



1. Requirement overview:

Requirements	An improved understanding of temporal variability of priority marine species and habitats
Requirement detail	<p>Species and habitats often have variable distribution and condition in space and time. Some are particularly dynamic such as those in transitional and intertidal waters that span the land and sea. Variability occurs over many different times scales from seasons to multi-year cycles and decades.</p> <p>Temporal changes however, remain a challenge for management, particularly separating the different sources of natural variation including seasonal change or multi-year cycles like the North Atlantic Oscillation from human influences on natural variation including climate change impacts, or direct human induced variability. Similar challenges exist in defining the bounds of variability and accounting for the associated uncertainty in decision making.</p> <p>This requirement is for mechanisms to describe temporal variability, differentiate sources and apply these to priority species/habitats. It will also examine how best to incorporate such temporal variability within marine management approaches.</p>
MMO use	<p>Marine Licensing:</p> <p>This would inform marine licensing decisions including better defining uncertainty and informing interpretation of assessments and for condition monitoring.</p> <p>Marine Planning:</p> <p>An understanding of variability would assist planning to develop a temporal aspect to policy so that policy may only come into effect in certain times of year or for certain periods of time, increasing the value of marine plans.</p>
External interest	Natural England, Joint Nature Conservation Committee
Delivery target	Ongoing for Marine Licensing, by quarter 4 2018 to inform iteration 3 of marine plans.

2. Aims and objectives

Aim:

To improve understanding of temporal variability for priority species and habitats and account for temporal variability within marine management approaches.

Objectives:

Objectives to deliver this requirement include to

- describe temporal variability priority species/habitats across temporal scales
- differentiate sources of variation and their relative importance
- clarify how variability relates to uncertainty
- examine how best to incorporate temporal variability within marine management approaches

3. Existing evidence

MMO	The MMO has not directly produced any evidence in this area
Academic	<p>There is limited existing evidence specifically related to temporal variation in priority species and habitats although examples below illustrate the importance of defining and understanding such variability</p> <p>Long term datasets like plankton records have proved very important in identifying and defining temporal variability from different sources of variability such as lower abundances of warmer water species are currently increasing replacing higher abundances of cold water species in the North Sea due to regional climate warming and the North Atlantic Oscillation. There is a high confidence these trends are related to regional climate warming.</p> <p>Although not for priority species Warwick-Evans et al (2016) show inter annual variation in gannet foraging areas related to change in the North Atlantic Oscillation and its influences on local prey availability. Changes in foraging area alter the likelihood of gannets encountering disturbances pressures. Similarly, Loots et al (2010) predict inter-annual variability of the potential spawning habitat of plaice. Observations that actual spatial distribution remains stable against changing environmental conditions contrary to predictions, identified that other factors, such as population size, may control inter-annual variability of plaice spawning habitat. These two cases are illustrative of the complex links and sources of natural variability</p>
Other	VECTORS (European Union FP7 funded 2011 to 2015) was a large scale project examining the significant changes taking place in European seas, their causes, and the impacts they will have on society including developing

4. Current activity

Marine Ecosystems Research Programme (MERP - National Environment Research Council and Department of Environment food and rural Affairs funded 2013 to 2018) will provide a more complete picture of how marine food web components, pressures and environmental variables are distributed in space and time. This aims to underpin advice to maintain marine ecosystems and improve understanding of the effects of natural and human change

5. Associated evidence requirements

Ref	Title
R007	Seasonal bird density and key foraging areas
R023	The distribution and condition of protected species and habitats in English waters

More information on these evidence requirements is available [here](#)

6. Potential delivery route

The MMO will work with the Statutory Nature Conservation Bodies in **partnership** to enhance the evidence base. Additionally the MMO will, through groups such as the Healthy and Biologically Diverse Seas Evidence Group **influence** the research agenda in this area.

7. Contact

For more information or to add further research to the existing evidence list please email evidence@marinemanagement.org.uk

Table 1: Delivery timescales 2017 to 2020

Delivery Route	2017				2018				2019				2020			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Partnering								***								
Influencing the research of others								***								

Key

	No activity
	Actively undertaking
	Outside of delivery target

*** Planning team delivery timescale