Discovering marine species and their ecosystems

Written by: Alexander Rendoulis

Number of lessons: 3-4

Year level(s): 9

Australian Curriculum content descriptions:

Ecosystems consist of communities of interdependent organisms and abiotic components of the environment (ACSSU176).

Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment (ACSSU175)

Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS174)

Achievement standard:

Students analyse how biological systems function and respond to external changes with reference to interdependencies.

Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety.

Students analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others' methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences.

Lesson 1 –Introduction and specimen collection

Context

This lesson introduces marine ecosystems, in particular a soft sand ecosystem and takes students through the process of collecting species for examination.

Materials and equipment

First local permission to collect sand samples on the beach is required.
For one group;

- 1x shovel
- 1x 75mm PVC pipe
- 1x sifter
- 3x ziplock bags

Fig. 1 Sifter and PVC pipe used to collect sand samples

Safety Advice

Excursion

- Hats
- Sunscreen
- Water bottles

Objectives

The purpose is to collect sand from the beach to later **investigate the living organisms in this ecosystem.**

Introduction

Think – pair – share
Where might you find life in the ocean?

Many students will discuss sea floor but it is a good opportunity after the activity to introduce the idea of life under the sand. Many students won't think of this.

Core

Head to the beach.
After the Think – Pair – Share move into the data collection and asking students to follow the steps to collect sand samples.

1. Randomly choose a section of sand close to the shoreline.
2. Push your PVC pipe into the sand. This will take a core sample that is consistent each time.
3. Using your shovel dig up the PVC pipe and empty the core sample into your ziplock bag.
4. Follow these steps again and take two more core samples of sand

Conclusion

With the class and their sand samples ask students if they can see any life in their ziplock bags at this stage, without a microscope.

Lesson 2: using the dissecting microscope and data collection

Context

This lesson requires students to search for and collect microorganisms and practice using dissecting microscopes

Materials and equipment

First local permission to collect sand samples on the beach is required.

For one group;

- 1x white tray
- 1x tweezers
- 1x plastic pipette
- 1x petri dish
- 1x bottle water
- 1x dissecting microscope

Safety Advice

Brief students on proper equipment handling, e.g. carry miscroscope with two hands

Objectives

To practice correct procedure for collecting microorganisms and using dissecting microscopes

Introduction

The dissecting microscope

Ask students to familiarize themselves with the dissecting microscope. This may be done through teacher demonstration.

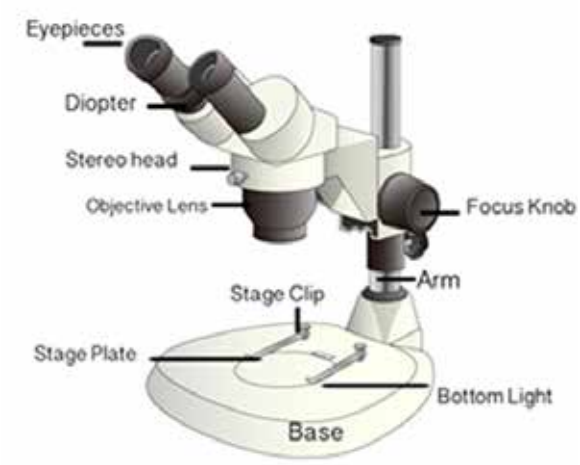

Fig 2: Dissecting microscope diagram

Core

Collecting organisms (see images)

1. Pour some water into your tray and then empty one of your ziplock bag sand samples into the tray.

2. Using the tweezers begin to shift the sand around in the water, looking closely for movement and microorganisms. Finding the organisms takes time and will require slow movements of the sand. One an organism is found follow the next steps.

3. Place a small drop of water in the petri dish to put microorganisms in to keep alive.

4. Use the tweezers to gently grab a microorganism and place them into the drop of water. If the organism is too small or quick using the suction of the pipette will work.

If following correct procedure each species will have their own drop of water in the petri dish.

5. Continue finding organisms and placing them in drops of water

Fig 3: Sifting through sand with tweezers

Fig 4: Place organisms in drop of water

Observing organisms

1. Once you have your petri dish with different species from the sand you can place this under the microscope.

2. Follow your teachers instructions for using and focusing with the dissecting microscope.

3. For each species in this ecosystem have a go at;

- Drawing a detailed picture
- Identifying specific features (body parts/colour/shape)
- Identifying the species or family

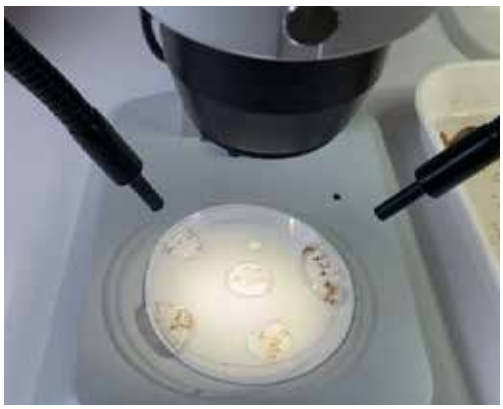

Fig 5: Observing organisms under the microscope

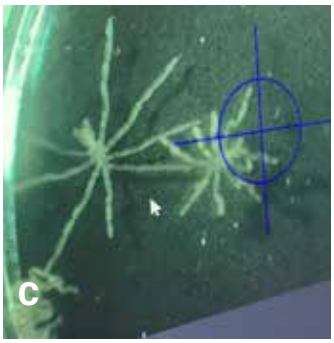

Fig 6: A-C Examples of organisms found during te Fowlers Bay Bush Blitz (SA). Nov 2021

Conclusion

To end the lesson a class discussion revisiting marine ecosystems is valuable. The discussion can open into areas such as biotic and abiotic features and survival in this soft sand ecosystem. Even consideration into how and why species are here. (10 mins)

Resources

You tube video: **How to use the dissecting microscope by SJU GEP Science**

https://www.youtube.com/watch?v=JNCeBBwfb_0&ab_channel=SJUGEPScience

Lessons 3-4: Connecting field work with background knowledge

Context

This lesson students will use their discoveries to question and discuss interactions, examine factors and investigate change in regards to their newly researched exosystem – soft sand (sandy shores ecosystem).

Materials and equipment

Collaboration and brainstorming materials (Pen/paper, laptops)

Safety Advice

n/a

Objectives

To discuss and investigate the sandy-beach ecosystem

Introduction

A fantastic paper by William Gladstone regarding Sandy-beach ecosystems found here: https://www.researchgate.net/publication/277359390_Australian_sandy-beach_ecosystems_and_climate_change_Ecology_and_management

Depending on the class, students can spend time reading the whole piece (some complex concepts), or certain sections can be isolated and provided to students, or as a class a read through and discussion.

Core

Students can use prior ecosystem knowledge and their newly acquired research findings to either work alone or collaboratively to produce a mind map or presentation exploring the sandy-beach ecosystem.

Questions to consider in the presentation or research piece are;

- How might human impact (in particular, but not limited to, beach popularity) affect the diversity or population numbers in the sandy-beach ecosystem?
- What biotic and abiotic features make up the sandy-beach ecosystem? And how might location impact this?
- What variances can you get from one sandy-beach location compared to others? Tides/weather/temperature
- From your discoveries and research what food chains can you begin to build? Where might some microorganisms get their energy from?
- Are there similarities or influences from nearby ecosystems, such as surf zones, sand dunes and coastal lagoons?
- How might climate change (particularly, temperature rising) impact the ecosystem.

Conclusion

Students can then present their findings and research to another group or class.

Resources

Jones, A. & Gladstone, William & Hacking, N.. (2007). Australian sandy-beach ecosystems and climate change: Ecology and management. Australian Zoologist. 34. 190-202.