

Fish and Fisheries

What is distinctive about tidal lagoons?



Workshop on Environmental R&D and Innovation Priorities for Tidal Lagoon Projects
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Joint Offshore Renewables Joint Industry Programme Ocean Energy (ORJIP OE)

2016 Call for Evidence - ORJIP

Briefing Paper highlights some of the key R&D challenges but also the evidence gaps and associated priorities.



Fish and fisheries and the potential interactions with tidal lagoons

Focus mainly on the diadromous fish species and associated fisheries

Commercial marine species are also important – more detailed discussions
in the afternoon Workshop Challenge Sessions



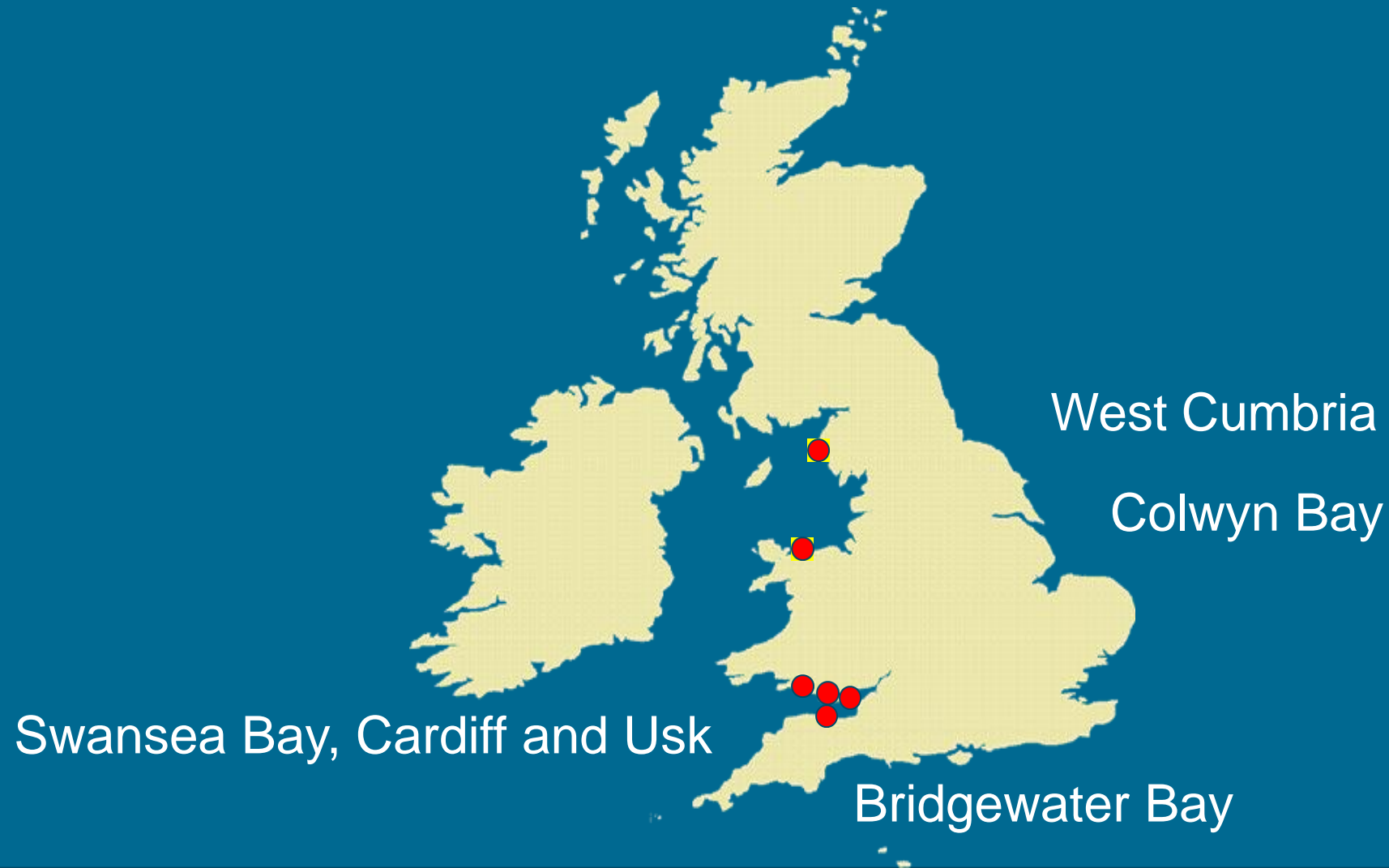
Key diadromous fish species

Atlantic salmon, sea trout, European eel, shads (Twaite and Allis), lampreys (River and Sea) and the smelt

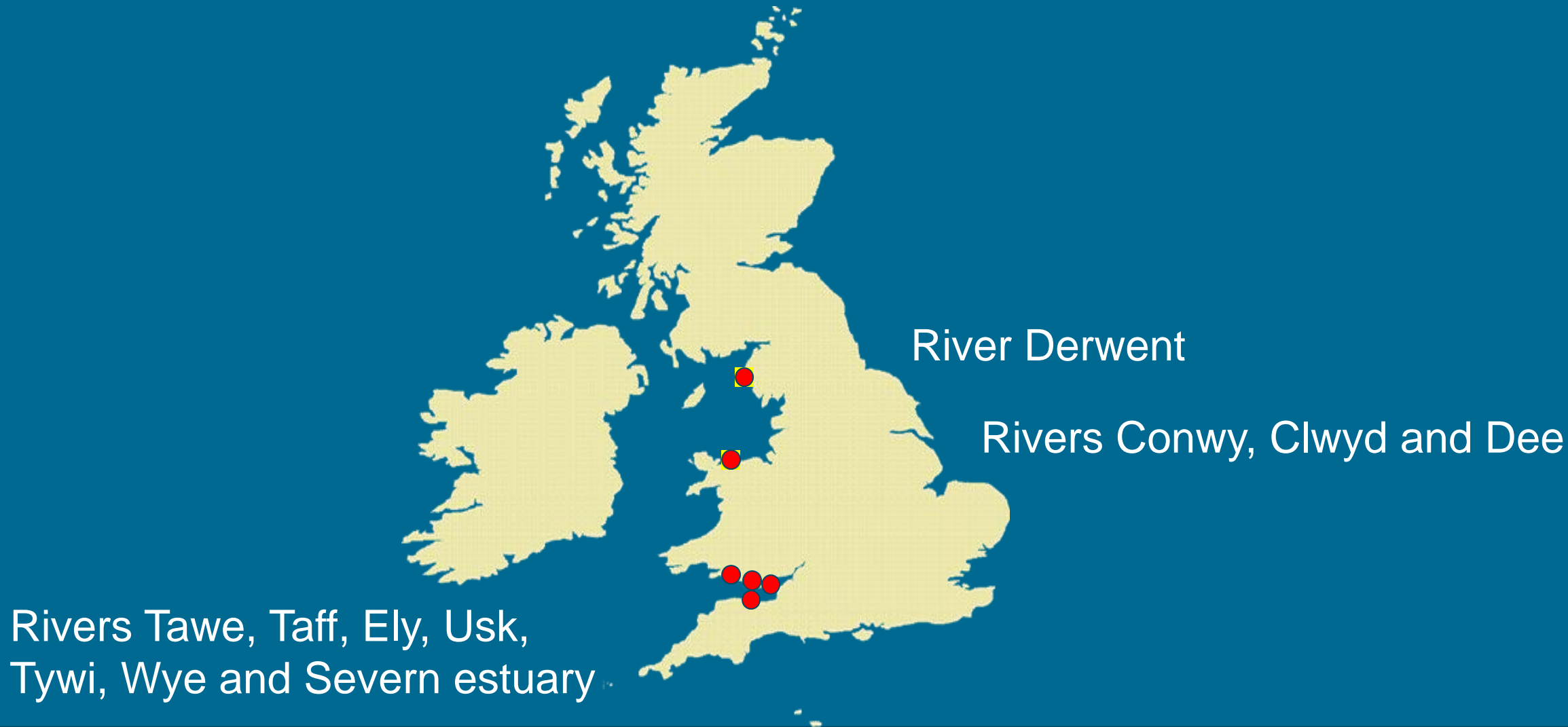
All species need to move between freshwater and the marine environment at least twice during their life cycle



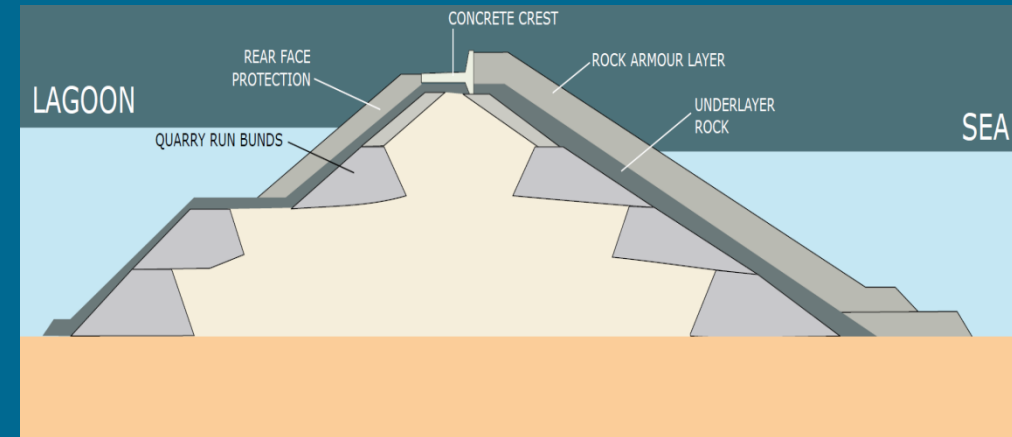
Proposed tidal lagoons



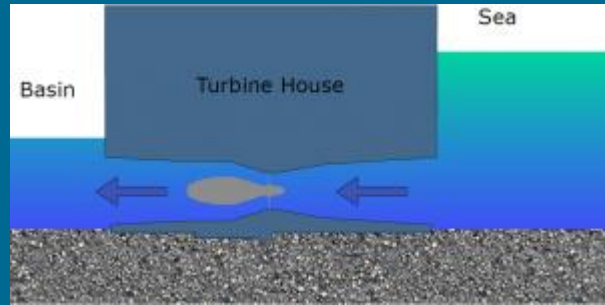
Principal rivers influenced by tidal lagoons



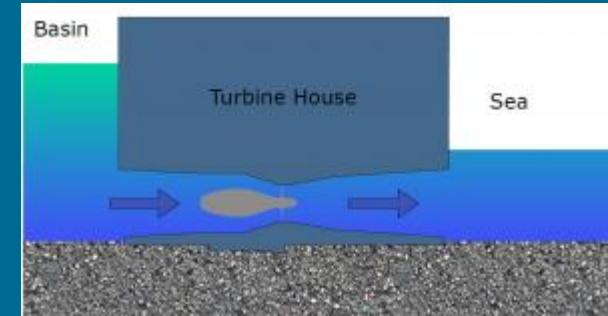
Proposed Swansea Bay Tidal Lagoon



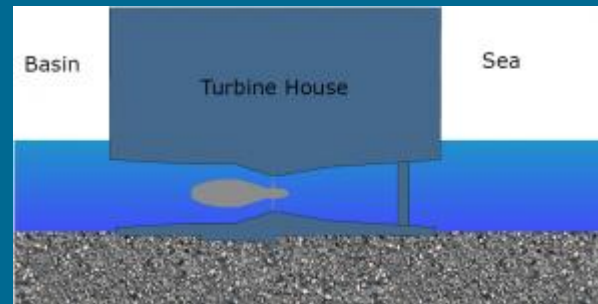
Operation of a tidal lagoon for power generation



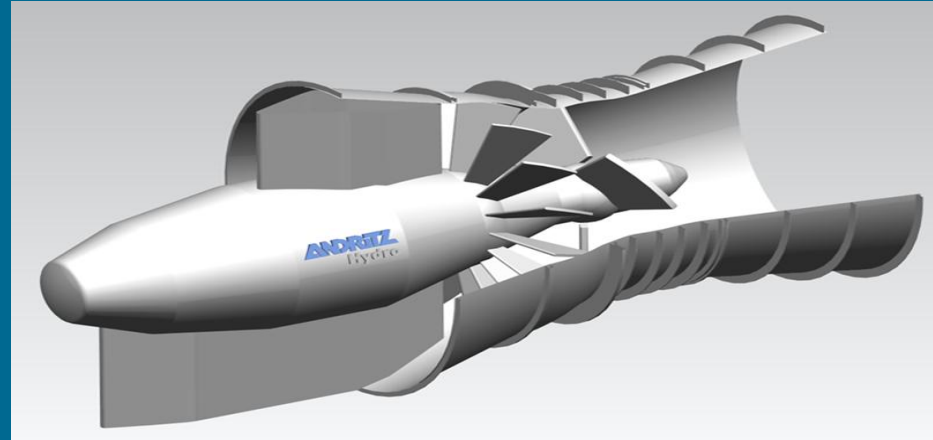
Generating on an Flooding Tide



Generating on an Ebbing Tide



Holding Period during High and Low Waters



Bi-directional, low head, Kaplan bulb hydro turbine

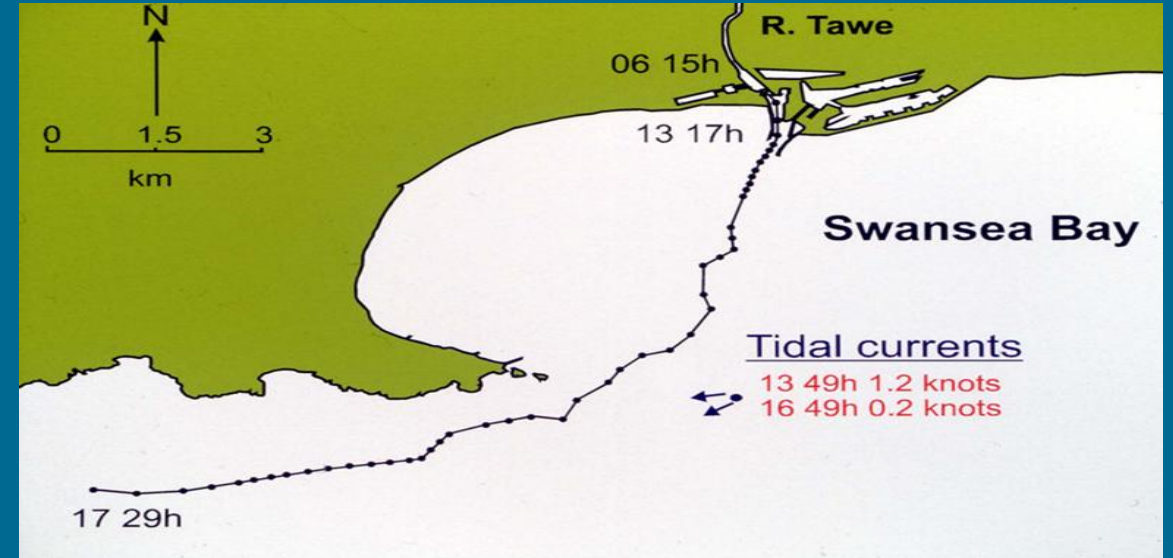


Principal concerns regarding tidal lagoons and fish

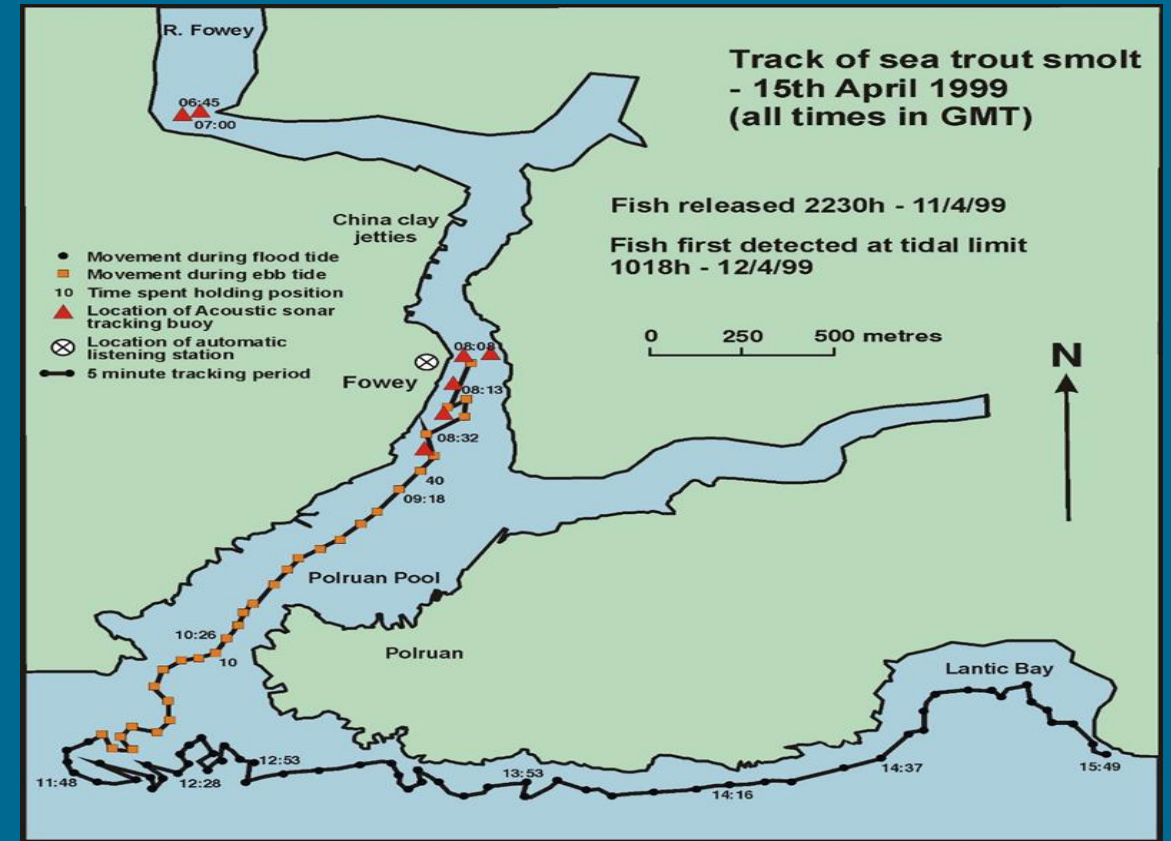
1. Location of tidal lagoons close to rivers
2. Turbine passage of migrating fish
3. Entrainment within tidal lagoon



1. Location of tidal lagoons close to rivers and main “migration” highways of diadromous fish

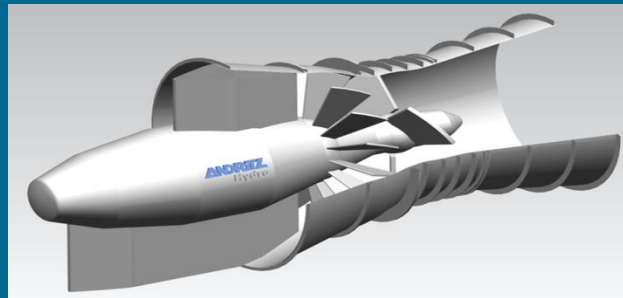


1. Location of tidal lagoons close to rivers and main “migration” highways of diadromous fish



2. Turbine Passage of Migrating Fish

Fish can be injured internally and externally due to adverse pressure change, water movement (known as shear stress), explosion of air bubbles (known as cavitation) and physical collisions with structures such as blades.



3. Entrainment of fish within tidal lagoon

- Removal of environmental cues that allow fish to orientate
- Variable thermal regimes
- Increased predation
- Variable water quality
- Delays to migration
- Artificial environment – colonisation and spread of non-native species
- Requirement to undertake turbine passage to open sea



Quantifying the potential impacts of tidal lagoons on fish and fisheries

Individual Based Modelling (IBM) is used to predict encounter rates of fish and the lagoon

However, models are only as good as the data with which they are populated

Apart from some very limited information on the movement of salmonid smolts in coastal waters, there is almost nothing known regarding the coastal movements of returning fish such as adult salmon sea trout shads, lampreys and smelt.

Further, there is also very limited information on the population dynamics of many of the rarer diadromous fish



R&D Requirements

- Requirement to understand the basic migratory biology of diadromous species and their potential interactions with tidal lagoons
- Requirement to understand the population dynamics of diadromous species such as shads, lampreys and smelt
- Requirement to understand the cumulative effects of tidal lagoons such as those proposed for the Severn estuary



Tidal lagoons and aquaculture?

- Is there an opportunity for growth and development of aquaculture
- Finfish, shellfish, seaweed
- Increased temperature – relatively secure site – pathogens/parasites
- Reduced interactions with wild fish stocks





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