MareFrame

1 4 9 5 UNIVERSITY OF ABERDEEN

The West of Scotland Case Study

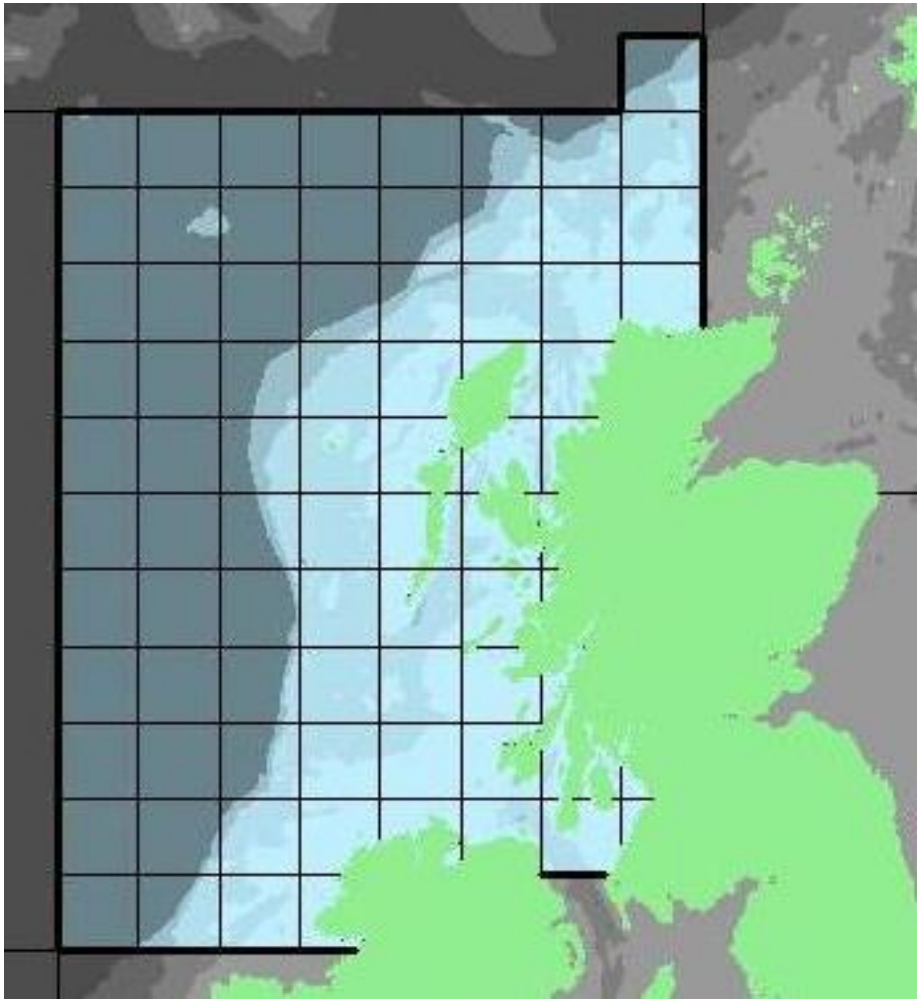
CONSEIL CONSULTATIF RÉGIONAL POUR LES EAUX OCCIDENTALES SEPTENTRIONALES

NORTH WESTERN WATERS REGIONAL ADVISORY COUNCIL

CONSEJO CONSULTIVO REGIONAL PARA LAS AGUAS NOROCCIDENTALES

West of Scotland

- ICES area VIa
- Wide range of habitats
  - Sand, mud, reefs, rock
  - Depth from 250m to 2,500 + m
- Changing conditions
  - NAO influence
  - Warming trend apparent
- Fresh water input
- Productivity
  - Change in plankton composition



West of Scotland fisheries

MareFrame

- **3 major fisheries**

Shelf edge anglerfish fisheries

Inshore Nephrops fisheries

Shelf gadoid fisheries

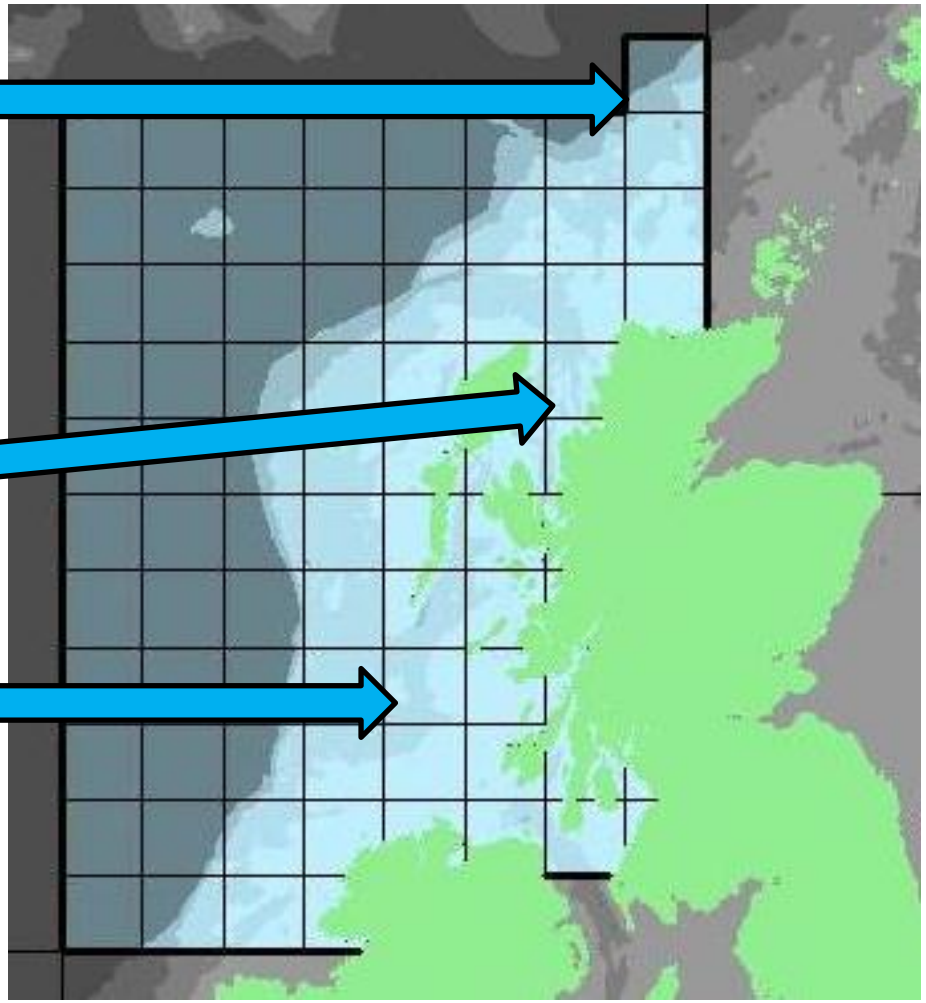
Cod 

Haddock 

Whiting 

Saithe 

Hake 

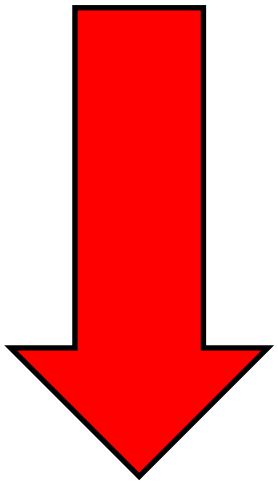


West of Scotland fisheries

MareFrame

- **Current management**

Policies	Measures
▪ Common Fisheries Policy	▪ TAC
▪ Marine Strategy Framework Directive	▪ Effort restrictions
▪ Habitats directive	▪ Seasonal/ spatial closures
	▪ Minimum landing sizes
	▪ Minimum mesh sizes
	▪ Gear restrictions
	▪ Bycatch regulations
	And soon…
	▪ Discard ban



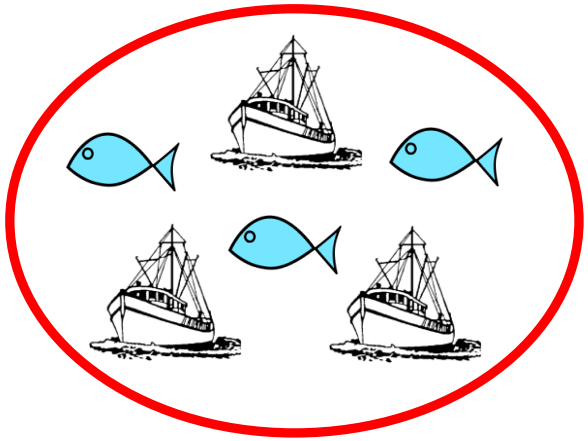
Top-down management

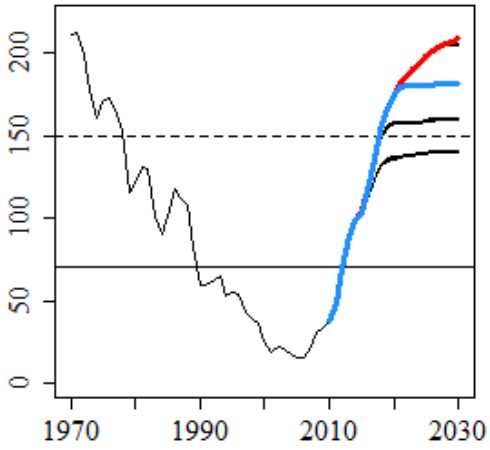
Little stakeholders involvement

Ecosystem modelling

MareFrame

- Ecosystem model: replicate the West of Scotland fisheries and the associated biological processes
- Includes trophic interactions between species
- Simulate different management scenarios and assess outcomes against various criteria
- Evaluate feasibility of alternative management scenarios
- Multispecies & ecosystemic approach
- Ecosystem Approach to Fisheries Management

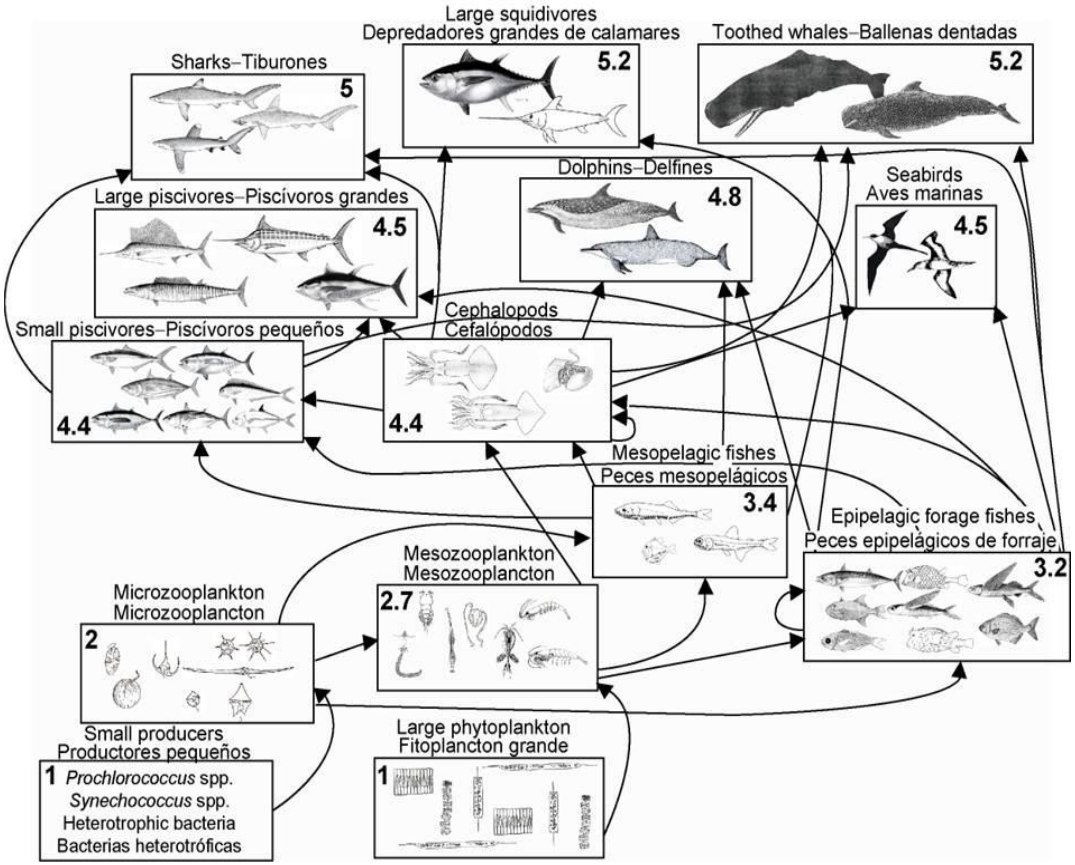




Ecosystem modelling

MareFrame

- **Ecopath with Ecosim**



- Full ecosystem model
- Ecosystem modelled by functional groups
- Groups: species (cod), or group of species with ecological similarities (gadoids)
- Trophic flow of biomass (carbon) between groups
- Species (groups) modelled in weight

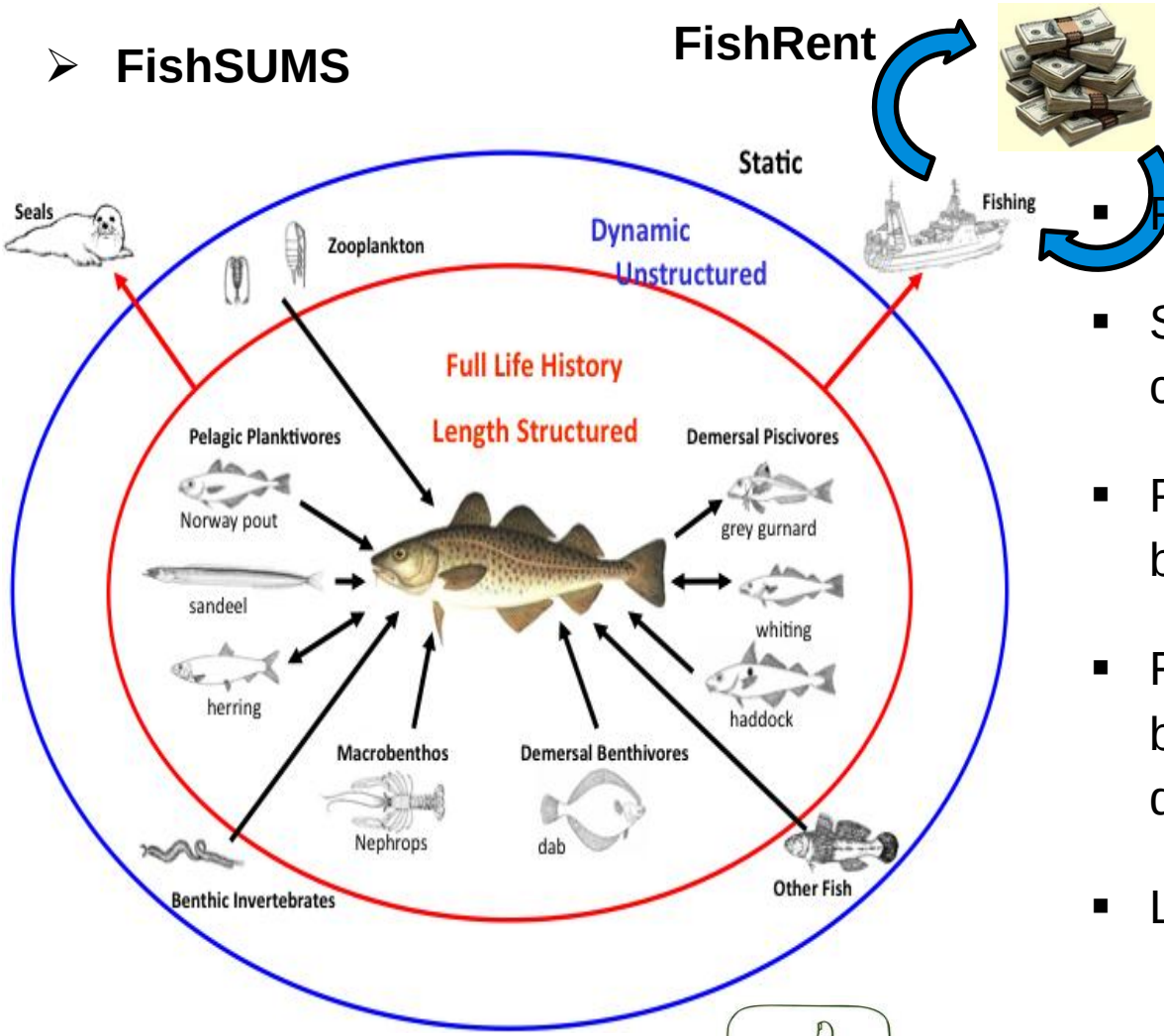
Well established / optimisation procedure

Population dynamics less detailed

Ecosystem modelling

MareFrame

- **FishSUMS**



- Partial Ecosystem model
- Species modelled in length classes through life stages
- Prey-predator interactions based on diet and length
- Fishing mortality / background mortality / density dependence
- Large Fish Indicator

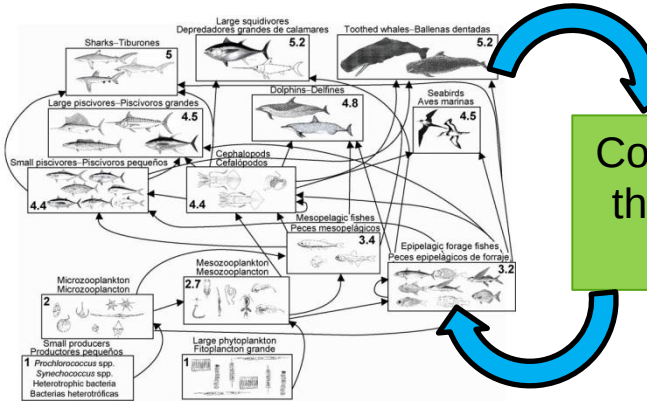
Realistic / population dynamics

Complex parameterisation / No optimisation procedure

Project methods

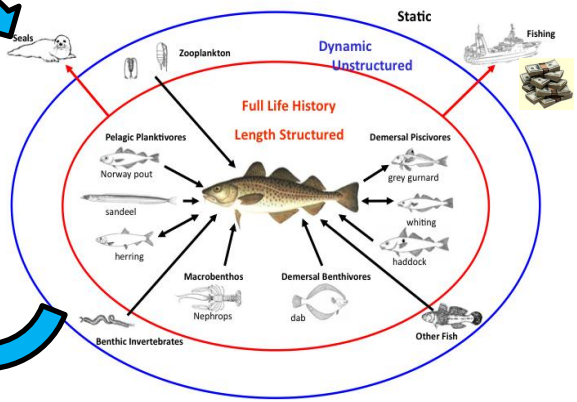
- **Apply two ecosystem models to the case study**

Production model: Ecopath with Ecosim



Comparative simulations for the West of Scotland case study

Mortality model: FishSUMS



- Parameterise the two models using available data to re-create historical time series
- Adapt and extend the candidate models to provide simulated data for Good Environmental Status Indicators, economic indicators, and social indicators
- Simulate, compare, and assess ecosystem-based management strategies using the candidates models available

Ecosystem Approach to Fisheries Management

MareFrame

- **West of Scotland: Management issues to investigate**

  - Whitefish stock recovery

    Explore management strategies to recover the low biomass of the cod and whiting stock.

  - Seal predation

    Seal predation is often blamed for the low biomass level of the cod stock. The impact of seal predation on whitefish stocks should be assessed.

Ecosystem Approach to Fisheries Management

MareFrame

- **West of Scotland: Management issues to investigate**

  - Maximum Economic Yield (MEY)

    Explore management strategies to achieve MEY including:

    (i) find the combination of fishing mortalities on every stock resulting in MEY

    (ii) find the optimum fleet size

  - Fish vs. shellfish

    Finding the right balance between the whitefish and *Nephrops* fisheries to achieve the highest profit

Ecosystem Approach to Fisheries Management

MareFrame

- **West of Scotland: Management issues to investigate**

  - By-catches of the *Nephrops* fishery

    Assessing the impact of the *Nephrops* fishery by-catches on juvenile whitefish and investigate alternative *Nephrops* fishing gear

  - Choke species

    Identify potential choke species for West of Scotland fishery and forecast the associated impact

Ecosystem Approach to Fisheries Management

MareFrame

- **West of Scotland: Management issues to investigate**

  - Trawling impact on seabed

    Investigate the impact of trawl fisheries on seabed and deep water corals

  - Climate change

    Investigate the bottom-up impact of changes in temperature, plankton, and water circulation on commercial stocks

West of Scotland case study: conclusions to date

- Dynamic environment
- 3 main fisheries
  - Management driven by cod recovery
- 2 models
  - EwE
  - FishSums & Fishrent
- Management issues to investigate
  - Stock recovery
  - Seal predation
  - Optimal fishery
    - Fish v shellfish
    - Effect of discard ban
      - On Prawn fishery
      - Choke species
    - MEY
  - Benthic impact
  - Climate change