

The Mini-Secchi manual v1.0

Welcome to the Mini-Secchi manual which contains all the information you need to start your sampling



What's in your pack?



Packaging with link to website

Mini-Secchi disk ready to be used



Replacement colour scale

Replacement disk



Replacement strap



Background to the Mini-Secchi

You are now contributing to the longest known record of water clarity and water colour measurements. The Secchi depth and the Forel-Ule colour have been recorded since the middle of the 19th Century in many lakes and oceans around the world. Let's learn a little about some of the key figures that pioneered the techniques behind your Mini-Secchi.



Pietro Angelo Secchi (1818-1878) developed the first standardised method for determining water clarity. This involved lowering a white disk into the water and measuring the depth at which it disappears from sight. This has become known as the Secchi depth.



François Alphonse Forel (1841-1912) proposed a standard set of colours for determining water colour in 1890. This classification was designed to categorise blue and green waters.



Wilhelm Ule (1861-1940) extended the colour scale proposed by Forel to include blue-green to brown waters. The combined scale became known as the Forel-Ule scale and has since been used to determine the colour of seas, lakes and rivers.

If you would like to learn more of this history we recommend reading the works of Marcel Wernand and colleagues, in particular, [Wernand \(2010, doi: 10.2971/jeos.2010.10013s\)](#) and [Wernand & van der Woerd \(2010, doi: 10.2971/jeos.2010.10014s\)](#).

Why collect Mini-Secchi data

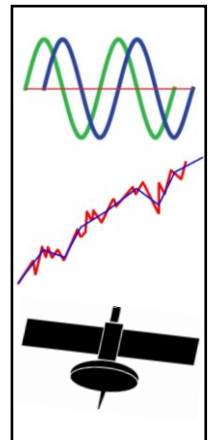
Human activity and environmental change are modifying water quality in many aquatic environments. The Secchi disk and Forel Ule colour scale are simple techniques for determining water clarity and water colour. These can inform us of the composition of substances in the water and their concentrations (e.g. sediments, dissolved substances and algae), important information for monitoring water quality.

By measuring the secchi depth and water colour, you can help monitor water quality. You will be contributing to the oldest record of water clarity and water colour measurements.

What will we do with the data

Secchi depth and water colour data you collect will help

- 1) Characterise seasonal change
- 2) Monitor unusual events
- 3) Monitor long-term change
- 4) Validate satellite observations
- 5) Complement biological surveys



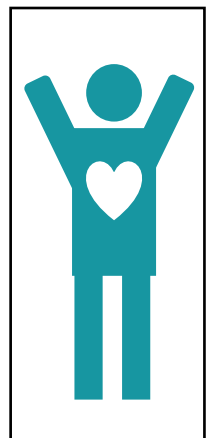
Every measurement you collect has huge value!

Keeping healthy

Get yourself into a routine of walking down to your local lake or estuary and collecting data. Not only will you be helping monitor, but also keep yourself fit and healthy.

Bring your Mini-Secchi with you when you walk the dog, you will soon be seeing how water clarity and water colour changes with the season and weather.

Stay safe! Only deploy from a secure platform.



Operating the Mini-Secchi disk

1



Place your left hand through the safety band

2



Push the weight out from the main body

3



Detach the disk from the main body

4



Place 1 or 2 fingers into the strap on the main body

5



Lift the handle from the main body

6



Wind the handle around the body to move the disk

Measuring the Secchi depth

The **Secchi depth** is measured by lowering the white disk into the water and recording the depth at which it disappears and reappears from sight



Distance from observer to water (DO)

Keep holding arm at 90 degrees for accurate DO!

Secchi depth
= (depth disk disappears + depth disk reappears)/2
= (TD1-DO + TD2-DO)/2

Total distance (TD1) from observer to depth at which disk disappears

Total distance (TD2) from observer to depth at which disk reappears

Depth disk disappears and reappears (set as equal for examples in this manual)

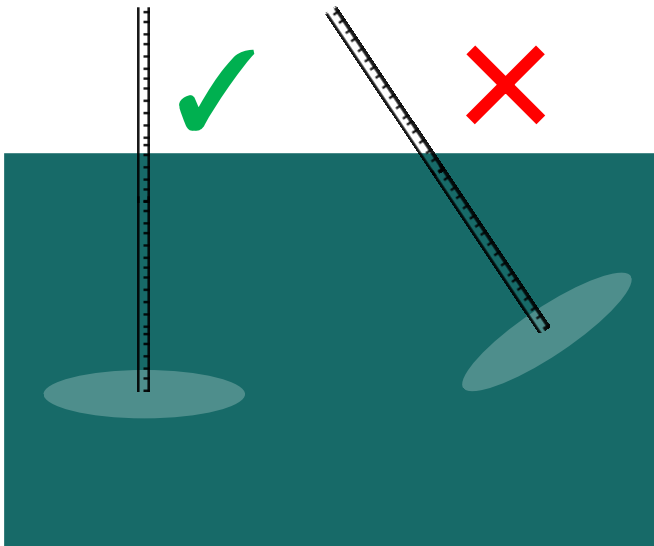
Only deploy under safe conditions!



It may be possible to directly view the **depth of disk disappearance and reappearance** from the measuring tape at the water surface, if not, measure the **distance from observer to the water surface** and subtract it from both the **total distance of disk disappearance and reappearance** and divide by two to derive the **Secchi depth**

Measuring the Secchi depth

The disk must sink vertically through the water for accurate **Secchi depth** measurements. Strong currents or boat movement may cause the disk to sink at an angle causing inaccurate readings.



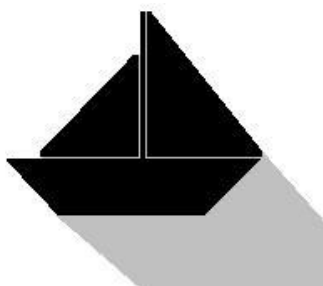
The Mini-Secchi weight is heavy enough for vertical deployment in waters with low current speed. However, in strong currents extra weight will be required. Some of the weights we designed have an attachment where extra weight can be added (see example below). Please let us know if you require one for your region of interest.



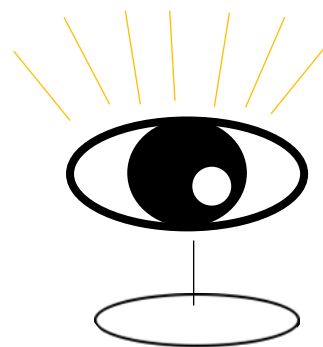
Tips for good deployment



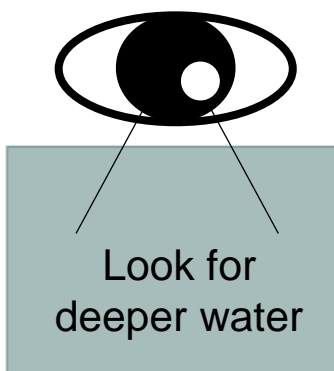
Avoid sun glint



Avoid shadows



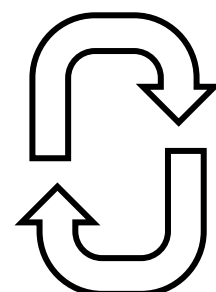
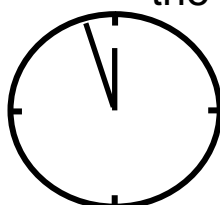
Allow eyes time to adapt to disk near Secchi depth



Look for deeper water



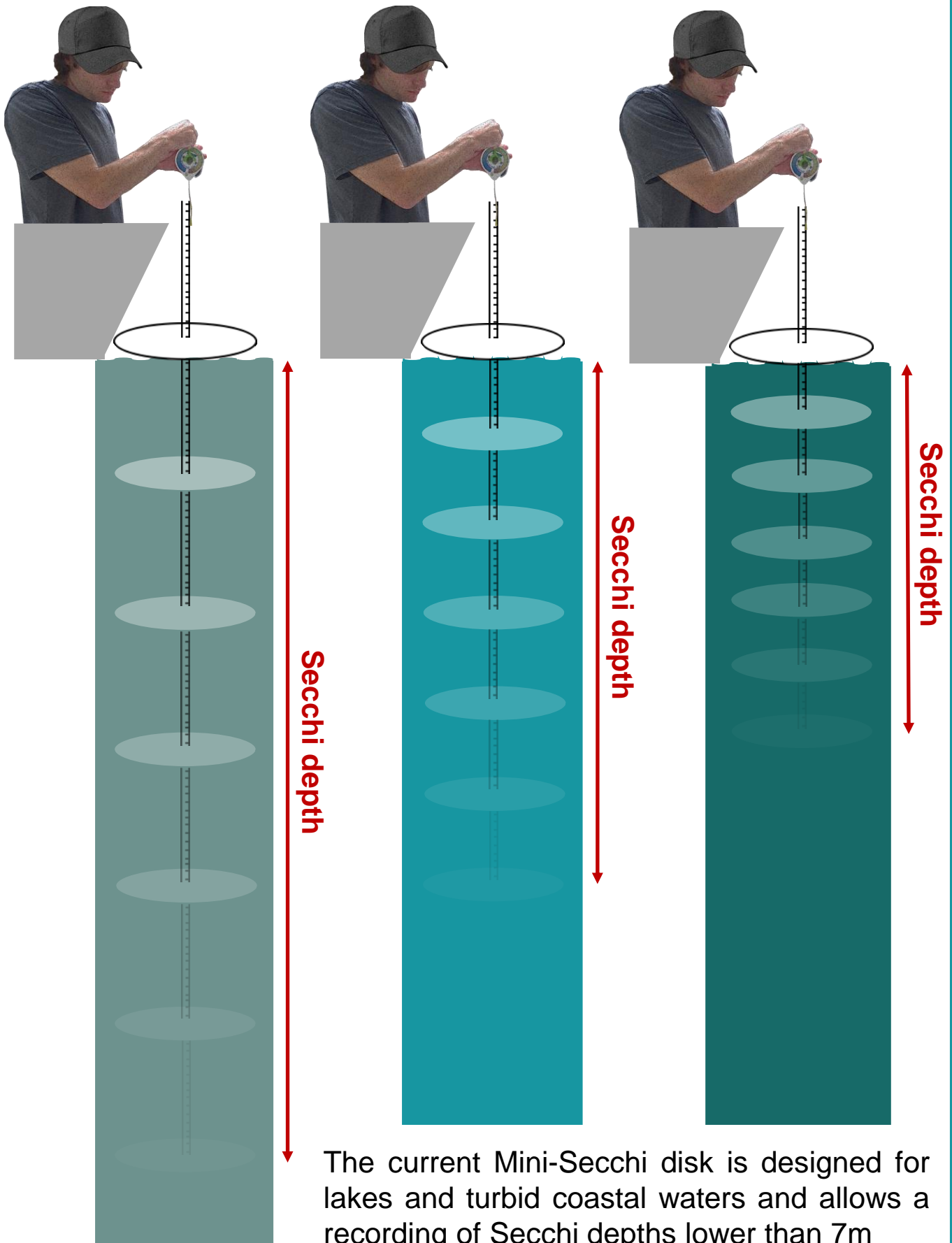
Closer to mid-day the better



Repeat measurements can improve precision

Measuring the Secchi depth

The **Secchi depth** will vary with changes in water clarity

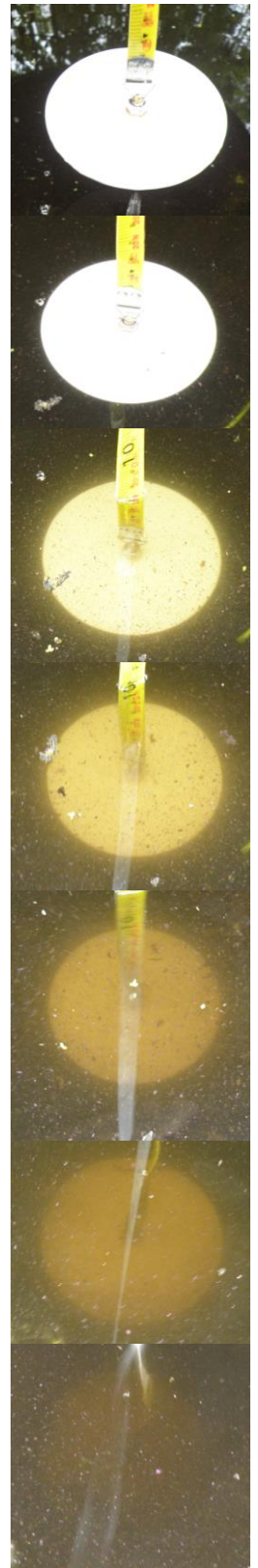
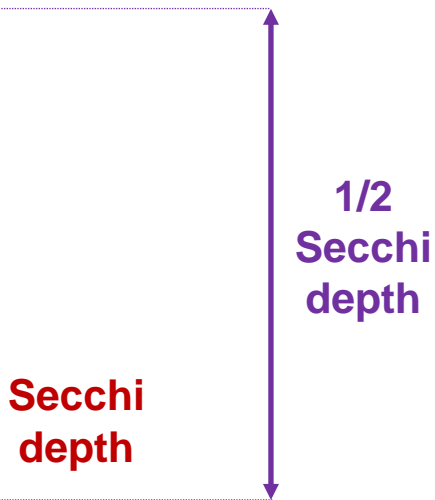


Measuring water colour



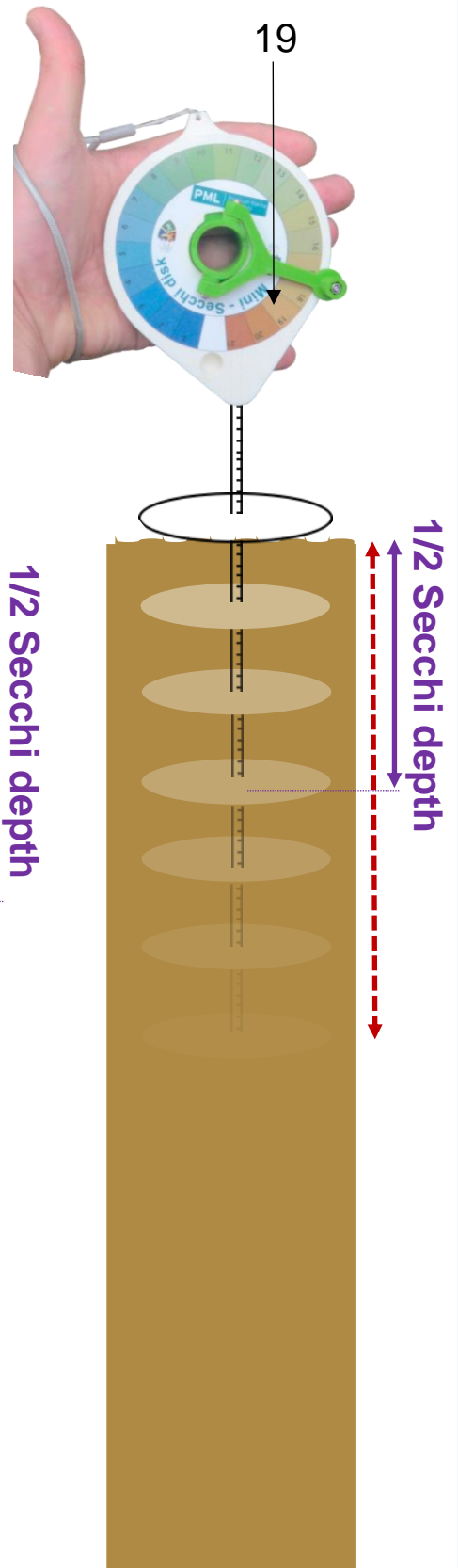
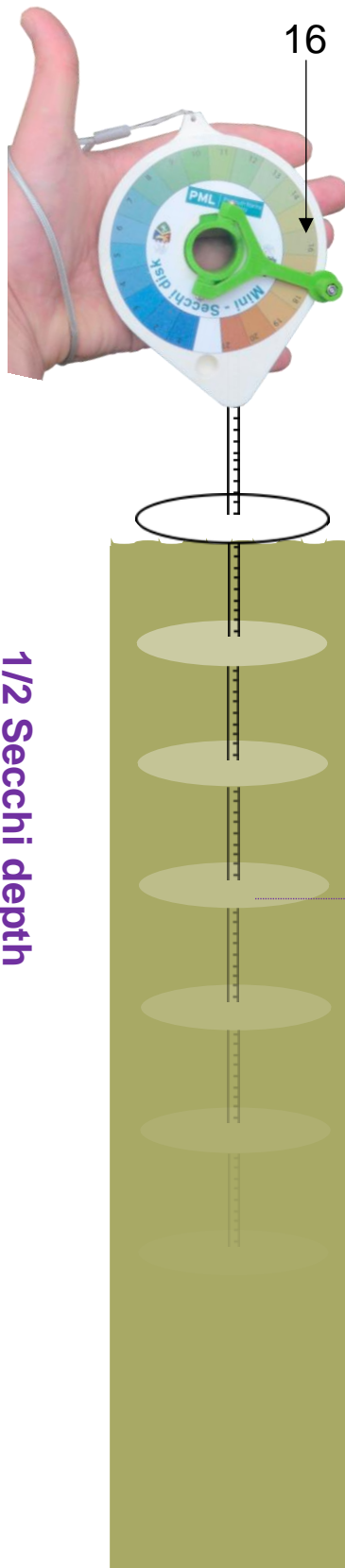
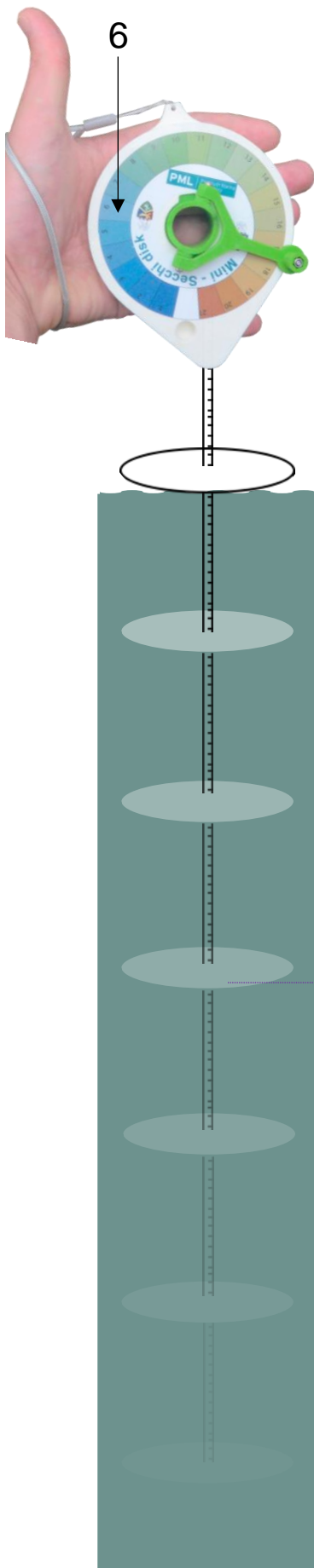
The **colour** of the water is measured by looking at the **colour** of the disk at roughly **1/2 the Secchi depth** and matching it to the closest number on the **colour** scale

Only deploy under safe conditions!



The easiest way to record the **colour** is to lean your hand holding the device such that your palm is facing up and the scale is visible and you can easily see the disk at **1/2 the Secchi depth** (see photo above)

Measuring water colour



The **colour** of the water, measured at **1/2 Secchi depth**, will vary with changes in substances contained in the water

Storing when sampling complete

1



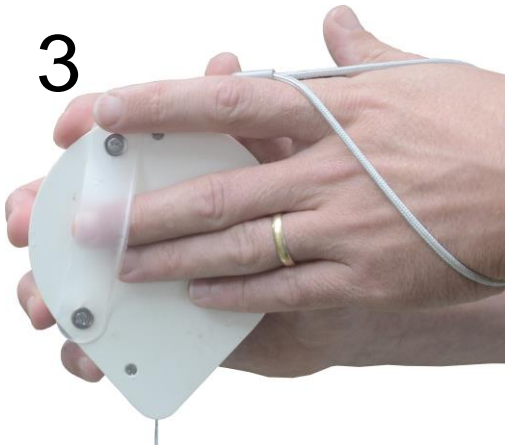
Wind the disk up to, but not beyond, the yellow marker

2



Place the end of the handle back into its hole on the main body

3



Remove fingers from the strap

4



Slide weight into hole on the main body so disk is flush with body

5



Store the instrument safely

6 Maintenance

Clean your Mini-Secchi with fresh water after operating it. Dry the tape if feasible. To remove any dirt from the white disk a little washing up liquid may be used. We recommend occasionally using a little silicon lubricant on the weight, its hole on the main body, and at the end of the tape.

Data storage and transfer

Data collection

The following four pieces of information are essential when collecting the data:

- 1) **Secchi depth** recording from your Mini-Secchi
- 2) **Colour scale number** from your Mini-Secchi
- 3) **Location** (latitude and longitude). This can be collected in three ways: i) Manually, by extracting your location on a map (see <https://www.latlong.net>); ii) through a separate GPS device you may be operating; iii) or through the Mini-Secchi app which is currently under development.
- 4) **Time** your measurement was collected at (in UTC ideally, or if not, please specify if was collected in local time, e.g. UTC+5:30 hours). A link to UTC time can be found here <https://time.is/UTC>

Any additional environmental information, such as cloud conditions and wind speed are useful, as are any notes you take. Also, photos of the Secchi disk at half the secchi depth would be useful.

Data Storage

You can enter your Mini-Secchi data using this form [Mini-Secchi-data-entry-form](#). We recommend you always carry a notebook to record and back-up your data. We are in the process of developing a mobile phone app and website interface to allow you to store, archive and access the data you collect using the Mini-Secchi.

While this app is being developed, and if you have problems using the [Mini-Secchi-data-entry-form](#) we request you email your data to minisecchi@gmail.com under the title “Mini-Secchi data” with: 1) Secchi depth; 2) colour scale number; 3) location; 4) time; and 5) any additional information.

Feedback

We are interested in any feedback you have on the Mini-Secchi that may help us improve the product. Please email your feedback to minisecchi@gmail.com under the title “Mini-Secchi feedback”.