

CLIMATE CHANGE: *potential impact on wild capture seafood*

1. Setting the scene
2. Climate change: potential impact and response
3. Examples and lessons

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1. Setting the scene

... an important industry with many uncertainties

- Wild capture seafood an important food source:
 - Contributing to global food security.
 - A relatively low impact protein if responsibly managed e.g. GHG emissions/carbon footprint.
- A complex and dynamic industry in terms of species, source fisheries and movement across boundaries.
- Industry operators highly adaptable in the near term (to ebb and flow of industry changes) but may not have sight of longer term changes.

... an inherently uncertain climate challenge

- Some changes quite noticeable – storm conditions.
- Some changes (quite literally) under the surface - temperature/acidification.
- Some quite difficult to 'disentangle' - UK weather quite variable anyway, often magnified by the media (e.g. Beast from the East, Spring 2018).

...only partially sighted on this

Limitations:

- Change is not linear cause and effect; multiple drivers and multiple effects.
- IPCC info is at a high level...global perspectives, not many localised models.
- Context supports action; need knowledge relevant to the situation at hand (or lessons from similar situations elsewhere).

Presents a challenge to understanding implications and responding:

- Reticence to invest time and other resources if loss/return is uncertain.

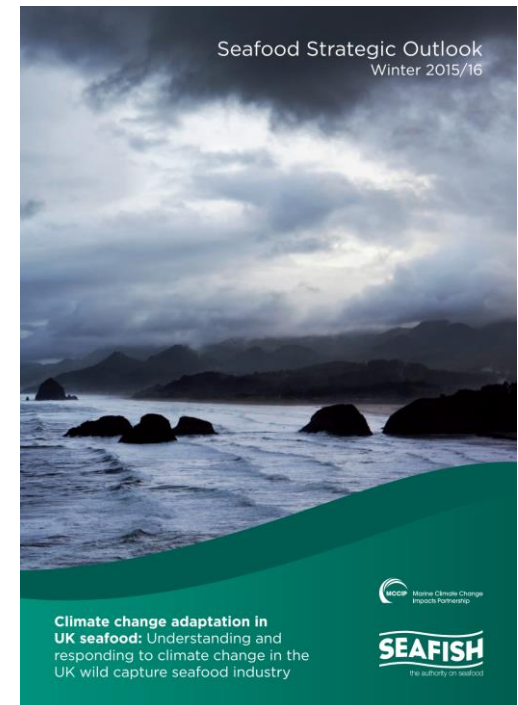
...what we need to consider in responding

- Due to inherent uncertainties, adaptation strategies should be flexible.
- Scoping and prioritising:
 - What are the dimensions of our industry?
 - What are the relevant dimensions of the climate challenge?
 - What priority climate change impacts are projected for seafood?
 - What are the priority seafood industry adaptation responses?
- Fit with policy:
 - UK Climate Change Act (2008) sets out the Secretary of State's Adaptation Reporting Power, supported by a National Adaptation Programme.

2. Climate change impact and response

Approach taken

- Combining different knowledge types: scientific evidence and industry experience.
- Collaboration: working with industry and experts to develop a managed adaptive approach.
- Facilitating /interacting role: maintaining a watching brief, identifying opportunities as well as threats.



Stocks	Capture / production		Transport and distribution	Trading, processing, storing	Market / sales outlet	Consumption	Waste
Target species	Capture fleets	Landing ports and auctioning markets	Air, sea, and road freight	Primary and secondary processors, importers and exporters, traders	Retail Food Service Wholesale Feed suppliers	'In-home' and 'out-of-home' consumers	Under-utilised product at all stages

Supporting inputs							
Fisheries management	Fishing gear Bait Cooling materials Fuels/energy Packaging Maintenance materials Equipment manufacturers	Fuels / energy Cooling materials Packaging Maintenance Vessel building / repair Equipment manufacturers	Transport infrastructure Cooling materials Fuels / energy	Ingredients Materials for processing Cooling materials Fuels / energy Packaging Maintenance materials			
Media, NGOs, Scientific community							

...framing climate change

- Major climate change drivers relevant to wild capture seafood:
 - Sea level rise and extreme water levels.
 - Increased **storminess and waves.**
 - Air or sea **temperature change.**
 - Ocean acidification and deoxygenation.
 - Changes in terrestrial rainfall / run off.

Areas of impact

- Temperature change may have contributed to ...
 - ...changes in the abundance and distribution of commercial fish stocks so **influencing catch potential**:
 - new or enhanced opportunities to exploit ‘warm-water’ commercial stocks (e.g. squid, John Dory, seabass, red mullet and anchovy).
 - more traditional ‘cold-water’ stocks become increasingly threatened (e.g. cod and haddock).
 - ... changing fish distributions with **implications for quota management**:
 - potential to lead to international disagreements as stocks move across international boundaries.
 - mal-adaptation of quota systems e.g. under EU’s ‘relative stability’ system which lacks the flexibility to respond to geographical shifts of fish species.

Areas of impact (continued)

- Changes in frequency and intensity of storms has the potential to ...
 - ...cause major disruption to both offshore and onshore operations.
 - At sea, the ability to go out to fish, especially for smaller vessels, is an issue, as is the safe deployment and performance of gear.
 - On land, port and harbour infrastructure, as well as day-to-day operations, can be adversely affected by storms, as can processing plants and transport routes to market.

Areas of impact

OFFSHORE					
	Sea level rise, extreme water levels	Increased storminess and waves	Air or sea temperature change	Ocean acidification and deoxygenation	Changes in rainfall / run off
WHITEFISH					
<i>a) Fishery resources</i>					
i. Alterations in species phenology			●		
ii. Impacts on choke species (linked to landing obligations)			● ●		
iii. Changes to growth rate of target species			● ●		
iv. Changes to the distribution of target species			● ●		
v. Changes to year-class strength (including larval survival)			● ●		
vi. Migration patterns of target species (timing and routes)			● ●		
<i>b) Offshore operations</i>					
i. Staff physical working conditions		●			
ii. Gear deployment / performance		●			
iii. Damage to fleet		●			

Areas of impact

OFFSHORE					
	Sea level rise, extreme water levels	Increased storminess and waves	Air or sea temperature change	Ocean acidification and deoxygenation	Changes in rainfall / run off
PELAGIC					
<i>a) Fishery resources</i>					
i. Migration patterns of target species (timing and routes)			●		
ii. Alterations in species phenology			●		
iii. Changes to the catchability of target species		●	●		
iv. Changes to growth rate of target species			● ●		
v. Changes to the distribution of target species			● ●		
vi. Changes to year-class strength (including larval survival)			● ●		
<i>b) Offshore operations</i>					
i. Staff physical working conditions		●			
ii. Gear deployment / performance		●			

Areas of impact (continued)

OFFSHORE					
	Sea level rise, extreme water levels	Increased storminess and waves	Air or sea temperature change	Ocean acidification and deoxygenation	Changes in rainfall / run off
SHELLFISH					
<i>a) Fishery resources</i>					
i. Presence of HABs		●	●		●
ii. Presence of pests and diseases					●
iii. Changes to year-class strength (including spatfall)			● ●		
iv. Presence of non-natives / jellyfish			● ●		
v. Changes to the distribution of target species (including squid)			●		
vi. Changes to growth rates of target species			● ●		
<i>b) Offshore operations</i>					
i. Staff physical working conditions		●			
ii. Gear deployment / performance		●			
iii. Damage to fleet		●			

Areas of impact (continued)

OFFSHORE					
	Sea level rise, extreme water levels	Increased storminess and waves	Air or sea temperature change	Ocean acidification and deoxygenation	Changes in rainfall / run off
ONSHORE					
<i>a) Ports and harbours</i>					
i. Damage to site infrastructure	●	●			●
ii. Boat damage in ports / harbours		●			
iii. Integrity of electricity supply					●
<i>b) Employment and fishing communities</i>					
i. Integrity of housing and local amenities	●	●			
ii. Days at sea		●			
<i>c) Transportation of catch</i>					
i. Disruption to ferry service		●			
<i>d) Processing of catch</i>					
i. Damage to site infrastructure	●	●			●
ii. Integrity of electricity supply					●

Areas of response

- Key areas for adaptation include:
 - Fisheries knowledge base (enhancing fisheries science).
 - Fisheries governance (flexibility in fisheries management regimes).

But also...

- Others (Operational safety, building port resilience, assessing transport vulnerability etc).
 - Keeping a 'watching brief'.
- Some action already underway, others are longer term (increasingly fundamental) adaptations.

Areas of response (continued)

Speed of response (inertia)	System	Adaptation response	Owner	Scale of resource			
				Minor	Moderate	Significant	Major
Underway	Fishery	Scientific advice and data collection through partnership working	Fisheries Science Partnerships				
		Development of training and education modules for fishermen	Fishing into the Future (with Seafish)				
	Operations	Enhance operational safety (raised decks)	Industry				
		Enhance operational safety (Personal Flotation Devices)	The Fishing Industry Safety Group				
		Enhance operational safety (Safety at Sea training)	Seafish-approved training providers				
Short term (2-5 years)	Fishery	Develop close science-industry collaboration and engaged research	Industry trade associations / scientists				
	Operations	Ensure quota swaps / transfers	Industry				
		Keep a watching brief on climate change and potential responses	Industry trade associations				

Areas of response (continued)

Speed of response (inertia)	System	Adaptation response	Owner	Scale of resource			
				Minor	Moderate	Significant	Major
Medium term (5-15 years)	Fishery	Developing a more robust, strategic fisheries knowledge base.	Scientists / industry / Govt				
		Review of domestic quota allocation	EU / UK Govt / Fisheries scientists / industry				
	Operations	Review of fishing seasons in response to disruptions	Industry / Government				
Long term (>15 years)	Fishery	Review 'Relative stability' (Governance) arrangements	EU / UK Govt / Fisheries scientists / industry				
	Operations	Assess vulnerability of fleets across the EU	EU research				

3. Examples and lessons

Adaptations as a result of independent stakeholder action:

- Fisheries knowledge base:
 - Closer science-industry collaboration and engaged research e.g. industry employment of in-house scientists (e.g. at SPFA, SFO) and development of a network of industrial scientists, FIS review of climate change impact on fish distribution, Nephrops survival, discards survival. EU Horizon 2020 climate research – *Climefish* and *Ceres* projects.
- Fisheries governance:
 - Efficient operation of quota swaps and transfers using industry data e.g. development of electronic catch and sales reporting systems under the MMO's 'Proteus' Programme, NFFO feasibility study for industry data collection and pooling system.

Adaptations as a result of 'game changing' events:

- Brexit opening up opportunities to advance fundamental changes:
 - Close science-industry collaboration and engaged research.
 - Developing a more strategic fisheries knowledge base.
 - Review of 'relative stability'.

Some lessons

- Some lessons to be drawn:
 - Climate change often a multiplier for existing concerns, so action often propelled by other factors.
 - Some adaptations lend themselves to predictive planning, but not all; events create opportunities for change.
 - Various pathways to adaptation:
 - agile adaptation...mindful of who bears the risk.
 - multiple stakeholders, and a balanced approach.
- Conclusion:
 - Evidence and experience are ingredients, alongside others, in a wider conversation about change and adaptation.

Further information:

<https://www.seafish.org/article/climate-change-adaptation>

<https://www.seafish.org/article/climate-change-greenhouse-gas-emissions>



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