Fishery Interactions with Marine Renewable Energy Developments

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Scottish Funding Council
Promoting further and higher education

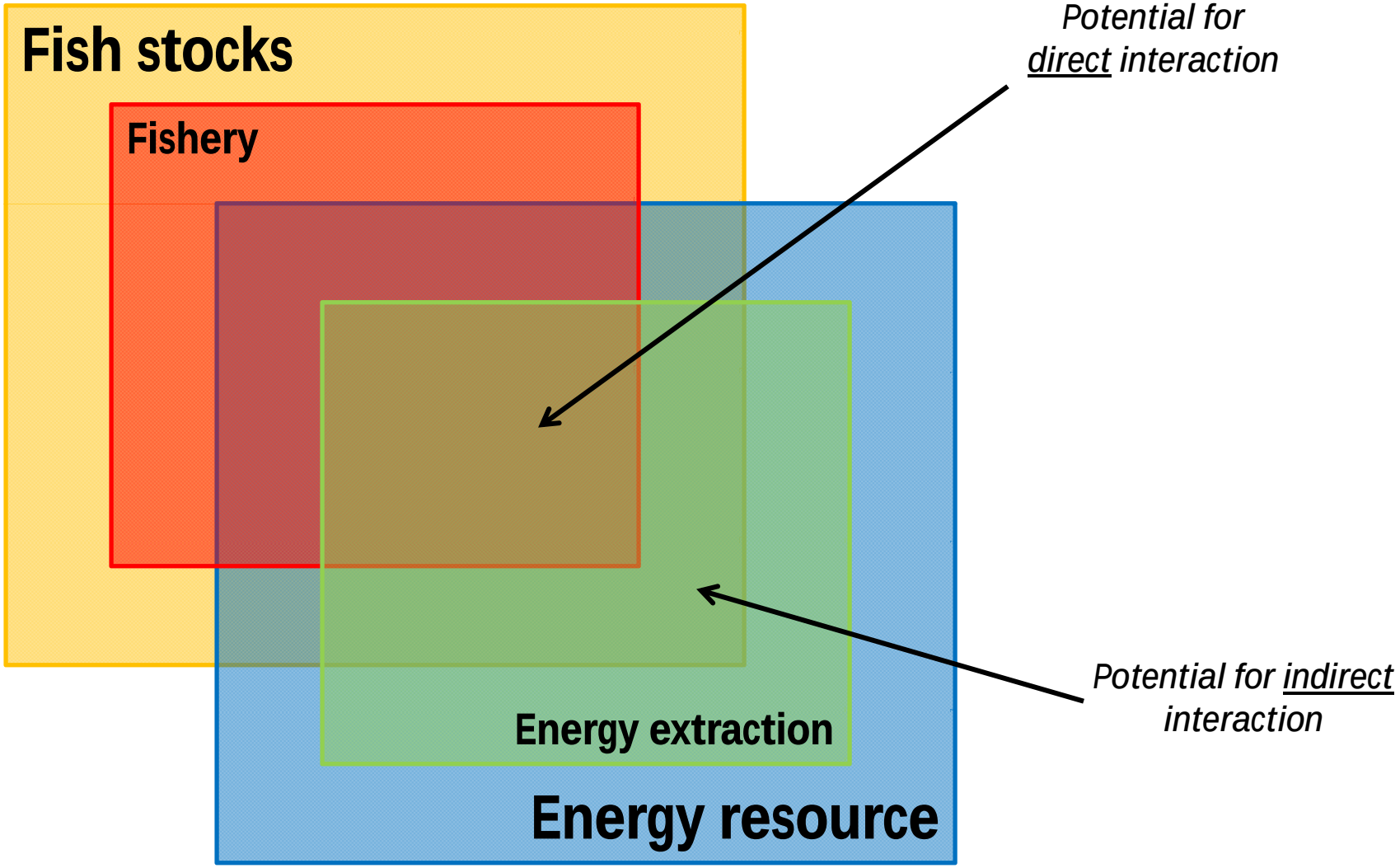
Marine renewable energy devices may...

- Damage or disturb fish
- Damage or disturb essential fish habitat
- Change physical processes, with implications for ecological processes and biological productivity
- Provide new ecological space
  - reef effects, providing new habitat for fish and shellfish
  - 'Fish Aggregation Device' effects
- Displace fishing activities
  - fouling / safety risks
  - exclusion zones as *de facto* marine reserves

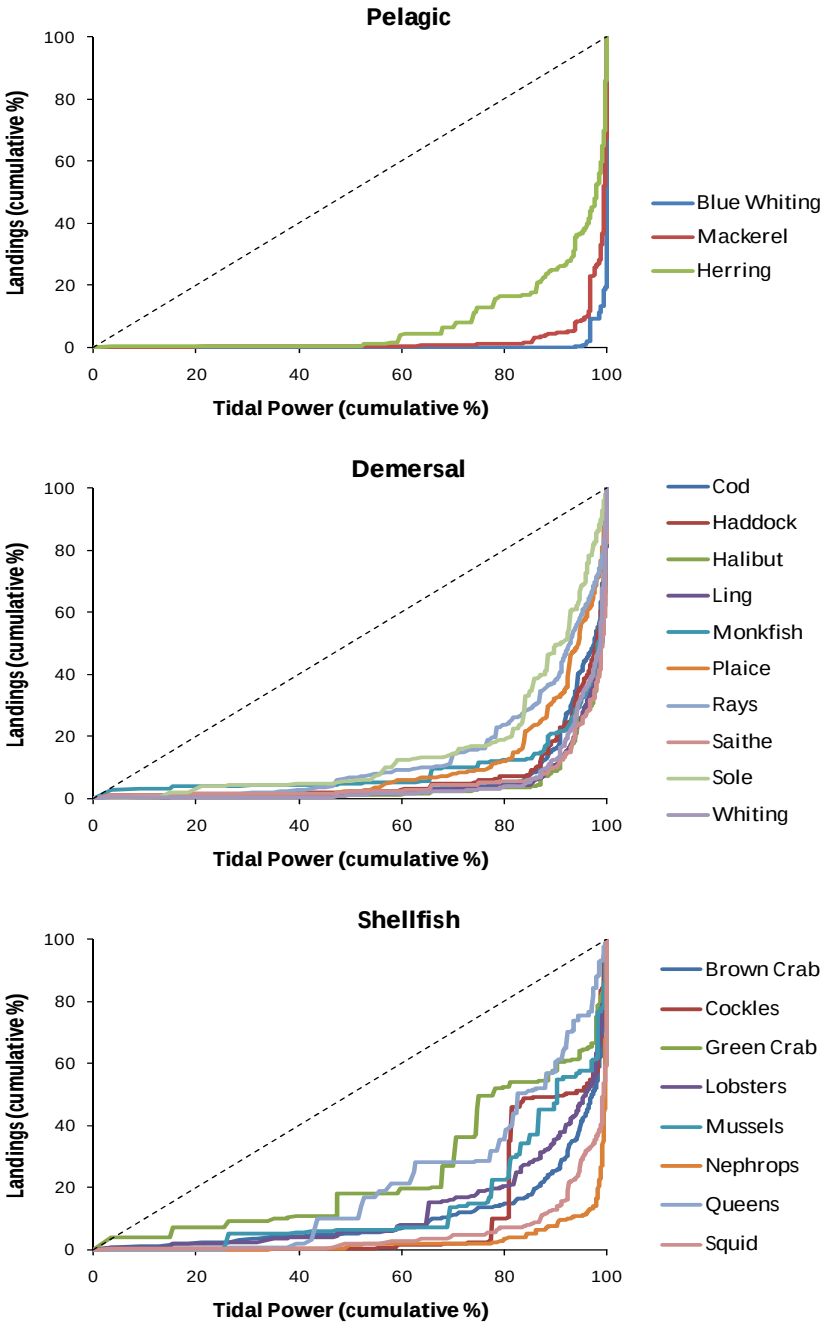
Consequences are likely to depend upon...

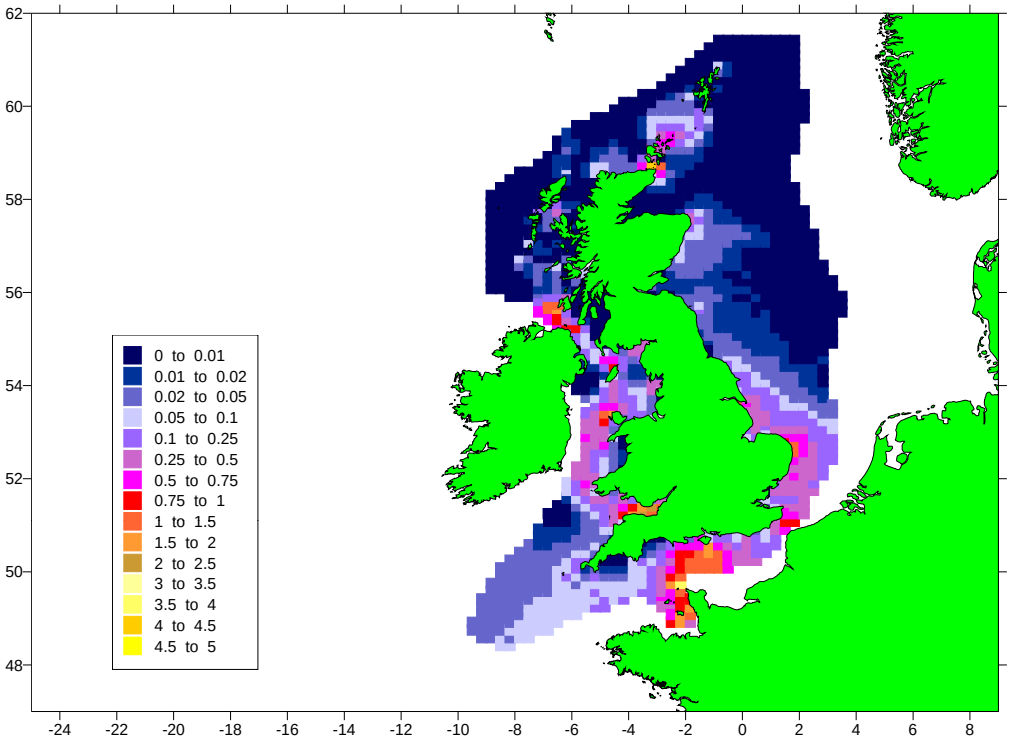
- Device design, including foot-print on sea bed and mooring type
- Maintenance requirements
- Scale of devices and arrays
- Location of developments in relation to
  - fish and shellfish habitat
  - migration routes
  - fishing areas
  - fishing types (static *vs* mobile gear)

Potential for interactions depends upon spatial overlaps:



FISH AND FISHERIES:





TIDAL RESOURCES AND FISHERY OVERLAPS

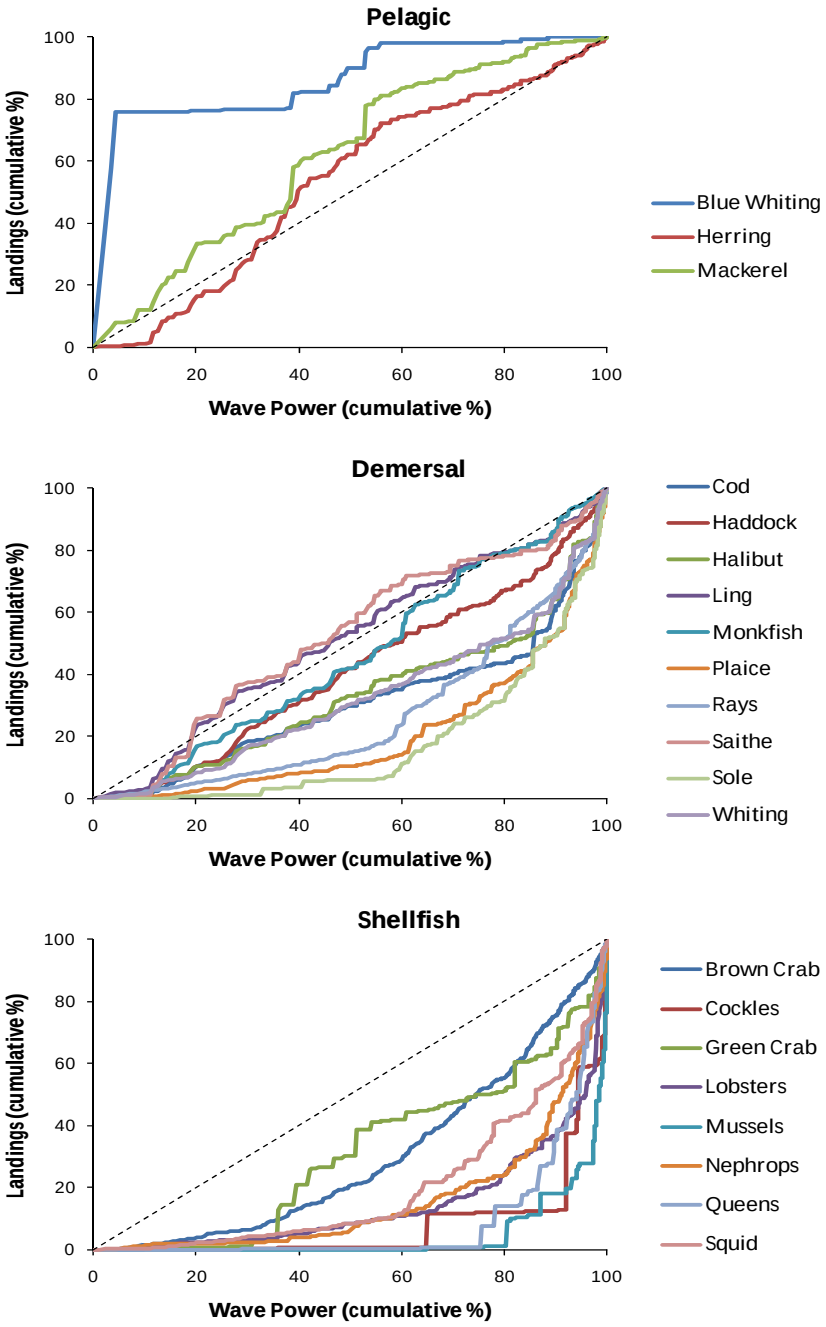
1:1 relationship (45º line) represents identical distribution of fishery and energy resource

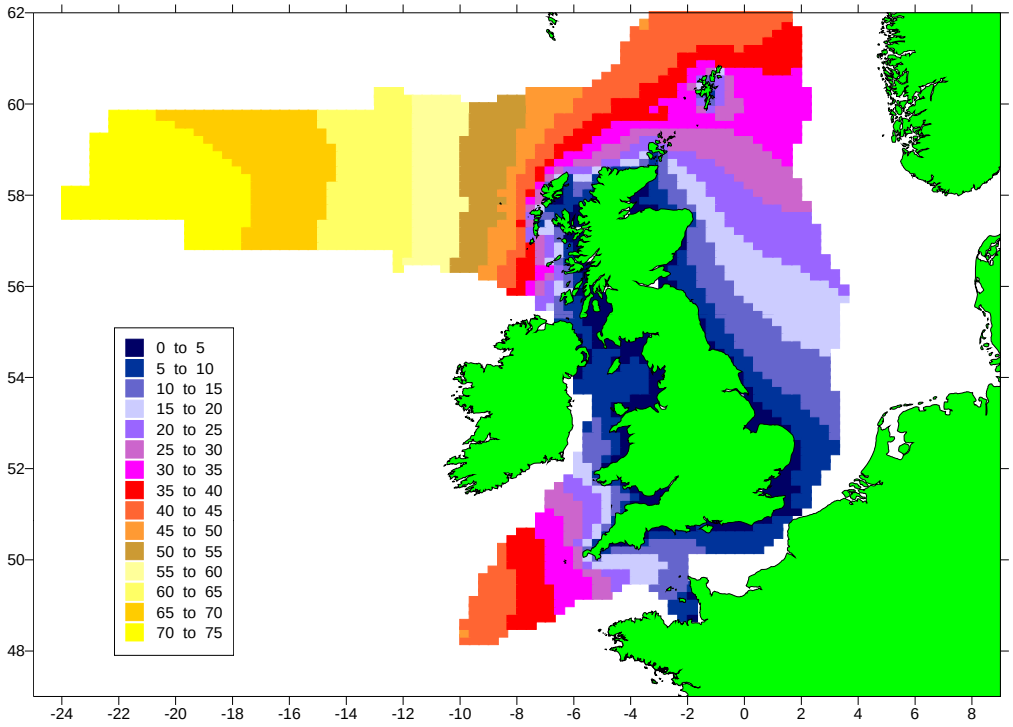
Plots above the line indicate that the fishery is aggregated with respect to the energy resource

Plots below the line indicate that the fishery is dispersed with respect to the energy resource

Only areas within 12 miles of the coast are included here (see Bell *et al.*, 2010)

FISH AND FISHERIES:





WAVE RESOURCES AND FISHERY OVERLAPS

1:1 relationship (45^{o} line) represents identical distribution of fishery and energy resource

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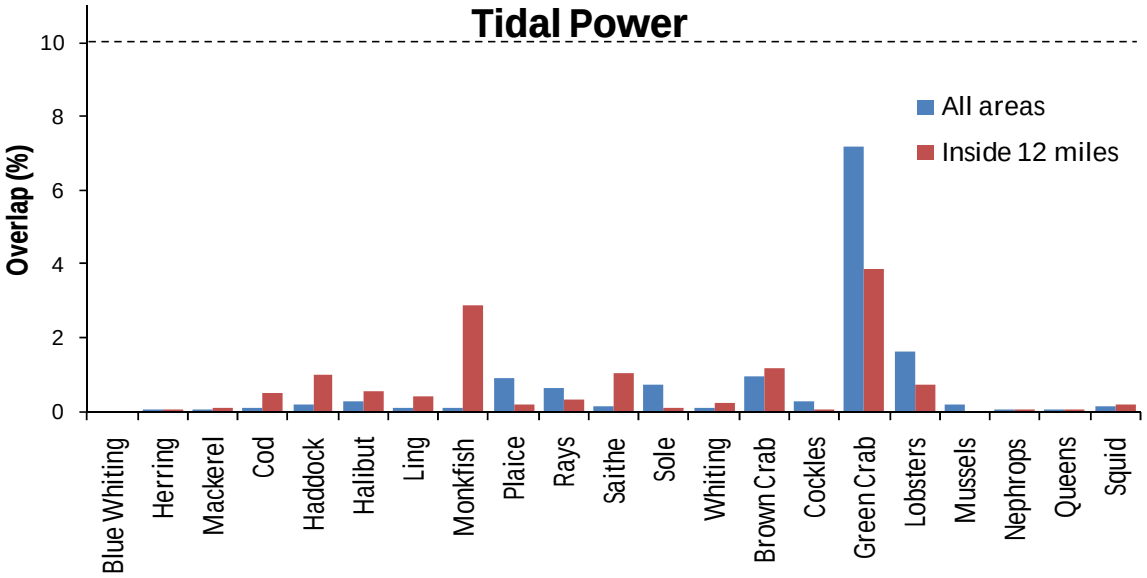
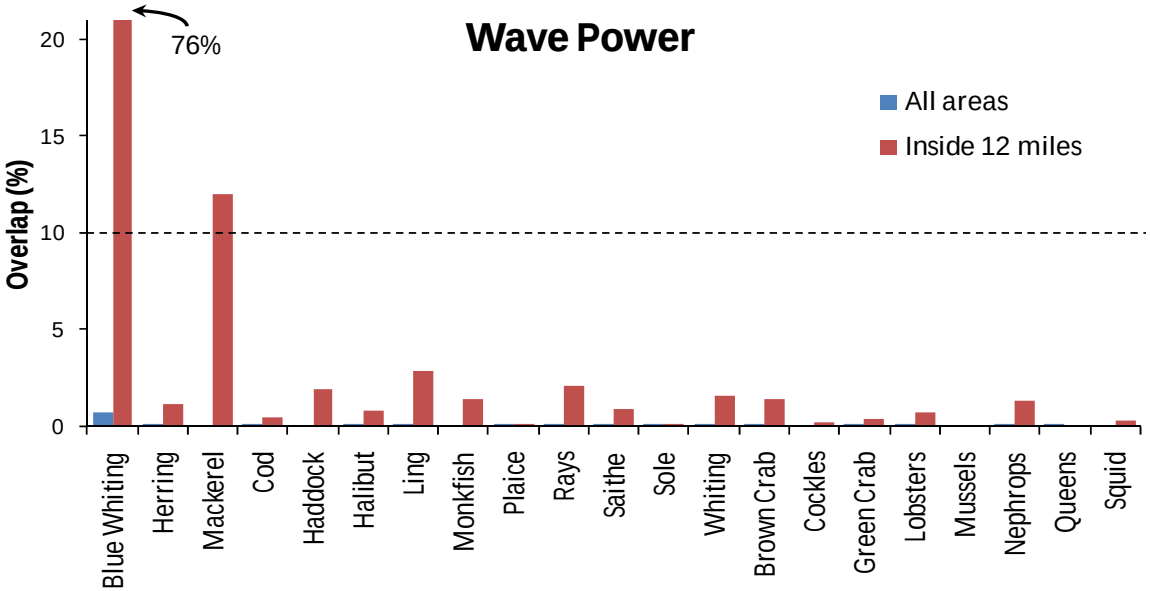




FISHERY SPECIES MOST AFFECTED ASSUMING 10% of ENERGY RESOURCE DEVELOPED

Shows % overlap with 10% of energy resource within 12 nautical miles of the coast and for the UKCS.

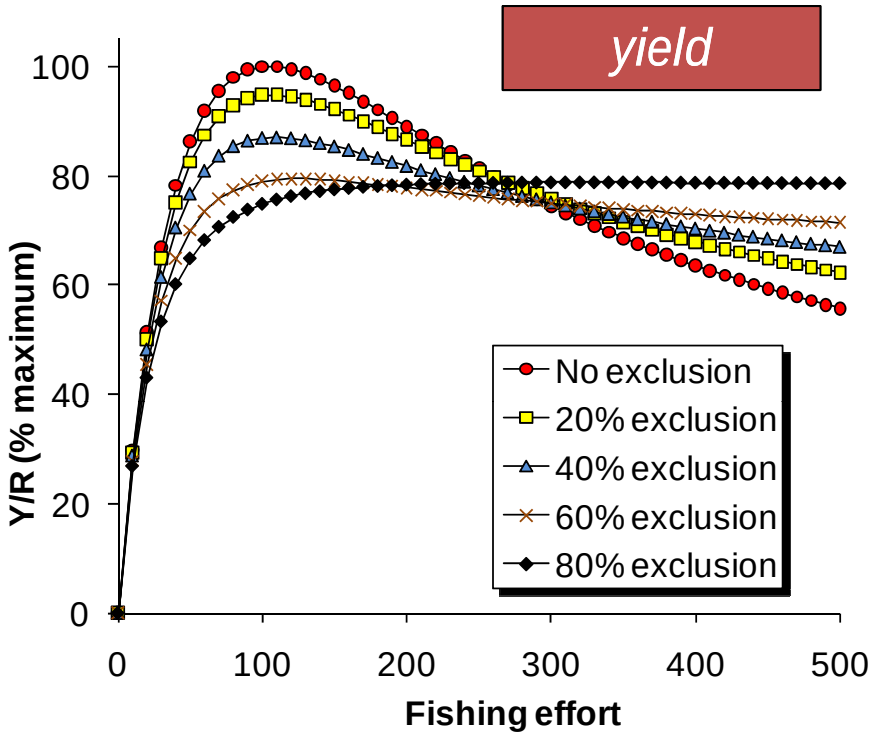
Some surprises, and this is a simple coarse scale analysis – finer detail would improve this.

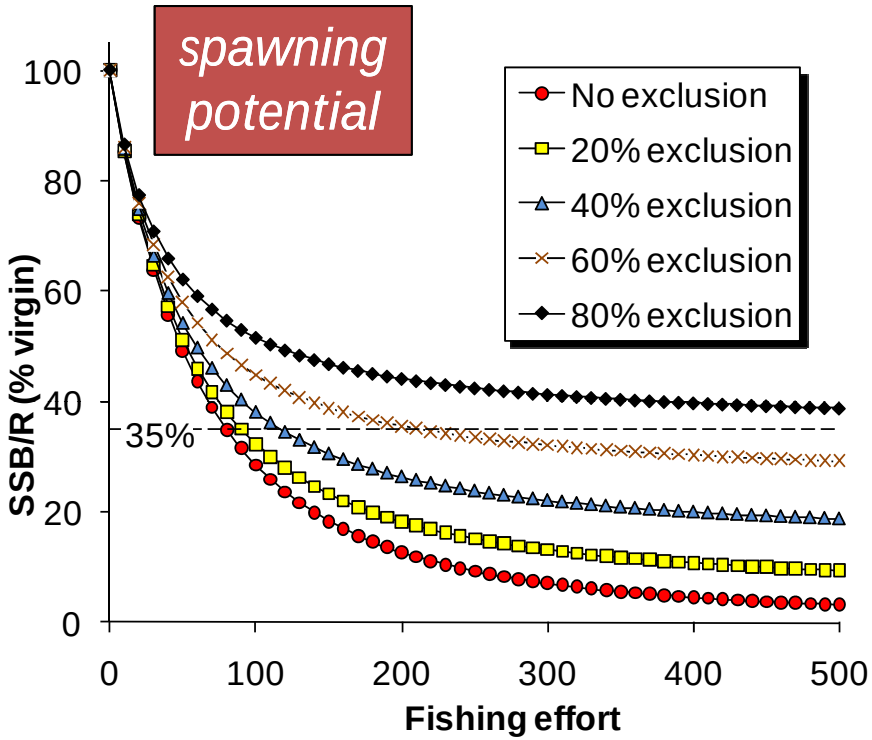
(see Bell *et al.*, 2010)

Importance of fishery interactions

- Important interactions likely to be at *local* scales
- Small (<15m) inshore vessels are most likely to be displaced from fishing grounds
  - no VMS data available for small vessels
  - need for local consultation and other sources of spatially-explicit catch and effort data
  - fishing vessels potentially important for monitoring activities (e.g. pot fisheries for crustaceans)
- Shellfish likely to be of greatest concern / potential

Spatial fishery models can be used to explore potential effects of exclusion zones:





- Potential benefits of exclusion zone are:
  - ➢increased resilience of yield at high fishing effort
  - ➢protection of spawning potential
- But large exclusion zones needed to confer significant benefits if exchange rates between open and closed areas are not very low

Spatial fishery modelling...

- Crucial parameter controlling the potential to confer benefits for yield and spawning stocks is the rate of exchange between closed and open areas
- Main potential is for species that are sedentary or of limited mobility – i.e. shellfish
- Potential for habitat creation is probably also greatest for shellfish (e.g. mussel settlement, habitat for juvenile lobsters)

Future research

- Need to know how fish and shellfish may move and aggregate in relation to developments
- Need to know how developments will change habitat in the immediate vicinity
- Need to model the far-field effects of removing kinetic energy from waves and tides and link to ecological models
- Information on fine-scale distribution of fishing activities by small vessels
- Spatial fishery models to examine implications of displacing fishing effort
- Direct impacts of collision risk and noise