

Coral Cover

Subject matter: interpret, with reference to regional trends, how coral cover has changed on a reef over time.

Recommended reading: *Coral Reefs and Climate Change - State of the reefs (p.124), Reefs in decline (p.125)*

View video: *Coral Reefs and Climate Change - Reefs our biggest concern*

Scientific article: *The 27-year decline of coral cover on the Great Barrier Reef and its causes.*

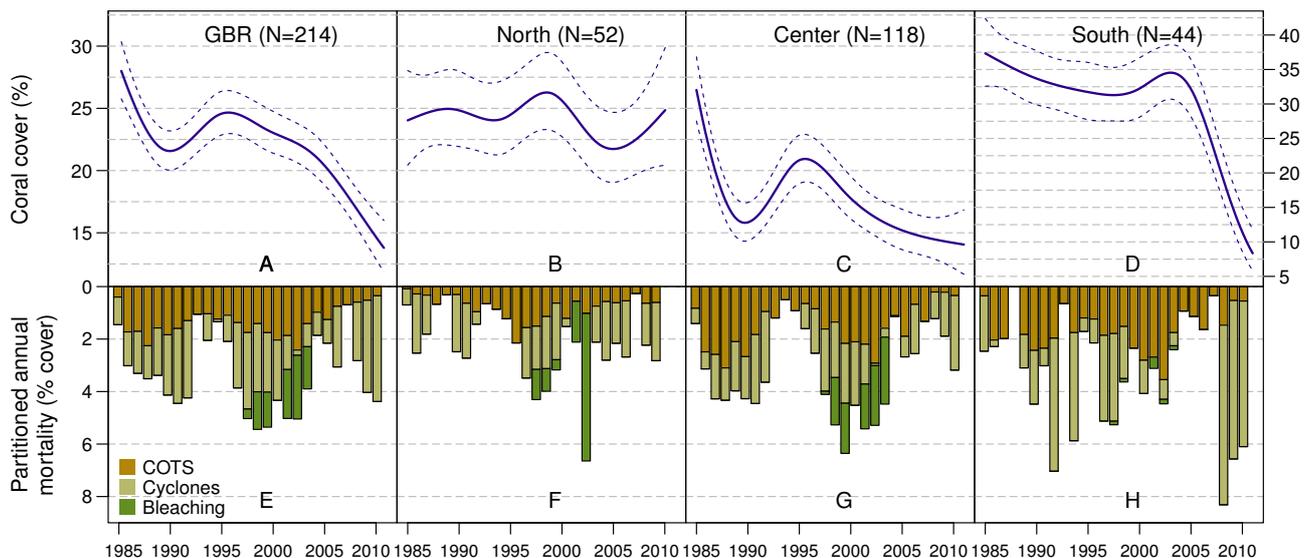
De'ath G, Fabricius KE, Sweatman H, Puotinen M (2012). *The 27-year decline of coral cover on the Great Barrier Reef and its causes.* (www.scienceinpublic.com.au/wp-content/uploads/Full-PNAS-paper-for-publication.pdf)

Ecological Monitoring of Coral Reefs, Jos Hill and Clive Wilkinson (<https://portals.iucn.org/library/efiles/documents/2004-023.pdf>)

Coral cover - Classroom

One important way to assess the health of coral reefs is to measure how much of an area is actually covered by hard corals. This measurement is called 'coral cover'. The amount of coral cover is influenced by rates of reproduction, growth and mortality. When corals reproduce less, grow more slowly or die more frequently, coral cover declines. Scientists around the world are identifying how coral cover is changing in response to local and global stressors.

The Great Barrier Reef is one of the best-managed reefs in the world. However, long term monitoring by the Australian Institute of Marine Science shows that the Great Barrier Reef is also exhibiting significant loss of coral cover. Between 1985 and 2012, coral cover over 214 sites has reduced from 28% to 14%. Most of this decline has occurred since 1998. Like the decline in the Caribbean, some regions were more affected than others. Key contributors to coral mortality were cyclones (48%), outbreaks of crown-of-thorns sea star (COTS) (42%) and coral bleaching (10%).



Temporal trends in coral cover (A–D) and annual mortality due to COTS, cyclones, and bleaching (E–H) for the whole GBR and the northern, central, and southern regions over the period 1985–2012 (N, number of reefs). (A–D) Trends in coral cover, with blue lines indicating estimated means (± 2 SEs) of each trend. (E–H) Composite bars indicate the estimated mean coral mortality for each year, and the sub-bars indicate the relative mortality due to COTS, cyclones, and bleaching. The periods of decline of coral cover in A–D reflect the high losses shown in E–H.

Explain the findings of the study (De'ath G, Fabricius KE, Sweatman H, Puotinen M (2012)) and address the following questions:

1. What does the research tell us about the health of reefs worldwide?
2. How have reefs changed over time?
3. Which areas of the Great Barrier Reef have exhibited the largest decline?
4. Which areas have exhibited the least decline?
5. Selecting one area of the reef, what factors have contributed to the observed decline?
6. How do these factors affect reef organisms?
7. What other factors are expected to influence health of the Great Barrier Reef in the future?

Coral Cover

Crown-of-thorns sea star - Classroom

The crown of thorns sea star can cause high rates of coral mortality. Use the internet to research this creature, and answer the following questions:

1. What is the scientific name of this animal, and what Phyla does it belong to?
What other marine organisms are in this phyla?
2. How does the crown-of-thorns sea star eat coral?
3. How much coral can a crown-of-thorns sea star eat in one day?
4. Why is it important not to touch these creatures?
5. What factors influence outbreaks of crown-of-thorns sea star ?
6. How do scientists and reef managers remove crown-of-thorns sea stars from the reef?



Angela Dean

Coral Cover - Classroom

Read Methods for Ecological Monitoring of Coral Reefs, Jos Hill and Clive Wilkinson.

Describe at least 3 different ways to measure coral cover in reef monitoring research. How is each of these conducted? List any specific advantages or disadvantages of each method.

Estimating coral cover using quadrats - Field

1. Start from the shore and work towards the reef crest.
2. Place your quadrat randomly.
3. Calculate the percentage of coral, algae and sand/rock within the quadrat.
4. Plot your results in a bar graph. Don't forget to label each axes.
5. Discuss your results.
 - a. Is there more coral cover towards the reef crest?
 - b. What is the size of the area you covered?
 - c. Based on your results, estimate the coral cover of the lagoon. Was the area you measured similar to other areas of the lagoon? Or did your area have more (or less) coral than the rest of the lagoon?
6. Answer the following questions:
 - a. How can you estimate coral cover using a quadrat?
 - b. Does the coral cover change when you move from shore to reef crest?
 - c. How can you estimate the overall coral cover of your area?



Chris Gillies

Equipment

- Booties, hat and sunscreen
- Waterproof slate or paper with pencil
- Viewing tube (if available)
- Quadrat

Teacher notes

- *The easiest way to conduct this activity is on the reef flat at low tide.*
- *The percentage cover of hard coral is one indicator of reef health.*
- *You can also use this exercise to practice recognising algae, invertebrates, hard corals and rock.*



CoralWatch

Estimating coral cover using transects - Field

1. Lay out a tape measure or string with measurements marked on it.
2. Record data every 50 cm. Is there coral found directly underneath the transect tape.
3. You can swim or walk along the tape.
4. Calculate the percentage coral cover. Number of times coral recorded divided by the total of points along the transect assessed (e.g if there are 40 points assessed and only 20 have coral then percentage coral is 50%).