Earth & Environmental Science 2019 v1.4

IA1: Sample assessment instrument

Data test (10%)

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

Student number

Teacher

Exam date

Marking summary

Criterion	Marks allocated	Provisional marks
Data test	10	
Overall	**10**	

Conditions

Technique	Data test
Unit	Unit 3: Living on Earth — extracting, using and managing Earth resources
Topic/s	Topic 1: Use of non-renewable Earth resources Topic 2: Use of renewable Earth resources
Time	60 minutes + 10 minutes perusal
Seen/Unseen	Unseen questions and datasets
Other	QCAA-approved graphics calculator permitted

Instructions

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

Data test summary

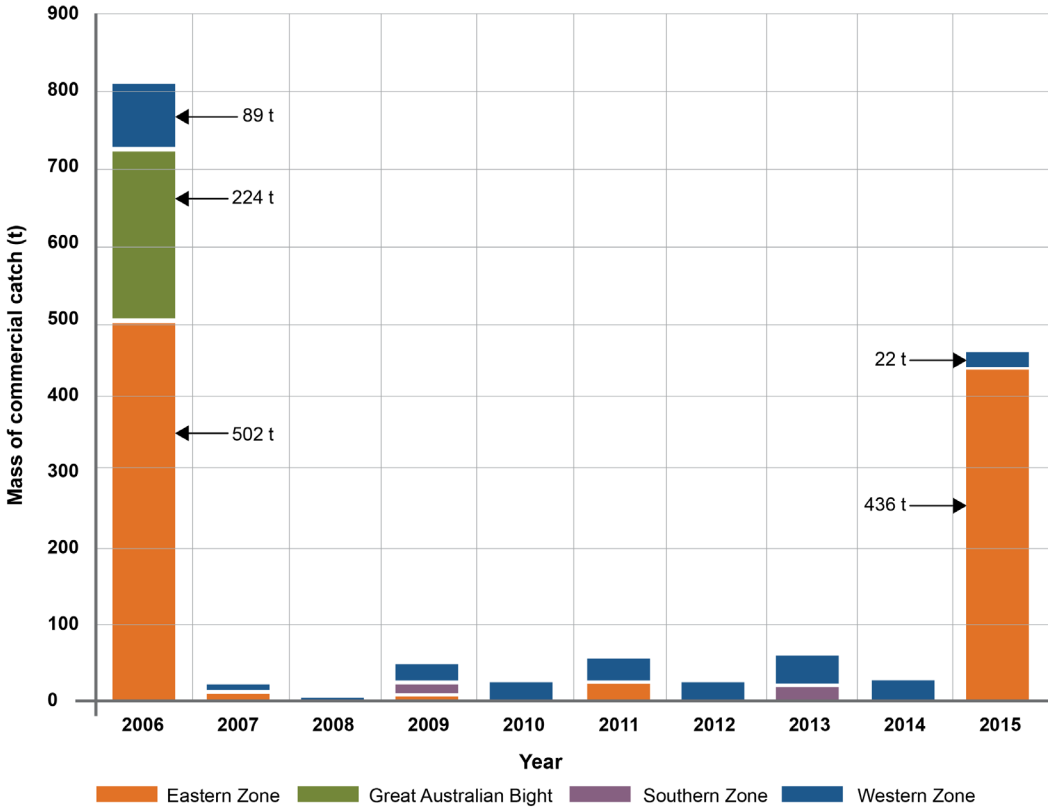
Dataset	Item	Objective			
		Apply understanding	Analyse evidence	Interpret evidence	
1	1	1			
	2	1			
	3	2			
	4		4		
2	5	2			
	6		2		
	7			2	
3	8			3	
	9			3	
Total		**6**	**6**	**8**	**20**
Percentage		**30%**	**30%**	**40%**	**100%**

Dataset 1

Australia has over 150 edible marine species that can be harvested for commercial purposes. An example of an edible marine species is the orange roughy. The catch data for the orange roughy in Figure 1 has been collected from Commonwealth and state 'wild-catch' fisheries from 2006 to 2015. The fisheries monitor the abundance of a species and maintain a sufficient minimum population of that species (i.e. of spawning size and age) to ensure that the species can be replenished and sustainably fished.

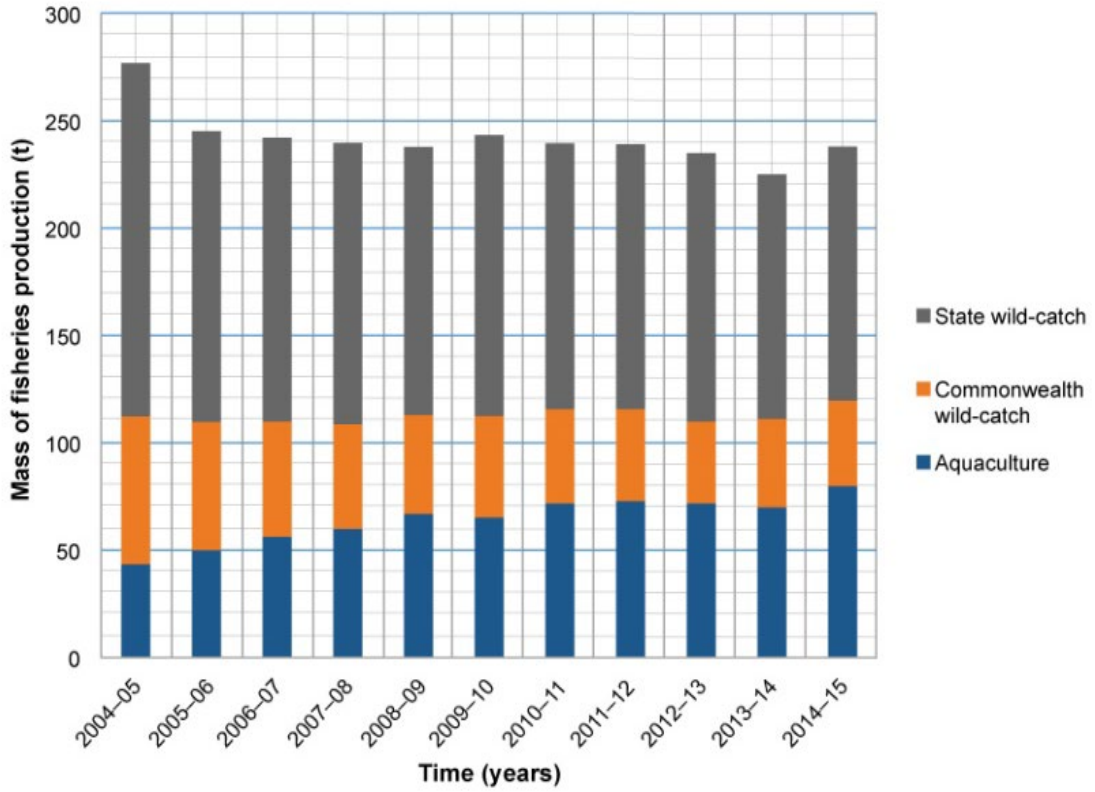
Two main sectors supply Australian consumers with seafood. The first sector is the commonwealth or state-controlled wild fisheries. The second sector is the aquacultural industry, comprising many different species enterprises across all Australian states and territories. Figure 2 provides data about these sectors.

Figure 1: Commercial catch of orange roughy in Commonwealth fishing zones



Source: Georgeson, L & Hansen, S 2016, 'Orange roughy — catch chart', Fisheries Research & Development Corporation, Creative Commons Attribution Generic 3.0 Licence, http://fish.gov.au/report/44-Orange-Roughy-2016.

Figure 2: Mass of Australian fisheries production, by sector, from 2004–2005 to 2014–2015



Source: Fisheries Research & Development Corporation 2016, 'Overview — introduction', Creative Commons Attribution Generic 3.0 Licence, http://fish.gov.au/Overview/Introduction.

Question 1 (1 mark)

Identify, from Figure 1, the mass of orange roughy caught in the Eastern Zone fishery in 2015.

Answer:..... tonnes

Question 2 (1 mark)

Identify, from Figure 1, which fishery recorded a commercial catch of orange roughy in 2010.

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Question 3 (2 marks)

Calculate, from Figure 1, the percentage of the total catch of orange roughy in 2006 that was caught in the Eastern Zone (to one decimal place). Show your working.

Answer:..... % (1 d.p.)

Question 4 (4 marks)

Identify how the percentage of Australian fisheries production coming from aquaculture has changed between 2004–2005 and 2014–2015.

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Dataset 2

Geologists suspect that an ore body containing copper is located at Sugarbag Creek. Stream sediment samples from the four points on the map (in Figure 3 below) were analysed. The samples from A and B showed traces of copper, but C and D did not.

The search for the ore body was narrowed to the north area of Sugarbag Creek identified in Figure 4. Stream sediment samples were taken at each point on a grid marked on a map of this area.

Figure 3: Four locations where stream sediment samples were taken for copper analysis

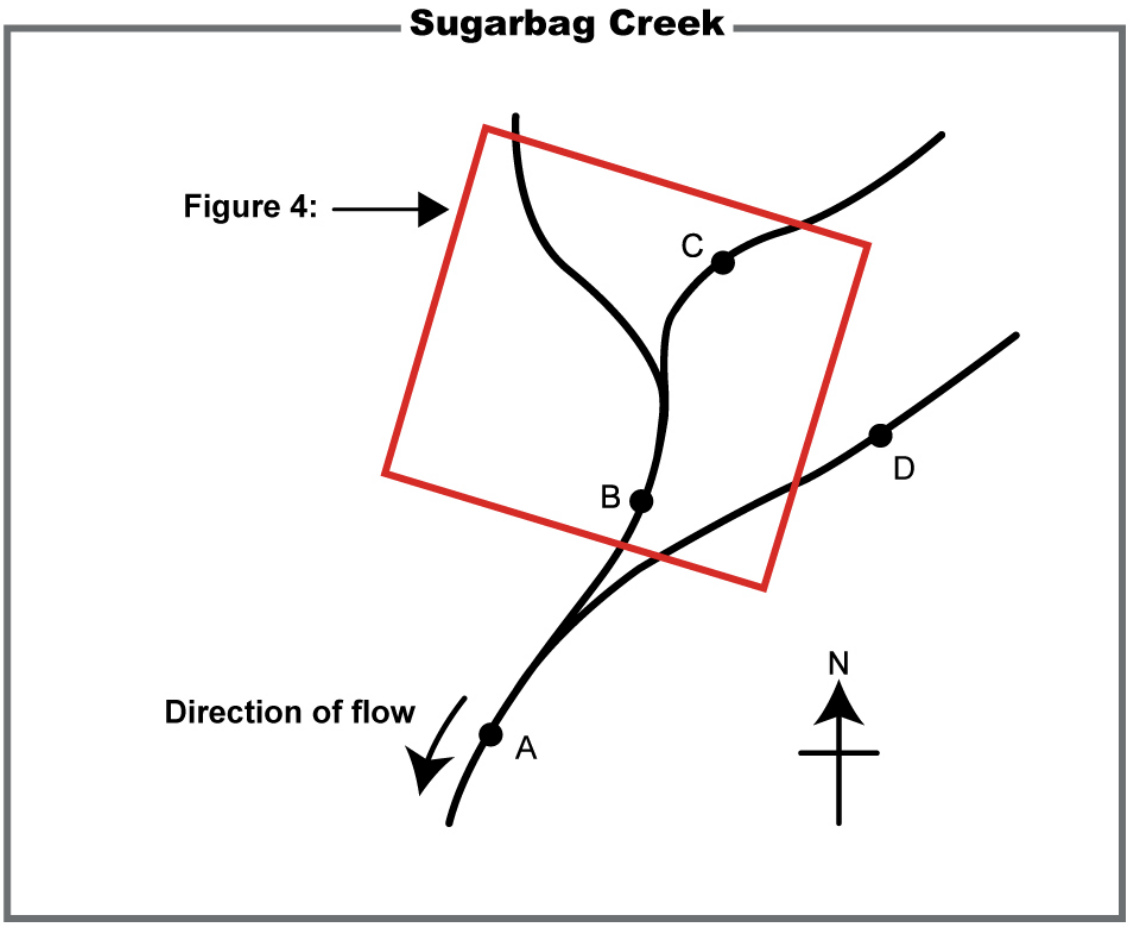

Figure 4: Grid map showing concentrations of copper found in Sugarbag Creek

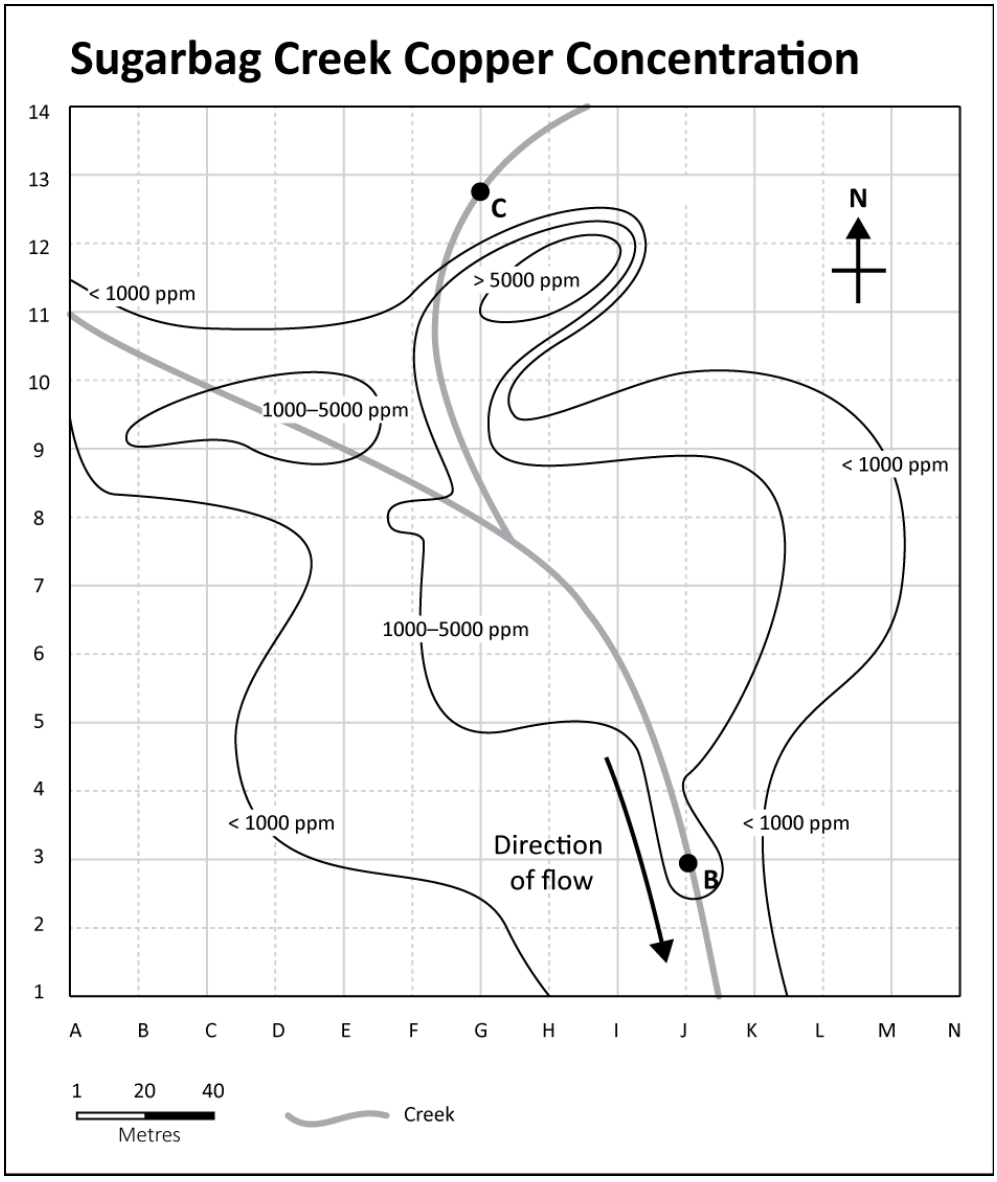

Table 1: Classification of copper concentrations

Copper concentration rating	Copper concentration
Medium	< 1000 ppm (< 0.1%)
High	1000–5000 ppm (0.1–0.5%)
Very high	> 5000 ppm (> 0.5%)

Question 5 (2 marks)

Identify two grid points on Figure 4 where you would expect to find copper concentrations greater than 5000 ppm.

Question 6 (2 marks)

Categorise the following grid points in Table 2 as either medium, high or very high concentrations of copper using information in Figure 4.

Table 2: Copper concentrations at marked grid points

Grid points	Copper concentration
G7	
E4	

Question 7 (2 marks)

Infer where you think the ore body is likely to be and give a reason for why you think it is there.

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Dataset 3

An article in a coastal newspaper in 2015 raised concerns about a desalination plant being built at a particular site. One of the concerns was about discharged brine flowing into a local creek and how this would affect the local marine ecosystems. The desalination plant became operational in early 2016.

Red waratah anemone is an indicator species for the health of rocky shore ecosystems.
A transect study of red waratah anemone in August 2015 was followed up by an identical study in August 2017. Data from these transects is shown in Figure 5 and Table 3.

A t-test was performed to determine if there was any statistical difference between the data collected in 2015 and 2017. The results are shown in Table 4.

Figure 5: Frequency of red waratah anemone along a transect line from low to high tide

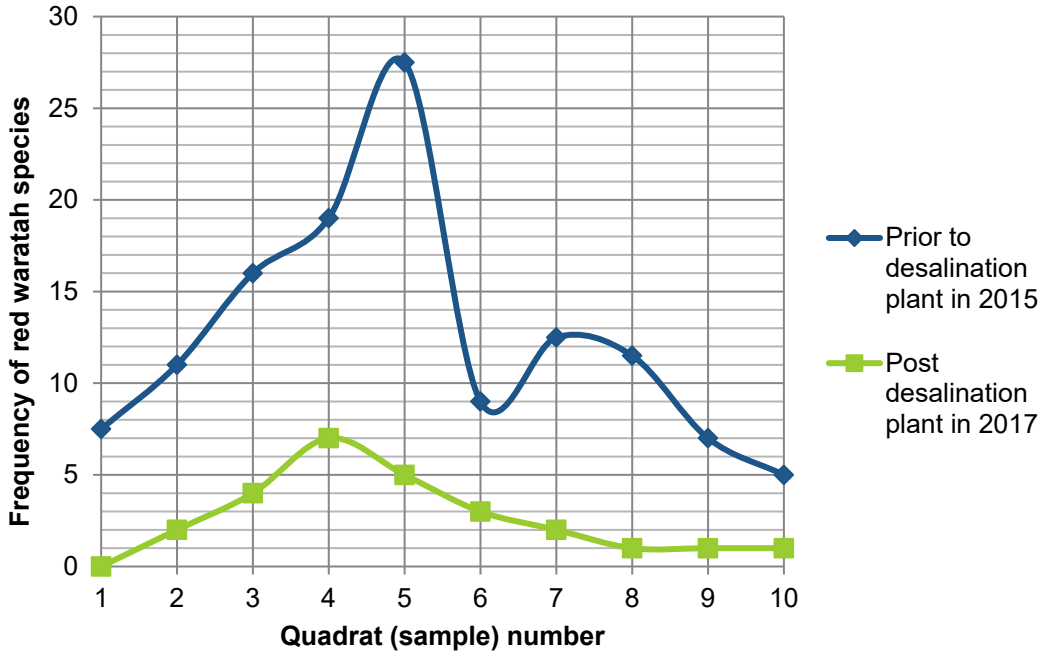

Table 3: Distribution of quadrat sampling in intertidal zones

Quadrat numbers	Intertidal zone
1–3	Low-tide
4–7	Mid-tide
8–10	High-tide

Table 4: Mean, variance and p-value (two-sample t-test) for frequency of red waratah anemone

Parameter	2015	2017
Mean	12.6	2.6
Variance	45.12	4.71
p-value	0.0002	

Question 8 (3 marks)

Compare the data in Figure 5 and Table 3 to determine if the desalination plant has affected the distribution pattern of red waratah anemone across the intertidal zones.

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Question 9 (3 marks)

Draw a conclusion about how the desalination plant has affected the health of the rocky shore ecosystem. Use data from Table 4.

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Instrument-specific marking guide

Criterion: Data test

Assessment objectives

2. apply understanding of the use of renewable or non-renewable resources to given algebraic, visual or graphical representations of scientific relationships and data to determine unknown scientific quantities or features
3. analyse evidence about the use of renewable or non-renewable resources to identify trends, patterns, relationships, limitations or uncertainty in datasets
4. interpret evidence about the use of renewable or non-renewable resources to draw conclusions based on analysis of datasets

The student work has the following characteristics:	Cut-off	Marks
• consistent demonstration, across a range of scenarios about the use of renewable or non-renewable resources, 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, in scenarios about the use of renewable or non-renewable resources, 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, in scenarios about the use of renewable or non-renewable resources, 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

The student work has the following characteristics:	Cut-off	Marks
• demonstration, in scenarios about the use of renewable or non-renewable resources, 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, in scenarios about the use of renewable or non-renewable resources, 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
• does not satisfy any of the descriptors above.	≤ 1%	0