Issue 77 – April 2026

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# Diving into the world of plankton with the Curiosity Microscope

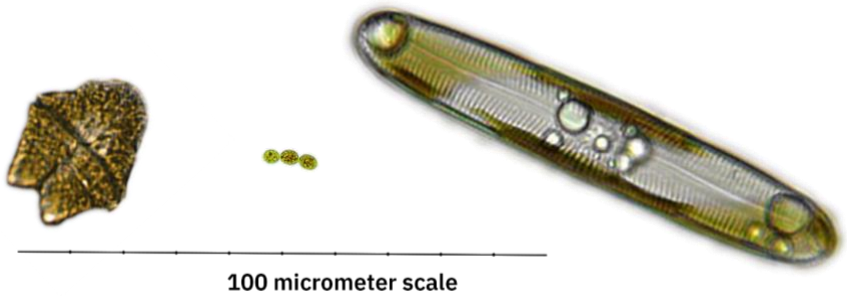
## Worksheet 2 - The role of plankton in ecosystems

1. Below is a scale comparison of individuals from three different groups of phytoplankton. The scale bar is 100 microns long and divided into 10 micron sections. Refer to the plankton fact sheet and **(5 Minutes)**:

    a. **Identify** the group to which each phytoplankton belongs and label them.

    b. **Estimate** the sizes of the individual cells in each group using the scale bar.

    c. Look at the three types of phytoplankton and **label** the visible parts of their cells that contain chlorophyll. **Explain** your reasoning.




2. Similar to ecosystems on land, ocean ecosystems rely on primary producers such as phytoplankton to sustain other organisms. In the diagram below, identify and label the primary producers and consumers that depend on them (5 Minutes).

3. With reference to Figure 5 of the "Plankton" information sheet, answer the following questions **(10 Minutes)**:

    a. How would the number of sperm whales change if the amount of phytoplankton in the region decreased?

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    b. How would the number of phytoplankton and sperm whales change if the krill population decreased?

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4. Below is a satellite image showing the chlorophyll intensity in parts of the Atlantic Ocean due to plankton growth. Next to the image is a scale that assigns the corresponding chlorophyll intensity to the colours. Answer the following questions **(10 Minutes)**.

    a. **Identify** the colour that shows the highest and lowest chlorophyll concentration in the ocean on the colour scale and label it accordingly.

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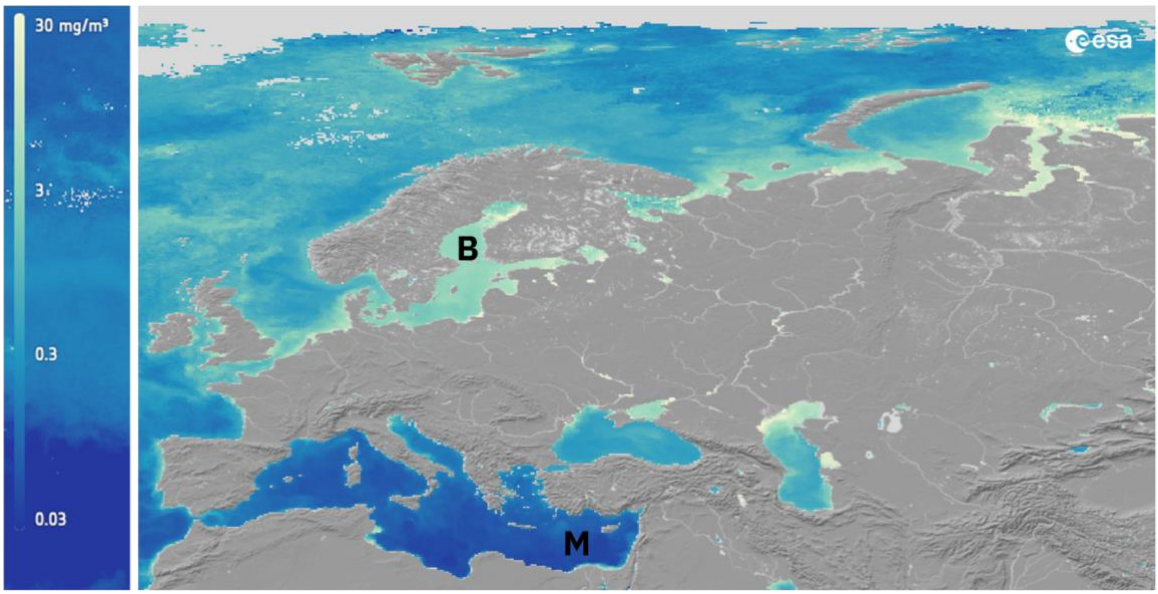
b. On the map below, **identify** a region with high and low chlorophyll concentration and label it "high chlorophyll concentration" or "low chlorophyll concentration".
c. Look at the chlorophyll intensity map and predict, with a reason, in which area of the oceans (labelled B or M on the map) there is more plankton in the water.




*ESA climate from space - concentration of chlorophyll-a*

d. **Explain** which of the two plankton groups (zoo- or phyto) is responsible for this colour change detected by satellites.

5. Phytoplankton shows an uneven distribution in the world's oceans. Therefore, certain areas of the oceans are rich in phytoplankton, while other areas lack it. Answer the following questions using the corresponding maps **(10 Minutes)**.

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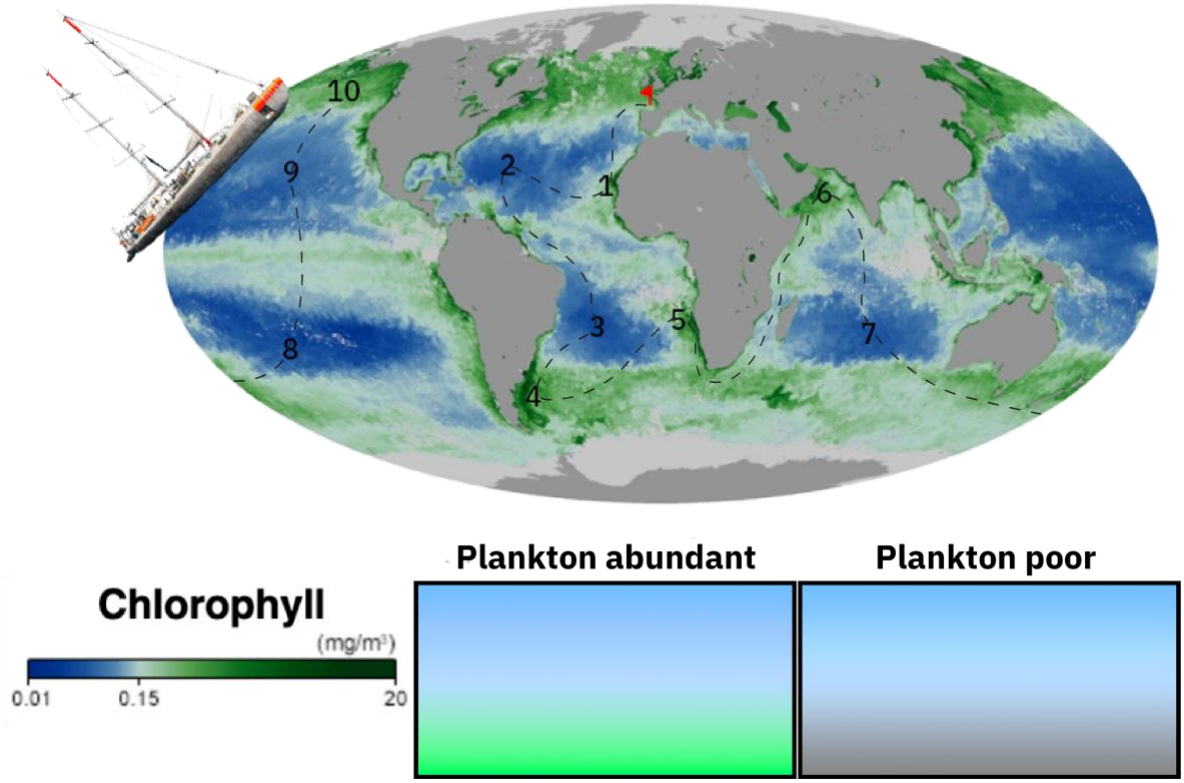
a. The following world map of chlorophyll concentrations shows where phytoplankton is most abundant in the ocean upper layer and the route of the Tara Ocean Foundation's research vessel Tara along which samples were taken (marked by numbers on the map). The route starts at the coast of France (red flag) and ends at location 10. Look at the ocean surface color at each location where samples were taken and **identify** the phytoplankton-rich and -poor parts of the ocean. **Write** them in the individual boxes you see in the diagram below.




*The route of the Tara in the world's oceans is shown by dashed lines. Each number represents a sampling point where the scientists in the schooner take water samples from the sea surface to analyse the presence of plankton. Source of the world image: NASA Earth Observatory*

b. The growth of phytoplankton in the ocean depends on factors such as the availability of sunlight and nutrients. On the map below, the regions marked in blue indicate where nutrients rise from the deeper environment to the surface in a process called upwelling. Look at the map and **indicate** whether the

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phytoplankton-rich regions you listed earlier correspond to the regions of nutrient upwelling.

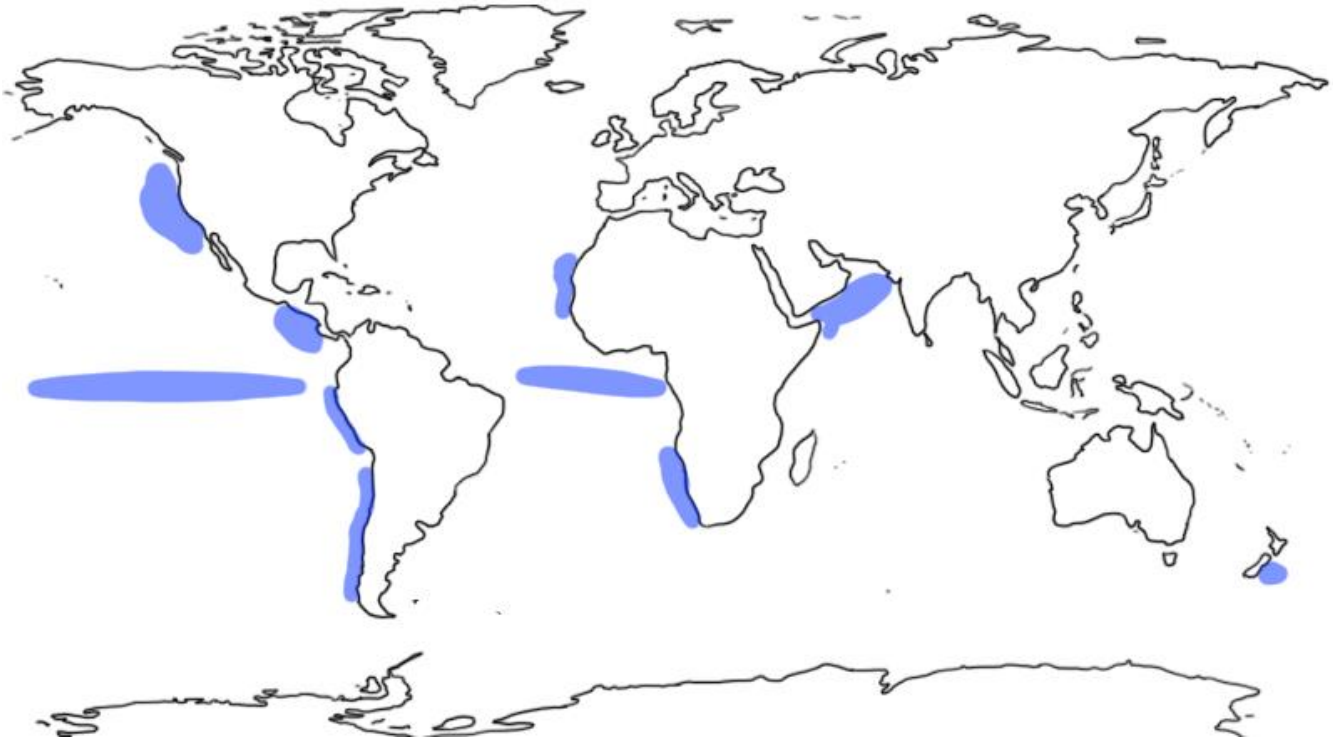

*Figure 2: Important areas for nutrient upwelling in the world's oceans (blue).*

i. **Briefly outline** how nutrients can contribute to the growth of phytoplankton.

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6. The following map shows where the largest populations of sardines and anchovies live in the ocean. Take a look at the map and answer the questions **(10 Minutes)**.

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a. Using the map, indicate whether the largest fish populations live in regions rich or poor in phytoplankton. Explain your reasoning **(5 Minutes)**.

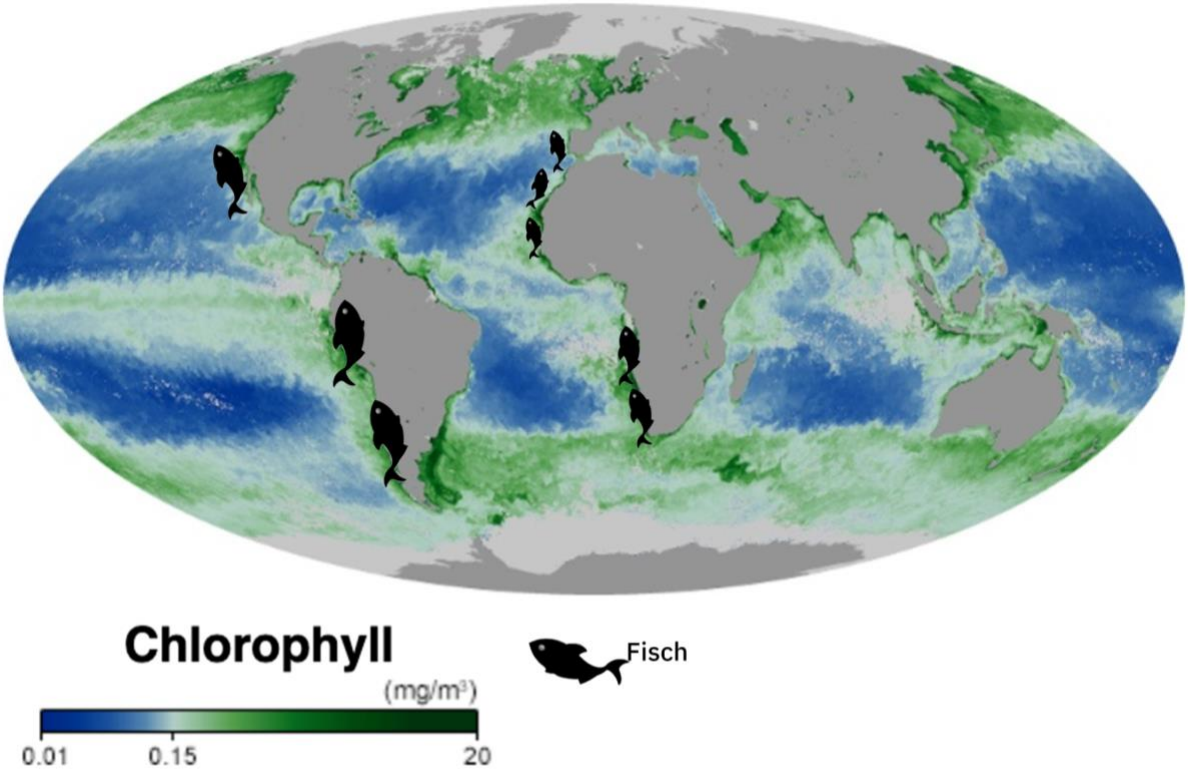


*Figure 3: The main areas of upwelling contribute up to 20% of the world's total fish catch (Adapted from Miller S et al., 2022).*

b. **Briefly outline** the role of nutrients in the fish populations of upwelling systems **(5 Minutes)**.

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7. As phytoplankton photosynthesises and grows, it uses the $CO_2$ diffusing from the atmosphere into the ocean and converts it into organic carbon to produce mass, or in other words, to produce more phytoplankton. While most of this phytoplankton is eaten by marine organisms, the rest sinks to the bottom of the ocean, taking the captured $CO_2$ from the atmosphere with it. By absorbing $CO_2$ from the atmosphere with the help of phytoplankton and binding it in its depths, the ocean plays a crucial role in regulating our planet's climate. The extraction of sunk carbon in the form of fossil fuels and its release into the atmosphere is a major cause of climate change[1].

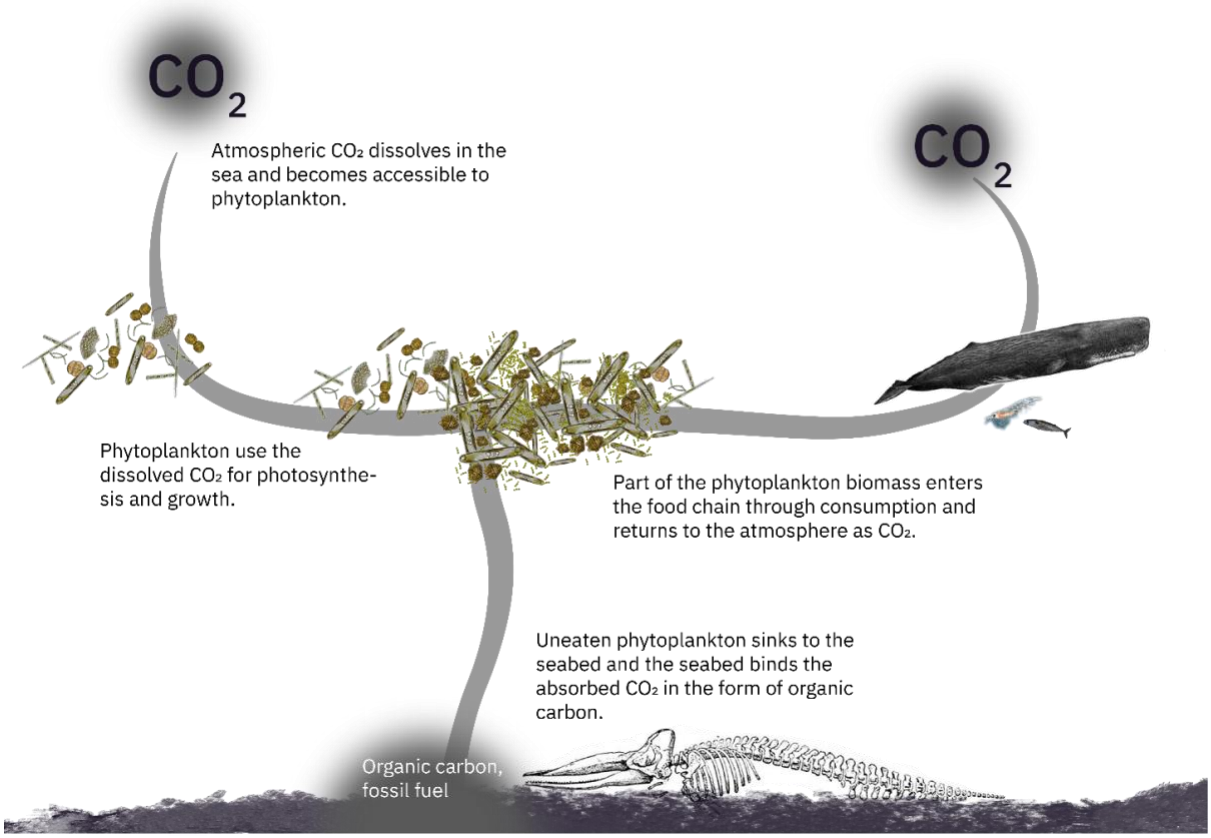


***Figure 5: Carbon cycle in the ocean.*** *Atmospheric $CO_2$ is dissolved into the seawater and becomes available for phytoplankton to use in photosynthesis and growth. With photosynthesis, inorganic $CO_2$ from the atmosphere is fixed into phytoplankton in the form of organic molecules such as carbohydrates and proteins. Part of this growing plankton population is consumed by other marine organisms in the food web. Remaining phytoplankton sinks to the bottom of the ocean following their death and becomes part of the ocean sediment that locks the atmospheric $CO_2$ under the ocean for millenia[2].*

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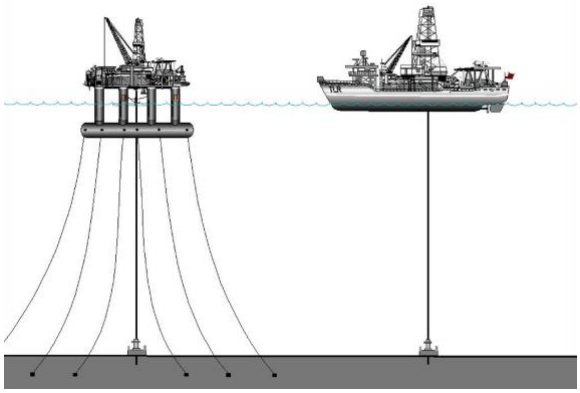
Taking into account the above information, **explain** how offshore drilling as a human activity intervenes in the different stages of the carbon cycle **(10 Minutes)**.

| Human activity | Where it disrupts the carbon cycle |
| --- | --- |
| Offshore drilling: the process of drilling through the seabed to extract fossil fuels used in industry and transport.  | |

# References

1. Causes and Effects of Climate Change. (n.d.). https://www.un.org/en/climatechange/science/causes-effects-climate-change
2. “Carbon Cycle.” National Oceanic and Atmospheric Administration, www.noaa.gov/education/resource-collections/climate/carbon-cycle

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