

Marine Science 2019 v1.3

IA3: Sample assessment instrument

Research investigation (20%)

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

Issued

Due date

Marking summary

Criterion	Marks allocated	Provisional marks
Research and planning	6	
Analysis and interpretation	6	
Conclusion and evaluation	6	
Communication	2	
Overall	20	

Conditions

Technique	Research investigation
Unit	Unit 4: Ocean issues and resource management
Topic/s	Topic 1: Oceans of the future Topic 2: Managing fisheries
Duration	10 hours class time
Mode/length	Written (e.g. scientific essay): 1500–2000 words
Individual/group	Individual
Resources	School library (online: internet and school intranet, databases, journals)

Context

Investigate one of the following claims:

- Regional increases in primary ocean productivity may be offset by large, global predicted losses in productivity.
- The global ocean conveyor belt can be 'shut down'.
- Aquaculture productivity is essential for achieving food security.
- As a model, maximum sustainable yield (MSY) should be used to inform fish stock management.

You may identify an alternative claim in consultation with your teacher. This claim must be related to Unit 4 subject matter.

Task

Gather secondary evidence related to a research question in order to evaluate the claim. Develop your research question based on a number of possible claims provided by your teacher.

Obtain evidence by researching scientifically credible sources, such as scientific journals, books by well-credentialed scientists, and websites of governments, universities, independent research bodies or science and technology manufacturers. You must adhere to research conventions.

To complete this task, you must:

- select a claim to be evaluated
- identify the relevant scientific concepts associated with the claim
- pose a research question addressing an aspect of the claim
- conduct research to gather scientific evidence that may be used to address the research question and subsequently evaluate the claim
- analyse the data to identify sufficient and relevant evidence
- identify the trends, patterns or relationships in the evidence
- analyse the evidence to identify limitations
- interpret the evidence to construct justified scientific arguments
- interpret the evidence to form a justified conclusion to the research question
- discuss the quality of the evidence
- evaluate the claim by extrapolating the findings of the research question to the claim
- suggest improvements and extensions to the investigation
- communicate findings in an appropriate scientific genre, i.e. empirical essay.

Checkpoints

- Week 1: Select claim and develop research question.
- Week 2: Identify sources and conduct research.
- Week 3: Analyse and evaluate evidence.
- Week 4: Submit draft.
- Week 5: Submit final response.

Authentication strategies

- The teacher will provide class time for task completion.
- Students will provide documentation of their progress at indicated checkpoints.
- The teacher will collect and annotate one draft.
- The teacher will conduct interviews or consultations with each student as they develop the response.
- Students will use plagiarism-detection software at submission of the response.
- Students must acknowledge all sources.

Scaffolding

The response must be presented using an appropriate scientific genre (i.e. scientific essay) and contain:

- a claim
- a research question
- a rationale for the investigation
- justified scientific arguments using evidence
- a conclusion to the research question based on the interpretation of the evidence
- evaluation of the claim and suggestions of improvements and extensions to the investigation
- a reference list

An example of how one of the claims could be developed into a research question

Claim: As a model, maximum sustainable yield (MSY) should be used to inform fish stock management.

Research question: Does the set annual total allowable catch (TAC) of southern bluefin tuna (SBT) in Australia effectively sustain the population at 20% of its original monitoring levels?

Developing the research question:

1. Identify the key (important) terms in the claim.
 - a. 'MSY' (maximum sustainable yield), 'fish stock management'
2. Propose refining questions that need to be addressed to refine key terms and narrow the focus of the claim.
 - a. What is MSY?
 - b. How is it measured?
 - c. What is fish stock management?
 - d. How are MSY and fish stock management linked?
 - e. How would we know if MSY was working as a model?
3. Provide an example of how one of the claims could be developed into a research question. Conduct research to gather information to address the refining questions.
 - a. What is a total allowable catch?
 - b. Which fish species have a TAC in the world? In Australia?
 - c. Does the fish stock management of this species involve MSY as well?
 - d. How are the numbers of this fish species monitored? Is the data reliable?
 - e. How do we measure if a fish population is at a 'sustainable level'?
4. Draft the research question to address the claim.
 - a. Does the TAC for SBT effectively sustain the population?
5. Refine and focus the research question.
 - a. Does the set annual total allowable catch (TAC) for southern bluefin tuna (SBT) in Australia effectively sustain the population?
6. Present the research question to the teacher for approval.
 - a. Does the set annual total allowable catch (TAC) of southern bluefin tuna (SBT) in Australia effectively sustain the population at 20% of its original monitoring levels?

Note: You cannot use this sample research question for your investigation.

Instrument-specific marking guide (IA3): Research investigation (20%)

Criterion: Research and planning

Assessment objectives

2. apply understanding of oceans of the future or managing fisheries to develop research questions
5. investigate phenomena associated with oceans of the future or managing fisheries through research

The student work has the following characteristics:	Marks
<ul style="list-style-type: none"> • informed application of understanding of oceans of the future or managing fisheries demonstrated by a considered rationale identifying clear development of the research question from the claim • effective and efficient investigation of phenomena associated with oceans of the future or managing fisheries demonstrated by <ul style="list-style-type: none"> – a specific and relevant research question – selection of sufficient and relevant sources. 	5–6
<ul style="list-style-type: none"> • adequate application of understanding of oceans of the future or managing fisheries demonstrated by a reasonable rationale that links the research question and the claim • effective investigation of phenomena associated with oceans of the future or managing fisheries demonstrated by <ul style="list-style-type: none"> – a relevant research question – selection of relevant sources. 	3–4
<ul style="list-style-type: none"> • rudimentary application of understanding of oceans of the future or managing fisheries demonstrated by a vague or irrelevant rationale for the investigation • ineffective investigation of phenomena associated with oceans of the future or managing fisheries demonstrated by <ul style="list-style-type: none"> – an inappropriate research question – selection of insufficient and irrelevant sources. 	1–2
<ul style="list-style-type: none"> • does not satisfy any of the descriptors above. 	0

Criterion: Analysis and interpretation

Assessment objectives

3. analyse research evidence about oceans of the future or managing fisheries
4. interpret research evidence about oceans of the future or managing fisheries

The student work has the following characteristics:	Marks
<ul style="list-style-type: none">• systematic and effective analysis of qualitative data and/or quantitative data within the sources about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">– the identification of sufficient and relevant evidence– thorough identification of relevant trends, patterns or relationships– thorough and appropriate identification of limitations of evidence• insightful interpretation of research evidence about oceans of the future or managing fisheries demonstrated by justified scientific argument/s	5–6
<ul style="list-style-type: none">• effective analysis of qualitative data and/or quantitative data within the sources about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">– the identification of relevant evidence– identification of obvious trends, patterns or relationships– basic identification of limitations of evidence• adequate interpretation of research evidence about DNA, oceans of the future or managing fisheries demonstrated by reasonable scientific argument/s.	3–4
<ul style="list-style-type: none">• rudimentary analysis of qualitative data and/or quantitative data within the sources about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">– the identification of insufficient and irrelevant evidence– identification of incorrect or irrelevant trends, patterns or relationships– incorrect or insufficient identification of limitations of evidence• invalid interpretation of research evidence about oceans of the future or managing fisheries demonstrated by inappropriate or irrelevant argument/s.	1–2
<ul style="list-style-type: none">• does not satisfy any of the descriptors above.	0

Criterion: Conclusion and evaluation

Assessment objectives

- interpret research evidence about oceans of the future or managing fisheries
- evaluate research processes, claims and conclusions about oceans of the future or managing fisheries

The student work has the following characteristics:	Marks
<ul style="list-style-type: none">insightful interpretation of research evidence about oceans of the future or managing fisheries demonstrated by justified conclusion/s linked to the research questioncritical evaluation of the research processes, claims and conclusions about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">insightful discussion of the quality of evidenceextrapolation of credible findings of the research to the claimsuggested improvements and extensions to the investigation that are considered and relevant to the claim.	5–6
<ul style="list-style-type: none">adequate interpretation of research evidence about oceans of the future or managing fisheries demonstrated by reasonable conclusion/s relevant to the research questionbasic evaluation of the research processes, claims and conclusions about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">reasonable description of the quality of evidenceapplication of relevant findings of the research to the claimsuggested improvements and extensions to the investigation that are relevant to the claim.	3–4
<ul style="list-style-type: none">invalid interpretation of research evidence about oceans of the future or managing fisheries demonstrated by inappropriate or irrelevant conclusion/ssuperficial evaluation of the research processes, claims and conclusions about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">cursory or simplistic statements about the quality of evidenceapplication of insufficient or inappropriate findings of the research to the claimineffective or irrelevant suggestions.	1–2
<ul style="list-style-type: none">does not satisfy any of the descriptors above.	0

Criterion: Communication

Assessment objectives

7. communicate understandings and research findings, arguments and conclusions about oceans of the future or managing fisheries

The student work has the following characteristics:	Marks
<ul style="list-style-type: none">• effective communication of understandings and research findings, arguments and conclusions about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">– fluent and concise use of scientific language and representations– appropriate use of genre conventions– acknowledgment of sources of information through appropriate use of referencing conventions.	2
<ul style="list-style-type: none">• adequate communication of understandings and research findings, arguments and conclusions about oceans of the future or managing fisheries demonstrated by<ul style="list-style-type: none">– competent use of scientific language and representations– use of basic genre conventions– use of basic referencing conventions.	1
<ul style="list-style-type: none">• does not satisfy any of the descriptors above.	0



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