**Coastal Custodians, Citizens & Scientists**

Teacher Guide

delwp.vic.gov.au

Coastcare Victoria School Kit

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| Ecosystem and Edible Urchins  Teacher Guide |

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Acknowledgements

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Author

Coastcare Victoria and Ecolinc Science and Technology Innovations Centre.

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Tim Goddard via Friends of the Barwon Bluff.

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| DELWP Pupangarli Marnmarnepu ArtworkAcknowledgment  We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.  We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond. |
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**Lessons overview**

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| --- | --- | --- | --- |
| **Activity** | **Time** | **Difficulty** | **Topic & Skills** |
| 1: Quiz | 5 min Video  15 min Quiz | **Simple** | The Barwon Heads Bluff and citizen science.   * Listening comprehension. |
| 2: Sea Slug Census | 30 min | **Simple** | Sea Slugs (Nudibranchs).   * Observation and illustration. |
| 3: Scientific Sampling - Survey | 60 min | **Moderate**: Multiple step activity. | Biodiversity.   * Data collection and calculation. |
| Investigation 1: The Language of Science | 60+ min | **Complex**: Using external resources. Independent learning. | Scientific literacy and design.   * Research and infographic. |
| Investigation 2: Scientific Poster | 60+ min | **Complex**: Multi-step instructions. Independent learning. | Community and citizen science.   * Research and scientific poster. |

# Curriculum links

|  |  |  |  |
| --- | --- | --- | --- |
| Year 5 and 6 Curriculum Area | C/ Code | Content Description | Elaboration / Link to this lesson/ Learning intentions |
| Science/ Science understanding > science as a human endeavour | VCSSU073 | Scientific understandings, discoveries and inventions are used to inform personal and community decisions and to solve problems that directly affect people’s lives | Learn how community members and scientists collaborate in citizen science projects |
| Science/ Science Inquiry Skills >  Recording and processing | VCSIS085 | Construct and use a range of representations, including tables and graphs, to record, represent and describe observations, patterns or relationships in data | Plan scientific sampling and record data on organism densities on an example rockyshore  Represent data in tables and make conclusions from describing patterns and relationships  Research and reorganise information and apply design principals to create science communication tools |
| Science/ Science Inquiry Skills >  Analysing and evaluating | VCSIS086 | Compare data with predictions and use as evidence in developing explanations | Make predictions about a population size from sample data |
| Science/ Science Inquiry Skills >  Analysing and evaluating | VCSIS087 | Suggest improvements to the methods used to investigate a question or solve a problem | Outline problems with a basic scientific investigation and provide suggestions for improvement |

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| --- | --- | --- | --- |
| Year 7 and 8 Curriculum Area | C/ Code | Content Description | Elaboration / Link to this lesson/ Learning intentions |
| Science/ Science understanding > science as a human endeavour | VCSSU089 | Scientific knowledge and understanding of the world changes as new evidence becomes available; science knowledge can develop through collaboration and connecting ideas across the disciplines and practice of science | Learn how community members and scientists collaborate in citizen science projects |
| Science/ Science Inquiry Skills >  Recording and processing | VCSIS110 | Construct and use a range of representations including graphs, keys and models to record and summarise data from students’ own investigations and secondary sources, and to represent and analyse patterns and relationships | Plan scientific sampling and record data on organism densities on an example reef  Represent data in tables and make conclusions from describing patterns and relationships  Research and reorganise information and apply design principals to create science communication tools |
| Science/ Science Inquiry Skills >  Analysing and evaluating | VCSIS111 | Use scientific knowledge and findings from investigations to identify relationships, evaluate claims and draw conclusions | Make predictions about a population size from sample data |
| Science/ Science Inquiry Skills >  Analysing and evaluating | VCSIS112 | Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method | Outline problems with a basic scientific investigation and provide suggestions for improvement |

## Key Themes

Scientific illustration and identification, data collection, scientific practices, citizen science, language for science communication, and the design of different science communication tools.

## Learning intentions

Students will:

* Identify features of sea slugs.
* Compare and contrast scientific illustrations with scientific diagrams.
* Understand that data can be collected by scientists and citizen scientists, and each have strengths and weaknesses.
* Deconstruct everyday words to understand their scientific meanings.
* Research and organise information into the structure of a scientific poster to engage a specific audience.

## Success Criteria

Students are able to:

* Choose and design the most appropriate science communication tool for a variety of purposes.
* Identify the two groups of nudibranchs and illustrate their anatomical differences.
* Use sampling techniques to calculate population estimates.
* Understand the scientific meaning behind common words.
* Use graphic design to show the connections between related words and concepts.
* Create a scientific poster to summarize the impact of a Coastcare community group.

## Background

This module is focused on Custodianship. A custodian is a person who feels compelled to care for a place they feel connected to. This connection may be due to loving a place, living there, or having ancestors who have lived there for many generations. Care is explored through community actions, like maintaining Wadawurrung language, and scientific actions, like monitoring for ecosystem health.

The video features Jon Duthie and the Friends of the Bluff (FoB) - a group of committed community members providing support, education, awareness and publicity for the physical regeneration of the natural habitat of the Barwon Bluff area. The group works in association with scientific and management staff of the [Barwon Coast Committee of Management](https://www.barwoncoast.com.au/) and [Parks Victoria](https://www.parks.vic.gov.au/). They also collaborate and communicate with environmental organisations like [Coastcare Victoria](https://www.marineandcoasts.vic.gov.au/coastal-programs/Coastcare-Victoria).

To achieve these aims, FoB members are actively involved in sustainable management strategies, such as weed eradication programs, planting indigenous species, surveying bird and animal life, and providing community interpretation and education sessions. Friends of the Bluff are committed to developing programs to promote conservation and preservation of the Bluff and to encourage others to recognise and appreciate this unique coastal landmark. Through these actions, FoB members are acting as custodians, citizen scientists and science communicators.

In this curriculum resource, students will be introduced to citizen science projects; the Melbourne Sea Slug Census and BioBlitz. Students are educated throughout the resource by different citizen and custodial science communicators. Kitty Turner is an artist whose colourful book pages will teach your students about sea slugs.

Students will also learn how to create different science communication tools like diagrams, illustrations, data tables, infographics and scientific posters. In learning why these tools suit different stories and audiences, your students are gaining the skills necessary to participate in their community as custodians, citizen scientists and communicators.

## Resources

* Video: Citizen Science at the Bluff
* Presentation Slides: Coastal Custodians, Citizens & Scientists
* Supplementary Presentation Slides: Citizen Scientist Profiles
* Teacher Guide: Coastal Custodians, Citizens & Scientists
* Answers: Coastal Custodians, Citizens & Scientists
* Worksheets: Coastal Custodians, Citizens & Scientists
  + Quiz
  + Sea Slug Census
  + Scientific Sampling - Survey
  + Investigation 1: The Science of Language
  + Investigation 2: Scientific Poster
  + Coastal Custodians, Citizens & Scientists Review Questions
* Print out: Barwon Bluff rockpool
* Coastal Custodians, Citizens & Scientists Glossary

## Other useful links

* iNaturalist: [Melbourne Sea Slug Census](https://www.inaturalist.org/projects/melbourne-sea-slug-census-march-2024)
* Girls that Scuba: [11 facts about nudibranchs](https://www.girlsthatscuba.com/facts-about-nudibranchs/)
* Kitty Turner: [The Weird and Wonderful World of Nudibranchs](https://www.kittyturner.com/nudibranch-book)
* Gigacalculator: [Random Number Generator](https://www.gigacalculator.com)
* Friends of the Bluff: [Wadawurrung Language Games](https://www.barwonbluff.com.au/wadawurrung-language/)
* Piktochart: [Why Use Infographics?](piktochart.com/blog/why-use-infographics/)
* Friends of the Bluff: [Explore life on the Bluff](https://www.barwonbluff.com.au/bluff-life/)
* Coastcare Victoria: [Environmental Volunteer Opportunities Map](https://www.marineandcoasts.vic.gov.au/coastal-programs/coastcare-victoria/volunteering-opportunities)

# Lessons

## Activity 1: Quiz

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Time** | **Difficulty** | **Skills** |
| The Barwon Heads Bluff and citizen science | 5 min Video  15 min Quiz | Simple | Listening comprehension |

After watching the video complete the quiz.

*\*Completed quiz (and all answers) are available in the accompanying answer booklet.*

## Activity 2: Sea Slug Census

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Time** | **Difficulty** | **Skills** |
| Sea Slugs (Nudibranchs) | 30 min | Simple | Observation and illustration |

**In this activity your students will learn the basic anatomy of sea slugs (nudibranchs), gather some statistics about the Melbourne Sea Slug Census from the** [**iNaturalist**](https://www.inaturalist.org/) **project page, and create a scientific diagram of a nudibranch of their choice. After completing the diagram, photocopy them so that your students can turn their diagram into a colour illustration. As a class, compare diagrams and illustrations as science communication tools.**

Scientific diagrams are simple but accurate line drawings which show the shape and dimensions of an organism very clearly. They do not include any colour, shading or texture which might make the essential details harder to see or understand. Diagrams also include a scale bar to show the real size of the animal and labels for important body parts, linked by carefully ruled lines.

However, colours and patterns are often essential in correctly identifying an organism. This is particularly true for nudibranchs which have a few simple body plans, covered with incredible colours which can be specific to species. This means a diagram is the best way to learn and understand the basic anatomy of nudibranchs, but a colour illustration is essential to properly depict each species.

1. Use Slides 5-12 to teach your students about nudibranchs.
   * Slides 6-12 are designed by UK artist Kitty Turner.
   * Older students can independently learn [11 facts about nudibranchs](https://www.girlsthatscuba.com/facts-about-nudibranchs/) from the Girls that Scuba website.
   * Supplementary Presentation Slides: Citizen Scientist Profiles, are available to facilitate a conversation about science communication careers.
2. Students use [iNaturalist](https://www.inaturalist.org/projects/melbourne-sea-slug-census-march-2024), and the Melbourne Sea Slug Census to answer the questions on the student worksheet (Activity 2. Sea Slug Census) [Slide 13]. There are multiple dates and years to choose from. Examples in the answer document are based on March 2024.
3. Students choose a nudibranch species from the Sea Slug Census and create a scientific diagram [Slide 14]. They will highlight the anatomy of either sea slug; Dorid (gills in a tuft on its back) or Aeolid (gills running the length of its back) [Slide 8 and 14].
4. Photocopy student diagrams so that they can add colour to match their nudibranch species [Slide 15].
5. Gather the student diagrams and illustrations in a binder to create your own nudibranch book like Kitty Turner.

**Talking points:** Diagrams are simplified so that basic anatomy is clear to see and easy to learn. Without colour, a diagram can never properly represent a nudibranch species, because they are identified using their patterns as well as their anatomy. Therefore, a scientific illustration is essential to convey species level information about nudibranchs. These are two different science communication tools, designed to meet different communication needs.

[Kitty Turner](https://www.kittyturner.com/nudibranch-book) is an artist who was inspired by nudibranch patterns and colours. She designed her own book to share her love of nudibranchs. Her book is a science communication tool, therefore, Kitty is both an artist and a citizen scientist.

Please share your nudibranch illustrations with us! Email Kitty and Coastcare Victoria or tag us online.

## Activity 3: Scientific Sampling - Survey

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Time** | **Difficulty** | **Skills** |
| Biodiversity | 60 min | Moderate: Multiple step activity | Data collection and calculation |

**Your students are going to do a BioBlitz, using the Barwon Bluff rockpool printout. They will learn about the population abundance of some organisms from the intertidal rockpools. Then conduct a survey by gathering count data using quadrats. These counts can be used to calculate population estimates in just the same way scientists monitor ecosystems.**

BioBlitz is a citizen science program facilitated by the iNaturalist website. Assisted by AI image recognition, anyone can help to count biodiversity by taking photos of species and adding them to the BioBlitz project page. Biodiversity surveys help scientists and land managers understand how many of which species are present in an ecosystem. Community composition says a lot about the health of an ecosystem [Slide 16].

On the rockpool print out, your students will be counting five common intertidal species. Use Slide 17 to learn about these species as a class. Knowing the expected species abundance will assist students to interpret their survey data.

**This is what the student worksheet looks like, with answers included.**

**STEP 1**: Count every species you can see on the rockpool print out and enter the data into the TOTAL COUNT row in your RESULTS table.

*Neptune’s necklace seaweed has been counted for you. It is recorded as the number of 25cm x 25cm grid squares the seaweed covers on your rockpool print out.*

It would be very hard to count every species on a real life rockpool platform. Instead, scientists count a subset of the rockpool area (called a survey) and then multiply their answer to estimate the total number of species. A 1m x 1m survey square called a quadrat, is used to count the subset.

*If we choose where to put our survey squares, we might pick the ‘best looking’ locations. This will bias the data and create inaccurate results. It is impossible not to be biased, it’s just how the human brain works. Therefore, we use an unbiased method to help us choose, which is a random number generator.*

**To select the coordinates of their ten quadrats, students will use a** **random number generator** [**https://www.gigacalculator.com**](https://www.gigacalculator.com) [Slide 18]

**STEP 2:** Use a random number generator to create coordinates for each of your ten quadrats and record them here.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Quadrat coordinates 1-8 x A-F: Teacher example coordinates** | | | | | | | | | |
| **1:** | **8C** | **2:** | **4C** | **3:** | **4D** | **4:** | **3A** | **5:** | **6A** |
| **6:** | **1F** | **7:** | **5D** | **8:** | **3F** | **9:** | **7E** | **10:** | **8F** |

**STEP 3:** Outline a 1m x 1m quadrat at each of your ten coordinates, and label them 1-10. [Slide 19. This slide also shows the example coordinates, and highlights in red that the number generator might produce duplicate coordinates, and you will need to skip them].

**STEP 4:** Count each animal or grid square with seaweed in it, and record in your RESULTS table.

**RESULTS:** These example results match the quadrats shown on Slide 19.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | A crab with claws and claws  Description automatically generated with medium confidence**Shore Crab** | **Eight-armed Sea Star** | **Free Vectors | White Tasuki NudibranchNudibranchs** | A close up of a white object  Description automatically generated**Elephant Snail** | Neptunes Necklace | Fishing Tasmania**Neptune’s Necklace Seaweed** |
| **TOTAL COUNT** | **35** | **30** | **10** | **15** | **420 grid squares** |
| **Quadrat 1** | **1** | **1** | **-** | **1** | **7** |
| **Quadrat 2** | **1** | **1** | **-** | **-** | **5** |
| **Quadrat 3** | **-** | **-** | **-** | **-** | **14** |
| **Quadrat 4** | **1** | **1** | **-** | **-** | **5** |
| **Quadrat 5** | **1** | **1** | **-** | **1** | **5** |
| **Quadrat 6** | **-** | **1** | **-** | **1** | **12** |
| **Quadrat 7** | **2** | **-** | **-** | **1** | **9** |
| **Quadrat 8** | **-** | **1** | **-** | **-** | **5** |
| **Quadrat 9** | **-** | **1** | **1** | **-** | **-** |
| **Quadrat 10** | **1** | **1** | **-** | **-** | **11** |

**Use your results to estimate the total population of organisms in the rockpools.**

The rockpool platform is 8m across x 6m down.

How many 1m square quadrats would it take to survey the whole reef? 48 x 1m squares

Now that we have completed our survey, we have ten subsets of the total population. Through multiplication these counts can be used to estimate the total population. You will investigate how the estimate changes when you use counts from 1, 5 and 10 quadrats. [Slide 20 - worked example]

**STEP 5:** Add together each organism you counted in 1, 5 and 10 quadrats. Enter the answers into the corresponding rows of the ESTIMATE table.

**Try visualising!**



**STEP 6**: Calculate your multipliers.

How much of the total rockpool area is 1 quadrat? **48 ÷ 1 = [\_48 \_] A**

Multiply the number of species from quadrat 1 by answer **A**

How much of the total rockpool area is 5 quadrats? **48 ÷ 5** **=** [**\_9.6\_] B**

Multiply the number of species from 5 quadrats by answer **B**

How much of the total rockpool area is 10 quadrats? **48 ÷ 10 =** [\_**4.8**\_] **C**

Multiply the number of species from 10 quadrats by answer **C**

**ESTIMATE**: [Q = quadrat]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | A crab with claws and claws  Description automatically generated with medium confidence**Shore Crab** | **Eight-armed Sea Star** | **Free Vectors | White Tasuki NudibranchNudibranchs** | A close up of a white object  Description automatically generated**Elephant Snail** | **Neptune’s Necklace Seaweed** |
| **TOTAL COUNT** | **35** | **30** | **10** | **15** | **420 grid squares** |
| **Number in Q1** | **1** | **1** | **-** | **1** | **7** |
| **Multiply x A**  **48** | **48** | **48** | **0** | **48** | **336** |
| **Number in Q1+2+3+4+5** | **4** | **4** | **0** | **2** | **36** |
| **Multiply x B**  **9.6** | **38** | **38** | **0** | **19** | **345** |
| **Number in**  **Q1+2+3…+9+10** | **7** | **8** | **1** | **4** | **73** |
| **Multiply x C**  **4.8** | **33** | **38** | **4** | **19** | **350** |

**Discuss: What happens to your estimate as you add more data?**

They become more accurate, which means they become closer to the total population number. Inaccuracies occur from low count numbers because the multiplier is so large, and because many organisms are absent from some quadrats. As you can see, abundant organisms, like the seaweed, can be estimated more accurately than rare ones.

Answers in your class should improve with more data but may not. Animals and plants clump together in their environment, so some quadrats will have more and some less. Once multiplied, these patchy results can give false positive or false negative counts of species in an environment. Learning about species biology and distribution tells scientists what to expect and how to recognise a faulty answer.

**There are less scientists in the world than regular people. Inviting regular people to collect data as citizen scientists, is one way for scientists to gather more data and hopefully get better estimates of species populations.**

## Investigation 1: The Science of Language

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Time** | **Difficulty** | **Skills** |
| Scientific literacy and design | 60+ min | Complex: Using external resources. Independent learning. | Research and infographic |

**In this activity students will create an infographic which will help to highlight the scientific meaning which is embedded in many everyday words. The word ‘gull’ describes a ‘long-winged**[**web-footed**](https://www.google.com/search?sca_esv=ea82e60a3593f99e&sca_upv=1&sxsrf=ADLYWIIXryn54fg-TS1XBeifUH-4xz4z3g:1726622156638&q=web-footed&si=ACC90nyOnVY18Aw7zUtkWPYo5mTnmTtEEDFx8gbun1OBV5gj_HOUH99PCMVhtyElW0HmjZRvVN7BXf436TxQTFZsDA0A4873_0TLTRoqErLDniLjQ16me_c%3D&expnd=1&sa=X&sqi=2&ved=2ahUKEwjE57riqMuIAxXCwTgGHeQRJ_cQyecJegQIPxAO)[**seabird**](https://www.google.com/search?sca_esv=ea82e60a3593f99e&sca_upv=1&sxsrf=ADLYWIIXryn54fg-TS1XBeifUH-4xz4z3g:1726622156638&q=seabird&si=ACC90nypsxZVz3WGK63NbnSPlfCBF8fdKzeAAO1HPQ6yXPXsBBIbDA1xba8HKd2mq46SoY0qjm4VYViJ2DA8-xLMllojNjaXXA%3D%3D&expnd=1&sa=X&sqi=2&ved=2ahUKEwjE57riqMuIAxXCwTgGHeQRJ_cQyecJegQIPxAP)**with a raucous call’, information which we see, but don’t consciously think about when we see a ‘seagull’ or a ‘pacific gull’.**

Infographics illustrate the old adage, *‘a picture paints a thousand words’*. An infographic combines facts and pictures to help break down long, wordy, explanations into smaller parts which are easier to understand, more fun to look at and are more memorable to a reader [Slide 23].

Further reading: <piktochart.com/blog/why-use-infographics/>

1. Using Slide 24 [also Slide 21-22], students will brainstorm examples of infographics. For example, an interpretative sign at a national park, a poster on a complex subject like climate change, a weather map on the nightly news, instructions which include a diagram, graphs and maps.
2. Using Slide 25 as an example, students will design an infographic which investigates the meaning behind three interrelated words.

* Define these words and illustrate their connections in a clear and creative way.
* Use search engines to gather definitions, illustrations and facts which help to explain the words and their connections.

1. Go to the [Friends of the Barwon Bluff ‘Living on the Edge’](https://www.barwonbluff.com.au/bluff-life/) website. Under the LIFE tab, students can see many species names and descriptions to spark ideas for their own infographic.

|  |  |  |
| --- | --- | --- |
| **Examples of interrelated words from** [**‘Explore Life on the Bluff’**](https://www.barwonbluff.com.au/all-life/) **website**  Underlined words are clickable links. | | |
| **Simple** |  |  |
| [Pacific](https://www.barwonbluff.com.au/bird-pacific-black-duck/) Black Duck | [Pacific](https://www.barwonbluff.com.au/bird-pacific-gull/) Gull | Silver [Gull](https://www.barwonbluff.com.au/bird-silver-gull/) |
| Coast [Salt](https://www.barwonbluff.com.au/plant-coast-saltbush/)bush | Seaberry [Salt](https://www.barwonbluff.com.au/seaberry-saltbush/)bush | Google: table salt |
| Coast Beard-[heath](https://www.barwonbluff.com.au/plant-coast-beard-heath/) | Sea [Heath](https://www.barwonbluff.com.au/plant-sea-heath/) | Google: common heath |
| [Austral](https://www.barwonbluff.com.au/austral-salt-grass/) Salt-grass | [Austral](https://www.barwonbluff.com.au/austral-seablite/) Sea Blite | Google: Australia |
| **Intermediate** | | |
| Sooty [Oystercatcher](https://www.barwonbluff.com.au/bird-sooty-oystercatcher/)  Pied [Oystercatcher](https://www.barwonbluff.com.au/bird-australian-pied-oystercatcher/) | [Pied](https://www.barwonbluff.com.au/bird-pied-currawong/) Currawong  Little [Pied](https://www.barwonbluff.com.au/bird-little-pied-cormorant/) Cormorant | Australian Mag[pie](https://www.barwonbluff.com.au/bird-australian-magpie/)  Mag[pie](https://www.barwonbluff.com.au/bird-magpie-lark/) Lark |
| Shared concept: beads/segments  [Beaded](https://www.barwonbluff.com.au/plant-beaded-glasswort/) Glasswort | Neptune’s [Necklace](https://www.barwonbluff.com.au/algae-neptunes-necklace/) | Google: necklace |
| Shared concept: shape words  Coast [Spear](https://www.barwonbluff.com.au/plant-coast-spear-grass/) Grass | Coast [Twin-leaf](https://www.barwonbluff.com.au/coast-twin-leaf/) | Coast [Fan](https://www.barwonbluff.com.au/coast-fan-flower/)-flower |
| **Complex: Aboriginal names which became common English names** | | |
| [Rakali](https://www.barwonbluff.com.au/mammals-rakali-native-water-rat/) (water rat)  More info [HERE](https://en.wikipedia.org/wiki/Rakali) | [Moonah](https://www.barwonbluff.com.au/moonah/) (Melaleuca)  More info [HERE](https://urbaqua.org.au/noongar-plant-species-list/) | [Brolga](https://www.barwonbluff.com.au/bird-brolga/)  More info [HERE](https://www.australiangeographic.com.au/fact-file/fact-file-brolga-grus-rubicunda/#:~:text=The%20silhouette%20of%20the%20dancing,which%20they%20are%20called%20burralga.) |

## Investigation 2: Scientific Poster

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Time** | **Difficulty** | **Skills** |
| Community and Citizen Science | 60+ min | **Complex**: Multi-step instructions. Independent learning. | Research and scientific poster |

**In this investigation, your students will research a Coastcare community group and summarise their work in a Scientific Poster.**

Science communication is the essential task of ‘spreading’ the word about new scientific discoveries, and there are many ways of doing it. Many modern scientists have social media where they share their work with followers.

Academic publications are a traditional way for researchers (not just scientists) to share their findings with the world. The format is a written document like a thesis, a journal article or a governmental report. Your students will write science reports to document experiments in their high school science class. These documents use specific language, technical diagrams, highly detailed descriptions, and they are very boring to read.

Scientific posters are another science communication tool used by real scientists to share their research. Posters follow the logical order of the ‘scientific method’ while also incorporating graphic design to make the display of results or research much more engaging.

*The format is up to you. Students might work alone or in groups. This could be a digital design task, or you could create A3 poster boards and hold a class science fair where your students present their research to an audience or display the digital posters on a social media platform.*

1. Introduce your class to scientific posters and help them to understand the terms used as subheadings [Slide 26-27].
2. Slide 28 shows how Coastcare community group activities can be fitted into the Scientific Poster format – with a little creative thinking. Students have a copy of this in their worksheets.

You might rewatch the Citizen Science at the Bluff video from the beginning of this unit and have students tick off information on their example poster as they hear it mentioned in the video.

1. Students have a blank Scientific Poster worksheet to help organise their research notes.
2. Students can choose a community group from the [Coastcare Victoria: Environmental Volunteer Opportunities Map](https://www.marineandcoasts.vic.gov.au/coastal-programs/coastcare-victoria/volunteering-opportunities) – it’s interactive!
   * Or they could choose videos from the Coastcare Schools Kit: Lesson 3, 4 and 7 which features community actions.
   * Advanced students might use iNaturalist and present the findings of a citizen science data collection project.
   * Or research the caring for country practices of the traditional custodians of your area.

## Review Questions

Students answer the Coastal Custodians, Citizens & Scientists Review Questions on their worksheet.

## Glossary

**Abundance**: The number or amount of something in a particular area or environment. In ecology, it often refers to how many organisms of a species are present.

**Accurate**: In statistics, refers to how close a measured or calculated value is to the true or actual value, indicating the level of correctness of the data.

**Bias**: A tendency to favour one thing over another in an unfair or unbalanced way.

**Citizen**: A member of a community who actively participates in and contributes to the well-being, decision-making, and social life of that community, with shared rights and responsibilities.

**Citizen scientist**: A regular person who volunteers to help with scientific research, often by collecting data or observing nature.

**Community composition** (in ecosystem terms): The different types of species that live together in a particular environment and how many of each are there.

**Custodian**: A person responsible for taking care of or protecting something, like a building or the environment.

**Traditional custodian**: A member of an Indigenous community who has ancestral ties and responsibilities to care for and protect their land, waters, and cultural heritage.

**Diagrams**: Simple drawings or plans that show how something works or how parts of something are arranged.

**Illustration**: A drawing or picture used to explain or decorate something.

**Infographic**: A visual image, like a chart or diagram, that presents information or data in an easy-to-understand way.

**Intertidal**: The area of the shore that is underwater at high tide and exposed to air at low tide.

**Nudibranch (also known as a sea slug)**: A colourful, soft-bodied marine mollusc belonging to the subclass *Nudibranchia*. Named for their lack of a protective shell in adulthood, leaving their gills-naked (nudi-branch). These gastropods are found in oceans worldwide, with diverse species displaying bright colours and striking patterns, often as a form of defence or camouflage.

**Organism**: Any living thing, like a plant, animal, or microorganism.

**Quadrat**: A frame, usually a square, used by scientists to mark off a small area to study the number of organisms in that space.

**Sea slug:** See nudibranch.

**Science communicator**: Someone who explains scientific ideas in a way that regular people can easily understand.

**Scientist**: A person who studies or works in science to understand how things in the world or universe work.

**Survey**: A method used by scientists to observe and record the types and numbers of organisms in an ecosystem, usually to understand the health or composition of that environment.

**Wadawurrung**: An Indigenous Australian group of people and their language, from the western part of Melbourne and surrounding areas.