

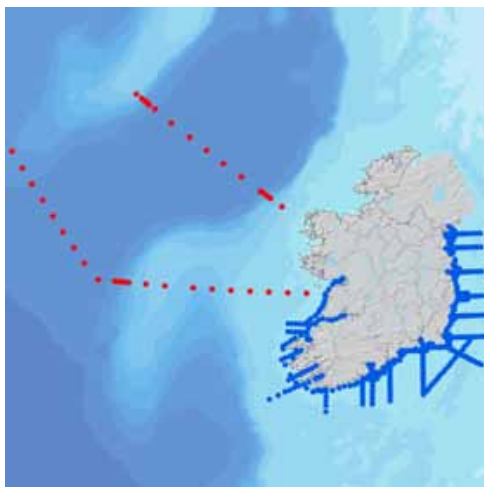
3.9 Nutrients

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Nutrients such as phosphate, nitrate, silicate and iron control the growth of phytoplankton at the base of the marine food chain and hence play an important role in structuring marine ecosystems. Nutrient concentrations in Irish coastal waters are determined by concentrations in shelf seas and biogeochemical processes that may release or remove nutrients from the water column. Other important sources in coastal waters are associated with riverine inputs from both natural sources and human activities – for example agricultural application of fertiliser and municipal waste discharges. Changes in climate such as altered rainfall patterns are also likely to influence nutrient inputs to the marine environment and therefore may also affect estuarine and coastal ecosystems.



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Map 3.9. Location of inshore points and offshore tracks where nutrient observations are made.

‘As many of the factors determining nutrient concentration in coastal waters are likely to change with a changing climate (e.g. altered rainfall pattern and the effect on riverine discharges), it is critical that nutrient observations are maintained.’

Measurements

The best time to monitor nutrients is during the winter when uptake by phytoplankton is at a minimum. The Marine Institute has undertaken annual winter-nutrient monitoring surveys in the Irish Sea since 1991. This

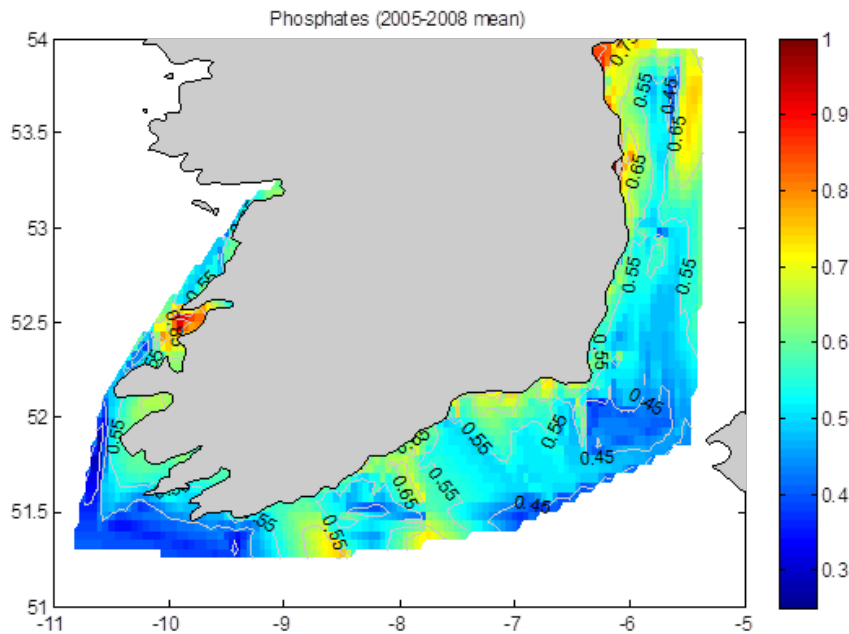


Figure 3.17. Mean surface phosphate concentrations (μM), 2005–2008.

has been extended to the Celtic Sea and west coast waters over recent years, and includes both inshore point monitoring and transects (blue), although annual coverage is variable due to prevailing weather conditions during surveys. Nutrient data has been collected in the open ocean across the Rockall Trough (red) every winter since 2007.

Time-series and Trends

Nutrients in near-coastal areas

Trend analyses of data from 1990 to 2000, and also from 1996 to 2008, for the western Irish Sea, carried out by the Marine Institute, indicated a decrease in some nutrients. One example in [Fig. 3.17](#) shows the mean surface phosphate concentrations in micro moles (μM) for the period 2005 to 2008 and highlights nutrient gradients from the coastline. Regions of elevated nutrients are associated with freshwater inputs and/or limited exchange of seawater.

Nutrients in the Rockall Trough

Nutrients at depth can be redistributed to the surface by mixing and water mass movements, whilst surface organic material such as plankton sinks and decomposes to release nutrients at depth. A full understanding of nutrient cycles requires sub-surface information. An example of such observations for nitrate is shown in [Fig. 3.18](#). The vertical profiles and spatial distribution from a large number of samples for 2008 (red), 2009 (green) and 2010 (blue star) are compared with those from a similar WOCE transect in December 1996 (blue dot). This indicates relatively low nutrient concentrations in surface waters, with a sharp increase in nutrients below approximately 300 m. Lower nitrate in surface waters in 1996 relative to recent years is largely due to the earlier sampling period that year, where winter mixing had not replenished surface nutrients to their winter maximum concentrations. Below the surface layer, nutrient concentrations are similar through the water column in 1996 and 2008 to 2010.

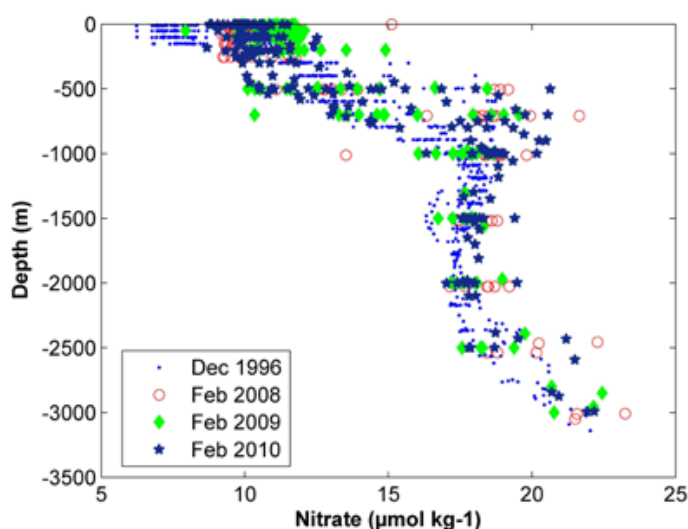


Figure 3.18. Sub-surface nitrate concentrations (μM) from WOCE (1996) and more recent surveys in the Rockall Trough.

'Observations between 1996 and 2010 indicate that there is little change in sub-surface offshore nutrient concentration.'

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Maintaining the Observations

The Marine Institute carries out an annual winter-nutrient monitoring programme in near-shore waters. Since 2007 this has been extended to include transects across the shelf in the deep sea Rockall Trough. In 2012 the inshore survey sampled northwest coastal waters for the first time. Surveys are funded under the National Development Plan Ship Time fund and through internal Marine Institute funding.

Further Information and Data Sources

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Nutrient data from cruises are archived by the Marine Institute and may be accessed on request: <http://www.marine.ie/home/publicationsdata/>