KTWQ Kit

In coral reef conservation, knowledge of water quality is important to have a better understanding of the environment surrounding the reef and of the related events as bleaching. It also makes it possible to effectively set up an active restoration, for instance to determine where implement an artificial reef. With this kit you will be able to undertake the experiments to evaluate the water quality around the island and get some keys to understand it.

Water temperature

Affects the amount of dissolved gases (O2, CO2, …) in the ocean and the sensitivity of organisms to diseases. A temperature over 30°C will lead to a bleaching event and eventually to coral death. A change in temperature can lead to changes in salinity.

Salinity

Corals require a salinity between 34 and 40 ppt, they cqn survive and live with lower salinity but then they are more sensitive.

Turbidity

The importance of suspended sediments in the water. A high turbidity can lead to a light limitation, which can be a risk for corals who rely on light to get energy and grow.

Nitrate and phosphate

Essentials nutrients for plants and animals metabolism in a low concentration. The closest to 0mg/l the better for the coral reef. If the amount of phosphate and nitrate increase it will lead to an overgrowth of algae and sea grass, directs competitors of corals for light access, and eventually to an eutrophication.

pH

Indicator of the acidity or alkalinity on a scale range between 0 and 14. The ocean is slightly alkaline, its historical pH is closed to 8,2 and now tends towards 8,1. A decrease in pH correspond to an acidification. It is an issue for organisms who are adapted to a certain pH. Especially, those with a calcium carbonate shell or skeleton as corals, clams or sea urchins are really sensitive to a small change in pH. It will affect their ability to produce and maintain their shell or skeleton.

Dissolved oxygen

Essential nutrient for all living organisms to breathe, it should be in between 4,6 and 7,6 mg/l for an healthy reef. Not enough oxygen can lead to a dead zone, area where life has completely disappear.

Let's get ready !

Take the slate and the pencil, the secchi tube to collect the water and a dive computer.
On the slate write :

- The name of the dive site.
- The date of the day.
- The weather
- The time you get into the water.

Sample collection

Look at the area and collect some water into the tube.
On the slate write :

- The depth.
- The temperature.
- The time.
- The global description of the area (healthy reef, bleaching area, dead zone …).
- You can also noticed any interesting facts (current, any particularity of the area).

Bonus : if you have a camera you can also take a picture.

During the process you will have to fill the template in the box. Be sure the template contains all the elements as presented in the 3rd page of this protocol.

Back on the boat

Turbidity measurement

You will use the secchi tube which already contains the water. Look into the tube and compare the color of the secchi disc at the bottom with the ones on the following chart. Write down on the template the value corresponding to the closest color.

pH and salinity measurement

1. Take respectively the pH-meter and the salinity meter in the kit.
2. Take off the cap, turn it on and put it in the tube.
3. Move it a bit to be sure no bubbles are stuck in the captor and be sure it is covered with water.
4. You can write down the results when it stop changing.
5. Put back the cap on the captor.

Nutrients

Prepare the 3 following solutions, and compare each ones color with the corresponding color chart. To do so, hold the vial around 1cm from the white surface of the chart and write down on the template the value corresponding to the closest color. An intermediate color correspond to an intermediate content.

Nitrate (NO_3^-)

1. Rinse the vial with a bit of the water sample.
2. Put 5 ml of the sample in the vial.
3. Add 14 drops of reagent 1, close the vial and shake gently.
4. Add 7 drops of reagent 2, close the vial and shake gently.
5. Add 1 spoon of the powder to the a vial, close and shake vigorously for 20 seconds (the powder does not dissolve).
6. Add 7 drops of reagent 3, close and shake gently.
7. Wait 10 minutes before color comparison.

For an healthy coral reef the concentration should be less than 10 mg/l.

Phosphate (PO_4^{2-})

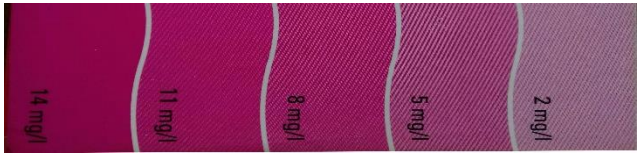
1. Rinse the vial with a bit of the water sample.
2. Put 10 ml of the water sample in the vial.
3. Add 4 drops of reagent 1, close the vial and swirl it gently for 10 seconds.
4. Add 1 spoon of reagent 2, close the vial and swirl it gently for 30 seconds.
5. Compare colors.

The water should present a concentration in phosphates less than 0,03 mg/l for an healthy reef.

Dissolved oxygen (O_2)

1. Rinse the vial with a bit of the water sample.
2. Put 15 ml of the water sample in the vial.
3. Add 5 drops of reagent 1.
4. Add 5 drops of reagent 2, close immediately and turn the vial upside down and back once.
5. Wait 30 seconds, a deposit will form.
6. Add 5 drops of reagent 3, close immediately and turn the vial upside down and back twice. The deposit with dissolve and the solution will turn a reddish-purple color.
7. Compare the colors with the chart.

An healthy reef should have a concentration in between 4,6 and 7,6.



All reacted samples can be disposed of in a sink by flushing down the drain with excess water.

On the template

Before diving	During diving	After diving
Date :	Sampling time :	Measurement time :
Dive site :	Area descritption :	Turbidity :
Weather :	Temperature :	pH :
Diving time :	Depth :	Nitrates (NO_3^-) :
		Phosphate (PO_4^{2-}) :
		Dissolved oxygen (O_2) :

Now that the template is fill with all these informations, take a picture of it and go to the excel template following that link to report the datas in.
https://docs.google.com/spreadsheets/d/1PVAov4eyfMAtio9yRw06pseiB6L2RdOfKytdMFsjxZI/edit?usp=drivesdk

Send the template with the pictures you may have take during the dive to innoceana@gmail.com

WQ Water Quality ELEMENTS – Koh Tao – by innoceana

innoceana

Act

You have already taken part in a citizen science project while doing the tests and now is time to think what else you can do! Turbidity, PH, Temperature and O2.... those indicators help us to understand the mass of water. But this is just the fist step. Now it is the time to think how to protect and fix the water if it is necessary. Environmental action can involve easy steps like make surveys or create awareness or complex processes and collaborations like fix underwater reservoirs or change the law.

Did you find high temperature?

Possible cause : The ocean absorb an excess of warm due to an increase amount of greenhouse gases in the atmosphere.

Possible actions : Reducing pollution by reducing cars use and overconsumption.

Did you find a PH lower than 8,1?

Possible cause: acidification due to an excess of CO2 equivalent in the atmosphere. Runoff from rainfall contains acid components.

Possible action: monitorize the atmosphere, find out factories, high tourism, transport...

Did you find a high turbidity or very low visibility?

Possible causes: too much water from runoff going to the mass of water

Possible action: create a fencing to distribute the water

Imagine that the water flow goes over a coral reef, you can create a fencing to move the water or distribute somewhere else

Did you find low O2 level ?

Possible cause: eutrophication due to high amount of nutrients (Phosphates, Nitrates...) in the water.

Possible action: find out where those nutrients are coming from (agriculture inputs, pipelines with waste water from resort going to a specific area). Alert those responsible and try to convince them to change, go to communities and maybe change the law.