

Google Arts & Culture

# Kelp: The Invisible Forest

Why it's important, why it's endangered and what we can do

**GREAT  
SOUTHERN  
REEF**

## Introduction

# Kelp: The Invisible Forest Lesson Plan

Join us as we learn about kelp, the invisible forest.

This lesson plan is designed to support you as you explore Google Arts & Culture stories related to the lesson topic. This lesson is suitable for anyone but is recommended for students aged 10-14 years

You can complete the lesson on your own working at home, with a group of friends, or in your classroom. They are designed so that you can work through them at a pace that suits you.

If you get stuck, you can talk to a teacher or parent.

Throughout the lesson you will find tasks to complete and questions to answer, so when you reach the end, you will have used a range of skills to create something on your own that demonstrates your knowledge and understanding of the subject.

All you need to get started is any device with internet access. You don't need to print this lesson plan, as there are links to different resources.

Are you ready to discover the underwater forest and the life it sustains?

No snorkel required!

Things you'll need to complete this lesson.



Tablet, laptop or computer with access to the internet.



Paper, or a notebook, and pen to make notes as you go.



Drawing materials, such as coloring pens and pencils, paper etc.



Scissors, glue, scrap paper and general stationery items.



Art materials, specifically paints and brushes.



A printer would be beneficial but not necessary – why not draw instead?

## Explore & Discover

# An Introduction to Kelp

## What can you expect to learn?

In the following lesson, you will discover:

1. The Great Southern Reef off the coast of Australia and Tasmania
2. How Kelp Forests are endangered globally
3. What is being done to save the forests and what we can do

## Activities to complete

1. Create a food web for the kelp ecosystem
2. Write an article for the local newspaper
3. Design a poster to help save the kelp forests

## Outcomes you will achieve

- Understand the importance of kelp
- The variety of life in the kelp forest
- An awareness of how humankind is impacting on natural systems
- What we can learn from first nations about living in harmony with our environment
- What can be done to preserve this precious ecosystem

Look out for the following tips which tell you what to do when during the lesson.



Key information to remember and to help guide you through the lesson.



Estimated time to complete a section or activity within the lesson.



Optional headphones to listen to videos and audio recordings.



Explore online content. Discover videos, stories, and zoom into pictures.



Activity - time to design, make or write something of your own.



# Vocabulary

## Words to look out for in the lesson

Aboriginal

Algae

Campaign

Carbon dioxide

Carnivore

Consumer

Depletion

Dwindling

Ecosystem

Endemic

First Nations

Food chain

Food web

Fossil fuels

Genomics

Harmony

Herbivore

Holdfasts

Hydration

Indigenous

Kelp

Leach

Marine biologist

Mitigate

Primary producer

Photosynthesis

Pollutants

Reforest

Restoration

Sea Country

Seagrass

Seaweed

Species

## An Introduction to Kelp

# Introduction

While many people think of seaweed as a plant, it is in fact an **algae**.

Like plants, algae get their energy from the sun, through photosynthesis. This means that it is a **primary producer**: it converts light energy into organic matter.

Unlike plants, seaweed doesn't have roots. Instead it has what are called **strong holdfasts** used to grip to shallow rocky surfaces.

The three main groups of seaweed are brown, red and green algae. Kelp is described as a brown but it is closer to a golden hue.

### Why are we looking at kelp? Why is it important?

It is one of the largest ocean ecosystems but it is often misunderstood and it is in danger from climate change.

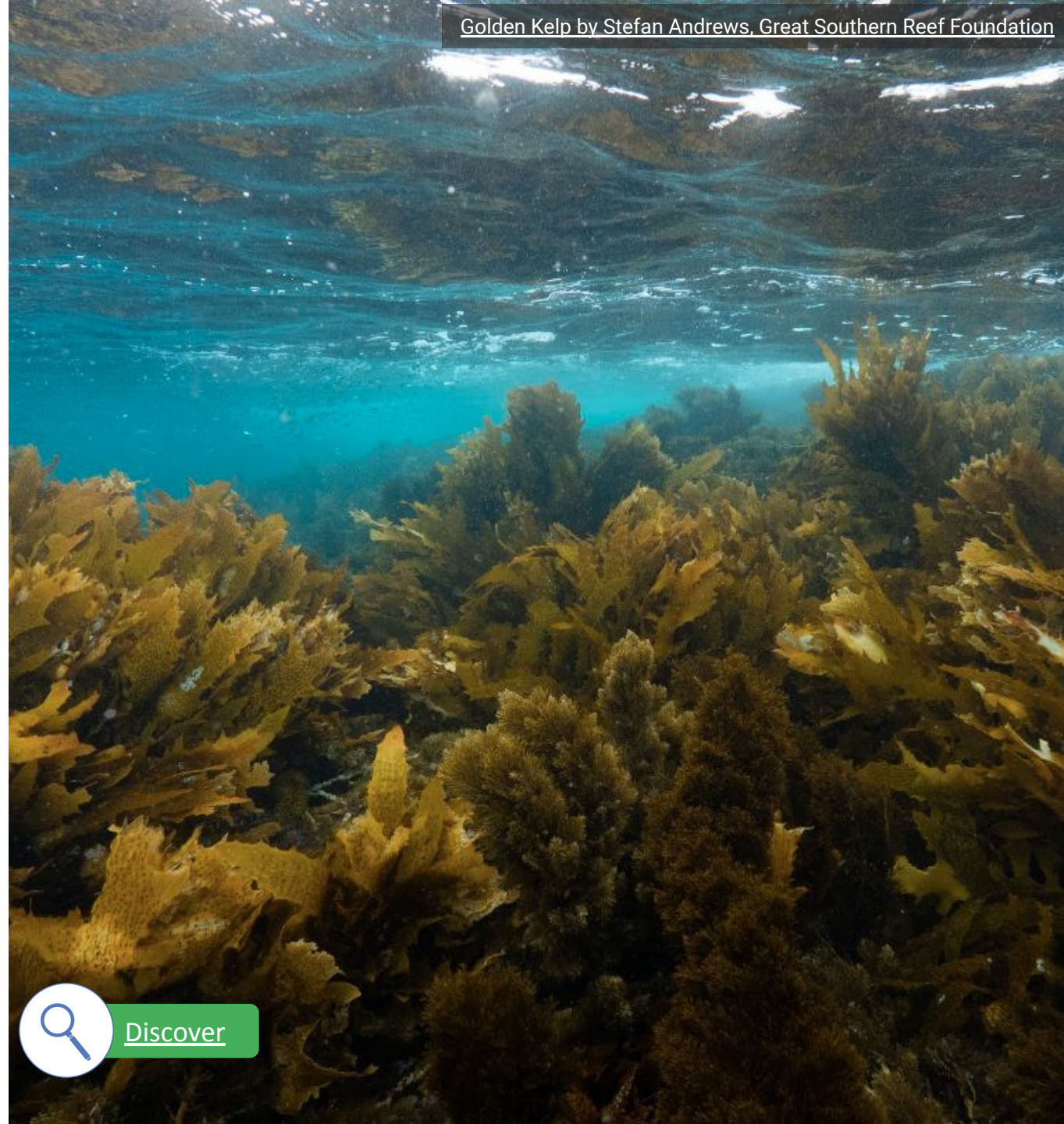
Read the story on the right to learn more about this beautiful and essential ecosystem.



If you make notes on the stories you read, this will help you for the end of lesson quiz.



[Discover](#)





[Kelp Forest Glass Fish by Stefan Andrews, Great Southern Reef Foundation](#)

# What Is This Lesson About?

This lesson is about the kelp forest, an important ecosystem. Kelp forests are being depleted. Learn what kelp is, why the kelp forests are disappearing, what we should learn from the First Nations and what we can do to stem the tide of oceanic deforestation.



This lesson will take around 180 minutes. Each chapter will take approximately 1 hour including the activity.



[Golden Kelp Forest by Stefan Andrews, Great Southern Reef Foundation](#)

# Chapter 1: The Great Southern Reef

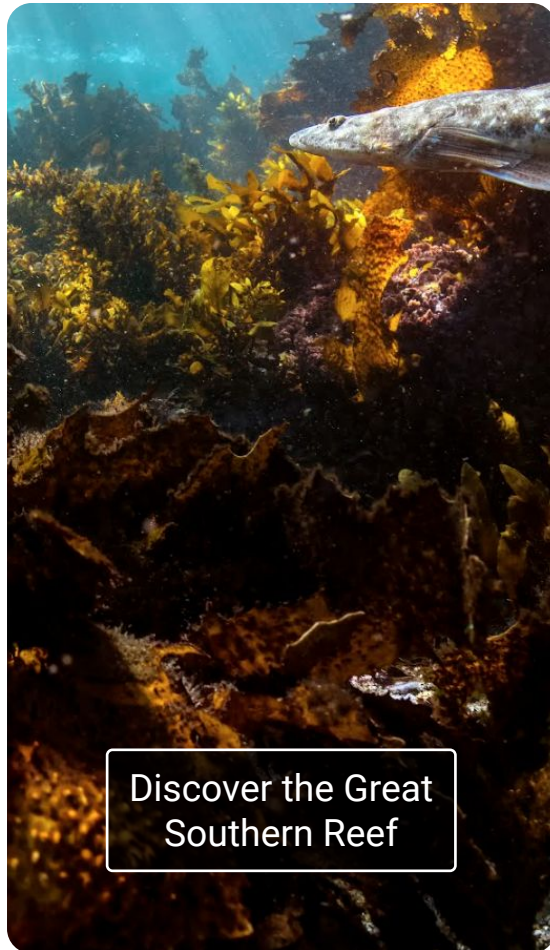
Explore the invisible forest off the coast of Australia. Understand the different types of seaweed and discover the species that live in this vital ecosystem.



This chapter will take around 60 minutes.

# The Great Southern Reef

Discover the underwater world off the coast of Australia



Discover the Great Southern Reef

[Flathead at Shelly Beach, NSW. Photo: Gergo Rugli, Great Southern Reef Foundation](#)



Species of the Great Southern Reef

[Leafy Seadragon by Stefan Andrews, Great Southern Reef Foundation](#)



Seaweed: More than a weed

[Giant Kelp, by Stefan Andrews, Great Southern Reef Foundation](#)





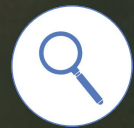
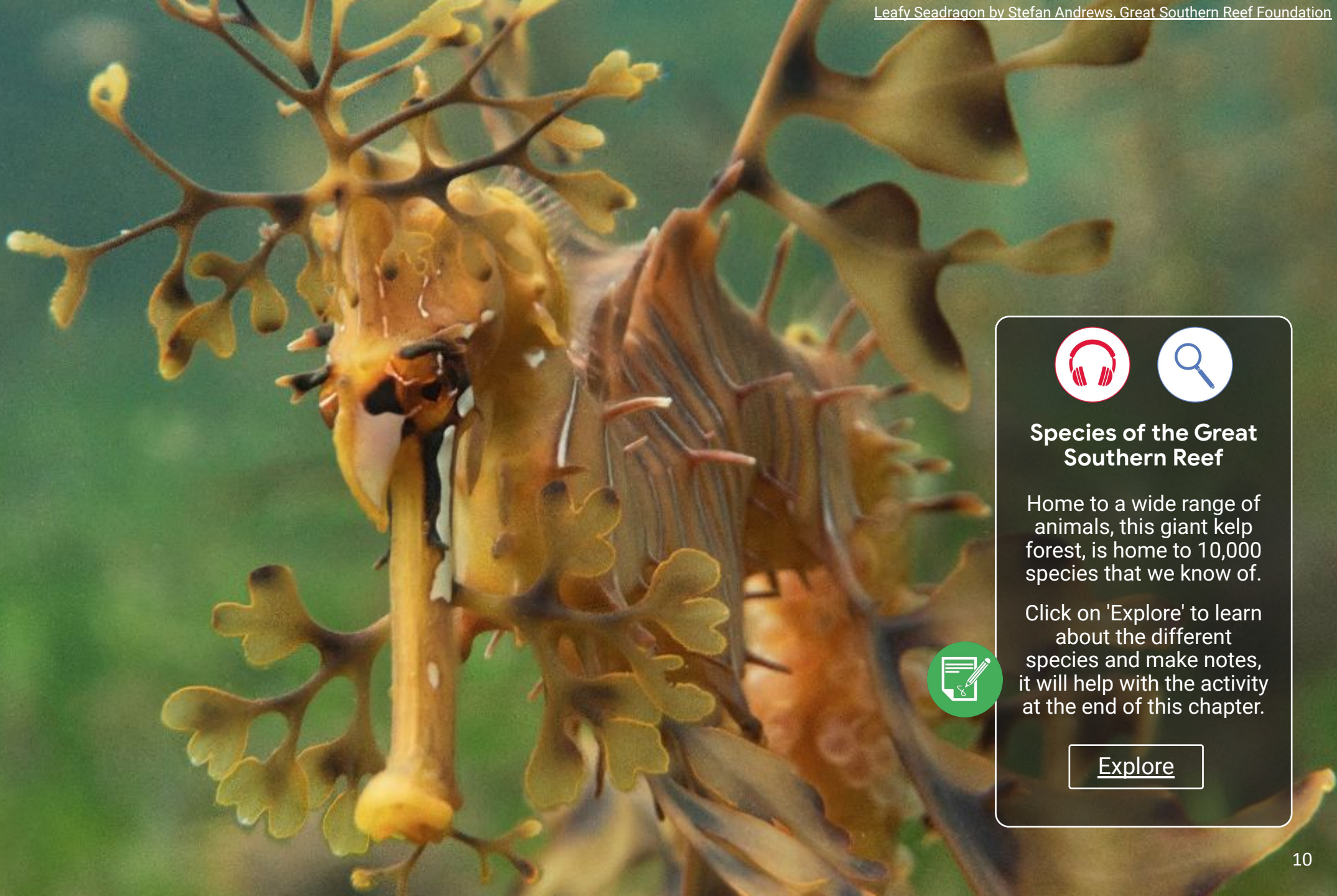
## Discover The Great Southern Reef

The Great Southern Reef is the largest continuous kelp forest in the world.

Click on the 'Watch' button to see a video about the Great Southern Reef kelp forest. Learn why it's important.

[Run time 3 mins]

[Watch](#)



### Species of the Great Southern Reef

Home to a wide range of animals, this giant kelp forest, is home to 10,000 species that we know of.

Click on 'Explore' to learn about the different species and make notes, it will help with the activity at the end of this chapter.



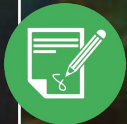
[Explore](#)



### Seaweed: More than a 'weed'

Click on the link below to discover the different types of seaweed, including kelp and why it's different from seagrass.

Make a note of three new facts you learn from the story. Compare them with your classmates.



[Discover](#)



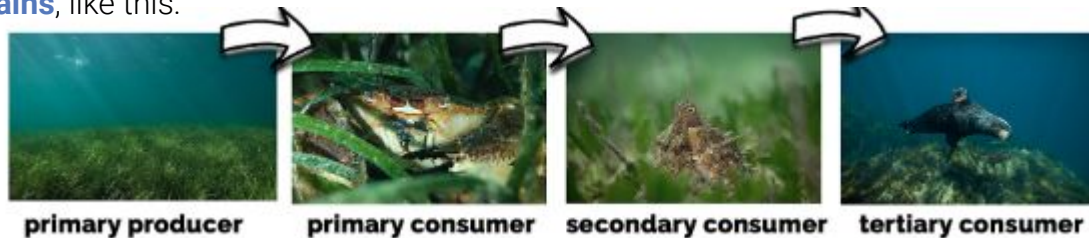
## Activity 1

# Chain of Food



As you've seen, kelp is a **primary producer** and the foundation for this oceanic ecosystem. Animals that feed on kelp are called **primary consumers** and animals that feed on primary consumers are called secondary consumers, and so on.

Feeding relationships between organisms can be shown in flowcharts called **food chains**, like this:

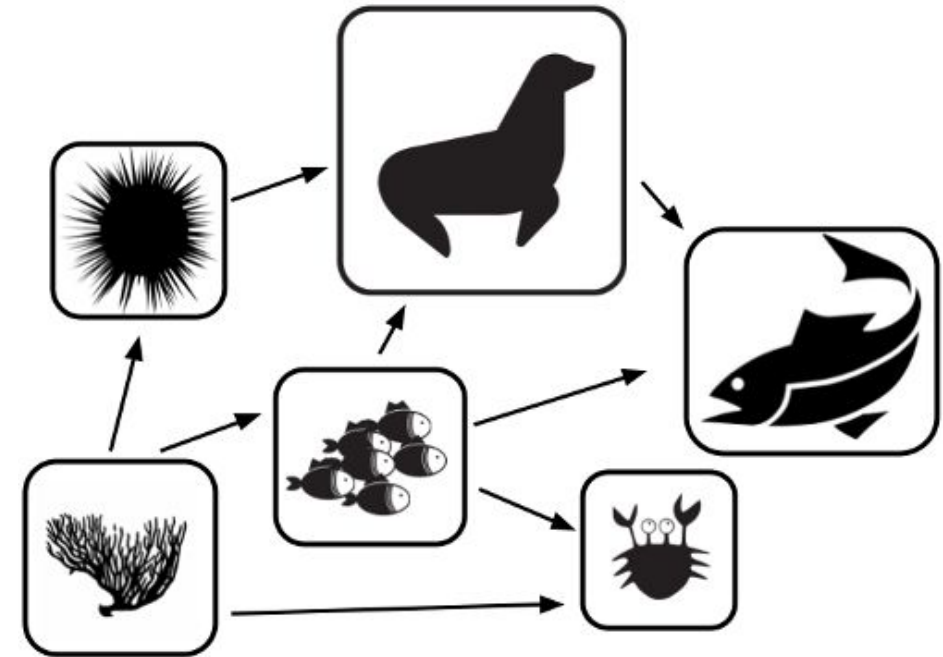


Diagrams showing interacting food chains are called **food webs** like the one on the right.

Do some research on the different species of the Great Southern Reef to create a food web. There are three main steps to this task:

1. Research
2. Draft version
3. Final version

Food webs may be created on paper or digitally. You can draw, use found images, and / or words to indicate the species that are part of the food web. Make it as colorful and complex as you want. Can you include humans in your Great Southern Reef food web?



Example of a simple aquatic food web.



A Kelp Forest, Norway by Erling Svensen, World Wildlife Fund

## Chapter 2: Climate Change

The kelp forest sustains a wide variety of life but these ecosystems are under threat from climate change. Find out what the issues are and how it affects all life forms.



This chapter will take around 60 minutes.



[Kelp Sydney by Louise Nott  
Great Southern Reef Foundation](#)

## Climate Change and Kelp Forests

Understand what is happening to kelp because of climate change. Rising temperatures are adversely affecting many ecosystems including the kelp forests.



[A restoration trial site by Jane Ruckert, Institute  
for Marine and Antarctic Studies, University of  
Tasmania](#)

## Kelp Forest Ecology

Marine biologists are investigating the loss of kelp forests and how this endangered marine community can be rebuilt.



[Abalone at Shouten Island, Tasmania, by  
Scott Ling, Great Southern Reef Foundation](#)

## Scientists Unravelling Secrets

Scientists explore the different life forms that live on the Great Southern Reef. The beauty and diversity of the underwater world is revealed.



# Climate Change and Kelp Forests

## How climate change affects ocean ecosystems

Between 1880 and 1980, the global temperature rose by 0.7°C or 1.3°F

Since 1981, the rate of increase more than doubled. Over the last 40 years, the global annual temperature has risen by 0.72°C, or 1.2°F.

It doesn't sound like a lot, but the the rate that the temperature is increasing is getting faster, putting stress on our environment.

### Why is the planet getting hotter?

**Carbon dioxide** and other **pollutants** are collecting in the Earth's atmosphere, preventing heat from the sun to escape, making the planet hotter. Burning **fossil fuels** is a key factor of climate change.

Click on 'Video' link to learn how climate change impacts oceanic ecosystems. [Run time 3.38 mins]



Jot down some key things you think people need to know about global warming in relation to kelp forests. This will help with the activity at the end of this chapter.



Video

# Kelp Forest Ecology

## Understanding the issues

Discovering that 95% of the kelp forest around Tasmania has disappeared, scientists are working hard to find out what is causing this deforestation and what they can do to **mitigate** the problem.



[Read more about how scientists are using kelp biology to rewild the kelp forests of Tasmania](#)

**Marine biologists** are studying the different species of kelp to understand why 5% of the Tasmanian kelp forest still exists and how this knowledge can be used to **reforest** this underwater ecosystem.

Protecting **dwindling** kelp populations is the priority, but it's also essential to begin to restore areas before entire forests are lost.

Click on '**Watch**' link to discover how scientists are researching kelp forest **depletion** and potential solutions for **restoration**.

Make notes about any key information you think is important or interesting. This will help with the activity at the end of this chapter. [Run time 3.46 mins]



[Watch](#)







# Scientists Unravelling Secrets

## Safeguarding marine biodiversity

The phrase “Out of sight, out of mind” certainly applies to the kelp forests but doesn’t mean they aren’t very important.

There is a variety of marine life that is dependent on the kelp forest. Marine biologists specialise in different aspects so that we can better understand each species and any problems that affect them.

By increasing our knowledge we are better able to protect and preserve the different animals and plants that make up the ecosystems which we all rely on.

Sharing that knowledge with others means that we are all able to help protect and preserve our natural world.

Click on 'Explore' to learn about the different scientists and their work on the Great Southern Reef.



You might want to make some notes about anything that grabs your attention. It will come in handy when you do the activity on the next page.



Explore



## Activity 2

# Climate Change Reporter



You are the Climate Change Reporter for your local newspaper. You are writing a series of articles about climate change and this week your article is about the kelp forest ecosystems.



You need to provide the facts in an interesting and clear style, so that all your readers can understand the what, why, where and how of kelp forests.



- Do some research on kelp forests and the climate change issues that affect them. You can reread the stories in this chapter. These links are also a good starting point: [NASA](#), [Natural History Museum London](#), [The Invisible Forest](#)

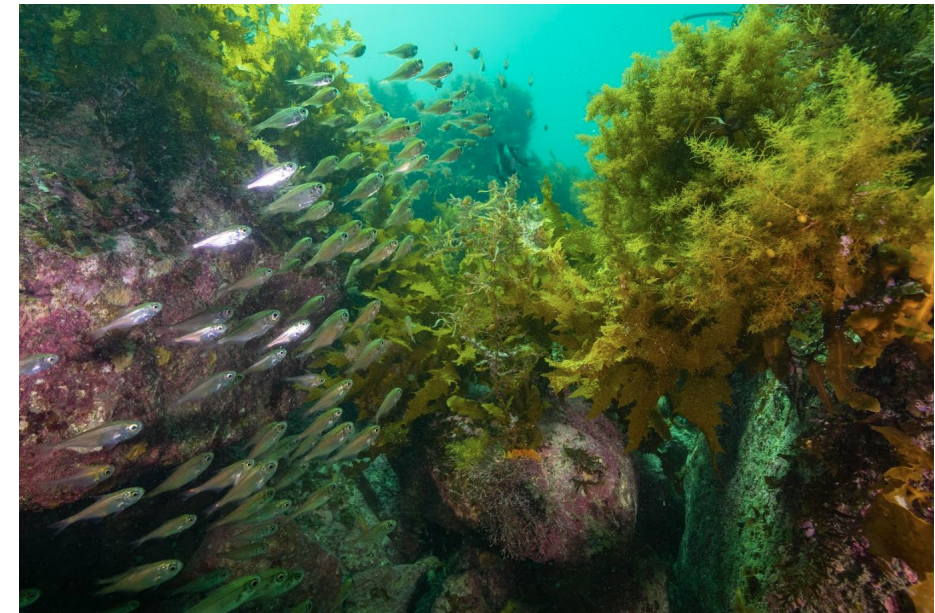


- Think about key facts your readers need to know, to understand the the importance of kelp forests and the problems they face.
- How can you explain what scientists are doing to preserve or reforest these kelp ecosystems?

Write a 200 word article covering the key points your readers need to know. Think of a good headline for the article to grab the reader's attention. You might want to illustrate your article with your own drawing or an image you find online (but make sure you have permission to use it!).



You may need help from your parents or teacher with this activity



[Kelp Forest Glass Fish by Stefan Andrews, Great Southern Reef Foundation](#)





Golden kelp wash up on beach by Stefan Andrews. Great Southern Reef Foundation

## Chapter 3: Custodians of Kelp

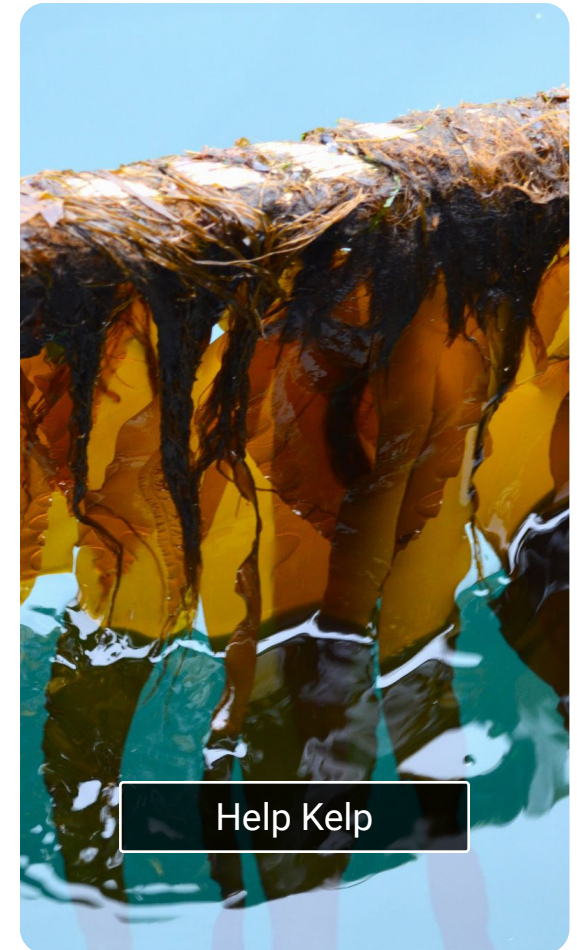
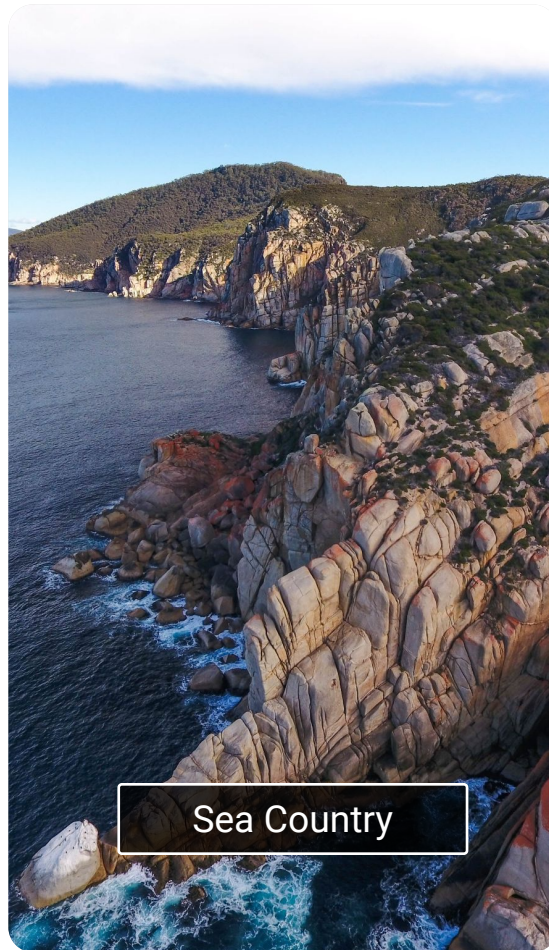
Learn from the First Nations and climate change experts to understand how to become custodians of the kelp forests.

Inspired by what we learn, what can we do to make a positive difference to the planet?



This chapter will take around 60 minutes.

# Custodians of Kelp





## Tune in to Saltwater Country

Listen to Emma Robertson, a palawa woman and artist, as she explains the importance of kelp to Tasmanian Aboriginal people.

Click on 'Listen' to learn about Saltwater Country

[Listen](#)





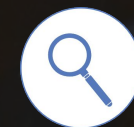
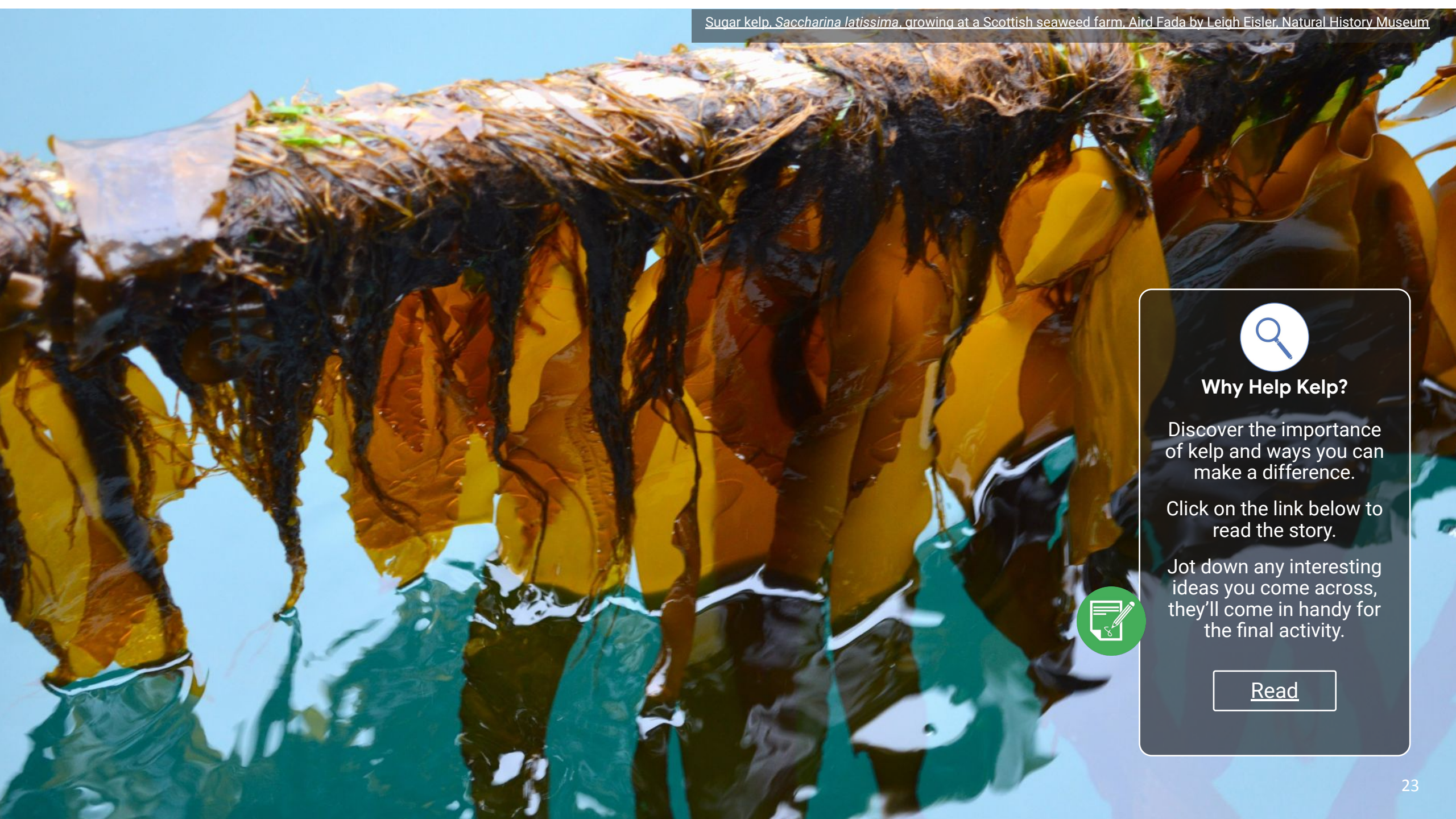
### Caring for Kelp

The First Nations people of Tasmania have always lived in **harmony** with the land and the sea.

Watch the video about **Sea Country** and learn about the Tasmanian **Aboriginal** connection to kelp forests

[Run time 15 mins]

[Watch](#)



### Why Help Kelp?

Discover the importance of kelp and ways you can make a difference.

Click on the link below to read the story.

Jot down any interesting ideas you come across, they'll come in handy for the final activity.



[Read](#)



### Activity 3

# Poster Design to #helpthekelp



You may need help from your parents or teacher with this activity



As human actions are causing an alarming decline kelp forests around the world, you are going to design a poster to persuade people to **#helpthekelp**



Do some research. You can revisit the stories from this chapter to refresh your memory. This video might help [Reviving Giants](#) and [this page](#) has lots of great images to inspire you.



Create a slogan and an eye catching design for your poster. Think about:

- What do **you** think is the key thing we can do to save kelp forests? This may depend on where you live - e.g. if you live in an inland city your options may vary to those who live near the ocean.
- Why should people care? What is the benefit of protecting kelp forests?
- Who is your target audience? Adults? Children? Politicians? Someone else?



You can work with a friend or by yourself on this poster design, but remember to make it clear what you want people to **DO!**



Poster Wall, Torres Strait 8. 23rd Biennale of Sydney (2022): rīvus







## Quiz

# End of Lesson Quiz

See if you can recall what you have learned from this lesson. How many questions can you answer without going back through the pages.

1. What is kelp?
2. Kelp is a primary producer. What does this mean?
3. Where are humans on the food chain?
4. What is causing kelp forests to decline?
5. How much has the global annual temperature has risen by in the last 40 years?
6. What percentage of the kelp forest around Tasmania has been lost?
7. Name three species that live in or near a kelp forest.
8. What was kelp used for in medieval Europe?
9. Why is Sea Country seen as women's Country by the Tasmanian Aboriginal people?
10. Why was kelp seen as medicinal by the Tasmanian Aboriginal people?





Sweep by Stefan Andrews, Great Southern Reef Foundation

## Want to Learn More?



Now you've completed this lesson you may want to continue to find out more about other ocean ecosystems such as [Coral Reefs](#). If you want to learn more about Kelp Forests, click [here](#). To find out more about climate change and how humans are connected to the environment, click [here](#).

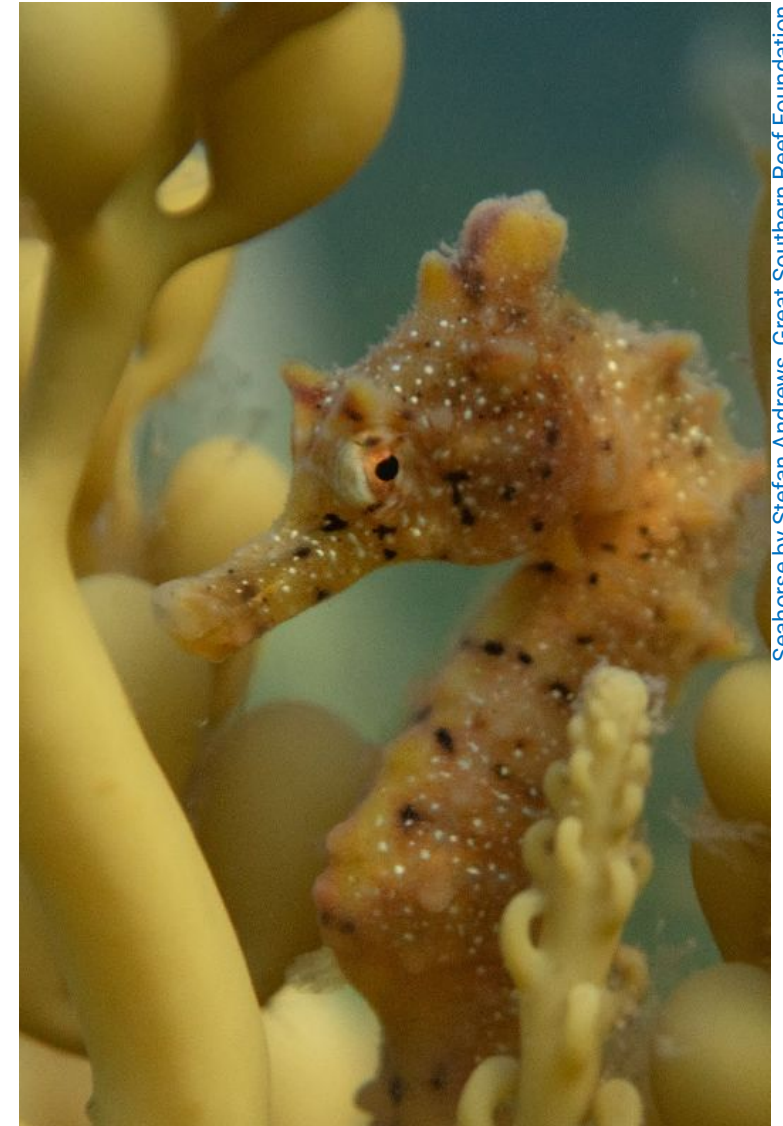


## Quiz Answers

# End of Lesson Quiz

Here are the answers to the quiz. How did you do?

1. Kelp is an algae and part of the seaweed family
2. Kelp uses photosynthesis to turn energy (sunlight) into organic matter
3. Humans are both primary and secondary consumers
4. Climate change and the resulting global warming caused by human actions
5. 0.72°C or 1.2°F
6. 95%
7. There are many species, but you might have thought of:
  - Cuttlefish
  - Sea Dragons
  - Sea Horses
  - Anemones
  - Urchins
  - Rockfish
  - Sea Otters
  - Sea Lions
  - Humans
8. Fertilizer, to help grow crops on land
9. Palawa women were skilled swimmers and divers and could hold their breath for a long time.
10. Water vessels were made of kelp and the nutrients and vitamins leached into the water making the water a source of nourishment and health as well as hydration.



Seahorse by Stefan Andrews, Great Southern Reef Foundation