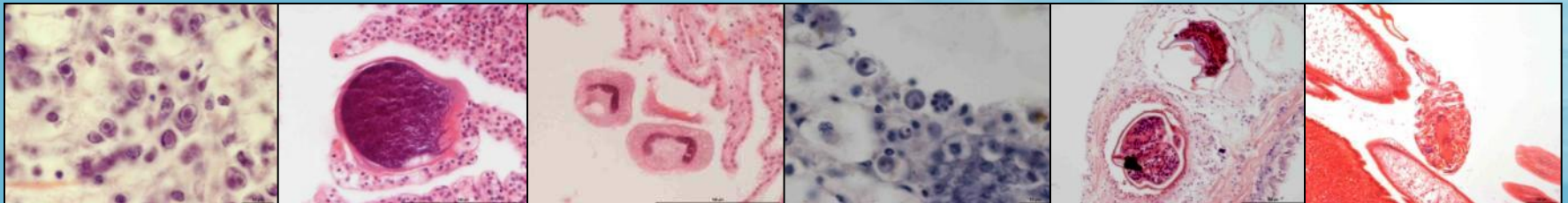
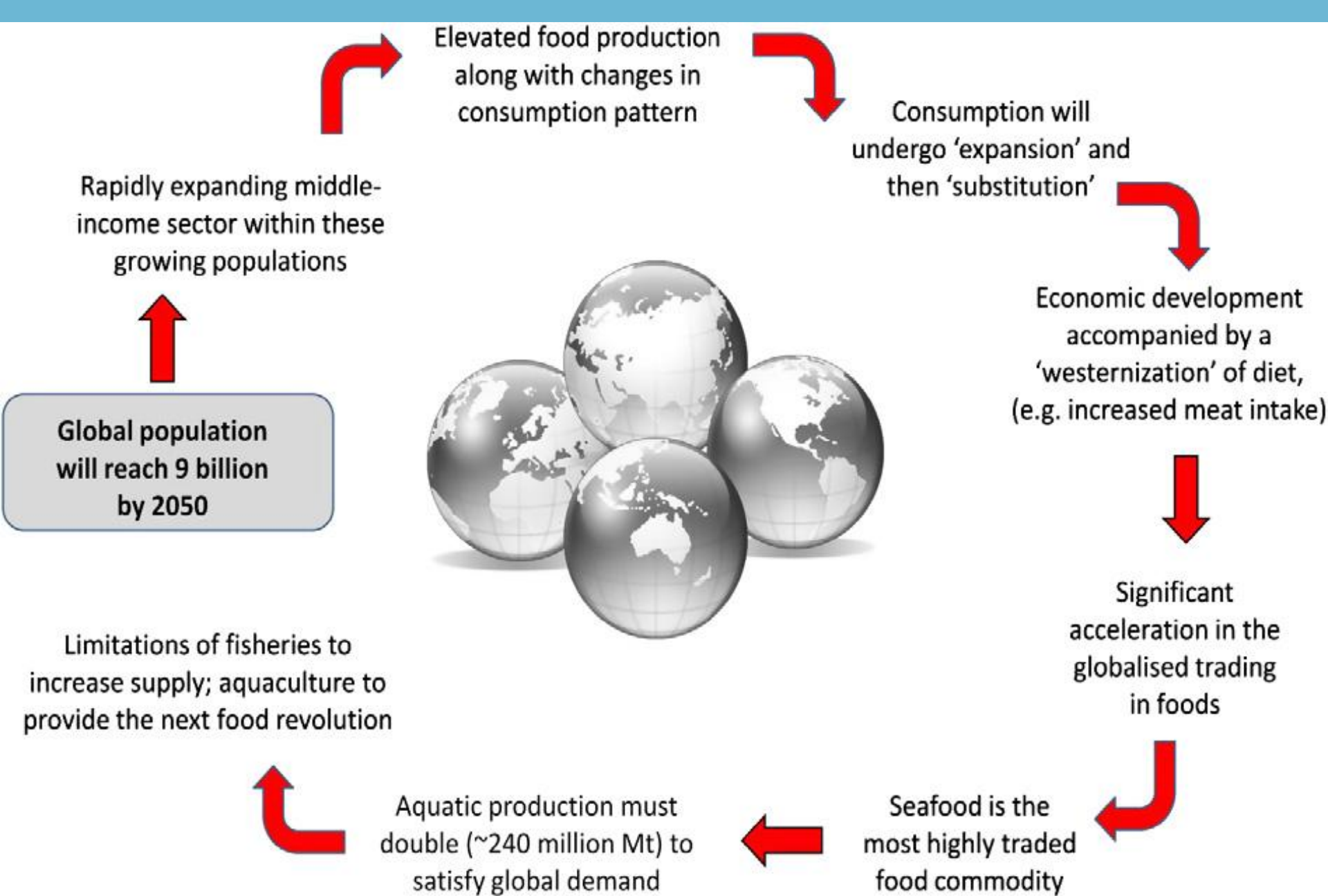


Food, disease and climate change – an unholy trinity?

Dr Matt Longshaw
Cefas Weymouth Laboratory





Elevated food production along with changes in consumption pattern

Consumption will undergo 'expansion' and then 'substitution'

Economic development accompanied by a 'westernization' of diet, (e.g. increased meat intake)

Significant acceleration in the globalised trading in foods

Seafood is the most highly traded food commodity

Aquatic production must double (~240 million Mt) to satisfy global demand

Limitations of fisheries to increase supply; aquaculture to provide the next food revolution

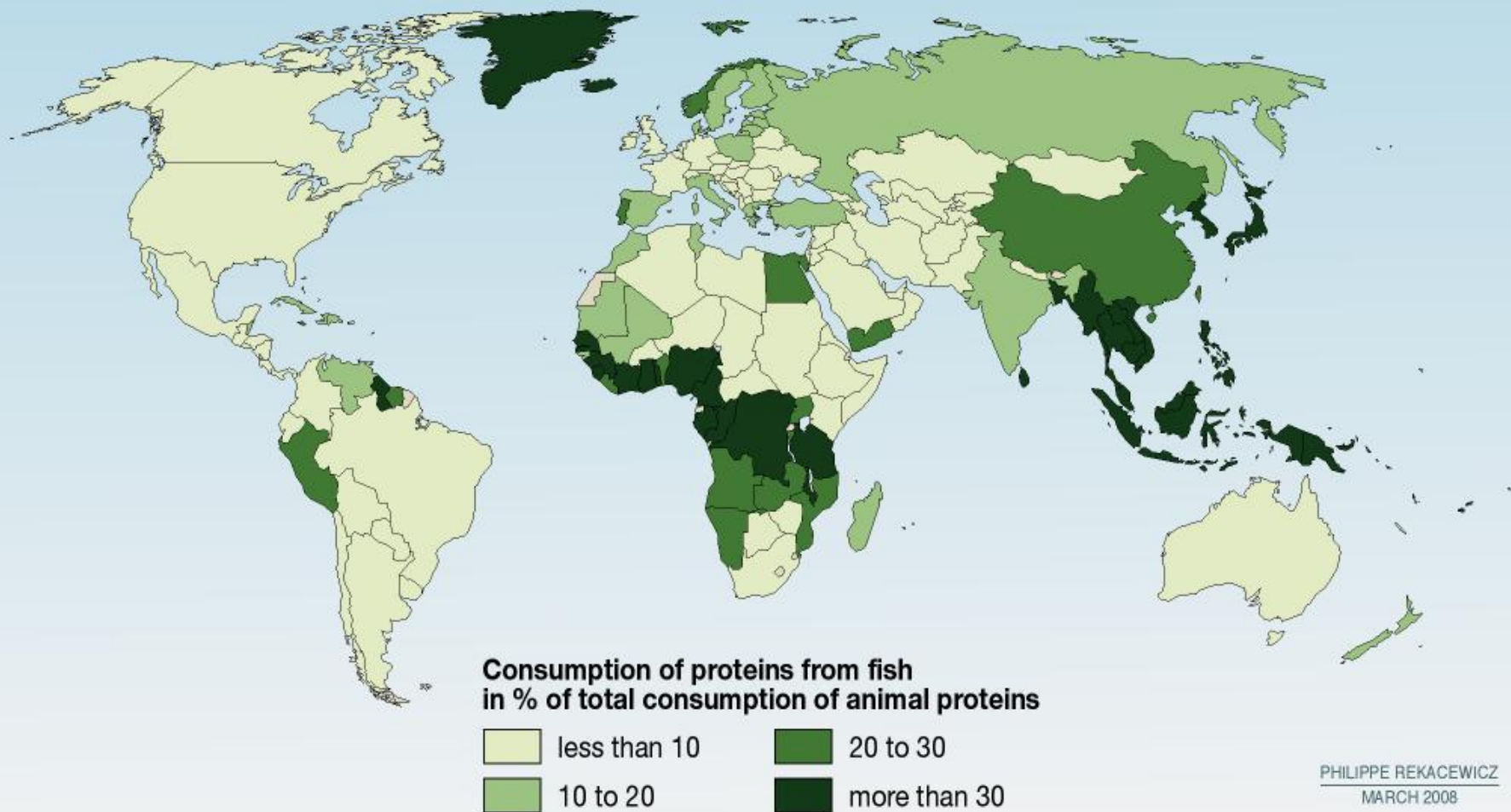
Global population will reach 9 billion by 2050

Rapidly expanding middle-income sector within these growing populations

Food security...

... exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Fish and shellfish increasingly becoming more important as a source of protein

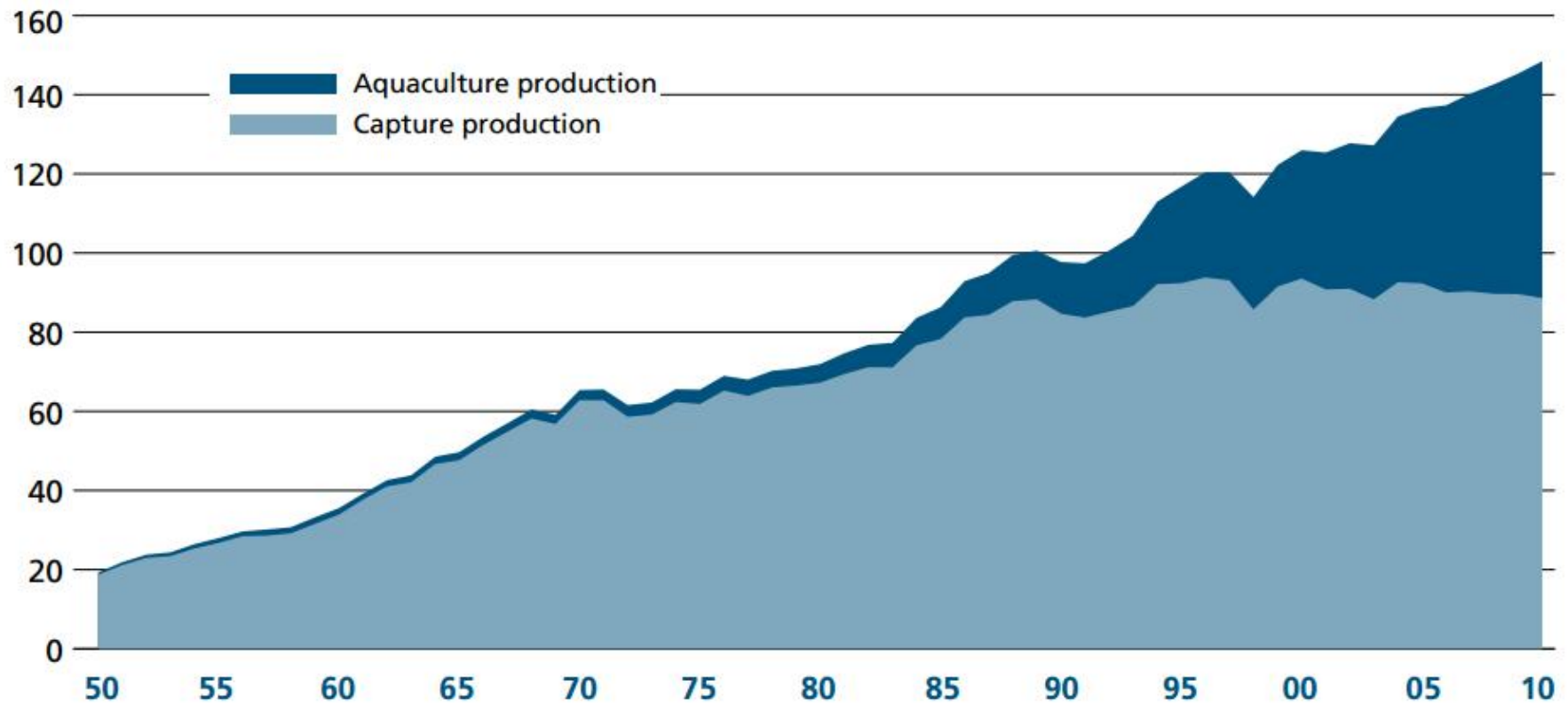


PHILIPPE REKACEWICZ
MARCH 2008

Source: Earthtrend database, World Resources Institute (WRI), Washington ; Faostat, Food and Agriculture Organization of the United Nations (FAO).

World capture fisheries and aquaculture production

Million tonnes

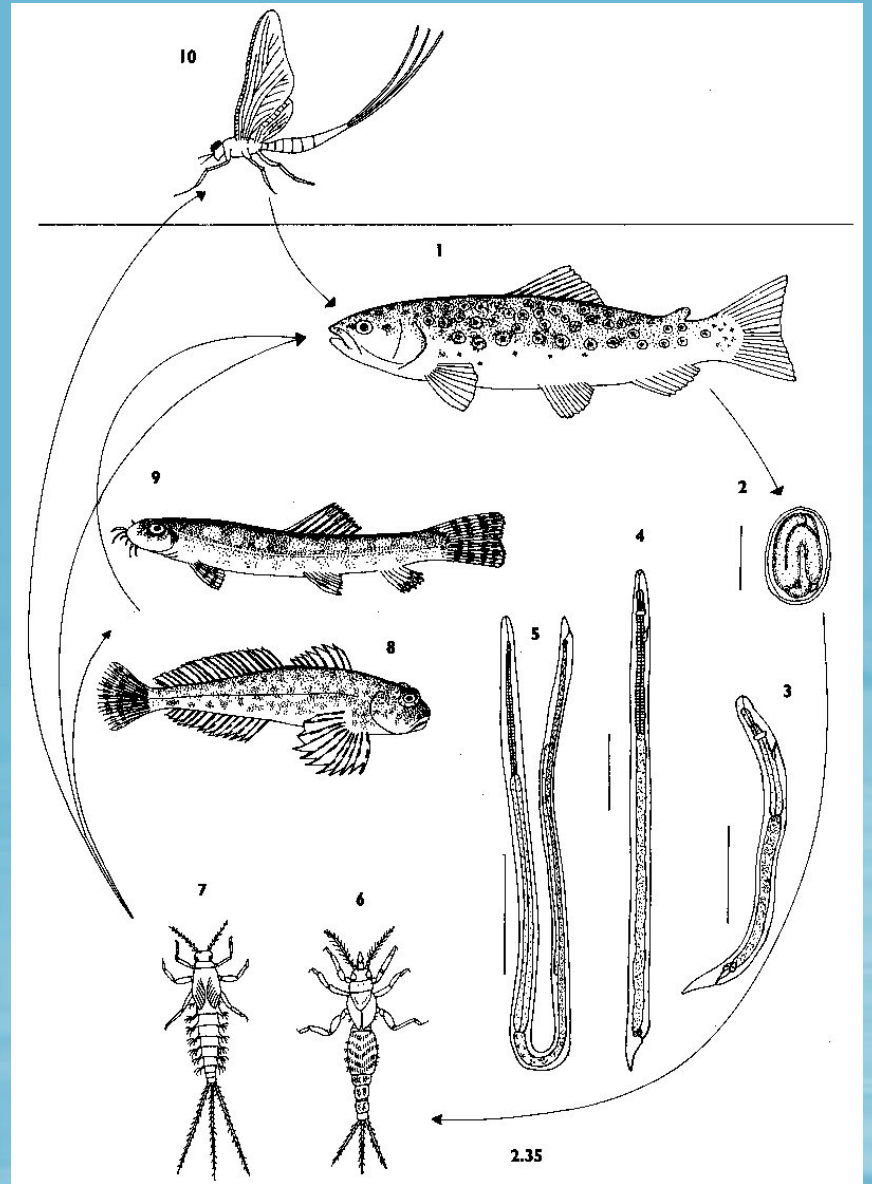
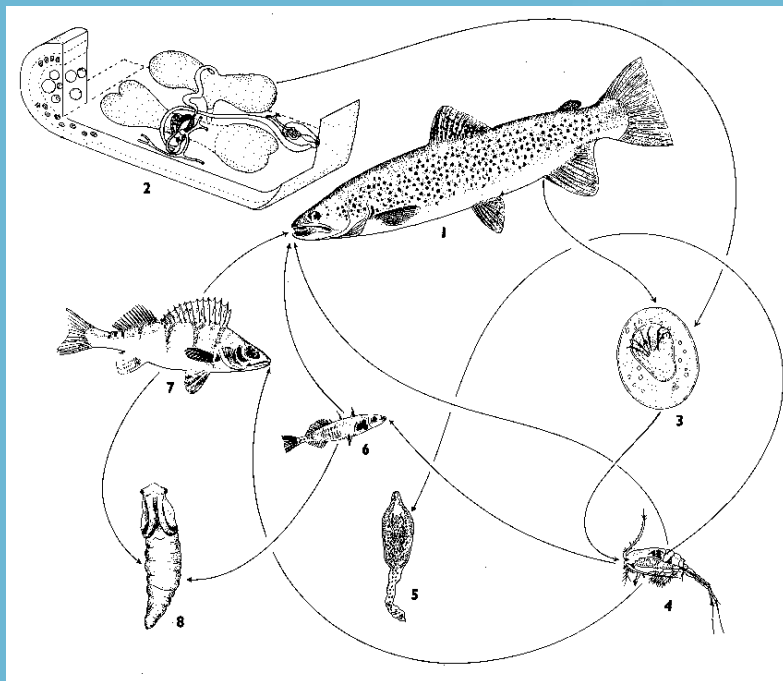
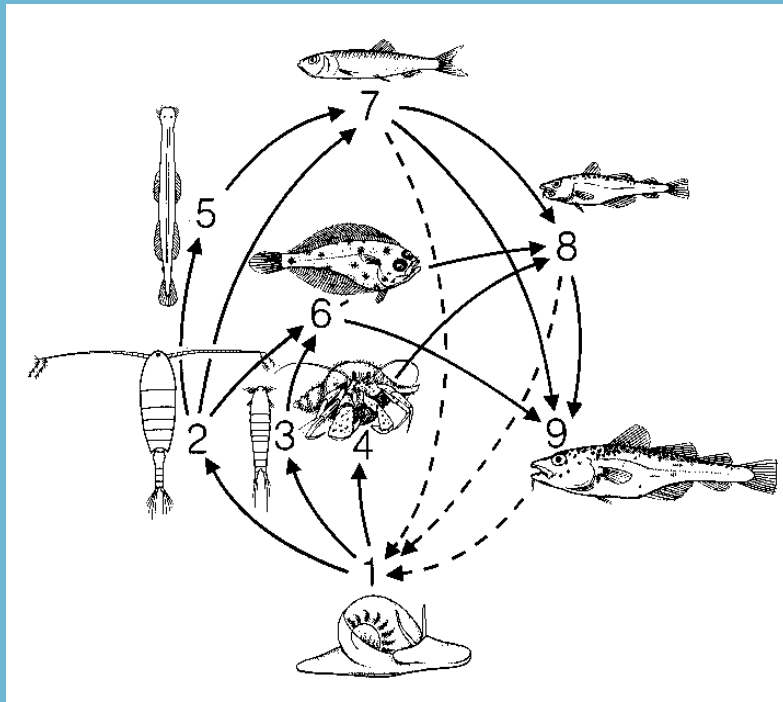


Predicted future scenarios

- **Temperature** – increased temperatures
- **Sea level changes** - rising 12-76cm by 2095. Coastal erosion, Sediment changes
- **Storms and waves** – variable, predictions show storm tracks moving south, lower waves north UK, slightly larger waves southern UK
- **Marine eutrophication** - Freshwater inflow, changes in recycling nutrients
- **Ocean de-oxygenation** and coastal hypoxia
- **Ocean acidification** – Continued acidification with increasing CO₂ emissions.

Likely biological changes

- Food web dynamics
- Latitudinal changes in distribution and migration
- Invasive species / non-natives
- Changes in spawning threshold and seasonality
- Diseases



Likely impacts

- Any alteration in host biology, behaviour, distribution, immune response, diet, foraging, reproduction status, recruitment, migration, geographic range, ecology, physiology, etc... will alter disease / parasite population dynamics.
- *Intrinsic component of and intricately linked with host.*

Responses of parasites and diseases

- “Cold-blooded”
- Subject to “global” environmental changes as well as “local” changes.
- In other words, a double whammy
- Agents are also impacted in host and in environment
- An important component in determining host diversity
- Part of the biodiversity of an ecosystem

Expected changes

- Increased temperatures will enhance immune responses, negatively impacting on diseases
- BUT... will enhance pathogen growth rates and infectivity
- Increased hosts susceptibility with stress
- Increased range of pathogens or hosts
- Alterations in species interactions, including predator-prey and parasite-host affecting transmission dynamics

Case study



- Acute cockle-specific mortalities reported in Burry Inlet, south Wales
- Mortalities in cockles up to 90% between March / April to August / September
- Multidisciplinary, integrated project with several Welsh / English partners
- Limited evidence of water quality issues
- Circumstantial evidence of non-native parasite infections causing mortalities here and in Europe.

Results



- Freshwater inputs, accretion, temperature
- No notifiable pathogens noted
- Higher diversity of pathogens compared with other sites (30 vs 10)
- Higher prevalence and intensity compared with other sites
- Multiple infections common
- No evidence of parasite death or host recovery
- Effects on food web dynamics (human consumption).

Conclusions and future needs

- Better diagnostics to identify pathogens sooner (early warning systems)
- Improved biosecurity
- Legislative control measures
- New species for aquaculture?
- Need for research on therapeutics in aquaculture
- Efforts to minimise losses post capture or post harvest