IRELAND'S environment

# Marine monitoring – phytoplankton

epa Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

## What are phytoplankton?

Phytoplankton are tiny, free-floating plants found suspended in the world's oceans. Their name comes from Greek and means 'plant drifter'. They are carried along by ocean currents and are usually found floating near the surface of the water. Like all plants they need sunlight to grow.

### Phytoplankton make the oxygen we breathe

Phytoplankton are one of the most important organisms on Earth, producing most of the oxygen that we breathe. They also play a vital role in helping to regulate the Earth's climate by absorbing carbon dioxide from the atmosphere.

### Marine life depends on phytoplankton

Phytoplankton form the base of the marine food web. They are a crucial part of the marine environment. All animal life that lives in or off the oceans, from crabs and fish to whales and sea birds, are directly or indirectly dependent on the phytoplankton community.

### Phytoplankton help to monitor water quality

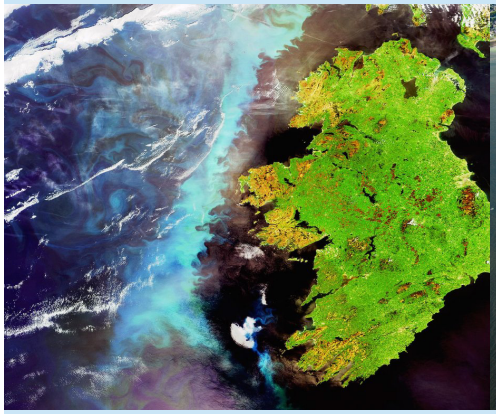
Phytoplankton need nutrients to grow, especially nitrogen and phosphorus. If there are too many nutrients in the environment, this can alter how phytoplankton grow and develop. These changes can show us how the environment is changing. Too many nutrients can also change the characteristics of the species and their population numbers. This may cause nuisance algal population increases or 'algal blooms' to form.

An algal bloom is a rapid increase in the population of algae in freshwater or marine water systems. Its pigments discolour the water.

The main sources of nutrients around Ireland's coast are discharges from wastewater treatment plants and run off from agricultural land. Phytoplankton in the estuaries and coastal waters around Ireland are monitored by the Environmental Protection Agency (EPA) and the Marine Institute. They monitor phytoplankton to assess the quality (status) of our marine environment. They must do this as part of the requirements of the European Water Framework Directive.

## What do marine phytoplankton look like?

Individual phytoplankton are usually too small to be seen with the naked eye and have to be identified using a microscope. However, when present in the environment in high numbers, they may form large algal blooms which may be visible from space. Some examples of algal blooms and individual phytoplankton species which can bloom in Irish waters are shown below.



A coccolithophore bloom off the coast of Ireland captured by Envisat 6th June 2006.
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A cyanobacteria (bluegreen algae) bloom off Mutton Island, Galway 8th September 2017.
© Joe Silke, Marine Institute

A dinoflagellate bloom in Dunmanus Bay, September 2017.
© Julie Maguire, Bantry Marine Research Station

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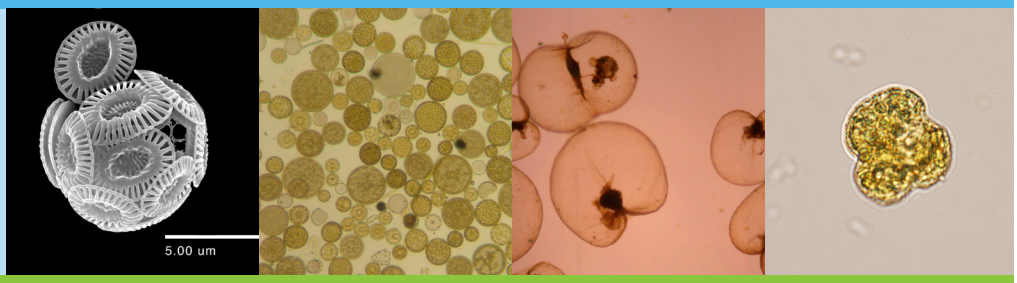
## What do marine phytoplankton look like? (continued)

From left to right: Emiliania huxleyi, a coccolithophore species ©Pauhla McGrane (GMIT). Centric diatoms ©Caroline Cusack (Marine Institute). Noctiluca scintillans © Shane O'Boyle (EPA). Karenia mikimotoi ©Joe Silke (Marine Institute).




## How do we monitor marine phytoplankton?

The EPA and the Marine Institute sample phytoplankton in estuaries and coastal waters around Ireland. They carry out sampling three times during the summer and once during winter.

At each location, they take water samples just below the surface and above the seabed. They use the samples to assess how much phytoplankton is in the water and what species are present.

To assess the abundance, they filter a measured volume of seawater and any phytoplankton present are collected on a filter paper. (top photo)

The amount of phytoplankton is later measured in a laboratory by analysing the amount of chlorophyll present on the filter. Chlorophyll is the pigment present in all green plants and this accurately assesses the amount of phytoplankton in the water.

A separate water sample is preserved and examined in a laboratory. The phytoplankton species present are identified and counted using a microscope.

**Phytoplankton are one of the most important organisms on Earth**

## How are the results used in ecological assessment?

A biological index has been developed for Irish estuaries (transitional waters) and coastal waters. As our estuaries and coastal waters are so large, they are broken down into more manageable units called 'water bodies'. The biological index gives us a measure of the ecological health of the marine environment based on the phytoplankton community.

This index allows us to quantify the biological status of each water body. The index has two different scores that capture important information about the phytoplankton community which are:

- biomass (measured as chlorophyll), and
- abundance (numbers of species in each sample).

Phytoplankton biomass is measured as chlorophyll. Persistent, high chlorophyll levels may indicate that there are too many nutrients in the environment.

Similarly, high phytoplankton abundance, where the number of a single species exceeds a certain threshold, may indicate 'bloom' formation.

We combine these scores to give an overall result for each water body. This means we can categorise water bodies into one of five status classes. 'High' is when the water is not polluted at all, and 'bad' is when the water is most polluted.

| 1. High | 2. Good | 3. Moderate | 4. Poor | 5. Bad |
|---|---|---|---|---|

For the latest information go to **www.catchments.ie** and **https://gis.epa.ie/EPAMaps/**

epaEcology Monitoring and Assessment

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