



## CORALWATCH



## ACT NOW for the future of our reefs

**Rising water temperatures are a major contributor to mass coral bleaching events. Get involved in CoralWatch to monitor and protect coral reefs around the globe.**

### What is CoralWatch?

CoralWatch is an organisation built on a research project at the University of Queensland in Brisbane, Australia. CoralWatch uses the Coral Health Chart as a cheap, simple, non-invasive method for the monitoring of coral bleaching, and assessment of coral health. In the field, users simply compare colours of corals with colours on the chart and record matching codes. We ask you to please help by using our Do It Yourself (DIY) Kit to monitor your local reefs, or any that you visit. The Coral Health Chart can be used while diving, snorkelling or reefwalking.

### What is coral bleaching?

Coral bleaching is the whitening of coral due to a loss of symbiotic algae living within the coral tissue. In healthy coral, algae supplies energy and provides colour. During bleaching events, coral expels the algae from their tissue which changes the colour of the coral. As coral expels more algae the coral becomes lighter in colour.

CoralWatch works closely together with Project AWARE Foundation, a nonprofit environmental organisation working with divers to conserve underwater environments through education, advocacy and action.



### How do I get involved?

Everyone can participate in our global reef monitoring project. On our website, you can view all the data of the reefs that have been monitored. To help collect more data, all you need is:

- a Coral Health Chart
- a CoralWatch data sheet.

Bring an underwater slate for snorkelling and diving and use a torch below 5m/15 feet.



Visit our website [www.coralwatch.org](http://www.coralwatch.org) and you can request a free Coral Health Chart. The chart is currently available in English, Chinese, Japanese and Spanish. Data sheets and other monitoring and education materials are available in a variety of languages and can be downloaded for free.

## Healthy and bleached corals



Healthy Branching Coral (BR)



Healthy Boulder Coral (BO)



Healthy Plate Coral (PL)



Healthy Soft Coral (SO)



Bleached Branching Coral (BR)



Bleached Boulder Coral (BO)



Bleached Plate Coral (PL)



Bleached Soft Coral (SO)



# CORALWATCH MONITORING METHODS

## How to use the Coral Health Chart

1. Choose a coral.
2. Look down at the coral and select the lightest area, avoiding the tip of branching corals.
3. Hold the colour chart next to the selected area.
4. Rotate chart until you find the closest colour match.
5. Record the matching colour code along with coral type on the data sheet.
6. Repeat steps 2 to 5 for the darkest area of the coral.
7. Continue survey with other corals.
8. When you finish, log on to our website [www.coralwatch.org](http://www.coralwatch.org) and enter your data online. If you don't have access to the web you can send us your datasheets and we will enter them on your behalf.

*Massive bleached boulder coral*  
Colour code: B1  
Coral type: B0

*Massive healthy boulder coral*  
Colour code: E4  
Coral type: B0

*Bleached branching coral*  
Colour code: E1 Coral type: BR

*Healthy branching coral*  
Colour code: D4 Coral type: BR

The brightness (the number code) indicates the degree of bleaching. It is OK if the colour (letter code) does not match perfectly. However, avoid using the chart for blue-purple coloured corals.

## Coral type

Classifying corals at the species level is very difficult, so easily identified groups are often used when recording data about coral cover or general coral health. For this purpose, coral types are described simply by the basic growth forms or shapes of coral colonies.

The Coral Health Chart uses four coral types to classify corals. **Branching** refers to any branching coral such as *Acropora* species. **Boulder** refers to any massive or rounded corals such as some *Platygyra* and *Porites* species. **Plate** refers to any coral that forms a plate-like formation such as tabular *Acropora* species, and the **soft** category refers to corals lacking a hard skeleton, such as the *Xenia* species.

Corals can exist in many shapes, and some corals may not clearly match any of these categories. Our aim is to keep the chart and survey as simple as possible, so if you're experiencing difficulties when classifying your corals, please simply choose the closest coral type.



branching (BR)



plate (PL)



soft (SO)



boulder (B0)

## Survey Methods

The Coral Health Chart can be used while diving, snorkelling or reefwalking. You can choose one of three monitoring methods depending upon your skills, experience and location:

**Random Survey** – select corals randomly, such as choosing the coral closest to you every second fin kick or when you are reefwalking measure your steps.

**Transect Survey** – select your corals by following a line (transect) and record colour scores every few meters. Make sure that the transect has no affect on marine life.

**Easily Identified Corals** – select corals that you can easily identify and return to.

## Tips

- Assess at least 20 corals per trip (the more the better).
- Use a GPS if available. Alternatively you can locate your reef on our worldmap online when you enter your data. Use our data sheet and don't forget to record your name, country, name of reef, date and time of survey, depth, water temperature and weather conditions.
- Avoid touching coral. A swipe of a fin or a touch of a hand can damage these fragile organisms. Make sure you don't step on corals while reefwalking.
- When diving, secure your equipment and make sure you're properly weighted. Use a torch when diving below 5m/15 feet.



Simply match the colour of the coral with the colour on the chart.

Visit our website and download our data sheets and monitoring materials in a variety of languages.

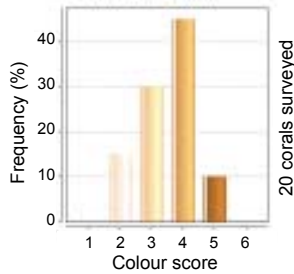




## Your survey

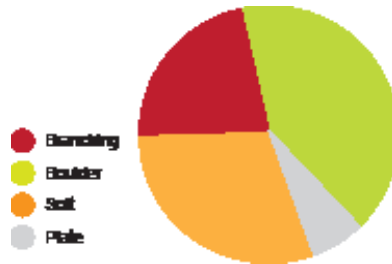
The following graphs will be automatically generated each time you enter data on the web.

### Reef colour score distribution



This bar graph explains the distribution of colour scores that you recorded for a particular reef. This will tell you how healthy your reef is today. A healthy reef has a majority of scores over 3.

### Coral type distribution



This pie chart explains the percentage of each coral type that you monitored. This can give you an idea if your monitoring site is dominated by one type in particular. Some coral types may be more sensitive to bleaching than others.

## Colour scores

The colour charts are based on the actual colours of bleached and healthy corals. Each colour square corresponds to the concentration of symbiotic algae living in the coral tissue, which is directly linked to coral health. The lightest and darkest scores are recorded to allow for natural colour variation across the coral. We use the average score for analysis.

## Why do corals change colour?

In healthy coral, algae (symbiotic dinoflagellates) live within the coral tissue. Algae provide the coral with energy (sugars and amino acids) and give the corals their characteristic brown colour.

Stressful environmental conditions can cause the coral to expel the algae, changing coral colour from brown to white, purple or green. This whitening of coral is called 'coral bleaching'. Sometimes corals can recover from bleaching. If the stressful conditions are severe or persist for a long time, loss of algae and the nutrients they provide for coral can lead to coral death. Even when corals do recover, they do not always return to full health.

The mass bleaching event of 1998 is the most severe bleaching event on record, where one-sixth of the world's coral colonies died! Every year, many corals in the Australian Great Barrier Reef and other reefs around the world show signs of coral bleaching.

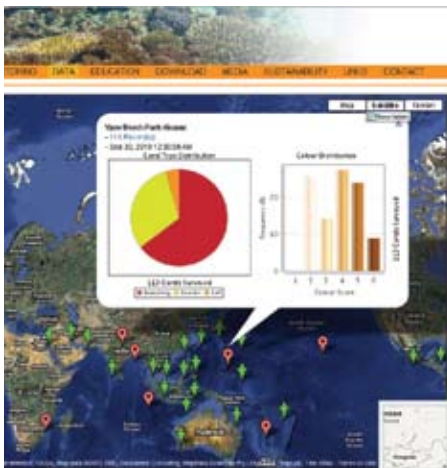
Many environmental stressors can lead to bleaching. However, research shows that increased water temperatures due to global warming is the major cause of recent mass bleaching events. Sea temperatures are predicted to continue to rise, and thus bleaching is expected to occur more frequently. Without action, many coral reefs around the world may be dead within decades.



Acropora corals in various stages of bleaching.

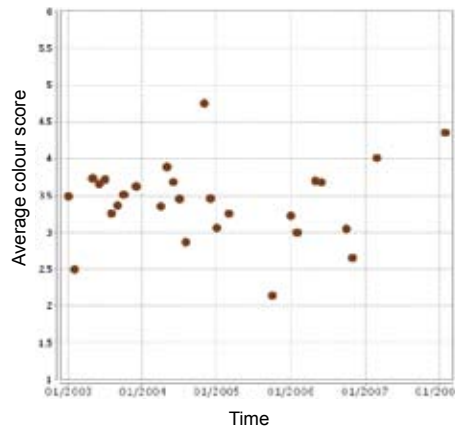
## Viewing worldwide data

### Reefs worldwide



Our website allows you to view all the data recorded for a particular reef. The worldmap shows all our monitoring sites worldwide, currently 551 reefs.

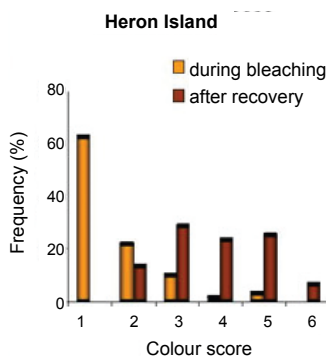
### Average colour score over time



This graph shows average health scores for a specific reef over time. Significant drops in your colour score can relate to coral bleaching or other threats to coral health.

## Further research

### Comparing reef health



With our Excel sheets (downloadable from [www.coralwatch.org](http://www.coralwatch.org)) you can create your own graphs. For example, you can compare reefs before, during and after a bleaching event, or compare health scores of different coral types.

This graph shows the colour scores obtained for unhealthy, bleached corals (1-3) during a bleaching event on Heron Island and healthy, brown-coloured corals after recovery (4-6).



# CORALWATCH EDUCATION

## Why we need your help

Very little is known about trends of coral bleaching on a global scale. Monitoring is most effective when conducted over years. There are not enough scientists to monitor all the world's reefs. This is where you can help! If many people around the world, like you, participate in the monitoring program we will be able to answer questions such as:

### Patterns of coral bleaching

Based on water temperature measurements and knowledge of currents, it is possible to predict which areas will be affected by bleaching. We hope to answer several questions within this. Do all reefs bleach during every El Niño event, or are there some reefs/zones of reef that never bleach? Does the same reef bleach every time?

### Severity of coral bleaching

For how long are different reefs affected by bleaching events? How severely are different reefs around the world affected? Is the severity and duration dependent on whether or not a reef has bleached before? Does the overall health of the reef get worse from one bleaching event to another?

### Patterns of recovery

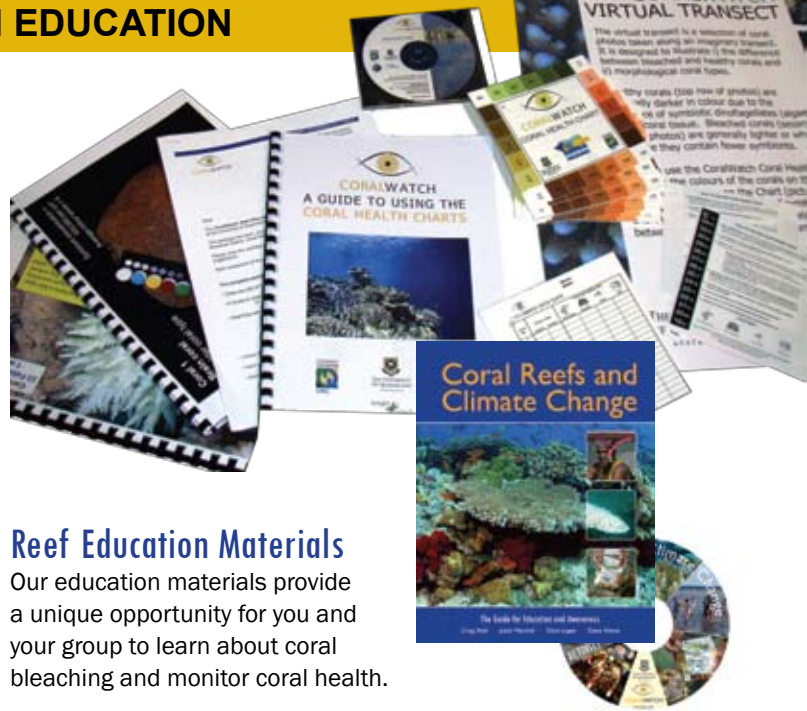
To date, most research has concentrated on the onset of bleaching rather than recovery. With your help it will be possible to measure recovery - how long does it take for different reefs to recover? Is it variable between different reefs and coral types?

## Other events that lead to bleaching

Stressors such as salinity changes after a storm or increasing ocean acidity can lead to coral bleaching. Outbreaks of natural coral predators such as the crown of thorns starfish can also lead to coral death. With your help, regular monitoring of coral health throughout the year will help us measure the impact of all events that damage coral health and assess how corals recover.



Crown-of-thorns sea-star.



## Reef Education Materials

Our education materials provide a unique opportunity for you and your group to learn about coral bleaching and monitor coral health.

“Coral Reefs and Climate Change: the guide for education and awareness”, focuses on coral reefs, the astonishing abundance of life within them, and the impacts of climate change on this beautiful environment. There is hope for reefs but we must act now! Coral reefs are being lost more than five times faster than the rainforest and it is up to us to prevent their continued degradation.

The book comes with a Coral Health Chart and an activity CD containing: a workbook with individual, classroom, lab and field activities, datasheets, CoralWatch instructional video, further reading and education materials. The book is not aimed at scientists but at educators, students, reef enthusiasts, professionals and interested people.

### Our complete education package contains:

- ‘Coral Reefs and Climate Change: the guide for education and awareness’, 256 pages
- ‘Coral Reefs and Climate Change’, Activity CD
- Class set (30) of Coral Health Charts
- A Guide to Using the Coral Health Charts (hard copy)
- Virtual Transect poster
- Virtual Reef & Virtual Lab (hard copies)
- Sample dive/snorkel data slate and datasheets

facebook

For more info visit [www.coralwatch.org](http://www.coralwatch.org)

twitter

## Further reading

- Teymour, A. Rad and M.S. Sanjani (2010) Status of Coral Reef Species at Chabahar Bay, Sistan and Baluchistan, Iran. Pakistan Journal of Biological Sciences.
- Reid, C., Marshall, N.J., Logan, D. and Kleine, D. (2009) Coral Reefs and Climate Change: The guide for education and awareness. CoralWatch, The University of Queensland, Brisbane. 256 p ISBN 9780646523606
- Leiper, I.A., Siebeck, U.E., Marshall, N.J., and Phinn, S.R. (2009) Coral health monitoring: linking coral colour and remote sensing techniques. Canadian Journal of Remote Sensing 35:276-286
- Siebeck, U.E., Marshall, N.J., Hoegh-Guldberg, O., (2006): Monitoring coral bleaching using a colour reference card. Coral Reefs 25:453-460
- Hoegh-Guldberg, O. (1999): Climate change, coral bleaching and the future of the world's coral reefs. Marine and Freshwater Research 50: 839-866.

## Support



### Do It Yourself Kit

Information leaflet, Coral Health Chart and CoralWatch Datasheet.

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### Contact details and more information:

CoralWatch, Sensory Neurobiology Group, Queensland Brain Institute, The University of Queensland, St. Lucia, Brisbane, QLD 4072 Australia, phone +61 (0) 7 3365 3127 fax +61 (0) 7 3365 4522 info@coralwatch.org www.coralwatch.org



# CORALWATCH

## DATA SHEET

Group name: \_\_\_\_\_ Your name: \_\_\_\_\_

Email address: \_\_\_\_\_

Participation field: dive centre / scientist / environmental / school or university / tourist

Country of reef: \_\_\_\_\_ Reef name: \_\_\_\_\_

GPS if possible: \_\_\_\_\_ Sea temperature: \_\_\_\_\_ °C

Date of survey: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ Time collected: (ie. 14:00 or 2pm) \_\_\_\_\_  
Day Month Year

Weather: sunny / cloudy / raining Your activity: reef walking / snorkelling / diving

**\*Please note: data will not be accepted on the website if any of these fields are left blank**

Coral Number	Colour Code		Coral Type			
	L=Lightest	D=Darkest	Br=Branching	Bo=Boulder	Pl=Plate	So=Soft
<i>example</i>	L: D2	D: E5	Br	Bo	Pl	So
1	L:	D:	Br	Bo	Pl	So
2	L:	D:	Br	Bo	Pl	So
3	L:	D:	Br	Bo	Pl	So
4	L:	D:	Br	Bo	Pl	So
5	L:	D:	Br	Bo	Pl	So
6	L:	D:	Br	Bo	Pl	So
7	L:	D:	Br	Bo	Pl	So
8	L:	D:	Br	Bo	Pl	So
9	L:	D:	Br	Bo	Pl	So
10	L:	D:	Br	Bo	Pl	So
11	L:	D:	Br	Bo	Pl	So
12	L:	D:	Br	Bo	Pl	So
13	L:	D:	Br	Bo	Pl	So
14	L:	D:	Br	Bo	Pl	So
15	L:	D:	Br	Bo	Pl	So
16	L:	D:	Br	Bo	Pl	So
17	L:	D:	Br	Bo	Pl	So
18	L:	D:	Br	Bo	Pl	So
19	L:	D:	Br	Bo	Pl	So
20	L:	D:	Br	Bo	Pl	So

### Check out these resources...

Reid, C., Marshall, J., Logan, D., Kleine, D. (2009) Coral Reefs and Climate Change: the guide for education and awareness. CoralWatch, Brisbane.

Siebeck, U.E., Marshall, N.J., Kluter, A. and Hoegh-Guldberg, O. (2006) *Coral Reefs* 25(3):453-460

Any other relevant information, e.g. average diving depth, species of coral, pollution, long term weather such as drought, flood, heat-wave.

Please submit all data directly onto the CoralWatch website [www.coralwatch.org](http://www.coralwatch.org)

Alternatively, if you don't have access to the web, you can send them;

ii) by fax: +61 7 3365 4522 to the attention of CoralWatch

iii) by post: CoralWatch, QBI, University of Queensland, Brisbane, QLD 4072 Australia

Thank you very much for participating! Check our website for survey results and global bleaching trends.