OCEANSINITIATIVE

Live! March – May 2020

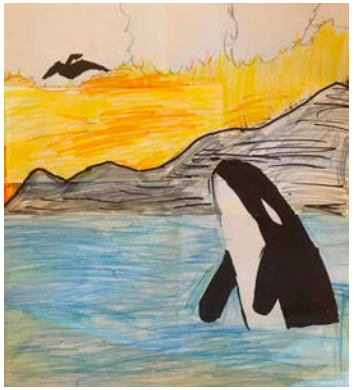
Virtual Marine Biology Camp

with Dr. Erin Ashe and Dr. Rob Williams

Photo credit: Dr. Erin Ashe, Oceans Initiative

Virtual Marine Biology Camp

Photo credit: Dr. Rob Williams, Oceans Initiative



Orca by Lara Marie

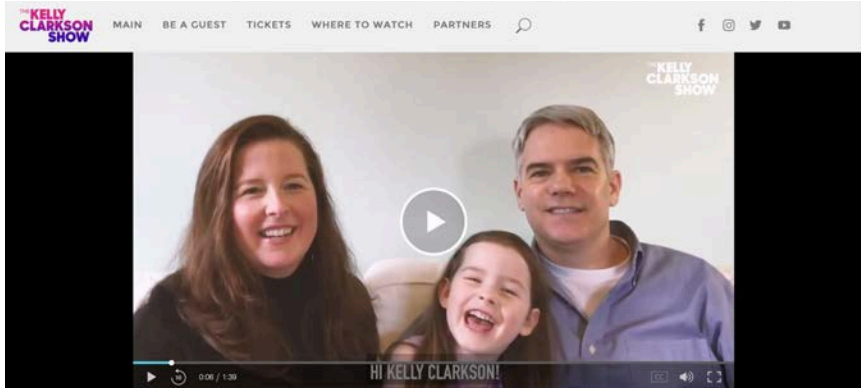
Orca by Makaela, age 10

What's inside

Hello, We're Oceans Initiative

Hi everyone! We're Dr. Erin Ashe and Dr. Rob Williams. We are marine biologists and we founded a nonprofit organization called Oceans Initiative where **we conduct research and scientific studies on whales and dolphins** and other marine wildlife so that we can do a better job of protecting them and their ocean habitat. We're also parents of six-year-old Clara who has joined us on our research boat since she was a tiny baby. She comes out in the field with us to study killer whales and dolphins and humpback whales.

We launched this **Virtual Marine Biology Camp** for kids when Clara's school was closed during what her teacher called the "strong germ days" and we were stuck at home. We initially thought, let's give other parents a break and let kids talk about marine biology and whales and dolphins and salmon and sharks. We thought a few of Clara's school friends would join us. But it turned out we have 15,000 friends from all over the world!



Dr. Erin Ashe, Dr. Rob Williams, and daughter, Clara

We had a tradition at the University of St. Andrews where we both went to school. Every day at 11:00 AM, all of the students and professors would **gather and talk about science** over coffee or tea and some kind of pastry. We called it ***elevenses.*** So we thought, let's carry on that tradition. So many of you joined us as we gathered virtually on Facebook and Instagram every Monday and Thursday at 11:00 AM (Seattle time) for seven weeks and chatted about Marine Biology.

At Oceans Initiative, **we're a team of scientists on a mission to protect marine wildlife** that need our help. We do science to estimate how many animals are in a population, whether it's going up or down and what help that population needs to thrive and to recover.

Here in Seattle, on the Salish Sea, the southern resident killer whales are among the most endangered whale populations anywhere on earth. There are only 72 of them left in the population. The southern residents are in trouble because they have three problems. There's not enough fish. There is too much noise—and noise makes it harder for the whales to find the fish. And unfortunately there is a lot of chemical pollution in the ocean and it ends up in the blubber of the whales and dolphins and porpoises that we study. So we thought this would be a great opportunity for us to talk about the work that we do and how we can come together as a community and help them because doing the **science is important, but sharing the science with our community is just as important**.

Reference Map for the Salish Sea Bioregion, Aquila Flower, 2020

Thank you for coming on this journey with us. We so appreciate everyone's involvement, the questions you've asked, your comments, and the drawings and paintings you've shared. We are so grateful for our growing pod of **friends who care about the oceans and marine life**.

Erin Ashe Rob Williams

Orcas

Q: Are they orcas or killer whales? Are they different species?

They're actually the same. All species have a **scientific name**. For killer whales, it's ***Orcinus orca***. And whether you speak Spanish, or French, or English, or Chinese, it doesn't matter. We know that if you say ***Orcinus orca***, you are talking about orca, or killer whale.

Q: How did they get their common name, killer whale?

They were originally called the 'whale killers' because when the whalers were out hunting, they noticed that sometimes the orcas would come up and scavenge on larger whales, like fin whales or humpbacks. Orcas are the only species of whale that eats other whales. So they originally got the name whale killer, but now they're called killer whales. That's the accepted common name.

Q: Are every orca's markings different?

Killer whales have unique markings. You can take photographs of their dorsal fins and the white patch behind their dorsal fin which is called a saddle patch. And each one is unique to each whale… **just like our fingerprints**. So, you can tell them apart. Scientists have been able to track individual whales for more than 40 years.

Q: Why are killer whales black and white?

Orcas are **black on the back and white on the belly**. Because orcas are predators, they are feeding on animals in the ocean. If you look down at an orca from above, it looks black, and it blends in with the ocean. So, a fish may not be able to see a killer whale below it. Imagine you're a fish under an orca and you're looking up to the sky. Well that white belly would blend in with the bright light of the sun above you. Scientists call this **counter-shading**.

Orca by Sophie, age 9

Q: Are they whales or dolphins?

Killer whales are actually dolphins. They are the largest member of the dolphin family.

Q: How do orcas breathe?

Killer whales are mammals like we are and breathe air. But instead of nostrils, they have a blowhole, that over a really long period of time, migrated to the top of their head. That allows whales and dolphins to be able to come up to the surface, exhale their breath really quickly and inhale really quickly. And they can do that in a fraction of a second without breaking their stride.

Q: If orcas are mammals that breathe air, why do they live in water?

Orcas are marine mammals, which is the subset of mammals that get **all of their food from the ocean**. That's why they live in water.

Water allows the whales to actually be buoyant, to be able to float. And that allows them to get really big. In fact, the biggest animals that have ever lived on earth are the blue whales…bigger than any of the dinosaurs. That's because water can hold up the weight of their body. If a killer whale was hauled out (resting on shore), its rib cage could not support the weight of its body on land. It would be really hard to breathe. But when they're in the ocean, the weight of the water holds up the weight of their body. This allows them to breathe. They get their air from the surface, dive down to get their food, and come back up again to breathe.

Whale by Alyssa, age 6

Q: How long can orcas hold their breath?

Typically, whales will take a few quick breaths of about 30 seconds each and then that's followed by a long dive for about three to five minutes. And then they'll come back up and take a breath. Now they can dive for 10 minutes, or even as long as 20 or 30 minutes, but that's the upper limit.

Cool Facts about Orcas

The coolest thing about orcas is that they have a society. And the center, the very core of their society, is a **mom and her babies**. And if her daughters live long enough to have babies of their own, you can have multi-generational matrilines. That's the core family unit. We call it a **matriline**.

And when a few matrilines get together, it's called a pod. When few pods get together, they're called a clan. And a few clans put together, form a society or a community. Killer whales are found in every ocean, but within the ocean there are different communities or populations of killer whales.

Photo credit: Oceans Initiative

Orcas and Salmon

Q: What do orcas eat?

There are orcas all over the world and they eat all sorts of things from sharks and penguins to seals and sea lions and fish. Here in the Pacific Northwest, we have a small population of orcas that are super specialized. They are very picky eaters and love salmon… and they love Chinook salmon in particular.

Photo credit: Center for Whale Research

Q: Are orcas at the top of the food chain?

Although the killer whales that we study prefer to eat Chinook salmon, orcas have been observed eating everything from little fish like herring all the way up to blue whales. In the North Pacific, we have a group of orcas called the offshores that eat sharks. It's pretty fair to say that orcas are the ocean's top predator.

Q: How many salmon does an orca eat in a day?

That's a hard question to answer because you can't ask them. So scientists have a number of different tools they use. In our work, we've been trying to figure out how many Chinook salmon each day it would take to feed the southern resident killer whale population. Our best estimate is that it takes 662 big fat Chinook salmon every day for the population.

If we want them to recover, we're going to need at least 50% more than that, around 1,000 big fat Chinook a day. If the Chinook aren't quite as big, or in the winter when Chinook are scarce and they each smaller Chum salmon, they have to eat more of those to get the same energy that they would get from big fat, healthy wild Chinook salmon.

Q: Where do salmon live?

There are no wild salmon populations in the Southern hemisphere. They are only found in the Northern hemisphere. There is one species in the Atlantic. But there are five species in the Pacific where they're really, really, important to the ecosystem.

Q: How do orcas drink water?

They let the salmon do all the work of collecting the fresh water for the whales. Then the whales eat the salmon, and that's how they get all of the fresh water that they need.

Q: Why are killer whales endangered?

Killer whales are found in every ocean around the world. So as a whole, they're not endangered. But the population of southern resident killer whales near Seattle and near British Columbia are endangered. The Chinook salmon that they prefer to eat are also in lower numbers than they used to be. So we think that these killer whales may be having a harder time finding food now than they have in the past.

Orca by Bridget, age 11, North Carolina

Cool Facts about Orcas and Salmon

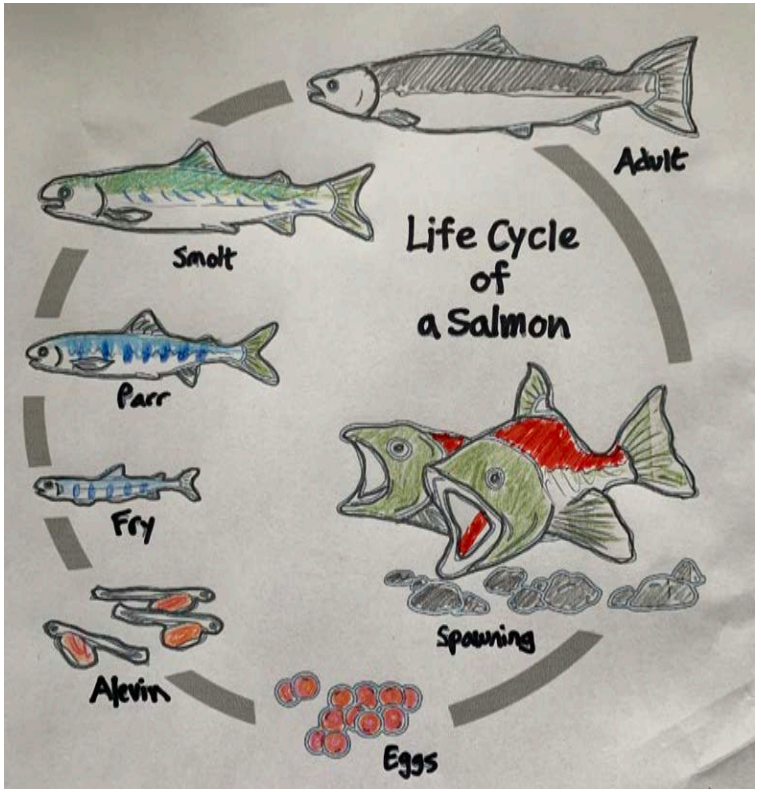
Orcas get almost all the information they need about their environment using sound. They stay in communication with their families by listening and by calling to each other. And each family has at least one call that they make that no one else makes.

Fish-eating orcas also use sound to locate food. Using echolocation, they send out a sonar signal and it bounces off the fish, and the signal comes back to them. And that is how they keep their community together.

Photo credit: NOAA

Wild About Salmon

Thank you to special guest, Laura Bogaard, Oceans Initiative's Field Operations Coordinator.



Q: What does the salmon's life cycle look like?

Salmon have a very special story. They're not like all fish. They start out as **eggs** that are laid in gravel stream beds. When they hatch, they are called **alevin** and they still have a little egg sack attached to them for food and nutrients while they're very young and vulnerable to predators. They hide in their nest, use up their egg sack, get a little bit bigger and that's when they turn into **fry**. When they get even bigger, they turn into **parr**. At each of these life stages, they're still in fresh water streams, finding little insects to eat because they don't have their egg sack anymore.

Then, when they get big and strong enough, they're called **smolts**. This is when their body starts going through a lot of changes so that they can adapt to living in an ocean environment. When they reach the ocean, that's their **adult** stage where they may spend four or five years eating plankton or smaller fish. At the end of their life cycle, after migrating around the ocean, they return to the same exact stream that they were born in. They often change color to attract a mate, they lay their eggs, and then the life cycle starts all over again.

Q: What part of the life cycle is most important for killer whales?

The **adult stage** of the salmon's life cycle is the most important. When you're a hungry killer whale, it takes a lot of energy to chase down your meal. So, they are going to look for the biggest species of salmon, Chinook. They will target the largest, oldest and **fattest Chinook.**

Orca and Salmon by Brenna, in London, Ontario

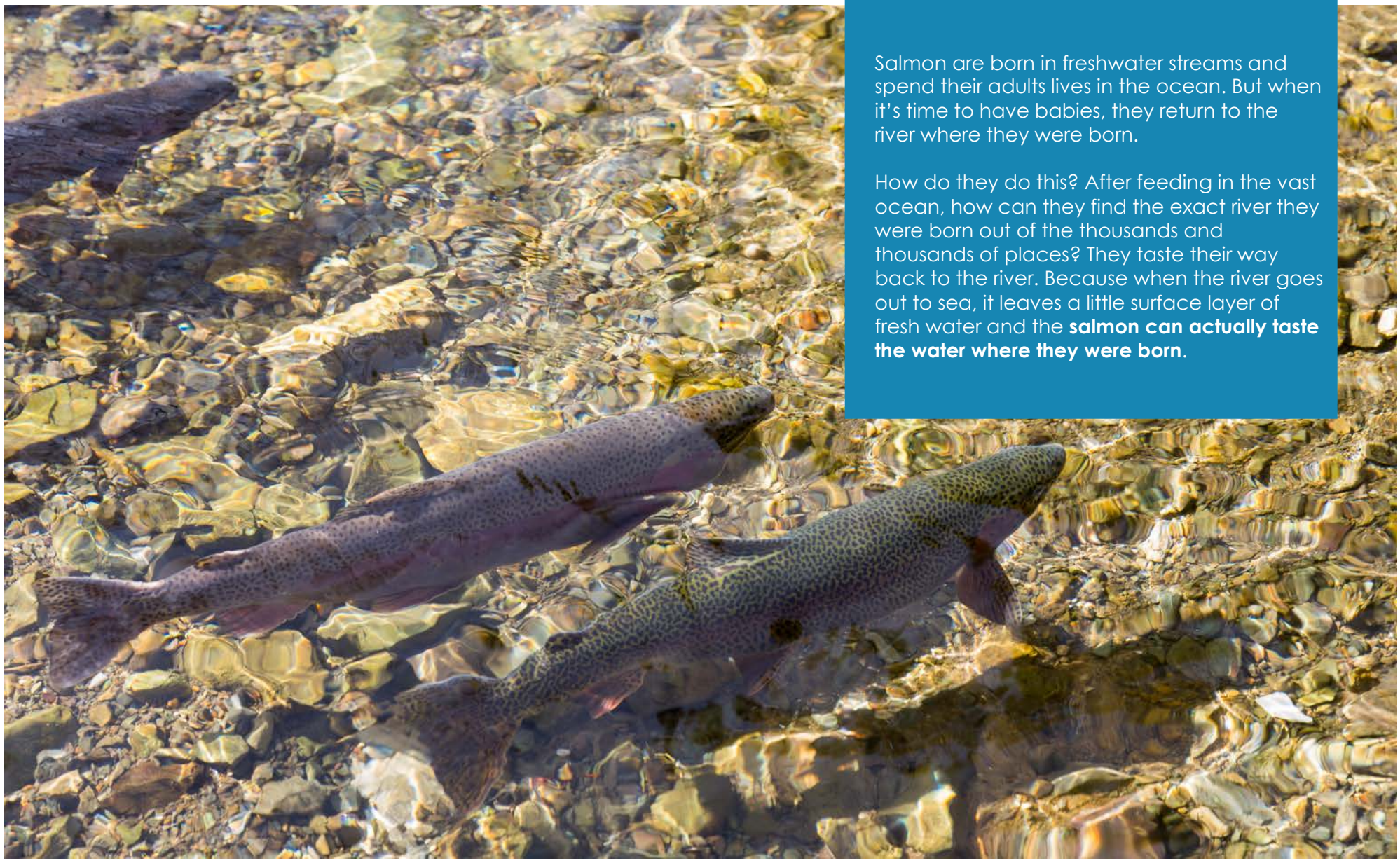
Q: How many species of salmon are there?

In the Pacific Ocean there are five species of salmon, and there's a really fun way to use your hand to remember their names. **Chum** is your thumb. **Sockeye**, the finger you'd use to poke your eye. **Chinook** (or king) salmon, the biggest species of salmon, is your biggest finger. **Coho** (or silver) salmon is your ring finger. **Pink** is your pinky.

Q: Why are salmon red?

The reason why their flesh is red has to do with what they eat. The creatures they eat—mainly **krill and shrimp**—are high in carotenoids (the same pigment that gives carrots color). Each species of salmon eats a different proportion of these carotenoid-rich crustaceans, which influences how pink or red they become.

Cool Facts about Salmon



Salmon are born in freshwater streams and spend their adults lives in the ocean. But when it's time to have babies, they return to the river where they were born.

How do they do this? After feeding in the vast ocean, how can they find the exact river they were born out of the thousands and thousands of places? They taste their way back to the river. Because when the river goes out to sea, it leaves a little surface layer of fresh water and the **salmon can actually taste the water where they were born**.

Worms and Whale Poop

Thank you to special guest, Oceans Initiative's Natalie Mastick, Graduate Fellow in Marine Parasite Ecology.

Q: What is a parasite?

Parasites are **animals that live in or on another animal** and use that animal to survive. So they feed off of it and use it as a home. Some of those parasites live inside a single animal their whole lives. Some of them move on to different animals.

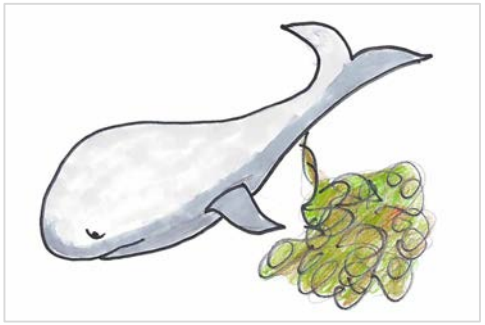
Q: Are all parasites worms?

There a lot of different types of parasites. Whales can get whale lice, for example, which look like tiny crabs that crawl around on top of the whale. Those don't seem to have as much of a negative effect besides being a friendly little hitchhiker. Parasitic worms are the ones that live in the gut of the whale.

Q: What does whale poop look like and how do you collect it?

Baleen whales, like humpbacks and blue whales that filter krill out of the ocean, have poop that is bright pink, just like the krill they eat. So we can see pink poop floating on the surface of the water and collect it in nets.

Killer whale poop is more of a yellow color and it's trickier to find. It's not exactly solid so it looks like clouds in the water. And you need to move quickly to collect it using a net or container to sweep it up.



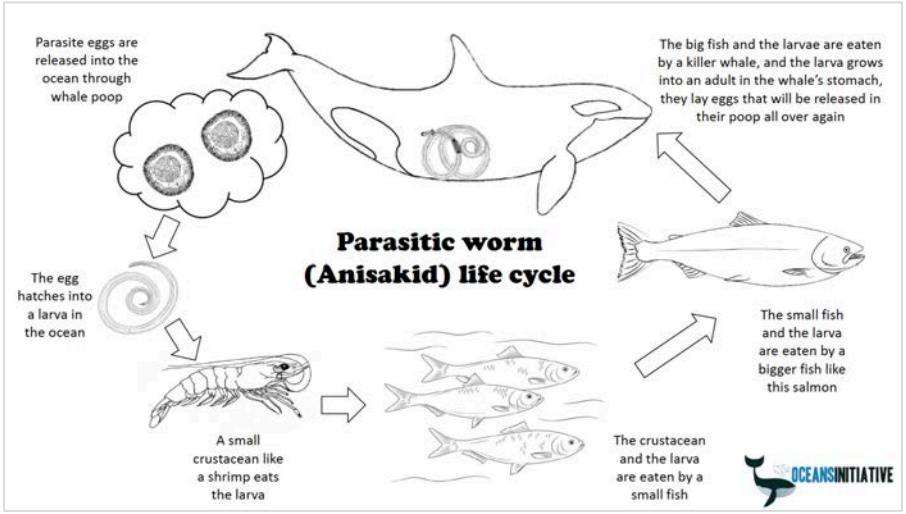
Drawing by Robert Krulwich of NPR

Q: What can you learn about a whale by looking at its poop?

Besides looking for parasites, you can also use poop to look at hormones, diet, diseases, contaminants and to get genetic information about the whale.

Q: What type of worms do you find? How do you tell them apart?

The types of worms we see are called ***Anisakids*** and that's a family of parasitic **worms that infect marine mammals**. We can tell them apart based on the eggs that they lay. The eggs are about the diameter of a strand of your hair so it takes a lot of magnification using a very big microscope to tell the eggs apart. We don't usually see adult worms in the poop, just the eggs. The **worms live in the digestive system**—the stomach and the intestines. The smallest of the adult worms are 2-3 inches long.



Q: Why are the worms there?

Worms have a pretty complicated life cycle. The worms that are infecting killer whales start out as eggs in the ocean and then they get eaten by a small shrimp. And then that shrimp gets eaten by a fish and then that fish gets eaten by another fish and eventually that fish gets eaten by a killer whale. So it **travels up the food chain to the killer whale**.

When it's in the killer whale, the worm is happy. That's where it wants to be and that's its final host. And then the worm reproduces in the killer whale's stomach. It lays a bunch of eggs and then the killer whale poops that out. So those eggs go back into the ocean and the cycle starts again.

Cool Facts about Studying Whale Poop

We study whale poop to see if parasites are having an impact on the health of whales. We can compare the amount of parasites that we see in the poop to the overall condition of the whale. In addition to poop sampling, we can take a picture of the whale from above and see how skinny or fat it is. We can then **figure out how healthy a whale is by looking at how many parasites the whale has and comparing that to how skinny or fat it is**.

Parasites could be taking a lot of the energy that killer whales need from the food they eat. Using science, we can figure out how many parasites are living in the whale's stomach and intestines. We do a lot of math equations to figure out how much food those parasites need to eat to survive. And further math equations to figure out how much energy is being lost to the parasites.

Photo credit: Lindsey Stadler

All About Sharks

Thank you to special guest, shark conservation biologist,
Dr. David Shiffman for sharing his expertise and passion for sharks.

Q: How many species of sharks are there? How many total sharks?

There are **551 species of sharks**. There is a new species of shark or shark relative—skates, stingrays, and manta rays—discovered by scientists on average about every few weeks, for the last decade.

No one really knows for sure how many total sharks there are but they are **estimated in the billions**. There are some species where there's not very many of them at all that are critically endangered. There are some species that are pretty common and doing okay.

Q: What makes a shark a shark as opposed to another kind of fish?

Sharks are a different group of fish, like a goldfish or a tuna or a bass. The big difference between those groups is what their skeletons are made out of. So tuna, goldfish, bass, and other fishes are called the bony fishes. They have skeletons made out of bone just like we do, bone that's rigid and strong, but not flexible. Sharks **bodies are made out of cartilage**, like our ears. Cartilage is lighter and more flexible. Sharks are called **cartilaginous fishes**, along with skates and rays.

Q: Are *whale sharks* whales or are they sharks?

Whale sharks are **definitely sharks**. They're called that because they're **big like whales and they feed in the same way** that the big whales do, they filter feed. So great white sharks will bite seals and jump out of the water chasing after them. Tiger sharks go after sea turtles and can bite through their protective shells.

But the biggest shark, the whale sharks, are filter feeders. They swim around with their mouths open and scoop up as much water and plankton as possible and filter out the tiny little shrimp and crabs and fish to eat.

Q: How do hammerhead sharks catch stingrays with their heads?

Sharks have an extra sense that humans don't have where they can sense electric fields and magnetic fields. If a prey animal like a stingray is hiding under the sand where you can't see it and you can't smell it and you can't hear it, sharks can still tell it's there because they can sense the electric field given off by its beating heart. When they get a prey animal, they can pin it down with their head and eat it.

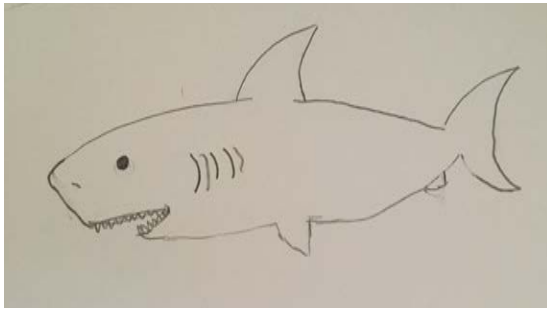
Q: Why do sharks matter?

Sharks are important. They **help keep the food web in balance**. Top predators always help the food web remain in balance and are important in maintaining a heathy ocean ecosystem.

Q: Why protect sharks? Don't they hurt and eat people?

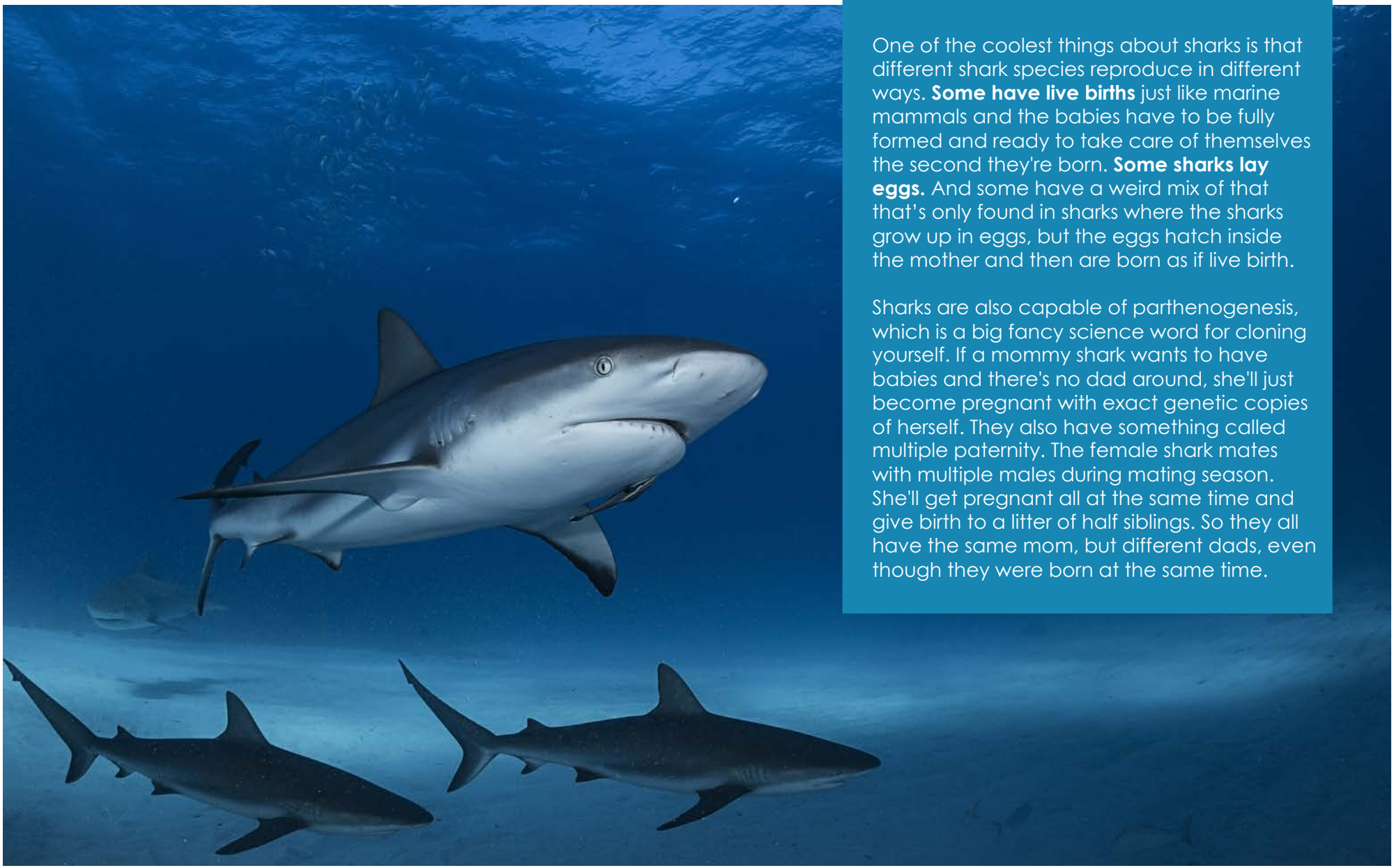
Every once in a while a shark does bite a human and that can cause a lot of pain and it can cause a serious injury. Sometimes it even kills the human but this is very, very, very rare. Hundreds of millions of people go in the ocean every year, about 60 are bitten, and about five die. So it's an extremely low risk, but the benefits of having a healthy shark population are huge.

Sharks are fascinating but they are very misunderstood. **A lot of people are afraid of them when they don't need to be**. Most sharks are not mean. They're just wild animals and would prefer to be left alone.



Shark by Autumn, age 10, Massachusetts

Cool Facts about Sharks



One of the coolest things about sharks is that different shark species reproduce in different ways. **Some have live births** just like marine mammals and the babies have to be fully formed and ready to take care of themselves the second they're born. **Some sharks lay eggs.** And some have a weird mix of that that's only found in sharks where the sharks grow up in eggs, but the eggs hatch inside the mother and then are born as if live birth.

Sharks are also capable of parthenogenesis, which is a big fancy science word for cloning yourself. If a mommy shark wants to have babies and there's no dad around, she'll just become pregnant with exact genetic copies of herself. They also have something called multiple paternity. The female shark mates with multiple males during mating season. She'll get pregnant all at the same time and give birth to a litter of half siblings. So they all have the same mom, but different dads, even though they were born at the same time.

Humpback Whales

Q: What is the average lifespan of a humpback whale?

Lifespan is a term for how long an animal lives. Humpback whales tend to live about **40 or 50 years**, which is a long time for a whale.

Q: What do they eat?

Humpbacks **mostly eat krill** but also other small fish like herring.

Q: What is a baleen whale?

Instead of teeth, humpback whales have **baleen that works like a strainer**. Humpbacks are gulpers. They fill up their throat with water and krill. Then stick their tongue up to the roof of their mouth, force the water out the sides and keep the yummy bits in their mouth.

Q: What is bubble-net feeding?

This is a feeding technique where a group of humpbacks will dive underwater and start blowing bubbles. The bubbles come up to the surface and **create a "net" of bubbles**. This spooks the fish and they tighten up to form a ball. The whales then lunge to the surface catching the school of fish in their mouths, instead of just a few.

Q: Where do they live?

You can find humpback whales in the Pacific and Atlantic oceans, in all parts of the world from North and South America, to Australia and Antarctica.

Q: Do they migrate?

Yes. For example, in British Columbia and Washington state, we have a few populations of humpback whales that all feed here. But they go to different places to find mates and to have their babies. Most of the humpback whales we see in the Pacific Northwest during the summer months go to **winter breeding grounds** in Hawaii, Mexico or Central America.

Q: What are flukes?

A **whale's tail is called its flukes**. Each humpback has its own natural markings on the underside of its flukes. Using photo identification, we can track individuals over time. This whale called "Lucky" has some scratches on the underside of its flukes from killer whale teeth, probably from an encounter that Lucky had when she was a baby.

Q: How does a mom humpback feed her babies? And, for how long?

Humpback whales are not fish, they are mammals. So they have mammary glands just like all mammals. You wouldn't believe how much fat is in the humpback whale's milk. It's 30 to 50% fat. The more fat there is in the milk, the faster the baby whale grows up.

If the calf is born in Hawaii in winter and they migrate to their summer feeding grounds in British Columbia, thousands of miles away, they will stay together for that migration. Then the mom will stop feeding the baby. Humpbacks don't form a tight social unit where babies spend their entire lives with their moms.

Humpback whale by Kelsey, age 9, Larchmont, NY

Cool Facts about Humpback Whales

Using a **hydrophone**, or underwater microphone, we can listen to the beautiful sounds made by humpback whales. They create sounds when they are feeding and other sounds for long-range communication that can be heard tens of miles away.

They sing much more **elaborate songs** when they're looking for mates. And the cool thing is that those **songs can change from year to year but all whales will sing the same song**. They disperse to their feeding grounds and then return to their breeding grounds singing the same song year after year after year.

The part of the brain called the cerebral cortex, that is involved in thinking and processing acoustic information is highly developed in humpbacks. So they are getting information from their songs and processing that information in a **very sophisticated brain**.

Photo credit: Dr. Rob Williams, Oceans Initiative

Seals and Sea Lions

Q: What is a pinniped?

Pinniped is a Latin word that comes from "pinna" which means feather or fin or flipper, and "pedia" which means feet. So they are feather-footed animals or **flipper-footed animals**, which is a catch all phrase for **seals, sea lions, fur seals, and walruses**.

Q: How are pinnipeds marine mammals if we seen them on land?

You may see seals on the beach or sea lions on the rocks. This is called "hauled out". That means their bodies are out of the water completely and on a rock or a beach. So if they spend a lot of time on land, aren't they terrestrial mammals or land-based mammals? No, they are **marine mammals**, which is the subset of mammals that **get all of their food from the ocean**.

Q: How can you tell the difference between a seal and a sea lion?

True seals are from a family called *Phocidae* and they do not have external ear pinna (ear flap). Sea lions and fur seals are from the family *Otariidae* and do have an external ear flap. But the big difference is that **sea lions can rotate their hind limbs forward**, under their body and walk on all fours when they're on land. And they can be quite fast. **True seals cannot rotate their hind limbs** under their body and instead, they crawl along on their belly.

Another important difference is that sea lions and fur seals can't put on blubber. They're kind of like toothed killer whales. And so they spend longer with their babies. True seals, like harbor seals and elephant seals, can put on lots and lots of blubber, similar to a baleen humpback whale. They live off that fat for a few months, feed their pups quickly and then abruptly stop feeding them.

Q: Why are baby seals sometimes seen alone on the beach?

True seals will haul out and use all the fat that's stored in their blubber to nurse their baby for a few weeks, maybe a month, then go out to sea to feed. The pup is left alone and after a few days realizes that mom is not coming back. They get so hungry that they too go out to sea to feed.

Q: Why are sea lions called "lions"?

The people who were hunting seals originally noticed that sea lions, especially the males, have a ruffled big neck that kind of looks like a lion's mane. They also **roar, or bark, quite loudly**. True seals, on the other hand, are pretty quiet on land.

Q: What are leopard seals and what do they eat?

These beautiful seals that live in the Antarctic are called leopard seals because of the **pattern of spots** on their body. They're one of the top predators in the Antarctic and are the **only seals that eat other seals** such as crabeater seals and Weddell seals. They're like the killer whale of the seal family.

Q: Are seals endangered?

Some of them are. Even though the Antarctic fur seal was hunted almost to extinction, it's now one of the most abundant marine mammals on the planet. Elephant seals in California and Mexico were hunted until just 100 animals remained. When the hunting stopped, they recovered.

Monk seal by Hope, age 8, Montgomery, TX

Hawaiian monk seals and Mediterranean monk seals, however, are endangered. They're still being caught in fishing gear and are affected by plastic in the ocean. If we stop hunting them, but we don't protect their habitat, they have a difficult time recovering.

Cool Facts about Seals

The coolest thing about true seals is that they are **really extreme athletes**. While they might look clumsy on land, they really come into their own when they're in the water environment.

Weddell seals and elephant seals can hold their breath for over an hour. That's a long time. They come up to the surface, catch their breath for a few minutes, and then go right back down to where they can get their food, like squid and other animals that live on the bottom of the ocean. They're so good at it that **they can dive in their sleep**. They're effectively napping while they're drifting down. And they can **dive 5,000 – 6,000 feet**.

Sea lions, on the other hand, don't travel as far from their haul out sites. They can dive 500-600 feet and hold their breath 20 minutes.

Photo credit: Oceans Initiative

All About Dolphins

Q: Are all dolphins whales?

Whales, dolphins and porpoises all belong to the same order of **cetaceans**. At some point, a **dolphin becomes big enough that you call it a whale**, like a killer whale. To use a different example, there is a point at which a boat becomes big enough that you just call it a ship. So all ships are boats, but not all boats are ships.

Q: What is the difference between a dolphin and a porpoise?

That's a very common question, particularly in our part of the world and in the Pacific because we have harbor porpoise and Dall's porpoise, and we have many different kinds of dolphins. So it can be confusing. One telltale sign is their size, porpoises are smaller. Dolphins have teeth shaped like an ice cream cone while porpoises have teeth that are flat, like our front teeth. And dolphins have a hooked dorsal fin and it's more curved. Porpoises have a more triangular dorsal fin. There are differences in their skull structure, and related to that, their acoustics are quite different. Porpoises produce high frequency sounds, above human hearing.

Q: What dolphins and porpoises live in Puget Sound near Seattle?

We have **Dall's porpoise** that live here that are often confused for baby killer whales. Pacific white-sided dolphin occasionally visit. There is a clever group of **bottlenose dolphins** that are actually from California that decided to move to Seattle. And, occasionally we get **common dolphins**, which is very rare to see as they are normally offshore. On the coast of Washington, there are lots of different dolphins, We see **Northern right whale dolphins, Risso's dolphins**, and **Pacific white-sided dolphins**.

Q: Do different types of dolphins and whales swim together?

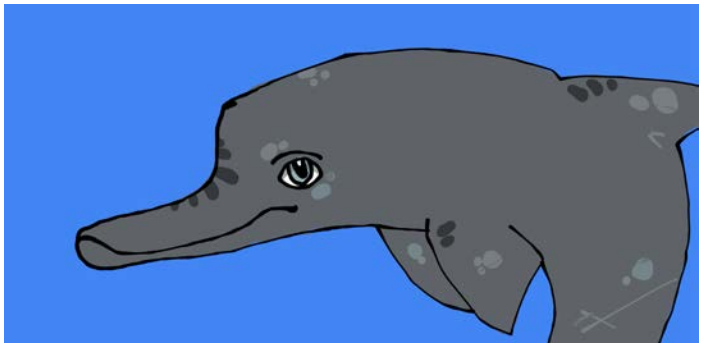
Yes they can. We have two different kinds of orcas in Washington state and British Columbia. The one that eats salmon is called the resident fish eating killer whale. And the one that eats marine mammals is the Bigg's or transient killer whales. We'll see Pacific white-sided dolphins swimming with the fish eating ones. They can tell the resident fish eating ones apart from the mammal eating ones because they make different sounds. And the **dolphins know that it's safe to be close to the fish eating ones**.

Q: How fast can dolphin swim, and which is the fastest?

Dall's porpoise can sprint really quickly to about 40 nautical miles per hour. Common dolphins can sprint for a few seconds at 35 miles an hour if they're trying to avoid a predator. They don't cruise at that speed. They'll cruise at five or six or ten miles an hour. Generally the longer the animal, the faster its cruising speed. Fin whales and blue whales are really fast for cruising. But smaller animals like dolphins and porpoises can sprint in short bursts.

Q: What is the rarest dolphin? Are any going extinct?

The Maui dolphin, which is a subspecies of Hector's dolphin in New Zealand, that's a really critically endangered dolphin species. For porpoises, the vaquita in Mexico is the most critically endangered porpoise. If you count killer whales as the world's biggest dolphin, then the Southern resident killer whales that we study with only 72 in the population, are among the rarest dolphins on the planet.



Bottlenose dolphin by Bridget, age 11, North Carolina

Cool Facts about Dolphins

Dolphins are **very smart**. The complexity of their brain is like a great ape—like a gorilla or an orangutan or a chimpanzee. So that tells us something about their ability to learn. And dolphins have **bigger brains** than you would expect of an animal of that size.

Dolphins have something similar to our prefrontal cortex which seems to be really developed for sociality—**to be social and to connect** with other dolphins. They rely on that to coordinate their movements and share information about prey and predators.

Photo credit: Oceans Initiative

Sound and Ocean Noise

Q: How do whales and dolphins make sounds?

For toothed whales, like killer whales and dolphins, they fill up their lungs and some of the air goes into sacs that are pretty much like our sinuses. They fill those sacs up with air and then they control how the air comes out through the blowhole (the nostril that's found on the top of their head).

So, imagine you're a dolphin and you have filled up your lungs, you're on a deep dive, you're hunting for food under water. You get your air at the surface, your food is underneath, you've got these air sacs in your sinuses, and your nasal passages around the blowhole. And then they can control an organ called the "monkey's lips" or phonic lips, releasing the air slowly. That's how they generate sound. Think of blowing up a balloon and then holding it by the neck and letting the air escape. That's what it sounds like.

Q: What is the melon organ in whales and dolphins?

The melon is a fatty organ located in the front of the skull. It's not just fat, it's fat plus a bunch of wax. And they **can use that to focus and direct the sound**. Think of it as though you have a flashlight and you are going from a broad flashlight beam to a really narrow, almost like a laser beam. That's how they use the melon.

Q: How important is the melon?

I want you to know how important sound is to these these animals. Here's one way that you know how important it is. If a whale is not getting enough to eat, it can live off its blubber. Killer whales have to eat all the time while humpback whales can put on a lot of fat and then live off that fat for months at a time while they're nursing their babies. But even if a whale is starving, they **do not use up the fats that are stored in their melons**. It's protected. The melon is a really, really special organ.

Q: What is echolocation?

Dolphins, porpoises and killer whales can echolocate. This means that **they produce the sound, it leaves their head, it bounces off an object, and then it comes back**. Instead of ears to collect that sound, they hear it through their lower jaw.

So the sound is going from air, not directly to water. It's passing through the melon, which is oily and waxy, which is kind of the same consistency as water. Think of the melon as a way of getting the energy into the ocean. Whales are dolphins are trying to send vibrations through the water. The energy comes back from the ocean through the lower jaw, which is filled with oil. Then that energy creates a wave that goes into the inner ear bone. So they "hear" sound through their lower jaw.

Q: How can they tell where the fish is?

When humans see things and we see a shadow, it tells us something about the shape that is blocking the light. Similarly, when a whale sends out a sound (clicks) and they get information back that's not identical to what they sent out, the shape can tell them something about what's blocking that sound. The whale can tell how far away the object is based on the amount of time between the time it sends the signal and the time it bounces back. Generally, the faster those clicks are, the closer the object is. The click will become super fast when they're really close to the object that they're trying to catch.

Q: What happens in a noisy environment?

In our work around the San Juan Islands, we found on a typical day, orcas are losing out on their opportunities to communicate 62% of the time because of boat and ship noise. On a busy shipping traffic day with lots ships and boats, the whales may be losing 97% of their opportunities to communicate. We know that when ships slow down, it is measurably quieter. Whales can hear each other farther away. Their echolocation travels further, and is more informative. And, they are more likely to be feeding.

The Importance of Sound — Dr. Rob Williams

Sound is as important to whales and dolphins and porpoises as vision is to humans. Whales and dolphins use sound to **hear their food**. They use sound to **choose their mates**. And they use sound to **navigate**.

Think of the five senses we use as humans: smell, taste, touch, vision, and sound. For whales, it's hard to smell when you're under the water. You wouldn't want to inhale water. So they do not have a very well developed sense of smell. And, taste is just smell under water. Whales and dolphins do interact and touch one another. Vision is of limited value as light disappears the further you dive under water.

Those senses are important but only useful at very close ranges. Whereas sound can travel tens of miles. It is the **best mode of sensing their environment** over very, very large spatial scales. Their world is an acoustic one.

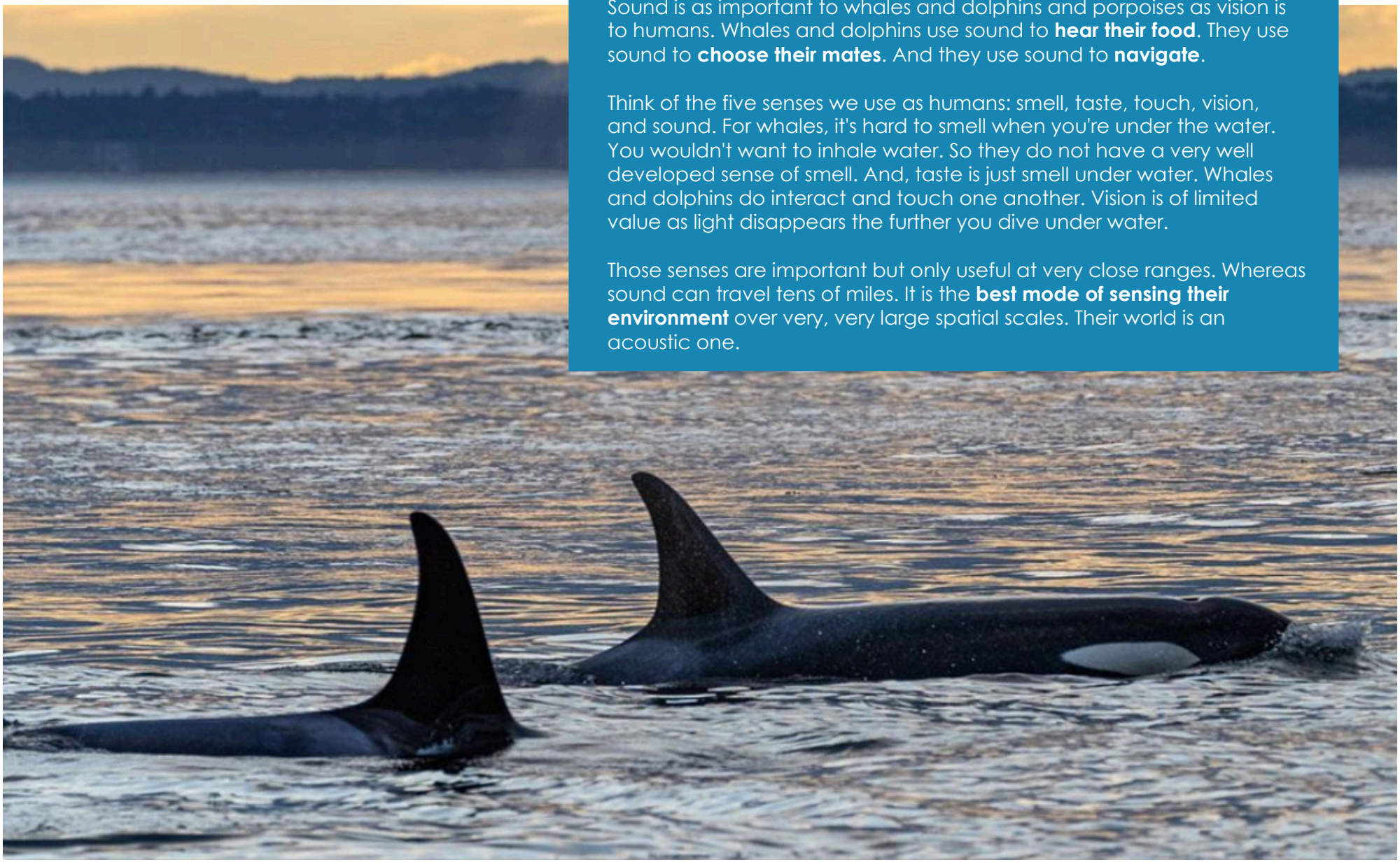


Photo credit: Ryan Tidman

Orca Watercolor Painting Class

Thank you to special guest, watercolor artist, Sophia Trinh,
who taught us how to paint the iconic killer whale.

Sketch the outline of the orca:

Most of my artwork begins as a sketch. When I'm starting a whale, I like to draw a horizontal line to guide me where the tail needs to go and where the fins need to go. I place the eye just above that line. Then I'll draw a curve from the eye down to the pectoral fin. Using that horizontal line I'll draw the rest of the whale's body, curving up to the dorsal fin. Then I'll draw a long curve toward the tail. And then I'll draw the tail.




Materials list for this class:

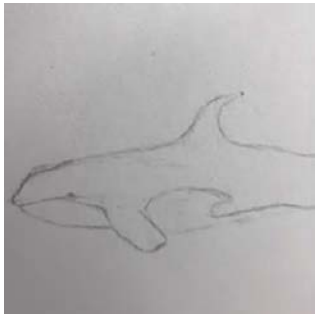
- Paper
- Pencil
- Black Pen
- Watercolor Paints
- Paintbrush
- Ruler
- Eraser
- Paper Towel

If you don't have watercolor paints, that's OK. You can use colored pencils. And if you prefer, you can create your orca using any colors you wish. It doesn't need to be black and white. You can use your imagination.

Continue drawing the details of the orca:

Using an eraser, you can remove that horizontal line you created as you won't need it anymore. Next, create the divides between the white part of the whale's body (its belly) and the black part of its body (its back). Then create the area for the white eye patch that's behind the eye.

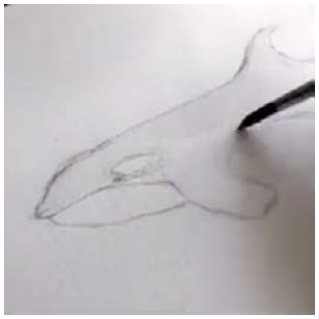




Add water to your paper:

The technique that I use is called “wet on wet” and this is where I will wet my paper first. A trick that I always teach my students about watercolors is that the paint will only go where the water goes. So if you don’t place water on the paper where you don’t want the paint to go, it shouldn’t go there.

And I want to remember to leave white space. I’m going to carefully add water around the eyepatch, because the eyepatch needs to be white. And I am not going to add water outside the outline of my orca because I don’t want the paint to travel there. Continue to add water to fill in the orca’s body where you want the paint to go. I very gently add water to the eye because I want to make sure the black ink doesn’t cover the entire eye. You will see that where you have added water there is a shine.



Begin adding paint to your orca:

With your paintbrush, begin adding paint onto the paper. You can see that my brush is not going outside the orca’s outline. And because I didn’t add any water there, the paint is also not traveling outside the line. If you see that your paint is not flowing well, you can always add water. I’m going to be super careful painting around the eye patch. For smaller areas you can always use the tip of your paintbrush to add that detail. Watercolor also requires a lot of patience because you have to wait for the first layer to dry before you can add any other colors. For the outline of the orca, sometimes I'll just leave it as pencil because I like that look. Or, I'll outline the rest in a black pen.

Pacific White-sided Dolphins

Q: Where do Pacific white-sided dolphins live?

There's a clue in their name—they live in the Pacific Ocean, although they do have cousins in other parts of the world such as the Atlantic. Pacific white-sided dolphins range from where we are in **Seattle, up to British Columbia, down to California and even into Mexico, and all the way over to Japan**. The dolphins that we study are in the Broughton Archipelago, just north of Vancouver Island in British Columbia, Canada.

Q: How big is the largest pod of Pacific white-sided dolphins?

There's a lot of uncertainly as to the total number of Pacific white-sided dolphins. For every 10 that you might see at the surface, there could be 50 underwater. We've been in situations where **we've seen a few thousand dolphins, which is not uncommon**. In the small inlets where we work, it's more common to see hundreds or even fewer. They have a wide range of behaviors. Big groups can be for protection against predators or for socializing. Smaller groups could be because of where their prey is arranged.

Q: How old do Pacific white-sided dolphins get?

We think they can get to around **40 or 45 years old**. Females probably live a little bit longer. They are a long-lived species.

Q: Why do Pacific white-sided dolphins have stripes?

Coloration patterns have different functions. We talked a few sessions ago about counter shading. When you have this black and white effect, it can help **protect dolphins from predators** such as sharks and killer whales. It can also help them **camouflage from their prey** such as herring and other small schooling fish. And in low light conditions, it can also help them coordinate their movements with each other. They may not have time to vocalize about it, but they can watch each other's bodies and move quickly, both in a predator and prey situation. Seeing flashes of white, up to maybe 10 meters underwater can help them coordinate their groups.

Q: What scientific equipment do you use in your dolphin fieldwork?

We track Pacific white-sided dolphins non-invasively through sound. We listen on **hydrophones** (underwater microphones) for their vocalizations. But, **the most important tool that we use in our work is a camera.** It's completely non-invasive and we use big cameras that can take photographs at a really high speed and in really low light. We can zoom in and see the natural shape and the nicks and notches of the dorsal fin. And we can tell each individual apart like a fingerprint. And this allows us to track dolphins over time. We also use underwater cameras and drones for aerial photographs.

Q: How fast can a Pacific white-sided dolphin swim?

If they are swimming long ranges, they may swim at 5 to 7 knots but, they have been recorded swimming as fast as 30 knots. If they've been alerted to the presence of dolphin eating killer whales and they're nervous about that, they will definitely use those high speeds.

Q: When a male Pacific white-sided dolphin jumps out of the water is it trying to attract mates?

We don't really know for sure. But we do know that when dolphins jump out of the water and land on the side of their bodies, it makes a huge loud sound both on top of and under the water. So it is definitely serving as some kind of signal, either warning that a predator is coming or it could be attracting mates.

Dolphins by Kaylin, age 13, South Africa

Such a special privilege — Dr. Erin Ashe

I will never forget the first time I saw Pacific white-sided dolphins. Rob and I were out on our boat in the Broughton Archipelago and I looked out on the horizon. There I saw what looked like a wall of water…like a herd of horses stampeding across the water. It was a pod of hundreds of Pacific white-sided dolphins and it was one of the most stunning things I had ever seen. From that moment, I was pretty hooked and fascinated.

There wasn't a lot known about this population in British Columbia. why were they coming into these waters, how many were there, is the population going up and down, what are they eating, where do they have their babies? All of these fascinating questions and I wanted to find the answers. In science, discovery and exploration are important. So is mentorship. When I was ready to go to graduate school, I had a fantastic mentor, marine biologist Alexandra Morton, who offered her data from over 20 years. And then I've been adding to it for almost 10 now. It is such a special privilege to study these animals and to learn about their fascinating lives.

Photo credit: Dr. Erin Ashe, Oceans Initiative

Becoming a Marine Biologist

Q: What does a marine biologist do?

There are many different career paths and things that you can do to be involved with the ocean and ocean science and marine life. You could be a veterinarian who works on marine wildlife. You could work in a museum and put skeletons together, which teaches us about anatomy and taxonomy. You could specialize in genetics or specialize on how pollution affects animals that live in the ocean. You could count whales and dolphins to figure out if their population is healthy or if they're at risk of being endangered. There are so many career paths depending on what interests you.

Q: What is the difference between a marine biologist and an oceanographer?

If you really care about the ocean—the wind and the currents and the chemical and physical processes that make the ocean as cool as it is—then you're an oceanographer. **If you really care about the plants and animals that live in the ocean, you're a marine biologist**. You do need to know something about oceanography in order to understand habitats. And although we study whales and dolphins and salmon and sharks, there is a huge demand for people who study jellyfish and sea urchins and fish.

Q: What does it mean to be a scientist?

You're a scientist if you are doing science. This means you are asking questions that no one has the answer to. You're designing a system to answer the question. You're collecting the data. You're analyzing the data. You're coming up with the results. You're sharing the results through peer review and you're sending that to a scientific journal. That's science.

Dr. Erin Ashe

Q: What if I don't live near the ocean?

There are a lot of skills you can acquire that could help you in marine biology that don't require being on the ocean. One of the first lessons our PhD advisor taught us is that marine mammals—the whales, the dolphins, the seals, the porpoises that we study—are a taxonomic group, not a scientific discipline. They're just a collection of animals. So what he was telling us is don't focus so much on which animal you want to study. Focus on the question. **Focus on the skills you want to get good at.**

One thing is you can learn statistics. If you get really good at that kind of math, then it doesn't matter if you're near the ocean. If you have those skills, there will be someone who wants to help you apply those skills to a marine biology question.

Q: What kind of math do you use?

We use trigonometry when we're tracking the movements of whales and dolphins. We use algebra in population models and calculus in ecology studies. We use a lot of statistics in almost every aspect of what we do. **It doesn't matter which field you go into in marine biology, statistics and statistical modeling is really important** for making decisions in the face of uncertainty.

Q: What is the best college to go to?

There is no one best answer. The best thing to do is find someone whose work you love and see where they're working. That gets easier as you get older and you start reading scientific papers. We both did our PhDs at the University of St. Andrews in Scotland. We wanted to know: are whale and dolphin populations okay? Are they going up or down? What help do they need? That really is the strength of the University of St. Andrews because they have a school of biology that works closely with the school of statistics in the analysis of animal populations. For conservation biology, we wanted to understand: do the whales need more fish? Do they need less noise? Do they need us to stop catching them in fishing nets? The University of St. Andrews was the best place in the world for us to go to work with a professor who was the right person to supervise our PhDs.

Q: What advice do you have? What classes should I take? What college degree do I need? Do I need to choose a specialty?

Dr. Rob Williams

You need a good foundation in math. In our field, we actually spend as much time doing math as we spend doing biology. But think about the skills that you love, which classes bring you joy. Ocean conservation needs all of us. Maybe you are an artist and you want to help tell marine biology stories with beautiful graphics and photography.

We need people who can translate the science into decisions about how much noise is too much, how much fish do the whales need and should that come from fisheries or should it come from habitat restoration. People who have a strong background in conflict resolution and getting people together and reaching consensus are needed in marine biology. So are lawyers, and accountants, and people who want to help raise money to keep this all going. You may or may not need a degree if you just want to help scientists collect data. But if you want to be in charge of a scientific project, it's helpful to learn basic scientific methods. And I think a master's and a PhD help give you those skills. I am a generalist, I did not specialize. I really like interdisciplinary biology where I'm including physics and chemistry and population dynamics, and fisheries interactions.

I do believe that there's an element of luck in every career path. When I was in grade three at elementary school, our teacher would take us all camping to a little Island where we would do tidal pool studies. And she taught us the basics about how to be a scientist. We didn't know that's what we were learning, but when I became an adult, I realized, she taught me how to be a scientist. And so I ended up dedicating my PhD thesis to her because the skills she taught me in grade three, ended up being extremely relevant to me 20 years later. And I think that's really, really important. If you get lucky and have a wonderful teacher, then you can use those skills in unexpected and unanticipated ways.

And I hit the jackpot, because my wife and daughter love the same work I do! Family support is key.

Dr. Erin Ashe

A broad education is beneficial along with having a good understanding of literature and science, math and statistics. In my experience, I went to Western Washington University in Bellingham, Washington for my undergraduate degree and they did require organic chemistry and physics, and biology, of course. Getting at least a bachelor's degree is helpful.

Early in my career, I did a lot of internships and volunteering with veterinarians because I was interested in animals and biology. I was collecting data for seabird studies before I got my graduate degree. After a while I thought, "I have these questions. And I'm curious about certain things." I did carry out a study before I had a master's and PhD, and with help from colleagues, I published a paper. But I wanted to be able to carry out a study from beginning to end. So that's why I went to graduate school. I went to do my master's degree at the University of St. Andrews.

When I was a kid I was fortunate to join pony club, where I learned how to take care of horses and ride. I was interested in learning about the anatomy of horses and how to take care of them. I earned a medal for being a stable manager, which meant organizing and labeling everything, making sure the horses were fed and had water, and the stalls were clean. Those skills help me today. When I'm getting ready for the field, I go through the same process. I get all my equipment lined up, make sure it's clean and in good condition and labeled and ready to go. So many of the experiences we have when growing up can really serve you in your career.

If you're really interested in something, understand that it takes work. Even if you have a passion and you know what you want, it still requires work to keep interested in that passion. I suggest finding the people who can support your path to help keep it going.

Threats to Marine Mammals

Q: What does conservation mean?

Conservation is a word used to talk about preservation of wild animals and their natural habitats, so that the animals can survive long into the future. It's looking what might be threatening the whales and dolphins and finding solutions for what to do about it.

Q: Have you seen global warming affect whales and dolphins, and how you predict it will affect cetaceans in future?

Primarily we think about those animals that are at the poles—the Arctic and the Antarctic—because obviously they rely on ice in that natural habitat. As one example, the Antarctic Peninsula is one of the fastest warming places on Earth. 20 years ago, you would see areas full of ice and full of minke whales feeding on the krill at the ice edge. Now these same areas are completely ice free and you do not see minke whales.

Animals in the polar regions aren't the only ones impacted by climate change. If the sea levels rise, this could also affect species such as monk seals in Hawaii that depend on small islands and atolls. Those environments could change quite a bit which may impact monk seals. We see ecosystem changes where different species may be exploring new territory. Humpback whales are entering the Arctic and as the Arctic ice melts, killer whales seem to be spreading out.

Orca by Annalee, age 12, Tennessee

Q: How does plastic in the oceans affect marine mammals?

Getting entangled in plastic is a bad thing. A sea lion can swim through a plastic strap and get it trapped around its neck. Accidentally eating plastic is another problem that can really affect whales as it gets into their stomachs. There's also microplastics, or very tiny pieces of plastic, that end up in zooplankton, which ends up in fish, which ends up in whales.

Q: What are the biggest threats to marine mammals?

There are some main threats that apply to all marine mammals.

- Hunting was a threat historically.
- Bycatch, which is a term used to describe interaction with fisheries such as getting entangled in fishing gear or a net.
- Pollution such as toxic chemicals and plastic. Noise pollution, or chronic noise from ships. And light pollution which can change the day/night patterns of fish and invertebrates.
- Vessel and boat traffic. Sometimes large ships accidentally collide with whales, or an animal may come in contact with a boat's propellers.
- And of course, climate change.

Q: What threatens orcas between Seattle, Vancouver, and Victoria?

The main reason the southern resident killer whale population has not recovered is that there's not enough fish in the sea. The fish that is there is full of chemical pollution, and the noise that we make from all of the boats, ships, and ferries make it harder for the whales to hear the salmon that are left.

Q: Is there a way to make boats quieter?

There are a number of ways that we can make boats quieter. The simplest one is to just slow down. If we slow down ships and boats, we make way less noise. It's much easier to build new ships to be quieter by changing the design or modifying the propeller. It's more difficult to make a noisy ship quieter. So just slowing down and staying farther away from the whales is the best solution.

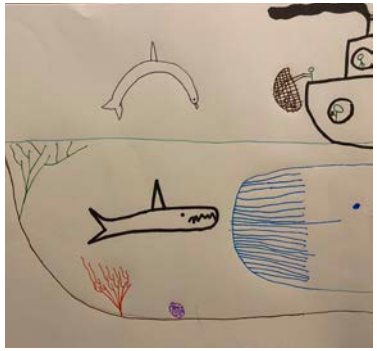
Hope, Ideas and Solutions

"Teach fisherman how to catch tuna without harming dolphins."

Jacob, age 5, in Philadelphia

Years ago, tuna fisheries used to catch an awful lot of dolphins accidentally. So kids started telling their parents, "I'm not going to eat tuna fish sandwiches because it's harming the dolphins." Slowly grownups listened and went to their representatives in government and said, "There's got to be a way to catch tuna without harming dolphins." The fishermen agreed to try a number of things such as lowering their nets to let the dolphins out. And as soon as they did, they were given permission to start putting a dolphin safe logo on their cans of tuna. And now if you go to a grocery store, anywhere in Canada or the United States, almost all tuna you see in the can says dolphin safe tuna. So kids changed the world, and changed it for the better.

Organizations are already working with fishers to reduce the number of marine mammals that caught get caught in fishing nets. In the meantime, what you can do is trust that your grownups are asking for sustainable fisheries. Sustainable fishing means leaving enough fish in the ocean, respecting habitats and ensuring people who depend on fishing can maintain their livelihoods.



Jacob, age 5, Philadelphia

"Stop using plastic so much. And reuse it."

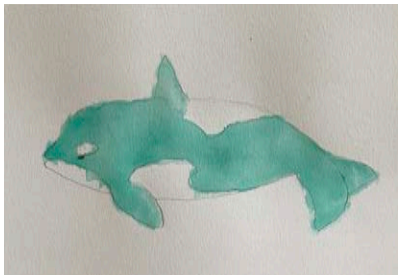
Tempess, age 8, in Des Plaines, Illinois

Absolutely. And we should try to find ways to use less plastic, like drinking your water from a glass instead of using plastic water bottles. Stop using plastic straws. And try to recycle as much plastic as possible.

"If you're in a boat, turn down your motor speed."

Travis, age 9, in Oregon

That's the greatest advice. It slows your boat down. It makes less noise. It makes lower frequency noise and that's better for the killer whales. During these "strong germ days" with not as many boats and ships out on the water, we want to be out on the water to measure how much quieter the noise is and whether the whales are feeding more.



Travis, age 9, Oregon

"Teach others, especially kids, about ocean conservation."

Rebecca, age 16, in Oceans Shores, Washington

Rebecca is working on her Girl Scout Gold Award project, the highest award Girl Scouts can earn. She is partnering with the Coastal Interpretive Center in Ocean Shores and has designed a program to teach kids about the ocean, why the ocean needs our help, and ideas on what they can do to help our oceans.

- If you go to the beach, pick up trash and snip soda can rings so sea turtles and seabirds don't get stuck in them.
- Reuse trash, like turning candy tins into first aid kits and making drums out of oatmeal tubs.

"Share your love of the ocean."

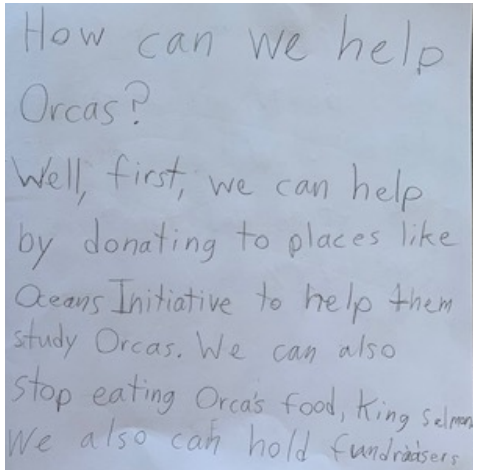
Kaylin, age 13, in South Africa

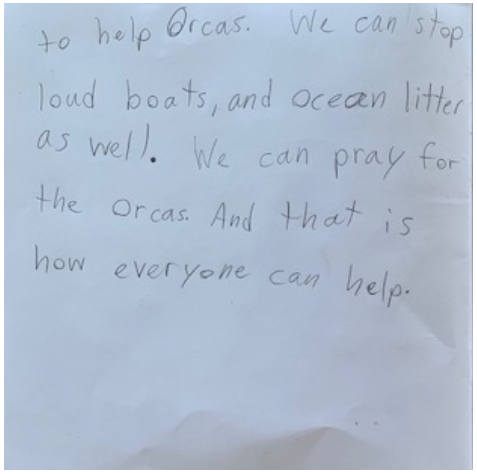
That's it! We're all in the same pod. By sharing your art or your super power with the world, you're growing the pod of people who love the ocean and who are invested in wanting to protect it. We all have different contributions to make. We all have different ways to help.

Kaylin, age 13, South Africa

Hope, Ideas and Solutions

"We can help the orcas in Washington."
Hannah, age 10, and Joseph, age 6, Florida





"Save chinook for the orcas."
Clara, age 6, Seattle, Washington

If you're going fishing, throw the chinook back…leave the chinook for the whales. You can eat as much fish as you like, except the chinook salmon. Tell your grownups not to buy chinook salmon from the store. Don't leave trash laying around. If you see trash tell your grown up so they can pick it up and help to keep things clean. If it blows into the ocean, an orca might think it's fish.

Mommy orca by Clara, age 6, Seattle

"I think that what everyone's doing now to learn more about the ocean and the whales is important. Being interested in and loving the ocean is an action in itself. Talking about it and having these discussions is the first step."

Dr. Erin Ashe

Yummy Recipes for Elevenses

Ultimate Banana Bread

SERVINGS: 8 to 10 TIME: 75 minutes SOURCE: Smitten Kitchen

Ingredients:

1/2 cup (4 ounces or 115 grams) unsalted butter, cut into chunks, plus more for pan

1 cup (190 grams) packed light brown sugar

2 slightly heaped cups (about 18 ounces or 510 grams) of mashed banana, from 4 extra-large or 5 medium-large bananas

2 large eggs

1 teaspoon (5 ml) vanilla extract

1 teaspoon fine sea or table salt

1 heaped teaspoon ground cinnamon

A few gratings of fresh nutmeg (optional)

1 teaspoon baking soda

1 teaspoon baking powder

2 cups (260 grams) all-purpose flour

2 tablespoons (25 grams) raw or turbinado sugar

Heat oven to 350 degrees F. Butter a 6-cup (9×5-inch) loaf pan or coat it with a nonstick cooking spray and set aside.

Melt butter in a large bowl and whisk in brown sugar until smooth, then stir in mashed banana. Whisk in eggs and vanilla. Sprinkle the surface of the batter evenly with salt, cinnamon, nutmeg (if using), baking soda, and baking powder, and whisk until the ingredients are fully dispersed in the batter, and then whisk 10 more times around the bowl because it's better to be overly cautious than to end up with unmixed pockets. Add flour and stir until combined. Scrape batter into prepared loaf pan. It should come to just over 1/2-inch from the top rim. Sprinkle the top of the batter with the raw sugar; it will seem like a lot but will bake up beautifully.

Bake banana bread for 55 to 65 minutes. It is done when a toothpick or skewer inserted into the bread is batter-free—be sure to check the upper third as well, near the rim of the pan. The bread will get very dark but will not taste burnt.

Let cool in pan. This banana bread is good on the first day but exceptional on the second and third, if you can bear to wait.

To store: Leave the banana bread in the pan, uncovered. Once cut, press a piece of foil against the cut side of the remaining loaf but leave the top uncovered — you worked hard for that crunchy top and should not sacrifice it to humidity. It keeps for five days at room temperature, possibly a week in the fridge.

NOTE: Very key is the size of your loaf pan because this will fill out every speck of it before it is done. Recipe is for a pan holding 6 liquid cups; it's 8×4 inches on the bottom and 9×5 inches on the top. If yours is even slightly smaller or you're nervous, go ahead and scoop out a little to make a muffin or two on the side. When making this for the first time, place a sheet pan underneath, just in case it spills over.

Yummy Recipes for Elevenses

Mary's Cherry Cake

SERVINGS: 10 to 12 TIME: 30-60 minutes SOURCE: Mary Berry

Ingredients:

200g /7oz glacé cherries

225g /8oz self-raising flour

175g /6oz softened butter, plus extra for greasing

175g / 6oz caster sugar

1 lemon, finely grated zest only

50g / 1¾oz ground almonds

3 large free-range eggs

For the decoration:

175g/6oz icing sugar

1 lemon, juice only

15g / ½oz flaked almonds, toasted

5 glacé cherries, quartered

Preheat the oven to 180C/160C Fan/Gas 4. Grease a 23cm/9in Bundt tin or savarin mold with butter.

Cut the cherries into quarters. Set aside five of the quartered cherries for the decoration later. Put the rest of the quartered cherries in a sieve and rinse under running water. Drain well then dry thoroughly on kitchen paper and toss in two tablespoons of the flour.

Measure all the remaining ingredients into a large bowl and beat well for two minutes to mix thoroughly. Lightly fold in the cherries. Turn into the prepared tin.

Bake in the preheated oven for 35-40 minutes until well risen, golden-brown and a skewer inserted into the center comes out clean. Leave to cool in the tin for 10 minutes then turn out and cool on a wire rack.

For the icing, mix the icing sugar together with the lemon juice to a thick paste. Drizzle over the cooled cake using the back of a spoon, sprinkle over the toasted almonds and reserved cherries.

NOTE: Dusting the cherries with flour helps stop them sinking to the bottom of the cake.

Yummy Recipes for Elevenses

Leopard Bread — in honor of Leopard Seals!

SERVINGS: 1 loaf TIME: 55 minutes SOURCE: Two Cups Flour

Bread Dough:

2 Tbsp. (25 g) Cornstarch

1 Cup (250 ml) Warm Milk plus more for brushing on dough

2 Tsp Active Dry Yeast

2/3 Cup (70 g) Granulated Sugar

4 Tbsp. Unsalted Butter melted

1 tsp Vanilla Extract

1 tsp Kosher Salt

2 Tbsp. Orange Zest

3 Cups (375 g) Bread Flour

Dark Chocolate Paste:

2 Tbsp. Cocoa Powder

1 Tbsp. Milk

Light Chocolate Paste:

2 tsp Cocoa Powder

1 tsp Milk

Make the Dough:
Stir cornstarch in cup of warm milk until dissolved. In the bowl of a stand mixer, combine milk mixture, yeast, and 2 Tbsp. of the sugar. Gently stir together and let sit for 8-10 minutes until frothy. Add melted butter (cooled to room temp.), the rest of the sugar, salt, vanilla and orange zest to yeast mixture. Using the dough hook attachment mix on medium low speed. Slowly spoon in flour on medium speed, and then turn up to medium high until dough has formed. The dough should be very slightly tacky, with a soft and smooth texture. Once formed, let the dough rest for about 10 minutes. Turn mixer back on to medium high and beat for 6-8 minutes. (Tear off a small piece of dough and stretch out with your fingers. A simple "window pane" test will let you know if the dough is ready. If not, beat for another 2-3 minutes and test again.) Remove dough from bowl and place on a lightly floured surface. Weigh your dough and divide into two halves. Lightly dust one half with flour, wrap in plastic wrap and place in the fridge. Take the second half and evenly divide it into two halves.

Make Chocolate Pastes and Dough:
Use a separate bowl for each paste. Stir cocoa powder and milk together with a spoon. You should have one thick chocolate paste and one light chocolate paste. Place one of the remaining halves of dough in each bowl of paste. Work the chocolate into the dough with your hands. Kneading to incorporate all the chocolate into each dough. You should now have one dark chocolate ball of dough and one light chocolate ball of dough. Lightly flour each ball, cover in plastic wrap and set in the fridge. Let all three dough balls chill for about 60-90 minutes.

Make the Loaf:
Remove all three dough balls from the fridge. Weigh the white ball of dough and divide into 7 equal pieces. Repeat with the light and dark chocolate dough balls. You should now have 21 pieces of dough. Start by rolling each of the light brown pieces into a small hot dog shape. Then using a rolling pin roll each of the dark chocolate hunks into flat oval. Place the light chocolate sausage onto the flat dark chocolate oval. Using a pastry brush lightly coat the edges of the dark chocolate with milk. Then fold the dark chocolate over the light chocolate as if you were wrapping a hot dog bun around a hot dog. The result should look like a chocolate cigar. Now take the white dough and toll into an oval with the rolling pin. Repeat the process by placing the dark chocolate wrapped 'sausage' onto the white dough oval. Paint the edges of the white dough with milk and then fold it over the dark chocolate, closing the seams. The result should now look like a log with a light chocolate center, a wrapping of dark chocolate, and then a final wrapping of white dough. Repeat this process with the remaining dough until you have 7 logs. Now, roll each log lengthwise with your hands, until it becomes doubled in length. Slice in half. You should now have 14 skinny logs.

Bake the Loaf:
Prepare loaf pan with parchment paper. Stack dough logs into the pan. Cover with a light tea towel and place in a draft free warm location to puff and double in size (at least an hour). Preheat oven to 375 F (190 C). Then turn down to 350 F (176 C) and place loaf into the oven. Bake for 35-45 minutes or until inner temperature reaches 190 F. Place pan on a cooling rack for 5-8 minutes.
Remove loaf from pan. Let bread cool another 10 minutes.

Thanks For Joining Us!

Thanks for being a part of our Virtual Marine Biology Camp

We hope you enjoyed participating in Oceans Initiative's virtual marine biology camp. We certainly appreciated having you along on this journey. We hope that what you've learned in marine biology camp will inspire your own journey and that you too may have the opportunity to show your love for the oceans and marine life. Marine conservation needs every single one of us. Let your talents, passion, and special gifts guide your own path.

Collection of Virtual Marine Biology Camp videos

If you would like to go back and watch any of the episodes that were your favorites or maybe one that you missed, we have all the videos saved on our Facebook page. You can also find them on our website at oceansinitiative.org. Here you will also find additional materials such as coloring pages and recordings of whale and dolphins calls.

Virtual Marine Biology Camp Certificate

For those of you completed all of episodes, we would like to offer you a special certificate. We're proud of you and we're so happy you are now part of our pod. You can download your certificate from our website at oceansinitiative.org.

Support an organization whose work you love

We'd love nothing more than for you to share our work with your friends and family who might also care about the oceans and marine life. Follow Oceans Initiative on social media and share your thoughts and ideas.
Learn as much as you can about marine conservation and discover what areas most interest you.
Our website is a good source of information for you to learn even more about whales and dolphins.
The oceans and many marine species are in need of protection and your voice is needed to help.

We can't thank you enough for your support of Oceans Initiative. You make all the difference in the world.

Pacific white-sided dolphin
by Karsten, age 10, Massachusetts

With oceans of gratitude,

Erin Ashe Rob Williams

Acknowledgements

We'd like to thank our team at Oceans Initiative for their help in organizing our March – May 2020 Virtual Marine Biology Camp. From collecting the questions for each episode and gathering artwork, to updating our website and social media pages, to documenting our journey. Thank you! We couldn't have done it without you.

We'd like to especially acknowledge a few people who contributed to the success of Oceans Initiative's first Virtual Marine Biology Camp.

Above all, we are most grateful for the generosity of foundations and individual donors like you who have given us the flexibility to pivot and serve our human and marine wildlife communities during these "strong germ days".

Laura Bogaard

Laura has worked for Oceans Initiative since 2016 as our Research Assistant and Field Operations Coordinator. She was our special guest for Episode 3, where we learned ***All About Salmon***, one of Laura's areas of expertise.

Natalie Mastick

Natalie is a Graduate Fellow in Marine Parasite Ecology with Oceans Initiative, pursuing her PhD at the University of Washington. Natalie was our special guest for Episode 4, ***Worms and Whale Poop***, where she shared her knowledge of the parasites affecting marine mammals.

Dr. David Shiffman

David is a shark conservation biologist and a scientific and environmental consultant. David joined us as our special guest for Episode 5, ***All About Sharks***, sharing his passion and expertise for these fascinating creatures. There are few people as knowledgeable as David to explain why sharks matter.

Karen Sinclair

Karen is a marketing and fundraising professional based in Seattle, and is a volunteer for Oceans Initiative. Karen helped to coordinate our Virtual Marine Biology Camp and documented our journey through the creation of this souvenir eBook.

Ryan Tidman

Ryan is a conservation photojournalist, videographer, and biologist based in British Columbia. Ryan has contributed his images and video footage to help tell our story. He also kindly offered his tips and tricks for making beautiful wildlife photographs.

Sophia Trinh

Sophia is watercolor artist from Seattle. She generously offered to lead a watercolor painting class for our Virtual Marine Biology Camp and we learned from Sophia how to paint the iconic killer whale. She has also donated several gorgeous paintings to Oceans Initiative.

Thank you for joining our pod!

With gratitude, Dr. Erin Ashe and Dr. Rob Williams

Photo credit: Dr. Erin Ashe, Oceans Initiative