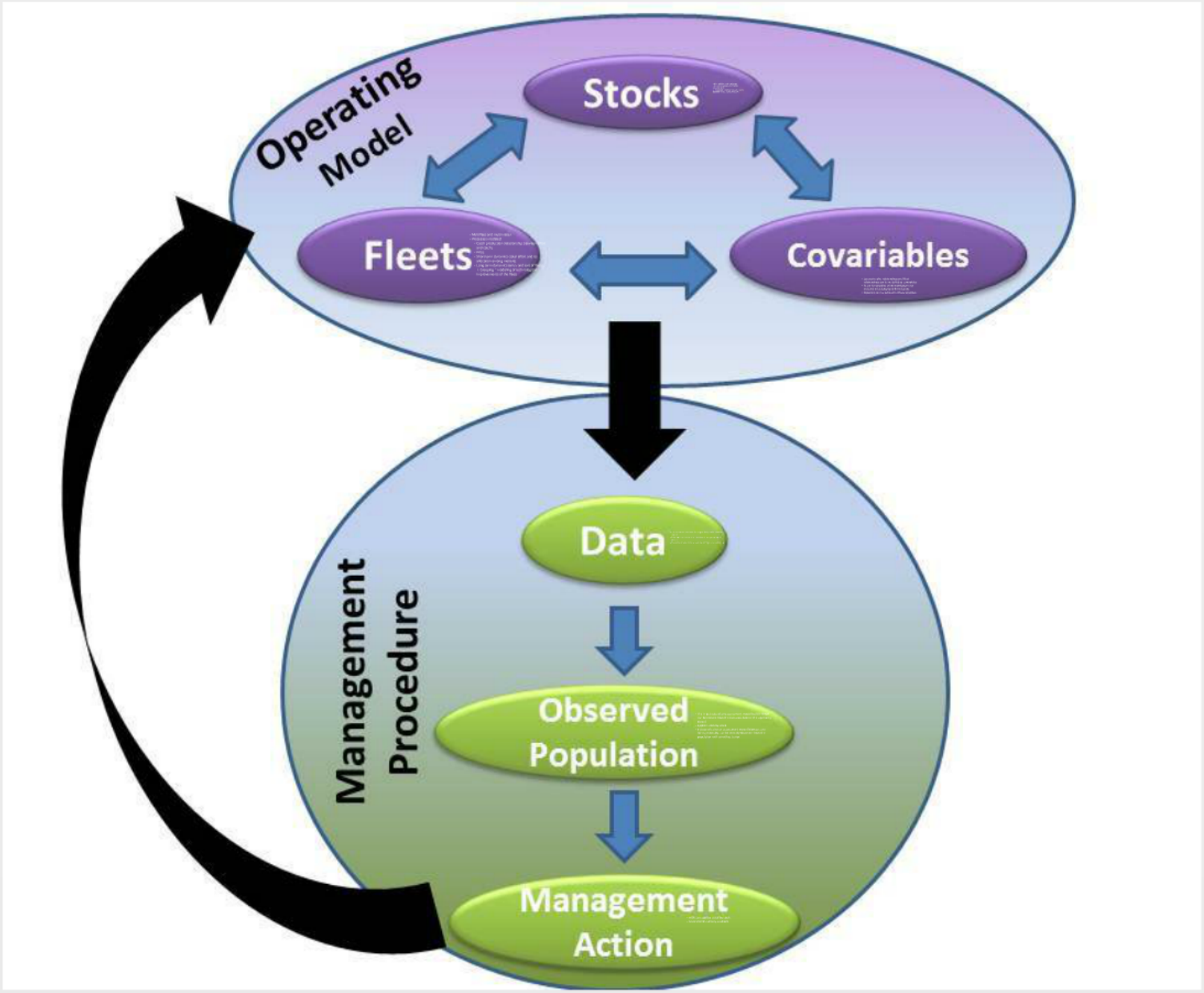
- Multifleet and multimetier.
- Processes modeled:
  - Catch production (relationship between effort and catch).
  - Price.
  - Short term dynamics (total effort and its allocation among metiers).
  - Long term dynamics (entry and exit of fleets, T. Creeping = modeling of technological improvements of the fleet)

Diagram

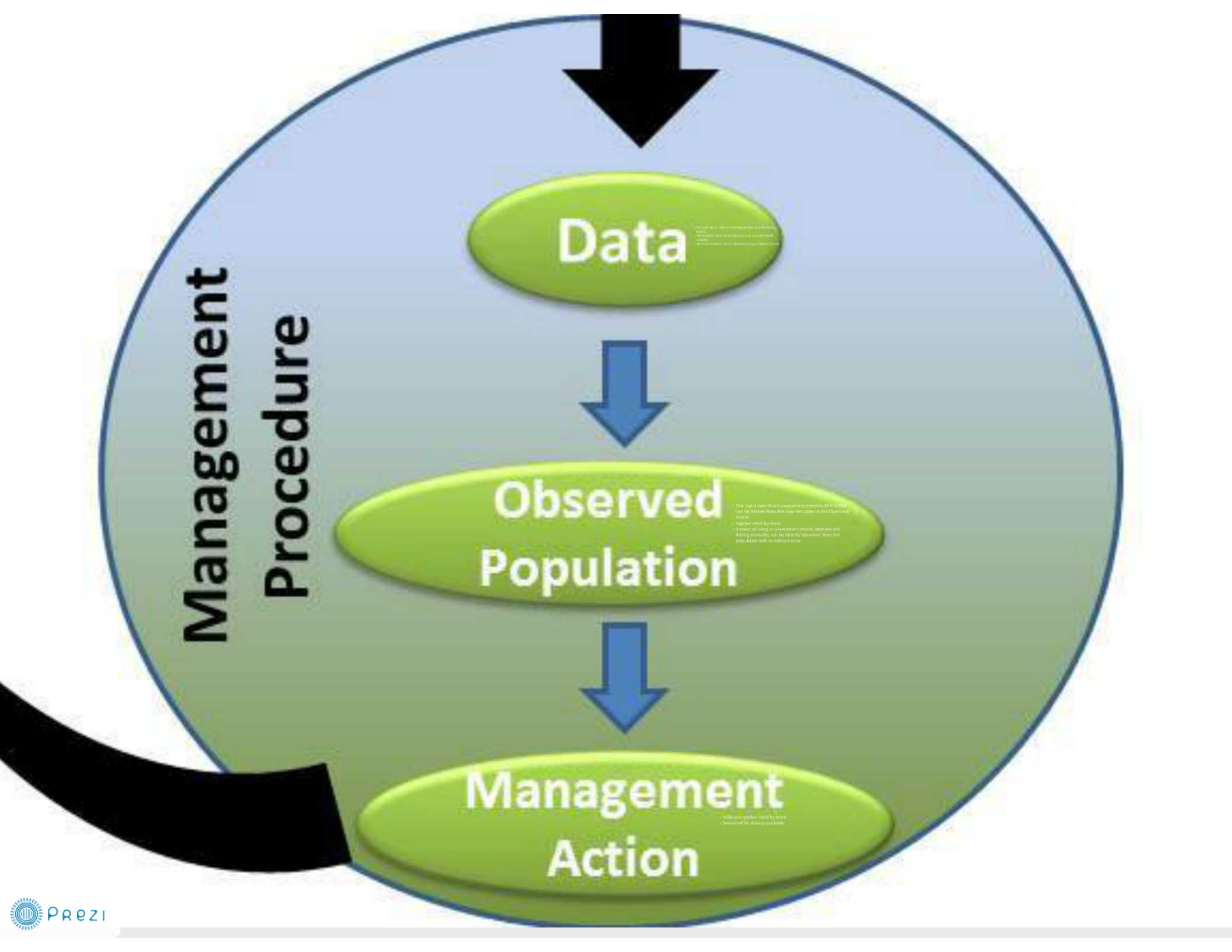


- Species trophic relationships and fleet relationships can be modelled as covariables
- Room for variables of interest that are not included in biological and fleet objects.
- Dynamics can be defined for these variables.

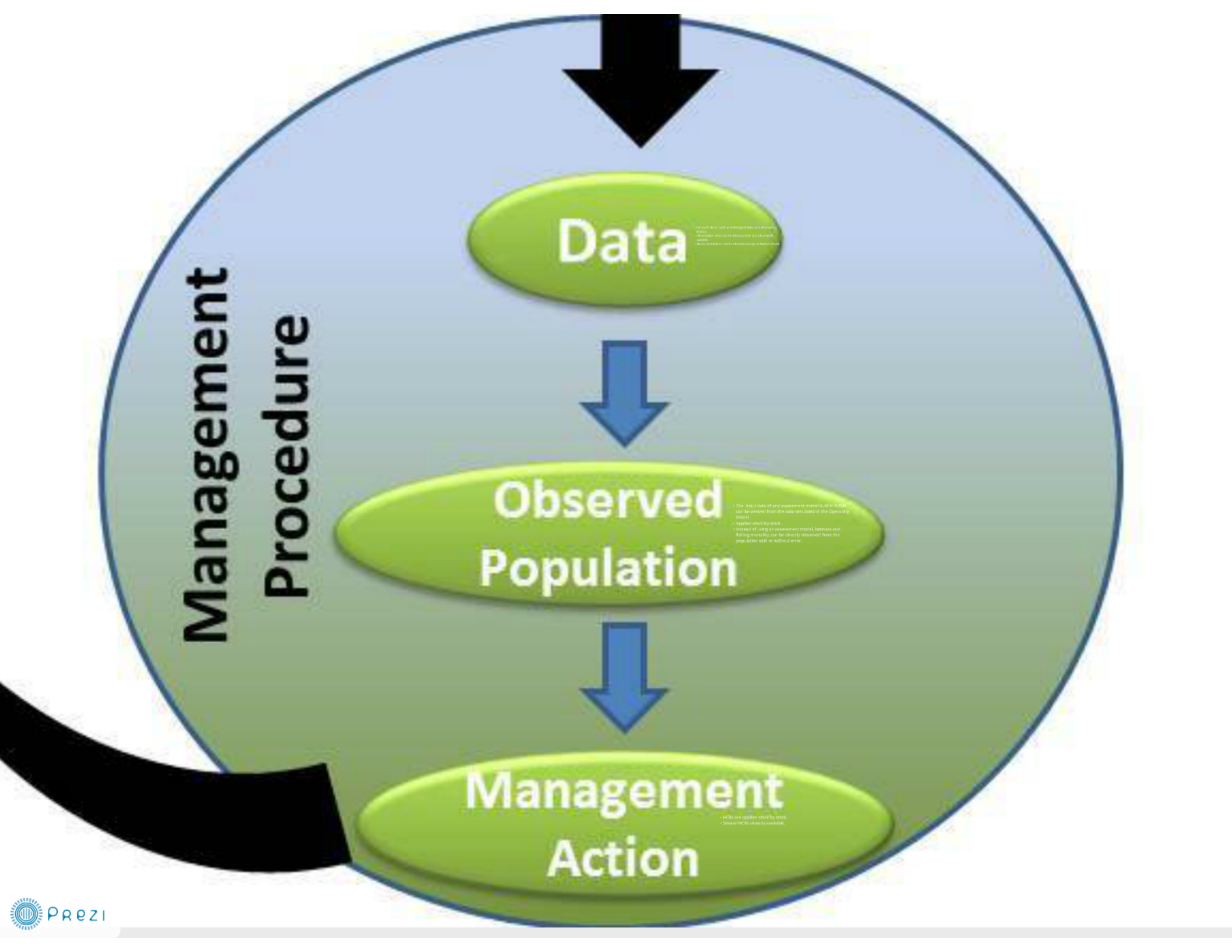
Diagram



- For each stock: catch and biological data, and abundance indices.
- Observation error can be introduced in any observable variable.
- Stocks and indices can be observed at age or biomass level.


Management Procedure
Data
Observed Population
Management Action

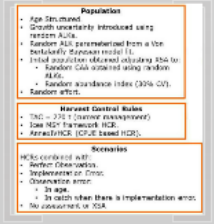
- The input data of any assessment model built in R/FLR can be derived from the data simulated in the Operating Model.
- Applied stock by stock.
- Instead of using an assessment model, biomass and fishing mortality, can be directly ‘observed’ from the population with or without error.

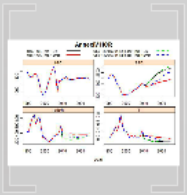

Management Procedure
Data
Observed Population
Management Action

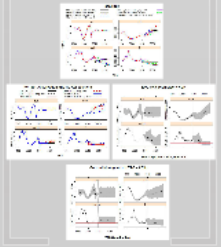
- HCRs are applied stock by stock.
- Several HCRs already available.

Dorleta Garcia, Guzmán Díez, Eider Andonegi, Agurtzane Urtizberea, Sonia Sanchez, Marina Santurtún, Juan Gil, Fernando González, Benjamin Planque, Paul Marchal, Phil Large, Pascal Lorance

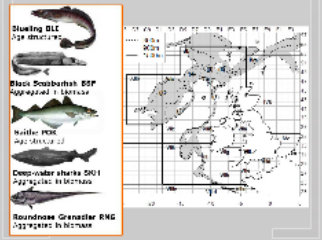
Red (black spot) Seabream in the Strait of Gibraltar (ICES Division IXa)

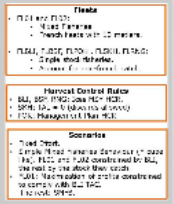


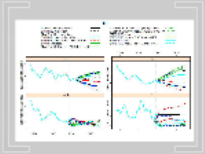


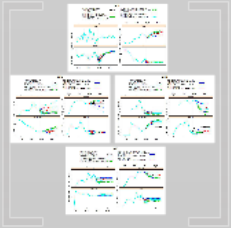


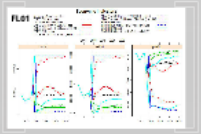
Blue ling (French Deepwater Mixed Fisheries) (ICES Divisions Vb, VI, VII and XIIb)



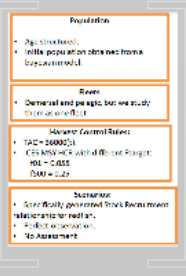


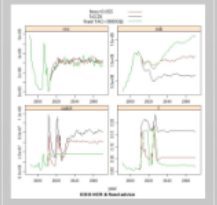




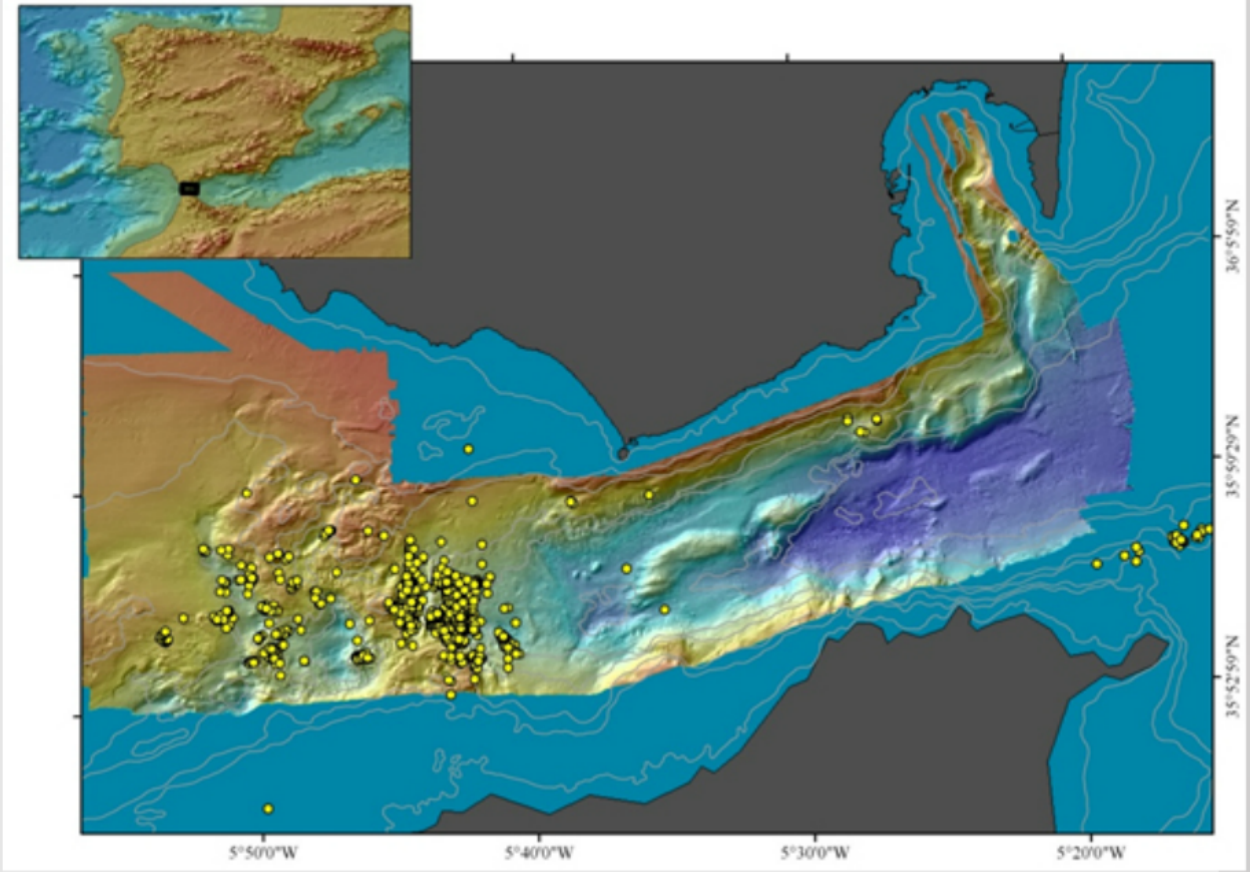


Red Fish (ICES Subareas I, II)





Red (black spot) seabream (*Pagellus bogaraveo*)



Population

- Age Structured.
- Growth uncertainty introduced using random ALKs.
- Random ALK parameterized from a Von Bertalanffy Bayesian model fit.
- Initial population obtained adjusting XSA to:
  - Random CAA obtained using random ALKs.
  - Random abundance index (30% CV).
- Random effort.

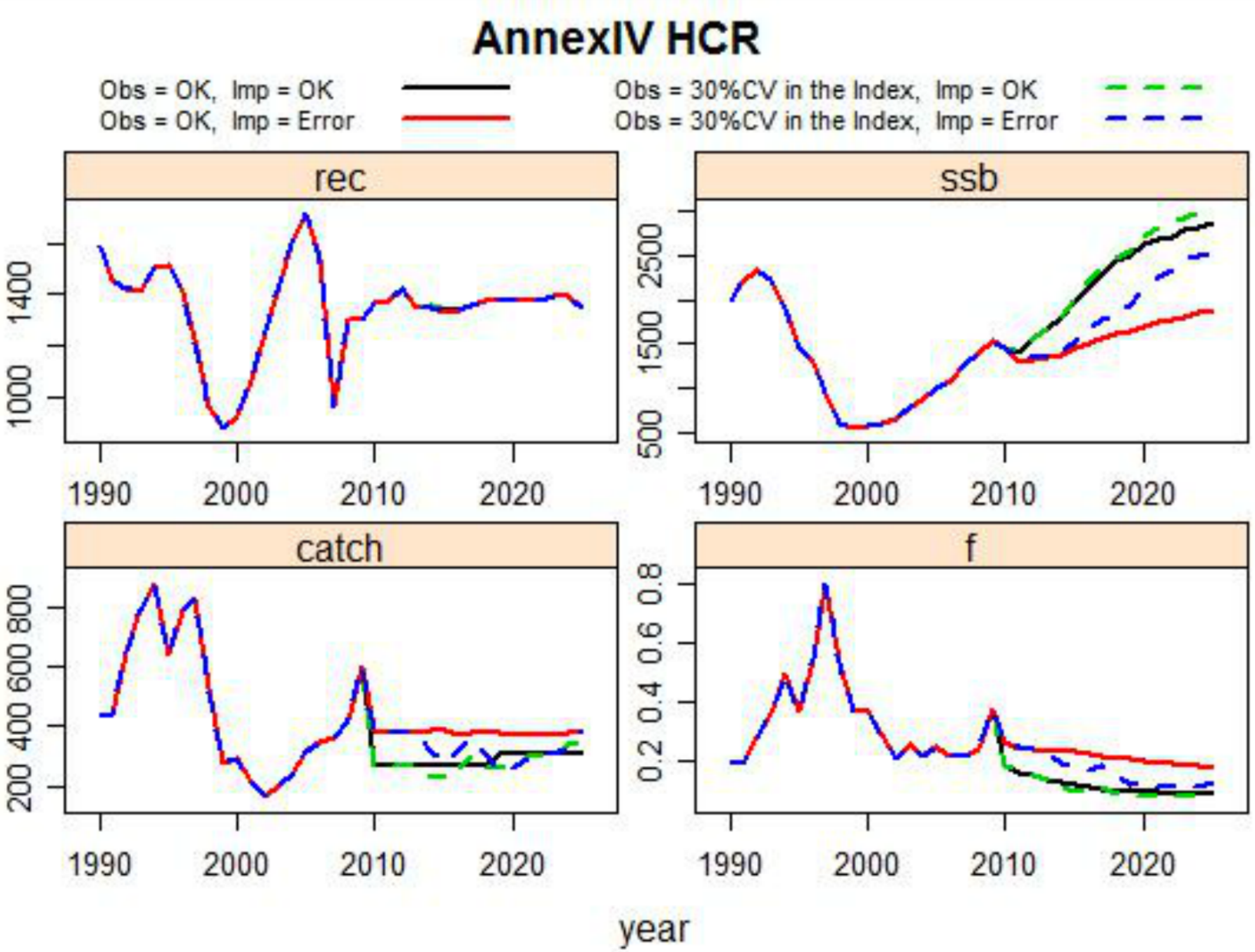
Harvest Control Rules

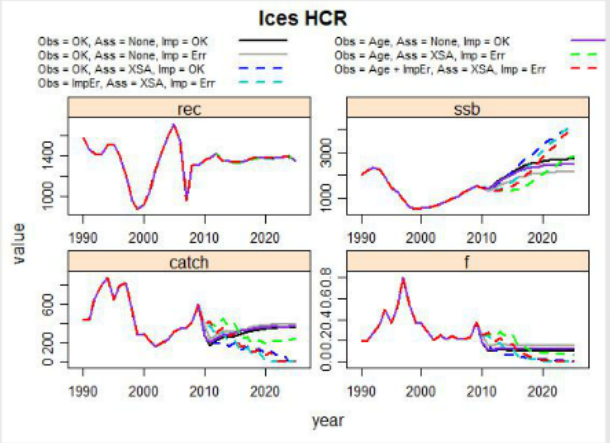
- TAC = 270 t (current management)
- Ices MSY framework HCR.
- AnnexIVHCR (CPUE based HCR).

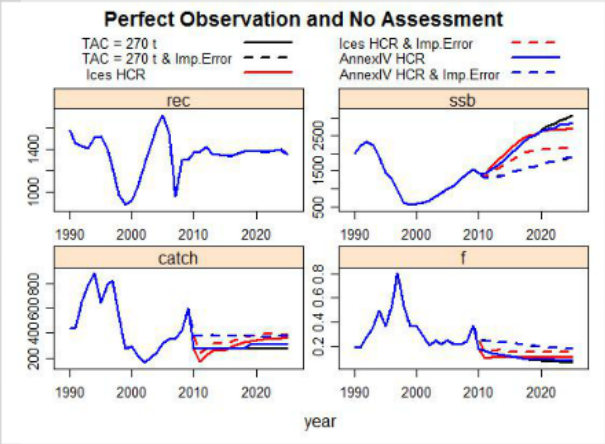
Scenarios

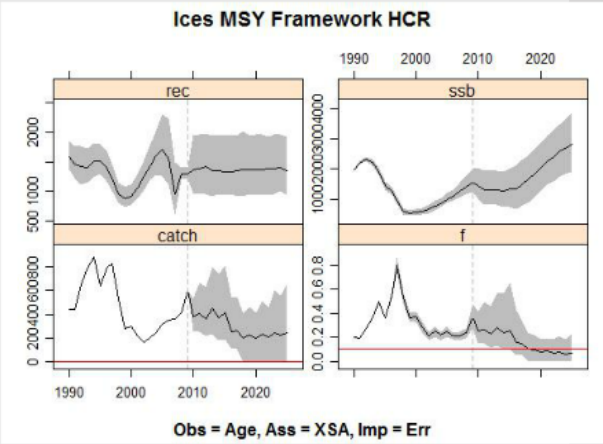
HCRs combined with:

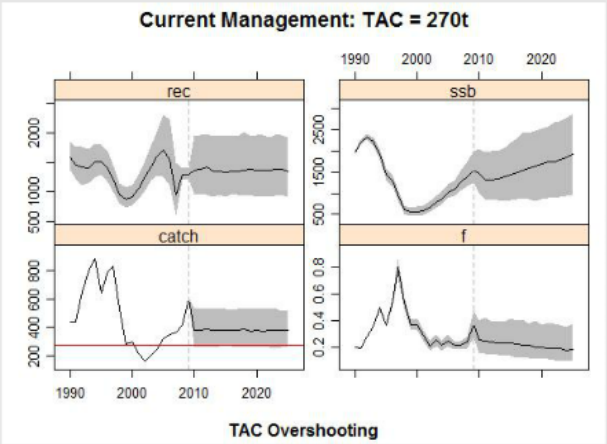
- Perfect Observation.
- Implementation Error.
- Observation error:
  - In age.
  - In catch when there is implementation error.
- No assessment or XSA


AnnexIV HCR
Obs = OK, Imp = OK
Obs = OK, Imp = Error
Obs = 30%CV in the Index, Imp = OK
Obs = 30%CV in the Index, Imp = Error
rec
ssb
catch
f
1000
1400
500
1500
2500
200
400
600
800
0.2
0.4
0.6
0.8
1990
2000
2010
2020
year

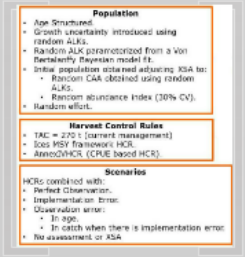

Ices HCR
Obs = OK, Ass = None, Imp = OK
Obs = OK, Ass = None, Imp = Err
Obs = OK, Ass = XSA, Imp = OK
Obs = ImpEr, Ass = XSA, Imp = Err
Obs = Age, Ass = None, Imp = OK
Obs = Age, Ass = XSA, Imp = Err
Obs = Age + ImpEr, Ass = XSA, Imp = Err
rec
ssb
catch
f
value
year

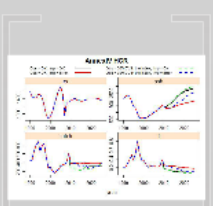

Perfect Observation and No Assessment
TAC = 270 t
TAC = 270 t & Imp.Error
Ices HCR
Ices HCR & Imp.Error
AnnexIV HCR
AnnexIV HCR & Imp.Error
rec
ssb
catch
f
year

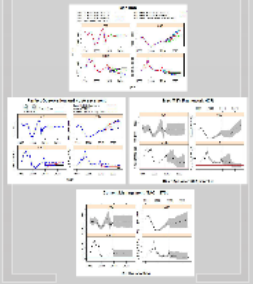

Ices MSY Framework HCR
rec
ssb
catch
f
Obs = Age, Ass = XSA, Imp = Err


Current Management: TAC = 270t
rec
ssb
catch
f
TAC Overshooting

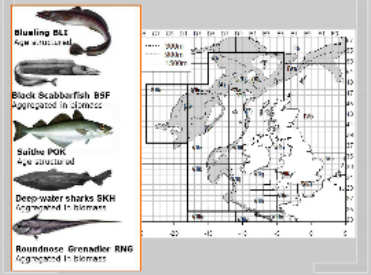
Red (black spot) Seabream in the Strait of Gibraltar (ICES Division IXa)

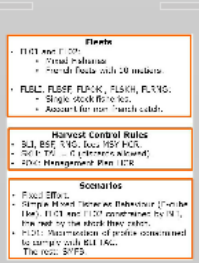


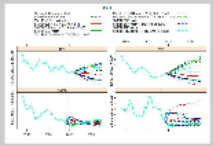


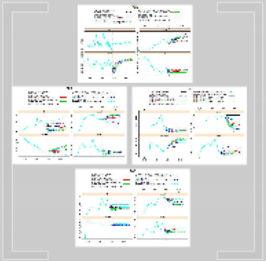


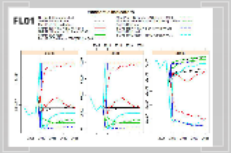
Blue ling (French Deepwater Mixed Fisheries) (ICES Divisions Vb, VI, VII and XIIb)



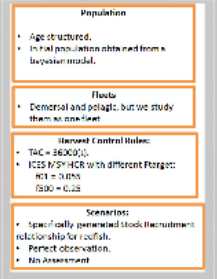


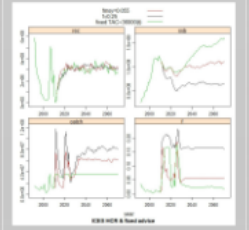




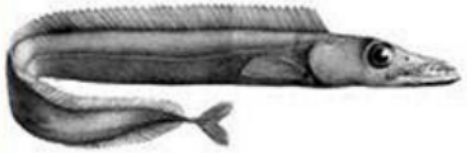


Red Fish (ICES Subareas I, II)





Blueling BLI
Age structured

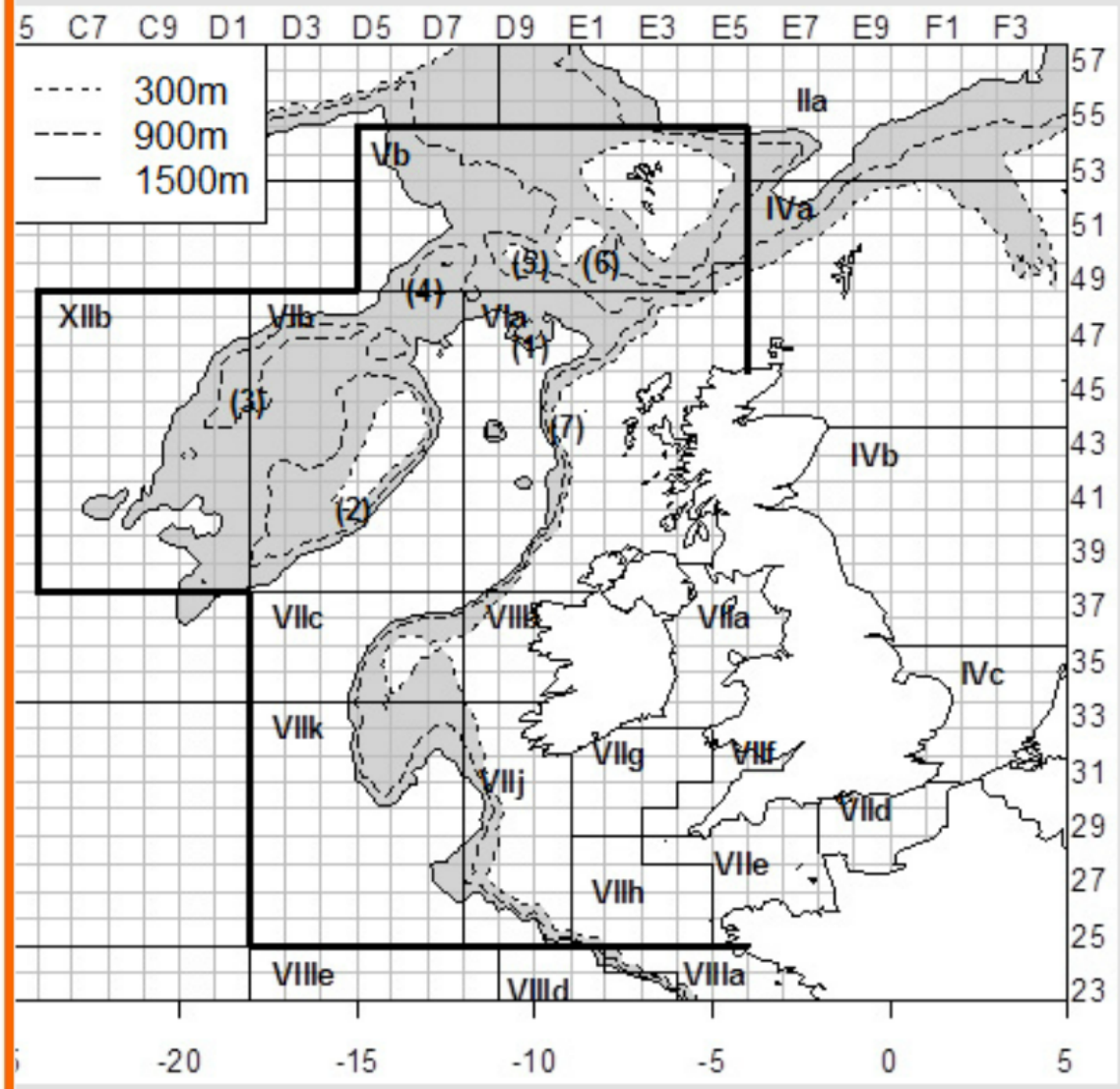


Black Scabbarfish BSF
Aggregated in biomass

Saithe POK
Age structured

Deep-water sharks SKH
Aggregated in biomass

Roundnose Grenadier RNG
Aggregated in biomass



Fleets

- FL01 and FL02:
  - Mixed Fisheries
  - French fleets with 10 metiers.
- FLBLI, FLBSF, FLPOK , FLSKH, FLRNG:
  - Single stock fisheries.
  - Account for non-french catch.

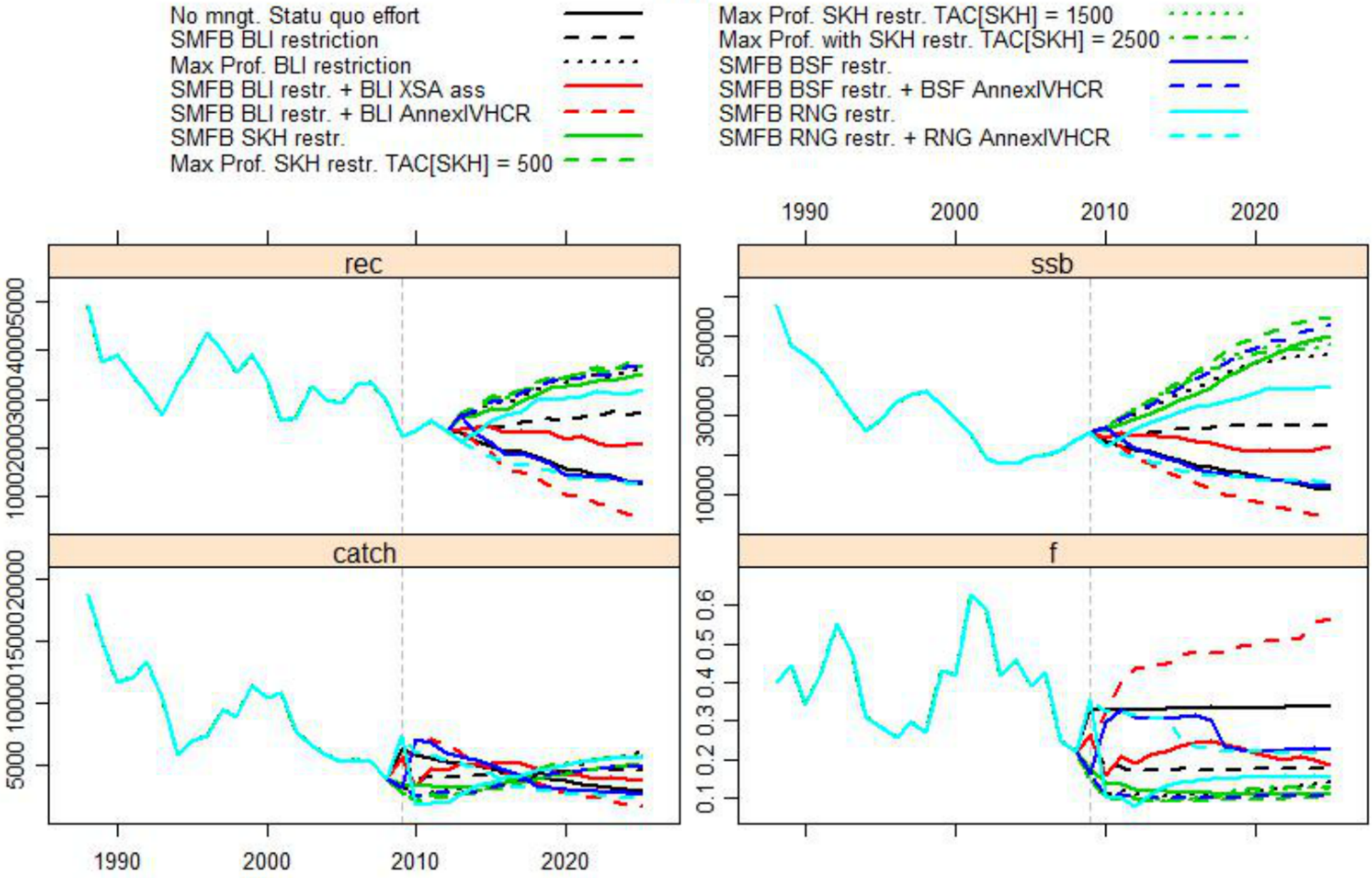
Harvest Control Rules

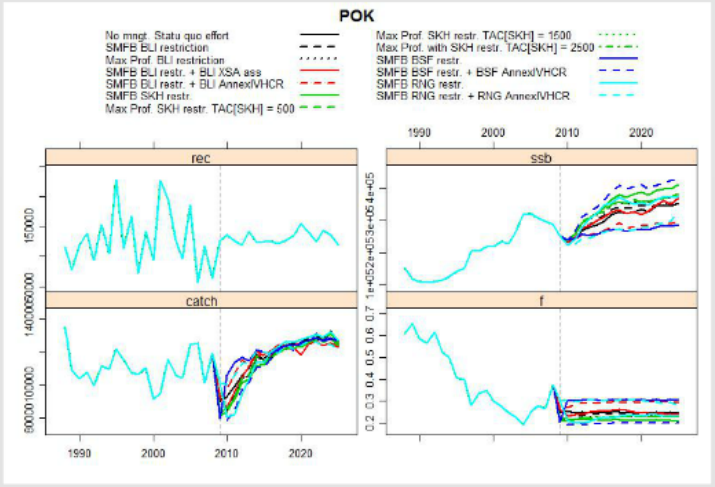
- BLI, BSF, RNG: Ices MSY HCR.
- SKH: TAL = 0 (discards allowed).
- POK: Management Plan HCR

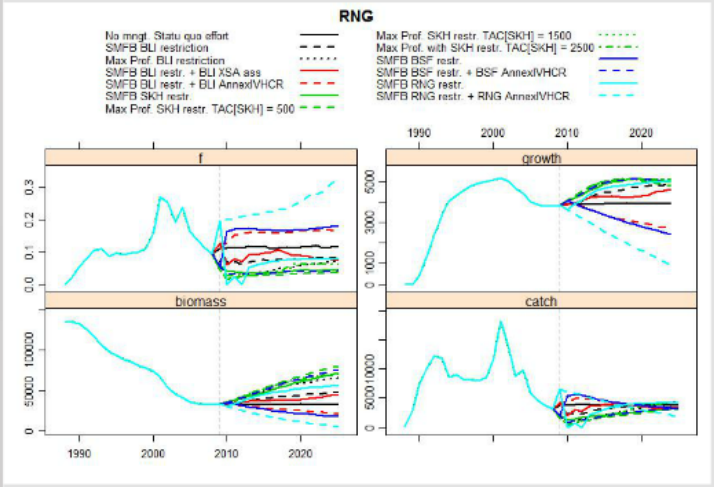
Scenarios

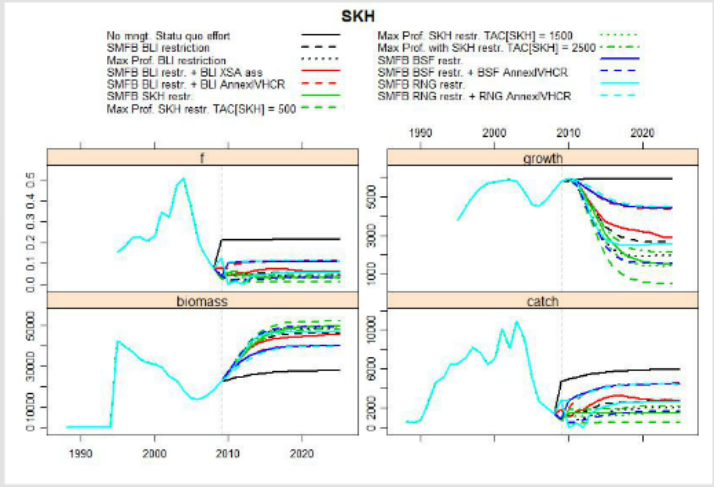
- Fixed Effort.
- Simple Mixed Fisheries Behaviour (F-cube like). FL01 and FL02 constrained by BLI, the rest by the stock they catch.
- FL01: Maximization of profits constrained to comply with BLI TAC.
  The rest: SMFB.

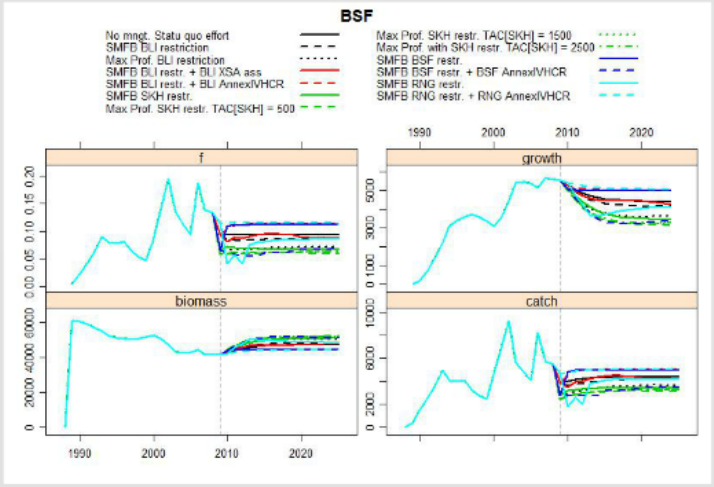
BLI


No mngt. Statu quo effort
SMFB BLI restriction
Max Prof. BLI restriction
SMFB BLI restr. + BLI XSA ass
SMFB BLI restr. + BLI AnnexIVHCR
SMFB SKH restr.
Max Prof. SKH restr. TAC[SKH] = 500
Max Prof. SKH restr. TAC[SKH] = 1500
Max Prof. with SKH restr. TAC[SKH] = 2500
SMFB BSF restr.
SMFB BSF restr. + BSF AnnexIVHCR
SMFB RNG restr.
SMFB RNG restr. + RNG AnnexIVHCR
rec
ssb
catch
f
1990
2000
2010
2020

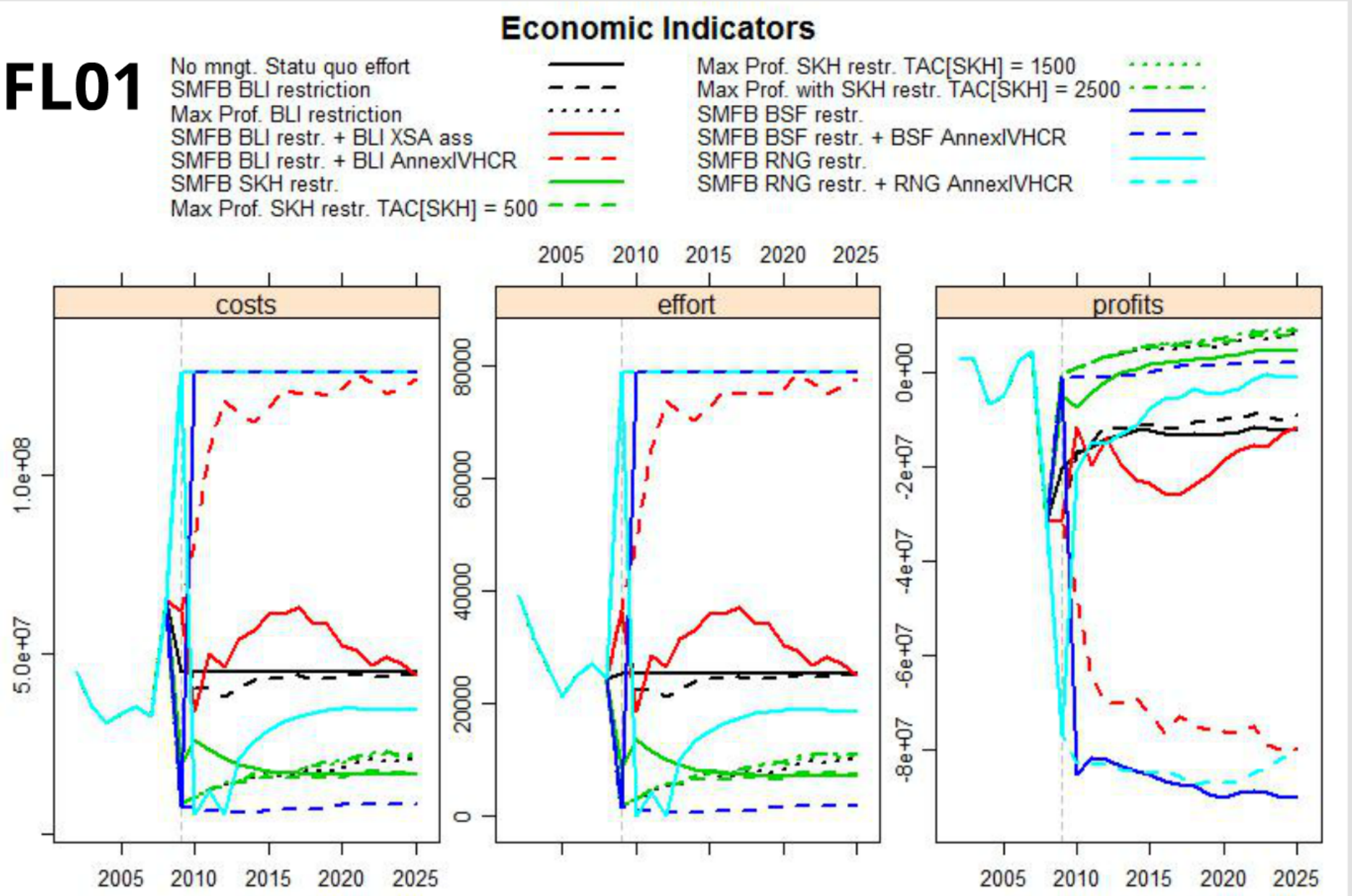

POK
No mngt. Statu quo effort
SMFB BLI restriction
Max Prof. BLI restriction
SMFB BLI restr. + BLI XSA ass
SMFB BLI restr. + BLI AnnexIVHCR
SMFB SKH restr.
Max Prof. SKH restr. TAC[SKH] = 500
Max Prof. SKH restr. TAC[SKH] = 1500
Max Prof. with SKH restr. TAC[SKH] = 2500
SMFB BSF restr.
SMFB BSF restr. + BSF AnnexIVHCR
SMFB RNG restr.
SMFB RNG restr. + RNG AnnexIVHCR
rec
ssb
catch
f
1990
2000
2010
2020


RNG
No mngt. Statu quo effort
SMFB BLI restriction
Max Prof. BLI restriction
SMFB BLI restr. + BLI XSA ass
SMFB BLI restr. + BLI AnnexIVHCR
SMFB SKH restr.
Max Prof. SKH restr. TAC[SKH] = 500
Max Prof. SKH restr. TAC[SKH] = 1500
Max Prof. with SKH restr. TAC[SKH] = 2500
SMFB BSF restr.
SMFB BSF restr. + BSF AnnexIVHCR
SMFB RNG restr.
SMFB RNG restr. + RNG AnnexIVHCR
f
growth
biomass
catch
1990
2000
2010
2020

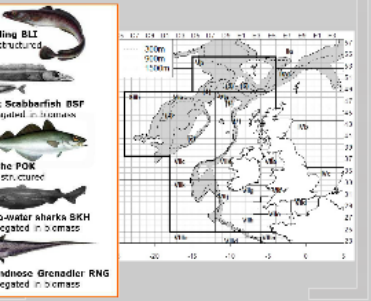

SKH
No mngt. Statu quo effort
SMFB BLI restriction
Max Prof. BLI restriction
SMFB BLI restr. + BLI XSA ass
SMFB BLI restr. + BLI AnnexIVHCR
SMFB SKH restr.
Max Prof. SKH restr. TAC[SKH] = 500
Max Prof. SKH restr. TAC[SKH] = 1500
Max Prof. with SKH restr. TAC[SKH] = 2500
SMFB BSF restr.
SMFB BSF restr. + BSF AnnexIVHCR
SMFB RNG restr.
SMFB RNG restr. + RNG AnnexIVHCR
f
growth
biomass
catch
1990
2000
2010
2020


BSF
No mngt. Statu quo effort
SMFB BLI restriction
Max Prof. BLI restriction
SMFB BLI restr. + BLI XSA ass
SMFB BLI restr. + BLI AnnexIVHCR
SMFB SKH restr.
Max Prof. SKH restr. TAC[SKH] = 500
Max Prof. SKH restr. TAC[SKH] = 1500
Max Prof. with SKH restr. TAC[SKH] = 2500
SMFB BSF restr.
SMFB BSF restr. + BSF AnnexIVHCR
SMFB RNG restr.
SMFB RNG restr. + RNG AnnexIVHCR
f
growth
biomass
catch
1990
2000
2010
2020

FL01


Economic Indicators
No mngt. Statu quo effort
SMFB BLI restriction
Max Prof. BLI restriction
SMFB BLI restr. + BLI XSA ass
SMFB BLI restr. + BLI AnnexIVHCR
SMFB SKH restr.
Max Prof. SKH restr. TAC[SKH] = 500
Max Prof. SKH restr. TAC[SKH] = 1500
Max Prof. with SKH restr. TAC[SKH] = 2500
SMFB BSF restr.
SMFB BSF restr. + BSF AnnexIVHCR
SMFB RNG restr.
SMFB RNG restr. + RNG AnnexIVHCR
costs
effort
profits
1.0e+08
5.0e+07
80000
60000
40000
20000
0
0e+00
-2e+07
-4e+07
-6e+07
-8e+07
2005
2010
2015
2020
2025

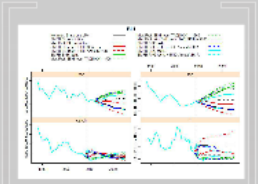
Blue ling (French Deepwater Mixed Fisheries)
(ICES Divisions Vb, VI, VII and XIIb)

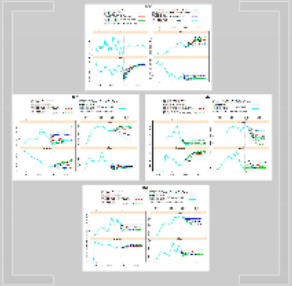


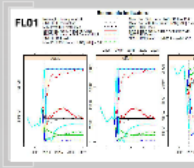
Fleets
- FL01 and FL02:
  - Mixed fisheries
  - French fleets with >10 metiers.
- FLBLI, FLBSF, FLPOK, FLSKH, FLRNG:
  - Single stock fisheries
  - Accounts for non-French catch.

Harvest Control Rules
- BLI, BSF, RNG: Ices MSY HCR.
- SKH: TAC = 0 (discards allowed).
- POK: Management Plan HCR.

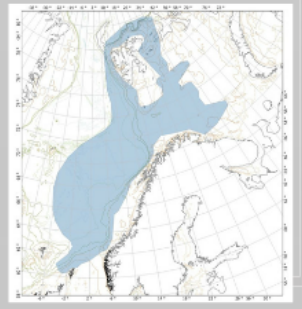
Scenarios
- Fixed Effort.
- Simple Mixed Fisheries Behaviour (F-subdivided): FL01 and FL02 constrained by BLI, the rest by the stock they catch.
- FL01: Maximization of profits constrained to comply with BLI TAC.
  The rest: SMFB.







Red Fish (ICES Subareas I, II)

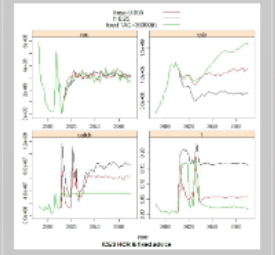


Population
- Age structured.
- Initial population obtained from a bayesian model.

Fleets
- Demersal and pelagic, but we study them as one fleet

Harvest Control Rules:
- TAC = 86000(t).
- ICES MSY HCR with different Ftarget:
  f01 = 0.055
  f500 = 0.25

Scenarios:
- Specifically generated Stock Recruitment relationship for redfish.
- Perfect observation.
- No Assessment



Red Fish (Sebastes mentella)

Population

- Age structured.
- Initial population obtained from a bayesian model.

Fleets

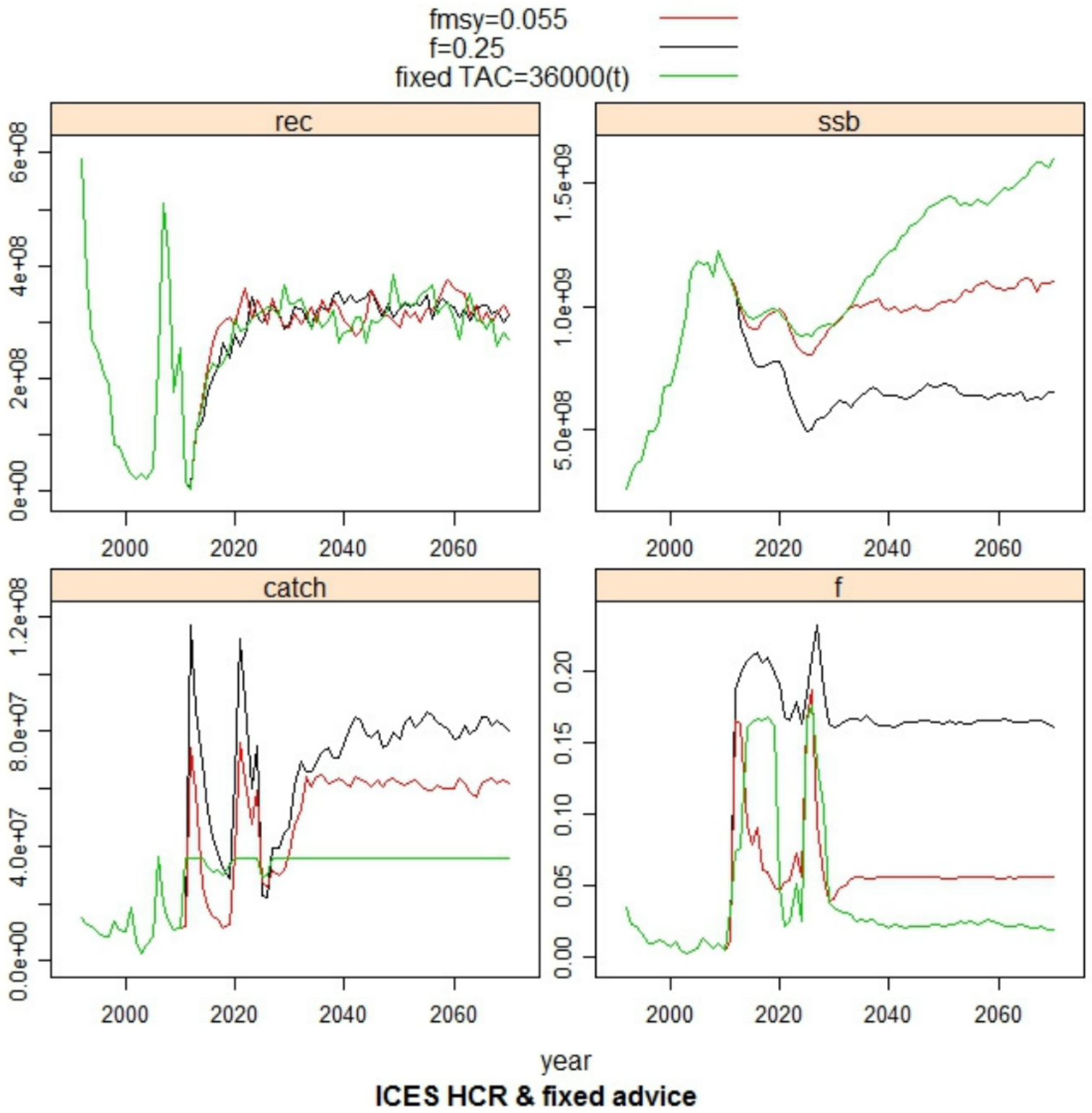
- Demersal and pelagic, but we study them as one fleet

Harvest Control Rules:

- TAC = 36000(t).
- ICES MSY HCR with different Ftarget:
  f01 = 0.055
  f500 = 0.25

Scenarios:

- Specifically generated Stock Recruitment relationship for redfish.
- Perfect observation.
- No Assessment



ICES HCR & fixed advice

Thanks !

azti tecnalia