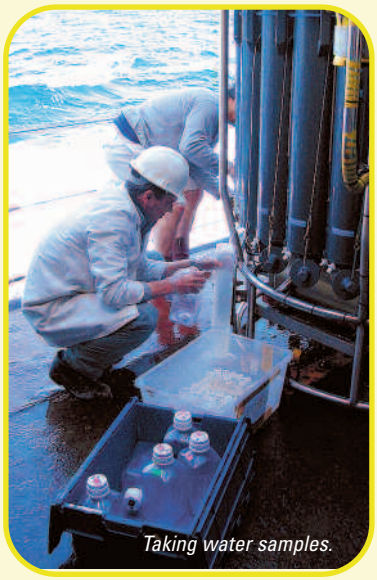
Patchy plankton

Life isn't evenly distributed in our seas. Jonathan Sharples has been finding out.


Taking water samples.

All summer long, a layer of tiny, singled-celled plants (phytoplankton), growing a few tens of metres below the sea's surface, feeds the marine life around our coasts. This layer, invisible from the surface, attracts tiny grazing animals (zooplankton), which in turn attract fish, then fishing boats, and, last summer, a team of scientists aboard the RRS *Charles Darwin*. We were studying the plankton layer south-west of the British Isles, using Seasoar, a towed vehicle that dives to a programmed depth, then follows an undulating (see-sawing) path, sampling water within a set depth range.

We found that the plankton is remarkably patchy—in some places there was a lot of phytoplankton, in other places there was hardly any. These variations are important as they affect where fish are found, and even how many there are.

Like all plants, phytoplankton need sunlight and nutrients to be able to grow. The summer phytoplankton layer exists because of the way the sun's light and heat penetrate the ocean. The sun warms the upper 20–30 metres of water, and in this layer any nutrients are quickly used up by phytoplankton. Further down, deeper water stays much cooler, and retains its nutrients because not enough light penetrates for phytoplankton to flourish. In the boundary layer between the warm surface water and the cooler, deeper water (a region called the thermocline), there is just enough light for the plants to photosynthesise, and enough nutrients leaking upwards from below for them to thrive.

Because they live below the surface, phytoplankton are difficult to observe and measure. We don't know how many of them are there, how quickly they grow, and how variable their numbers are in different patches of ocean. The answers would help us understand what controls populations of fish, seabirds and other creatures.

The team aboard the RRS *Charles Darwin* came from the Proudman Oceanographic Laboratory, the National Oceanography Centre, Southampton, and the University of Wales, Bangor. We worked together to study the physics, biology and chemistry of the phytoplankton layer. We sent Seasoar down to observe the phytoplankton in a layer about 30 metres below the surface.

We utilise the properties of the chlorophyll to count phytoplankton—flash the right colour light at them, and their cholorphyll fluoresces. It's the strength of that fluorescence that we use to tell us how many phytoplankton there are. We found that the numbers varied greatly over quite short distances, and that a lot of the dense patches of phytoplankton were above large banks in the seabed. It was no coincidence that the largest numbers of fishing vessels we saw were also near these seabed banks, catching feeding fish.

The team collected information about water temperatures and turbulence, as well as nutrient and oxygen levels. We are now trying to understand exactly what makes the plankton patchy, and particularly why the seabed banks are such important places for plants, fish and, ultimately, the fishing boats.

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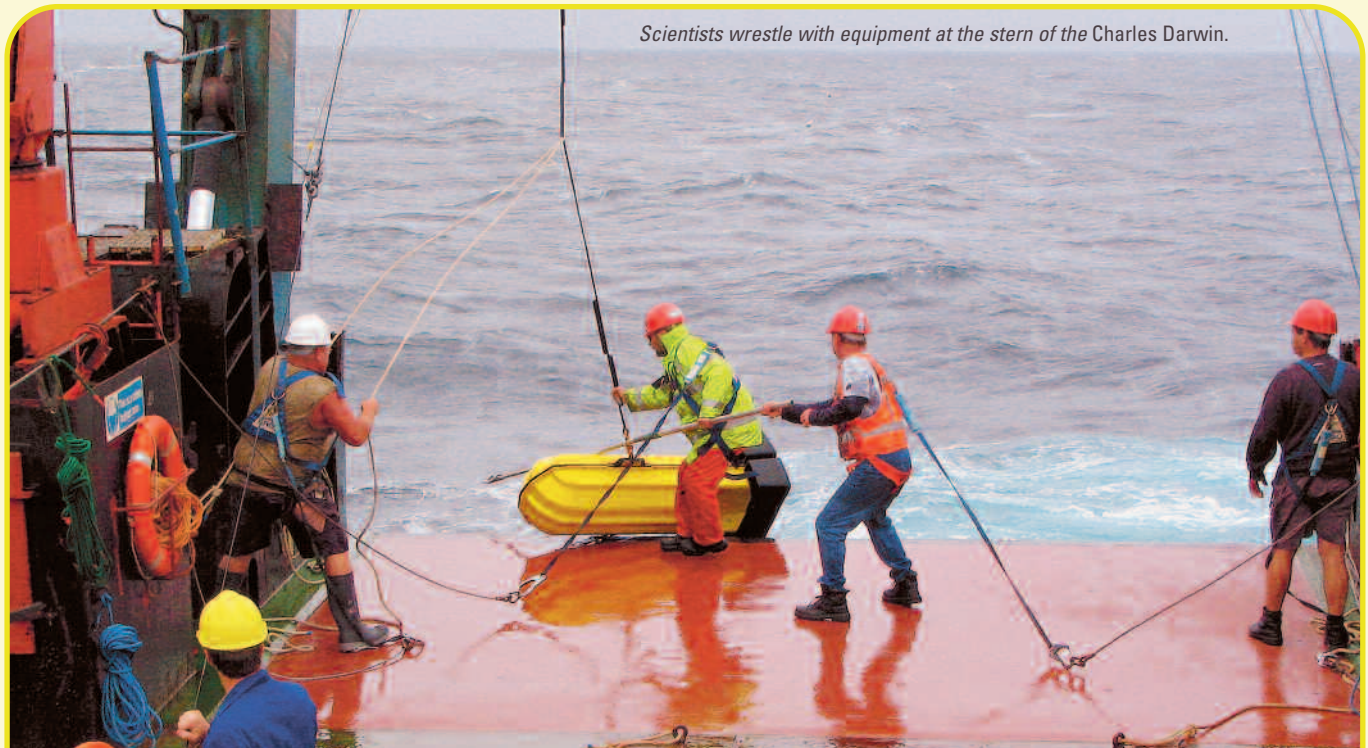
Scientists wrestle with equipment at the stern of the Charles Darwin.