



Secchi Disk Study

This project requires some pre-season preparation.

Background

The Secchi Disk Study www.secchidisk.org is a citizen science study of marine phytoplankton. Phytoplankton are microscopic algae that float around in the oceans and are basically the equivalents of plants on land. Consequently, phytoplankton are at the base of the food web supporting all life at sea. Phytoplankton are so abundant that they account for about 50% of the oxygen produced on Earth.

Motivated by research published in 2010 suggesting that phytoplankton had declined by 40% globally over the preceding 50 years due to climate change, the Secchi Disk Study was established in 2013. It has no end date or geographic boundaries.

Our knowledge of how phytoplankton are reacting to a changing world is still limited. This is especially true for Antarctica, where data on phytoplankton abundance are particularly sparse. By participating in the Secchi Disk Study, guests can help scientists better understand how phytoplankton in the Southern Ocean are reacting to changing environmental conditions and what implications this will have for the wider Antarctic ecosystem: from the tiny algae all the way to the charismatic penguins, seals and whales.

The Secchi Disk was invented in 1865 by Astronomer and Physicist Angelo Secchi to measure water clarity. Away from estuaries and coasts, phytoplankton are the major determinant of water clarity. Secchi Disks are used by scientists around the world to measure phytoplankton abundance in the water column.

How can you/guests participate?

The Secchi Disk Study is a fun and easy project to engage and educate guests about phytoplankton and the ocean while out during Zodiac cruises. It only takes about 5-10 minutes. In Antarctica, make sure to be away from the coast, ideally over 1km from shore and in over 25m of water depth. The Secchi Depth should be measured between 10:00 and 14:00. **Do NOT** wear sunglasses!

The project should be led by an expedition staff member, who will assist guests in taking a measurement using a Secchi Disk and will upload the measurement to the study's database using the free Secchi app.

Detailed instructions are included in the smartphone app and available via the resource material (see below). Briefly, the Secchi disk is lowered vertically into the seawater from the side of a stationary Zodiac with the sun behind you. The depth below the surface at which the Secchi Disk just disappears from sight is recorded from the tape measure; this depth is called the "Secchi Depth" and reflects the transparency of the water column. The quicker the Secchi Disk disappears from sight the smaller is the Secchi Depth and the more phytoplankton is present in the water.

The measured Secchi Depth is then uploaded by the expedition staff member using the Secchi app. No internet connection is required at this time: have your smartphone's/tablet's GPS enabled, then open the app to obtain the GPS location and record the measured Secchi Depth. The Secchi app stores the data on the smartphone/tablet and you can send the data to the Secchi Disk project database as soon as network connectivity is regained.

Training and equipment required

The leading expedition staff member should read the project instructions (available via the Secchi app or resource material below) to understand when and how to measure the Secchi Depth. No other training is required.

The equipment needed for this project includes

- Secchi Disk
 - Plain **white** disk (ø30cm) homemade or purchased e.g. via www.secchidisk.org. **NOTE:** black and white disks exist as well, but are to be used in freshwater only.
- Smartphone/tablet
- Secchi app – download before sailing
 - Free app, **Secchi** (iOS & Android)



Expected results/feedback

The collected data are building a long-term database of phytoplankton abundance across all oceans that will be used to study the effects of a changing climate on phytoplankton abundance and the wider marine ecosystem.

Guests can see their data points on the interactive project map available at the study's website www.playingwithdata.com/secchi-disk-project. More results and feedback are available through updates on Facebook and Twitter, www.facebook.com/SecchiDisk/ and <https://twitter.com/secchiapp>, respectively.

Results are also published in the scientific literature. Data collected by citizen scientists have already been published:

- Citizens and scientists collect comparable oceanographic data: measurements of ocean transparency from the Secchi Disk study and science programmes. Kirby, R.R., Beaugrand, G., Kleparski, L. et al. Sci Rep 11, 15499 (2021). <https://doi.org/10.1038/s41598-021-95029-z>
- **Seafarer citizen scientist ocean transparency data as a resource for phytoplankton and climate research**
Seafarers SD, Lavender S, Beaugrand G, Outram N, Barlow N, et al. (2017) Seafarer citizen scientist ocean transparency data as a resource for phytoplankton and climate research. PLOS ONE 12(12): e0186092. <https://doi.org/10.1371/journal.pone.0186092>



Scientific project partners

All citizen science data are submitted to the Secchi Disk Study via the Secchi app and can be viewed from the study's website www.secchidisk.org. The data are freely available to study participants. The Secchi Disk Study is an independent study run by The Secchi Disk Foundation www.secchidiskfoundation.org, a UK registered charity.

Main contact information

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The lead scientist is Dr Richard Kirby, website www.PlanktonPundit.org and Twitter <https://twitter.com/PlanktonPundit>

IMPORTANT NOTICE: It is recommended that you discuss permitting or authorisation needs with the project lead for any citizen science project in advance of the Antarctic season, engaging with your National Competent Authority as necessary. Please remember to add citizen science activities to your Post Visit Report form.

