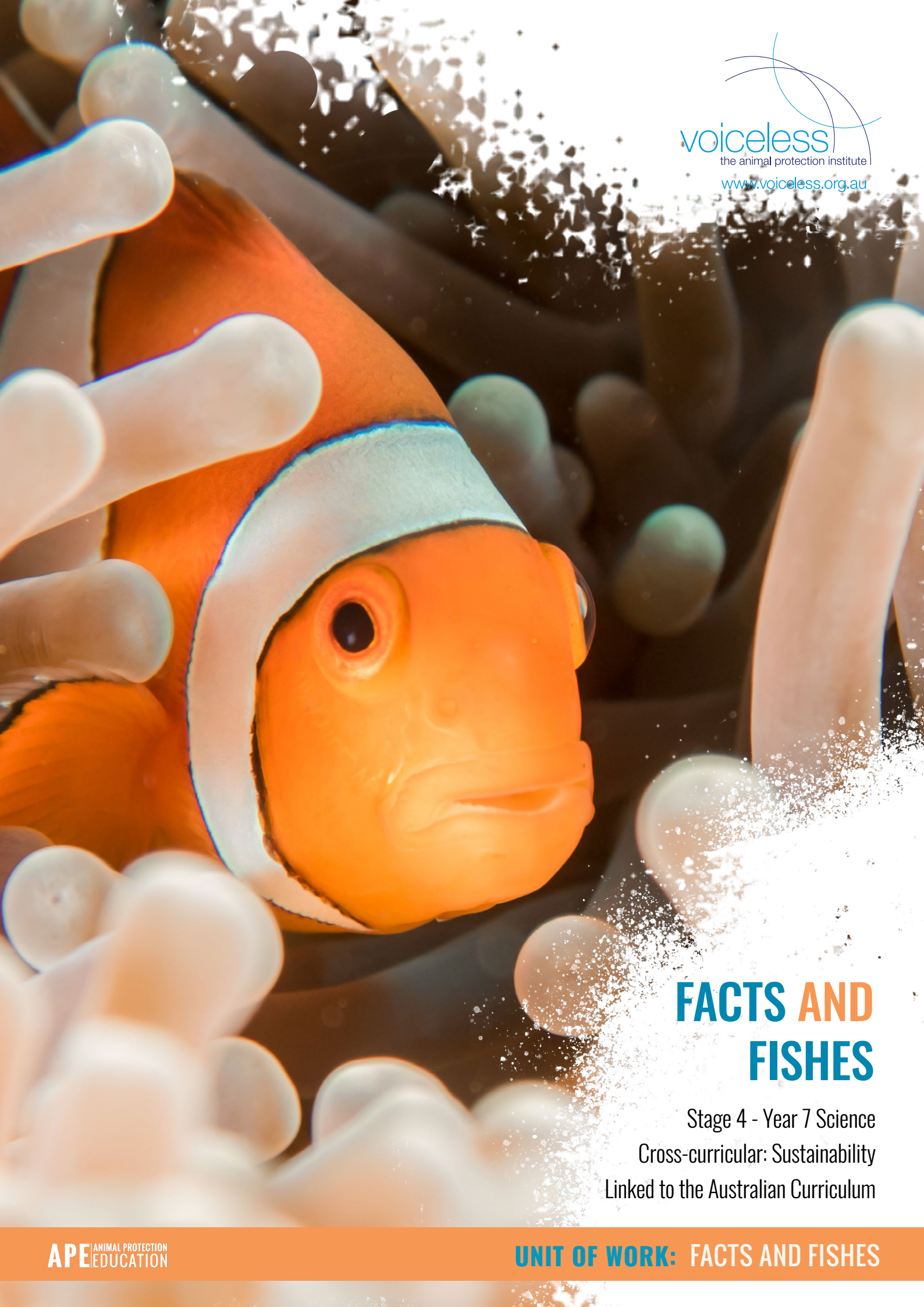

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FACTS AND FISHES

Stage 4 - Year 7 Science
Cross-curricular: Sustainability
Linked to the Australian Curriculum

Year 7 Science Facts and Fishes	Pre-test/ Pre-requisite/ Starter	Explore	Discuss	Share and Reflect		Extend
Focus Area 1: Myth Busting - The Capabilities of Sophisticated Fishes						
Content Descriptors ACSSU111 ACSIS133	**Pre-test** Something Fishy? Fact or Fiction? SEQUENCING TASK STATEMENTS	**Reading + Glossary** Navigating the high seas: Mini research task	**Fact or Fiction** Pair + class discussion	**Bust the Myths Through Visual Literacy** Poster design FORMATIVE ASSESSMENT TASK 1	**Reflection Activity** Written reflection STUDENT WORKSHEET	**Taking from the Environment** Debate or extended response
Focus Area 2: Myth Busting - Consciousness Under the Sea						
Content Descriptors ACSSU111 ACSIS124 ACSIS133	**Starter** Cloze Passage STUDENT WORKSHEET	**Etymology Exploration**	**What is Consciousness?** Case study: Octopuses	**Pair Up and Speak Up** Oral Task Thoughts - Questions - Epiphanies STUDENT WORKSHEET		**Investigation of the *Declaration on Consciousness*** Personhood and Fishes?
Focus Area 3: Myth Busting - Memory and Innovation						
Content Descriptors ACSSU111 ACSSU112 ACSIS124 ACSIS125 ACSIS132 ACSIS133	**Starter** Mind Mapping STUDENT TEMPLATE	**Fact Files** STUDENT TEMPLATE FORMATIVE ASSESSMENT TASK 2	**Asking Difficult Questions** Group/class discussion	**Tweet it**	**I Used to Think... But Now, I Think...** Written reflection	**Asking Difficult Questions**

FACTS AND FISHES: UNIT OVERVIEW

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Focus Area 4: Myth Busting - Social Shooting

Content Descriptors ACSSU111 ACSSU112 ACSHE120 ACSIS124 ACSIS125 ACSIS130 ACSIS133	**Starter** What does it mean to be social?	**Filter and Distil** STUDENT WORKSHEET	**Factual Conceptual Debatable** Group/class discussion FORMATIVE ASSESSMENT TASK 3	**Missing Fish** Poster Design STUDENT TEMPLATE	**Vlog** Video Blog	**Listening Comprehension:** Podcast - Facts and Fishes Part 1 with Dr. Jonathan Balcombe and Prof. Culum Brown STUDENT WORKSHEET

Focus Area 5: Industry Matters - Extension

Content Descriptors ACSSU112 ACSHE120 ACSIS124 ACSIS130 ACSIS133	**Prerequisite:** Reading of booklet and familiarisation of other resources in this unit of work	**Commercial Fishing and Fish Farming** Ted Talk - Sylvia Earle + viewing questions STUDENT WORKSHEET	**Class Discussion** How should this information affect our relationship to fishes?	**Sharing Solutions** Written reflection in response to 2 thought provoking questions	**Listening Comprehension:** Podcasts - Facts and Fishes Part 2 with Dr. Cat Dorey STUDENT WORKSHEET

FACTS AND FISHES

Focus Area 1: Myth Busting - The Capabilities of Sophisticated Fishes

Australian Curriculum Alignment

Learning Area	**Science**
Year Level	Year 7
General Capabilities	• Critical and Creative Thinking • Literacy • Information and Communication Technology (ICT) Capability
Strands	• Science Understanding - Biological Sciences • Science Enquiry Skills - Communicating
Content Description	Classification helps organise the diverse group of organisms (ACSSU111) Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133)
Elaborations	(ACSSU111) • Considering the reasons for classifying such as identification and communication • Considering how biological classifications have changed over time • Using scientific conventions for naming species • Grouping a variety of organisms on the basis of similarities and differences in particular features (ACSIS133) • Presenting the outcomes of research using effective forms of representation of data or Ideas and scientific language that is appropriate for the target audience • Using digital technologies to access information and to communicate and collaborate with others on and off site

Cross-Curricular Priority	**Sustainability** **Systems** OI.1 - The biosphere is a dynamic system providing conditions that sustain life on Earth OI.2 - All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival **Futures** OI.9 - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments

Acknowledgments: This Australian Curriculum alignment statement is based on the Australian Curriculum, Assessment and Reporting Authority (ACARA) materials, which are licensed under CC BY 4.0. The material has been modified from the Australian Curriculum website (accessed July 2019).

Information to teachers

In these lessons students will learn about the many capabilities of fishes, including sensory abilities, communication, and navigation. Through close reading, research, class discussion, and visual literacy, students will explore the many ways in which fishes can be viewed as sophisticated and consider why it may be necessary for young people to be possess such knowledge.

Time and Structure

- 6-8 weeks
- 5 Focus Areas – Each Focus Area could take anywhere between 1-2 lessons or longer.
- Each Focus Area looks at common myths associated with fishes and how these have been busted due to advancements and new discoveries within the scientific community.
- The unit has been designed to be flexible, so that teachers may choose to alter or omit tasks to suit the needs of their students.
- A range of verbal, written, analytical, creative, research, reflection and extension tasks have been incorporated into the unit of work.

Target

Mixed ability class with extension tasks.

Unit Focus

Question whether our treatment of fishes reflects what we know about them.

Consider the different views on this issue and decide for yourself where you stand.

Discuss with your friends, family, classmates and teachers. Debating complex issues is healthy and helpful.

RESOURCES

Voiceless Fact Sheet- *The Watery World of Fishes (available online)*

Voiceless Infographic - *Facts and Fishes Pg. 55*

Voiceless Video - *Fascinating Fishes (available online)*

Voiceless Podcast - *Facts and Fishes Part 1 (available online)*

Something Fishy: Fact or Fiction Statements Pg. 10

3.2.1 Reflection – Worksheet Pg. 11

*Glossary (selected words appear in **bold**) Pg. 53*

Quizlet (available online)

All resources can be downloaded at www.voiceless.org.au/schools

INQUIRY QUESTIONS

- In what ways can fishes be viewed as sophisticated?
- Why is it necessary for young people to become knowledgeable about the capabilities and **sentience** of fishes?

SUGGESTED LEARNING ACTIVITIES

1. PRE TEST

The aim of this pre-test is to:

- Get students physically moving at the beginning of the lesson to assist in cognitive functioning;
- Encourage students to make quick decisions (with the purpose of discussing the nature of how and why they make their decisions);
- To obtain the level/s of prior knowledge students may already have on the capabilities of fishes.

TEACHER TIP

This task is to be completed prior to reading the Voiceless Fact Sheet: ***The Watery World of Fishes.***
Download at: www.voiceless.org.au/schools

Sequencing Task: Something Fishy - Fact or Fiction?

Using the **Something Fishy: Fact or Fiction Statements** students will make quick decisions on a range of statements relating to the capabilities of fishes.

Instructions for Teacher

Read the statements aloud and ask students to line up from one end of the classroom to the other. One end will signify 'Fact', whilst the opposing end will signify 'Fiction'.

Students will sequence themselves along the line according to their own understanding/knowledge of the statement.

Encourage students to make up their own minds as to how they feel about each of the statements, rather than following a friend.

2. EXPLORE

Read and Review

Read through Pages 2-3 of ***The Watery World of Fishes*** as a class, or teacher led.

Students to highlight unfamiliar words as they go. Most scientific terms can be found in the **Glossary**, however, depending on the literacy capabilities, there may be others which will need to be addressed by the teacher.

Hand out the **Glossary**. Spend some time discussing the language, if required.

Mini Research Task: Navigating the High Seas

Students take 10-15 minutes to research the three ways in which fishes navigate through the water.

- Hydrodynamic imaging
- Sun compassing
- Electromagnetic navigation

Students to complete the following:

1. Write one sentence which explains the form of navigation.
2. Identify an example of a specific fish species which uses this form of navigation?

3. DISCUSS

1. Once you have read through the resources, ask students to pair up. Give students a copy of the **Fact or Fiction Statements** (used in the pre-test) and ask them to consider the following questions with their partner:

    - How did you make your decisions?
    - What is an assumption?
    - What is a generalisation?
    - Why might these be considered negative, dangerous or ineffective in the science community?
    - Which of the statements surprised you the most and why?

2. Open the discussion up to the whole class, reflect on the questions above and give students an opportunity to share their thoughts and opinions.

EXTENSION TASK

Taking from the Natural Environment – What do you think?

Professor Culum Brown and Dr. Catarina Vila Pouca point out that **fishing** and **hunting** are often not viewed in the same light and that in some national parks it is legal to fish but illegal to pick flowers (refer to Page 3 in ***The Watery World of Fishes***).

Use this question as a starting point for a class discussion or debate on the following topic:

Is it okay for human beings to take from the natural environment?

Alternatively, as an individual task, students can be asked to compose an extended response where they explain their point of view in a persuasive manner.

4. SHARE

Bust the Myths through Visual Literacy!

Students are to use their knowledge and understanding, obtained from the resource material, and the class activities above, to create an A4 poster (digitally or by hand) which seeks to bust the first myth of fishes: Fishes aren't Sophisticated.

Students should aim for the following:

1. Focus on **ONE** key area, relating to the capabilities of fishes. They may choose from the list below:

    - Sensory abilities;
    - Communication;
    - Navigation.

2. Aside from statistics, students must express the facts in their own words and should use the **Glossary** to help them.
3. Consider the visual layout of the poster including:

    - Font design;
    - Colour and symbolism;
    - Vectors;
    - Salient image (the dominant image).

4. Create their own slogan or catch phrase which promotes the message they are trying to convey. *E.g. Fishes! The True Seafarers.*
5. Target Audience: Their peers!

TEACHER TIP

This would work well as a homework task if time does not allow for it to be completed in class.

5. REFLECT

3. 2. 1

Ask students to complete a written reflection using the **3.2.1 Reflection Worksheet** on what they have learnt during this lesson/s. Refer to the Worksheet attached to this focus area.

3 things you learnt
2 things you found interesting
1 thing you would like to know more about

6. TAKING IT FURTHER

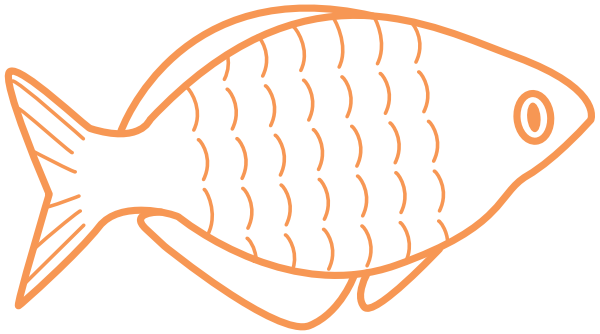
If you and your students enjoyed these activities, then please continue to work through the subsequent focus areas within the unit. Up next, **Myth Busting - Consciousness under the Sea.**

Myth 1

Sophisticated Fishes

Pre-Test Sequencing Task

Something Fishy - Fact or Fiction?



Statements:

1. Fishes are animals
2. Fishes are not clever or sophisticated
3. All fishes in Australia are protected by animal welfare laws
4. Fishes are capable of suffering and feeling pain
5. Fishes have existed for over 500 million years
6. We have evolved from fish-like ancestors
7. Fishes can have tastebuds on other parts of their bodies, not just in the mouth
8. Many fishes can make distinctions between different colours
9. Some fishes possess the ability to distinguish between different music genres – E.g. Pop or Jazz
10. Fishes are silent creatures
11. Fishes can eavesdrop on dolphins
12. Some fishes use the sun to navigate through the ocean

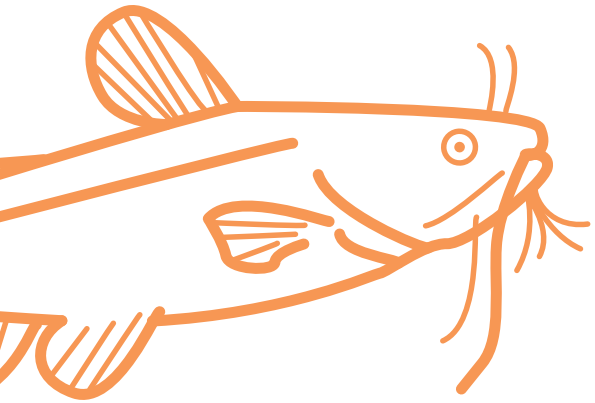
Myth 1

Sophisticated Fishes

3	2	1
things you **learnt**	things you found **interesting**	thing you would like to **know more about**

Reflect: 3, 2, 1

Complete a 3, 2, 1 Reflection on what you have learnt during this lesson.



Focus Area 2: Myth Busting - Consciousness under the Sea

Australian Curriculum Alignment

Learning Area	**Science**
Year Level	Year 7
General Capabilities	• Critical and Creative Thinking • Literacy • Ethical Understanding • Personal and Social Capability • Information and Communication Technology (ICT) Capability
Strands	• Science Understanding - Biological Sciences • Science Inquiry Skills - Questioning and Predicting / Communicating
Content Description	Classification helps organise the diverse group of organisms (ACSSU111) Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124) Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133)

Elaborations	(ACSSU111) • Considering how biological classifications have changed over time • Using scientific conventions for naming species • Grouping a variety of organisms on the basis of similarities and differences in particular features (ACSIS124) • Recognising that the solution of some questions and problems requires consideration of Social, cultural, economic or moral aspects rather than or as well as scientific investigation (ACSIS133) • Presenting the outcomes of research using effective forms of representation of data or Ideas and scientific language that is appropriate for the target audience • Using digital technologies to access information and to communicate and collaborate with others on and off site
Cross-Curricular Priority	**Sustainability** **Systems** OI.1 - The biosphere is a dynamic system providing conditions that sustain life on Earth OI.2 - All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival **Futures** OI.8 - Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgements based on projected future economic, social and environmental impacts OI.9 - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments

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Information to teachers

These lessons focus on understanding new scientific evidence which suggests that fishes have the ability to feel both pleasure and pain. Students will also investigate the biology and behaviour of fishes, as well as look at how some fishes can be considered intelligent and self-aware. The learning sequence begins with unpacking the etymology of words, then moves to exploring a case study involving octopuses, and finishes with a written and oral reflection task.

Time and Structure

- 6-8 weeks
- 5 Focus Areas – Each Focus Area could take anywhere between 1-2 lessons or longer.
- Each Focus Area looks at common myths associated with fishes and how these have been busted due to advancements and new discoveries within the scientific community.
- The unit has been designed to be flexible, so that teachers may choose to alter or omit tasks to suit the needs of their students.
- A range of verbal, written, analytical, creative, research, reflection and extension tasks have been incorporated into the unit of work.

Target

Mixed ability class with extension tasks.

Unit Focus

Question whether our treatment of fishes reflects what we know about them.

Consider the different views on this issue and decide for yourself where you stand.

Discuss with your friends, family, classmates and teachers. Debating complex issues is healthy and helpful.

RESOURCES

Voiceless Fact Sheet *- The Watery World of Fishes (available online)*

Voiceless Infographic *- Facts and Fishes Pg. 55*

Voiceless Video *- Fascinating Fishes (available online)*

Voiceless Podcast *- Facts and Fishes Part 1 (available online)*

Cloze Passage – Worksheet Pg. 17

Pair Up and Speak Up – Worksheet Pg. 19

Glossary (selected words appear in ***bold****) Pg. 53*

Quizlet (available online)

All resources can be downloaded at www.voiceless.org.au/schools

Other Resources

Cláudio L. Guerra, Why the Octopus Brain is so Extraordinary, TED-Ed, ed.ted.com

Etymology Online, www.etymonline.com

Phillip Low, The Cambridge Declaration on Consciousness, The University of Cambridge, 2012, http://fcmconference.org/img/CambridgeDeclarationOnConsciousness.pdf

INQUIRY QUESTIONS

- How do we know if a fish is **conscious?**
- To what extent can fishes be likened to human beings?

SUGGESTED LEARNING ACTIVITIES

1. STARTER

Cloze Passage

Teacher to distribute each student a **Cloze Passage Worksheet** on the **sentience** and biology of fishes.

Once completed, ask for a volunteer to read out their response.

TEACHER TIP

Answers for the **Cloze Passage** can be found on Page 5 of the booklet **The Watery World of Fishes.**

Download at: www.voiceless.org.au/schools

2. READ AND EXPLORE

Read Pages 5-6 from ***The Watery World of Fishes.***

Etymology Exploration

Create a Glossary

1. Using the **Glossary** provided in this unit – students read the definitions of the words in bold print from their **Cloze Passage.**
2. Ask students to create their own glossary of words and definitions they are unfamiliar with. They should include the remaining words from the cloze passage. Where possible, encourage students to write their own definitions of the words.

TEACHER TIP

This may be a good opportunity to show students the **Quizlet** which also accompanies this unit of work, particularly useful to differentiate learning within the class.

3. Etymology – Students choose ONE of the words from their **Glossary** in order to research its etymology.

   Direct students to Online Etymology.

   www.etymonline.com

   Encourage them to experiment with how they input the word into the search bar – it may generate some interesting results.

For example:

- Vertebrat**es**
- Vertebrat**e**
- Vertebr**a**

Word	Date of Origin	Language of Origin	Explanation
Vertebrate	1826.	Latin - vertebratus.	"joint or articulation of the body, joint of the **spine**."
Vertebra	Early 15th Century.	Latin Vertebra. Perhaps from the Latin word vertere.	"to turn, bend." "the spine as the 'hinge' of the body."

Explanations taken from www.etymonline.com.

Optional Extension

Ask students to further investigate the *Declaration on Consciousness* put together by scientists at Cambridge University.

TEACHER TIP

This is a challenging read for a Year 7 student, yet worthwhile for students of gifted ability or those who display a genuine interest in the area.

Prompts for Research

- Can you sum up the *Declaration* in less than 100 words?
- Who else (aside from fishes) does the *Declaration* include?
- What does this mean for Australia? There has been movement in the ACT (Australian Capital Territory) – can you find out more about this?

3. DISCUSS

Facilitate a whole class discussion

1. What does it mean to be **conscious**?

   (As human beings we associate consciousness as being in a state of awareness and that we can respond to things happening around us.)
2. From your reading of ***The Watery World of Fishes***, in what ways can fishes be considered **conscious** animals?

Case Study – The Behaviour of Octopuses

Watch the Ted Ed Video:

Why the Octopus Brain is so Extraordinary by Cláudio L. Guerra.

Ted.com

Ask students to jot down 3 interesting facts they learnt from watching the video.

TEACHER TIP

Watch the clip uninterrupted first. During the second viewing students will make their notes.

Further Discussion

Although the biological structure of octopuses is very different to that of a human being – what sorts of things does the octopus in the video do which demonstrates that she is an extraordinary **conscious** animal?

4. SHARE AND REFLECT

Partner Up and Speak Up

For this task, use the **Partner Up and Speak Up Worksheet** with your students. Give students time to complete the Worksheet first. Then ask them to partner up with another student to share their thoughts verbally to one another on what they have learnt throughout this lesson/s.

To generate rich responses students must use the following points (from the Worksheet) to guide their oral response:

- What are your ***Thoughts*** on the **sentience,** behaviours and consciousness of fishes?
- Do you have any further ***Questions*** you would like to investigate?
- Did you have any ***Epiphanies*** during the lesson/s?

Instruct students to use a countdown timer or stop watch and aim to speak for 2 minutes before swapping. Ask students to jot down 3 interesting facts they learnt from watching the video.

5. TAKING IT FURTHER

If you and your students enjoyed these activities, then please continue to work through the subsequent focus areas within the unit. Up next, **Myth Busting - Memory and Innovation.**

Myth 2

Consciousness under the Sea

Cloze Passage

Use the words on the opposite page to complete the passage

Are fishes sentient?

_____ is commonly understood as the ability to feel pleasure and pain. Although debate continues in the scientific community, there appears to be a clear case that fishes can feel pleasure and pain. This evidence has been considered sufficient enough for various organisations to formally recognise fish sentience, such as the American Veterinary Medical Association, the Australian Veterinary Association and RSPCA Australia. The World Organisation for Animal Health also states that we have an _____ _____ to ensure the _____ of fishes.

Biology of fishes

The main argument against fish sentience is based on a particular interpretation of fish biology. In 2012, a paper was published concluding that fishes cannot feel pain or have other feelings, because they are _____.

The basis of this conclusion was that fishes lack a part of the brain called the _____, which only _____ have, and that a neocortex is necessary in order to feel pain. Numerous scientists have since produced a large body of evidence to _____this.

These scientists explain that different _____ can still achieve the same results, and fishes have all the hardware they need to have the same experiences as mammals with a neocortex.

In fact, they explain that the neocortex takes over _____ that may also exist in other parts of the brain. For example, _____ in birds has been widely accepted even though they too lack a neocortex.

Myth 2

Consciousness under the Sea

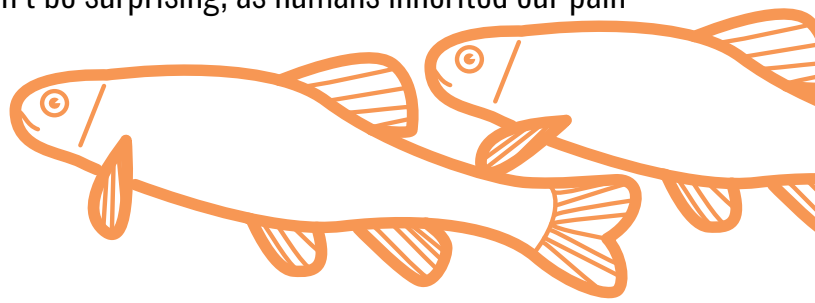
Cloze Passage

Instead of a neocortex, birds have a _____ and fishes have a _____, both of which are sufficient to suggest that these animals are conscious and able to feel pain.

A group of scientists held a forum at Cambridge University to discuss the current scientific understanding of animal consciousness. As a result, they drafted and signed a _____ _____ _____, which concludes that consciousness isn't limited to _____; that emotions can derive from parts of the brain other than the cortex; and that pain can still be felt without a neocortex.

In simple terms, the case in favour of fish sentience is that fishes have all the biological and physiological systems necessary for _____.

Moreover, many scientists draw attention to how similar these systems are to those of mammals, including _____. They explain that this shouldn't be surprising, as humans inherited our pain receptors from_____.



WORDS TO CHOOSE FROM

ethical responsibility welfare **dispute** anatomy **unconscious**
humans **pain perception** fish-like ancestors **sentience** mammals
consciousness paleocortex **pallium** functions **neocortex**
Declaration on Consciousness **vertebrates**

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Myth 2

Consciousness under the Sea

Partner Up and Speak Up

Use the spaces below to document your ideas.

What are your **Thoughts** on the sentience, behaviours and consciousness of fishes?

Do you have any further **Questions** you would like to investigate?

Did you have any **Epiphanies** during the lesson?

Now partner up with another student to share your ideas verbally – articulating our ideas clearly can sometimes be difficult, but it is a very useful skill to learn. You might like to have a practice run first!

Use a stopwatch to time your peer – aim to speak for 2 minutes before swapping to let your partner speak.

Focus Area 3: Myth Busting - Memory and Innovation

Australian Curriculum Alignment

Learning Area	Science
Year Level	Year 7
General Capabilities	• Critical and Creative Thinking • Literacy • Ethical Understanding • Personal and Social Capabilities • Information and Communication Technology (ICT) Capability
Strands	• Science Understanding - Biological Sciences • Science Inquiry Skills - Questioning and Predicting / Planning and Conducting / Evaluating / Communicating
Content Description	Classification helps organise the diverse group of organisms (ACSSU111) Interactions between organisms, including the effects of human activities can be represented by food chains and food webs (ACSSU112) Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124) Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125) Use scientific knowledge and findings from investigations to evaluate claims based on evidence (ACSIS132) Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133)

Elaborations	(ACSSU111) • Grouping a variety of organisms on the basis of similarities and differences in particular features • Considering how biological classifications have changed over time • Using scientific conventions for naming species • Classifying using hierarchical systems such as kingdom, phylum, class, order, family, genus, species (ACSSU112) • Investigating the effect of human activity on local habitats, such as deforestation, agriculture or the introduction of new species • Exploring how living things can cause changes to their environment and impact other living things, such as the effect of cane toads (ACSIS124) • Recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation (ACSIS125) • Developing strategies and techniques for effective research using secondary sources, including use of the internet (ACSIS132) • Using the evidence provided by scientific investigations to evaluate the claims or conclusions of their peers (ACSIS133) • Presenting the outcomes of research using effective forms of representation of data or ideas and scientific language that is appropriate for the target audience • Using digital technologies to access information and to communicate and collaborate with others on and off site
Cross-Curricular Priority	**Sustainability** **Systems** OI.1 - The biosphere is a dynamic system providing conditions that sustain life on Earth OI.2 - All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival **World Views** OI.4 – World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice, are essential for achieving sustainability **Futures** OI.9 - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments

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Information to teachers

In this lesson/s, students will better understand how fishes can be viewed as smart by looking at specific case studies, including; rainbow fish, salmonids and the frillfin goby. Students will read about fishes and their exceptional memories and consider to what extent fishes are able to use tools.

Time and Structure

- 6-8 weeks
- 5 Focus Areas – Each Focus Area could take anywhere between 1-2 lessons or longer.
- Each Focus Area looks at common myths associated with fishes and how these have been busted due to advancements and new discoveries within the scientific community.
- The unit has been designed to be flexible, so that teachers may choose to alter or omit tasks to suit the needs of their students.
- A range of verbal, written, analytical, creative, research, reflection and extension tasks have been incorporated into the unit of work.

Target

Mixed ability class with extension tasks.

Unit Focus

Question whether our treatment of fishes reflects what we know about them.

Consider the different views on this issue and decide for yourself where you stand.

Discuss with your friends, family, classmates and teachers. Debating complex issues is healthy and helpful.

RESOURCES

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Voiceless Infographic - *Facts and Fishes Pg. 55*

Voiceless Video - *Fascinating Fishes (available online)*

Voiceless Podcast - *Facts and Fishes Part 1 (available online)*

Problem Solving Fish – Template Pg. 25

Fishes Fact File – Template Pg. 26

*Glossary (selected words appear in **bold**) Pg. 53*

Quizlet (available online)

All resources can be downloaded at www.voiceless.org.au/schools

Other Resources

Harvard Visible Thinking, www.visiblethinkingpz.org

INQUIRY QUESTIONS

- Can fishes remember things?
- To what extent can fishes create and use tools?
- Should fishes be treated like us?

SUGGESTED LEARNING ACTIVITIES

1. STARTER

Problem Solving Fishes – Mind Mapping Ideas

Ask students to form groups of three. They will have 10-15 minutes to complete the mind map by brainstorming their ideas on the following points:

- In which sorts of situations might fishes require the use of tools?
- What sorts of things, or ways to use parts of the body, could be considered a tool?
- How do fishes learn to use tools?

TEACHER TIP

Refer to the **Problem Solving Fishes Template** which accompanies this focus area – could be printed off per student, or one per group to save paper.

2. EXPLORE

1. Ask students to remain in the groups of three to read Pages 7-8 in ***The Watery World of Fishes***.

TEACHER TIP

If comfortable, students are encouraged to read aloud to one another – stopping where required to check definitions of words in the **Glossary**.

2. Students then select one of the species (from the list below) and create a fact file. Refer to the **Fishes Fact File Template.**

- Rainbowfish;
- Frillfin goby;
- Salmonids;
- Tuskfish;
- Cleaner wrasse;
- Tigerfish;
- Sunfish.

Fact File Requirements:

- Habitat – where do I live and what's my lifestyle like?
- Classification - including my scientific name.
- Size and appearance – including my distinguishing features.
- Unique characteristics – can you link these to memory or innovation?

3. DISCUSS

Asking the Difficult Questions

All Levels Question

1. Human beings have not always viewed fishes as intelligent animals. However, as our knowledge about them grows should we reassess how we treat them and speak about them?

TEACHER TIP

Remind students about the need to be open minded and respectful in these sorts of discussions. Everyone is entitled to have an opinion and we should respect one another's views, even if we don't agree with them.

Extension Questions

1. As fishes have memory and the ability to be creative in their pursuit of food, grooming, looking after their young, problem-solving, finding mates, and are **self-aware**, should we consider giving personhood to fishes?
2. What is personhood?
3. Watch the Voiceless video – *Animals: Property or Persons?*
4. Ask students to spend 5 minutes discussing their thoughts and reactions to the video in groups of three.
5. Finally, discuss as a whole class – taking the time to write notes on the board (this could be in the form of two columns: 'Positives' and 'Needs Further Consideration').

TEACHER TIP

- Watching the video twice is recommended. During the second viewing instruct students to make notes to assist their understanding.
- Encourage students to think about the variety of fishes/**mammals** under the sea – perhaps making some distinctions between whales and rainbow fish for instance.
- Aim to respond to student opinions and ideas with a fair and open mind.
- Some students may be able to consider the implications on a society if such laws were implemented.

4. SHARE

Tweet it!

It is often very difficult to write succinctly, especially when students have so much to say on topics which spark interest or are controversial.

Ask students to write a message which seeks to educate others on the capabilities of fishes – in particular, their memory and innovative ways.

Messages must be no more than 280 characters if typing, or less than 50 words handwritten.

5. REFLECT

Ask students to write a 150-200 word reflection using the Harvard Visible Thinking Routine of: 'I Used to Think…But Now, I Think….' Students should consider their thoughts and opinions regarding the memory and innovation of fishes prior to this lesson and how their thinking has changed as a result of new discoveries.

Sentence starters:

- I used to think…
- Now, I think…

6. TAKING IT FURTHER

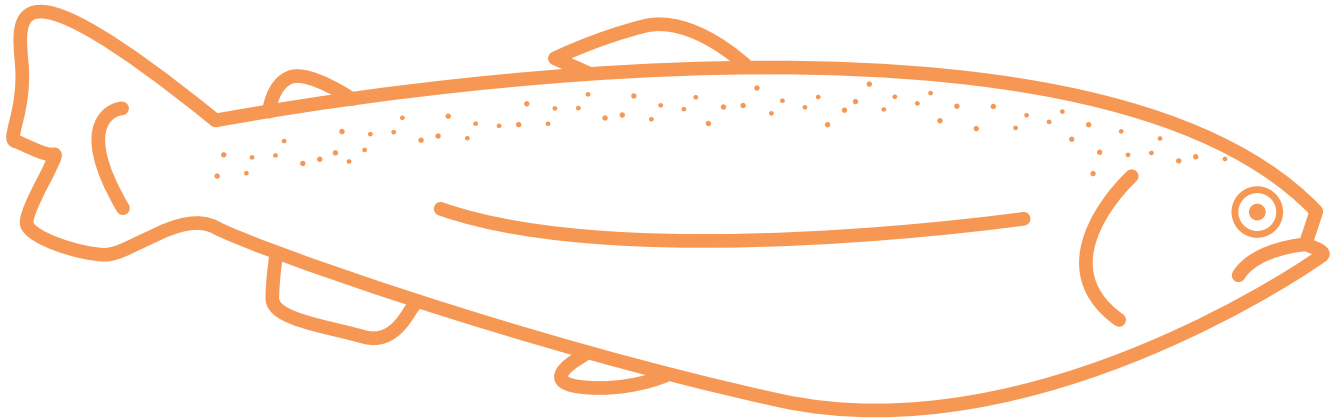
If you and your students enjoyed these activities, then please continue to work through the subsequent focus areas within the unit. Up next, **Myth Busting - Social Schooling**.

For more information on personhood – see our specialised **APE Legal Personhood**, complete with up to date resources, podcast, and lesson plans on this topic.

www.voiceless.org.au/schools

Myth 3

Memory and Innovation: Problem Solving Fishes



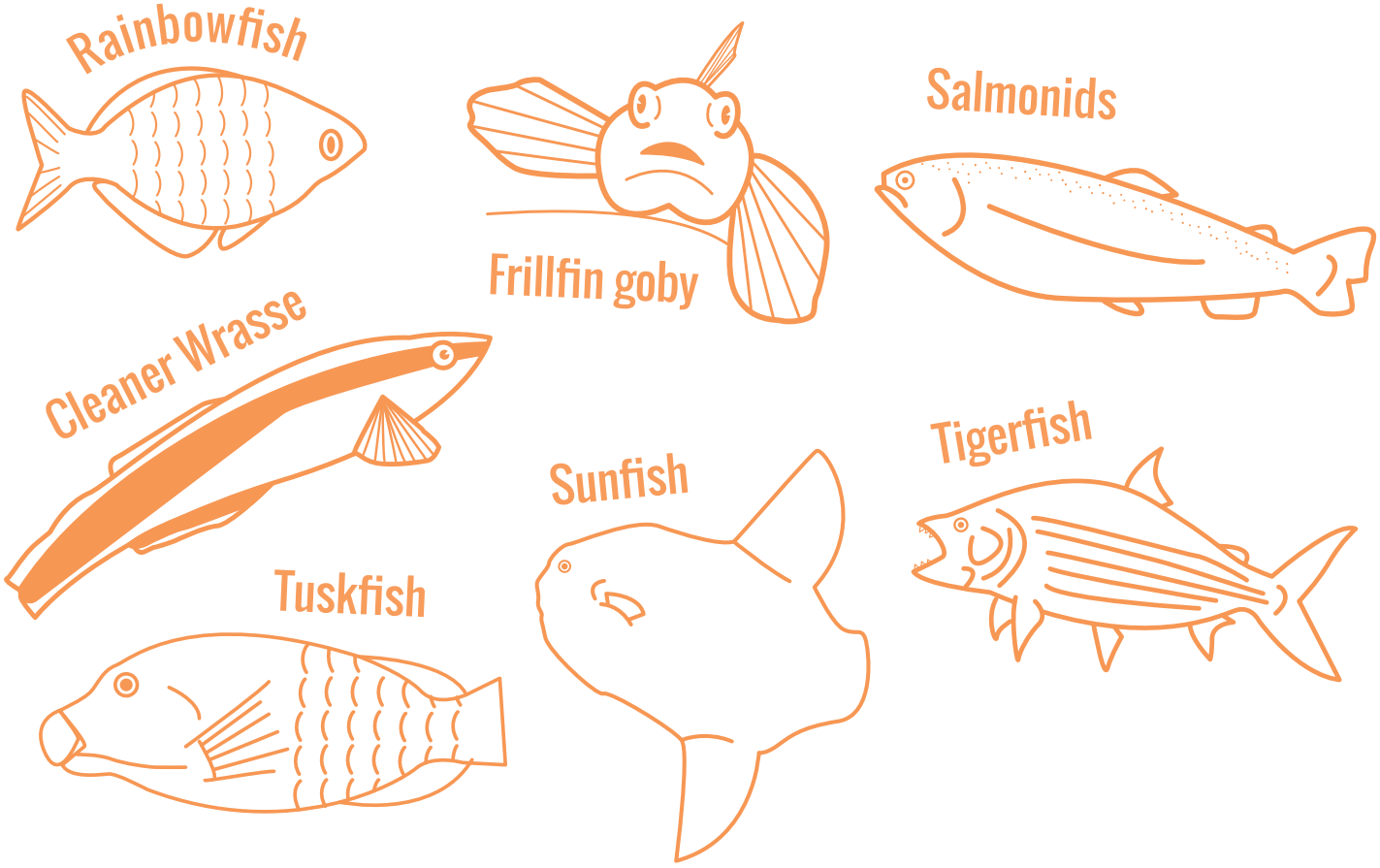
- In which sorts of situations might fishes require the use of tools?
- What sorts of things, or ways to use parts of the body, could be considered a tool?
- How do fishes learn to use tools?

Myth 3

Memory and Innovation

Fact File

Select one of the species (from the list below) and create a fact file.



Fact File Requirements:

Habitat – Where do I live and what's my lifestyle like?

Classification – Can you find my scientific name?

Size and Appearance – What are my distinguishing features?

Unique characteristics – Can you link these to memory or innovation?

Focus Area 4: Myth Busting - Social Schooling

Australian Curriculum Alignment

Learning Area	**Science**
Year Level	Year 7
General Capabilities	• Critical and Creative Thinking • Literacy • Ethical Understanding • Personal and Social Capabilities • Information and Communication Technology (ICT) Capability
Strands	Science Understanding - Biological Sciences Science as Human Endeavour - Use and Influence of Science Science Inquiry Skills - Questioning and Predicting / Planning and Conducting / Processing and Analysing Data and Information / Communicating
Content Description	Classification helps organise the diverse group of organisms (ACSSU111) Interactions between organisms, including the effects of human activities can be represented by food chains and food webs (ACSSU112) Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE120) Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124) Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125) Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS130) Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133)

Elaborations	(ACSSU111) • Grouping a variety of organisms on the basis of similarities and differences in particular features • Considering how biological classifications have changed over time • Using scientific conventions for naming species • Classifying using hierarchical systems such as kingdom, phylum, class, order, family, genus, species (ACSSU112) • Investigating the effect of human activity on local habitats, such as deforestation, agriculture or the introduction of new species • Exploring how living things can cause changes to their environment and impact other living things, such as the effect of cane toads (ACSHE120) • Considering how human activity in the community can have positive and negative effects on the sustainability of ecosystems (ACSIS124) • Recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation ACSIS125) • Developing strategies and techniques for effective research using secondary sources, including use of the internet (ACSIS130) • Referring to relevant evidence when presenting conclusions drawn from an investigation (ACSIS133) • Presenting the outcomes of research using effective forms of representation of data or ideas and scientific language that is appropriate for the target audience • Using digital technologies to access information and to communicate and collaborate with others on and off site
Cross-Curricular Priority	**Sustainability** **Systems** OI.1 - The biosphere is a dynamic system providing conditions that sustain life on Earth OI.2 - All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival **World Views** OI.4 – World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice, are essential for achieving sustainability **Futures** OI.7 - Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments

Acknowledgments: This Australian Curriculum alignment statement is based on the Australian Curriculum, Assessment and Reporting Authority (ACARA) materials, which are licensed under CC BY 4.0. The material has been modified from the Australian Curriculum website (accessed July 2019).

Information to teachers

The focus of these lessons is to investigate the ways in which fishes can be considered social animals. Students will read about how fishes cooperate and have cultural traditions. This Focus Area includes a range of different tasks including, reading and synthesising information, debate, a creative research activity, and vlogging. As an extension task, students can listen to experts discuss the capabilities of fishes in our Talking APEs podcast series.

Time and Structure

- 6-8 weeks
- 5 Focus Areas – Each Focus Area could take anywhere between 1-2 lessons or longer.
- Each Focus Area looks at common myths associated with fishes and how these have been busted due to advancements and new discoveries within the scientific community.
- The unit has been designed to be flexible, so that teachers may choose to alter or omit tasks to suit the needs of their students.
- A range of verbal, written, analytical, creative, research, reflection and extension tasks have been incorporated into the unit of work.

Target

Mixed ability class with extension tasks.

Unit Focus

Question whether our treatment of fishes reflects what we know about them.

Consider the different views on this issue and decide for yourself where you stand.

Discuss with your friends, family, classmates and teachers. Debating complex issues is healthy and helpful.

RESOURCES

Voiceless Fact Sheet - *The Watery World of Fishes (available online)*

Voiceless Infographic - *Facts and Fishes Pg. 55*

Voiceless Video - *Fascinating Fishes (available online)*

Voiceless Podcast - *Facts and Fishes Part 1 (available online)*

Filter and Distil – Worksheet Pg. 33

Missing Fish – Template Pg. 34

Facts and Fishes Part 1 Podcast Worksheet Pg. 36

*Glossary (selected words appear in **bold**) Pg. 53*

Quizlet (available online)

All resources can be downloaded at www.voiceless.org.au/schools

Other Resources

The Australian Museum, www.australianmuseum.net.au

Thought Co, www.thoughtco.com

INQUIRY QUESTIONS

- What are the social and cultural aspects of fish communities?
- How can we better protect fishes?

SUGGESTED LEARNING ACTIVITIES

1. STARTER

What does it mean to be social?

Give students 5 minutes to write down as many words or phrases they can think of which relate to the question above.

TEACHER TIP

Some general words/phrases which should come up are:

- Communication;
- Choosing friends/partners;
- Being part of a family;
- Being compassionate;
- Cooperating or working with others;
- Hierarchy or status;
- Culture or tradition.

Now ask the students to go through their list and draw a fish icon next to the points which they think may apply to communities of fishes.

2. EXPLORE

Read Pages 9-10 from ***The Watery World of Fishes***, either as a whole class exercise or in small groups.

From the information provided, ask the students to complete the **Filter and Distil Worksheet.**

The aim of this task is for students to be able to read, process, and evaluate the most important facts from a resource.

3. DISCUSS

Facilitate a class discussion, or in small groups, using the following higher order thinking questions.

Factual	We may look totally different to animals under the sea, but in what ways are we similar?
Conceptual	How can we define 'culture' in the aquatic world?
Debatable	Ensuring biodiversity within our oceans should be a priority for governments (extension question with links to sustainability).

TEACHER TIP

- Refer to the Australian Museum's resource on biodiversity. www.australianmuseum.net.au
- These questions are a good way to differentiate within your classroom.

4. SHARE

Missing Fish

Students to create a 'Missing Fish' poster to raise awareness about a species of fish that is now extinct. Refer to the **Missing Fish Template** for this task.

See below as an example:

Must include:

- **Name of species…Tecopa pupfish**
- **Unique name… Robert**
- **Image / drawing…**
- **Reason/s for extinction…**
- **Last seen…**

TEACHER TIP

Direct your students to '10 Fish That Have Recently Become Extinct' at www.thoughtco.com, for an interesting resource regarding extinct fishes.

5. REFLECT

VLOG – Video Blog

Ask students to record themselves on a digital device (iPad, laptop or other) speaking for 2 minutes about what they have learnt during this unit of work.

Refer students to the **Unit Focus Questions**, as seen below:

Question whether our treatment of fishes reflects what we know about them.

Consider the different views on this issue and decide for yourself where you stand.

Discuss with your friends, family, classmates and teachers. Debating complex issues is healthy and helpful.

Or, the **Inquiry Questions:**

What are the social and cultural aspects of fish communities?

How can we better protect fishes?

TEACHER TIP

- Vlogging works well for many students who find it difficult to speak in front of their peers – it is a safe way to share ideas and opinions with their teacher.
- If students do not have access to computers, this task can also be done in a written format, or even on a post-it note as they exit the classroom.

If parents and students consent, teachers are welcome to share vlogs from their class with Voiceless!

Please email student work to education@voiceless.org.au.

6. REFLECT

Play the podcast **Facts and Fishes Part 1** (approximately 20 minutes).

Students listen to experts; Dr Jonathan Balcombe and Prof. Culum Brown, as they discuss the capabilities of fishes.

Use the Podcast **Listening Comprehension Worksheet** which accompanies this Focus Area.

TEACHER TIP

You may need to play the podcast twice so students have time to both listen and respond.

7. TAKING IT FURTHER

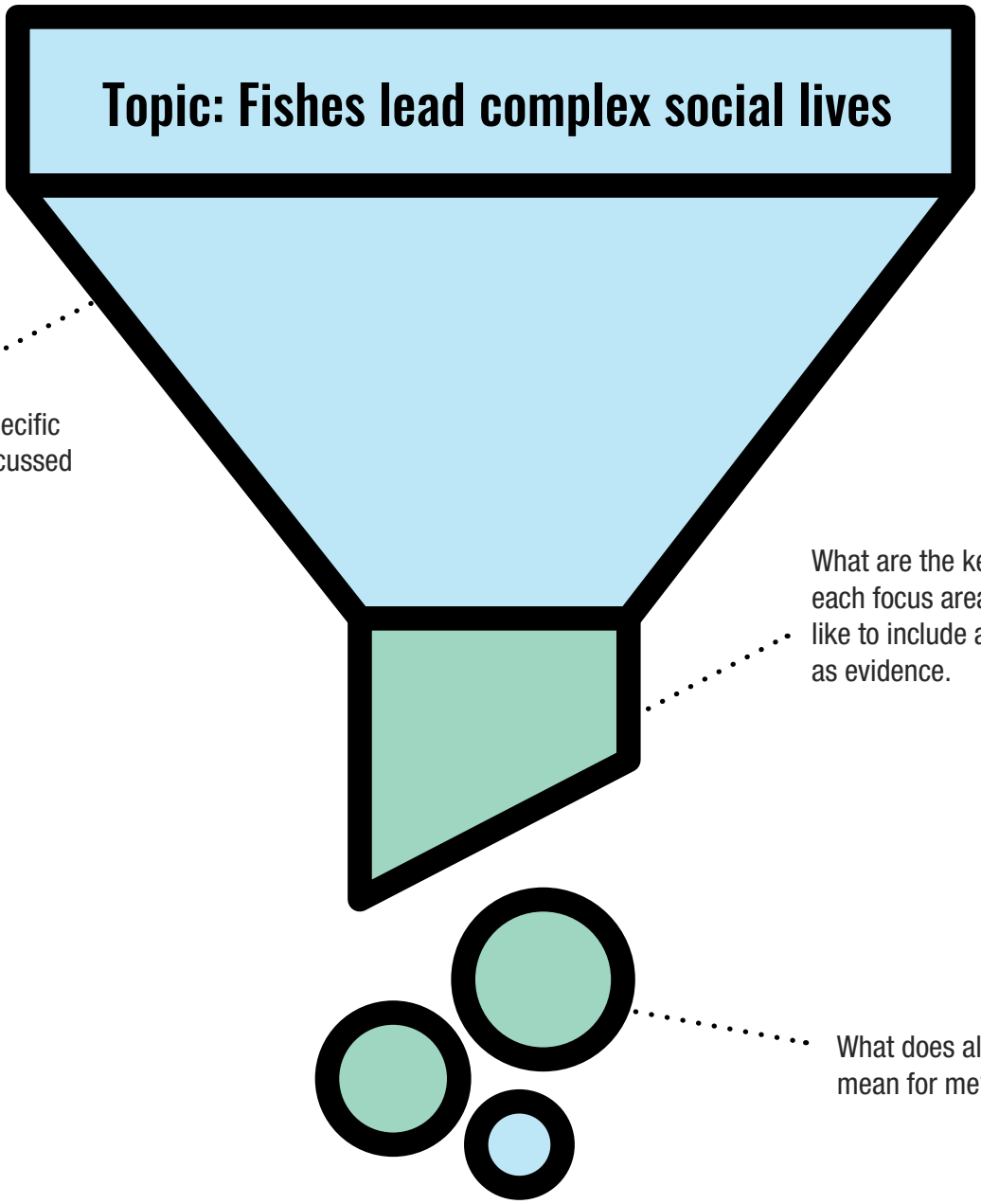
If you and your students enjoyed these activities, then please continue to work through the subsequent focus areas within the unit. Up next, **Industry Matters** and our **Facts and Fishes Podcast Part 2.**

Myth 4

Social Schooling

Filter and Distil

After you have read Pages 9-10 from the booklet The Watery World of Fishes complete the task below:



Learning outcome:

to be able to read, process and evaluate the most important points from a resource.

Myth 4

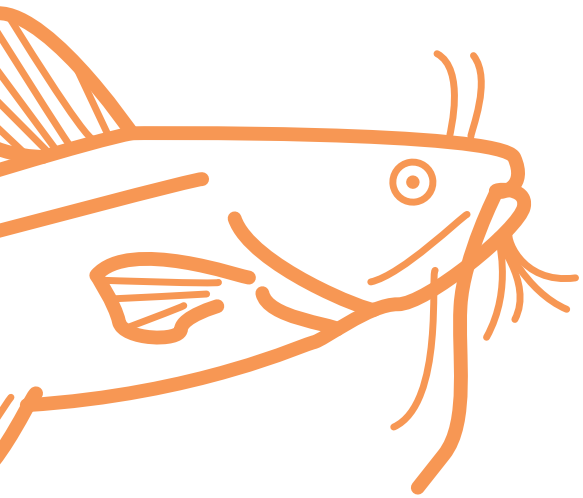
Social Schooling

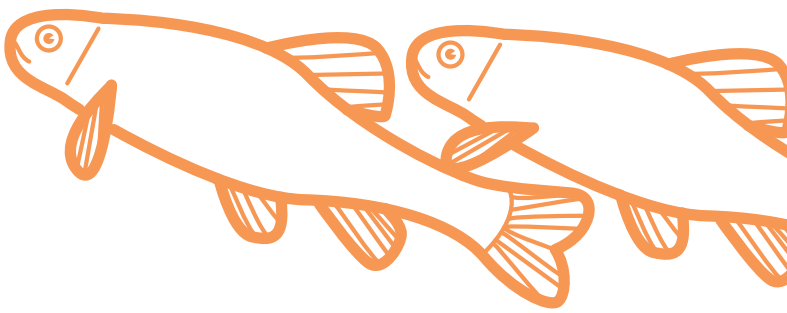
Missing Fish

Use the template on the opposite page to create a 'Missing Fish' poster to raise awareness about a species of fish that is now extinct.

Include the following:

Name of species
Image / drawing...
Reason/s for extinction...
Last seen...





MISSING!

Myth 4

Social Schooling

Podcast: Facts and Fishes Part 1

As you listen to the podcast answer the following questions:

1. What does Prof. Culum Brown's job entail?

2. Where did human beings inherit their pain mechanisms?

3. What is your understanding, from listening to the podcast, of 'emotional suffering'?

4. Prof. Brown discusses the 'doubters' – why does he believe they are 'wrong'?

5. In what ways are fish considered intelligent?

6. In what ways do fishes cooperate with one another?

7. Are fishes silent? Explain your response.

8. What are Frequent Repetitive Ticks? And why are they used?

9. Why do younger fish need older fish?

10. What image does Dr. Balcombe use to help listeners visualise how many fish are killed per year?

11. Dr. Balcombe says, "the mysteries of animal intelligence often confound us" – what are you confounded by?

Focus Area 5: Industry Matters - Extension

Australian Curriculum Alignment

The following activities can be taught to students from Years 7-10. Please refer to the appropriate year level for the relevant content descriptors.

Learning Area	**Science**
Year Level	Year 7
General Capabilities	• Critical and Creative Thinking • Literacy • Ethical Understanding • Personal and Social Capabilities • Information and Communication Technology (ICT) Capability
Strands	• Science Understanding - Biological Sciences • Science as Human Endeavour - Use and Influence of Science • Science Inquiry Skills - Questioning and Predicting / Processing and Analysing Data and Information / Communicating
Content Description	Interactions between organisms, including the effects of human activities can be represented by food chains and food webs (ACSSU112) Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE120) Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124) Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS130) Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133)

Elaborations	(ACSSU112) • Investigating the effect of human activity on local habitats, such as deforestation, agriculture or the introduction of new species • Exploring how living things can cause changes to their environment and impact other living things, such as the effect of cane toads (ACSHE120) • Considering how human activity in the community can have positive and negative effects on the sustainability of ecosystems (ACSIS124) • Recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation (ACSIS130) • Referring to relevant evidence when presenting conclusions drawn from an investigation (ACSIS133) • Using digital technologies to access information and to communicate and collaborate with others on and off site
Cross-Curricular Priority	**Sustainability** **World Views** OI.4 – World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice, are essential for achieving sustainability **Futures** OI.7 - Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments OI.9 - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments

Learning Area	**Science**
Year Level	Year 8
General Capabilities	• Critical and Creative Thinking • Literacy • Ethical Understanding • Personal and Social Capabilities • Intercultural Understanding
Strands	• Science as Human Endeavour - Use and Influence of Science • Science Inquiry Skills - Questioning and Predicting
Content Description	People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE136) Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)
Elaborations	(ACSHE136) • Recognising the role of knowledge of the environment and ecosystems in a number of occupations (ACSIS139) • Recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation
Cross-Curricular Priority	**Sustainability** **World Views** OI.4 – World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice, are essential for achieving sustainability **Futures** OI.7 - Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments OI.9 - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments

Learning Area	**Science**
Year Level	Year 9
General Capabilities	• Critical and Creative Thinking • Literacy • Ethical Understanding • Personal and Social Capabilities • Information and Communication Technology (ICT) Capability
Strands	• Science as Human Endeavour - Use and Influence of Science • Science Inquiry Skills - Questioning and Predicting
Content Description	People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities (ACSHE160) Formulate questions or hypotheses that can be investigated scientifically (ACSIS164)
Elaborations	(ACSHE160) • Considering the impacts of human activity on an ecosystem from a range of different perspectives (ACSIS164) • Using internet research to identify problems that can be investigated • Developing ideas from students own or others' investigations and experiences to investigate further
Cross-Curricular Priority	**Sustainability** **World Views** OI.4 – World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice, are essential for achieving sustainability **Futures** OI.7 - Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments OI.9 - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments

Learning Area	**Science**
Year Level	Year 10
General Capabilities	• Critical and Creative Thinking • Literacy • Ethical Understanding • Personal and Social Capabilities
Strands	• Science Understanding - Biological Sciences • Science as Human Endeavour - Nature and Development of Science • Science Inquiry Skills - Planning and Conducting / Evaluating / Communicating
Content Description	The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence (ACSSU185) Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community (ACSHE191) Plan, select and use appropriate investigation types, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS199) Critically analyse the validity of information in primary and secondary sources, and evaluate the approaches used to solve problems (ACSIS206) Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS208)

Elaborations	(ACSSU185) • Describing biodiversity as a function of evolution (ACSHE191) • Recognising that Australian scientists such as Brian Schmidt and Penny Sackett are involved in the exploration and study of the universe (ACSIS199) • Identifying safety risks and impacts on animal welfare and ensuring these are effectively managed within the investigation (ACSIS206) • Describing how scientific arguments, as well as ethical, economic and social arguments, are used to make decisions regarding personal and community issues (ACSIS208) • Constructing evidence based arguments and engaging in debate about scientific ideas • Presenting results and ideas using formal experimental reports, oral presentations, slide shows, poster presentations and contributing to group discussions
Cross-Curricular Priority	**Sustainability** **World Views** OI.4 – World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice, are essential for achieving sustainability **Futures** OI.7 - Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments OI.9 - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments

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Information to teachers

This Focus Area has been designed as a set of extension activities to follow the previous four Focus Areas within the unit of work Facts and Fishes, or as a stand-alone lesson/s. The purpose of this lesson/s is to educate young minds about the human impact of commercial fishing and fish farming on our oceans. All activities have been designed with the intention of encouraging critical and creative thinking skills and should therefore act as catalysts for interesting and provocative discussions on the issues explored within the unit of work.

Time Allocation

1-2 lessons or approximately 100 minutes.

Target

Year 7 gifted or high ability students.

Year 8-10 students of all abilities.

Unit Focus

Question whether our treatment of fishes reflects what we know about them.

Consider the different views on this issue and decide for yourself where you stand.

Discuss with your friends, family, classmates and teachers. Debating complex issues is healthy and helpful.

RESOURCES

Voiceless Fact Sheet *- The Watery World of Fishes (available online)*

Voiceless Infographic *- Facts and Fishes Pg. 55*

Voiceless Video *- Fascinating Fishes (available online)*

Voiceless Podcast *- Facts and Fishes Parts 1 + 2 (available online)*

Industry Matters Ted Talk Viewing Questions Worksheet Pg. 47

Industry Matters Facts and Fishes Podcast Part 2 - Listening Comprehension Worksheet Pg. 49

Glossary (selected words appear in ***bold****) Pg. 53*

Quizlet (available online)

All resources can be downloaded at www.voiceless.org.au/schools

Other Resources

Sylvia Earle, My Wish: Protect Our Oceans, 2009, www.ted.com

INQUIRY QUESTIONS

- In what ways does commercial fishing and fish farming impact our oceans?
- Should we be rethinking our relationship with fishes?

SUGGESTED LEARNING ACTIVITIES

Pre-requisite

Read through the Fact Sheet – ***The Watery World of Fishes*** and view the accompanying resources for this unit of work, as required.

SUGGESTED LEARNING ACTIVITIES

1. EXPLORE

Discuss the use of fishes by industries.
Refer to Pages 11-12 of ***The Watery World of Fishes.***

Commercial Fishing and Fish Farming

1. Students compare and contrast the two modes of industry fishing – using the evidence provided on Page 11.
2. Students watch oceanographer, Sylvia Earle's Ted Talk: My Wish: Protect Our Oceans (18 Minutes).

TEACHER TIP

Stop and pause the video a few times to allow for students to answer the questions. Allow time for discussion after, if required.

Ted Talk Viewing Questions (Worksheet available)

1. Earle makes the comparison of our world to the *'World Bank'* – what does she mean by this?
2. Why is the ocean so important? Note down as many points as possible that Earle raises in her speech.
3. What impact does excess carbon dioxide have on our environment, human beings, and the sea?
4. What is the shocking statistic to do with **'by-catch'**?
5. What's the good news?
6. How much of the world's land is protected to safeguard biodiversity?
7. How many places in the world can you find natural marine sanctuaries?
8. In which countries/continents is the land protected but not the sea?
9. Earle frequently uses the metaphor of a *'life support system'* – what point is she trying to make?
10. What does Earle say *'we need'* to do?

2. DISCUSS

Facilitate a class discussion on the points below:

As the science shows, fishes are social, sophisticated and smart. Most importantly, there is overwhelming evidence that fishes are sentient.

- Did you find any of this information surprising or new?
- If so, how should this information affect our relationship to fishes?

3. SHARE AND REFLECT

Sharing Solutions

Students to complete a written reflection on the issues pertaining to the use of fishes by industries and human beings.

Questions for Reflection:

1. "Fish account for nearly 97 per cent of all animals slaughtered for food globally". Considering what you have read and viewed during this lesson/s, what do you think about this statistic? Were you surprised by this statistic? Why do you think many people may not realise how many fish are slaughtered globally for human consumption?
2. It can be overwhelming to think about how the animals of the sea are suffering due to actions of human beings. What small steps can you take to help combat this issue?

Listening Comprehension

- Play the podcast **Facts and Fishes Part 2** (approximately 7 minutes).
- Students listen to expert Dr. Cat Dorey discuss the commercial industry of fishing.
- Use the Podcast **Listening Comprehension Worksheet** which accompanies this focus area.

TEACHER TIP

You may need to play the podcast twice so students have time to both listen and respond.

4. TAKING IT FURTHER

We hope that you have enjoyed using our teacher and student resources for this APE on **Facts and Fishes**.

We are always looking to improve our educational resources, please get in contact with us if you would like to provide some feedback on this APE, including how it was received by your students.

INDUSTRY MATTERS

As you watch oceanographer Sylvia Earle's Ted Talk, answer the following questions:

1. Earle makes the comparison of the world to the 'World Bank' – what does she mean by this?

2. Why is the ocean so important? Note down as many points as possible that Earle raises in her speech.

3. What impact does excess carbon dioxide have on our environment, human beings, and the sea?

4. What is the shocking statistic to do with 'by-catch'?

5. What's the good news?

6. How much of the world's land is protected to safeguard biodiversity?

7. How many places in the world can you find natural marine sanctuaries?

8. In which countries/continents is the land protected, but not the sea?

9. Earle frequently uses the metaphor of a 'life support system' – what point is she trying to make?

10. What does Earle say 'we need' to do?

PODCAST

Industry Matters

Facts and Fishes Part 2

As you listen to the podcast, answer the following questions:

1. In what ways do we interact with fish?

2. Dr. Dorey discusses the statistics of fishes killed every year in commercial fishing – how many does she estimate, and what is your reaction to this?

3. Identify some of the welfare issues that Dr. Dorey discusses in relation to how fishes are caught. How does this make you feel?

4. Identify the three main impacts fishing has on our environment.

PODCAST

Industry matters

Facts and Fishes Part 2

5. In your own words, explain 'aquaculture'.

6. According to Dr. Dorey, what is the main problem with aquaculture in relation to fishes and the environment?

7. What do you think? Does our treatment of fish in commercial industries reflect what we know about them?

Assessment

Australian Curriculum Alignment

Learning Area	**Science**
Year Level	Year 7
Achievement Standards	By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of Earth, the sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of human and environmental changes on interactions between organisms and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines and diverse cultures has been used to solve a real-world problem. They explain possible implications of the solution for different groups in society. Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

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ASSESSMENT TASKS

See the range of suggested assessment tasks below which are also embedded into the sequence of learning for this unit of work. Also note that some of the student worksheets would also work well as a means of assessment.

Formative Assessment 1

Creative Task.

Students to design a poster which busts the myth: Fishes aren't Sophisticated.

Refer to **Focus Area 1: Myth Busting - The Capabilities of Sophisticated Fishes**, for more information on this task.

Formative Assessment 2

Research Task.

Students undertake a research task and complete a **Fishes Fact File.**

Refer to **Focus Area 3: Myth Busting - Memory and Innovation** for more information on this task.

Formative Assessment 3

Report.

Students write a report on one of the three higher order thinking questions from the 'Discuss' section of Focus Area 4.

Refer to **Focus Area 4: Myth Busting** - Social Schooling for more information on this task.

Formative Assessment 4

Reflection – Assessing the ability to reflect.

All 5 focus areas have a reflection component which could be used as a formative reflection assessment.

Summative Assessment

Evidence of student work from each of the 4-5 focus areas can be brought together as a portfolio of work to show how achievements have been met.

Voiceless would be delighted to receive any completed student work to feature on the Voiceless website (student and parental consent required). Please email any work or feedback to education@voiceless.org.au.

Glossary

Vocabulary	Definition
Aquaculture	The growing or farming of aquatic animals and plants, including fish farming.
Biomass	The mass of living organisms in an ecosystem at a particular point in time.
By-catch	Animals unintentionally caught in commercial fishing, such as dolphins, turtles, sea birds and non-target fishes.
Cognitively affected	A mental state where usual thought patterns and brain activity may be interrupted, disturbed or unusual.
Conscious	To be aware and able to respond to one's surroundings.
Culture	Non-biological information or traditions transferred across generations.
Electroreception abilities	The ability to detect and emit electric signals, sometimes as a form of communication.
Ethologist	A scientist who studies animal behaviour.
Group memory	The shared knowledge and information held by a social group of animals, often passed on between generations.
Intelligence	An ability to learn, acquire knowledge and process information.
Inter-species communication	When animals of different species exchange information.
Inter-species cooperation	When animals of different species work together to achieve a common goal.
Mammals	A class of vertebrate animals that give birth to live young and produce milk for their young, including humans.
Mirror self-recognition test	A method of determining whether an animal is self-aware, by observing whether or not the animal recognises themselves in a mirror.
Neocortex	A part of the brain in mammals that is responsible for various functions, including pain perception.

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Pain perception	The ability to feel and process painful experiences.
Paleocortex	A part of the brain in birds that is responsible for various functions, including pain perception.
Pallium	A part of the brain in fishes that is responsible for various functions, including pain perception.
Positive cognitive states	A desirable mental state, such as contentment or happiness.
Predator	An animal that hunts and eats other animals.
Prey	An animal that is hunted and eaten by other animals.
Primates	An order of mammals that includes chimpanzees, gorillas, monkeys and humans.
Reflex	An automatic response that is performed unconsciously.
Schooling	The action of fishes swimming together in a coordinated way.
Self-awareness	The ability to identify a separate sense of self, distinct from other entities; an understanding of one's individual character.
Sentience	The ability to perceive and feel things, such as pleasure and pain.
Shoaling	The action of fishes staying in a specific group for social reasons.
Stimuli	Things that cause a reaction (for example, spikey objects are stimuli that may cause pain when touched).
Unconscious	To not be awake, lacking awareness and responsiveness to one's surroundings.

Fantastic fishes: FIND OUT WHAT OUR FINNED FRIENDS CAN DO

The term 'fishes' is used to refer to multiple species of fish. Fishes make up **60%** of all vertebrate species in the world, so when we use the term 'fish' we clump together a huge range of diverse aquatic individuals from over **33,200** species. Salmon, goldfishes, eels, manta rays and sharks are all different kinds of fishes. Scientific evidence shows that fishes feel pain and are capable of suffering, just like us. In addition to being sentient, fishes are also highly intelligent and socially sophisticated animals.

Fishes have more ways of communicating with each other than any other vertebrate group

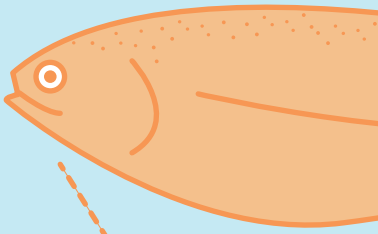
Fishes lead complex social lives and can remember hundreds of individuals

Fishes play and have cultural traditions

Cleaner wrasse ARE SELF-AWARE

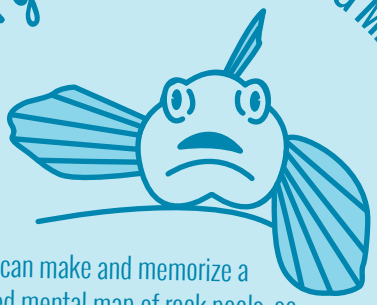
In 2018, I passed the classic mirror self-recognition test, which shows I'm self-aware just like humans, elephants, dolphins and crows..

Salmon HAVE A REMARKABLE SENSE OF SMELL



I can smell a single drop of water in an Olympic-sized swimming pool!

Frillfin gobies HAVE AMAZING MEMORIES

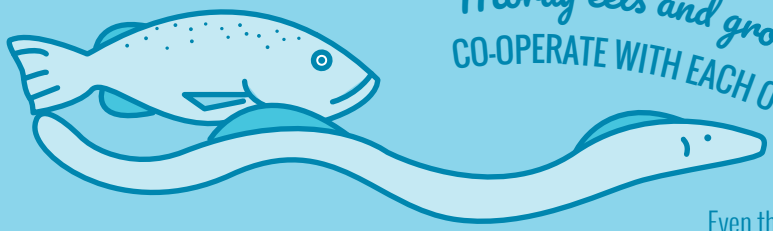


I can make and memorize a detailed mental map of rock pools, so that I can safely jump between them at low tide.

Archerfish ARE INNOVATIVE

I can accurately aim and spit sharp jets of water through the air to catch insects taking visual distortion into account.

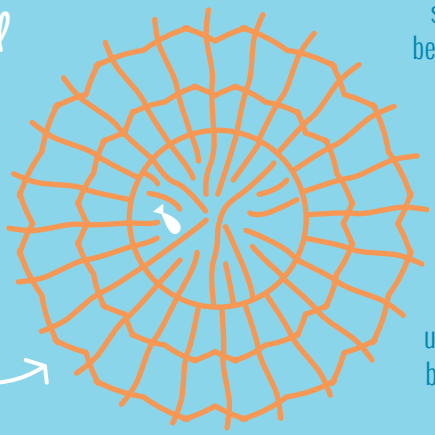
Moray eels and groupers CO-OPERATE WITH EACH OTHER



Even though we're different species, we hunt in pairs because we catch more prey when we work together.

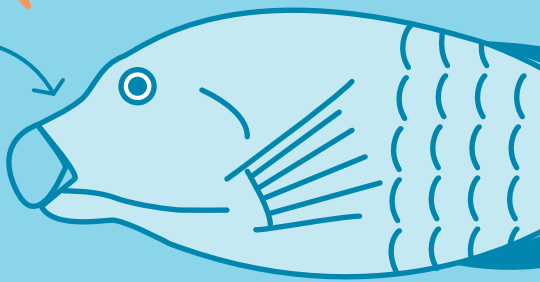
White-spotted puffer fishes MAKE ART

I spend weeks making geometric patterns in the sand to impress my perfect mate!



Tuskfishes USE TOOLS

Tool-use was thought to be unique to mammals and birds… but then scientists saw me using rocks to crack open clams!



? Question whether our treatment of fishes reflects what we know about them.

Consider the different views on this issue, and decide for yourself where you stand.

Discuss with your friends, family, classmates and teachers. Debating complex issues is healthy and helpful.

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