Marine Science 2019 v1.1

IA1 sample assessment instrument
December 2019

The following Data Test has been drawn from the research paper, '*Annual pattern of settlement of Sydney rock oyster (*Saccostrea glomerata*) spat in Pumicestone Passage, Moreton Bay'*. The paper provides additional information regarding purpose, process and results that provides context to the Marine Science curriculum. The paper also provides access to further data for the development of additional assessment items.

Access to the full paper is found at *Proceedings of the Royal Society of Queensland*, 2017, vol. 122, pp 17-32 .

Please note: This assessment item requires submission to QCAA (Queensland Curriculum and Assessment Authority) for endorsement prior to being used as an official assessment item in Queensland schools.

Data Test (10%)

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

2. Apply understanding of the reef and beyond or changes on the reef to given algebraic, visual or graphical representations of scientific relationships and data to determine unknown scientific quantities

3. Analyse evidence about the reef and beyond or changes on the reef to identify trends, patterns, relationships, limitations or uncertainty in datasets

4. Interpret evidence about the reef and beyond or changes on the reef to draw conclusions based on analysis of datasets.

Note: Objectives 1, 5, 6 and 7 are not assessed in this instrument.

Subject	Marine Science	**Instrument no.**	IA1
Technique	Data Test - Study Resource		
Unit	Not Specific - Unit 2 or Unit 3		
Topic	Not Specific – Study Resource		

Conditions			
Response type	Short Response Supervised exam conditions		
Time	35 minute	**Perusal**	5 minutes

Other	• Length. Up to 500 words in total, consisting of
	  ○ Short response, i.e. sentence or short paragraphs.
	  ○ Written paragraphs, 50-250 words per item
	  ○ Other types of item response, e.g. interpreting and calculating, should allow students to complete the response in the set time.
	• Queensland approved graphics calculator permitted.
	• Unseen stimulus		

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.

Criterion	**Marks allocated**	**Result**
Data test Assessment objectives 2, 3, 4	**14**	
Total	**10**	

Dataset	Item	Objective			
		Apply understanding	Analyse evidence	Interpret evidence	
1	1	2			
	2	1			
	3		2		
	4			3	
2	1	1			
	2		2		
	3			3	
Total		**4**	**4**	**6**	**14**
Percentage		**29%**	**29%**	**42%**	**100%**

Both data sets relate to the information below.

The Sydney rock oyster (*Saccostrea glomerata*) is a species that was historically common in the Pumicestone Passage but has recently become rare. It is believed that sedimentation from local land-based developments has reduced the reproduction of the oyster by reducing the ability for larvae to settle on hard substrates. Scientists conducted research aiming to determine the habitat suitability for the successful spatfall (settlement of and development of larvae) of *S. glomerata*. Artificial reefs designed to collect spatfall were placed in Pumicestone Passage for a period of 15 months between September 2015 and November 2016. The artificial reefs were made from concrete blocks (Besser™) with surfaces named based on the exposure to settling sediments, with the top and sides being most prone to sedimentation of mud and silt and the internal and underside being less prone (dimensions and nomenclature shown in Figure 1).

Six blocks were placed in the intertidal zone roughly 1 metre above the low tide mark while the other six were place in the subtidal zone roughly 0.5 metres below the low tide mark. The blocks were removed from the water monthly to count and record any new spatfall that had settled. For each of these treatments the six blocks were then further separated into 1 of 3 treatments (2 blocks in each treatment). Two blocks remained in the water and any new spatfall was counted *in-situ* by researchers using SCUBA gear with nothing further done to them ("monitor treatment"). In the second treatment two blocks were removed from the water, new spatfall was recorded, the block was pressure cleaned to remove mud, silt or algae but not remove existing spatfall, and then returned to the water ("clean treatment"). In the final treatment the remaining two blocks were removed from the water, spatfall was counted and then they were replaced by new previously unused blocks ("replace treatment"). The number of spatfall for each treatment was then averaged between the two blocks in each treatment and the results are shown in Table 1 and Figure 2.

DATA SET 1

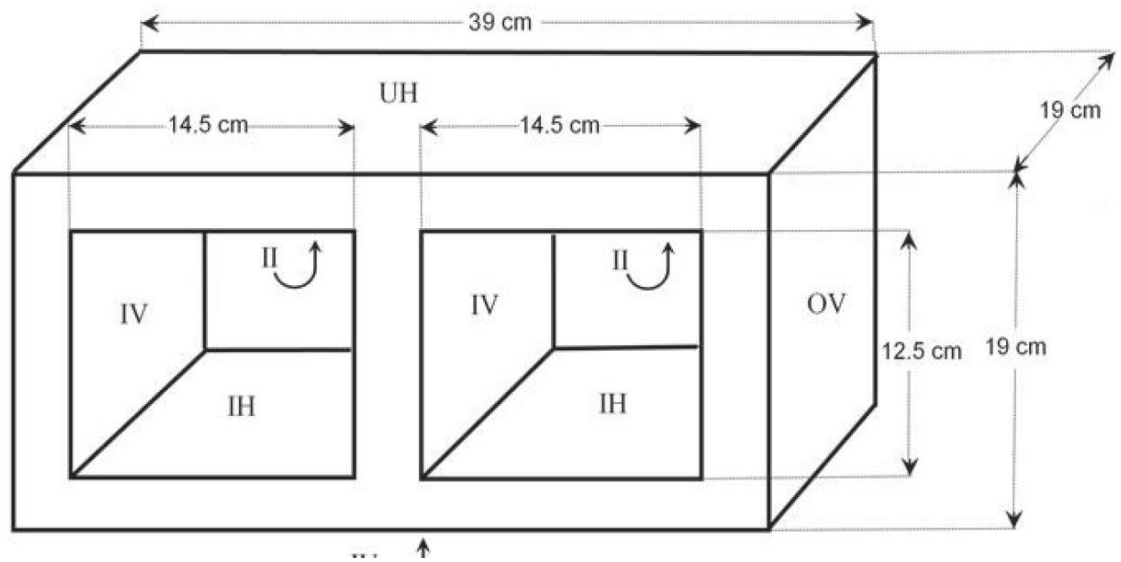

Figure 1: Dimensions and nomenclature for three-dimensional concrete spat collection units (Besser blocks). UH = upper horizontal surface, IH = internal horizontal surfaces, IV = internal vertical surfaces, OV = outer vertical surfaces, IU = inverted under surface, II= inverted internal surface.

Treatment	Subtidal			Intertidal		
	Top (UH)	Sides (OV)	Under/internal (IU, II, IV, IH)	Top (UH)	Sides (OV)	Under/internal (IU, II, IV, IH)
Monitor	0	37	777	0	35	725
Clean	1	11	630	2	197	1750
Replace	1	8	487	0	16	269
Total	2	56	1894	2	248	2744

Table 1 Data on settlement microhabitats utilised by S. glomerata spat collected on various surfaces of three dimensional concrete spat collection units

Data source: Diggles, B.K. (2017). "Annual pattern of settlement of Sydney rock oyster (*Saccostrea glomerata*) spat in Pumicestone Passage, Moreton Bay." *Proceedings of the Royal Society of Queensland, vol. 122, pp 17-32.*

Item 1 (apply) 2 marks

Calculate the density (spatfall per cm^2) of spatfall settling on the sides (OV) of the clean treatment blocks in the intertidal zone.

spatfall/cm^2 (2 d.p.)

Item 2 (apply) 1 marks

Calculate the percentage of the total number of spat that settled on the subtidal blocks that settled on the under/internal surfaces.

% (2 d.p)

Item 3 (analyse) 2 marks

Contrast between the number of spatfall settling on the clean and replace treatments in both the subtidal and intertidal zones.

Item 4 (interpret)	3 marks

Infer in which of the two sites (subtidal or intertidal) the oyster spatfall is most affected by sedimentation. Give two reasons for your inference.

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DATA SET 2

In each of the months when water temperature was above 24°C, the number of spat settling on the "replace treatment" artificial reefs was counted and averaged for the subtidal and the intertidal areas.

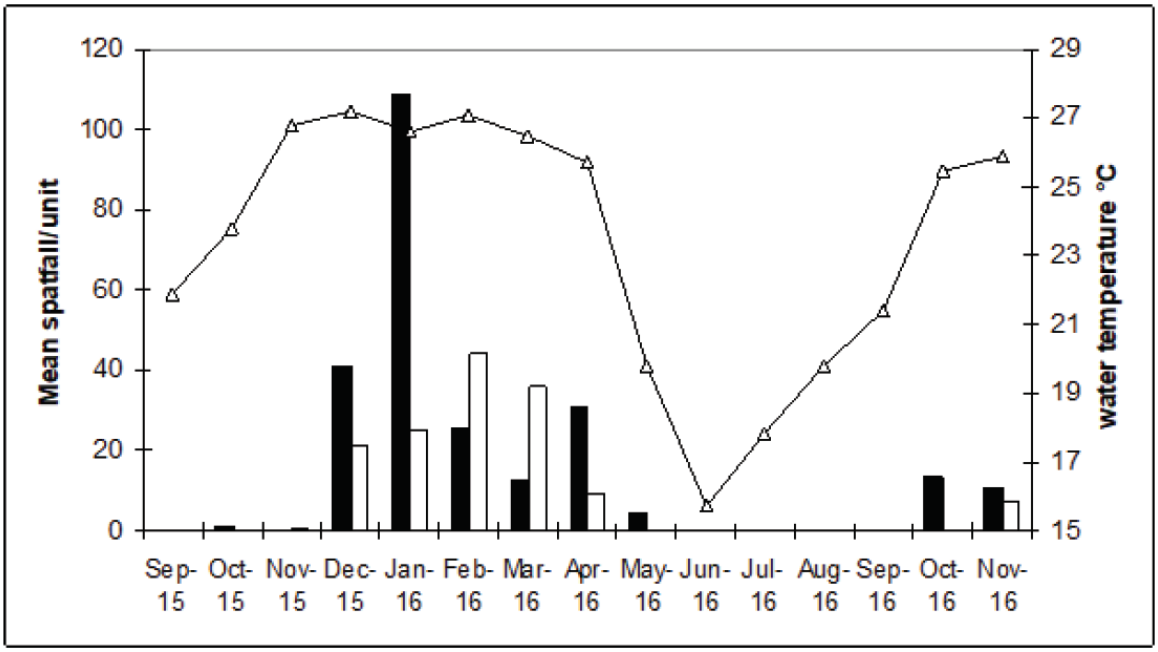

Figure 2: Mean monthly spatfall settlement on subtidal l(black columns) and intertidal (white columns) artificial recorded in months with greater than 24°C (-Δ-) water temperatures.

Data source: Diggles, B.K. (2017). "Annual pattern of settlement of Sydney rock oyster (*Saccostrea glomerata*) spat in Pumicestone Passage, Moreton Bay". *Proceedings of the Royal Society of Queensland, vol. 122, pp 17-32.*

Item 1 (apply) 1 mark

Identify the month and year in which the water temperature first drops below 19°C.

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Item 2 2 marks

Distinguish the features of this graph that increase the uncertainty of the dataset. Give a reason for your response.

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Item 3	3 mark

Extrapolate the data to suggest what the average spatfall would be for December 2016 and January 2017. Give two reasons for your response.

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