Sustainable aquaculture:
Assessing & mitigating the risks of harmful algal blooms (HABs)

A GLOBAL FOOD SECURITY ISSUE

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PML – UoE Research Day 24 April

International programmes on HABs

- IOC - UNESCO - Intergovernmental Panel on Harmful Algal Blooms (IP-HAB)

  Species identification, toxin chemistry and toxicology, monitoring, and management
  - GOOS - Global Ocean Observing System
  - ICAM - Integrated coastal area management (incl. nutrient loading)
  - GEOHAB - Global Ecology and Oceanography Programme (climate change)

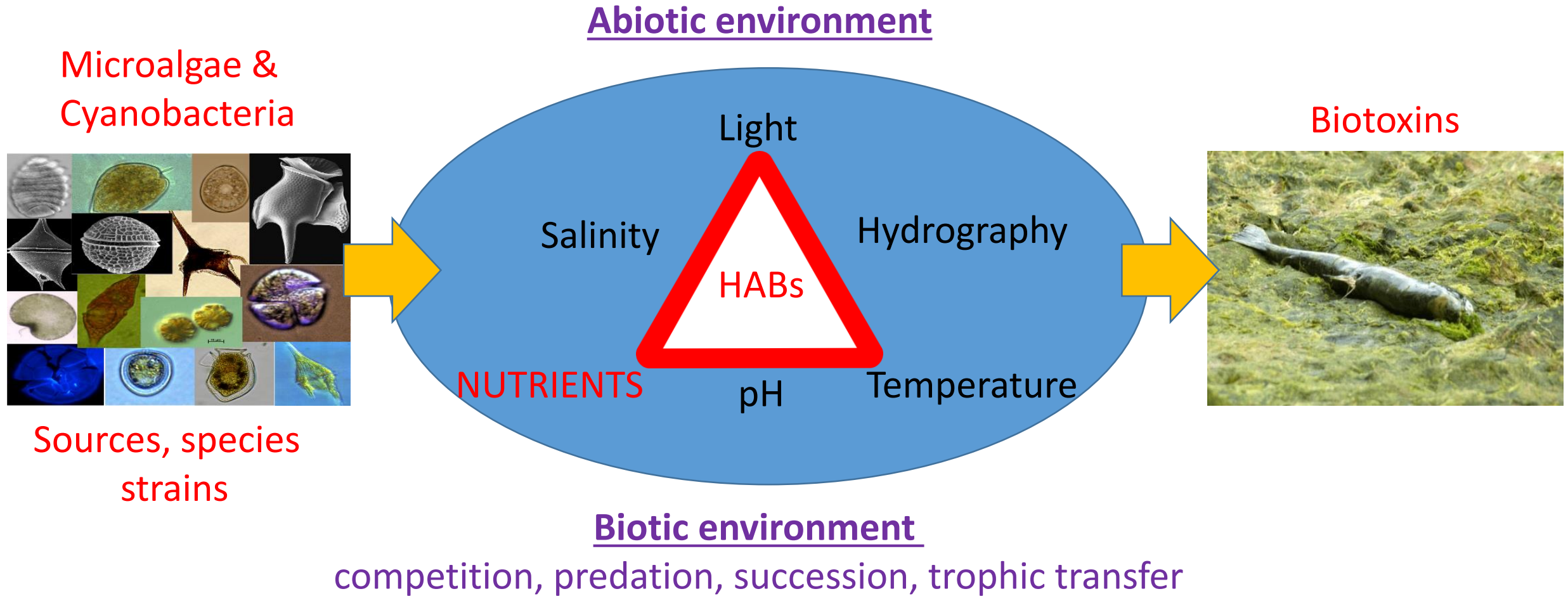- (ICES - IOC) - Working Group on Harmful Algal Bloom Dynamics (WGHABD)

GLOBAL issue requiring FINE-scale knowledge, skills and tools
Critical need for tools to PREDICT, DETECT & MITIGATE HAB outbreaks

If only there had been some warning!!!!

Key risk factors (& challenges) for predicting HABs

Microalgae & Cyanobacteria

Abiotic environment

Biotoxins

Light

Salinity

Hydrography

HABs

NUTRIENTS

pH

Temperature

Sources, species strains

Biotic environment
competition, predation, succession, trophic transfer

ENVIRONMENTAL FACTORS VARY SPATIALLY AND TEMPORALLY

Possible solution – mechanistic ecosystem modelling

Mechanistic models accounting for spatio-temporal variation in abiotic & biotic environment:

European Regional Seas Ecosystem Model (ERSEM) incl. benthic-pelagic lower food web, nutrient cycling & hydrodynamics
(Butenschön 2016. Geosci. Model Dev., 9, 1293-1339.)
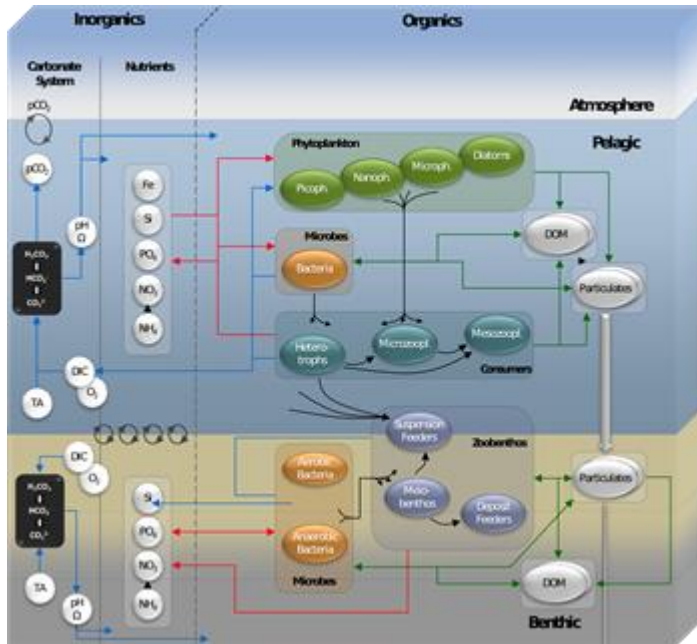
Next gen' network models incl. HAB ecology e.g. species interactions & variation in species states (traits)
(Poisot, 2015. Oikos 124: 243–251)
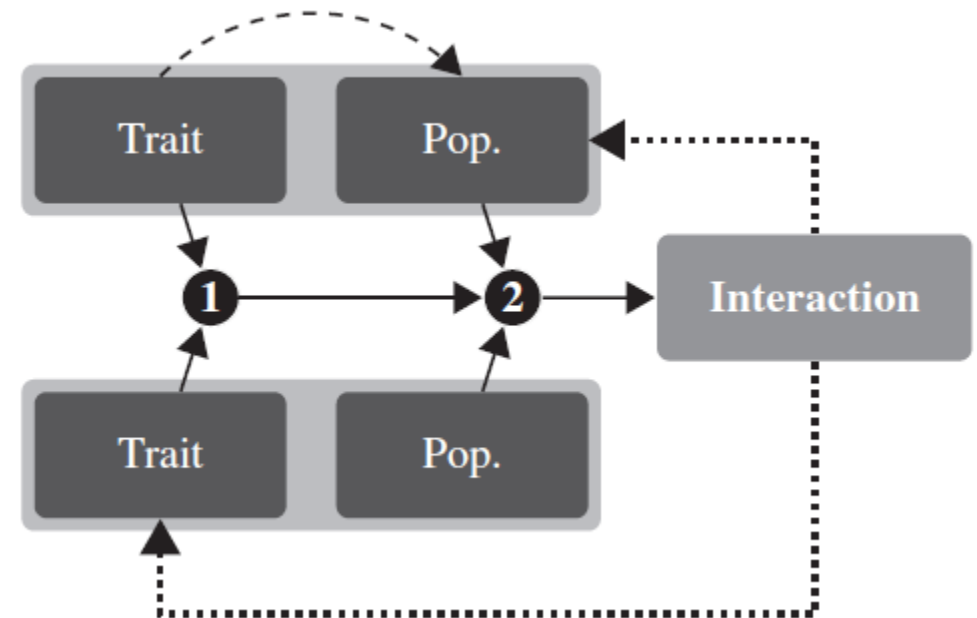
Advantages

- Early warning

- Identify hotspots

- Forecast future risks associated with climate change

- Predict environmental as well as human health impacts

Regulatory limits (toxicity thresholds) for HABS may be based on toxin concentrations in fish food or algal cell counts in water.

Thanks for listening

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