# UNDERSTANDING WATER QUALITY MEASUREMENTS

FOR THE WHITSUNDAYS WATER QUALITY BLUEPRINT FOR TOURISM PROJECT

## DATA FROM IN-SITU LOGGERS

DATA LOGGERS ARE ANCHORED UNDER WATER AND CONTINUOUSLY COLLECT DATA ON A RANGE OF INDICATORS.

| WHAT WE MEASURE | WHY WE MEASURE IT |
|---|---|
| **WATER TEMPERATURE**<br>The temperature of water is measured in degrees. | Water temperature is an important parameter for a range of reasons. Temperature affects many things in the marine environment including coral health, cyclone development and algae growth. For example, marine heatwaves have caused mass coral bleaching events in the Great Barrier Reef which can result in the death of corals. Water temperature can also be important in explaining many other indicators, such as electrical conductivity and PAR. |
| **WATER DEPTH AND HEIGHT**<br>Water depth is measured in two ways by the data loggers –average water depth and root mean square (RMS) water height. | Water depth is a straightforward measurement of the depth of water under which the logger sits. The depth of water overlying the logger fluctuates constantly with tidal movements. RMS water height or RMS depth, rather than being an indicator of water depth, is an indicator of the force of water and therefore an indicator of wave action. Higher RMS water height values indicate stronger wave action, and we would expect sites with high RMS water height values to be more exposed to the open ocean. The RMS water height shows short term variation in water depth and is therefore an indication of wave action. RMS water height can be used to analyse the link between wave activity and water clarity.<br>Both the water depth and RMS water height can be used to analyse the influence that tide and water depth may have on turbidity, deposition and light levels where the data logger is. |
| **TURBIDITY**<br>Turbidity is reported in nephelometric turbidity units equivalent (NTUe) and is a measurement of how much light is scattered as it passes through water. | When there is dirt and other sediment floating in the water, light cannot pass straight through – it is scattered. The more the light is scattered by sediments in the water, the more turbid the water is. Algae and other organic material may also scatter light but are generally only considered a minor portion of turbidity. Turbidity is therefore an indicator of the amount of suspended sediment in water, which can have many negative effects on aquatic life. The suspended sediments that cause turbidity can block light to aquatic plants, smother aquatic organisms, and carry contaminants and pathogens. |
| **PAR**<br>Photosynthetically active radiation (PAR) refers to the spectral range of light that is used in photosynthesis. | There is a broad spectrum of light, ranging from ultraviolet to infrared. Our eyes can only see a small part of that spectrum. Similarly, plants only use a small part of the spectrum to photosynthesise. This is relevant for primary producers in the marine environment such as seagrass, phytoplankton and most reef-building corals which contain photosynthetic algae (zooxanthellae). In this project PAR is the amount of light reaching the bottom of the ocean, where the logger is located, and may reflect either weather conditions (i.e. cloud cover, haze), water clarity, or both. Insufficient PAR can lead to reduced growth or loss of seagrass, corals and other photosynthetic organisms. |

REEF CATCHMENTS

# WATER SAMPLES

## WATER SAMPLES ARE TAKEN BY TOURISM OPERATORS AND SENT TO JCU FOR LABORATORY ANALYSIS ON A RANGE OF INDICATORS.

### WHAT WE MEASURE

### WHY WE MEASURE IT

#### PHYSICO-CHEMICAL PARAMETERS

Electrical conductivity (EC), total suspended solids (TSS) and pH are all physico-chemical parameters of water measured as part of this project.

We measure electrical conductivity to tell us the amount of salt, chemicals and dissolved solids that are present dissolved in the water. Distilled water has a very low EC, but as things are added into water (e.g. salt, chemicals) they break down into charged particles and increase the water's ability to pass an electrical current. High EC measurements can therefore mean that water is very saline. This is important to overall water quality as aquatic animals and plants are adapted for a certain range of salinity. Outside of this range, they will be negatively affected.

Total suspended solids are defined as solids in water that can be trapped by a filter, so TSS is essentially a measure of how much dirt and other particles are suspended (floating) in the water. As you can imagine, this is closely linked with electrical conductivity and turbidity. Measuring all of these things gives a fuller suite of information about what is in the water.

An indicator that most are familiar with is pH. pH measures how acidic (low pH) or alkaline (high pH) water is. pH is an important measurement as aquatic animals and plants are adapted for a certain range of pH – similar to salinity. We are seeing a gradual decrease in the pH of the ocean at a global scale, and this process is called 'ocean acidification'. With more carbon dioxide in our atmosphere, more is being absorbed by the ocean, lowering its pH. This process is especially significant for our coral reefs because more acidic oceans mean it is harder for calcium carbonate to form, which is what corals and shells are largely made of.

#### NUTRIENTS

Two nutrients, nitrogen and phosphorous, are measured as part of this project.

Nitrogen and phosphorous are critical for plant growth, and therefore high levels can cause rapid growth of aquatic plants and algae, which competes with corals. Nitrogen and phosphorous are both present in the marine environment naturally, but runoff from urban and agricultural sources (e.g. fertilisers) have meant that there is more ending up in the waterways and oceans. Nutrients can be measured in a range of ways including the total amount dissolved in the water, particulates, and as ions.

#### CHLOROPHYLL

Chlorophyll-a is a green pigment found in plants. It absorbs sunlight and converts it to sugar during photosynthesis.

Chlorophyll-a in the marine environment usually comes from phytoplankton, which are microscopic marine plants. Phytoplankton have predictable chlorophyll-to-nutrient ratios, so for a given amount of chlorophyll we can estimate the amount of nutrients that must have also been present (e.g. nitrogen and phosphorous). Therefore the amount of Chlorophyll-a is also used to indicate the amount of nutrients in the water.

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