

Tackling key questions on the effects of climate change on the benthos

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Benthos – epifauna & infauna

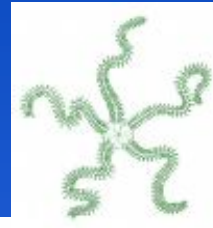
Amphipoda



Cumacea



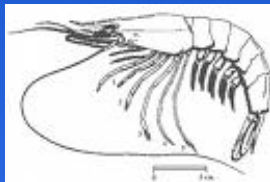
Asterozoa



Ophiurozoa



Copepoda



Echinozoa



Holothurozoa



Gastropoda



Polychaeta



Decapoda



Bivalvia

Background...



- Results from a workshop of benthic experts (CBPNS)
- Setting = North Sea (offshore), but issues broadly applicable

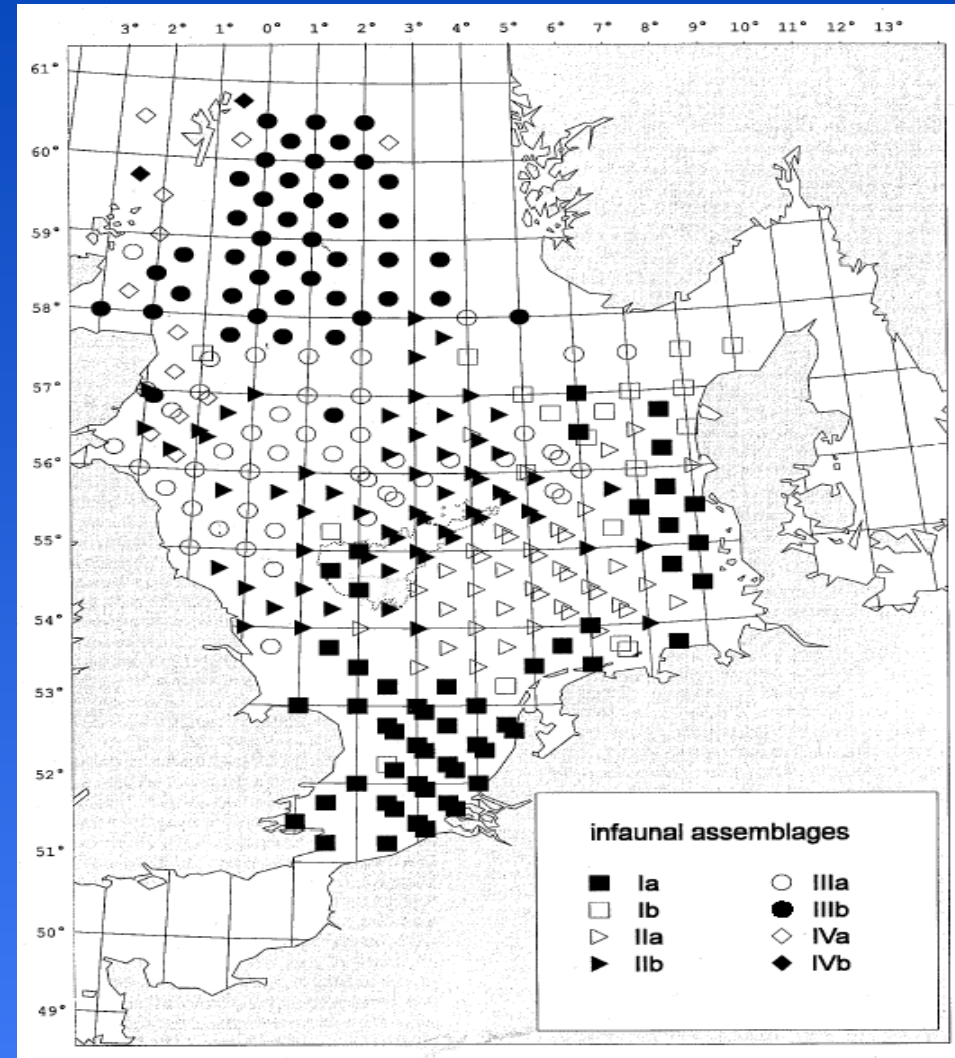
Aims:

- Prioritise **key unanswered questions** on climate effects on benthos
- Outline research strategies to tackle these & **additional expertise required**

What we already know...

1. Major structuring factors for benthic communities

- Substrate type
- Temperature
- Hydrodynamics (bottom stress)
- Nutrient/organic matter fluxes
- Food availability
- Osmotic stress



What we already know...

2. More and more of the key process issues....

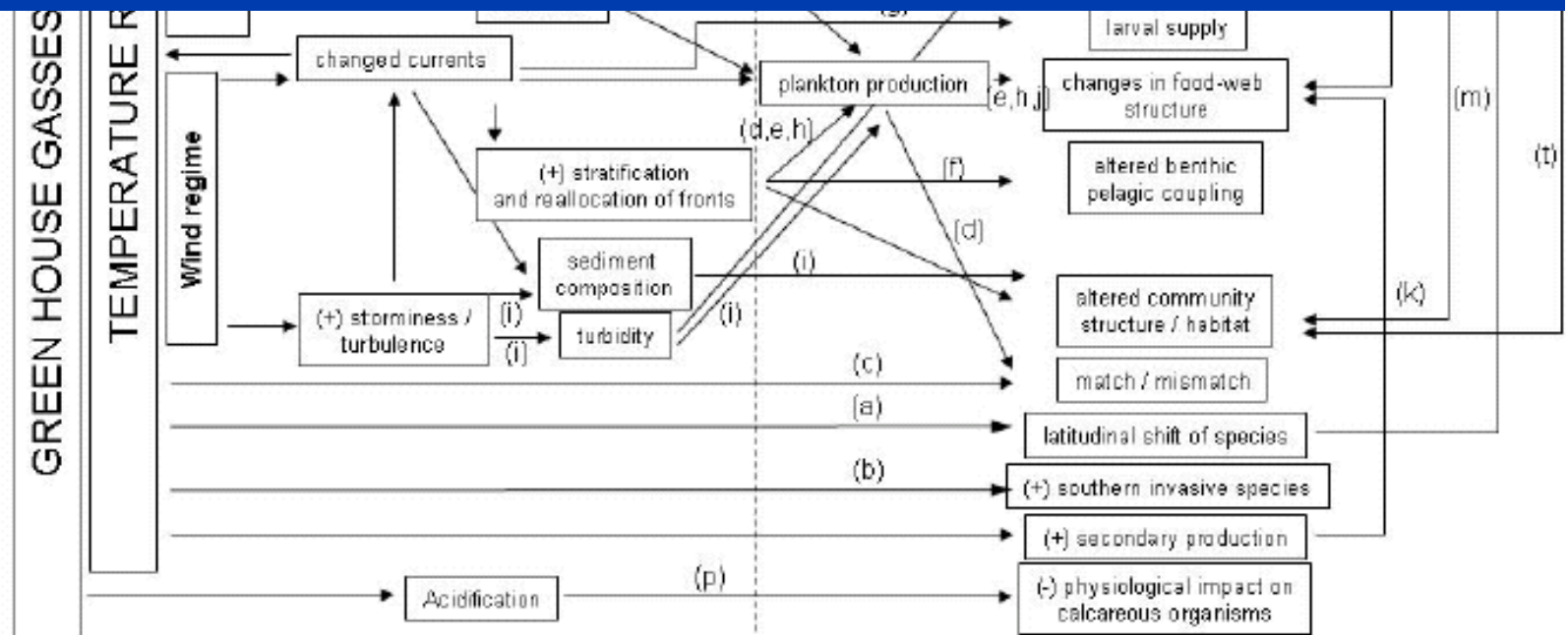
- Benthic-pelagic coupling
- Trophic interactions
- Growth/ secondary production
- Dispersal/ larval supply
- Nutrient cycling
- Resilience/resistance

& how community structure related to these....



ABIOTIC EFFECTS	BIOTIC EFFECTS	
	non benthos	benthos
		First-order effects

How could climate change influence community structure and key processes?



Anthropogenic interactions: (r,s)

Hypotheses...



- 21 key hypotheses selected by BEWG

Examples:

- i) Changes in the frequency and intensity of storms will change wave energy, which will have an effect on the benthic environment.
- f) Reduced mixing may enhance the risk of oxygen depletion and result in altered pelagic-benthic coupling.
- c) Climate change might result in changes in the timing of reproduction. This might result in a temporal mismatch between the larval period and/or settlement and the availability of food, i.e. the plankton bloom.

Prioritisation of hypotheses...



Hypotheses were assessed based on five criteria:

- Impact (hot topic?)
- Urgency
- Feasibility (approach)
- Geographic scale of issue
- (Cost)

For the highest scoring hypotheses research strategies were discussed in terms of:

Objectives; Suitable approaches (e.g. experimental, field (spatial and/or temporal), modelled?); **Recommendations for future work and collaborations**

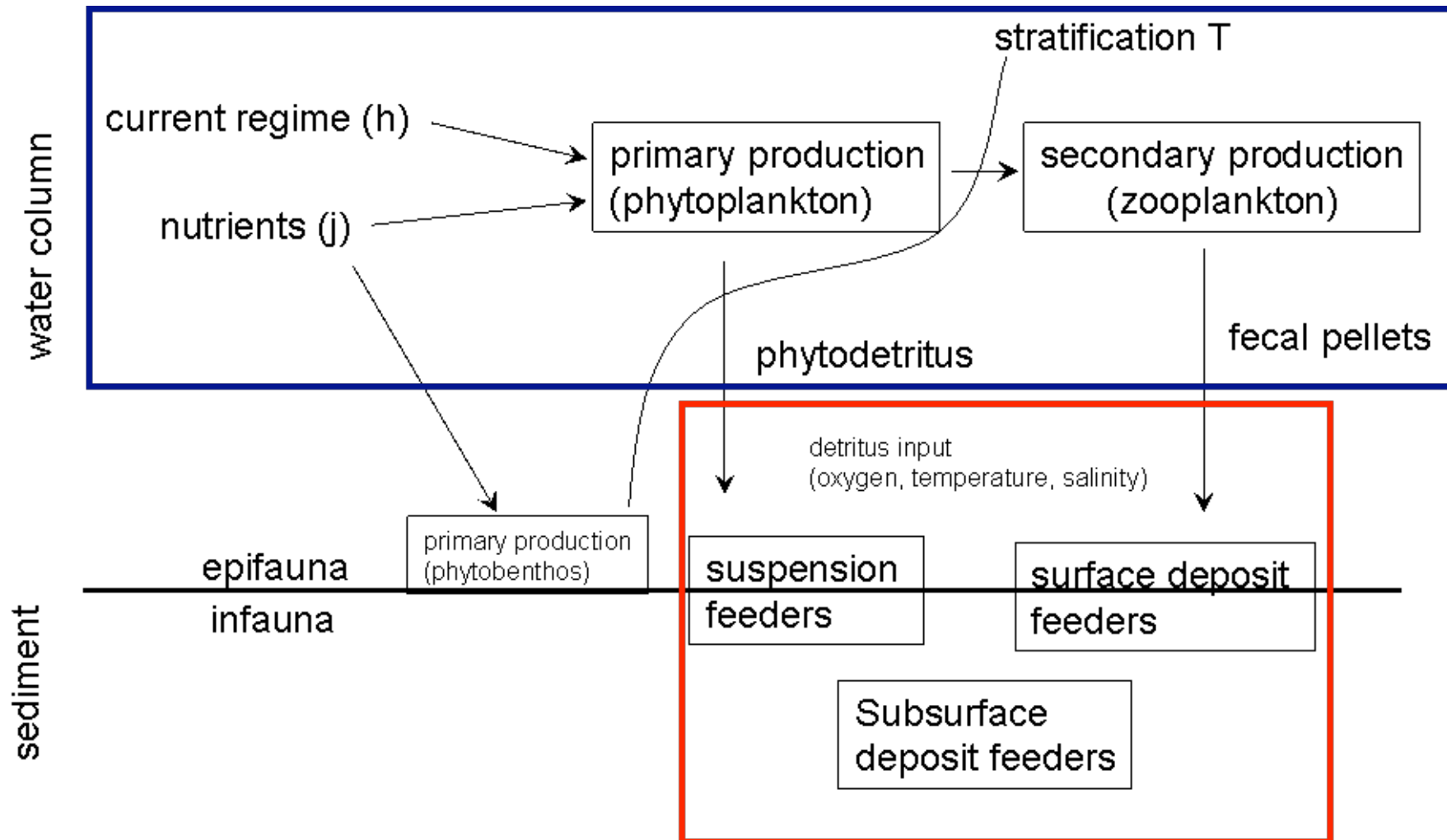
Examples...



- HYPOTHESIS (h): Altered current conditions may lead to shifts in frontal areas and may change upwelling. This will influence primary production with consequences for the food supply to the benthos.
- HYPOTHESIS (j): Changes in nutrient fluxes due to advection, vertical diffusion and mixing, river flows and atmospheric deposition, will lead to changes in primary production with consequences for the secondary production and biomass of the benthos.

1st issue – are the hypotheses realistic/credible?

Hypotheses (h) and (j)...



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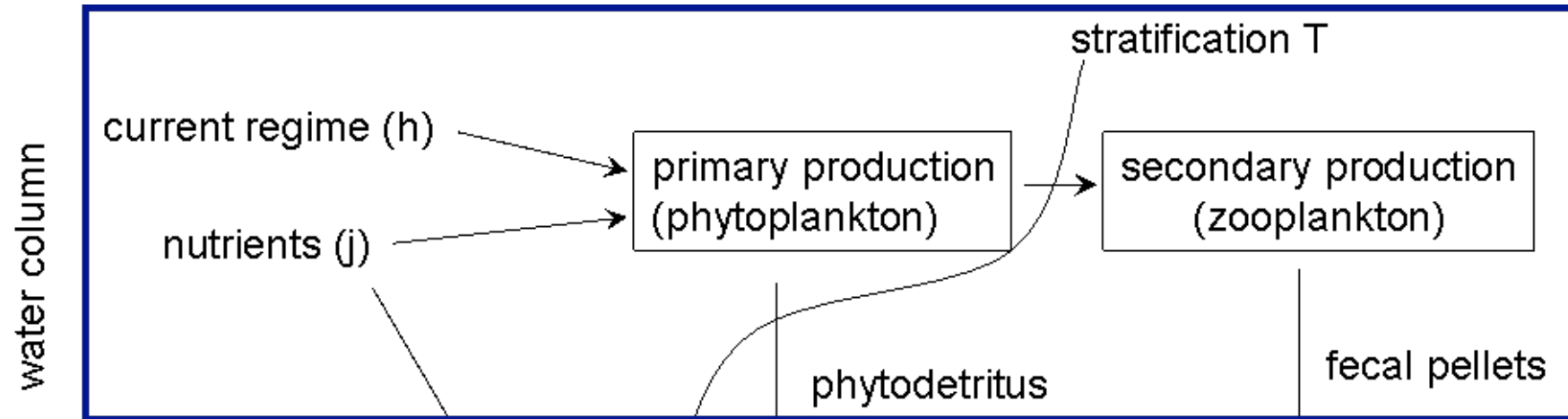
Overall aim:

To explore the effect on benthic biomass and secondary production, of alterations in food input (variation in quantity, quality & timing) from the pelagic realm, driven by climate change.

Key (benthic) research aims:

- Review work on relationship between food input (quality, quantity & timing) and benthic biomass/ secondary production
- Using field data, test model predictions on change in biomass/ 2ary prod over different scenarios of food input
- Using controlled experiments, measure variation in biomass/ 2ry prod for different scenarios of pelagic food input

Hypotheses (h) and (j)...



Need for collaboration:

What are the likely scenarios in terms of future current regimes and nutrient fluxes?

What are the consequences of altered current regimes and nutrient fluxes on primary and secondary pelagic production?

Summary



Major gaps in knowledge identified:

- temperature tolerance & implications of sea temp. changes
- likely alterations in secondary production from benthos under different climate scenarios (food web)
- synergistic effects of climate change and anthropogenic forcings

Way forward:

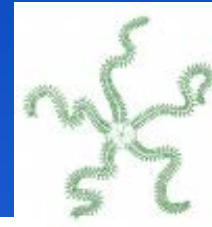
- New survey designs for international field work
- Setting up collaborations with key disciplines
- Getting the work funded...

Acknowledgments – CBPNS group/ ICES

Amphipoda



Asteroidea



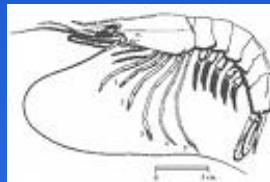
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