

# A Tiny Octopus with a Deadly Bite

by Annie Kiyonaga



Sasipoteuthis (CC BY-NC-SA 2.0)

*a southern blue-ringed octopus*

In June 2020, an Australian scuba diver was diving near Bondi Beach when he saw something unusual. As he was setting up to photograph a sea spider on a rock, he noticed some blue flashing rings. Looking more closely, he saw that the rings were on a small octopus. Luckily, he knew to stay far away. He was inches away from a southern blue-ringed octopus, one of the most venomous sea creatures in the world!

Sometimes, the most dangerous animals come in the smallest packages. This is definitely true for the southern blue-ringed octopus. This small animal usually only reaches a length of 8-10 inches. It usually looks like a common, small octopus. When it does not feel threatened, its skin is a light brown color. However, if a predator makes the octopus feel threatened, its skin will start to pulse with bright blue rings. This is how the octopus gets its name. When a predator sees this, it's a visual sign, telling it to back away. If the predator doesn't take the hint, the southern blue-ringed octopus might use its venom.

The venom that the southern blue-ringed octopus releases is more deadly than any venom released by land animals. Venom is different from poison. The venoms of many octopuses don't immediately kill their victims. Instead, many of these venoms paralyze their victims. This means that the animal injected with the venom from one of these octopuses cannot move or defend itself. Eventually, the venom paralyzes the animal's whole body, even its heart, so it dies. All octopuses are venomous, but the southern blue-ringed octopus's venom is especially strong.

If the southern blue-ringed octopus feels threatened, it will use its venom in one of two ways. Sometimes, the octopus bites its victims, injecting them directly with venom. Other times, it will release a cloud of venom into the water. The other animal absorbs the venom through its gills. This venom is produced by bacteria in the octopus's salivary glands. Those are the glands that produce saliva. People also produce saliva, which is the liquid in their mouths. However, unlike people, the saliva of the southern blue-ringed octopus has a toxin in it that causes muscle paralysis in the octopus's victims. The southern blue-ringed octopus also uses its venom to hunt for prey. Like other blue-ringed octopus species, it mostly eats crustaceans, like small crabs and shrimp.

The southern blue-ringed octopus can be found along Australia's southern coast. The octopus is usually found in tidal pools or in shallow areas near reefs. If you see a southern blue-ringed octopus, watch out! It has enough venom in its body to kill 26 adult humans. Although they're extremely deadly, these octopuses are not aggressive. In fact, they are often described as shy creatures. They usually hide under ledges and rocks to try to avoid interaction with larger animals. Usually, the only times they hurt humans is when they are picked up or stepped on.

# These Fish Make Their Own Light!

by Annie Kiyonaga



NOAA Office of Ocean Exploration and Research, 2016 Hohonu Moana

*a lanternfish*

What do fireflies and lanternfish have in common? They both create their own sources of light! Lanternfish are deep-water fish that have the ability to produce their own light. Deep-water fish live in, you guessed it, some of the deepest parts of the ocean. In fact, lanternfish are some of the most common deep-water fish. They exist in bodies of water all over the world. There are about 300 different types of lanternfish. They are so common in some places that scientists have estimated over 60% of deep-water fish biomass are made up of lanternfish! That means that lanternfish make up the majority of living fish in some areas of the ocean.

How have these glowing fish become so common in our oceans? Their bioluminescent qualities help them to survive in the deep seas. The light on a lanternfish's body is produced by photophores. Photophores are tiny organs on the lanternfish's body. Inside these organs, chemical reactions occur and produce light. This light gives off very little to no heat, unlike many other sources of light. It is known as "cold light," and it usually glows blue or blue-green. Lanternfish have photophores on their heads, bellies, and tails. They use these light sources in a few different ways.

For one, lanternfish use their bioluminescence to hide themselves from predators. This might sound confusing. How could a bright light in the ocean be used to hide? But for lanternfish, their glowing spots on their bodies help them camouflage themselves during the day. Picture this: a predator is swimming underneath a lanternfish during the day. If the predator looks up, it could clearly see the outline of the lanternfish's body in the sunlight. The lanternfish would look like a dark shadow in the sun. However, since the lanternfish can create its own light, it confuses the predator's eyes. The predator sees spots of light and dark, much like the sun's natural appearance in the water. In this way, the lanternfish is hidden from the predator.

Another way that lanternfish use their bioluminescence is to see their own prey. Lanternfish can use their bioluminescence to see better, like how we might use a lamp to see in the dark at night. Their

natural light allows them to more easily find prey. Lanternfish mostly eat plankton. Plankton are tiny organisms that drift along with the ocean's currents. Lanternfish follow plankton deep into the depths of the ocean during the day, and then towards the ocean's surface at night. This pattern of movement also allows lanternfish to avoid many predators that swim near the ocean's surface during the day.

Finally, research suggests that lanternfish use their bioluminescence to communicate with each other. For a long time, researchers did not know why lanternfish had bioluminescent photophores on the sides of their bodies. They knew that the photophores on their stomachs were used for camouflage from predators swimming below them. The photophores on their heads and faces were used to improve their vision and help them find food. But why do these fish have photophores on their sides? Researchers have discovered one possible answer. They think that the photophores on the sides of different types of lanternfish are unique to each species. One type of lanternfish will have one photophore pattern on its side, while another type will have a different pattern on its side. The photophores might help lanternfish communicate with potential mates. A lanternfish can signal to other lanternfish that it is looking to mate using the photophores on its sides. When different types of lanternfish mate and reproduce, they produce new combinations of lanternfish traits. This bioluminescent communication has led to more diversity of lanternfish species!

# Jellyfish Take Over!

by Annie Kiyonaga



Janne Hellsten (CC BY 2.0)

*the Nomura's jellyfish*

A giant jellyfish species is overtaking the waters of the Sea of Japan. Fishing nets-and fish-are being overwhelmed by these giant sea creatures. And no, this isn't the start of a science fiction novel! This is a real problem happening today because of one very large type of jellyfish.

## A huge jellyfish...

Jellyfish are invertebrates, or animals with no backbone. There are many different kinds of jellyfish in the oceans around the world. The Nomura's Jellyfish is one of the largest jellyfish species in the world. These huge sea creatures can grow as big as 450 pounds. That's as heavy as a full-grown lion! Their bodies are six feet wide, with long tentacles. Nomura's jellyfish grow to this massive size very quickly. When they are born, they are the size of a grain of rice. Within one year, these jellyfish grow to their full size.

The Nomura's jellyfish has hundreds of tiny mouths all over its body. It uses these tiny mouths to eat plankton. Plankton are extremely small plants or organisms that drift along with the tide in the ocean. Using all its mouths, the Nomura's jellyfish eats massive amounts of plankton.

Even though the Nomura's jellyfish is so large, the jellyfish's body is still soft and vulnerable to attack by larger animals. But the Nomura's jellyfish has special protections against predators: it has stingers called nematocysts all over its body. These stingers inject the jellyfish's victims with toxins. The

Nomura's jellyfish stingers don't just hurt other sea creatures, though. They also provide protection for some small fish. Since the Nomura's jellyfish is so large, some small fish have learned how to avoid the jellyfish's dangerous stingers. These fish hang out inside the jellyfish's tentacles, avoiding its stingers and staying safe from predators!

Unfortunately, humans have not learned how to avoid the Nomura's jellyfish's stings yet. Thousands of swimmers off the coasts of Japan are stung by Nomura's jellyfish every year. These stings can be dangerous for people, sometimes leading to pain, swelling, or death. Today, there are so many Nomura's jellyfish in the Sea of Japan that the Japanese government has created a special government group to try and fix the problem.

### **...And a huge jellyfish problem!**

Some experts think that overfishing is one of the main reasons the population of the Nomura's jellyfish has been increasing. The Nomura's jellyfish eats the same types of plankton as many fish do in the Sea of Japan. Usually, because the jellyfish and fish are competing for food, the two groups stay about the same size. But due to overfishing in the Sea of Japan, there are less fish in the water than there were in the past. This means that the Nomura's jellyfish has a larger food supply. Because of this larger food supply, the Nomura's jellyfish population has increased more and more.

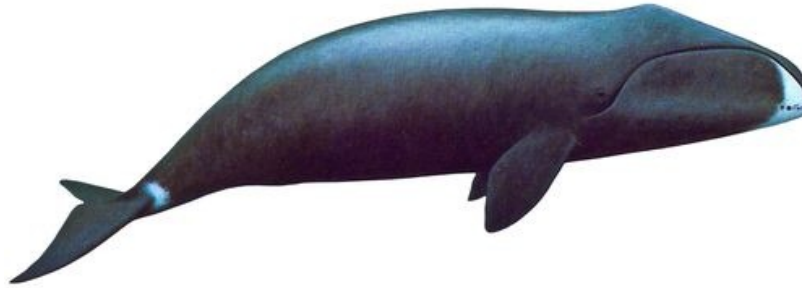
Additionally, the Nomura's jellyfish reproduces extremely quickly. An adult Nomura's jellyfish can produce billions of eggs at a time. Even if only some of these eggs get fertilized and become more jellyfish, you can imagine how quickly the jellyfish's population could expand. On top of that, the Nomura's jellyfish sometimes eats fish eggs. This only adds to the problem of too many jellyfish and not enough fish. This imbalance between jellyfish and fish populations could cause problems for the Sea of Japan's ecosystem. Scientists don't know yet exactly how the Sea of Japan ecosystem would respond, but they are worried that decreased biodiversity there could lead to problems for all of the sea creatures in this ecosystem.

The increase in the Nomura's jellyfish population has also made fishing in these waters extremely hard. Sometimes, fishermen will pull up their nets, only to find that they are completely filled with these giant jellyfish! One 10-ton boat in the Sea of Japan even capsized while trying to pull its net in because it was so heavy from all the Nomura's jellyfish.

Unfortunately, this is not a problem that is unique to the Sea of Japan. Jellyfish populations around the world are expanding and causing problems for fishermen. From moon jellyfish in the Gulf of Mexico to the Nomura's jellyfish in the Sea of Japan, people around the world are trying to address the problems created by these increased jellyfish populations.

# All About the Bowhead Whale

by Annie Kiyonaga



Bering Land Bridge National Preserve (CC BY-SA 2.0)

*a bowhead whale*

The Arctic is one of the most intense environments for any animal to survive in. The long, cold winters are harsh and snowy, with thick ice floes covering much of the Arctic Ocean. Ice floes are thick sheets of ice that float in the ocean. Sea creatures that live in the Arctic waters have adapted in special ways to survive there. One remarkable animal living in the Arctic is the bowhead whale.

Bowhead whales are baleen whales. Baleen whales filter food through the baleen plates in their mouths. These baleen plates are kind of like combs. Bowhead whales open their mouths and take in a lot of ocean water. Their baleen plates act like filters, so while the water is pushed out of the whales' mouths, small crustaceans are kept in. These crustaceans include shrimp and krill. Bowhead whales have to filter a lot of water in order to get enough food. These whales eat about 220,000 pounds of food a year! This helps explain how they get so big. A fully grown bowhead whale can be up to about 60 feet long and weigh up to about 200,000 pounds.

Bowhead whales migrate to follow food sources. Cold water usually has more small crustaceans in it, so in the winter, bowhead whales stay close to the edges of the big sheets of ice that form in the ocean. In the summer, some of that ice melts as the Arctic warms up. Bowhead whales swim farther north in the summer. They are one of the only whale species that lives their whole life in the Arctic. Bowhead whales' bodies are built to survive in the Arctic waters. They have the thickest blubber layer of any whale. Blubber is a thick layer of fat that keeps sea animals warm. The blubber layer in bowhead whales is 17 to 19 inches thick. Also, bowhead whales have skulls that are especially thick and strong. This makes them perfect for a very specific task. Their strong skulls allow these whales to break through ice floes as thick as eight inches. Some of Alaska's indigenous people have reported seeing bowhead whales break through ice floes that are two feet thick!

Like other whales, bowhead whales use sound to help them survive. Bowhead whales produce a variety of sounds. Sometimes, they produce one constant note. Other times, they make lots of different noises at different pitches. Researchers think that bowhead whales use these sounds, sometimes called "songs," to communicate with each other. Bowhead whales may also use these songs to navigate or find food. Some other whales, including humpback whales, usually have one song that they sing consistently. But bowhead whales change their songs all the time.

Another especially interesting thing about bowhead whales is how long they live. Scientists are able to track the ages of bowhead whales by studying harpoons that they find in the whales' skin. Harpoons are special kinds of spears that people use to hunt whales. By studying harpoons in some bowhead whales, scientists have discovered that bowhead whales might be able to live over 200 years! Some evidence suggests that they can live as long as 250 years. This makes them one of the longest-living mammals in the world. So if you ever see a bowhead whale, just think... that whale could have been born in the 1800s!

# The Ocean Sunfish: A Strange Swimmer

by Annie Kiyonaga



*an ocean sunfish*

When you picture a fish, you might think of a little clownfish, darting quickly in and out of ocean reefs. Or maybe you think of a catfish, slithering smoothly along the bottom of a river. At the very least, you probably picture an animal that's good at swimming! This description doesn't match one very peculiar fish, though. A *Mola mola*, or ocean sunfish, is probably pretty far from what you imagined. Ocean sunfish aren't like other fish. One aquarium described ocean sunfish as looking like the "invention of a mad scientist." So what makes these fish so strange?

Well, for one, the ocean sunfish's size is remarkable. They are the largest bony fish in the world. (The bony fish category means that sharks and rays are not counted.) The largest ocean sunfish can weigh about 5,000 pounds. That's heavier than most adult rhinoceroses! These massive fish have very short tails, unlike most other fish. Their bodies are tall and flat. They also don't have the gas-filled swim bladders that most other bony fish have. Swim bladders are organs inside most bony fish that are filled with gas, which allow them to float more easily. Because of their shape and lack of swim bladders, ocean sunfish are not very fast swimmers. A lot of the time, they float along near the ocean's surface. However, scientists have discovered that these huge fish can also dive deep into the ocean.

When ocean sunfish dive down into the ocean, they are looking for food to eat. Ocean sunfish mostly eat jellyfish. They also sometimes eat squid, fish, algae, and other small marine animals. The way that ocean sunfish eat their prey is another strange aspect of these fish. Ocean sunfish don't eat like how most other fish eat. Their mouths are stuck permanently open. Their mouths have even been



described as looking like beaks. The beak-like openings are actually two bony plates made of teeth fused together. A lot of meat-eating fish use their teeth to capture and hold their prey, and then they swallow their prey in chunks or sometimes whole. Instead of capturing and holding jellyfish, ocean sunfish suck jellyfish in and out of their mouths quickly. Eventually, this back-and-forth suction breaks down the jellyfish into chunks that ocean sunfish can digest. Ocean sunfish are able to eat jellyfish without getting stung in their bodies because of a special mucus lining. This lining protects their digestive system from jellyfish tentacles.

While ocean sunfish are eating jellyfish, many different kinds of parasites are using ocean sunfish to live! Parasites are living things that live off of a "host" animal or plant. Many parasites are extremely small. Because of their broad, flat shape, ocean sunfish are easy targets for parasites. These fish often have many different kinds of parasites on them at once. Scientists have documented over 50 different kinds of parasites on, and inside, one ocean sunfish! Ocean sunfish have a special strategy for getting rid of these parasites. They would float very close to the ocean's surface and wait for seabirds, like gulls and albatrosses, to come near them and try to bite them. Instead of swimming away, though, ocean sunfish would let the birds bite them. They do this so that the seabirds would bite some of the parasites off of their skin.

Unfortunately, drifting near the ocean's surface presents some problems for ocean sunfish. For one, they are sometimes hit accidentally by boats' propellers. This can injure ocean sunfish. Additionally, fishing nets often pull ocean sunfish in along with other fish. In some parts of Asia, fishermen are allowed to fish for ocean sunfish. But in most other parts of the world, fishing for ocean sunfish is not allowed. However, since they're so large and float so close to the surface, sometimes they're hard to avoid while fishing. Ocean sunfish are not endangered, but they are listed as "vulnerable." This means that they are at risk of becoming endangered. Hopefully, these huge and strange fish will continue to adapt and survive in their ocean habitat.

# An Ancient Crab

by Annie Kiyonaga



Kaldari (CC0 1.0)

*an American horseshoe crab in the Delaware Bay region*

The American horseshoe crab, also known as the Atlantic horseshoe crab, has been crawling on the ocean floor for a very, very long time. In fact, this crab has been around for longer than most other animals on Earth! This sea creature is one of the oldest animal species still alive today. The American horseshoe crab has been around for at least 450 million years. To put that in perspective, dinosaurs were alive between 66 and 245 million years ago. That means that American horseshoe crabs were scuttling along the ocean floor 200 million years before dinosaurs even existed!

So why has this ancient species survived for so long? Well, American horseshoe crabs have bodies that are built for survival. Like many other crabs, they have a tank-like shell, or exoskeleton, that protects them. These exoskeletons are skeletons that grow on the outside of their bodies. As the crabs grow larger, they molt, or shed their exoskeletons. They usually molt 16 or 17 times before they reach their adult size. Below these exoskeletons, American horseshoe crabs have five sets of legs, a tail, and one pair of feeding pincers. They use their legs to grind up their food, and then they use their pincers to feed the food into their mouth. For American horseshoe crabs, meals are usually other invertebrates, which are animals without backbones. For example, they often eat worms and mollusks.

One especially interesting part of the American horseshoe crab's body is its eyes. American horseshoe crabs have ten eyes. Some of these eyes are on the tops of their shells, and some of them are on the bottoms of their bodies. Even their tails are part of their vision systems! There are photoreceptors on the American horseshoe crab's tail. These photoreceptors aren't "eyes" in the way

that we might understand them. The crabs don't use them to see their surroundings. Instead, these photoreceptors help regulate the American horseshoe crab's body clock. American horseshoe crabs usually look for food in the dark, at night. The photoreceptors on their tails are sensitive to changes in light so that the crabs know when to hunt for food.

Another unique part of the American horseshoe crab's body is its copper-based blood. Unlike human blood or most animal blood, the blood in American horseshoe crabs' bodies is bright blue when it's exposed to the air. The copper base of the crab's blood gives it its distinctive color. Their blood also contains highly sensitive immune cells. When a toxin from bacteria gets into an American horseshoe crab's blood, its blood cells clot around the invader. This protects the crab's body from the toxin. In addition to protecting the American horseshoe crabs, these immune cells can also help protect humans! In fact, scientists have used these immune cells to test vaccines for contamination. By using the crab's blood, scientists can make sure that vaccines are clean of any toxins from bacteria and are safe for humans.

American horseshoe crabs also are important for other animals in their ecosystems. These sea creatures provide food for many shorebirds and other animals. When American horseshoe crabs are ready to lay their eggs, they gather on the shores of the Atlantic Ocean. The biggest concentration of American horseshoe crab eggs is found in the Delaware Bay and on the shores of New Jersey and Maryland. For many migratory birds, these eggs are an important food source on their journeys north. Shorebirds like the red knot, an endangered species, depend on these crab eggs to survive. In this way, American horseshoe crabs are an essential part of the food chain. And don't worry, plenty of American horseshoe crab eggs survive to become baby horseshoe crabs! After 450 million years of existence, these sea creatures definitely know how to survive and thrive in their habitats.

# An Unexpected Trip

by ReadWorks



Sarah wasn't quite sure what was going on. She had been sitting in the back of the car for hours as it rumbled up the highway's six spotless lanes. There were not many other cars. When they turned off the main highway, Sarah wasn't very worried. This was the way to the house her parents had far, far out in the country. She'd been before, for summers. Sometimes she got to bring her friend, Sam. Going to the house by itself did not worry Sarah. The chains rattling around the back seat next to her, though, were a different story.

Sarah's mom and dad had said not to worry and that everything was fine. If everything was fine, though, why had they gotten so upset when the phone had rung last night? This time of month, Sarah usually spent the night with her grandmother, watching old movies and eating popcorn that Grandma made on the stove in a pot (not in the microwave). It was delicious. She couldn't quite make out what her mom had been saying into the phone. Something like, "What do you mean, you can't come, Mom? I need you. No, you don't understand; it has to be tomorrow night!" Later, her mom and dad told her that Grandma wasn't coming, and that she'd have to come on a little car ride with them.

"Can I still have popcorn the way Grandma makes it?" Sarah had asked. Her parents had seemed nervous before, but when she asked this, they'd looked at each other and had a nice, loud laugh, collapsing into a hug.

"We'll see what we can do, ladyface," her dad said, giving her a kiss on the cheek.

Today her parents had woken her up very early in the morning. They'd told her they'd only be gone for a night but let her pack as many toys and movies as she wanted. Sarah was a little confused—normally one night meant two toys and two movies. Her mother was very strict about this, and Sarah had often gotten a stern talking-to when her mother found an extra game or stuffed animal packed in-between her sweaters.

Today, however, there weren't any toy restrictions. There were no restrictions on soda, junk food or TV watching. Her parents didn't seem to be paying much attention to her. They weren't doing much of anything, actually, except staring out the windows as the flat countryside rolled past.

When they made it to the cottage, it seemed strange. It was fall, and what looked beautiful in the summertime seemed odd and spooky now. The friendly green trees had lost their leaves, and now had sharp-looking branches pointing in every direction. In summer, Sarah loved playing in the little barn-shaped garage. Today Sarah couldn't tell what was hiding in its shadows. She hurried out as soon as the car engine shut off.

True to their word, Sarah's parents made her popcorn as soon as they got to the house in the late afternoon. Her mom put one of her favorite movies on the TV, covered her in a blanket and sat in the kitchen. Her father brought things into the house, and then disappeared into the garage for a long time. She heard banging. She could not imagine what was going on. Eventually, she fell asleep.

When she woke up, the sun was setting. Her mom sat in a chair across the room, looking her in the face. It was not usual for Sarah's mom to be there when she woke up, lovingly looking into her eyes. Tonight she seemed nervous.

"Where's Dad?" Sarah asked, rubbing her eyes.

Her mom looked down, and twisted her fingers together. "Your dad ... he has some things he has to do. Alone. We'll see him in the morning." Suddenly, she stood up. "Sarah, it's time for bed."

"Mom! It's not even dark out!"

"Sarah."

"And I'm not tired! I just woke up!"

"Don't argue with me!" Sarah's mom yelled. She hardly ever yelled. Sarah was a little scared. Mom let out a deep sigh. "Sarah, honey, we should go to bed. It's been a long day. I'll lie down with you."

They went to her room, and read books together. Sarah was not tired. They talked and read for a long time. Eventually, Sarah's mom fell asleep. Sarah tossed and turned, burrowing her head into her mom or rolling far across the bed. She decided she needed to walk around a bit. Her legs were crampy. Plus, she *had* had an awful lot of soda to drink. She got up to walk to the bathroom.

The bedroom door opened with a long, low creaking sound. All the lights in the house were off. Sarah could only see because of the big full moon shining through the windows. She put her hands on the wall, feeling her way forward, bumping into tables and tripping on shoes. Just as she got near the bathroom, she realized she could hear a sound. It was like a wailing, crying sound. It was like a dog that was hurt, but also somehow ... different. Mixed in with the howls and yelps were the sounds of the chains rattling. Sarah remembered that sound-the one the chains next to her in the car made every time it hit a bump in the road. What was going on?

She realized the sound was coming from the garage, which connected to the house via a small door. As Sarah crept towards the door, the howling stopped. What was in there? It sounded hurt and afraid. Maybe Sarah could help it?

She eased open the door, which made its own low creak, like a very old ghost waking up in the morning. At first, Sarah saw nothing. Then out of the darkness, a huge shape lunged at her. It was covered in wild, dark fur. It had a huge snout full of long, sharp teeth that snapped and trailed froth. It made the loudest sound Sarah had ever heard as it came at her. Then at the last minute, she heard

the sound of chains, and the animal seemed to snap backwards. Sarah screamed as loud as she could. The thing came at her again and snapped back towards the wall a second time. Then a lot of things happened at once: Sarah heard her mom yell her name. She fell to the floor. Things started to go dark. Just before they did, Sarah noticed something very odd. The thing was wearing a torn up pair of red pants. "Just like my dad's," she thought as she drifted off.

The next morning, Sarah was in bed. Birds chirped. Sun streamed in the window. Had it all been a dream? Sarah stood up and went into the house. Everything looked normal. She smelled bacon and heard it sizzle and pop in the pan. She made her way to the kitchen where her mom was happily frying up eggs and bacon. The waffle maker was out too, sending steam up towards the ceiling. Her dad sat at the table sipping coffee. When he saw her come into the room, he put down the paper he was reading. He motioned for her to come over.

Sarah hesitated a little, and went over and sat. Her dad looked at her kindly. "Hey, ladyface," he said. "Do you know what a werewolf is?"

# Save the Monarch Butterfly

This text is from the U.S. Fish & Wildlife Service.



Jim Hudgins/USFWS

*a monarch butterfly on swamp milkweed in Michigan*

The monarch butterfly is one of the most recognizable species in North America, and it's in trouble. Habitat loss and fragmentation has occurred throughout the monarch's range. Pesticide use can destroy the milkweed monarchs need to survive. A changing climate has intensified weather events, which may impact monarch populations.

Numbers of monarchs have decreased significantly over the last 20 years, but together we can save the monarch. In the United States, there is a massive effort to provide habitat for monarch butterflies, imperiled bumble bees, and other pollinators. There is no one group or agency responsible for providing habitat needed for monarch conservation. All organizations, agencies, and individuals must work together to improve, restore, and create grassland habitats to save monarchs.

No matter who you are or where you live, you can get involved today. Start by planting milkweed and nectar plants that are native to your area. Garden organically to minimize your impacts on monarchs, their food plants, and other pollinators. Become a citizen scientist and monitor monarchs in your area. Educate others about pollinators, conservation, and how they can help.

# Pollinators

This text is from the U.S. Fish & Wildlife Service.



These hard-working animals help pollinate over 75% of our flowering plants, and nearly 75% of our crops. Often we may not notice the hummingbirds, bats, bees, beetles, butterflies, and flies that carry pollen from one plant to another as they collect nectar. Yet without them, wildlife would have fewer nutritious berries and seeds, and we would miss many fruits, vegetables, and nuts, like blueberries, squash, and almonds ... not to mention chocolate and coffee ... all of which depend on pollinators.

[...]

## HOW YOU CAN HELP

Pollinators need your help! There is increasing evidence that many pollinators are in decline. However, there are some simple things you can do at home to encourage pollinator diversity and abundance.

1. Plant a Pollinator Garden
2. Provide Nesting Sites
3. Avoid or Limit Pesticide Use

## WHY POLLINATORS ARE IMPORTANT

Pollinators, such as most bees and some birds, bats, and other insects, play a crucial role in flowering plant reproduction and in the production of most fruits and vegetables.

Examples of crops that are pollinated include apples, squash, and almonds. Without the assistance of pollinators, most plants cannot produce fruits and seeds. The fruits and seeds of flowering plants are an important food source for people and wildlife. Some of the seeds that are not eaten will eventually produce new plants, helping to maintain the plant population.

In the United States pollination by honey bees directly or indirectly (e.g., pollination required to produce seeds for the crop) contributed to over \$19 billion of crops in 2010. Pollination by other insect



pollinators contributed to nearly \$10 billion of crops in 2010.

A recent study of the status of pollinators in North America by the National Academy of Sciences found that populations of honey bees (which are not native to North America) and some wild pollinators are declining. Declines in wild pollinators may be a result of habitat loss and degradation, while declines in managed bees is linked to disease (introduced parasites and pathogens).

## **WHAT IS POLLINATION?**

Pollination results when the pollen from the male part of the flower (stamen) is moved to the female part of the same or another flower (stigma) and fertilizes it, resulting in the production of fruits and seeds. Some flowers rely on the wind to move pollen, while [other flowers] rely on animals to move pollen.

Animals visit flowers in search of food and sometimes even mates, shelter, and nest-building materials. Some animals, such as many bees, intentionally collect pollen, while others, such as many butterflies and birds, move pollen incidentally because the pollen sticks on their body while they are collecting nectar from the flowers. All of these animals are considered pollinators.

# How to Build a Pollinator Garden

This text is from the U.S. Fish & Wildlife Service.



Courtney Celley/USFWS

*Pollinator garden in Minneapolis, Minnesota. Creating habitat, no matter the size, is helpful for monarchs and pollinators.*

Monarch butterflies and pollinators are in trouble. You can help by planting a pollinator garden! You can plant a garden anywhere - your yard, school, church, business, or even in a pot for your front steps.

A simple, native flower garden will attract beautiful butterflies to your yard and help pollinators stay healthy. In addition to nectar from flowers, monarch butterflies need milkweed to survive, so if you notice the leaves on your milkweed have been chomped, don't worry, it's a great sign!



Joanna Gilkeson/USFWS

*Despite its namesake, milkweed is not a weed. These beautiful wildflowers are the only source of food for monarch caterpillars and essential for their survival. Plant milkweed that is native to your area, and attract all kinds of pollinators.*

## Before gardening

Gather your supplies, and research what varieties of milkweed and wildflowers are native to your area. You can also look up pollinator-friendly plant lists for your region. If you're starting from seeds, find a local seed supplier.

## What you'll need

- A yard, raised bed, or some flower pots
- Garden tools to break the soil or build a raised bed
- Extra dirt and mulch
- Native milkweed and nectar plants

## Seven easy steps

- 1. Choose your location:** Butterflies enjoy basking in the sun. Gardens should be planted in sunny spots, with some protection from the wind.
- 2. Take a look at your soil:** Break ground to see the consistency of the soil in your yard. Soil may influence the kinds of plants you can grow, or may require special considerations. If you find that your soil type doesn't match the plants you'd like to plant, you might consider building a raised bed or using flower pots.
- 3. Prep your soil:** If you're planting in your yard, remove the lawn and current plant cover and rake the soil. Additional dirt can be helpful no matter the location and is necessary for raised beds and flower pots - add your soil to the bed or pot.



4. Jim Hudgins/USFWS

*Native wildflower gardens add a pop of color to your garden, help bumblebees and butterflies, and need less maintenance. This purple coneflower attracted both bumblebees and a crab spider! What's not to love?*

**Choose your plants:** Find a nursery near you that sells native and local plants and milkweed for your area. Native plants are the ideal choice because they require less maintenance and tend to be heartier.

1. Choose plants that have not been treated with pesticides, insecticides, or neonicotinoids.
  2. Plant perennials to ensure your plants come back each year and don't require a lot of maintenance.
  3. Choose a diversity of plants that bloom throughout the seasons to ensure pollinators benefit in the spring, summer, and fall. This will also ensure that your garden is bright and colorful for months!
- 5. [Choose] seeds or small plants:** Small plants that have already started growing in a nursery are simple and show instant return on pollinator visits, especially if you are planting in a small space. Seeds are best if you have more time. If you'd like to use seeds, plan ahead to plant in spring or fall, giving the seeds time to germinate. Seeds can also be best if you are doing a very large garden as they tend to cost less. Remember to water your seeds even before you see plants.
- 6. Plant your flowers and milkweed:** For small plants, dig holes just big enough for the root system. Cover the roots with dirt, and reinforce with dirt or straw mulch to reduce weed growth. For seeding, spread seeds across your freshly prepared garden, and cover them with dirt. Consider adding some flat rocks so butterflies can bask in the sun!
- 7. Wait, watch, water, and weed your garden:** It may take some time, but you will eventually see butterflies and other pollinators enjoying your garden. Make sure to weed and water your garden to keep it healthy.

Best of luck, and thank you for helping monarchs, bumble bees, and other pollinators!

# The Mexican Long-Nosed Bat

This text is from the U.S. Fish & Wildlife Service.



*the Mexican long-nosed bat*

The Mexican long-nosed bat, first discovered in 1937, is primarily found in Mexico, but also lives in the southern part of the United States (Texas and New Mexico), and is relatively larger in comparison to other bat species. If you happen to be in an area where they live, the Mexican [l]ong-nosed bat can be identified by its dark gray to dusky brown color. Additional features include a long muzzle with a prominent nose leaf (small fold of skin) at the tip, a long three-inch tongue, and a small tail that may appear to be missing.

These bats are found in desert scrub vegetation covered with century plants (agaves), mesquite, creosote bush, and a variety of cacti, which serves as their primary food source. While the population status of the Mexican long-nosed bat is uncertain, there are strong indications that they are declining. The largest reported population of Mexican long-nosed bats in the United States is in Texas in and around Big Bend National Park.

The feeding ecology of the Mexican long-nosed bat is of great importance in understanding its life history and recent decline. The bats are considered an important pollinator for century plants, because they have developed a mutualistic relationship with one another. The bats' migration from northern Mexico to Texas coincides with the blooming of the plants from June through August.

As the Mexican long-nosed bats move along their migratory path, they are attracted to large quantities of nectar that are present in century plants. In flight, the bats hover over the plants, while using their long tongues to drink the nectar. Their tongues become coated with pollen grains that stick to their fur, thus transferring the pollen as they move from one plant to another to feed. The century plant needs this cross-fertilization to produce fruit and viable seeds for more century plants.

In 1988, the Mexican long-nosed bat was listed as endangered by the U.S. Fish and Wildlife Service. Some of the factors that contributed to the listing include harvesting of agaves for the production of liquor, limited growth and lifespan of the agave plants, frequent wildfires, and the clearing of rangeland areas in northern Mexico. The clearing of rangeland reduces the food supply, which affects the bat population.

# The Lesser Long-Nosed Bat

This text is from the U.S. Fish & Wildlife Service.



Bill Radke/USFWS

*the lesser long-nosed bat (Leptonycteris curasoae yerbabuena)*

[The lesser long-nosed bat] (*Leptonycteris curasoae yerbabuena*) is a medium-sized, migratory nectar bat native to the [southwestern] United States and northern Mexico. It has an extensive range, spanning southeastern Arizona through southwestern New Mexico in the United States, and moving south into Mexico for the winter months. The lesser long-nosed bat is yellow-brown or cinnamon gray and is about three inches (8 cm) long. The tongue measures approximately the same length as the body and provides access to the nectar of deep desert flowers. This species also has a small noseleaf on the tip of its nose. A "noseleaf" is a small flap of tissue shaped like a leaf growing out of the top of the nose. The wingspan of the lesser long-nosed bat is approximately 10 inches long. These bats can live for about 12 years.



George Gentry/USFWS

*habitat of the lesser long-nosed bat, showing  
Saguaro cacti*

Lesser long-nosed bats are nectar feeders and important pollinators for their nectar plants. In the United States, this includes agaves, saguaro, and organ pipe cacti. As the bats approach the host plant flowers, they use their long, extendable tongue to gather nectar, [which is] stored at the bottom of the flower. In the process, the bat's face and neck fur become covered with pollen that it unwittingly transports to other flowers it visits, resulting in cross-pollination. Like other nectar feeders, lesser long-nosed bats may either hover at, or land on, flowering stalks to feed. Although nectar, pollen, and insects are consumed, fruits, especially fruits of the columnar cacti, are also eaten after the flowering season, and these bats are also important seed dispersers for these cacti species. Lesser long-nosed bats are also opportunistic feeders at hummingbird feeders because of the loss of habitat and other food sources. The loss of habitat and other food sources is mainly due to human development and increased fire due to invasive non-native species and changes in the amount and timing of precipitation.

The lesser long-nosed bat is found in a variety of vegetation communities including desert scrub, desert grasslands, Madrean oak woodlands, thorn scrub, and tropical deciduous forests supporting agaves, saguaro and organ pipe cacti, and flowering trees; their primary food source. Female lesser long-nosed bats migrate north, following the blooming desert flowers in the spring, into southwestern Arizona to give birth. Roosts are typically within caves and mines, offering darkness and protection. The adult males tend to roost in different locations than the adult females and babies, often remaining in Mexico. Day roost sites include caves and abandoned mines, and night roosts range from these same caves and mines to buildings, bridges, and trees.

# Overwintering Monarchs

This text is from the U.S. Fish & Wildlife Service.

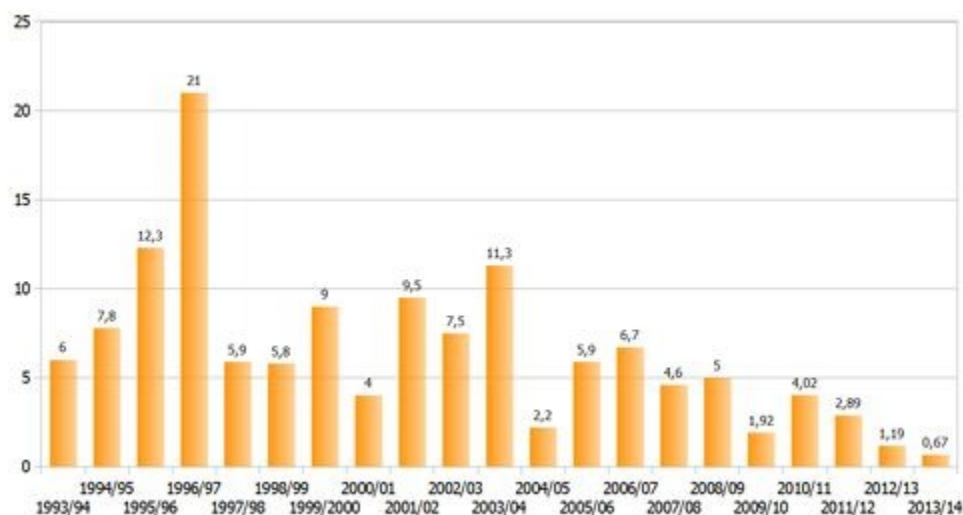
After a phenomenal two-month-long migration from the United States and southern Canada, beginning in August, the North American monarch butterfly reaches Mexico, where it spends the winter months.

The monarchs cluster in Mexico's rare oyamel fir forests, occasionally taking shelter in pines and other trees. The oyamel trees provide much needed refuge and protect the butterflies from extreme temperatures, rain, snow, and predators. As temperatures drop over the winter, monarch movement decreases, and the butterflies form large, dense clusters on oyamel branches, coloring the forest orange.

By mid-December, monarchs have settled into their overwintering homes. With colder temperatures, monarchs gather in several predictable areas, with little movement[.] This is when the overwintering count takes place. The monarch population is estimated by the total area they occupy in the overwintering grounds, and has been conducted by the World Wildlife Fund and the Mexican National Commission of Protected Natural Areas since the winter of 2004-05.

Mexico established the Monarch Butterfly Biosphere Reserve in 1980 to protect the monarch's mountainous home. Just over 60 miles from Mexico City, the 138,000-acre reserve is sectioned off into several sanctuaries that provide winter refuge to the millions of monarchs who migrate to Mexico each fall. From roughly late October through February, monarchs live in the forested mountains of Mexico, where temperatures are mild enough for survival. This habitat is only found on 12 mountaintops on the planet, and is essential to the persistence of the monarch and its migration.

## [S]tatus of the monarch population [in 2016]



*overwintering area of the monarch butterfly (y-axis=total area of forest that monarchs occupy (hectares); x-axis=winter season)*

The 2015-16 monarch butterfly population estimates reflect a 255% increase in the area occupied by



monarchs in the overwintering habitat since [the previous] year. Overwintering monarch butterflies occupied approximately 10 acres of habitat in Mexico [the winter of 2015-16] compared to [the previous] year's estimate of 2.8 acres. This is great news, but more work is needed to restore the eastern population of monarchs.

To provide some context, in the winter of 2013-14, experts reported the lowest monarch population on record with an occupied 1.66 acres of overwintering habitat. In 1996-97, monarch populations peaked with estimates reporting more than one billion monarchs occupying 44.5 acres of habitat.

## **You can help!**

You can help monarchs as they prepare to migrate between Mexico, the U.S., [and] Canada each year by planting native milkweed and wildflowers. Avoid tropical milkweed, and delay mowing during times of peak monarch activity in your area. Everyone and every little bit of habitat can help. The more monarchs we have, the better they can withstand extreme weather and climate events.

# Letters from the Past

by ReadWorks

In the muggy heat of late July in Washington, D.C., it is easy to remember that our nation's capital is built on top of a swamp. The temperature and the humidity battle each other to see which can reach 100 first. Business people suffer through their commutes, red-faced and moist from the heat, dripping with sweat that stubbornly refuses to evaporate. Jamal and Lisa were familiar with the D.C. heat waves. Every summer they came to stay with their grandmother for the month of July. Every summer the heat was miserable. This summer was no exception.

Jamal lay on the screened-in porch, his body draped over a chair. He held a glass of sweet tea to his forehead, trying to absorb some of the cool. It was early afternoon, and his grandmother had lain down for her daily nap. The heat in the middle of the day gave her migraines, and she had learned that sleep was the best escape.

"Jamal! Jamal!" said Lisa, trying to get his attention.

"What?" he asked, irritated at the interruption.

"I'm going to sort out the attic. Want to come?" she asked, unperturbed. Lisa was two years younger than Jamal and was used to being blown off.

"You're crazy," Jamal said. "It's got to be 100 degrees up there, not to mention that it's dusty and full of spiders and who knows what else."

"Grandma said that if we see anything we want up there, we can keep it," said Lisa.

"What makes you think I want any of that old junk?" asked Jamal.

"Suit yourself," said Lisa. She went to the bedroom to change into old clothes that could get covered in sweat, dust, and possibly dead spiders.

Up in the attic, Lisa began to see Jamal's point. The heat in the house rose upwards, only to be trapped in the small attic. Everything was covered in a fine layer of dust, mummified by the passing of time and inattention.

Lisa thought briefly about turning around and heading downstairs, spending the rest of the day lounging on the porch with Jamal. Maybe they would play a game or find a movie on the television. But something pushed her to investigate the attic further. A tingling in her body suggested that in these dusty boxes stacked against the walls something important was waiting for her.

As Lisa began going through the boxes, she realized that no one had touched them for years. The first boxes held memorabilia from her grandparents' youth: old family photographs that had turned yellow around the edges, diplomas from high school and college, even pictures of a pet pig that one of her grandmother's sisters had kept for several years. Lisa came across a picture of a pretty girl with "Maud" written across the bottom. She stared at the photograph. Maud was her grandmother, and it was hard to believe that the wrinkled woman downstairs had been this laughing, vivacious girl.

She sorted through the boxes, labeling them more clearly and throwing out anything that seemed useless. After a couple of hours, Lisa's back ached, and her shirt was drenched.

"Lisa, honey!" she heard her grandmother call. "Come take a break and have some tea."

Lisa went downstairs and took the picture with her. "Grandma, is this really you?"

Her grandmother laughed. "What, you can't believe it? Yes, that's me; that was taken at my homecoming almost sixty years ago."

"You were beautiful, Grandma," said Lisa admiringly.

"You'd be surprised, Lisa," her grandmother responded. "Adults, all of us, were once young and irresponsible like you."

"I don't think Mom was ever like that..." said Lisa. She couldn't imagine her stern, hardworking mother doing anything remotely irresponsible. Her mother held the family together and took care of Lisa and Jamal. But no one would ever call her the life of a party.

"Your mother..." her grandmother's voice trailed off as she carefully chose her words. "When your father died in the service, your mother was still just a girl herself. You were a baby, and Jamal was only two. She had to grow up real fast. She loves you two so much, and that's why she's so strict."

Lisa nodded. She knew her grandmother was right. She just wished that she could see a glimpse of the fun-loving, carefree woman her mother had once been. Lisa finished her tea, thanked her grandmother, and turned to go back upstairs.

"Lisa," her grandmother called, as Lisa climbed the stairs. "There's a box of your parents' things in the corner up there. Maybe it will help you understand better."

Lisa looked through several of the boxes before she found the one her grandmother had mentioned. It was smaller than the others, with "Laura," her mother's name, written on it in cursive. When she opened the box, she found a pack of old letters, tied together with a faded blue ribbon.

Opening the first letter, she skimmed through until she saw the signature: Daryl. These were love letters between her father and her mother. Lisa's father had been in the army when he'd first met her mother, and had written her from every duty station. Lisa read through the letters voraciously. Her mother was witty and charming in the letters, teasing Daryl and citing inside jokes they had. It was a side of her mother that Lisa had never before seen. She was so full of hope, so optimistic about the life that they would have together when he returned.

Lisa took the packet of letters downstairs to the den, where her grandmother was watching TV. She curled up almost in her grandmother's lap, even though she was too old to be doing that anymore. Her grandmother put her arm around Lisa and began to stroke her hair.

"Grandma?" Lisa asked. "Will it be okay with Mom that I read the letters?"

"Oh, honey," said her grandmother. "She was the one who asked me to show them to you."

# A History of Salt-Baking

by Caitlyn Meagher



Stijn Nieuwendijk on Flickr

*a salt-crusted fish*

Salt-baking is a cooking method that involves covering fish, meat, or vegetables with large amounts of salt and baking it. Egg whites or water are often added to bind the salt to the food. While baking, the salt forms a crust over the food and insulates it. The salt crust ensures that the food cooks evenly and doesn't lose any of its moisture. After baking, the salt crust is cracked open and discarded, revealing the tender food inside. Different cultures around the world have played a part in the long history of salt-baking.

One of the earliest known recipes using this technique comes from Ancient Greece in the 4th century B.C.E. This recipe was found in fragments of Arcestratus' poem, *Life Of Luxury*. Arcestratus was a Greek living in Sicily. The poem fragments reveal information about simple Greek cooking methods used at the time. One of the methods involved baking white fish in a mixture of salt, water, and egg whites. The salt crust was removed after baking and olive oil was drizzled on top to serve. This simple recipe illustrates the long history of salt-baking in Mediterranean cuisine.

Recipes that rely on salt-baking can also be traced to the Hakka people in China. The Hakka people are a Chinese ethnic group whose history involves many migrations. During the 4th and 9th centuries, the Hakka people moved southward from the Huang He valley in northern China, most likely to escape warfare and famine. These migrations were difficult and strenuous. One way to preserve food on this journey was salt. Salt became a very important part of their cuisine. After many difficult migrations, most of the Hakka people settled in southern China. They had to adapt to their new environment for survival. Many Hakka became skilled farmers and were able to grow their own food. Domestic livestock such as chicken became an important food source. To keep up their strength, the Hakka people ate dishes high in protein and calories. One of these dishes was salt-baked chicken.

The Hakka did not have ovens, so they had to be resourceful. They would bury the chicken in a pit, covering it with hot salt and rocks. The salt around the chicken would keep the flesh moist. This recipe remains popular today. Instead of using a pit in the ground to bake the chicken, the Hakka now use a clay pot filled with hot salt. They wrap the chicken in paper and place it in the pot, covered with salt, to cook with low heat. This is still quite a popular dish in Guangdong, a coastal region in southeast China where many Hakka still live.

Countries around the world have their own relationship to salt-baking. In Thailand, salt-crusted fish is first stuffed with lemongrass for added flavor. In Colombia, beef tenderloin is baked in a salt crust. France, Portugal, and Spain also have their own spin on this technique. Salt-baking continues to be a time-honored tradition in many parts of the world, creating tender, flavorful dishes enjoyed by many.

# Brazil's Celebratory Stew: Barreado

by Caitlyn Meagher



Kevinklop at Dutch Wikipedia

*barreado*

Clay pottery is one of the oldest human inventions. In ancient times, clay pots were used to transport and hold liquids. Later on, more durable clay pots were created and used as cookware. Instead of grilling food over an open fire, people used earthenware pots for their cooking. This revolution in cooking reduced bacteria in food. It also increased the nutrients in food, since less of the fat and vitamins escaped from the contained pot. Although metal pots are more popular today, clay pots are still used in many different cuisines. They help ensure that food cooks evenly, and they keep food hot for long periods of time. In Brazil, a popular dish using a clay pot is called barreado. Barreado is a beef stew cooked in a clay pot for 12 to 20 hours.

Barreado's origins are linked to the Azores, a Portuguese archipelago in the Atlantic Ocean. This dish was first created there about 300 years ago. Instead of using a wood fire to cook the dish, people in the Azores used an underground pit and let volcanic steam in the ground cook the meat over many hours. At first, people wrapped the meat in a sack and placed it in the pit, but all the juices escaped during cooking and the meat was quite dry. They then began putting the meat in clay pots to keep its moisture. The Portuguese arrived in the 18th century to the coast of Paraná, Brazil. They brought this recipe with them. In Paraná, people used underground ovens covered in embers to create barreado. More recently, wood fires were used to slow-cook the dish. The clay pot was traditionally sealed with a ring of dough made from a mixture of manioc flour, ash and water. In fact, barreado means "covered in mud" in Portuguese, referring to the way the lid pot is sealed.

Today, barreado is a delicacy that is often cooked during Carnival. Carnival is a large celebration of

parades, music, and festivities. It occurs a few days before the beginning of Lent, the 40-day period before the Christian holiday Easter. Carnival is a time for Brazilians to celebrate community and honor their cultural backgrounds. Barreado is a perfect dish for this type of celebration because it does not take a lot of preparation and can be left for many hours untouched. The lid of the pot is sealed, and it is only opened when it is ready to serve. It can also be reheated many times, and it retains its original flavor, making it a perfect dish for a multiple-day celebration.

Barreado is made from beef and various ingredients. People add onions, garlic, black pepper, fried bacon, bay leaves and cumin. After many hours of cooking, the beef is falling apart and tender. The traditional way of serving barreado is to add dry manioc flour into a bowl and mix it with some of the liquid from the barreado stew. This creates a gravy called *pirão*. Then, people add the barreado meat and top it with banana slices. The dish is often served with a side of white rice. The finished dish is a combination of rich, savory flavors and a hint of sweetness from the banana. It is loved by locals and visitors alike!

# Preparing Zarb, Bedouin Barbecue

by Caitlyn Meagher



by [\[unintelligible\]](#) on Wikimedia

*a modern metal grill plate for cooking zarb*

When you think of an oven, what do you picture? Are you thinking about an oven you might find in an apartment in a U.S. city? How about a blazing hot brick oven, where someone might make a delicious pizza pie? Or a tandoor, used to create delicious dishes in Central, South, and West Asia? One kind of oven that's been used across the world is an earth oven, or an underground cooking pit. This kind of oven doesn't require much equipment to bake or steam food. Underground cooking pits, or earth ovens, have been used in many different cultures to bake or steam food without requiring much equipment.

To this day, communities across the globe use cooking pits for celebratory or ceremonial purposes. Bedouins are one of these communities. Bedouins are historically Arabic-speaking semi-nomadic peoples who live in the deserts of North Africa, the Arabian Peninsula, and Jordan. Some Bedouins also live in Israel, Egypt, Iraq and Syria.

The word "bedouin" comes from the Arabic word *bedu*, meaning "desert dweller." Bedouins traditionally moved from place to place in the deserts of North Africa and the Arabian Peninsula. Many



Bedouins would raise livestock such as camels, sheep, or goats to make a living. They used these animals for dairy products and clothing. Bedouins would migrate to the desert during the rainy winter season to find food for their animals. Some Bedouins continue this practice today. In the desert, Bedouin tribes must be quite resourceful. They use camel or goat hair to create shelters. They eat dates from palm trees and make yoghurt and butter from camel or goat milk. They also dig holes in the sand to create cooking pits, or earth ovens. The particular cooking technique they use with these earth ovens is called *zarb*. *Zarb* also refers to the food cooked inside of the earth oven. Bedouins thousands of years ago created this form of cooking for practical reasons. They were making the most of the resources around them and their demanding schedules as herders. Because of the intense heat in the desert, most herders would take their animals out to graze early in the morning. Then, they would come back to their tents during the hottest part of the day for shelter. They would take their animals to graze again in the afternoon. This meant that the Bedouin had to find a way to cook a meal during the day that would be waiting for them when they returned home in the evening. Slow-cooking meat in a covered oven was one answer to this problem.

The traditional way of making *zarb* involves the use of wood, palm leaves, and a large stone. First, Bedouins would dig a large hole in the sand. They would make sure to create rounded walls to keep the sand from falling on the food. Next, Bedouins would light a fire in the hole and let the wood burn down until it turned to coals. Meat (such as goat or lamb) and vegetables were then wrapped in palm leaves and placed on the coals. Bedouins would then cover the hole with a large stone, clay or branches to keep out any sand. Inside the sand pit, food would cook for a few hours. After that, it would be time to take the food out of the oven and eat it together as a group.

The modern way *zarb* is prepared hasn't changed much since ancient times. Now, Bedouins and chefs use metal grill plates with three tiers to hold the meat and vegetables over the hot coals. People place rice on the bottom tier so the juices from the meat drip down to flavor the rice. The meat and vegetables are placed on the two top tiers. Instead of palm leaves, people use tin foil to cover the food. Dips and salads accompany the meat, rice, and vegetables. Large groups of families and friends eat together and enjoy this feast.

Although many Bedouins are no longer nomadic, they still often use this cooking technique for large feasts. Bedouins are known for their hospitality. They welcome guests to partake in these meals. This traditional meal is very popular in many Middle Eastern countries. In fact, one fast food restaurant in Amman, Jordan, uses underground ovens! Nabil Haddad owns "Shawerma Zarb" and has helped bring Bedouin culture to the city. His restaurant is committed to honoring Bedouin traditions, like *zarb*, and serving the community. At the restaurant, strangers eat together at a long table to connect with each other, honoring the Bedouin tradition of welcoming strangers into their community.

# Cooking with Banana Leaves

by Caitlyn Meagher



sarunya from Pixabay

*parcels of sticky rice wrapped in banana leaves*

Cooking with banana leaves is a popular technique that has been used for thousands of years in Asia, Africa, and Latin America. Before the invention of aluminum foil and refrigeration, people cooked and wrapped food in banana leaves to keep it from spoiling. Now, people use banana leaves to steam, boil, bake, and grill foods. The benefits of banana leaves are numerous. Wrapping food in a banana leaf while cooking protects the food from burning over an open fire. Banana leaf wraps also trap steam from the food as it cooks, keeping the food tender and adding a distinct, earthy flavor to the dish. Although the leaves themselves are inedible, they give off antioxidants that are absorbed by the food in the cooking process. After cooking, banana leaves are used to serve and present many dishes. Some people line their plates with banana leaves or wrap desserts in banana leaf parcels. Banana leaves are also woven to create bowls for certain dishes. It is no wonder why many cultures around the world make use of this versatile cooking tool!

People in many African countries use banana leaves in a variety of ways. In central African cuisine, fish and other types of meat are wrapped in banana leaves and steamed in a pot or roasted on a grill. For instance, *Liboke de Poisson* is a dish that involves marinating a whole fish in spices and wrapping it in banana leaves. This fish is then grilled, steamed or baked. A popular dish in Uganda is *matoke*. Matoke refers to plantains, or unripe green bananas. Matoke is the national dish of Uganda, since plantains are quite prevalent throughout the country. For the dish, the plantains are steamed in banana leaves until tender. Then, they are mashed and often served with meat.



whologwhy on Wikimedia

*Bibingka rice cakes*

People in many Asian countries also make use of the banana leaf when preparing desserts and savory dishes. In Vietnam, *Banh Gio* are pork dumplings with mushrooms and pork. These dumplings are steamed inside banana leaves. In the Philippines, banana leaves act as cake holders for *bibingka*, a type of coconut rice cake. These cakes are prepared in special clay ovens and sold around the Christmas season. Many different types of Southeast Asian desserts are wrapped and steamed in banana leaves.

Many countries in Latin America and the Caribbean also grow banana trees and use the leaves for cooking. One popular dish that makes use of banana leaves is the tamal. Tamales are a popular food item in many Latin American countries. They are a full meal that can be eaten on the go. The outer layer of a tamal is made from a mixture of corn dough, broth, lard, and seasonings. These ingredients form a soft dough. The tamale filling often is made of slow-cooked meat, vegetables, cheeses, or dried fruits. These dough pockets are steamed in either corn husks or banana leaves and served with the wrappers. They are enjoyed throughout Latin America and have become popular worldwide.

Banana leaves are used around the world to create and serve delicious dishes. Have you ever had food cooked in a banana leaf?

# Dessert in Thailand: Khao Lam

by Caitlyn Meagher



by Renaudsechet on Wikimedia

*Khao lam in a bamboo tube*

Rice has been an essential part of Southeast Asian cuisine for thousands of years. It is a staple ingredient in the cuisine and a rich source of carbohydrates. Rice production is also an important source of income for many people living in Southeast Asia.

One type of rice that is extremely popular in many parts of Asia, including Southeast Asia, is sticky rice. Sticky rice is exactly what it sounds like -- a type of rice that's sticky when steamed! Sticky rice is used as the base for many sweet and savory dishes, including the Thai dessert *khao lam*. Khao means "rice" in Thai and Lao. The original version of khao lam comes from northern Thailand, where sticky rice is prevalent. The simplest form of this dessert uses only sticky rice mixed with water and salt. However, most people make khao lam with coconut milk, grated coconut, sugar, and red beans. This dessert is made using another popular and versatile plant found in many parts of Southeast Asia: bamboo.



by shankar s. on Flickr

*a woman selling khao lam*

People making khao lam cut and wash sections of bamboo. Then, they mix uncooked white or dark purple sticky rice with the other ingredients and place this mixture inside the hollow bamboo. Coconut milk is added to the rice mixture. Traditionally, the end of the bamboo is plugged with a piece of coconut husk or a banana leaf. This helps steam the rice inside the bamboo during the cooking process. The bamboo used for khao lam has thin walls that allow heat to cook the rice inside of it. The bamboo tubes are placed upright in a slanted position over hot coals. The bamboo is cooked anywhere from three to eight hours. As the rice steams inside the bamboo, the coconut cream rises to the top, creating a sweet custard. The bottom of khao lam is less sweet and drier. When the cooking is done, the outer skin of the bamboo is cut with a knife, leaving only a thin layer of bamboo skin. People pry apart this layer of bamboo with their fingers to get to the delicious dessert inside.

Residents of the Chachoengsao province in Thailand use khao lam as a part of a sacred Buddhist tradition. This tradition is called Makha Bucha Day, and it occurs every year on the full moon of the third lunar month. People join together to roast lots of khao lam. This tradition was originally observed to give thanks to the harvest. On a Rayong mountaintop, there is an important relic of Buddha's footprint. Locals would trek up the mountain to worship this relic. Khao lam was a food of choice because it was filling and energizing to those walking up the mountain. People would roast the khao lam one day before this festival.

Khao lam is also used to "make merit" as part of Makha Bucha Day. Making merit is an important Buddhist practice where people donate food or money to Buddhist temples and do good deeds for others. Khao lam is handed out at neighborhood temples and offered to Buddhist monks. This day continues to be an important tradition that brings the community together and encourages people in this area to visit their local temples.

Khao lam can be found in many countries across Southeast Asia, including Cambodia and Laos. In Vietnam, *com lam*, or "bamboo cooked rice," is a dish quite similar to khao lam. Khao lam's sweet taste and soft texture make it an extremely popular and filling dessert in many Southeast Asian countries.

# The National Dish of Peru: Ceviche

by Caitlyn Meagher



by Aldana Malpartida from Pixabay

*Peruvian ceviche*

Ceviche is a seafood dish that most likely originated in Peru. This tasty dish is Peru's national dish, but it is also popular across the globe. The basic ingredients in ceviche are fresh fish, citrus juice, and salt, but there are many recipe variations.

How do you make ceviche? You may be surprised to learn that making this dish does not require a stove or an oven. Rather, acids like lime and bitter orange juice are used to "cook" the fish. How does this work? It has to do with the proteins in fish. Proteins are large, complex molecules held together by bonds. These molecules twist and fold in on themselves like a wad of rubber bands. When proteins are exposed to heat or acid, the molecules get rearranged and their structure is forever changed. This process is called protein denaturation. Normally, people use heat to denature proteins in food. However, fish are made up of very delicate proteins. These proteins are so fragile that soaking the fish in a strong acid causes the proteins to break down in a similar way to how they would if the fish were cooked with heat. After the fish sits in this acid marinade, the texture of the fish is similar to a traditionally cooked fish.

The perfect ceviche fish texture is firm on the outside and tender on the inside. How do you get this perfect texture? It is all about timing. If the fish sits too long in the citrus marinade, it may come out tasting dry and chalky. If it sits for too short a time, the fish may still be completely raw. Usually, people marinate the fish anywhere from 5 to 30 minutes.

A basic Peruvian ceviche recipe usually includes fresh white fish or shellfish, lime or bitter orange juice, hot chiles and thinly sliced red onions. This dish is usually served with corn on the cob, sweet potatoes, and toasted corn nuts called "canchas." A common way of presenting the ceviche is serving it in a bowl with the marinade used to "cook" the fish. This marinade is called "leche de tigre," or tiger's milk. People eat the marinade with something crunchy, like plantain chips. Other recipes involve adding fresh herbs, coconut milk, garlic or different peppers.

Ceviche has been made for hundreds, and possibly even thousands of years. Many different civilizations contributed to the creation of ceviche. Although the origins of ceviche are not fully known, one theory is that this seafood dish was created by the Moche civilization about 2,000 years ago. The Moche people lived on the northern coast of modern-day Peru. Fishing was a large part of their lifestyle. The Moche people marinated fresh seafood using fermented Tumbo passionfruit juice. Later on, Incas in Peru marinated fish using a fermented corn beverage called *chicha*. When Spanish colonizers arrived in Peru in 1526, they brought citrus fruits. These fruits were used in ceviche preparation.

As time went on, many Peruvians added their own spins to create unique versions of ceviche. Today, there are thousands of different ceviche recipes enjoyed all around the world. Even within Peru, different regions have their own takes on this classic dish. Peru has plenty of *cevicherias* (ceviche restaurants) that serve different versions of this special dish. Have you tried ceviche?

# Across the Lake

by W.M. Akers



"What do you think's over there?" asked Bart.

"What do you mean?" said Patsy.

"On the other side of the lake. What do you think is over there?"

Patsy and Bart were sister and brother-twelve and eight years old. They were on vacation, but Patsy was bored out of her mind. Ever since Bart was born, their family had been coming to Lake Wenatchee, a crystal blue sheet which stretched as far as the eye could see. Ever since Bart was born, they had stayed in the same cabin, a musty old wreck just steps from where the water met the gritty beach. And ever since Patsy was 10, she had hated coming here.

The mosquitoes got bigger every year. By now they were larger, it seemed, than her fist. The humidity got worse, and the rain became more constant. If this is what people meant by climate change, she thought, she was opposed to it. She spent most of the day reading in bed, stretched out on the scratchy blanket on the rock-hard mattress, wishing she was at home with her friends doing normal summer stuff: going to the mall, watching movies, eating popsicles in the park. She wished she was anywhere but Lake Wenatchee.

But there was nowhere else Bart wanted to be. He didn't mind the humidity, he found the constant rain soothing, and thought the giant mosquitoes were the most amazing animals he had ever seen. He didn't have time for reading on a scratchy blanket because he was in love with the lake. As soon as dawn broke, he was on its shore-building gritty sand castles from the gritty sand. He imitated the birds, trying to get their attention. He crept up on geckos, hoping they would want to play. He threw rocks in the water doing everything he could to entertain the fish. Bart loved nature-even if the towering mosquito bites that dotted his arms and legs were proof that nature didn't love him back.

"I bet the other side of the lake is even better than this side," he said.



Trying to act interested, Patsy said, "What makes you say that?"

"It's tough to believe, I know, because this side is so unbelievably super perfect. There are birds and lizards and mosquitoes and fish. But something in my gut tells me that it's even better over there."

The summer before, Patsy and her mother had driven to the other side of the lake to buy shampoo at the drugstore. The other side of the lake was nothing too exciting: strip malls and gas stations, with a shopping mall in the middle. But before she told Bart the truth, she wanted to know what he was imagining. It would be more fun to burst his bubble that way.

"Describe it to me," she said. "Tell me everything that's on the other side of the lake."

"Fish, obviously. But much bigger ones, I bet. The kind we saw at the natural history museum last year-like the super-underwater kind that have the little lamp hanging in front of their eyes. I bet there's a whole bunch of those. And birds, too-obviously-but great big huge ones. Not just seagulls and stuff-falcons, hawks, and snowy owls."

"And bald eagles, too, I bet."

"Tons of them."

"Do you know what they call a group of eagles?"

"I don't know...a flock?"

"A convocation."

"No way."

"It's true! I learned it in science class last year."

"So if I went to the other side of the lake, I'd see a convocation of eagles?"

"And I bet that's not all you'd see. What else?"

"Uh...I don't know." Bart tossed a rock into the lake and watched the ripples drift slowly to the dock. He was appearing to lose interest.

"Come on, Bart! Let your imagination run wild. Anything in the world could be over there. So what do you want to see?"

"Well, uh...an ice cream store."

"What *kind* of ice cream store? The best one in the world?"

"Definitely."

"What makes it the best one in the world?"

"Well, uh-all the ice cream costs 25 cents. And if you ask for a free sample, they give you a whole scoop. And they have all kinds of crazy flavors, like butternut peanut butter walnut, and triple chocolate marshmallow fluff surprise."

"Triple chocolate marshmallow fluff surprise? What's the surprise?"

"More marshmallow."

Patsy felt her stomach give a rumble. "Huh. That actually sounds really good."

"Of course. And next to the ice cream store is a roller coaster park."

"And all the roller coasters are free?"

"Yep. And each one has a double loop-the-loop."

"You'd better ride that before you go to the ice cream store, not after."

"Good point." Bart trailed off again, distracted by a snail. Patsy found herself strangely impatient. She wanted to know what else was on the other side of the lake.

"Is there anything that I will like?"

"You like ice cream."

"Yeah, but what else?"

"Uh, I don't know. I guess there's probably a movie theater and stuff."

"But I can see movies at home. What's over there that's special?"

"There's a clothing store where they give you five free outfits, just for coming in the door. And all the clothes fit you perfectly, and the sales ladies are never mean to us, just because we're kids."

"Oh man, that sounds great."

"Yeah! And..." Bart tried to remember what else his sister liked. "There's a place where you can get free notebooks for school!"

"Really?"

"The really expensive kind, with the heavy paper and colorful covers and stuff. And you can have all the fancy pens you want!"

"That does sound nice..."

"Wait a minute! Didn't you and Mom go over there last year? To buy shampoo or something?"

"Yeah."

"Well, what was it like?"

Patsy remembered the strip malls and gas stations-a lake of concrete, where the humidity was unbearable and the mosquitoes, somehow, even bigger-and she looked at her brother's hopeful, dreaming face.

"It was exactly like what you said," she said. "Free ice cream and roller coasters and everything. Exactly like that."