



**OCEAN
WISE**

Species at Risk

EDUCATOR GUIDEBOOK

Grades 3 - 6

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LAND ACKNOWLEDGEMENT

We acknowledge and are grateful that many Ocean Wise employees work and play on the traditional, ancestral and unceded territories of the x^wməθk^wəyəm (Musqueam), S_kwxwú7mesh (Squamish), and səliłwətaʔt (Tsleil-Waututh) peoples.





INTRODUCTION

The Earth's ocean and its interconnected systems are vital to every living thing on Earth. Marine species play a pivotal role in maintaining the efficiency and balance of these systems, and their role in the ocean has a direct impact on its health. And yet the health of the ocean, and the well-being of all life on earth, is at risk due to human activity.

Everyday thousands of animals fall victim to the anthropogenic threats imposed on the ocean, and species are pushed to the point of extinction. Indeed, as of 2022, as many as 45 thousand marine species are at risk of extinction due to climate change, ocean pollution, plastic pollution and overfishing! It is going to take a deep, transformational change in humanity's consciousness and behaviors regarding the ocean to ensure species protection and to preserve healthy, sustainable life on this planet.

At Ocean Wise, we believe this is possible – but we need to work together. Our youth must become aware of the

interconnectedness between our lives and the ocean and understand the important role diverse species play in the health of the environment. By merging our experience with climate change education and the research of our own conservation teams, we aim to do just that. For over 50 years, we have dedicated our work to ocean conservation and education guided by the international community such as the Sustainable Development Goals (SDG) of the United Nations and the International Union of Conservation for Nature (IUCN). Informed by recognized science and climate change education pedagogies, these lessons aim to guide our youth to become leaders of change. The ultimate objective being to educate, equip and empower students to become ocean champions and stewards for species at risk.

NOTE TO EDUCATORS

Each lesson follows the same format throughout the kit with **critical questions** and **reflections** built into the **activities** section.

The kit follows the overarching theme of **interconnectedness**, integrating decolonization practices with scientific, conservation, and Indigenous knowledge. The thought book component prompts students to journal on interconnectedness and consider its connection to each lesson's focus. Through reflection, students will consider their role in decolonization and climate action so that they are encouraged to be changemakers within their community.

Each lesson ends with ways to **take action**. We invite educators and students to create their own actions acknowledging that those provided may not be accessible or applicable to all. We recognize that individual action should be coupled with systemic change. We aim to empower students through active approaches and creative problem solving that address individual or smaller-scale behavior change, but also through actions that can positively influence large systemic issues.

Finally, we want to thank you for promoting climate change education, social justice and Indigenous knowledge in your classroom. By doing so, you are providing a unique skill set to the future leaders of the world so they are better equipped to deal with environmental issues. Nonetheless, today you are the leader, leading our youth towards a cleaner and more sustainable future.



CURRICULUM LINKS

The table below illustrates curriculum connections, outlining the Big Ideas in a variety of courses and detailing which lessons are connected to which Big Ideas. Please note that although this resource is developed with a focus on aligning to the BC curriculum, there exists a lot of overlap across provincial curricula and lesson activities possess room for interpretation so different curriculum objectives can be met, making this kit applicable throughout Canada.

LESSON 1

- Science 3
- Arts Education 3
- Social Studies 3
- Science 4
- English Language Arts 4
- English Language Arts 5
- Science 6
- English Language Arts 6

LESSON 2

- Science 3
- English Language Arts 3
- Arts Education 3
- Social Studies 3
- English Language Arts 4
- Science 5
- English Language Arts 5
- Science 6
- English Language Arts 6

LESSON 3

- English Language Arts 3
- Arts Education 3
- Social Studies 3
- English Language Arts 4
- Social Studies 4, Science 5
- English Language Arts 5
- Social Studies 5
- English Language Arts 6

LESSON 4

- Arts Education 3
- Social Studies 3
- Science 4
- English Language Arts 4
- English Language Arts 5
- English Language Arts 6

LESSON 5

- Science 3
- English Language Arts 3
- Arts Education 3
- Social Studies 3
- Applied Design, Skills, and Technologies 3
- Science 4
- English Language Arts 4
- Social Studies 4
- Science 5
- English Language Arts 5
- Science 6
- English Language Arts 6

| GRADE | SUBJECT | BIG IDEAS | CONNECTED LESSON(S) |
|-------|--|---|---------------------|
| 3 | Science | Living things are diverse, can be grouped, and interact in their ecosystems. | 1, 2, and 5 |
| | English Language Arts | Stories and other texts connect us to ourselves, our families, and our communities. | 2, 3, and 5 |
| | | Stories can be understood from different perspectives. | 2 and 5 |
| | Arts Education | The mind and body work together when creating works of art. | 1, 2, 3, 4, and 5 |
| | | The arts connect our experiences to the experiences of others. | 4 and 5 |
| | Social Studies | Learning about indigenous peoples nurtures multicultural awareness and respect for diversity. | 1, 2, 3, 4, and 5 |
| | | Indigenous knowledge is passed down through oral history, traditions, and collective memory. | 1, 2, 3, and 5 |
| | | Indigenous societies throughout the world value the well-being of the self, the land, the spirits, and ancestors. | 1, 2, 3, 4, and 5 |
| | Applied Design, Skills, and Technologies | Designs grow out of natural curiosity. | 5 |
| | Earth Sciences | The distribution of water has a major influence on weather and climate. | 1 and 5 |



| GRADE | SUBJECT | BIG IDEAS | CONNECTED LESSON(S) |
|-------|-----------------------|--|---------------------|
| 4 | Science | All living things sense and respond to their environment. | 1, 4, and 5 |
| | English Language Arts | Texts can be understood from different perspectives. | 1, 2, 3, 4, and 5 |
| | | Exploring stories and texts help us understand ourselves and make connections to others and to the world. | 1, 2, 3, 4, and 5 |
| | Social Studies | The pursuit of valuable natural resources has played a key role in changing the land, people, and communities of Canada. | 3 and 5 |
| 5 | Science | Multicellular organisms have organ systems that enable them to survive and interact with their environment. | 2, 3, and 5 |
| | English Language Arts | Texts can be understood from different perspectives. | 1, 2, 3, 4, and 5 |
| | | Exploring stories and texts help us understand ourselves and make connections to others and to the world. | 1, 2, 3, 4, and 5 |
| | Social Studies | Natural resources continue to shape the economy and identity of different regions of Canada. | 3 |
| 6 | Science | Multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment. | 1, 2, and 5 |
| | English Language Art | Exploring and sharing multiple perspectives extends our thinking. | 1, 2, 3, 4, and 5 |
| | | Exploring stories and texts help us understand ourselves and make connections to others and to the world. | 1, 2, 3, 4, and 5 |



GLOSSARY

- **ANTHROPOGENIC**

The impact on the environment, as it relates to climate change, originating from human activities.

- **APEX PREDATOR**

A predator at the top of their food chain with no natural predators. This term excludes humans.

- **BREACHING**

When whales use their powerful tail to launch themselves out of the water.

- **BY-CATCH**

Fish or non-target species that are caught unintentionally while fishing for another species.

- **CETACEANS**

An order of aquatic mammals that includes all whales, dolphins, and porpoises.

- **FORAGING/FORAGE**

When animals actively search for food in their environment.

- **INTERNATIONAL UNION OF CONSERVATION FOR NATURE (IUCN)**

An international organization working in the field of nature conservation and the sustainable use of natural resources.

- **KEYSTONE SPECIES**

An organism that significantly defines how an ecosystem functions. Without this species, the ecosystem may be dramatically altered or cease to exist.

- **OVERFISHING**

Removing a species of fish from the oceans, through fishing activities, at a rate greater than the species can replenish its population.

- **TROPHY**

A fish that is captured only for its large size and not necessarily used for subsistence.

- **URCHIN BARREN**

A part of the ocean where the urchin population growth has gone unchecked causing the destructive grazing of kelp forests.

Lesson 1

Climate Change - Humpback Whale



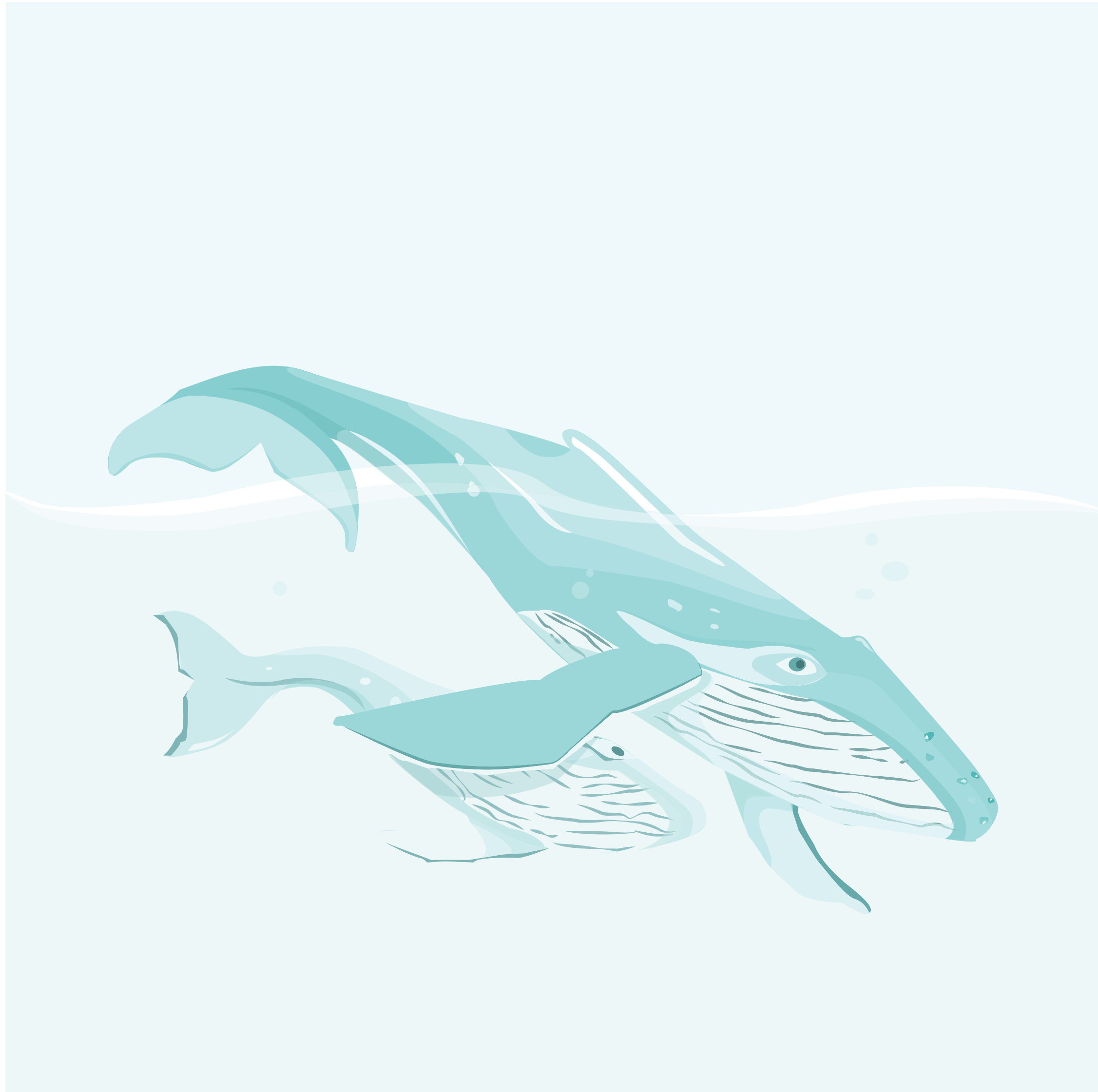
BACKGROUND

The humpback whale is found in all major oceans and is a highly migratory species. They feed in cold productive waters during the summer and travel to warm tropical waters for the winter to breed. As an animal that lives mostly in nearshore areas and is known for its spectacular surface-active behavior, including breaching and tail slapping, the majestic humpback whale is incredibly popular among whale watchers. However, not too long ago, the humpback whale was a target for a much more gruesome activity - whale hunting. The humpback whale was one of the five large whale species hunted throughout the 19th century and consequently, some populations were dramatically reduced by almost 95%! Today, the humpback whale population has mostly recovered due to conservation efforts to prevent whaling and has been listed as a species of least concern by the International Union of Conservation (IUCN). However, a more contemporary issue is now threatening their existence.

Research has shown that climate change disproportionately affects ecosystems at higher latitudes, which the humpback whale

relies on for intensive feeding throughout the year. As climate change warms ocean waters and melts sea ice, changes in the food web decreases the abundance of the humpback whale's prey. As they have less to feed on, these whales are unable to meet certain survival requirements. In fact, the higher number of unsuccessful pregnancies and lower calving rates of the humpback whale population in the north Atlantic has been attributed to the lack of available prey. Indeed, 65% of the humpback whale's breeding grounds are projected to be adversely impacted by climate change this century. As water temperatures rise above the range tolerated by humpback whales, they may stop using these areas altogether further reducing their breeding rates.

As the humpback whale population just began to show signs of recovery from their exploitation by whalers, they now face the impacts of climate change. While humans have contributed to the successful protection of the spectacular humpback whale, there is still lots of work for us to do, especially as it relates to climate change mitigation.



STUDENTS WILL BE ABLE TO

- Develop an understanding of how climate change affects ocean health and species.
- Make connections between mitigating climate change and protecting species.
- Develop an understanding of the role of humans in the climate change crisis.

CRITICAL QUESTIONS

- How does climate change affect marine animals?
- What are some of the ways marine animals can reduce the impacts of climate change?
- What role(s) do humans have in contributing to climate change?

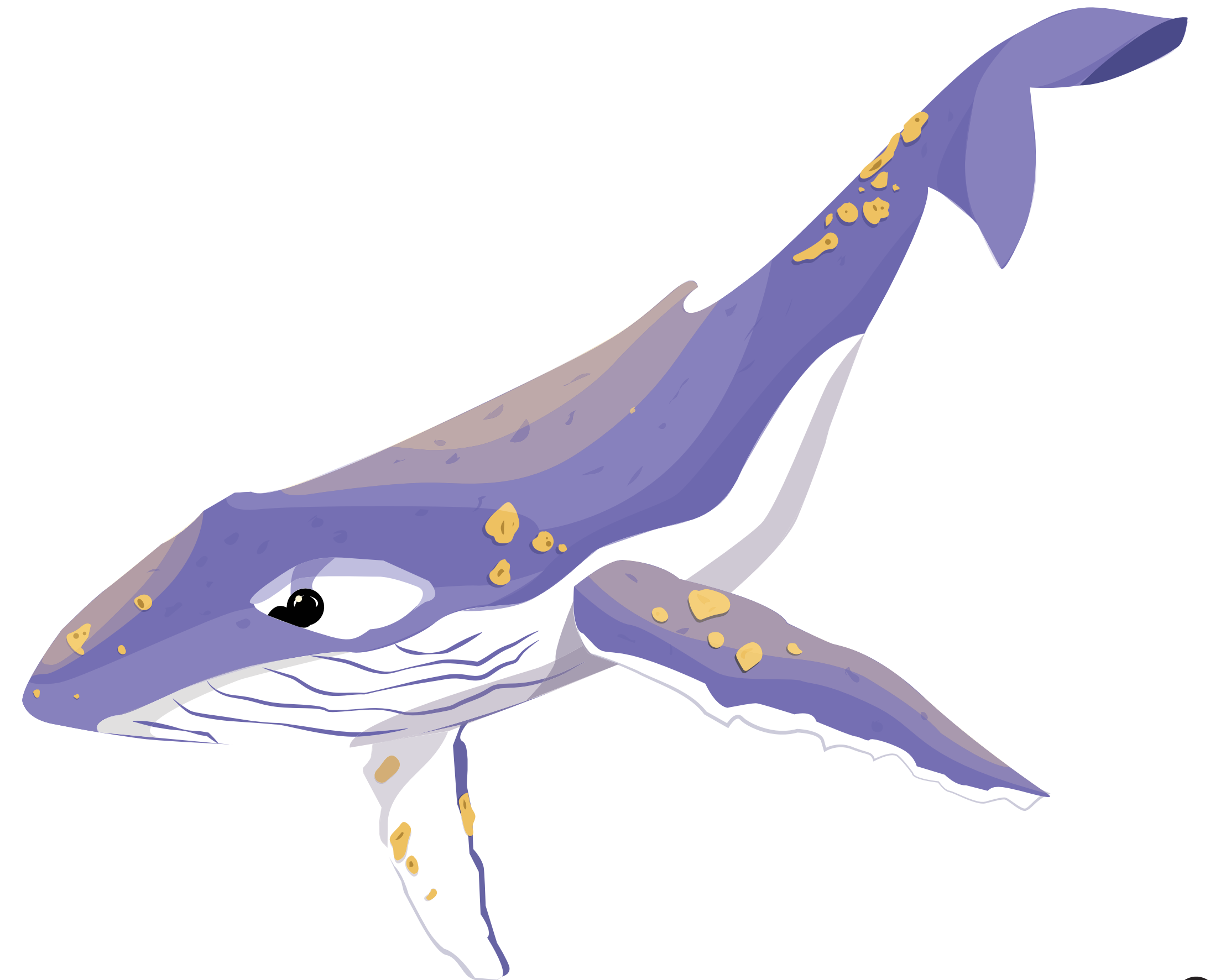
RESOURCES

- Watch: [The Green Whale: Climate Giants Can Help Save The Planet by Whale and Dolphin Conservation](#)
- Watch: [Climate Change and Whales by Kids News Break](#)
- Watch: [Our Planet - Humpback Whales by Netflix](#)
- View: [Footprint Calculator](#)
- Watch: [Human-Whale Relationship in The Face of Climate Change - Dr. Chie Sakakibara by UN University](#)



ACTIVITIES

1. Watch: [***The Green Whale: Climate Giants Can Help Save The Planet by Whale and Dolphin Conservation***](#) and discuss as a class how the video made students feel.
 - Ask students to complete the humpback whale drawing in their workbook. From their understanding of the video, students should try to identify the different parts of the whale that help mitigate climate change.
2. As a class, watch [***Climate Change and Whales by Kids News Break***](#). In their workbook, students should create a short story about a whale facing the impact(s) of climate change. Their story should have a happy ending (i.e., the whale overcomes ocean warming because of x and lives happily ever after). Students can present their short story verbally, as a paragraph, comic strip, or any other creative literary format.
3. Have students calculate their carbon footprint using the [***Footprint Calculator***](#) and complete the “How Do You Feel” section at the top of the web page. As a class, discuss with students some of the ways they can reduce their ecological footprint. Consult the “Solutions” section for discussion ideas.
4. Watch [***Human-Whale Relationship in The Face of Climate Change - Dr. Chie Sakakibara by UN University***](#). Allow students to reflect on how climate change is impacting Indigenous relationships with nature and discuss as a class.



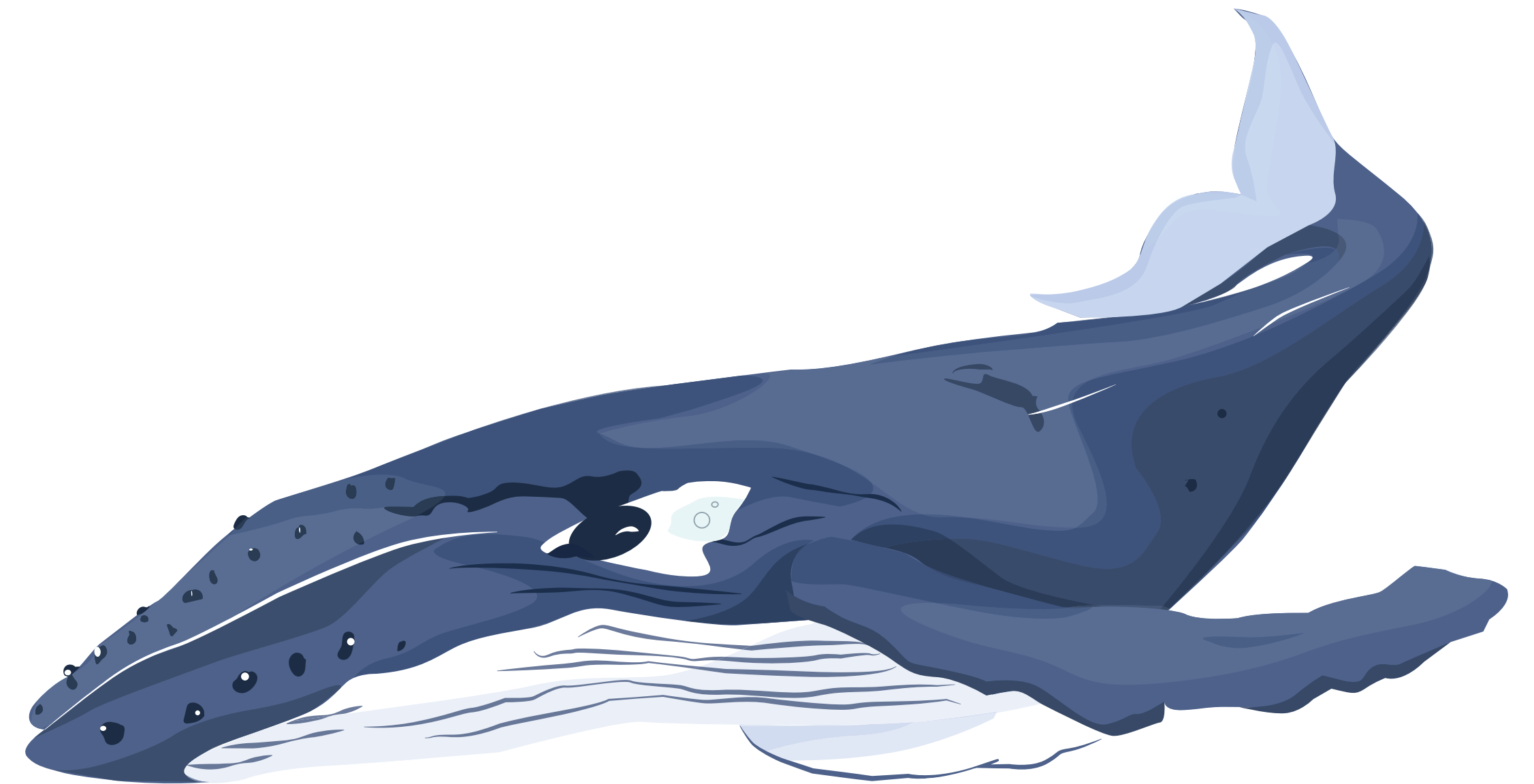


THOUGHTBOOK

This lesson focused on the different ways we contribute to climate change and how we can change our practices to reduce our impacts. Take time to journal on your thoughts and things you have learned.

REFLECT

1. How does climate change affect marine animals?
2. What are some of the ways marine animals can reduce the impacts of climate change?
3. What role(s) do humans have in contributing to climate change?





TAKE ACTION

Report a whale sighting using the [*Ocean Wise Whale Report Alert System*](#).

THE WHY

Reporting a whale sighting provides scientists with information about the number of individuals in order to properly determine if the population is doing good or bad. It also helps scientists understand where the whales are having babies and eating food, and how these locations may have changed due to climate change. With a better understanding of their abundance and location, people near them can be made aware of their presence so they can avoid them, reducing the risk of vessel strikes and other disturbances. By helping provide more information to scientists and the community, you can have a role in contributing to climate change mitigation and conservation measures to help protect animals like the humpback whale!



Lesson 2

Ocean Pollution - Killer Whale

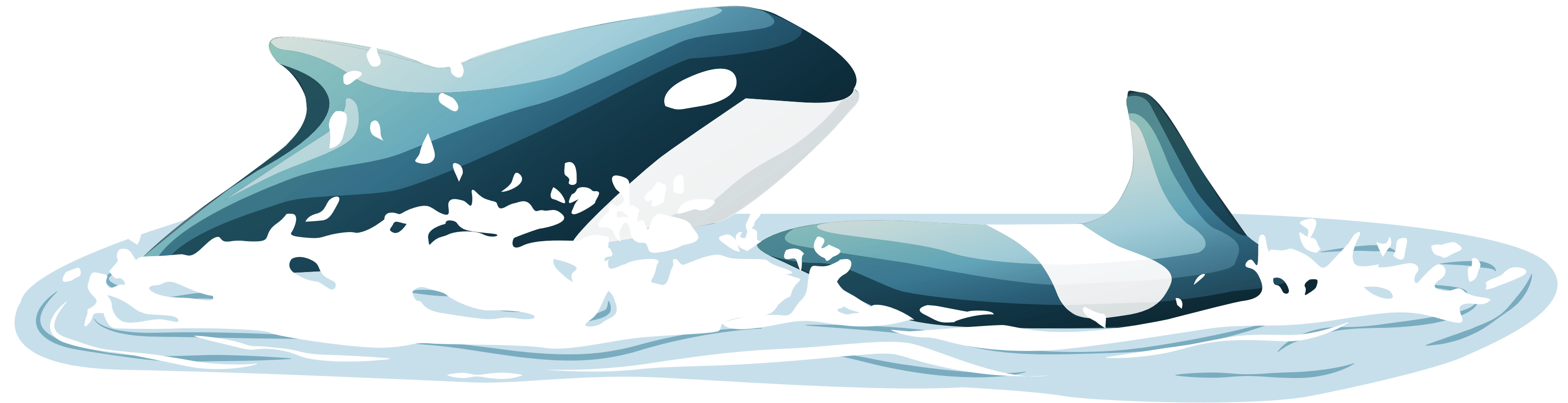
BACKGROUND

Orcas, more commonly known as killer whales, are the largest marine mammals belonging to the dolphin family. Despite living mostly in colder regions where their prey is most abundant, killer whales can be found all over the world feeding on a variety of different prey. In fact, this species has the most varied diet and foraging behavior of all cetaceans. Despite being so widely distributed and easily recognized by their signature black and white coloring, it has been extremely difficult for researchers to accurately gather information on species distribution and population size as they are found in such remote areas. This has led to the IUCN listing the killer whale as a data deficient species on their Red List.

Although little is known about the killer whale, scientists have shown that their greatest threat is ocean pollution. While ocean pollution affects all marine animals, it has a disproportionately greater effect on killer whales as they are a top (apex) predator. This means that they are found at the top of the food chain where the bioaccumulation of ocean pollutants is at its highest. Bioaccumulation occurs when a toxin enters the food chain via primary producers (i.e., algae) and increases in

concentration as it moves up. Top predators, such as the killer whale, will possess the highest concentration of that toxin. Killer whales are most likely to be harmed by industrial and household chemicals, which persist through the food chain over several decades by storing itself in the blubber of the killer whale's prey. As a result of their chemical contamination via feeding, killer whales across the world are facing high rates of infertility, high calf death (due to mothers offloading chemicals to their calves via milk), and poor immune system functioning, which has contributed to a decline in their population.

There is no doubt that the ban of certain ocean pollutants has significantly mitigated the effects of its bioaccumulation in killer whales. However, we must recognize that we have yet to act on countless unregulated pollutants entering our oceans. We still have lots of work to do.



STUDENTS WILL BE ABLE TO

- Understand the interdependence of ocean health, the food chain, and trophic structure connections as it relates to ocean pollution.
- Discover the interconnectedness of species within the same food chain.
- Develop a meaningful understanding of advocating for better ocean health and climate change mitigation.

CRITICAL QUESTIONS

- What are the most significant ways that humans impact ocean health?
- Why are some species more affected by ocean pollutants than others?
- How can a single pollutant affect all species in a food chain?

RESOURCES

- Read: [Killer Whale Facts For Kids by National Geographic](#)
- Watch: [Bioaccumulation and Biomagnification: Increasingly Concentrated Problems! by Catalina Island Marine Institute](#)
- Read: [Ocean Wise's Blog: Tracking Contaminants in Killer Whale Habitats by Ocean Wise](#)
- Read: [Natsilane - A Tlingit Legend](#)

ADDITIONAL RESOURCES

- Watch: [Killer Whales Under Threat by Ocean Wise](#)
- Read: [OCEANWATCH Spotlight – Pollution Hotspots in Killer Whale Habitat Pinpointed by New Conservation Tool by Ocean Wise](#)
- Watch: [The Parallels Between Orcas and Indigenous Rights by CBC](#)



ACTIVITIES

1. As a class, read through [*Killer Whale Facts For Kids by National Geographic*](#) and allow students to complete the questions in their workbook. Discuss as a class their answers.
2. Watch [*Bioaccumulation and Biomagnification: Increasingly Concentrated Problems! by Catalina Island Marine Institute*](#).
 - In small groups, ask students to complete the killer whale food chain pyramid by drawing the animals listed in their workbook into the appropriate pyramid levels.
 - As a class, discuss why and how ocean pollutants entering the food chain would affect the killer whale the most. Encourage students to refer to their food chain pyramid and the size of the different pyramid levels during the discussion.
3. Preferably outdoors or in a large space, play the *Polluted Food Chain Game*. Refer to the Instructions for the Polluted Food Chain Game in the appendix for lesson 2 at the end of this guidebook.
4. Read to the class [*Natsilane - A Tlingit Legend*](#) and discuss the importance and significance of the killer whale to Indigenous peoples. How may ocean pollution affect the culture of Indigenous communities through the killer whale?

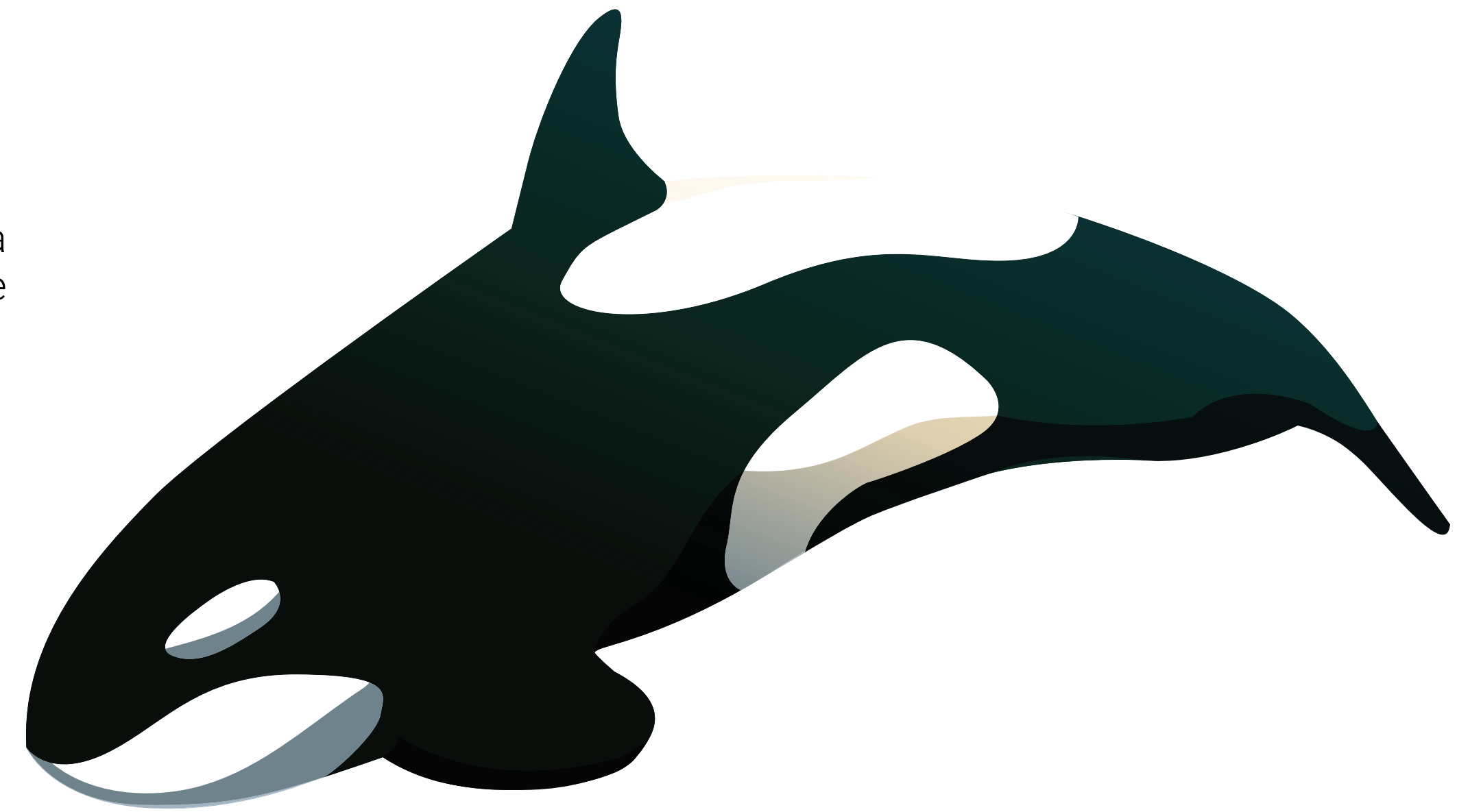




THOUGHTBOOK

In this lesson, you learned about ocean pollution and how it impacts nearly all species in a food chain or ecosystem, as well as pollution's direct negative impact on all species. Take a moment to reflect on what you have learned and how it made you feel.

1. What are the most significant ways that humans impact ocean health?
2. Why are some species more affected by ocean pollutants than others?
3. How can a single pollutant affect all species in a food chain?





TAKE ACTION

Take [Ocean Wise Plastic Pledge](#). Reduce your consumption of single-use plastic, for example: bring a reusable water bottle or reusable containers in your lunchbox!

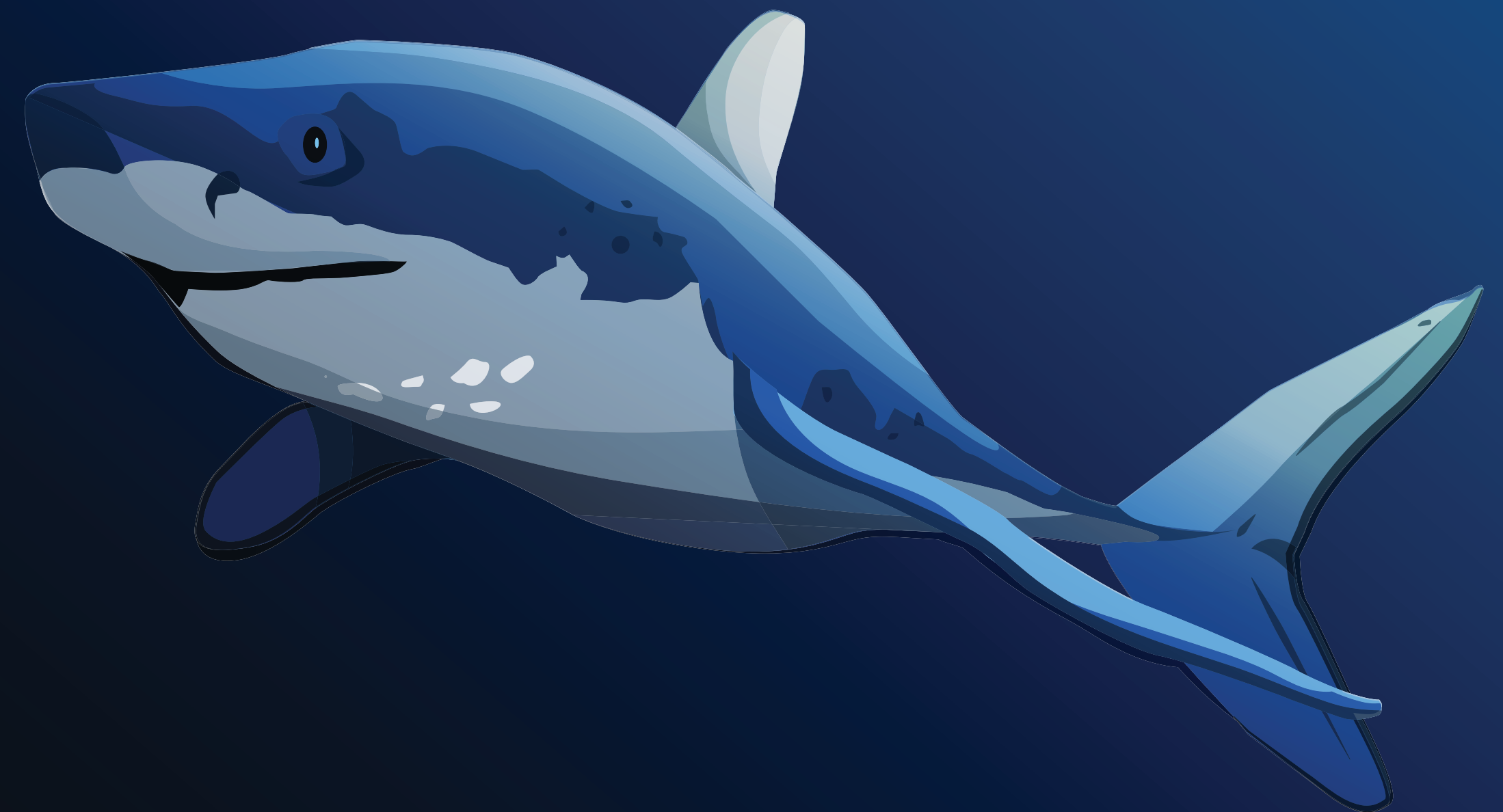
THE WHY

Not only does reducing your consumption of single-use plastic (such as plastic straws or bags) prevent plastics from entering the environment, but it also discourages their production and the release of harmful chemicals used to create them (including the industrial chemicals harming killer whales!) By taking Ocean Wise's Plastic Pledge and reducing your use of plastics, you are contributing to the reduction of not one, but two types of ocean pollutants from entering our waterways.



Lesson 3

Fishery Bycatch - Great White Shark





BACKGROUND

Perhaps one of the most iconic shark species, the great white shark is the largest predatory fish on earth. They are found in oceans around the world where they feed on seals, whales, and seabirds. Despite humans not being their prey, they can sometimes make mistakes! Each year, a third to a half of the 100 shark attacks reported throughout the world are caused by great white sharks attacking people who harass them or try to feed them. However, they are not trying to eat us! Unlike what is portrayed in the media, such as in the film *Jaws*, great whites are not malicious creatures that intend to cause harm, but simply mistake us for prey. In fact, humans pose a greater threat to them by killing around 100 million sharks and rays every year.

The great white shark population is in decline owing to years of being hunted by humans for their highly valued fins and teeth or as trophies. Over the past 150 years, global populations have declined by an estimated 30%-49%. Today, despite the value of shark products, great whites are

rarely caught on purpose by commercial fisheries as they target other shark or fish species whose meat is more desirable for food. Instead, great whites, especially juveniles, are accidentally caught in fishing nets as by-catch. During their yearly migration, great whites pass through areas with high levels of fishing activity increasing their vulnerability to becoming by-catch. These fisheries also pose an additional threat as they contribute to the overfishing and abundance reduction of the great white's prey.

With the great white shark's population in decline, the IUCN has listed the species as vulnerable on their Red List. They are also listed as endangered under the Canadian Species at Risk Act (SARA) and many other legislations across the world. Being listed in legislation gives great white sharks legal protection, however, simply listing their name on a piece of paper is not enough to protect this species, especially if fisheries continue to use unsustainable and dangerous fishing practices.

STUDENTS WILL BE ABLE TO

- Deepen their personal connection to global environmental issues related to resource use.
- Develop an understanding of how unsustainable fishing impacts ocean and species health.
- Develop an understanding of the importance of making informed choices regarding seafood.

CRITICAL QUESTIONS

- What are the differences between the sustainable and unsustainable use of ocean resources?
- How does eating seafood hurt the environment?
- What can we do to minimize the impacts of fishing on the environment?

RESOURCES

- Read: [The Ocean Literacy Principles on pg.5 of Ocean Literacy](#)
- View: [OCEARCH Shark Tracker](#)
- Watch: [What is Bycatch - A Cartoon Crash Course by Pew](#)
- Watch: [Living Legends: The Teachings of The Salmon by Indigenous Tourism BC](#)
- View: [Ocean Wise Seafood Partner Map](#)
- View: [Ocean Wise Seafood Recommendations](#)



ACTIVITIES

1. Using [OCEARCH Shark Tracker](#) – Ask students to choose a shark and draw a picture of it with its name, sex (male or female), age, weight, length, tag date, and last known location in their workbook. Students should present these facts and their drawing to the class.
2. Spot the Difference! In their workbooks, task students with circling the differences between pictures a) and b). Once completed, review the answer key with the class and provide them with explanations for the differences observed in each picture. Discuss which picture illustrates a more sustainable/environmentally friendly way of fishing. The *Spot the Differences Answer Key* can be found in the appendix section for lesson 3.
- 3.a) As a class, watch [Living Legends: The Teachings of The Salmon by Indigenous Tourism BC](#). Discuss how this video made them feel and the different perspectives that the Indigenous community has regarding salmon and fishing compared to that of the western world. Refer to the guiding questions below during the discussion:

GUIDING QUESTIONS FOR CLASS DISCUSSION

- What connection does the narrator have with the salmon?
- What does the salmon represent for this Indigenous community?
- Does the salmon represent more than just a meal for this Indigenous community?

- Does the narrator seem to have respect for the salmon?
- What feelings do you have when you see fish at the grocery store?

b) After watching the video and contributing to the discussion, students should explain how they perceive the relationship that Indigenous communities have with local salmon populations compared to that of the western world by answering the question in their workbook.

4. Watch [What is Bycatch - A Cartoon Crash Course by Pew](#) and discuss with students why it's bad to catch marine creatures we won't eat and the type of animal characteristics that can make a marine animal more vulnerable to by-catch. Try to relate these characteristics back to the great white shark. You can use the guiding questions below during the discussion:

GUIDING QUESTIONS

- Does animal size influence if an animal gets caught in a net?
- Is the great white shark small enough to escape through the holes of a fishing net?
- What if an animal eats in the same area someone is fishing?
- Does the great white shark eat animals that we also want to eat?
- Does the great white shark swim near the surface of the water where we fish? Do we sometimes see a shark's fin sticking out of the water?

CLIMATE CHANGE
Humpback Whale

OCEAN POLLUTION
Killer Whale

FISHERY BYCATCH
Great White Shark

PLASTIC POLLUTION
Hawksbill Turtle

HABITAT LOSS
Sea Otter

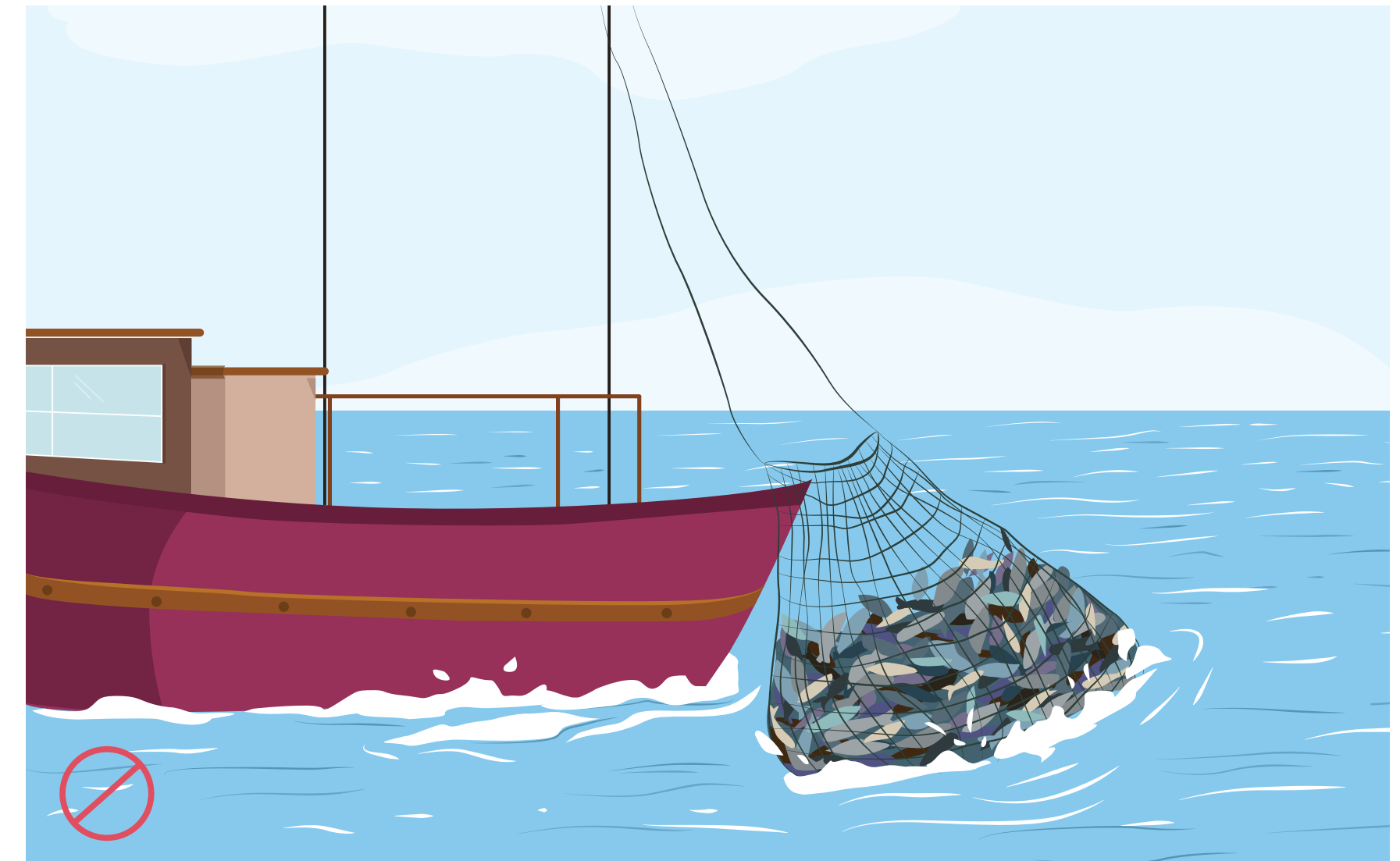


THOUGHTBOOK

From these activities, you should understand how unsustainable fishing practices, such as overfishing and by-catch, impact ocean health. Reflect on the environmental cost of the overexploitation of ocean resources such as seafood.

REFLECT

1. What are the differences between the sustainable and unsustainable use of ocean resources?
2. How does eating seafood hurt the environment?
3. What can we do to minimize the impacts of fishing on the environment?





The Ocean Wise Seafood symbol is your assurance of an ocean-friendly choice.



TAKE ACTION

Use the [Ocean Wise Seafood Partner Map](#) and the [Ocean Wise Seafood Recommendations](#) before purchasing a seafood product and look for our logo on seafood packaging!

THE WHY

Ocean Wise’s seafood recommendations identify sustainably farmed or fished seafood products. By using the variety of tools created by Ocean Wise, such as the Seafood Partner Map and Seafood Recommendations Search Tool, you can easily make an informed choice regarding the sustainability of the seafood that you are purchasing. By doing so, you will be directly contributing to ocean sustainability by supporting fisheries which have implemented the appropriate measures to protect and respect our oceans and its resources and encouraging others to do the same.



Lesson 4

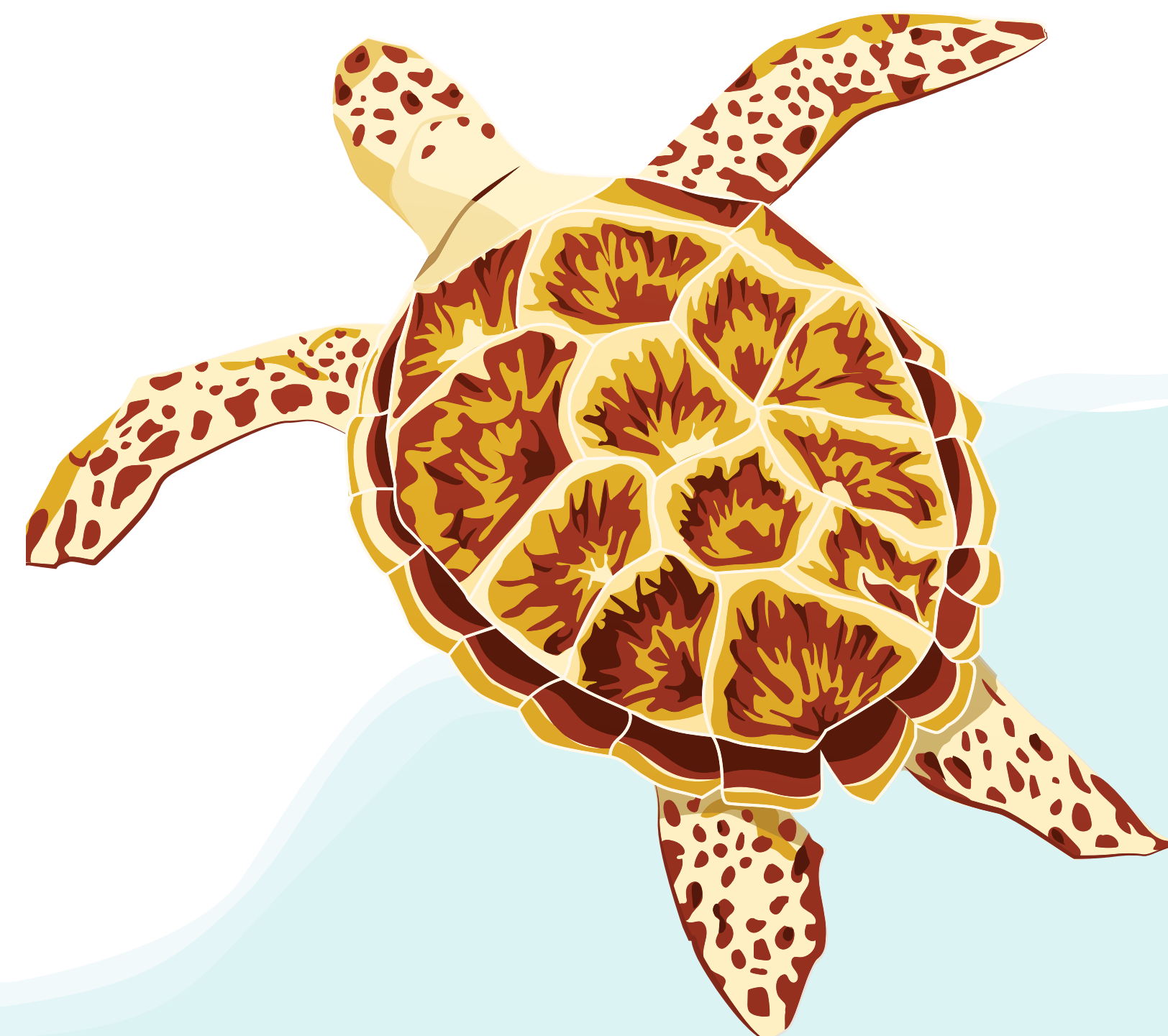
Plastic Pollution - Hawksbill Turtle

BACKGROUND

Hawksbill turtles are globally distributed throughout the tropical and subtropical waters of the Atlantic, Indian, and Pacific oceans. They can be found migrating in the open ocean between breeding and foraging sites, however most of their time is spent near reefs and on sandy beaches reaching from Australia and Indonesia to Mexico and Puerto Rico. Unfortunately, it is their frequent appearance on beaches and in coastal waters which make them vulnerable to threats such as hunting, loss of habitat, fishery by-catch, and marine pollution.

The hawksbill turtle is known for the uniqueness and beauty of their shell making them a target for hunters and illegal wildlife trade. They are also particularly vulnerable to habitat loss from coastal development as they lay their nests further in-land compared to other sea turtle species. However, the most severe threat to the hawksbill turtle's global population is that of marine pollution, more specifically plastic pollution. The threat of plastic pollution to the hawksbill turtle is multifaceted. Marine plastic debris can often be mistaken as food and ingested, (a floating plastic bag is mistaken for a jellyfish for example), causing reduced growth rates and reproductive output, poor health, and death. While fisheries threaten the hawksbill sea turtle through bycatch, they are also contributors to plastic pollution by leaving ghost fishing gear in the ocean. Turtles get entangled in this gear causing fatal lacerations and drowning. When plastic pollution washes up on the shoreline, it threatens nesting mothers as they can't dig through to lay their eggs and they will often get entangled or injured by beach litter. Furthermore, plastic pollution on the shoreline can barricade hatchlings from reaching the ocean.

Despite being only one type of pollution, the variety of impacts that plastic has on the hawksbill turtle is what make it such a powerful threat. With the increasing amount of plastic entering our ocean, it is no surprise that the hawksbill turtle has been listed as critically endangered by the IUCN. Unfortunately, this situation is not getting any better. While we have already lost 85% of the species, their population is still in decline. Therefore, we must act fast and reduce our plastic consumption to save the hawksbill turtle and many other species!



STUDENTS WILL BE ABLE TO

- Understand how plastic pollution impacts ocean health and species.
- Develop an understanding of conservation initiatives and citizen science projects.
- Deepen their understanding of how plastic pollution affects species in a nearby ecosystem.

CRITICAL QUESTIONS

- How does plastic pollution negatively impact ocean health and marine species?
- What are some alternatives to single-use plastic that are less harmful to the environment?
- How do garbage clean up projects help animals and Indigenous communities?

RESOURCES

- View: [Ocean Wise Shoreline Cleanup Data Card by Ocean Wise](#)
- View: [iNaturalist](#)
- View: [iNaturalist App Download](#)
- Watch: [How to Make an Observation on iNaturalist Using our Mobile App by iNaturalist](#)
- View: [Getting Started by iNaturalist](#)
- Watch: [How Ocean Plastic Threatens Sea Turtles by Newsy](#)
- Watch: [10 Simple Ways to Reduce Plastic Waste - For Kids by Rubbish Reads](#)
- Read: [Plastic Found Inside Arctic Char Has Nunavut Hunters Fearing For Local Food Sources by CBC](#)
- View: [Ocean Wise Shoreline Cleanup](#)



ACTIVITIES

1. GARBAGE CLEAN UP X CITIZEN SCIENCE

STEP 1 - GARBAGE CLEAN UP

- As a class, conduct a plastic clean up either on school property or in a local outdoor community by following the *garbage clean up guidelines* in the appendix for lesson 4.
- Ask students to identify the different types of plastic products gathered during your clean up and record their observations in their [Ocean Wise Shoreline Cleanup Data Card by Ocean Wise](#).
- Once observations are recorded and garbage is collected, assist students with garbage triage and disposal.

STEP 2 – SPECIES ID

- Once the garbage clean-up is complete, ask students to take out their phone/tablet and open [iNaturalist](#) (app needs to be [downloaded](#) before hand). If using iNaturalist, watch [How to Make an Observation on iNaturalist using our Mobile App by iNaturalist](#) and view [Getting Started by iNaturalist](#). If students do not have access to the internet, they can take pictures and upload them once internet connection is re-established.

Note: If students don't have access to iNaturalist or a camera, task them with drawing a picture of the species they observed or writing down its common name (i.e, squirrel, mouse, etc) in the notes section of their workbook.

- Ask students to walk around and try to identify different animals or insects in the vicinity of where the garbage clean up took place. If students use iNaturalist, their observations will automatically be recorded and saved and can be found in the “me” section at the bottom of the screen.

STEP 3 - RESEARCH AND DISCUSS

- In their workbooks, students should think of ways that the animals and insects they observe interact with the plastics they collected and how it may be bad for them.
- Watch [How Ocean Plastic Threatens Sea Turtles by Newsy](#) and discuss how the plastic pollution they observed may harm the hawksbill turtle if it ended up in the ocean.

2. Watch [10 Simple Ways to Reduce Plastic Waste - For Kids by Rubbish Reads](#). Have students create a poster advocating for alternatives to single-use plastics, using the video above for inspiration, and how it can save the sea turtles. Encourage them to get creative and include real examples of plastic pollution on their posters (i.e., water bottles, wrappers, etc).

3. Read [Plastic Found Inside Arctic Char Has Nunavut Hunters Fearing For Local Food Sources by CBC](#) to the class. Allow the class to discuss and reflect on how their plastic pollution can harm others, especially Indigenous peoples.



THOUGHTBOOK

Now that you have participated in your own garbage clean up and/or citizen science project targeting plastic pollution, reflect on the positive impact you brought to your school or community, marine species, and the environment!

REFLECT

1. How does plastic pollution negatively impact ocean health and marine species?
2. What are some alternatives to single-use plastic that are less harmful to the environment?
3. How do garbage clean up projects help animals and Indigenous communities?





Ocean Wise | Shoreline Cleanup



TAKE ACTION

Take part in an [Ocean Wise Shoreline Cleanup](#) with your classmates or within your community!

THE WHY

So far, Ocean Wise's shoreline cleanups have removed 13,915kg of litter from coastlines in Canada and the United States. That's the equivalent of 140 hawksbill sea turtles in weight! Shoreline cleanups have prevented these plastics from entering marine ecosystems, reducing fatal impacts on thousands of species, such as the hawksbill sea turtle. Since plastics travel with ocean currents around the world, by participating in a shoreline cleanup, you are directly contributing to the removal of plastics in every ocean and shoreline around the world!

CLIMATE CHANGE
Humpback Whale

OCEAN POLLUTION
Killer Whale

FISHERY BYCATCH
Great White Shark

PLASTIC POLLUTION
Hawksbill Turtle

HABITAT LOSS
Sea Otter

Lesson 5

Habitat Loss - Sea Otter



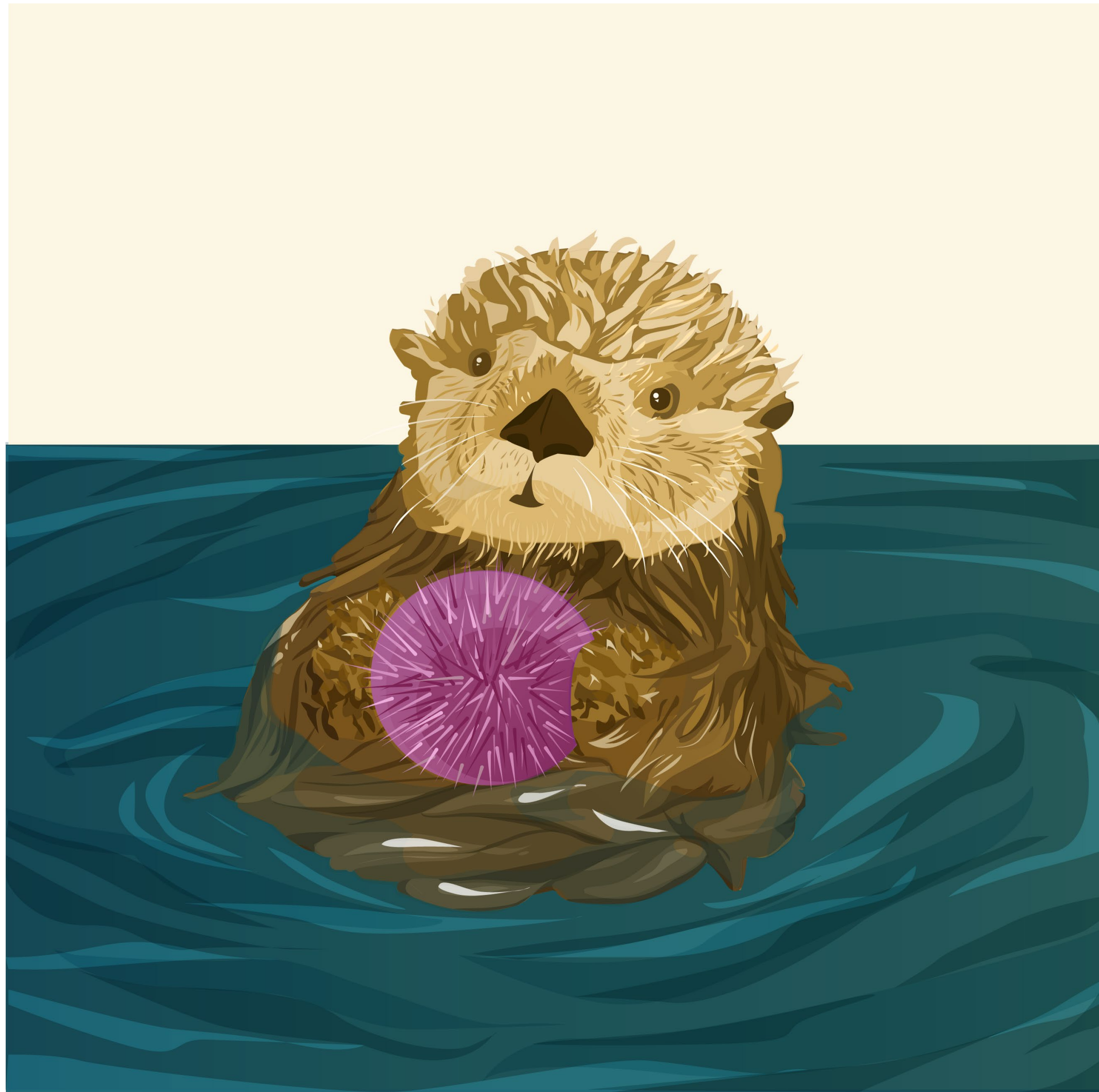
BACKGROUND

The southern sea otter once called the entire West Coast home, with populations stretching from Baja, California, to the Pacific North-West. However, when the hunting of this charismatic creature for their fur began in the 1700s, the population was rapidly decimated to the point that they were thought to be extinct. In 1977, a small population was discovered on an island 500 km off California's coastline, and this led to huge efforts to repopulate their species! Today, efforts to keep the animal thriving have intensified thanks to various conservation organizations, including Ocean Wise. While the wild population has been holding steady in the thousands for nearly a decade, it has not grown significantly. Of the 13 otter species, the IUCN lists 5 as endangered, 5 as near threatened, and 2 as vulnerable. Researchers believe that the lack of population growth is a result of competition for food and various anthropogenic threats.

Sea otters are vulnerable to many human inflicted threats including pollution, habitat destruction, poaching, overfishing, and entanglement in ghost nets and rogue fishing gear. As many live near major oil tanker routes, oil spills are another major threat to sea

otters. Oil destroys the insulative properties of the sea otter's fur which is responsible for keeping them warm. Therefore, when sea otters unintentionally wander into an oil spill, they become more susceptible to hypothermia as their fur encounters oil.

The changing environment is another threat to sea otters, especially with changes observed in kelp forests. Sea otters are a keystone species in kelp forests as they forage on kelp-grazing invertebrates, such as sea-urchins, keeping their population to a minimum and preventing the formation of urchin barrens. In return, kelp provides sea otters with cover from predators, habitat, and nurseries. As ocean warming persists and sea otter populations are threatened, the intensifying degradation of kelp forests is leaving sea otters out in the open ocean, stranded and helpless with no protection. In just the last 30 years, over 725 sea otters have been stranded. However, in areas with at least 10% kelp cover, virtually no strandings have been reported. This shows that there are hopeful solutions to restore sea otter populations including Seaforestation. By growing kelp to restore underwater forests, Seaforestation can help support ecosystems and save the sea otter population!



STUDENTS WILL BE ABLE TO

- Understand the importance and role of keystone species.
- Understand the importance of kelp forests to all living things.
- Understand the interconnectedness of ecosystem functioning and ocean health.

CRITICAL QUESTIONS

- What are the potential effects of removing a species from an ecosystem?
- How does ocean health depend on ecosystem relationships?
- How can we help protect ocean health with kelp products?

RESOURCES

- Watch: [The Kelp Forest Ecosystem: Brain Waves Episode 3 by Ocean Wise](#)
- Watch: [Take a Virtual Kelp Dive in a Kelp Forest by California Academy of Science](#)
- Watch: [Keystone Species by Oxbow Meadows Environmental Learning Center](#)
- Watch: [Sea Otters: This Kelp Forest's Best Friend by National Geographic](#)
- View: [The Seaweed Company Home Page](#)
- View: [Kelp Scones | Ocean Kitchen by Ocean Wise](#)
- Watch: [Cultural Significance of Oregon's Sea Otters by Elakha Alliance](#)

ADDITIONAL RESOURCES

- Watch: [Sea Otters vs Climate Change by One Earth](#)



ACTIVITIES

1. As a class, watch [The Kelp Forest Ecosystem: Brain Waves Episode 3 by Ocean Wise](#). In their workbooks, students will draw the relationship circle between kelp, urchins, and sea otters by using the appropriate arrows.
 - Discuss as a class what may have happened when sea otters were hunted in the 1700's and then watch [Take a Virtual Kelp Dive in a Kelp Forest by California Academy of Science](#). In their workbooks, students should identify which picture illustrates an ecosystem with and without sea otters and explain why.
2. a) Watch [Keystone Species by Oxbow Meadows Environmental Learning Center](#) and [Sea Otters: This Kelp Forest's Best Friend by National Geographic](#). As a class, discuss why a sea otter may be considered a keystone species. Refer to the guiding questions

GUIDING QUESTIONS

- What do sea otters eat?
- What do sea urchins eat?
- If sea otters stop eating sea urchins, what would happen to the sea urchins and kelp forests?

below during your discussion:

- b) By cutting out the prints of the kelp ecosystem species in their workbook, task students with creating a kelp forest collage. Students can also use other arts and crafts material. Students should indicate the keystone species (i.e., the sea otter) in their collage by placing the key print out next to it.
3. Ask students to create a kelp product that can be sold at their local market.
4. View: [The Seaweed Company Home Page](#) and [Kelp Scones | Ocean Kitchen by Ocean Wise](#).
 - After viewing the above resources, get students into small groups to brainstorm their dream kelp product. They should present their product with a drawn product design.
 - Ask students to present their kelp product to the class.
4. As a class, watch [Cultural Significance of Oregon's Sea Otters by Elakha Alliance](#) and discuss with students how the colonizer's exploitation of sea otters affected the environment and Indigenous communities.



THOUGHTBOOK

Now that you have a better understanding of how each species has a special role in an ecosystem, especially keystone species, you should also better understand the consequences if one of those species disappears. Reflect on the role of all species as it relates to the integrity of an ecosystem.

REFLECT

1. What are the potential effects of removing a species from an ecosystem?
2. How does ocean health depend on ecosystem relationships?
3. How can we help protect ocean health with kelp products?



TAKE ACTION

Buy a sustainable kelp product!

THE WHY

Similar to your business ideas, there are many great products with kelp in them! Next time you go to the grocery store, take a look at the toothpaste, shampoo, salad dressings, dairy products, and/or frozen foods to see if they contain kelp. By buying sustainable kelp you are supporting and ensuring the planting of kelp. In other words, you are enabling greater carbon storage by kelp and better protection of sea otters and other ocean creatures which rely on kelp for a home! Kelp is also incredibly healthy and considered to be an excellent source of micronutrients, antioxidants, vitamins, and dietary fiber. So, buy a sustainable kelp product to make sure you and the oceans stay healthy!

APPENDIX

FOR LESSON 2

Instructions for the Polluted Food Chain Game

Purpose:

The purpose of this game is for students to learn about bioaccumulation in the food chain of the killer whale in an interactive and movement focused activity. We recommend that this activity be conducted outdoors or in a large space (i.e., gym) since it requires students to run around. The activity will essentially be a large game of tag to simulate the hunting of species in the killer whale's food chain.

Read to Students:

You will be divided into 4 groups which will represent the 4 trophic levels (levels of a food chain) in the killer whale's food chain including herring, salmon, seal and killer whale. There will also be 3 rounds of tag which will simulate the hunting of each animal by the trophic level above them. This will consist of salmon hunting herring, seals hunting salmon, and killer whale hunting seals. In each round, the goal of the higher trophic level will be to hunt as much food as possible by tagging someone of the lower trophic level. The lowest trophic level group, otherwise called the herring group, will be given small objects at the beginning of the game which represent phytoplankton contaminated by an ocean pollutant. These small objects will be passed from the tagged/hunted to the tagger/hunter. In other words, when a herring is tagged by a salmon, they will give their phytoplankton to the salmon, when a salmon is tagged by a seal, they will give their phytoplankton to the seal, and so on and so forth.

For Educators:

The instructions below give a detailed breakdown on how to conduct this activity and the materials you need.

INSTRUCTIONS

1. This activity requires a minimum of 19 students who will be divided into the following 4 groups:
 - 12 students in the herring group
 - 4 students in the salmon group
 - 2 students in the seal group
 - 1 student in the killer whale group

*If there are more than 19 students in your class, you can add extras to the herring group.
2. Once students have been divided into each group, provide them with a visible marker that will identify their belonging to their respective group. Markers can include; armbands, pinnies, facepaint, etc.
3. Provide each student in the herring group with 3-5 small objects like poker chips, milk bottle caps, pieces of paper, etc. It may be useful to also provide all students with a reusable bag to hold the small objects they have accumulated. These reusable bags can represent the stomachs of the animals while the small objects represent phytoplankton or zooplankton which have been contaminated by an ocean pollutant. They will be passed down from the person tagged/hunted to the tagger/hunter (i.e, from herring to salmon, salmon to seals, and seals to killer whales) during each round of tag. This will help students recognize the concept of bioaccumulation.

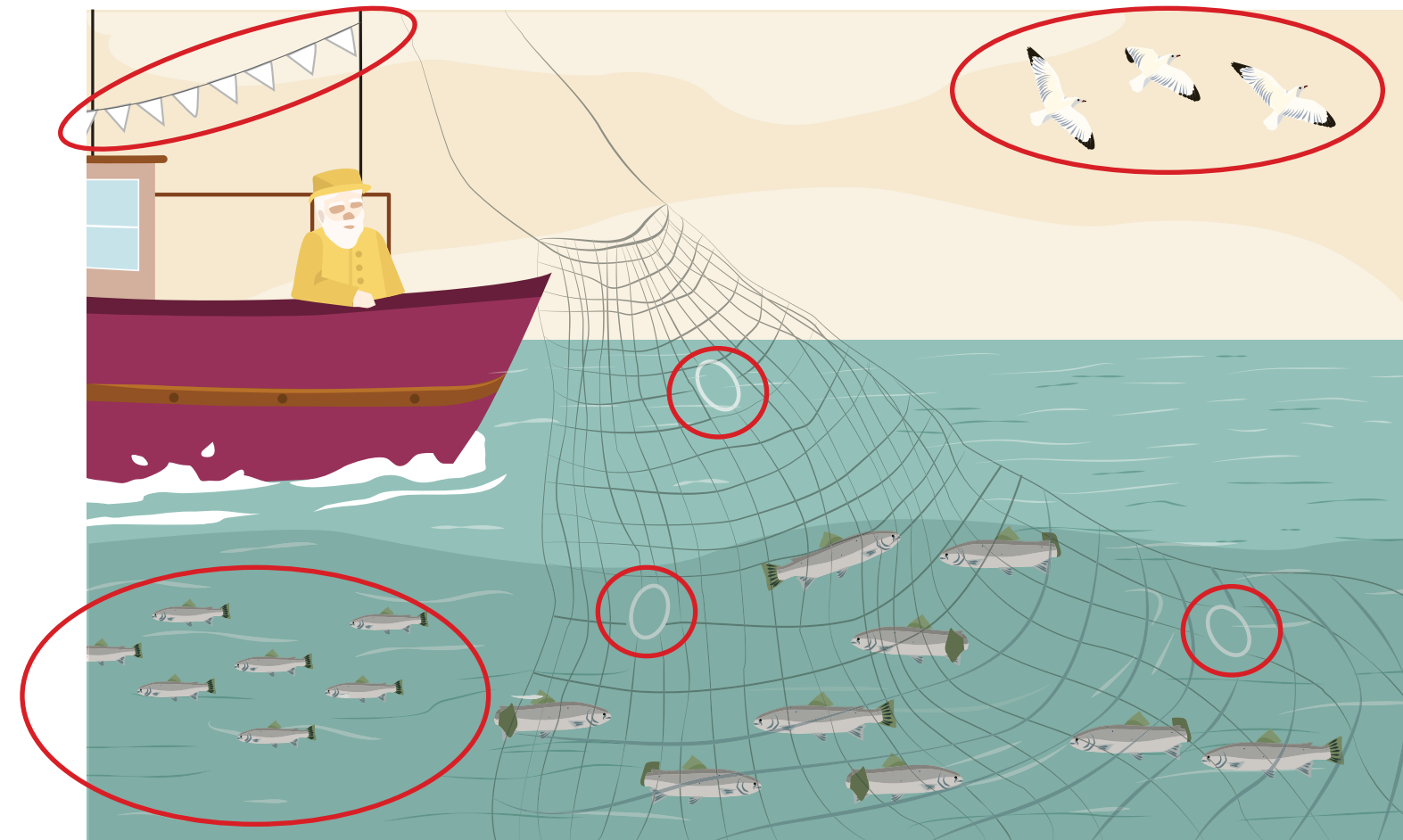
4. Once each student/group has been marked and the herring group has received their small objects, begin the rounds of tag. At the end of each round of tag, count how many contaminated phytoplankton each tagger/hunter has and record it.
 - Round 1: The salmon group is the tag and is chasing/hunting the herring group. This round will end once all of the herring have been hunted.
 - Round 2: The seal group is the tag and is chasing/hunting the salmon group. This round will end once all of the salmon have been hunted.
 - Round 3: The killer whale is the tag and chasing the seal group. This round will end once there is one seal left.

5. Form a talking circle and discuss with students what this activity represents. You want to focus on the reason and phenomena that resulted in the killer whale possessing so much more contaminated phytoplankton than the herring.

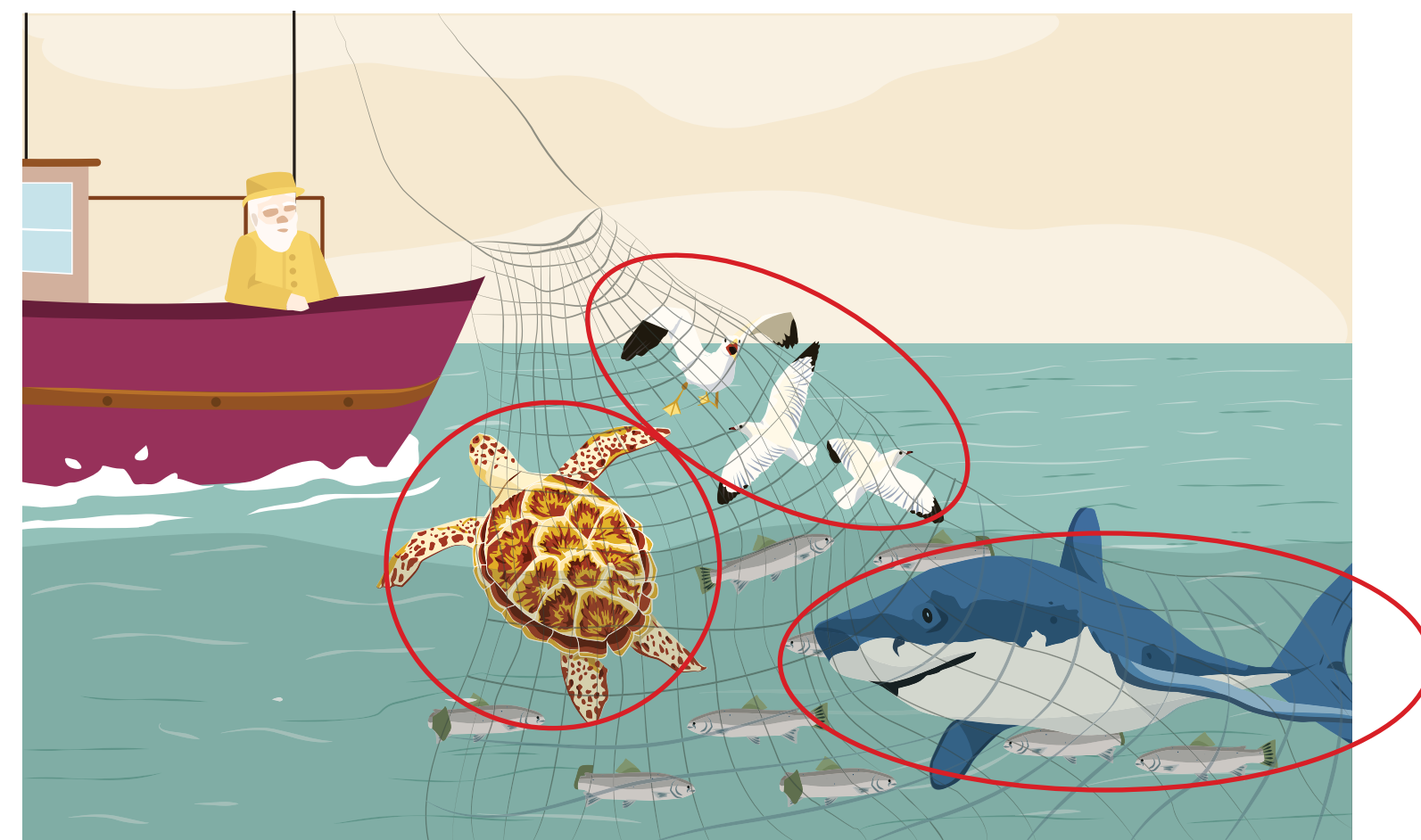


FOR LESSON 3

Spot the Difference Answer Key



a



b

Picture a) illustrates more sustainable/environmentally friendly fishing methods.

White Flags and Birds:

The white flags are used by fishermen to repel birds and prevent them from getting stuck in the fishing net. In picture a), we can see the birds flying high in the sky and away from the fishing net because they are being repelled by the white flags on the boat. In picture b), we see the birds have gotten tangled and drowned while trying to feed on the fish in the fishing net because there were no white flags to scare them away.

The White Circles and School of Fish Outside the Net:

The white circles in the fishing net are small holes that allow smaller fish, that have not yet had a chance to make babies and are too small for us to eat, to escape. In picture a), we see the small holes in the fishing net and a school of smaller fish that were able to escape. These fish will go on and make babies so that the next time the fisherman comes to fish, there will be fish left for him to catch. In picture b), there are no holes in the fishing net therefore both large and small fish have been caught. Since the fisherman removed ALL the fish from the ocean and didn't let the smaller ones escape and make babies, next time he comes to fish, there may not be fish for him to catch. This is bad for the fisherman and the ocean!

The Shark and Sea Turtle:

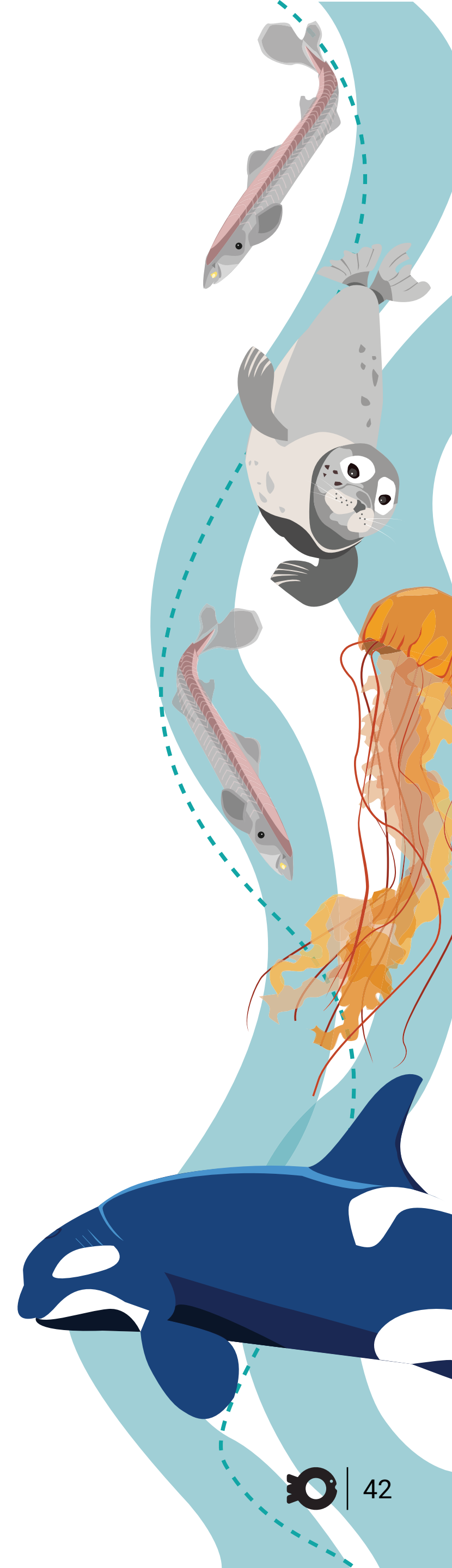
In picture b), we see that the fisherman caught a great white shark and a sea turtle, even though he only wanted to catch fish. This is because the fisherman used a non-selective fishing net which catches all sea creatures, even those that won't be eaten. In other words, the fisherman used a fishing net that creates lots of by-catch. In picture a), we see that the fisherman only caught the fish that he's going to eat. This means the fisherman uses a more selective fishing net that reduces by-catch by only catching the animals that he intends to catch and eat. Selective fishing nets are much better than non-selective fishing nets because they prevent animals like great white sharks and sea turtles from getting caught and dying for no reason!

FOR LESSON 4

Garbage Clean Up Guidelines

When conducting a garbage clean up, the most important thing is your safety. Please read and follow the guidelines below when conducting a garbage cleanup to make sure that you and all participants are safe.

1. Survey your clean up site. You want to make sure that the area where you will be conducting your clean up does not pose any threat to students. Things to look out for; hidden ditches, high traffic areas, cliffs, etc.
2. Gather supplies. You will need:
 - Gloves - preferably reusable safety or garden gloves to avoid single use plastic gloves. You can encourage students to bring their own.
 - Buckets or garbage bags - to place the garbage in.
 - Sharps container - note that garbage such as broken glass, broken hard plastics, metal, etc should be placed in the sharps container and handled by the educator or host of the clean up.
 - Data cards - should be printed for each student. You can find a PDF version [here](#).
 - Pickers (optional) - to pick up garbage. You can encourage students to bring their own.
3. Go to the clean up site and divide the class into small groups (3-4 students). Designate a rough area to each group where they will conduct their garbage cleanup. Make sure students record their findings in the data cards.
4. At the end of the garbage clean up, assist students with separating garbage (plastic recyclables, paper recyclables, cans, etc) so they can be disposed of properly.



WHAT IS OCEAN WISE?

Ocean Wise is a non-profit organization whose mission is to empower communities and individuals to take action to protect and restore our world's ocean.

Ocean Wise does this by tackling three critical ocean challenges - climate change, overfishing and plastic pollution – through six intersecting initiatives: seaforestation, changing arctic, plastics, fisheries and seafood, youth, and whales. Through our work we make a real and measurable difference to the health and well-being of the ocean and the people who depend on it. You can learn more about the actions you can take at ocean.org.

Looking for more Ocean education?

Ocean Wise's Education team offers in-person mobile education opportunities, online virtual programs, and more. Ocean Wise Professional Development Workshops are designed to train educators on discussing ocean health and literacy for students K-12. Visit ocean.org or email education@ocean.org to learn more.

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