

Workshop: Build a Secchi disk and run a test sampling

Baltic Sea Water Colour and Transparency.
What makes Baltic Sea water green and low transparent?
 This workshop shows you how to measure water transparency simply. You will learn what the causes of low sea water transparency and colour changes are.

1) Read the theory first.
 2) Run the experiment. Read the instructions, conduct the experiment and answer all given questions.

Worksheet: Some facts about water colour, transparency and its measurements

Water molecules and other substances dissolved in sea water absorbs different colours of visible light. Pure water absorbs orange and red light, that is why “clean” waters seem blue to us. Other most important absorbents are so called yellow substances which are dissolved organic matter - they consist of small particles of decaying organic matter. They absorb violet and blue light, thus water becomes green or even yellowish. Only small part of yellow substances in water environment is natural, most of them come from human activity (water treatment plants, agriculture) and get to the marine environment by rivers. Yellow substances are rich in nutrients. That is why estuaries are places of frequent phytoplankton blooms which is a major problem of Baltic ecology. Chlorophyll in phytoplankton cells makes the water colour look green. Phytoplankton together with suspended inorganic material scatter the light and make water less transparent.

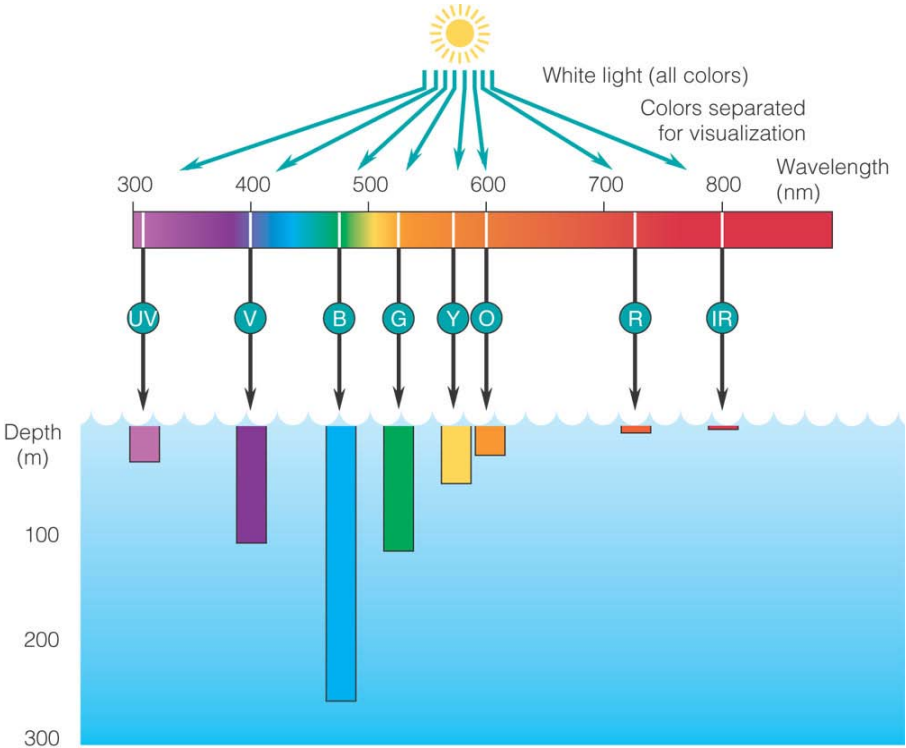


Fig. 1 Light in the sea

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As mentioned, *transparency* can be affected by the colour of the water, algae blooms, and suspended sediments. Transparency decreases as water colour, suspended sediments, or algal abundance increases,. Because phytoplankton blooms are caused by yellow substances which are mainly of human origin, transparency is therefore an indicator of the impact of human activity on the water ecosystem. If transparency is measured through the season and from year to year, trends may be observed.

To measure water transparency, we will use **Secchi disk**. An original Secchi disk is 30 cm white disk and is lowered into the water until it can be no longer seen by the observer. This depth of disappearance, called the **Secchi depth**, is a measure of the transparency of the water. In theory, the Secchi disk works as a contrast instrument. It disappears when the human eye can no longer see it, meaning that there no longer remains any contrast between the disk and its background. A white disk should remain visible longest if viewed against a completely black background.

Experiment 1: Build your own Secchi disc

Instruments:

Coloured plastic discs, rope, eyebolts, tape, nuts

Instructions:

1. Take one colourful plastic disk
2. Put eyebolt into disk and tighten it with nuts. Don't forget the weight! (Sequence should be eyebolt, weight, disk, nut)
3. Tie rope to eyebolt.
4. Use the marker or tape to mark off distances on the rope every 1 m.
5. Lower the Secchi disk into the water. Keep lowering the disk slowly until it disappears. Note the depth on the rope.
6. Repeat with different coloured disk
7. Decide which colour of the disk is the best to do the oceanographical measurements.



Fig. 2 Secchi disk measurement

Questions:

- 1) Describe why the Baltic Sea is so green.
- 2) Why do oceanographers use white Secchi disks?
- 3) Do you expect open water will have a different colour then a estuary?
- 4) How will Secchi depth change when there is algae bloom?

Notes:



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