LUI | | | | | | | | | | | School code | | | | |

School name

Given name/s

Family name

Attach your barcode ID label here

Book of books used

External assessment 2025

Question and response book

Marine Science

Paper 2

Time allowed

- Perusal time — 10 minutes
- Working time — 90 minutes

General instructions

- Answer all questions in this question and response book.
- Write using black or blue pen.
- QCAA-approved calculator permitted.
- Planning paper will not be marked.

Section 1 (46 marks)

- 11 short response questions

Clear zone — margin trimmed off after completion of assessment

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

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Section 1

Instructions

- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page …
  - If you do not do this, your original response will be marked.

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QUESTION 1 (1 mark)

Identify a factor that reduces the capacity for aquaculture to address food security in developing countries.

QUESTION 2 (3 marks)

Explain how dynamic spatial monitoring informs the effective management of a migratory species fishery.

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QUESTION 3 (4 marks)

Barramundi are a relatively difficult fish to breed. Fish that are less than 150 mm total length will cannibalise smaller fish up to 67% of their own length. Despite these challenges, barramundi remain a popular aquaculture species.

a) Identify two attributes of barramundi that make them desirable to farm. *[2 marks]*

1. _____

2. _____

b) Infer how cannibalism in barramundi can be reduced. Show your reasoning. *[2 marks]*

_____

_____

_____

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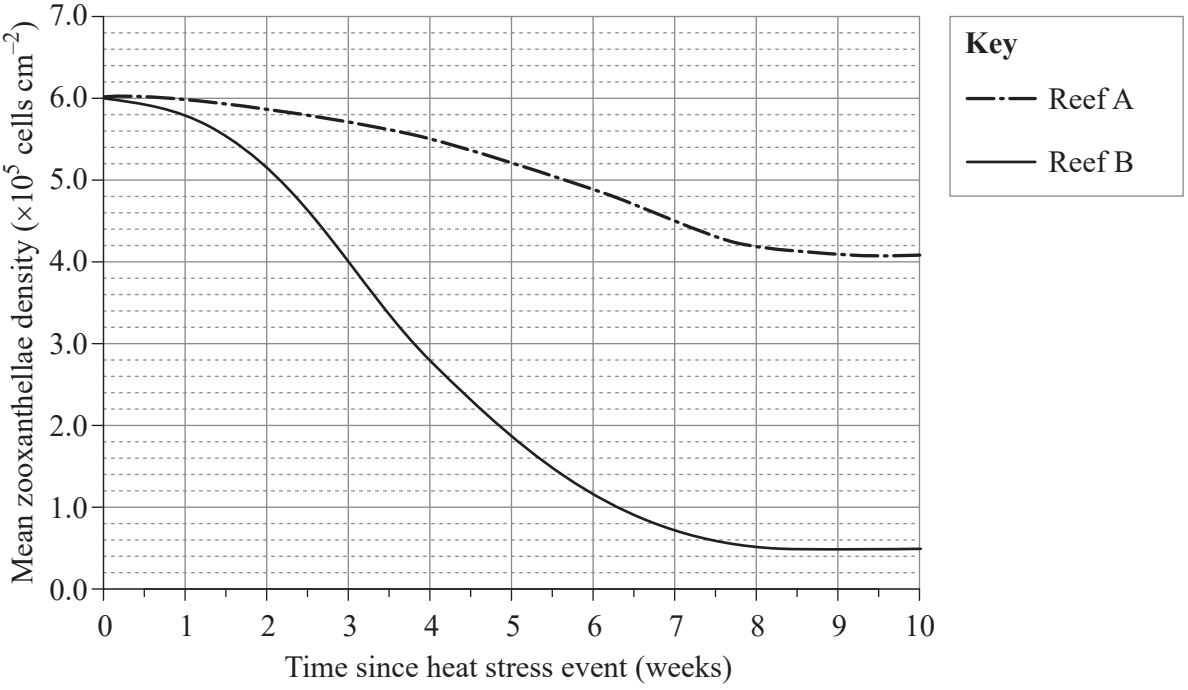
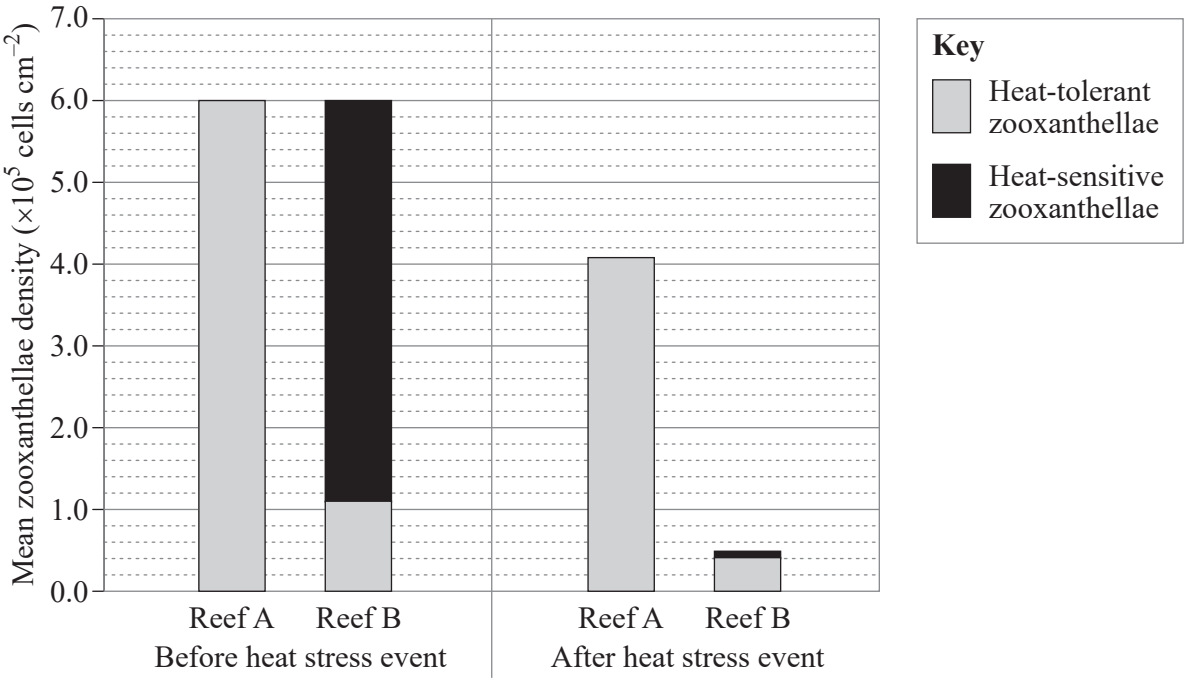
QUESTION 4 (9 marks)

A study was conducted to measure the effect of a heat stress event on the density and type of zooxanthellae in *Acropora*. Tissue samples from corals were collected from two reef locations (A and B).

The first graph shows the mean zooxanthellae density over time after the heat stress event for each reef. The second graph shows the mean density of two different types of zooxanthellae before and after the heat stress event.





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a) Determine the reef that would most likely show *Acropora* bleaching as a result of the heat stress event. Show your reasoning. *[2 marks]*

b) Compare the responses of reef A and reef B to the heat stress event. *[3 marks]*

Similarity:

Difference:

Significance:

Do not write outside this box.

c) Predict the effect that a reduction in zooxanthellae density would have on the energy of *Acropora* on reef A. Justify your reasoning. *[2 marks]*

One year after the study, *Acropora* on both reefs had recovered their zooxanthellae density to the level seen before the heat stress event, however, the altered proportions of zooxanthellae types was maintained.

d) Predict how the altered proportion of zooxanthellae would affect the heat tolerance of *Acropora* on reef B to future heat stress events. Justify your response, referring to the second graph. *[2 marks]*

Do not write outside this box.

QUESTION 5 (4 marks)

a) Describe the concepts of maximum sustainable yield (MSY) and maximum economic yield (MEY). *[2 marks]*

b) Explain whether MSY or MEY should be used to manage a fishery in decline. *[2 marks]*

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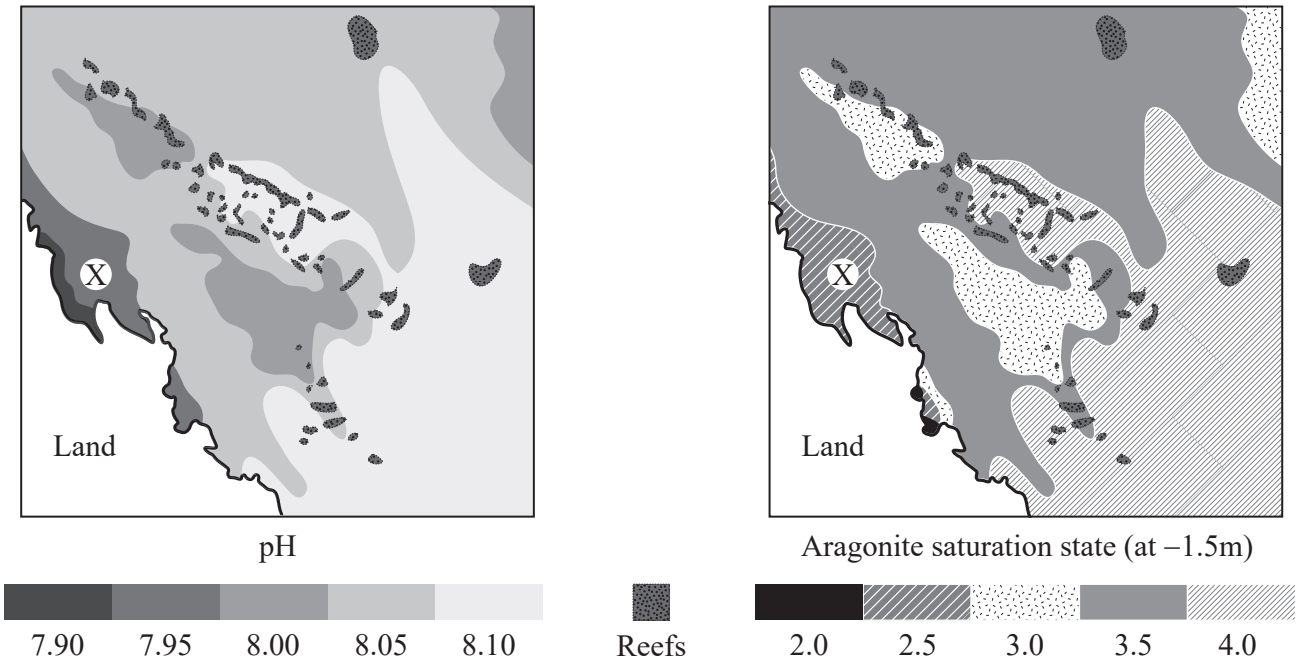
QUESTION 6 (3 marks)

The maps show the average yearly pH and aragonite saturation state for a section of the lower Great Barrier Reef.



a) Describe the relationship between pH and aragonite saturation state. *[1 mark]*

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b) Predict how corals would respond to the pH and aragonite saturation state at location X. Justify your prediction. *[2 marks]*

QUESTION 7 (3 marks)

a) Identify two reasons a significant proportion of Australian seafood is exported. *[2 marks]*

b) Describe how market demand influences the price of a seafood product. *[1 mark]*

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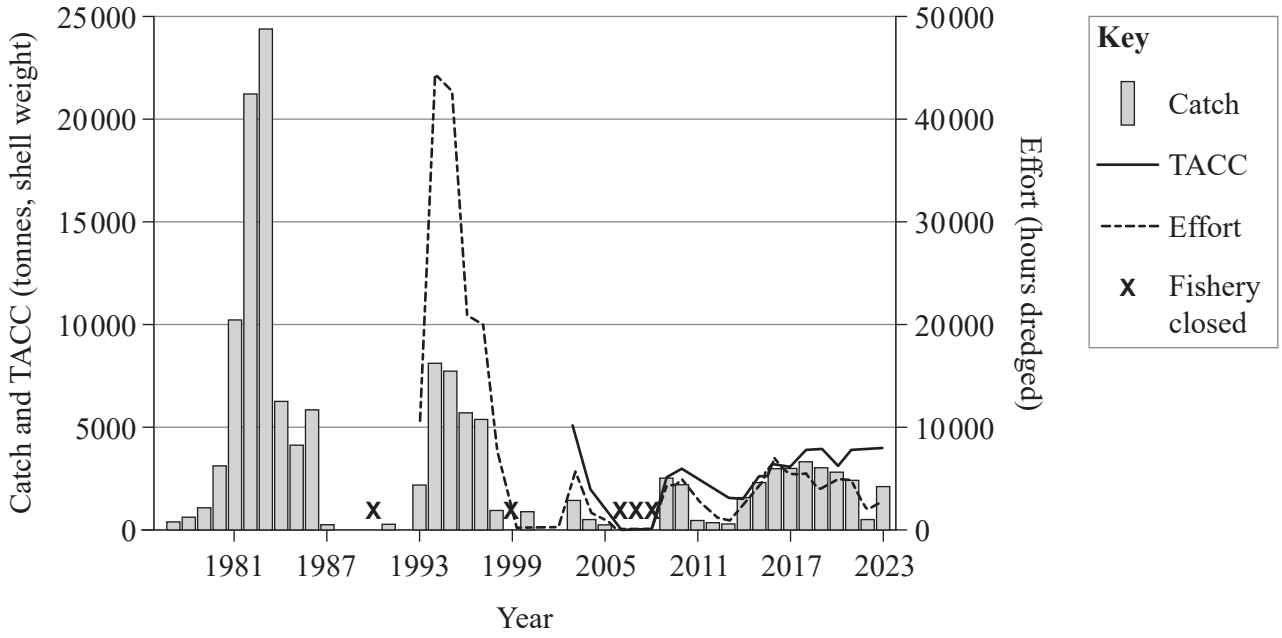
QUESTION 8 (4 marks)

The graph shows the catch, total allowable commercial catch (TACC) and effort for a scallop fishery between 1977 and 2023.



Infer two ways this data was used to inform fishery management decisions and the effect of those decisions on the fishery. Refer to data in your response.

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QUESTION 9 (7 marks)

As part of an investigation into the population dynamics of Australasian snapper (*Chrysophrys auratus*), researchers collected data from commercial fisheries logbooks and self-reported recreational boat charter reports. The researchers also recruited recreational fishers to catch, tag and release 1500 juvenile snapper in an inshore estuarine area. Four tagged fish were subsequently recaptured at deep offshore reefs.

a) Explain why estuarine fish were recaptured on an offshore reef. *[2 marks]*

b) Discuss the reliability of commercial fisher logbooks and self-reported recreational boat charter reports as sources of fisheries management data. *[3 marks]*

Do not write outside this box.

c) Identify two limitations of the capture–recapture method of data collection. *[2 marks]*

QUESTION 10 (3 marks)

Explain how changing sea levels have influenced the Great Barrier Reef over the past 20 000 years.

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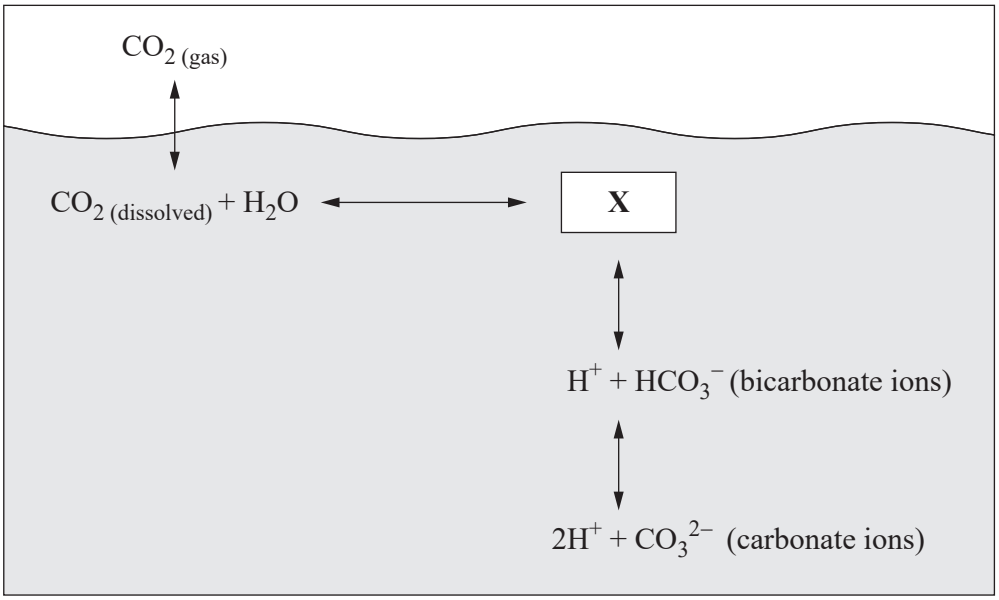
QUESTION 11 (5 marks)

The diagram shows how atmospheric carbon dioxide influences ocean chemistry.



a) Identify X. *[1 mark]*

b) Explain why high atmospheric carbon dioxide has different chemical effects in sea water and fresh water. *[2 marks]*

Do not write outside this box.

c) Explain the effect of increasing ocean temperature on carbon dioxide uptake and the pH of oceans. *[2 marks]*

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ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

References

Question 4

Jones G & King S 2015, 'Dimethylsulphoniopropionate (DMSP) as an Indicator of Bleaching Tolerance in Scleractinian Corals', *Journal of Marine Science and Engineering*, 3(2), 444–465. https://doi.org/10.3390/jmse3020444

Bar graph inspired by

Naugle, M 2018, 'Do the Shuffle: One Way Corals May Cope with Climate Change', *Reefbites*, https://reefbites.com/2018/07/16/do-the-shuffle-one-way-corals-may-cope-with-climate-change/

which takes data from

Berkelmans R, van Oppen MJH 2006, 'The role of zooxanthellae in the thermal tolerance of corals: a 'nugget of hope' for coral reefs in an era of climate change'. *Proceedings of the Royal Society B Biological Sciences*, https://royalsocietypublishing.org/doi/10.1098/rspb.2006.3567

Question 6

Australian Institute of Marine Science (n.d.). Total alkalinity, pH and aragonite saturation state (GBR4 BGC v3.1 baseline), *AIMS eReefs*, https://ereefs.aims.gov.au/ereefs-aims/gbr4/bgc/baseline/alk_ph_omega-ar#frame=Yearly;region=south-2;year=2010

Question 8

ABARES, 2024, 'Fishery status reports 2024', *Australian Government – Department of Agriculture, Water and the Environment*, https://daff.ent.sirsidynix.net.au/client/en_AU/search/asset/1036261/0.

Question 10

Webb, P 2023, 'Introduction to Oceanography', *Pressbooks*, p. 177, https://rwu.pressbooks.pub/webboceanography/

Data and information provided in this paper may have been developed or adjusted for exam purposes and should not be taken as factual.