

Seafarers Turn Scientists to help create the world's biggest citizen science plankton survey

A unique global seafarer study uses a Secchi disk and a free mobile phone app called Secchi to conduct a vital global study of the sea's plankton.

In 2010 a group Canadian marine scientists reported that the phytoplankton – the tiny plant-like cells that underpin the marine food web and colour the sea usually green – had declined globally by 40% since the 1950s. The scientists suggested that a warming of the ocean surface due to climate change had reduced the vertical mixing of the water column, thereby reducing the supply of nutrients from deeper waters – in effect the input of fertiliser to the surface had lessened to reduce phytoplankton growth. The scientist's results provoked debate as others thought they saw no change or even an increase in phytoplankton in some places. Part of the controversy stems from a lack of continuous, long-term data on the phytoplankton, the vastness of the seas and oceans, and the fact that there aren't that many marine scientists. Because of the important role played by the phytoplankton, we need to know if, how and why they are changing, and this is why seafarers, acting as citizen scientists have been asked to help. Since the project's launch in February 2013 seafarers have already established the Secchi Disk study as the largest, global marine citizen science study.

So how does the Secchi Disk study work? As the name suggests, the project uses a Secchi Disk, which is a self-made component of the study. A Secchi Disk is a round, white disk exactly 30 cm in diameter that is attached either to a fibreglass tape measure or to a marked length of rope, and weighted from below. The Secchi disk was invented by the Pope's astronomer in 1865, initially to measure the clarity of the Mediterranean to chart its currents. A Secchi disk can be made from any material, such as a white plastic bucket lid or a piece of plywood painted white. So far, seafarers have been very ingenious in the materials they have used. The tape measure is held, and the Secchi disk is lowered vertically into the seawater from the side of a boat (you need sufficient weight to make the disk sink vertically), and you note the depth below the surface at which the Secchi disk just disappears from sight. This number, the "Secchi Depth", reflects the transparency of the water column, which is influenced by the amount of phytoplankton in the sea. The quicker the Secchi Disk disappears from sight the smaller is the Secchi Depth and the more phytoplankton there is in the water. The Secchi Disk is a tried and tested, and a very simple tool to measure the phytoplankton.

Once the Secchi Depth is determined, seafarers then use their smartphone and the free Secchi app to obtain their GPS location and to enter the Secchi Depth - a network connection isn't required for this. The Secchi App then stores the data on the phone and the Secchi Disk project database receives the data as soon as network connectivity is regained. Anyone can follow the data collected on the project map.

The aim of the project is to build a map that charts the seasonal and annual changes of the phytoplankton from now and into the future. It is a long-term project that carries on indefinitely. Seafarers may measure the Secchi depth at the same place regularly, or occasionally, or they may take measurements from different places as they travel. The more seafarers that take part the better the coverage of the oceans, and the more remarkable the database will become.

Since the initial study in 2010 that suggested the phytoplankton are declining in the oceans, other studies have also suggested that the phytoplankton are declining due to climate-induced changes in their sea surface habitat. The most recent of these entitled "A reduction in marine primary productivity driven by rapid warming over the tropical Indian Ocean" has just been published in the *Journal Geophysical Research Letters* - <http://bit.ly/1PvYhcQ>. In this paper led by author Matthew Koll Roxy from the Centre for Climate Change Research at the Indian Institute of Tropical Meteorology, data is presented demonstrating a decline in phytoplankton in the western Indian Ocean by up to 20% over the last 60 years. Interestingly, the western Indian Ocean shows the largest warming trend among the tropical oceans and the study's authors found the downward trend in phytoplankton could be explained by a reduction in nutrients reaching the surface from deeper waters due to increased stratification of the water column. Clearly, studying the phytoplankton is of current importance.

Dr Richard Kirby the Secchi Disk project leader says: "Often we look back and wish we had already started monitoring something about the natural world - *if only we had started measuring 'x' some years ago*. Our view was there is no time like the present to start something for the future. This is why we created the Secchi App and this citizen science project for seafarers, to try to encourage global data collection on the phytoplankton and to make data submission simple."

In just 4 years the Secchi Disk study has become the world's largest marine citizen science study. Seafarer participants include sailors, divers, school children with access to boats, and small boat commercial fishermen. The project not only collects important data on the phytoplankton but is also a gateway to learning about the smallest of marine life that lives at the sea surface. If you are a seafarer, why not take part ?

You can find the Secchi Disk project at its website www.secchidisk.org, on Facebook www.facebook.com/secchidisk and on Twitter @secchiapp