Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Queensland Curriculum and Assessment Authority

Marine Science 2025 v1.2

IA1: Sample assessment instrument

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Student name	sample only
Student number	sample only
Teacher	sample only
Exam date	sample only

Marking summary

Criterion	Marks allocated	Provisional marks
Data test (10%)	10	
Overall	**10**	

Conditions

Technique	Data test
Unit	Unit 3: Marine systems — connections and change
Topic/s	Topic 1: The reef and beyond Topic 2: Changes on the reef
Time	60 minutes + 5 minutes perusal
Seen / Unseen	Unseen questions and data sets
Other	QCAA-approved graphics or scientific calculator permitted

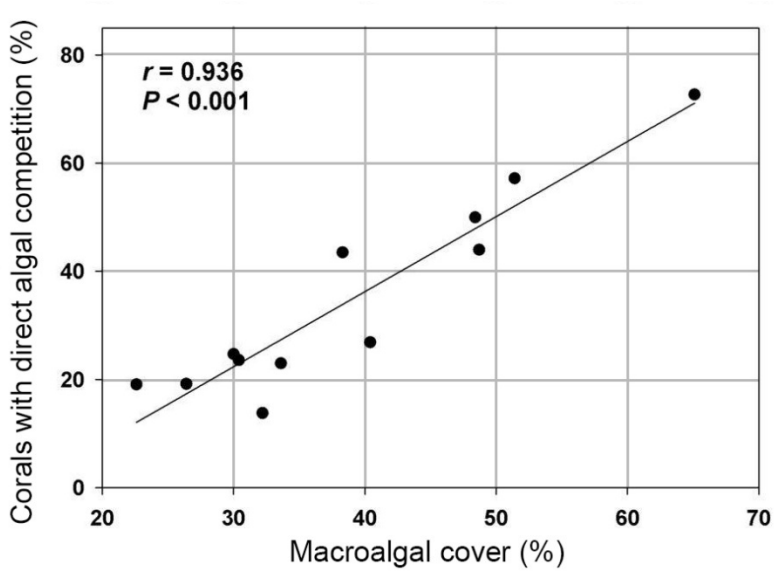
Instructions

Use the datasets to respond to the associated questions in the spaces provided. Each question is associated with the dataset that immediately precedes it.

Dataset 1

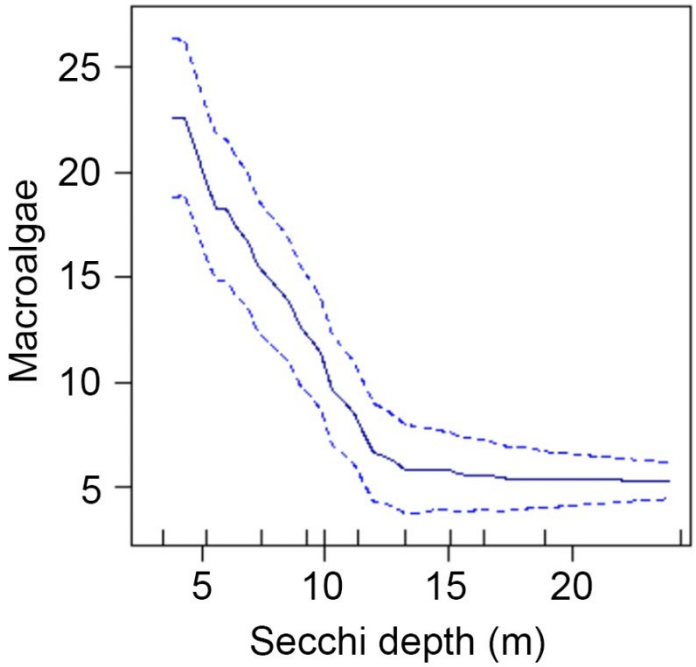
The graphs below show patterns in macroalgal cover, coral competition and water clarity.

Figure 1: Patterns in macroalgal cover and juvenile coral density and competition



(Burkepile, D. E., et al, 2013)

Figure 2: Partial effects plots of changes of macroalgal cover along gradients of water clarity (Secchi depth, in m)



(De'ath, G. & Fabricius, K. E., 2008)

Question 1 (2 marks)

Determine the:

a. percentage macroalgal cover that corresponds to a 40% direct competition with coral (refer to Figure 1)

Answer: ……%

b. Secchi depth that corresponds to the highest macroalgal cover (~22.5%) (refer to Figure 2).

Answer: ……m

Question 2 (4 marks)

Identify the relationship between percentage macroalgal cover and:

a. direct competition with coral

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b. water clarity (Secchi depth).

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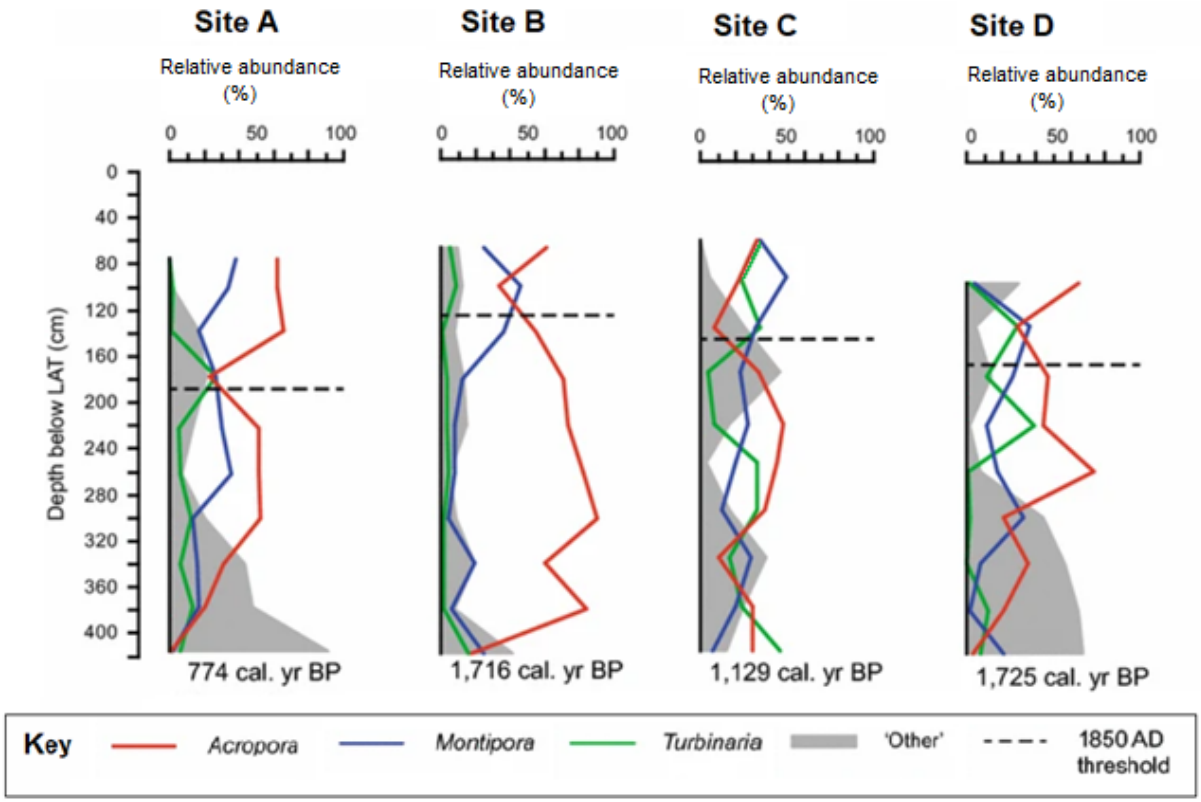
Dataset 2

The figure below shows the changes in coral communities over time, as reconstructed from coral cores collected at four sites on an inshore reef.

In the figure, the relative mass abundance of the major coral genera (*Acropora*, *Montipora*, and *Turbinaria*) is shown with a coloured line. All remaining taxa are grouped as 'Other' and shaded grey. Average ages (calibrated year before present [cal. yr BP]) and elevations (depth below lowest astronomical tide [LAT] cm) of the European settlement 1850 AD threshold (dashed line) are presented for each reef.

Figure 3: Fossil coral assemblages at Paluma Shoals, Great Barrier Reef



(Johnson, J.A., et al, 2017)

Question 3 (1 mark)

Identify the depth below LAT of the 1850 threshold at site A.

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Question 4 (2 marks)

Determine the site that shows the greatest change in coral diversity over time. Provide evidence to support your response.

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Question 5 (2 marks)

Infer which coral genus is most resistant to environmental changes since European settlement.

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Dataset 3

Scientists investigated the biodiversity of hard coral on Moffatt Reef in Hypothetical Bay. Their investigation lasted several months. The scientists recorded the number of individual coral colonies in multiple underwater video transects. Table 1 summarises their results.

In writing your response, you may use the abbreviations given in the table for the species' names.

Table 1: Mean number of coral recorded on Moffatt Reef in Hypothetical Bay

Species of coral	Mean number of individual coral colonies		p-value
	Site A	Site B	
Fungia fungites (FF)	14	0	< 0.001
Stylophora pistillata (SP)	25	11	< 0.05
Acropora hyacinthus (AH)	19	21	< 0.001
Acropora tenuis (AT)	32	3	< 0.001

Question 6 (2 marks)

Contrast the difference in the mean number of individual coral colonies in site A and site B for *Fungia fungites* and *Acropora hyacinthus*.

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Question 7 (2 marks)

Draw a conclusion about what the different p-values in Table 1 show. Give reasons for your conclusion.

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Question 8 (3 marks)

Calculate the species diversity for Site B (to two decimal places) using the following formula:

$$\text{SDI} = 1 - \left(\frac{\sum n(n-1)}{N(N-1)}\right)$$

where:

N = total number of organisms of all species

n = number of organisms of one species

Show your working.

$SDI_{Site\ B}$ =.....

Question 9 (2 marks)

In a follow-up experiment, two individual coral colonies were observed in Site B of Moffatt Reef in Hypothetical Bay.

Infer the probability that these two individual coral colonies were from the same species. Give a reason for your response.

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Instrument-specific marking guide (IA1): Data test (10%)

Data test	Cut-off	Marks
The student response has the following characteristics:		
• consistent demonstration, across a range of scenarios, of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data – correct and appropriate use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty – correct interpretation of evidence to draw valid conclusions	>90%	10
	>80%	9
• consistent demonstration of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data – correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty – correct interpretation of evidence to draw valid conclusions	>70%	8
	>60%	7
• adequate demonstration of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data – correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty – correct interpretation of evidence to draw valid conclusions	>50%	6
	>40%	5
• demonstration of elements of – selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications – correct calculation of quantities through the use of algebraic, visual or graphical representations of scientific relationships or data – correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations or uncertainty – correct interpretation of evidence to draw valid conclusions	>30%	4
	>20%	3
• demonstration of elements of – application of scientific concepts, theories, models or systems to predict outcomes, behaviours or implications – calculation of quantities through the use of algebraic or graphical representations of scientific relationships and data – use of analytical techniques to identify trends, patterns, relationships, limitations or uncertainty – interpretation of evidence to draw conclusions.	>10%	2
	>1%	1
The student response does not match any of the descriptors above.		0