External assessment

Marine Science

Paper 1

General instruction

• Work in this book will not be marked.

Section 1

QUESTION 1
Which of the following reef structures is commonly associated with continental islands?

(A) atoll

(B) coral cay

(C) fringing reef

(D) platform reef

QUESTION 2
Shelford's law of tolerance can be used to explain coral abundance, thermal tolerance and species

(A) distribution.

(B) resilience.

(C) diversity.

(D) size.

QUESTION 3
The three main types of fisheries are

(A) surf, estuarine and reef.

(B) trawler, pot and long line.

(C) wild caught, sea cage and pond.

(D) artisanal, recreational and commercial.

QUESTION 4

Ocean water resists changes in pH more than fresh water because ocean water has a greater concentration of

(A) hydrogen ions.

(B) carbonate ions.

(C) dissolved carbon dioxide.

(D) dissolved sodium chloride.

QUESTION 5

The Simpson's diversity index (SDI) values for two reefs are shown in the table.

	Reef 1	Reef 2
SDI	0.23	0.78

This data indicates that Reef 2 has

(A) more coral cover.

(B) a higher rugosity.

(C) a larger population of fish.

(D) greater species richness and evenness.

QUESTION 6

Which of the following strategies improves the short-term resilience of coral reefs against ocean acidification?

(A) monitoring coastal run-off, such as nitrogen inputs

(B) investigating the effect of CO_2 on planktonic organisms

(C) promoting the growth of calcium carbonate organisms to buffer the system

(D) implementing catchment management plans to reduce nutrient load in run-off

QUESTION 7

A resilient reef will respond to ocean acidification by

   (A)   maintaining condition in the short term before declining.

   (B)   immediately declining before returning in another form.

   (C)   maintaining condition indefinitely.

   (D)   immediately declining.

QUESTION 8

These diagrams represent the average coral cover for the Great Barrier Reef and three of its individual regions.
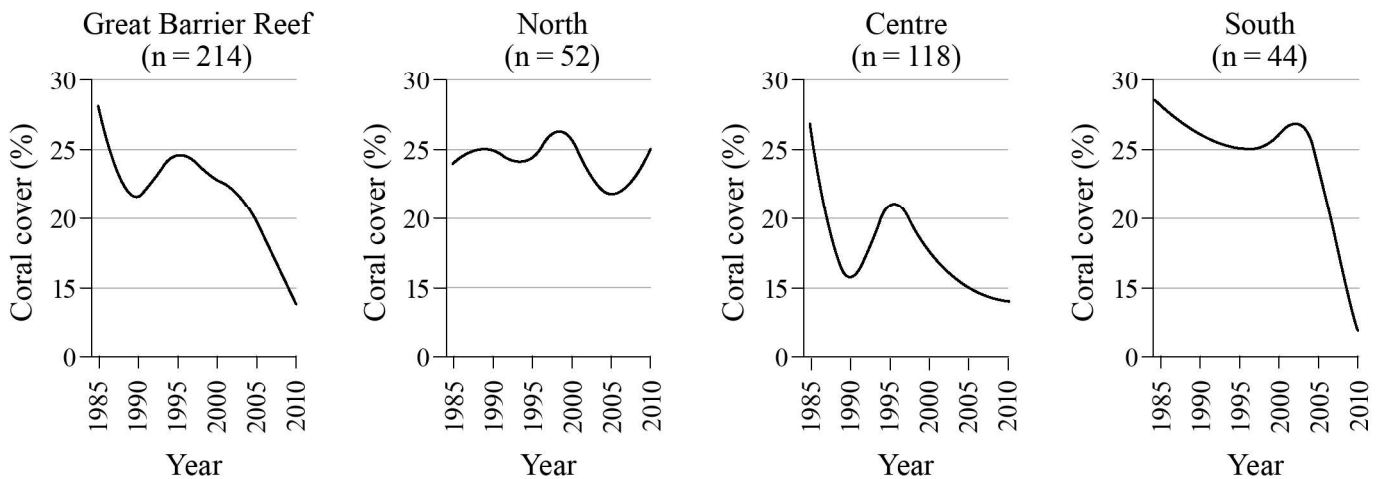
Which statement correctly describes changes in coral cover on the Great Barrier Reef between 1985 and 2010?

   (A)   The northern section experienced no decline.

   (B)   The southern section experienced a rapid decline.

   (C)   The Great Barrier Reef experienced a 10% decline.

   (D)   The central section experienced the greatest decline.

QUESTION 9

Which of the following is a global anthropogenic factor that affects the distribution of coral?

(A)   surface run-off

(B)   climate change

(C)   salinity fluctuations

(D)   crown-of-thorns starfish outbreak

QUESTION 10

101 coral trout (*Plectropomus leopardus*) were caught, marked and released. Five months later, 64 fish were recaptured at the same site. 12 of the recaptured fish were tagged.

Calculate the total population of coral trout using the Lincoln index, $N = \dfrac{M \times n}{m}$

(A)   153

(B)   539

(C)   1212

(D)   6464

QUESTION 11

An indirect consequence of ocean acidification is an increase in

(A)   aragonite saturation.

(B)   sea surface temperature.

(C)   hydrogen ion concentration.
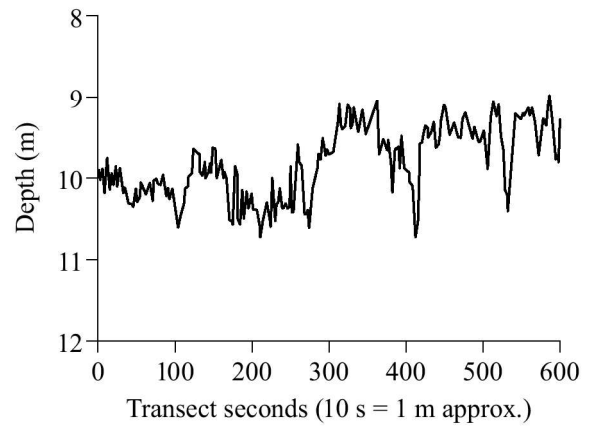
(D)   bleaching frequency and severity.

QUESTION 12

The rugosity transects for four sites on the same reef, measured with an electronic depth sensor, are shown. Which site would have the greatest diversity of fish?
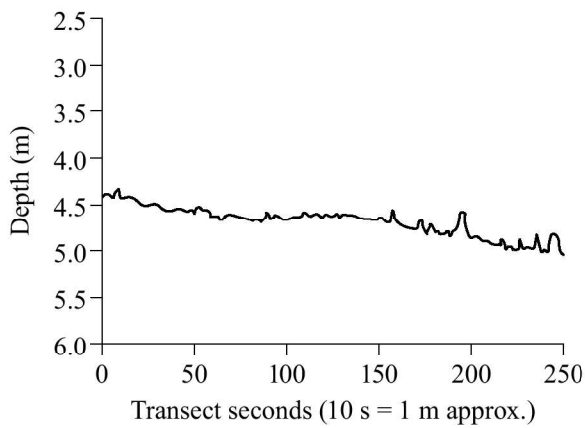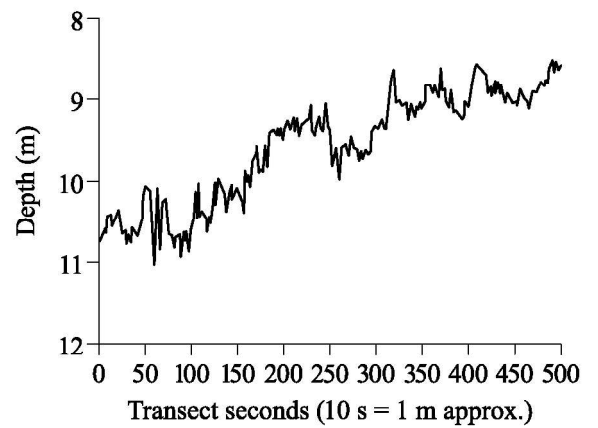
(A)
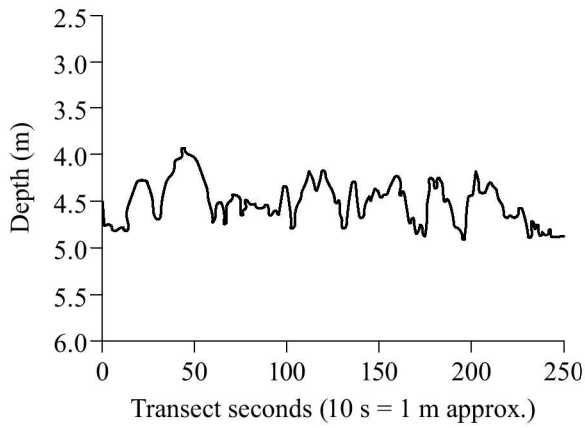
(B)

(C)

(D)

QUESTION 13

Identify the part of a coral polyp where digestion occurs.

    (A)   coelenteron

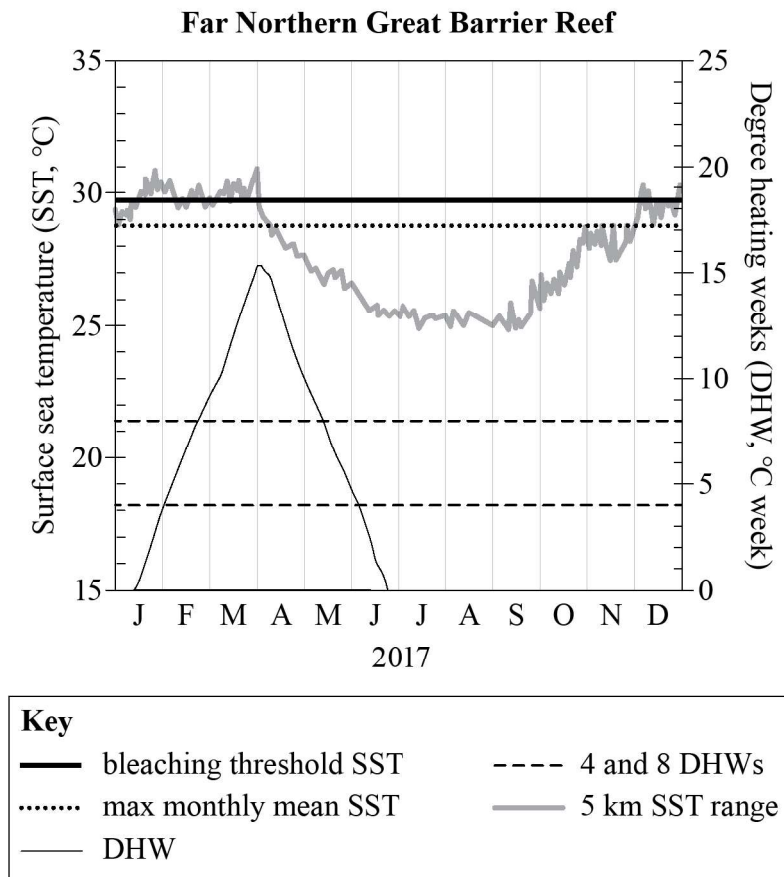   (B)   nematocyst

    (C)   tentacle

    (D)   mouth

QUESTION 14

The dispersive stage of the life cycle of a coral that eventually settles in a fixed location is called a

(A) zygote.

(B) gamete.

(C) planula.

(D) juvenile.

QUESTION 15

Deduce the month that corals in the Far Northern region of the Great Barrier Reef experienced the greatest level of bleaching in 2017.

Far Northern Great Barrier Reef

Key
— bleaching threshold SST   - - - - 4 and 8 DHWs
.... max monthly mean SST   —— 5 km SST range
— DHW

(A) January

(B) February

(C) March

(D) April

References

Question 8

Adapted from: De'ath, G, Fabricius, KE, Sweatman, H, Puotinen, M 2012, Figure 2 in 'The 27-year decline of coral cover on the Great Barrier Reef and its causes', *PNAS*, vol. 109, issue 44,
This article is a PNAS open PDF licensed under CC BY 4.0 or CC BY ND 4.0 (unclear which)
https://www.pnas.org/content/pnas/109/44/17995.full.pdf

Question 12

Adapted from: Dunstan, P, Doherty, O, Pardede, S 2013, Figure 3 and Figure 4 in 'Digital reef rugosity estimates coral reef habitat complexity', *PLoS ONE*, vol. 8, issue 2, https://doi.org/10.1371/journal.pone.0057386 Licensed under Creative Commons Attribution (CC BY 4.0)

Question 15

Adapted from: Coral Reef Watch 2017, *NOAA Satellite and Information Service*, https://coralreefwatch.noaa.gov/product/vs/gauges/gbr_far_northern.php