

Lessons and resources based on:

The Menjangan Island Reef Project, Bali, Indonesia:

Preserving ocean biodiversity & ecosystem integrity through Marine Protected Areas: defining Indonesian coral reef tipping points

Reef exploitation and management - Lesson 1: Case study

Key questions: what is a coral reef ecosystem like? How is this environment being used, impacted and managed?

Aim: To produce a case study on the area of Menjangan Island, Bali, Indonesia. To include:

- 1) Location of the Menjangan Islands.
- 2) Location specific-information with the physical and human geography of the area.
- 3) The use of this area by people and resulting impacts.
- 4) The role and level of success of the 'Friends of Menjangan' in mitigating human impacts on the reef ecosystem.

Resources:

- 1) Factfile
- 2) Glossary
- 3) Menjangan Island Activity Sheet
- 4) Menjangan Island Fieldtrip Power Point presentation
- 5) Ask the expert

Starter:

Whilst watching the PCRF Documentary: pcrf.org/pcrfmovie.php (7 minutes) make notes to answer the following questions: why are coral reefs important? What is the project about? What are the scientists trying to do? What methods are they using? Discuss your findings as a class.

Main:

1. Go to <http://reefgis.reefbase.org> or <http://www.exploringnature.org/db/detail.php?dbID=44&detID=582> to look at a map of the world's coral reefs. Write a paragraph to describe the distribution of the world's coral reefs. Make sure you include as much evidence from the map and your own knowledge to do this. e.g. Hemisphere, latitude and longitude, ocean names and direction.
2. Use Google Earth to find the location of Menjangan Island, Bali. Produce a sketch/diagram or a number of different scale maps to show its location in the planet (include world, national and local scale)
3. Now you are going to produce a Case study of the Menjangan Island and reef. It will look particularly at the human and physical impacts on the reef, management of activities in Menjangan and the role of the 'Friends of Menjangan'.

To do this, you have been given an activities sheet with a number of tasks and questions. Work in pairs to explore the area of study, its uses, exploitation and information on climate, using the 'Menjangan Island Virtual Fieldtrip' PowerPoint and the links from it to website resources.

As you explore the area, you must answer the questions given. Remember, this is a case study, so extracting and using relevant facts and figures is important. You will be able to make use of these in your exam.

Plenary:

Now it is time to make use of your findings. You have 10 minutes to answer this exam question using your notes and answers to the activities from today's lesson:

For an example you have studied, explain the management and exploitation of the area (6 marks).

Reef exploitation and management - Lesson 2: Data collection techniques

Key questions: What does the life of a field researcher involve? What methods were used to collect data for this study? Why were these methods chosen?

Aim: To have a good understanding of the kinds of activities undertaken by Phillip and the other field researchers, the importance of accuracy and to be able to both describe and explain at least two of the fieldwork methods utilized by Phillip.

This lesson focuses on your understanding of the process of planning, organising effective fieldwork investigations. During today you will see how important it is to follow exact and precise processes to ensure that you collect the most reliable results possible. During the lesson, think carefully about why reliability is important and what safety measures the team have to think about before they get started. Try to get in to the role of a field researcher. Remember this could be you in the future!

Resources:

- 1) "A day in the life of...." Photos prompts
- 2) Data collection methods table
- 4) Storyboard template
- 5) "Ask the Expert" with Phil Dustan

Starter:

Go to the **Friends of Menjangan** blogsite (<http://www.friendsofmanjangan.blogspot.co.uk>) and use the *Biosphere Foundation in Menjangan* slideshow from Saturday 11th June 2011 to answer these questions:

What things are important to the people of Menjangan?

What job do you think the divers are doing?

What is the island like?

What do you think the some of the roles of the Friends of Menjangan might be?

Main:

Phillips research is focussed on exploring 5 main issues:

1. Looking at the physical structure of the reef.
2. Assessing human and physical Impacts on the reef.
3. Looking at the abundance and variety of Species in the Menjangan Reef.
4. Exploring the patters and relationship between reef structure, species variety and abundance.
5. Considering the implications of the study's results to future management and projects to protect the Island and reef.

We will consider issues 4 and 5 next lesson, during this lesson we will look at the first 3 of these, which focus on methods of data collection whilst out in the field.

You have been provided with a set of images to show some of the main activities during the day, as well as information on the study methods used.

First, sort these images in a way which you think will correctly demonstrate the order of the main activities of the day. You have 3 minutes.

Your main challenge today is to create a storyboard which shows off a day in the life of a field researcher on the Menjangan reef study.

You need to include:

- Typical daily activities whilst out in the field.
- A description of at least two of the methods used.
- Reasons for the choice of method (what is good about them? What are the advantages of using them?).

(Make sure that you use the images to help remind you of each method.)

Below are the resources that you should use in addition to the method information and images to create your storyboard:

- Sams blog: mir-makeitreal.blogspot.co.uk/ (In particular look at, 'Mir, the story of a boat...' blog, Saturday, April, 16th 2011. 'Science, schools and friends of Menjangan').
- The website, www.biosfirindonesia.org/menjangan.php
- 'Ask the Expert' pdf.

Plenary:

Your teacher will have chosen a couple of storyboards created by students in your class to photograph (using iPad or other device) and project on the Interactive White Board. As a class go through the aspects of the daily routine of a researcher in the field that these examples show well and important areas of the methodology they have missed out or could add more to. When doing this highlight and annotate the projection of the work to show these things as appropriate.

Finally spend 5 minutes in pairs looking at each other's work. Suggest at least 2 things which have been done well and 2 aspects which could be improved.

Homework:

- a) Complete your storyboard by using the advice of your peers and your own opinion to improve the work already done. You may feel that you need to continue exploring the Menjangan expedition a little further to do this.

Or,

- b) Practice exam question. Looking at the data collection techniques used in this study. Focus of question is on describing and explaining the methods of data collection used and why these are appropriate to this particular study.

Reef exploitation and management - Lesson 3: Analysis task

Key questions: Which graph presentation methods are most suited to the data collected. How do we analyse graphs and the results collected. What conclusions have been drawn? How will Phillips research influence future research and the management of the Menjangan coral reef ecosystem?

Aim: To have learnt ways to present, analyse and draw conclusions from research. To have considered how Phillips study will influence future coral reef investigation and management.

Resources:

1) Data collection Methods starter activity for Interactive White Board.

2) Data analysis activity sheet

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3) Data presentation techniques

4) Data presentation tasks sheet

5) Ask the Expert

Starter:

Complete the Interactive whiteboard activity by matching the data collection techniques name with both description of method technique and image of it.

Main:

Having been out at Menjangan Island, spent four months out in the field and many days diving in the reefs to collect over 3300m of transect data, Phillip and his team have returned back home. But their work is not over yet and so neither is yours. Now, all of the data collected has to be analysed, patterns identified and conclusions made. So that is our focus for today.

1. Look at the data sets in the tables on the worksheet. Using the information sheet 'data presentation techniques', work in pairs to decide on the two different types of presentation techniques which you think are most suited to the data (make sure that you can explain your choice). Having discussed your choice with your teacher and the rest of the group, in your pairs construct these graphs as accurately as you can (complete 1 graph each).
2. Look at the activity sheet 'Data analyses'. Follow the instructions to analyse the graphs given. Do this as carefully as you can. Remember this is something you are expected like Phillip to be able to do in both your controlled assessment write up and in your exams.

You or your teacher may like you to present your data presentation and analysis using ICT, perhaps by creating a layered PowerPoint, with graphs linked to location maps, to show where data sets were collected. On other slides extra layers of information can be added in the form of photographs and annotations to show analysis.

Note: By presenting results in this way you are showing links between different data and information, this is a presentation method that is considered more sophisticated and useful in some controlled assessment tasks. When you add layers of different information to a base map like this, you are using a mapping technique called GIS (Geographical Information Systems) a presentation technique that it is essential to understand and one which you will be examined on.

3. Below are a few of the conclusions that Phillip was able to make from the data collected during his research. Look at your analysis, which graphs help to back up the conclusions Phillip has made? Discuss the evidence your graphs give in small groups or as a class.

Phillips conclusions:

- In a wide variety of reef conditions, fish abundance increases with topographical complexity.
- A rise in species diversity will occur with an increase in coral diversity.
- In terms of management, areas where reef has been damaged and fishing grounds degraded, artificially increasing rugosity, may increase fish abundance, but not to its previous natural level.

Plenary:

Phillip and your final task is to evaluate his research, looking at questions such as what went well and what could be improved, in terms of the methods used and the reliability of the data collected. You are going to help him with part of this evaluation, by thinking about these questions:

- How could the study be taken further?
- What aspects/areas would it be beneficial to focus on?
- Which three areas would you consider important to publicise and educate the public on?

Take a look at the 'Ask the expert' piece and see if your ideas match Phillip and his team's thoughts.

Extension/ Follow up task:

To sum up and review all that you have done over the last few lessons, you are going to write and present an article for the National Geographic exploring one of the issues covered in the learning from the lessons. The piece needs to be a combination of a written article with photographs and a script for a short video clip where you present and discuss the key points of the issue. The final piece will be presented and recorded and peer assessed by your classmates.

Before you start have a good look at the National Geographic website and or magazine. Explore some of the current stories on the site. When looking through each article try to answer these questions:

- 1) What is the layout like?
- 2) What is the structure of the article?
- 3) What kind of language is used (e.g. formal? informal? Persuasive? Emotive?)
- 4) Does the article have a key question or point to it?
- 5) What message do the photographs send out? And why have these images been chosen?

When writing your article and video clip script make sure to:

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- Use what you have learnt from the observations of the National Geographic website.
- Think carefully about the message you want to send out in your piece.
- Use key geographical terms
- Consider the language of your piece.
- Ensure you are accurate with spelling, punctuation and grammar.

Finally you will perform your script, when doing this think carefully about:

- Your tone of voice (which parts of the script require emphasis?)
- The clarity and pace of your presentation.
- Your body language.

Not only will you be expected to present your article and issue, but you will also be expected to peer assess the presentation of your classmates. This is an important responsibility as your comments will help your classmates improve in future work.

When peer assessing:

- Listen carefully to what is being said as well as how the person presents (you should be judging quality of the content as well as the quality of presentation).
- Judge the quality of presentation using the pointers above.
- Judging the content of the presentation will be more difficult, but again use the points above on writing the article to do this.
- In your feedback give your classmate comments on what they have done well and then constructive comments on how they could improve. Try to be as specific as possible with these as this will help your classmates the most.