

External assessment 2023

Multiple choice question book

Marine Science

Paper 1

General instruction

- Work in this book will not be marked.



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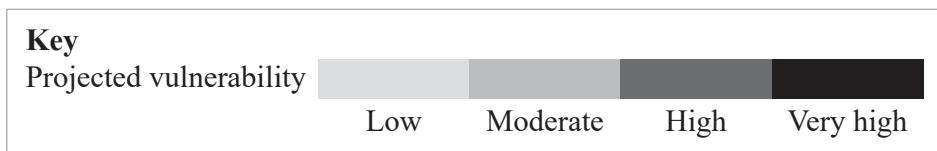
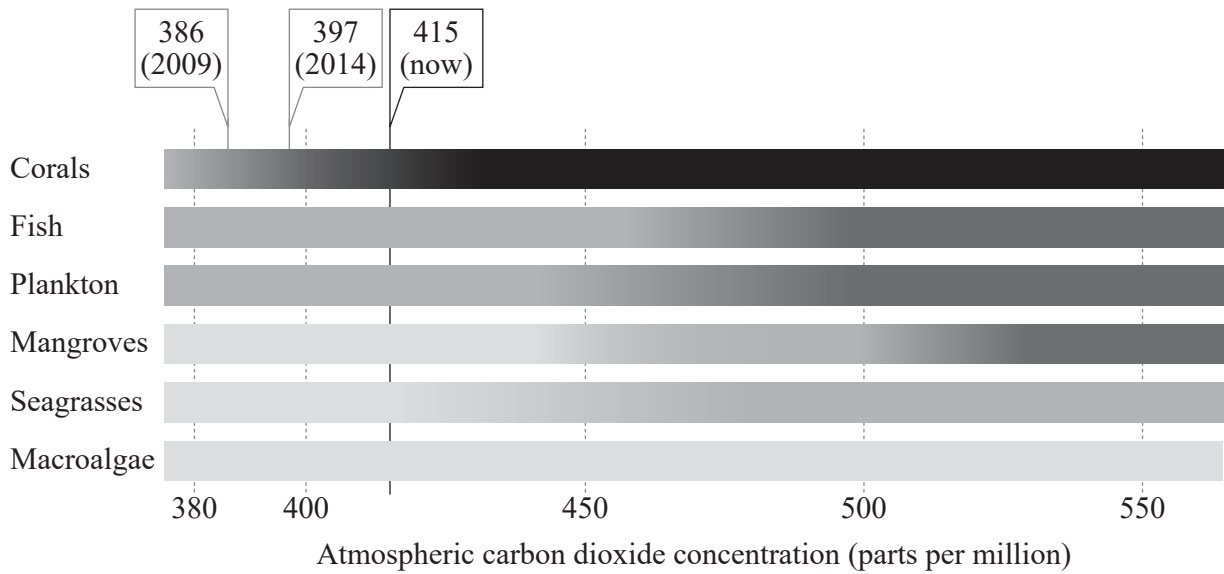
Section 1

Instruction

- Respond to these questions in the question and response book.
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QUESTIONS 1–2

These questions refer to the graph showing the projected vulnerabilities of groups of tropical marine species to increasing atmospheric carbon dioxide concentrations. Recorded concentrations of atmospheric CO₂ at specific times are also shown.



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QUESTION 1

Identify the species most resilient to increasing atmospheric carbon dioxide concentrations.

- (A) corals
- (B) plankton
- (C) seagrasses
- (D) macroalgae

QUESTION 2

Infer the projected vulnerability of coral reef habitats to a 450 ppm atmospheric carbon dioxide concentration.

- (A) low–moderate
- (B) moderate–high
- (C) high–very high
- (D) very high

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QUESTION 3

Which factor has the greatest influence on biodiversity of coral reef fish species?

- (A) rugosity
- (B) predation
- (C) light availability
- (D) dissolved oxygen

QUESTION 4

Fisheries management practices are implemented to recover populations in decline and monitor populations in recovery. The practice only used with fish populations in serious decline is

- (A) restricting total allowable catch.
- (B) monitoring stock levels.
- (C) closing fisheries.
- (D) limiting effort.

QUESTION 5

Changes in Great Barrier Reef coral distribution since the end of the last ice age can be mostly attributed to rising sea levels and

- (A) decreased aragonite concentration.
- (B) increased light and substrate availability.
- (C) increased temperature and decreased salinity.
- (D) decreased nitrate and phosphate concentrations.

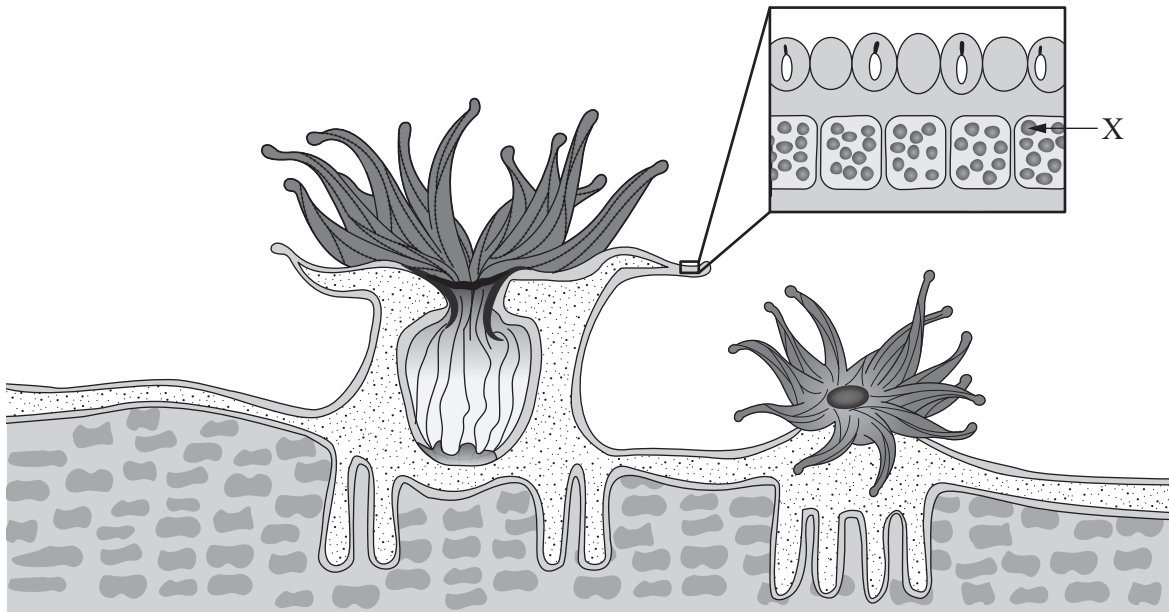
QUESTION 6

The abiotic factor limiting the carrying capacity of an Atlantic salmon farm is low

- (A) dissolved oxygen.
- (B) temperature.
- (C) ammonia.
- (D) nitrites.

QUESTION 7

The anatomy of a coral is shown.

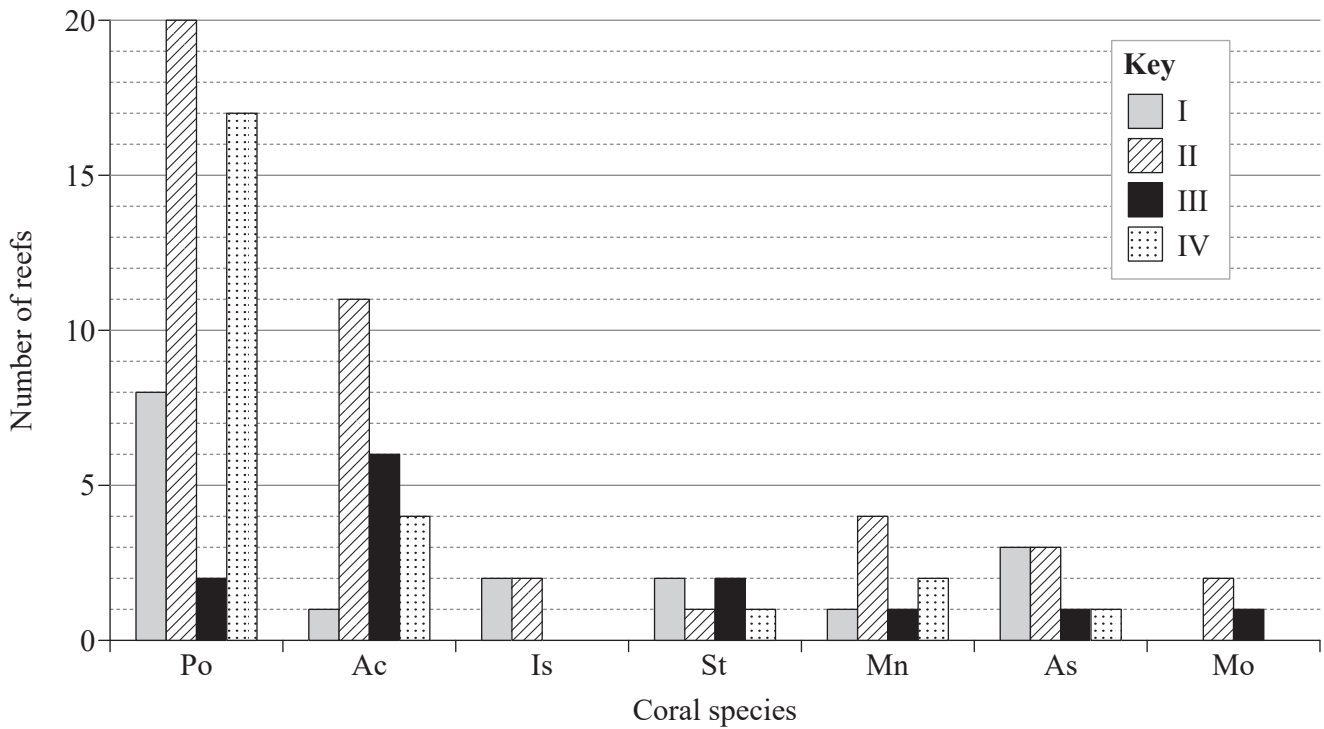


X indicates a

- (A) zooxanthella.
- (B) nematocyst.
- (C) coelenteron.
- (D) tentacle.

QUESTIONS 8–9

These questions refer to the graph showing the occurrence of coral species across four locations (I, II, III and IV).



QUESTION 8

Identify the species seen on the greatest number of reefs in location III.

- (A) Po
- (B) Ac
- (C) St
- (D) Mn

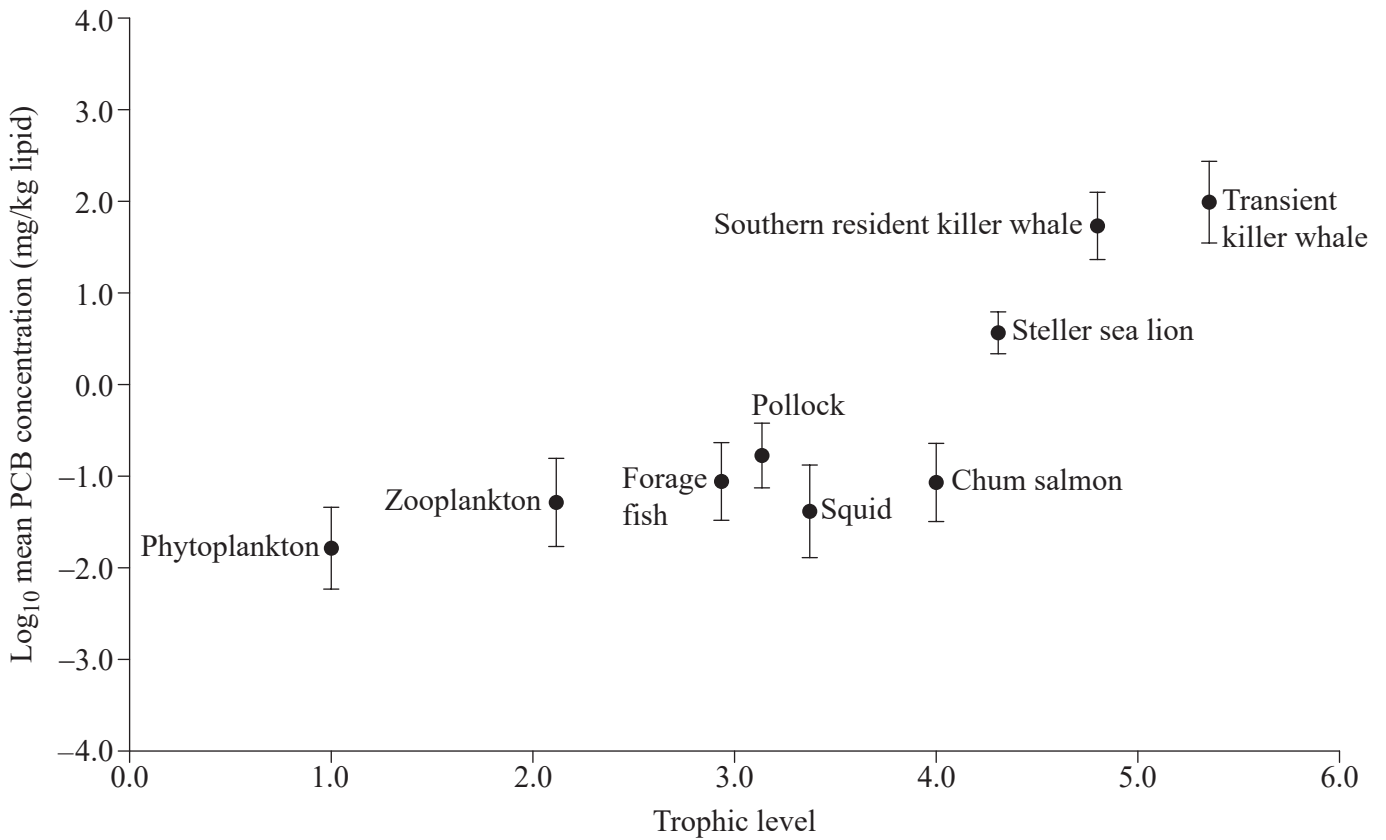
QUESTION 9

Species evenness is lowest at location

- (A) I.
- (B) II.
- (C) III.
- (D) IV.

QUESTIONS 10–11

These questions refer to the graph showing the concentration of polychlorinated biphenyl (PCB) in the lipids of various organisms from the north-eastern Pacific Ocean. Error bars show standard deviation.



QUESTION 10

What is the relationship between mean PCB concentration and trophic level?

- (A) Mean PCB concentration causes a change in trophic level.
- (B) As trophic level increases, mean PCB concentration increases.
- (C) There is no relationship between trophic level and mean PCB concentration.
- (D) There is a negative correlation between trophic level and mean PCB concentration.

QUESTION 11

The mean PCB concentration of zooplankton and southern resident killer whales differ by an approximate factor of

- (A) 3
- (B) 30
- (C) 100
- (D) 1000

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QUESTION 12

When the recovery pathway of an ecosystem differs from its degradation pathway, the ecosystem

- (A) shows hysteresis.
- (B) has low resilience.
- (C) has high biodiversity.
- (D) exists in a single stable state.

QUESTION 13

Which type of fishery is most likely to be a food source for small communities from developing nations?

- (A) trawling
- (B) artisanal
- (C) commercial
- (D) recreational

QUESTION 14

Identify the relationship between atmospheric CO₂ concentration, ocean pH and temperature.

- (A) Increased atmospheric temperature has led to increased atmospheric CO₂ concentration, ocean temperature and pH.
- (B) Decreased ocean pH has led to increased atmospheric temperature and decreased atmospheric CO₂ concentration.
- (C) Increased atmospheric CO₂ concentration has led to decreased ocean pH and increased ocean temperature.
- (D) Decreased ocean temperature has led to increased atmospheric CO₂ concentration and ocean pH.

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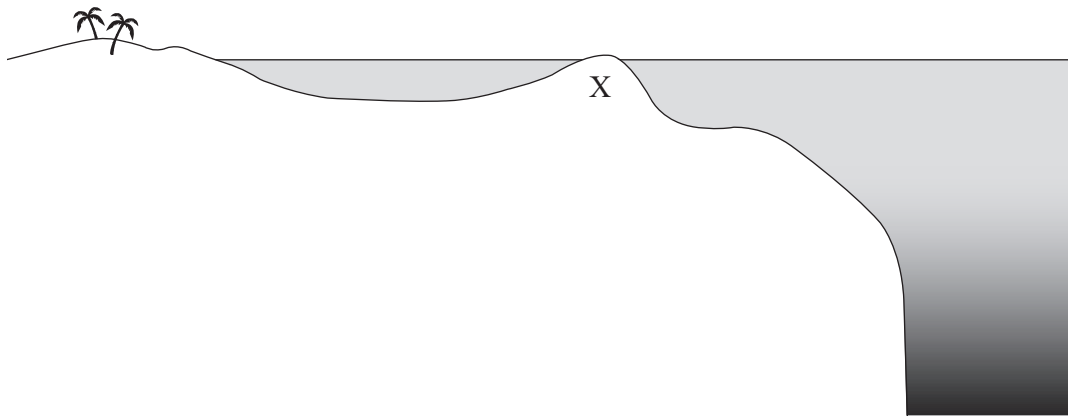
QUESTION 15

Most hard corals only extend their tentacles at night, as this is when

- (A) spawning occurs.
- (B) zooxanthellae photosynthesise.
- (C) zooplankton are more abundant.
- (D) corallivorous fish are more active.

QUESTION 16

A reef cross-section is shown.



The structure labelled X is

- (A) a fringing reef.
- (B) a barrier reef.
- (C) a platform.
- (D) an atoll.

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QUESTION 17

Coral reef growth occurs when the

- (A) dissolution rate is the same as the calcification rate.
- (B) calcification rate is less than the destruction processes.
- (C) accretion rate is greater than the dissolution and erosion rates.
- (D) dissolution and erosion rates are greater than the accretion rate.

QUESTION 18

An increase in which factor would likely prevent a coral-dominated reef system from phase-shifting into an algae-dominated system after a mass bleaching event?

- (A) sediment run-off
- (B) severe weather events
- (C) sea cucumber numbers
- (D) herbivorous fish numbers

QUESTION 19

An effect of climate change on coral reef health is

- (A) decreased surface run-off.
- (B) increased COTS outbreaks.
- (C) increased coral bleaching events.
- (D) decreased cyclone frequency and severity.

QUESTION 20

When designing marine protected areas, what best describes the connectivity criterion?

- (A) Distances between habitats are sufficient to enable organism transfer between them.
- (B) Different habitat types are included to ensure habitat maintenance.
- (C) Reserves are large enough to minimise edge effects.
- (D) Multiple different habitat types are included.

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References

Questions 1–2

Adapted from Lawrey, E, *Pressures on the Great Barrier Reef over time* in ‘NESP TWQ Round 5 — Project 5.2 — From exposure to risk: Novel experimental approaches to analyse cumulative impacts and determine thresholds in the Great Barrier Reef World Heritage Area (GBRWHA)’, eAtlas.org.au, CC BY, <https://eatlas.org.au/media/4441>

Question 7

Adapted from

- Richards 2019, ‘Corals not growing? Here could be some reasons why’, *The Beginners Reef*, <https://thebeginnersreef.com/why-are-your-corals-not-growing/>
- Pacific Coastal and Marine Science Center 2012, ‘Simplified coral anatomy’, USGS, <https://www.usgs.gov/media/images/simplified-coral-anatomy>

Questions 10–11

Adapted from Alva, J, Cisneros-Montemayor, A, Sumaila, R & Cheung, W 2018, *Figure 5: Log PCBs vs TL under RCP 2.6* in ‘Projected amplification of food web bioaccumulation of MeHg and PCBs under climate change in the Northeastern Pacific’, *Scientific Reports*, vol. 8, issue 13460, CC BY 4.0, <https://www.nature.com/articles/s41598-018-31824-5.pdf>

Question 16

Adapted from National Oceanic and Atmospheric Administration 2017, ‘*How do coral reefs form?*’, *NOS Education*, https://oceanservice.noaa.gov/education/tutorial_corals/coral04_reefs.html#1. This U.S. Government material is not subject to copyright protection.



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