

Ecosystem consequences of a ban on fishery discards

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What is discarding?

Dumping at sea of components of fishery catch rather than bringing ashore for marketing

- Discards comprise unwanted by-catch of fish, benthos, macro-algae and inorganic debris
 - Discarded fish and many benthic species are usually fatally damaged
 - 30-40% of demersal fish catch in North Sea is discarded, ~10% of pelagic fish catch
 - Many reasons why discarding occurs...
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- ***Discards are not currently included in Total Allowable Catches (TACs) set under the Common Fisheries Policy***
 - ***i.e. outside any form of regulation or control***

Bringing discarding under control is part of the CFP reform...

- Publicity campaigns have labelled discarding as morally repugnant – e.g. “Hugh’s Fish Fight”
 - Criteria for ‘sustainable fisheries’ accreditation include low discard rates
-
- EU Fisheries Council has voted to proceed with implementation of a ban on discarding of fish in EU waters (Norway already has such legislation).
 - BUT – the devil is in the detail ! Consequences of a ban will depend on how it is implemented

Implementation of a discarding ban

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What are the conservation and ecosystem consequences of these alternatives ?

Possible ecosystem consequences of a discard ban

- Removal of a food source for scavenging species
- Improvements in capture selectivity will have additional ecosystem effects – due to reduction in effective harvest rate.

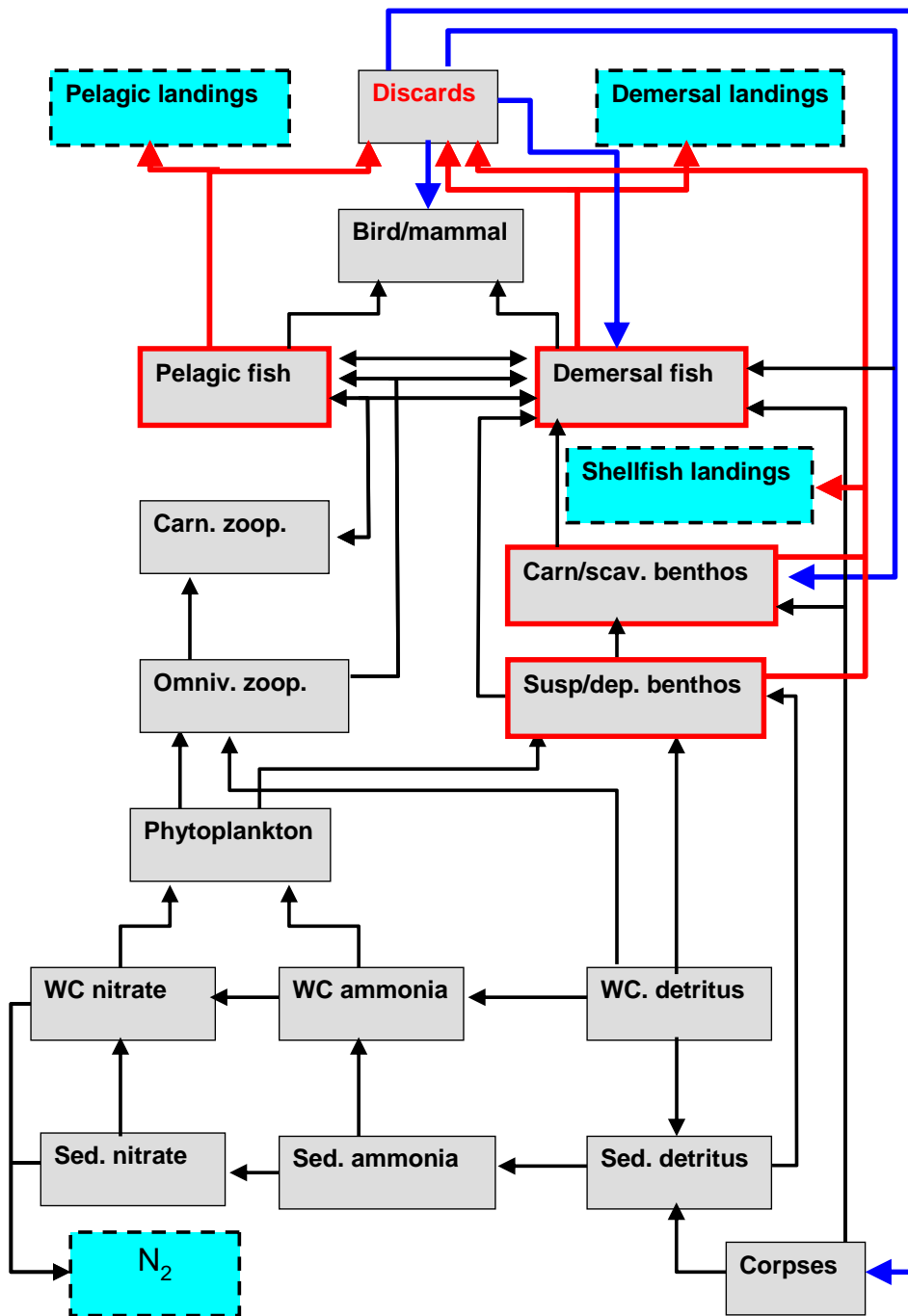


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We used a food web model of the North Sea to investigate the consequences of the two contrasting implementations of a discard ban.

North Sea food web model (StrathE2E)...



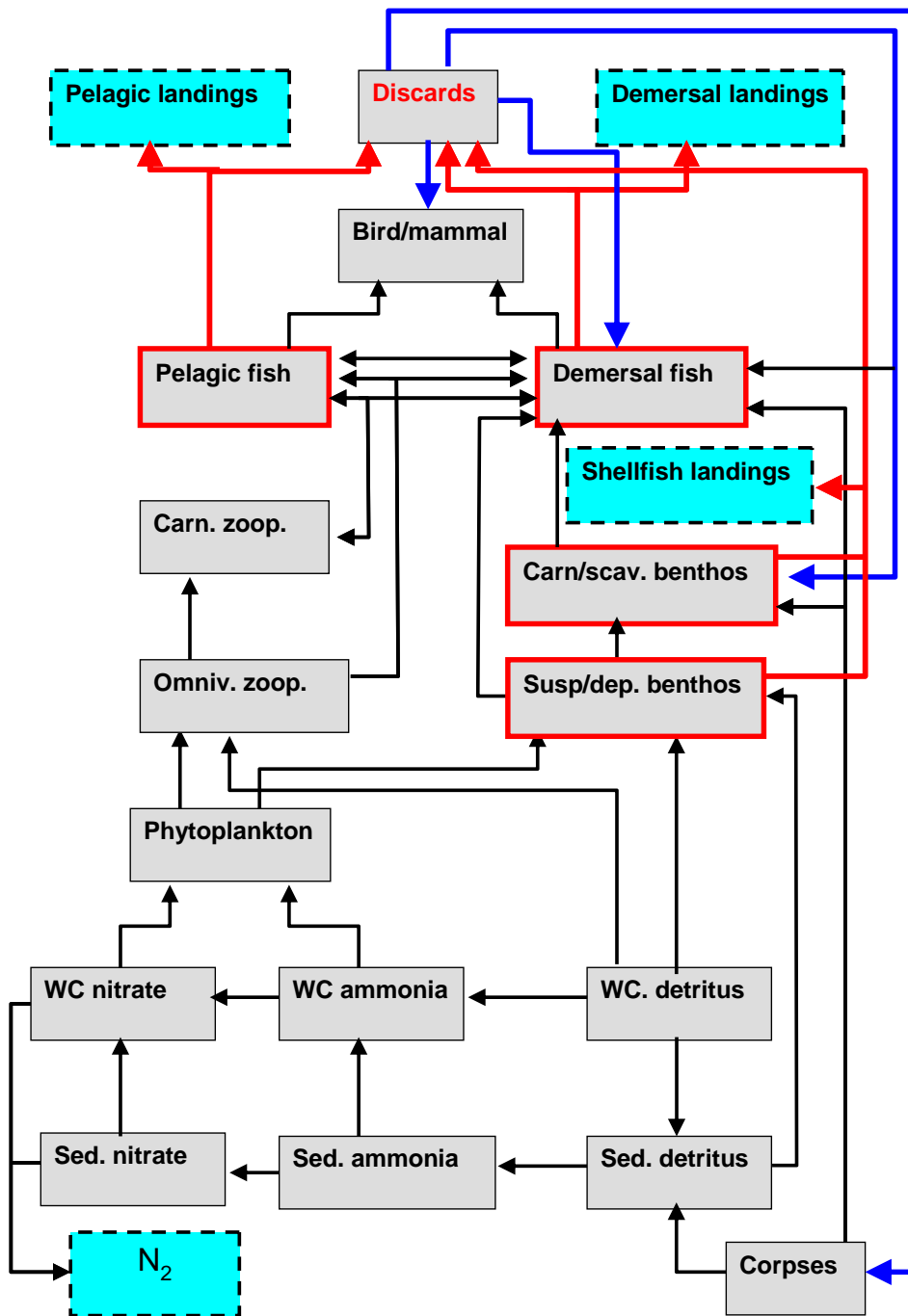
Fluxes of nitrogen modelled by a set of linked Ordinary Differential Equations

Horizontally averaged over the whole North Sea

Two water column layers plus sediment layer

Includes exchanges of material between layers and with ocean, land and atmosphere

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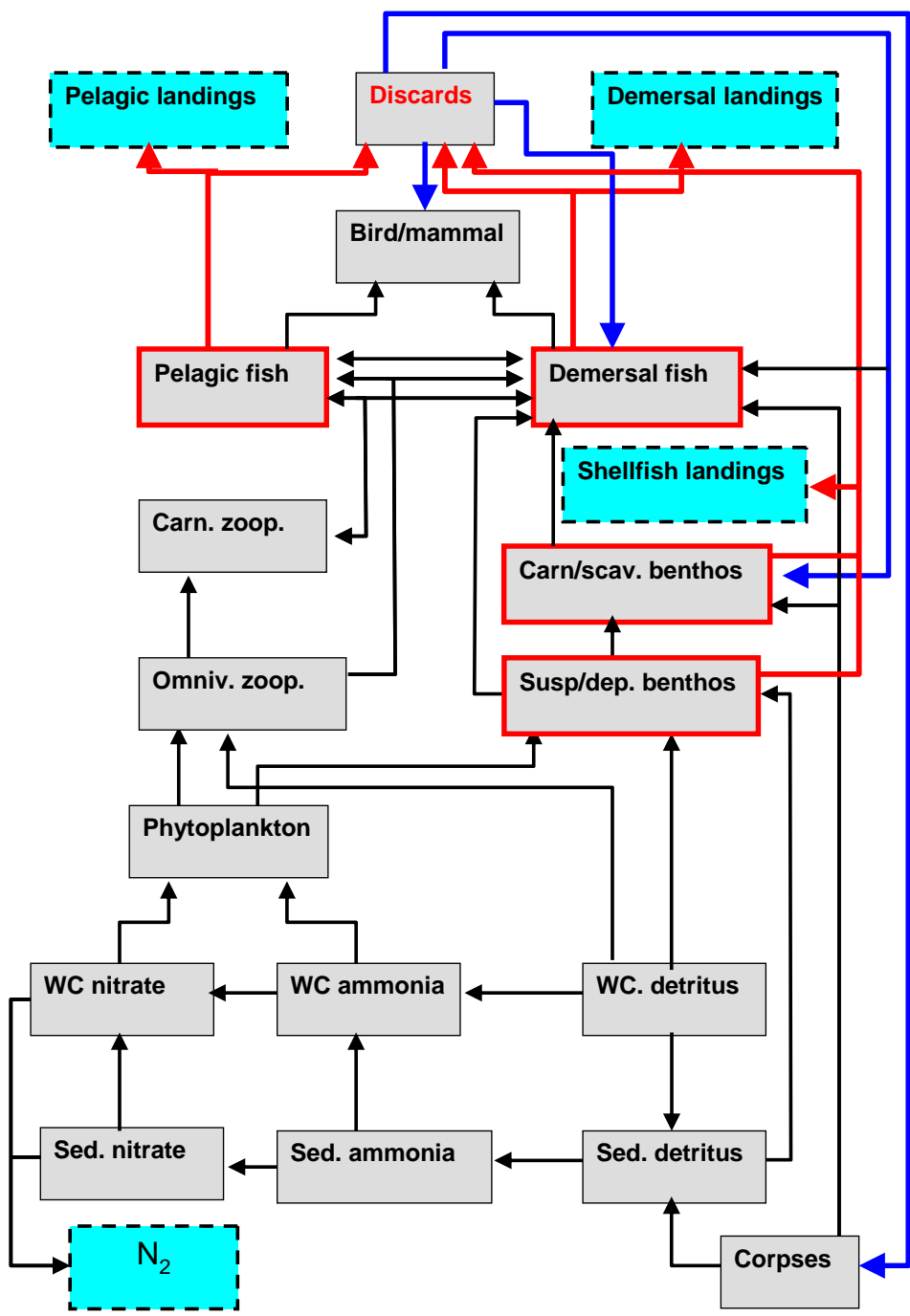


- Forcing data...**
- Harvest rates of demersal & pelagic fish, carn & susp feeding benthos.
 - Ocean & river inflow volumes
 - Vertical mixing rates
 - Ocean & river nutrients
 - Atmospheric deposition of nutrient
 - Sea surface irradiance
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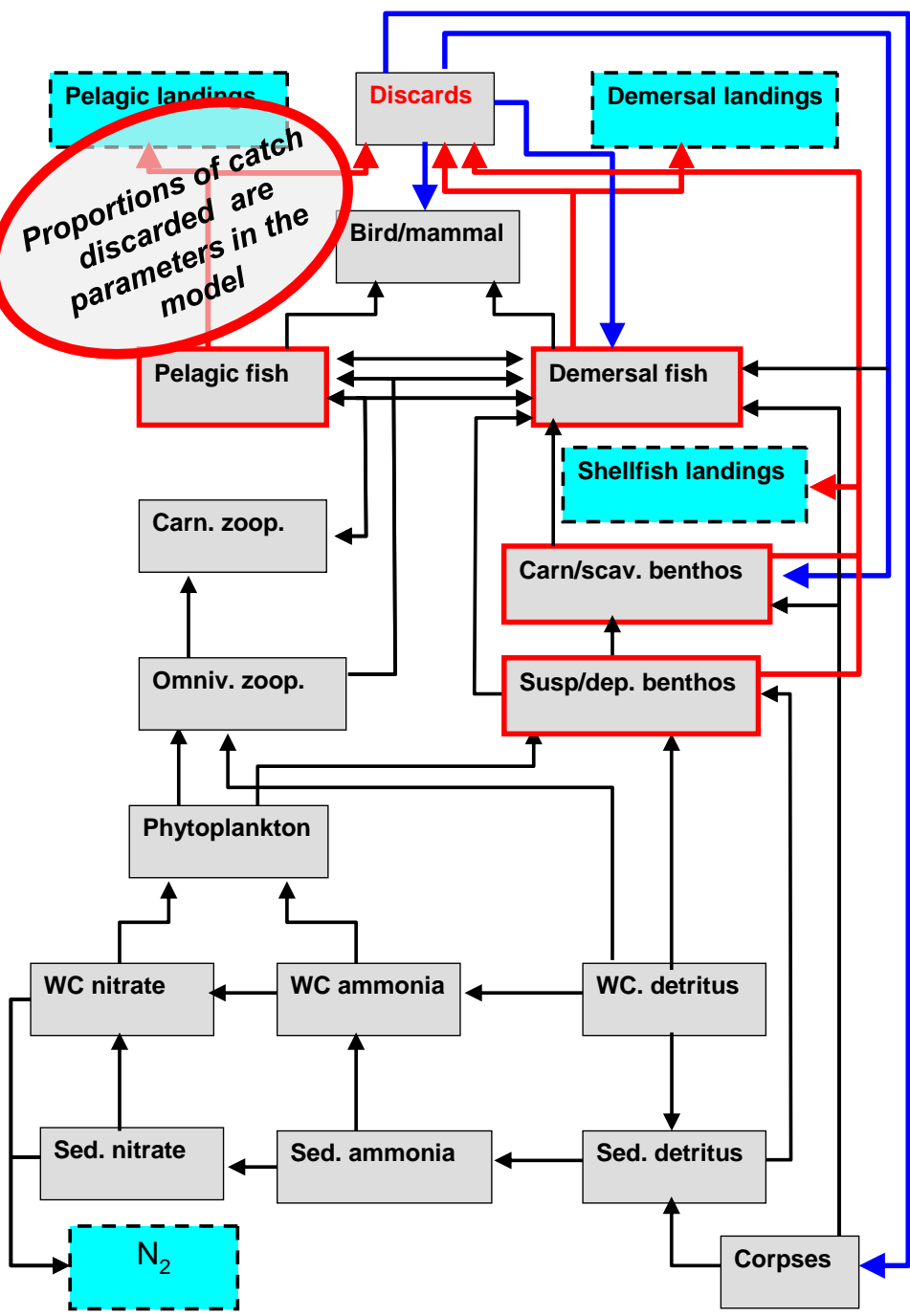
Proportions of biomass caught per day



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Proportions of catch discarded are parameters in the model

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Modelling two alternative scenario for implementation of a discard ban ...

- Run the model for two discard ban scenarios.
- Compare each set of results with a default model statistically fitted to the average observed conditions over 1970-1999.

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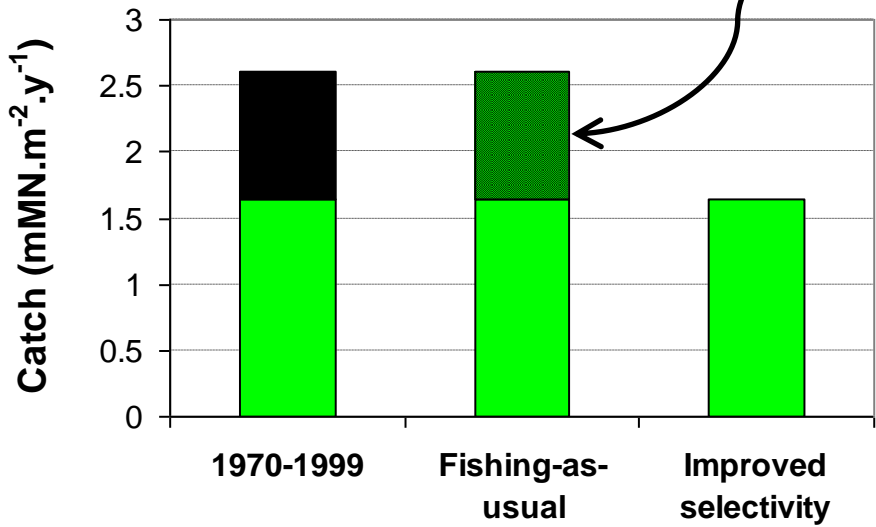
2. “Improved selectivity”

Demersal fish harvest rate optimised so that demersal **CATCH** = 1970-1999 **LANDINGS**, with none discarded

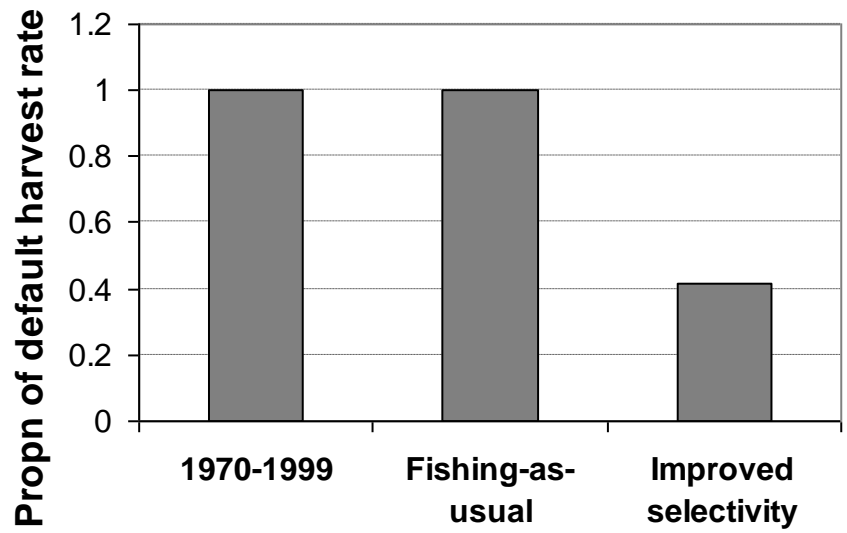
Pelagic fish harvest rate optimised to deliver maximum sustainable yield, with none discarded.

Modelled demersal fish yields under discard ban scenarios

By-catch brought ashore rather than being recycled through the food web



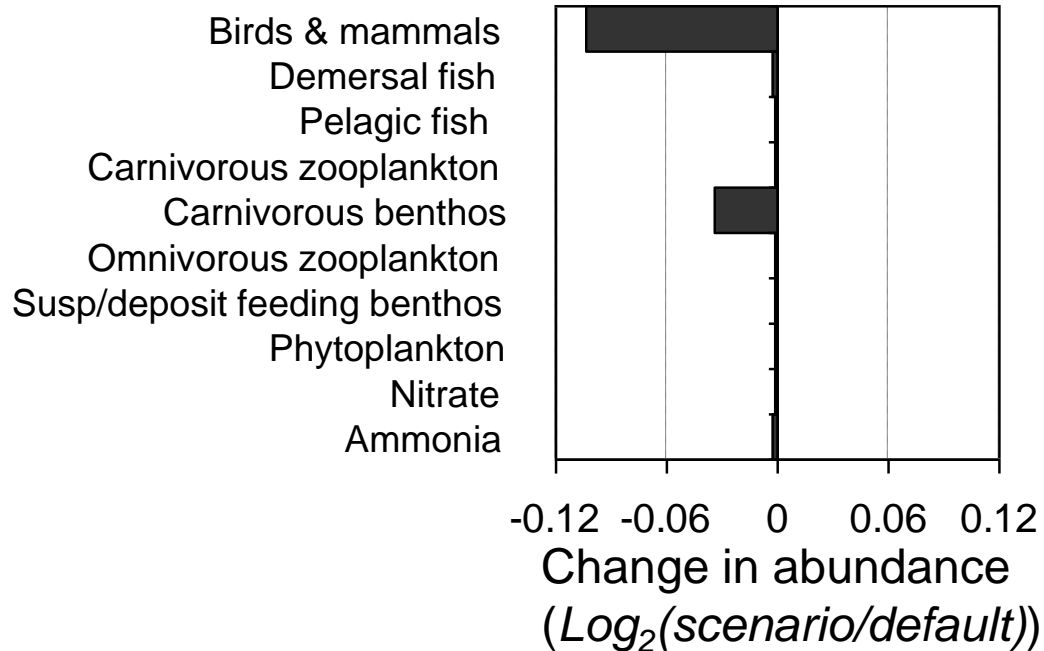
- Discarded at sea
- Landed by-catch
- Marketable landings



“Improved selectivity” ...

By eliminating by-catch, marketable demersal landings achieved with ~40% of current harvest rates

“Fishing as usual”

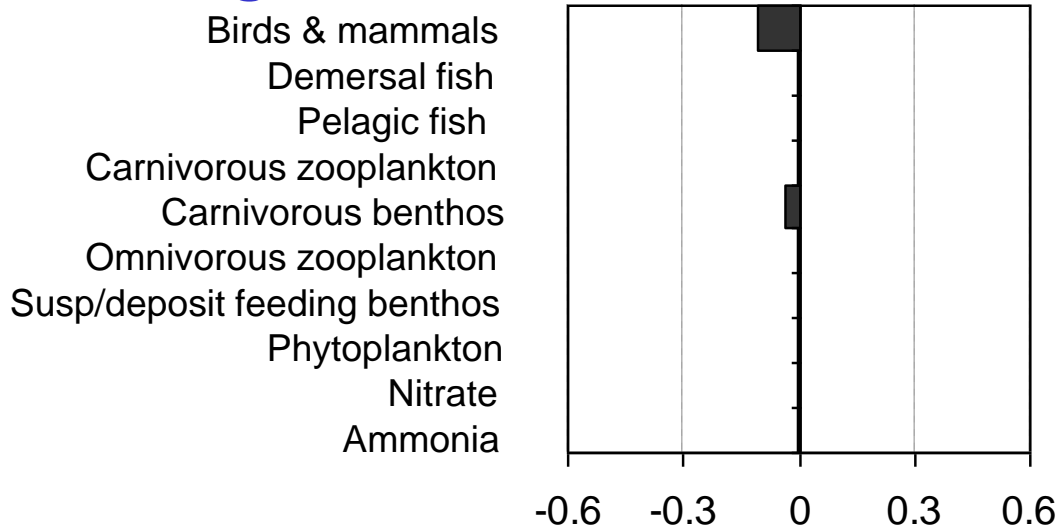


Food web effects of discard ban scenarios

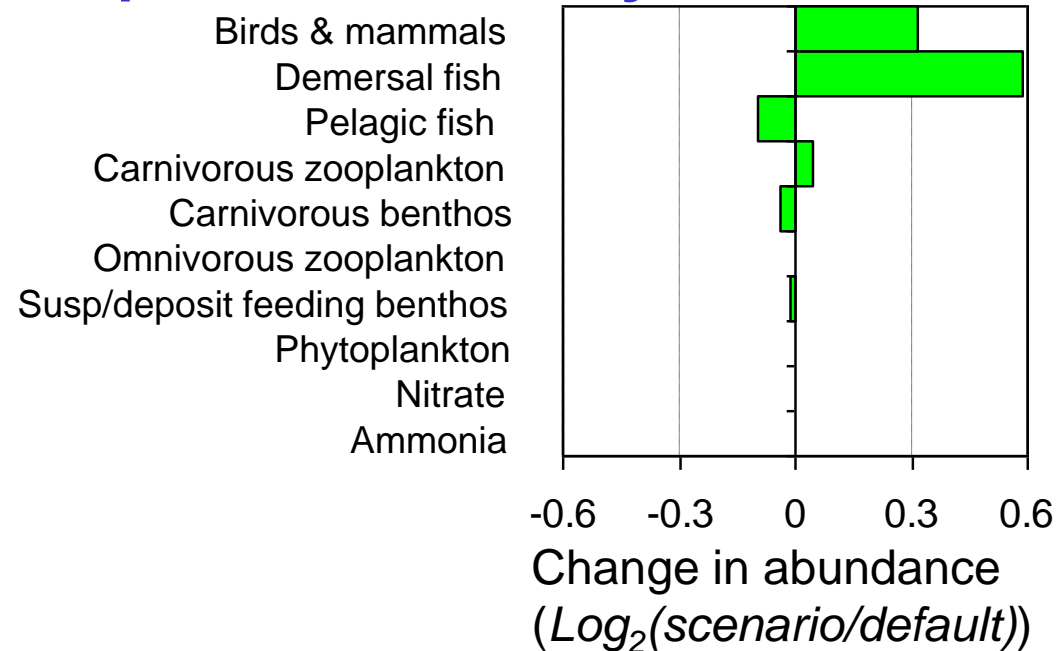
Change in abundance of food web components relative to 1970-1999 average.

“Fishing as usual” has small negative effect on scavenging components

“Fishing as usual”



“Improved selectivity”



Food web effects of discard ban scenarios

Change in abundance of food web components relative to 1970-1999 average.

“Fishing as usual” has small negative effect on scavenging components

“Improved selectivity” creates a trophic cascade and positive effects on top-predators

Take-home message...

“Fishing as usual but land everything” may salve our conscience, but no conservation benefit.

- *What will happen if landing of currently low or zero value by-catch becomes economically rewarding ?*



“Improved selectivity” is politically challenging, but has clear conservation benefits.




At the moment, the CFP reform process looks like opting for “fishing as usual”.

Issues to consider in further modelling:

- *Economic incentives to improve selectivity*
- *Include offal disposal in the model*



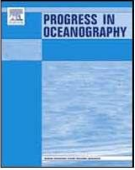
More information...



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Ecosystem limits to food web fluxes and fisheries yields in the North Sea simulated with an end-to-end food web model

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Run the model online and conduct your own experiments at:
www.mathstat.strath.ac.uk/outreach/e2e/

PhD student starting October 2013 at University of Strathclyde on statistical analysis and modelling of fishery discards