

Please consider donating to your favorite conservation programs this holiday season!

See page 3 for more details!

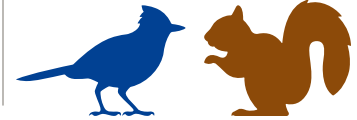


ZOOLOGY DESTINATIONS
PINNACLES NATIONAL PARK



CANNIBALISM IN ANIMALIA
WAY MORE COMMON THAN YOU THINK!

MORGAN'S WILDLIFE VIEWING TIPS
(ZOOLOGY DEBUNKERS AND WEIRD AND INTERESTING ADAPTATIONS ARE ON BREAK)

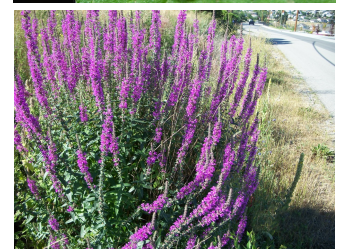


NEWS FOR THE DEDICATED ZOOLOGIST

Invasive Species: An Unnatural Threat

A 20 foot, 200 pound behemoth slithers along the marsh of the Florida Everglades. The Burmese python edges closer to a weary raccoon washing itself by a watering hole. For a moment, everything is still, until the python lashes out and begins to coil its fat body around the small mammal. This is only the beginning, as anywhere from tens of thousands to hundreds of thousands of these Burmese pythons devastate all feats of life that roam the Everglades. Every year, countless marsh rabbits, bobcats, opossums, deer, snowy egrets, roseate spoonbills, wood storks, alligators, and even other snakes fall victim to the python. If you haven't gotten the message already, Burmese pythons are invasive species, terrorizing an ecosystem they were never meant to be in. With no natural predators, invasive species' populations increase uncontrollably, posing a serious threat to the wildlife and to the environment that they live in.

Burmese pythons are only the beginning. Of the 50,000 non-native species inhabiting the United States, approximately 4,300 have been



identified as invasive species, according to the U.S. Fish and Wildlife Service. At its simplest, an invasive species is a non-native species that has been introduced to an area with the perfect conditions for it to live and reproduce. Because they are non-native, invasive species generally have no problem with neighboring would-be predators. The combination of no natural enemies and ideal living conditions leads to an endless population boom, which only leads to worsened conditions for the habitat and its inhabitants. Invasive species stress out environments, and ultimately cause other species to die off. Just look at the Burmese python, apex predator of the Florida Everglades with the ability to reproduce rapidly, considering that females lay clutches of 50-100+ eggs. And worse of all, many invasive species, like the python, are numerous but elusive. Making them all the more difficult to capture and remove from the ecosystem.

Other examples include the brown marmorated stink bug (pictured above), zebra mussel, red gum lerp psyllid, nutria, Chinese mitten crab, coconut scale, and thousands more in the United States alone. Not to mention non-animal species including plants such as the purple loosestrife (pictured above), water hyacinth, buffelgrass, ice plant, Himalayan blackberry, and Brazilian peppertree. Algae such as the (*overly*) common brown algae and *Caulerpa Taxifolia* introduce threats to aquatic life, to name a few. All of the species listed above are not native to the U.S., and can even be found on completely different continents.

Take buffelgrass (*Cenchrus ciliaris*) for example, it's native to Africa, south Asia, and southern Europe, but not the United States. Now, it endangers the Sonoran Desert's flora, outcompeting native plant species and creating fire hazards. Interestingly, it was introduced to parts of Arizona to help prevent soil erosion in the 1930s. By the 1980s, buffelgrass became incredibly invasive. The zebra mussel (*Dreissena polymorpha*) had a classic introduction. Native to Russia and the Ukraine, it was likely introduced to Michigan's Great Lakes during the 1980s when ships from Europe emptied their ballast tanks into the water. After that, the zebra mussels multiplied exponentially and now pose a threat to the native mussels and other filter feeders of the lakes by diminishing their main food source, algae.

So how are we handling the seemingly endless battle with invasive species? It depends. In the case of the Burmese python, zoologists and federal employees will go out into the field to trap and euthanize the species. In other instances, people are hired and paid to shoot and kill species such as alligators and nutria. Pesticides (more on this in a future issue) and introducing predators are other methods, but can be very risky. As for us, small steps such as checking to make sure you aren't carrying any hitchhiking invaders, to larger steps like volunteering to help remove an invasive species, reporting invasive species sightings, and educating others. If there is one thing we learn about invasive species it's that we can prevent things like this from happening by being more aware and educated of how ecosystems work.

Iconic Wildlife of the 50 States



Florida: Florida scrub-jay

The Florida scrub-jay (*Aphelocoma coerulescens*) is a member of the family *Corvidae*, along with crows, ravens, magpies, and other jays. This scrub-jay lives exclusively in central Florida's flatwoods, oak scrubs, and ridges. All of these ecosystems are arid and warm, with frequent natural and prescribed fires. When the shrubbery in their habitat becomes too dense because of fewer fires, the scrub jays leave in search of more open areas. This is because Florida scrub-jays are ground foragers, regularly consuming acorns, berries, insects, and even mice, snakes, and lizards on occasion. In fact, the Florida scrub-jay will plant any acorn it doesn't finish and may come back to it later in the year. Any forgotten ones grow into oak trees. Many endemic species are facing a decreasing population, and the Florida scrub-jay is no exception. Since 2000, the scrub-jay has been listed as vulnerable on the IUCN Red List. Facing habitat loss, climate change, and fire suppression put the Florida scrub-jay at risk of extinction.

For more information, please visit the websites listed below:

<https://www.invasivespeciesinfo.gov/take-action>

<https://wildlife.ca.gov/Conservation/Invasives/About>

<https://www.fws.gov/invasives/faq.html#q9>

<http://www.iscc.ca.gov/docs/californiainvasivespecieslist.pdf>

<- Ways to take action

<- More information and pictures

<- Invasive species FAQs

<- List of California's invasive species

Interesting Reads

Top 10 Invasive Species: When Pest Control Goes Wrong

<https://eandt.theiet.org/content/articles/2018/05/top-10-invasive-species-when-pest-control-goes-wrong/>

Deoxyribonucleic Acid (DNA) Fact Sheet from the National Human Genome Research Institute

<https://www.genome.gov/about-genomics/fact-sheets/Deoxyribonucleic-Acid-Fact-Sheet>

The Snakes That Ate Florida

<https://www.smithsonianmag.com/science-nature/snakes-ate-florida-180972534/>

Don't Miss This!

Technically molecular biology and biochemistry, but thought I would share this link detailing the Nobel Prize win in chemistry.

For some background, the Nobel Prize in chemistry was awarded to American biochemist Jennifer Doudna and French microbiologist Emmanuelle Charpentier for their revolutionary application of the enzyme Cas9 in CRISPR, a DNA editing tool. Making them the 56 and 57th women to win the Nobel from 1901 to 2020. Comparatively, 930 total people have received the prize. That's about 6% of prizes awarded to women.

<https://innovativegenomics.org/news/jennifer-doudna-emmanuelle-charpentier-development-crispr-genome-editing/>

You can also click the image below if viewing on a PDF for an interview with Jennifer Doudna. The video is also included in the link above.



Please consider donating to conservation this holiday season!

Though we may be celebrating the holidays a bit differently this year, one thing remains the same, and that is: conservation still needs our help! What better time to do something good for the planet than right now? If you can, please consider donating to conservation efforts and programs this year! I've done so in the past and let me say, there is no gift better than the knowledge that you are helping ecosystems, wildlife, and communities thrive!



Helping People. Saving Gorillas.
Visit <https://gorillafund.org>

"Your gift will give a critical boost to the Fossey Fund's work in the areas of gorilla protection, scientific research, helping communities, and educating the next generation."

"Your donation goes directly to our campaigns, providing fuel and equipment for our ships and volunteer crews as they take on the biggest threats facing the oceans today."



Visit <https://seashepherd.org>



Visit <https://www.rootsandshoots.org>

"With your support, the JGI can protect chimpanzees, conserve critical habitat while strengthening surrounding communities, and empower the next generation of conservation leaders."

Nature Poll

Which looks funnier?

Answer here: <https://forms.gle/jf9PxE4vY25KxWpPA>



← Planarian

Hookworm ↓



Last Issue:
Deep sea beat outer space 5-2

Endangered Species Spotlight

Kemp's Ridley Sea Turtle



There are seven sea turtle species inhabiting Earth's oceans, from Papua New Guinea to coastal California. All are listed as endangered, with the exception of the loggerhead sea turtle, which was removed from the United States' Endangered Species Act back in 1978. However, the most endangered out of the sea turtle species is the Kemp's Ridley sea turtle (*Lepidochelys kempii*), an inhabitant of the Atlantic Ocean, particularly a stretch of water spanning from the Gulf of Mexico and as far north as Nova Scotia. Characterized by their triangular-shaped head, gray-green coloration on their top and yellow-white underside, single clawed front flippers, and carapace as long as it is wide, the Kemp's Ridley sea turtle is listed as critically endangered on the IUCN Red List. Their diet includes small animals, plants, and algae during their early years, and crabs and fish as they get older.

The Kemp's Ridley sea turtle, along with the olive Ridley sea turtle, will participate in arribada nesting, a type of sea turtle nesting in which large groups of females will come ashore to lay their eggs together. Birds such as seagulls and albatross are notorious for hunting sea turtle hatchlings as they migrate from sand to ocean. Evolutionarily speaking, arribada nesting increases an individual's chances of making it to safety. "Arribada" means "arrival" in Spanish and nesting may be triggered by lunar cycles, the releases of pheromones, or offshore winds, though scientists haven't determined a conclusive result. Unlike most sea turtle species, Kemp's Ridley and olive Ridley sea turtles will nest during the daylight hours. Often, Kemp's Ridelies lay around 100 eggs per nest and two to three clutches per season during the months of May through July. After the eggs are laid, the female will return to the ocean, leaving her offspring to incubate for 50 to 60 days before hatching and making their way to the ocean along with their fellow hatchlings. Female hatchlings will return to the nesting site 10 to 13 years later when they have reached sexual maturity and are ready to lay their own eggs. Like all sea turtle species, sex is determined by temperature instead of chromosomes (XX is female, XY is male). Cooler temperatures result in males and warmer temperatures result in females (I wasn't able to find the exact values -sorry), this is called temperature dependent sex determination, or TSD.

Considering the Kemp's Ridley's abundance in the Gulf of Mexico prior to the mid 20th century, it is no surprise that these sea turtles nested together by the tens of thousands. But all was not smooth sailing. During the late 1940s through mid 1980s, the sea turtle population seemed to be declining, reducing from an approximated 42,000 nesting individuals in 1947 to 205 by 1985. In response, conservation efforts helped the population regain strength by the 1990s, increasing the number of nesting individuals by an estimated 15% each year up until 2009. In 2010, the population trend seemed to be decreasing again. In 2019, the number of nesting individuals dropped to 22,341. Because of the varying population trends, it is unclear as to the Kemp's Ridley's trend at this time, being labeled as "unknown" on the IUCN Red List as of January 14, 2019.

I do not know what caused the dramatic decline during the mid 20th century, but I can tell you what the Kemp's Ridley sea turtle's threats are today. Bycatch is a big issue, the indiscriminate use of hazardous fishing gear that trawls the ocean floor for shrimp, fish, and whatever else gets caught, useful or not. Bycatch not only harms sea turtles, but also coral reefs, vaquita porpoise, sharks, rays, and more. Ocean pollution, whether in the form of plastics, fishing lines, or balloons, affects Kemp's Ridelies as well. Climate change has also played an interesting part in the sea turtles' story. As glaciers melt, beaches become more scarce as sea levels rise. Though climate change only alters the temperature by a tiny fraction of a degree each year, the affects on sea turtle sex determination are already evident. Remember how warmer temperatures means more female sea turtles? In Florida during the 1980s, 9 out of 10 of loggerhead sea turtles are female. Recently in Australia, 99 out of 100 green sea turtle hatchlings are female. This is, without a doubt, another threat that the Kemp's Ridley sea turtles face, as a loss in males could be devastating for the species (though not as devastating if the sexes were flipped). The Kemp's Ridley sea turtle, and all other sea turtle species, are in my opinion, really cool. But, they also face a wide variety of threats, ones that you and I need to prevent.



Zoology Destinations

Discovering Our Local Species

I hope you were able to enjoy the Joshua Tree National Park photos and multimedia pages from the last issue of NFDZ. If you haven't done so already, you can click this link: <https://www.nps.gov/jotr/learn/photosmultimedia/index.htm> to access it! There is a lot of great stuff on there- photos of cactus, quails, and desert tortoises, the *Nature Minute* series, which includes eight videos featuring the cactus wren, hedgehog cactus, globemallow, and even a coachwhip raiding a burrow, to name a few. Not to mention webcams on Belle Mountain, which gives you a wonderful, yet slightly polluted view of the landscape. Today, we discuss another popular destination- Pinnacles National Park. On the websites listed below, you will find beautiful photos of wildflowers, California condors, and oak woodlands, as well as the official park video.

What you will find at the Photos and Multimedia Websites:

1. Photos
2. Videos
3. Podcasts
4. 360° views
5. Webcams
6. Live broadcasts

***Note** Not all national parks have every single item listed. For general photos and multimedia, please visit: <https://npgallery.nps.gov>

Pinnacles National Park

Pinnacles National Park is one of nine parks in California. Located east of Salinas Valley in central California near the Gabilan Mountains, Pinnacles highlights the power of geology. Some 23 million years ago, the Pinnacles volcanic field found near present day Lancaster, CA formed along the San Andreas Fault. Before that, the Farallon plate had been fueling the volcanoes' movement for a long time, until it finally ran out of magma when subduction ended. In the tectonic zone however, the Pacific plate was not far behind and jammed right into the North American plate, creating a 600 mile crack called the San Andreas Fault. The Pinnacles volcanic field lay right in front of its path, and since this geologic activity, the volcanic field has been relocated some 195 miles from its original location. Over time, water and wind eroded the landscape and carved out caves, spires, and canyons. Today, we call this place Pinnacles National Park and it is composed of about 26,000 acres of protected land.



The environment of Pinnacles changes with the seasons, with wildflowers engulfing the hillsides and pollinators galore in the spring, to a desert-like climate in the summer. With minimal light pollution, Pinnacles National Park is an excellent place to go stargazing, with clear nights all year long. Plant life here is abundant, with numerous species of tree including the valley oak, western sycamore, gray pine, California buckeye, and blue oak, over 50 species of shrubs including California blackberry, point-leaved manzanita, California juniper, blue elderberry, poison oak, and woolly Yerba santa. Flowers such as shooting stars, bush poppies, fiddleneck (genus *Amsinckia*), and monkey flower (genus *Mimulus*) dot the landscape. Lichen including *Acarospora socialis*, *Candeloria concolor*, and *Umbrilicaria phaea* make up the some 40-50 total lichen species and provide a food source for deer and nest material for birds. With a multitude of wildflowers, it is no surprise that there is a plethora of insects, including Edith's checkerspot, sylvan hairstreak, and a variety of bee species. Members of the insect order *Odonata* (dragonflies and damselflies) include the giant darner and cardinal meadowhawk. The three-spined stickleback is the only native fish species in the park. Then, you have amphibians such as the arboreal salamander and California red-legged frog, who had struggled with invasive species during the 1980s, but has since made a comeback. 8 lizard, 14 snake, and 1 turtle species inhabit Pinnacles, including the western whiptail, striped racer, and western pond turtle. The California condor, which is back to Pinnacles after over 80 years, California quail, oak titmouse, and acorn woodpecker call the park home, among other birds. Bobcats, gray fox, and 14 bat species including the western mastiff bat inhabit Pinnacles as well. Whether it be in person, or virtually, Pinnacles is a beauty to behold, a place that showcases geology and wildlife at its finest.

Physical Address: 5000 Highway 146 Paicines, CA 95043
 Pinnacles Visitor Center: 1901 Spinnaker Drive Ventura, CA 93001 (average 74 miles)
 National Park Service Website: <https://www.nps.gov/pinn/index.htm>
 Photos and Multimedia Website: <https://www.nps.gov/pinn/learn/photosmultimedia/index.htm>

Cannibalism in *Animalia*

Cannibalism may seem like a very gruesome topic, after all, it is what we call a species consuming another member of the same species. It happens in humans, as seen all over the world, especially in parts of New Zealand and the Pacific Islands, where people have been less influenced by Western culture's cannibalism taboo. For humans, cannibalism can be ritualistic. Consuming deceased relatives as a way to grieve and show respect. Then there are those serial killer type situations, perhaps more murderous than anything, but can still hold a deeper meaning. Now a days, there is a whole debate surrounding human cannibalism- is it ethical or even legal? That's for the humans to decide. For now, I focus on cannibalism in the rest of *Animalia*. And you may be surprised to hear that it is way more common than you think, even more common than scientist thought until recently.



So why be a cannibal in the first place? Recent studies connected cannibalism to Charles Darwin's theory of evolution and his statement of "survival of the fittest" and other related statements. Cannibalism is, without a doubt, a mean for a species to survive, harsh conditions or not. After all, that's basically what evolution boils down to, survival and reproduction so that a species may continue to thrive and pass down favorable traits. Cannibalism offers a solution for both.

Cannibalism can be triggered by a variety of things, including (but not limited to) shortages of food, significantly larger populations, overcrowding, and even sacrifice. However, as we see in animals such as invertebrates, cannibalism can be a regular occurrence in a species, such as consuming the eggs or larvae of one's own species. Cannibalism may also occur during mating, generally a sacrifice by the male that increases the chances of their genes getting passed on. Of course, cannibalism can provide a quick and efficient way for an animal to get nutrients, and even a way for unborn individuals to develop hunting skills before they are born. Cannibalism also occurs when an individual wants to reduce mating competition, or even instigate mating behaviors. And while there are drawbacks to cannibalism, such as leading to a quicker spread of disease, the positives usually outweigh the negatives.

So what animals are cannibals? You'll be surprised to hear that cannibalism is not limited to a few species. By that I mean, every animal can be a cannibal! With cannibalism being so prevalent, there are many terms to describe the types. Filial cannibalism is the eating of one's own offspring, especially when they are deformed, weak, or dead. This can also happen when the number of offspring exceeds food supply. In the case of many rodents, rabbits, and boney fishes, the parents will eat their offspring. Why? The added nutrients can be used to produce healthier and stronger offspring. Heterocannibalism is the consumption of unrelated members of the same species. This happens most often in filter feeders such as mollusks and corals, who consume plankton (the larval forms of species such as crabs, clams, mussels, coral polyps, etc.). Sexual cannibalism is the consumption of one's mate during copulation, especially for added nutrients, and more sperm. In the case of Australian red-back spiders, cannibalized males were found to have copulated longer and therefore released more sperm. This means the female becomes less receptive to other males and the cannibalized male's genes are more likely to be passed onto the next generation. In contrast, male wolf spiders will lure females to their burrows and cannibalize them if they are deemed "unfit". Otherwise, the spiders mate and the "more fit" female is more likely to survive and produce the male's offspring. In the case of mammals such as gorillas and lions, males will eat infants so that the females become immediately receptive. One of my personal favorites is utero cannibalism, otherwise known as "extreme sibling rivalry", if you know what I mean. This is the product of siblings eating siblings while still in utero. During such time, the individual gains much needed nutrients and learns hunting skills. Sand tiger sharks are notorious for such cannibalism. And that's only the start! In an extreme act of parental care, elephant mosquitos will cannibalize adults so that their helpless offspring can survive to the adult stage. As if it couldn't get more extreme, black lace-weaver spiders will lay unfertilized (trophic) eggs for her newly hatched spiderlings. When those are gone, she willingly lets her offspring eat her alive (pictured above), a form of cannibalism called matrophagy. So whether you're a mouse mom getting nutrients to produce a healthier generation of offspring, or a sand tiger shark learning your first hunting skills with your siblings as a target, cannibalism is an undeniable way to survive and reproduce.

Prehistoric Animal of the Issue: *Ichthyosaur*



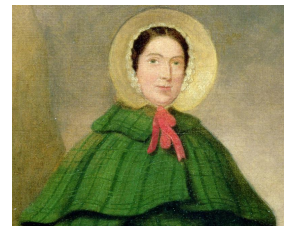
Similar to a dolphin or shark in shape, but from a totally different class. A reptile, that gives live birth in the ocean. The size of a small porpoise, or the size of a large whale. This is ichthyosaur, a prehistoric marine reptile order living from the late Triassic time period 250 million years ago through the late Cretaceous roughly 90 million years ago. Ichthyosaur's evolution is interesting in that, like modern day whales and dolphins (order *Cetacea*), they are descendants of ancient fish that adapted to life on land that switched back to aquatic life millions of years later. Why return to the ocean? Scientists are not sure why ichthyosaur's ancestors did this, but hypothesize that it may have to do with increased competition on land. Contrary to reptile custom, ichthyosaur gave birth to live young, in water. While, some reptiles, such as snakes and lizards, experience viviparity, most reptiles lay their eggs on land, the whole reason for the amniotic egg some 312 million years ago when the first amniotes evolved. The amniotic egg allowed embryos to develop in a watery environment away from a water source as seen in fish and amphibians. But back to ichthyosaur. Developing embryos have been identified in well preserved female ichthyosaur fossils, sometimes with ten individual embryos.

While multiple relatives of the ichthyosaur are helping paleontologists decode its evolution, we are still awaiting the missing link between earlier genera of the superorder *Ichthyopterygia* and the *Ichthyosauria* order itself. Though genera of *Ichthyopterygia* include earlier specimens such as *Utatusaurus* from Japan and *Chaohusaurus* from China, the order can also include later specimens from *Ichthyosauria*, the order I've been talking about. On the quest to find this missing link, paleontologists have suspected that the genus *Mesosaurus* from Brazil may be helpful in determining ichthyosaur's reason for returning to the ocean.

In terms of body shape, ichthyosaur looks rather similar to sharks and dolphins. Upon recalling that sharks are fish and dolphins are mammals, this similarity becomes a classic example of convergent evolution, or the evolution of relatively unrelated species developing similar traits to help them adapt to a specific environmental niche. In this case, by developing streamlined bodies with powerful fins, certain sharks, ichthyosaur, and dolphins began to share similar body shapes. An interesting thing to note is that both sharks and ichthyosaur have vertical tail fins and pelvic fins, while similarities between the ichthyosaur and dolphin include the absence of gills (yes, ichthyosaur breathed air), anal fins, and an elongated snout. Though the ichthyosaur order lasted some 155 million years, they mysteriously disappeared from the fossil record. Perhaps with the discovery of new specimens, we will one day understand how this marine reptile came and went.

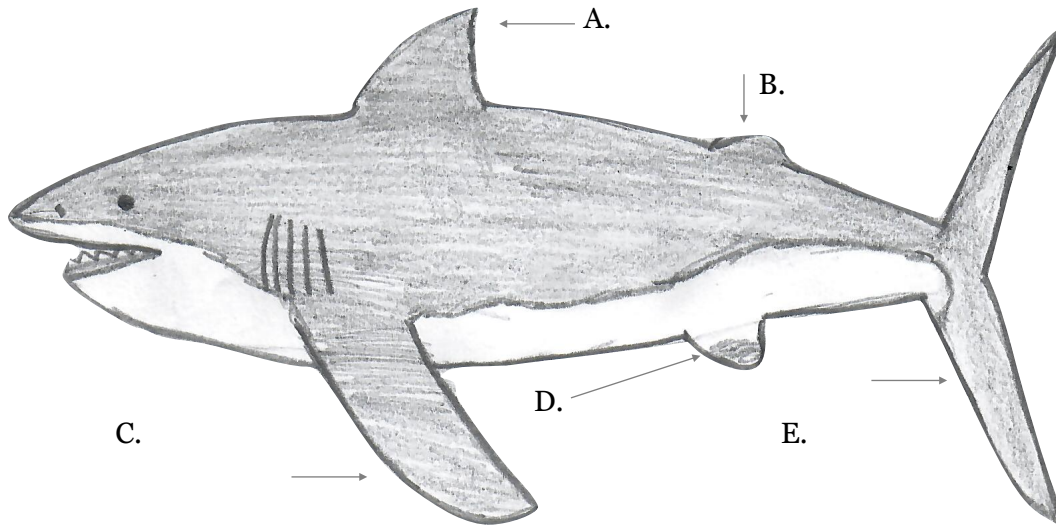
Who Was Mary Anning?

Mary Anning (1799- 1847) was a fossil hunter and paleontologist from England. Her father was a fossil collector, but died when Mary was just 11, leaving his family in debt money wise. However, he did leave Mary with greater knowledge of paleontology and the needed skills of a fossil hunter in the field. Mary and her family were avid fossil hunters, even owning a small fossil business, which supplied much of their income in the years after Mary's father's passing. Professional fossil collector Thomas Birch visited the Anning family one day and even auctioned off his own collection to help them get out of debt. When she was only 10-12 years old, Mary and her brother Joseph co-discovered the first ichthyosaur specimen known to the scientific community in London. Years later, she discovered the first plesiosaurs skeleton. However, due to her gender, young age, and low income background, Anning was not respected for her skills and dedication, with most of her finds being presented in museums and private collections without her name included. While also being a fossil collector, it was apparent that Anning knew the science behind such finds as well. Her contributions to paleontology are extremely admirable and have provided a deeper insight to Earth's prehistory.



Games

Label the Fish Fins!



Fish Fin Anatomy: Great White Shark Example

The *dorsal fin* stabilizes the fish and helps make sudden turns.
 The *caudal (tail) fin* controls most of the fish's movement, being very powerful. It is similar to a motor. In sharks, the caudal fin moves from left to right instead of up and down as seen in dolphins, penguins, and seals.
 The *pectoral fin* controls smaller direction changes. They are similar to paddles on an oar or your hands when you are swimming.
 The *anal fin* helps to stabilize the fish while swimming, similar to the dorsal fin. It is located behind the anus/cloaca.
 The *adipose fin* may serve as a smaller fin that deflects water prior to the caudal fin, making turbulent waters more manageable. Though it is also hypothesized that the fin could just be a vestigial structure, serving a purpose in the shark's ancestors but no longer serving a function in the shark itself.

In other fish species, you have the *pelvic/ventral fins* which are located on the underside/ventral side of the fish. This fin also helps the fish stay balanced.

Zoology Term of the Issue

Niche, noun



Jumping over to community ecology, a niche is essentially the role a species plays in its environment. A niche includes that species' habitat, behavior, predators, prey, and its impact on other species and the environment as a whole. This includes the ecosystem's abiotic factors/non-living things, such as temperature, humidity, and rainfall. Ideally, two species do not fill the same niche, as this would create competition for resources. Instead, species may have overlapping roles in their ecosystem or unrelated niches all together. This is called the "Competitive Exclusion Principal". This overlap can be prevented by evolving to have different food sources, feeding during different times of day, living in a different part of the species' habitat, etc. By reducing competition via occupying different niches, both species are able to thrive better. This is called resource partitioning. There are various types of niches, such as symbiotic relationships (mutualism, parasitism, and commensalism-more on this soon), predator-prey relationships, fundamental niches, and realized niches. Fundamental niches are theoretical niches that a species would occupy if there was no competition. Realized niches is the niche that a species fills as a result of limiting factors to their ecological niche.

Name the Animal!



Prevalent throughout Southern Canada, Western United States, and Baja California (All bordering the ? Ocean) but also as far inland as Montana and Nevada

Tadpoles of this species consume algae and other aquatic plants. As adults, they switch to a completely carnivorous diet, feeding mainly on insects.

Uses pads on their front and hind toes to climb trees, mainly in search of food

This species' predecessor family *Ichthyostega* evolved some 370 million years ago.

This particular species is part of the family *Ranidae*.

Though their color is variable, you can be sure of the dark stripe that begins at this species' nostril and ends at its shoulder.

This frog's skin color can change, caused by temperature and/or humidity differences.

Sexual dimorphism: females are slightly larger than males

Males make a "kreck-ek" sound to attract females during the mating seasons or to tell other males to stay out of their territory.

This species generally lives on the ground, unlike its name suggests.

Find the answer on page 12!

Invertebrates of the Issue: Classification: *Arthropoda* and *Ctenophora*

Arthropoda (“arthro” meaning “jointed” and “poda” meaning “foot” in Greek) is the phylum of invertebrates containing crustaceans, insects, arachnids, etc. Most notable for their jointed appendages, arthropods are the most diverse phylum in the world, with anywhere between 800,000 to 1,000,000 named species. Arthropods are an example of a coelomate, or an animal whose body cavity is lined with mesodermal cells composing the coelom. If you recall from issue #12, flatworms are acoelomates, the opposite of a coelomate. Arthropods are also protostomes. Meaning they are animals whose blastula’s first hole is the mouth. Blastulas are hollow balls of multiplying cells (around 100) that are the result of a sperm cell fertilizing an egg cell. Humans by the way, are deuterostomes, the first hole in the blastula is the anus.



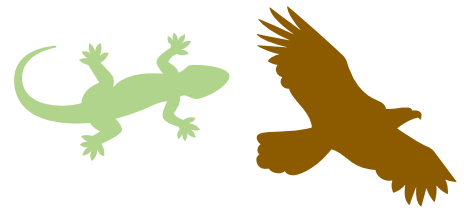
Unlike some invertebrates, arthropod bodies are composed of specialized, non-repetitive segments. For example, the head, thorax, and abdomen in insects house organs and appendages. As do the prosoma, mesosoma, and metasoma in scorpions. Each body segment is covered in an exoskeleton, a protective material made up of chitin, a flexible and dense carbohydrate with a similar function to keratin. This exoskeleton is shed throughout the arthropod’s life cycle, with the exception of most insects, who generally molt prior to reaching the adult stage. Molting, or ecdysis is controlled by the hormone ecdysone. In the case of aquatic arthropods, namely crustaceans, the exoskeleton is reinforced with hardened calcium salts. In insects, chitin acts as scaffolding, protecting the epidermis, intestinal epithelium, and trachea.

As mentioned above, arthropods are extremely diverse, but how? First things first, jointed legs allowed arthropods and their ancestors to crawl, burrow, jump, grasp, feed, and even hear. Specialized mouthparts enable arthropods to chew, sting, lap, suck, and bite. Insects also have wings, which allow them to fly to desirable habitats with ideal living conditions and resources. While I’m on the topic of resources, often times, arthropods have different diets depending on their lifecycle. Mosquito larvae eat algae, mosquito females consume blood, and males consume flower nectar. In addition, arthropods have narrow niches, allowing them to coexist with minimal to no competition. Lastly, arthropods take the form of omnivores, carnivores, herbivores, scavengers, filter/suspension feeders, parasites, and cannibals. By having different roles in their environment, arthropods reduce competition for prey.



Ctenophora (meaning “comb bearer” in Greek) is the invertebrate phylum containing the comb jellies. However, they are not true jellyfish (phylum *Cnidaria*) as their name may suggest and can also go by the name of “Ctenophores”. The Greek name refers to the comb-like cilia located along the sides of the animal. These cilia aid in locomotion by moving synchronously to propel the Ctenophore through the water. Ctenophores live exclusively in marine waters, from polar to tropical regions of the Earth. There are an estimated 100-150 species belonging to *Ctenophora*, and despite being fairly common, the phylum is largely unknown. Some Ctenophores are planktonic, mixing in with other microscopic creatures that float around in water. These species typically live in coastal regions and are lightly pigmented or even transparent. Others live in the deep sea and are bioluminescent and/or highly pigmented. The not yet formally described “Tortugas red” thrives at depths of around 1,000 meters and secretes bioluminescent material when threatened in order to confuse predators. Notice the rainbow colored lights in the picture to the left? This is not bioluminescence, in fact, it is the refraction of light that is produced when a Ctenophore beats its cilia. Many Ctenophores are hermaphroditic and self fertilizing, allowing for rapid population growth. Both arthropods and ctenophores have evolved such incredible adaptations for survival, no wonder they’ve survived for hundreds of millions of years!

Morgan's Wildlife Viewing Tips!



Tip #1

Always carry your binoculars and phone (if you have), notebook, and pen with you whenever you go outside! Going back to retrieve something only wastes time!

Tip #2

Even if you think you are going outside for a couple minutes, don't wear slippers. Always wear close-toed shoes (hiking shoes or other high traction shoes)!!! There have been quite a few times when I have ventured outside, spotted a cool species, and was weary of twisting my ankle. Close-toed shoes!

Tip #3

When you want to document a species/individual, first decide if you want to take a photo, audio recording, or note all details. In an "ideal" situation with a bird for example, I recommend audio first (bird sounds are one of the best forms of identification), noting details (do as many as you can, drawings help too), and then taking a photo or video (if you don't have a high quality camera, you can always align a phone (one camera only) to binoculars, just make sure you have a steady hand).



Tip #4

Mentally note every detail!!! If you are less than 75% sure with an identification, don't have bias towards a particular species. This may cause you to get characteristics mixed up or make you miss certain details.

Tip #5

A species' range is one of the best methods for identification. Familiarize yourself with local (and state) wildlife! I also like to keep a journal of all the species I have identified (in my backyard). Noting migration patterns (birds) is also important.

Tip #6

Always have a resource in mind. This makes identification quicker and you will be less likely to forget a species' appearance. Some of my favorite resources include Audubon (birds), *Wild LA* by the Natural History Museum, and *The Laws Field Guide to the Sierra Nevada* by John Muir Laws (which isn't technically Los Angeles, but is still surprisingly useful).



Tip #7

View and document (tally, species, life stage, gender) at least once a day to know how wildlife behaves, sounds, moves, etc.

Tip #8

Always be on high alert, inside and outside. Have one eye looking out the window or one ear listening for the sounds of birds, running, pouncing, etc. outside.

Tip #9

For birds, familiarize yourself with their sounds! There are so many ways to learn them- apps, recordings, quizzes, websites. I love Brain Pop's Bird Song Hero (<https://www.brainpop.com/games/birdsonghero/>). The great thing about birds sounds is that you can tally individuals without having to actually see them.

*Okay fine, I may be a bit bias towards birds. If you are too, join Audubon Society's Young Birders Club (usually in-person, but now virtual). You can visit their website at <http://www.pasadenaudubon.org/?q=youngbirders>.

Resources

- <https://www.smithsonianmag.com/science-nature/snakes-ate-florida-180972534/>
- <https://www.fws.gov/invasives/faq.html#q9>
- <http://www.iscc.ca.gov/docs/californiainvasivespecieslist.pdf>
- https://www.allaboutbirds.org/guide/Florida_Scrub-Jay/lifehistory
- <https://www.news4jax.com/weather/2017/12/06/saving-the-florida-scrub-jay/>
- <https://www.nobelprize.org>
- <https://www.fisheries.noaa.gov/species/kemps-ridley-turtle>
- <http://www.southernfriedscience.com/altered-sea-turtle-sex-ratios-can-global-warming-harm-warm-water-animals/>
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- <https://fishionary.fisheries.org/category/p/>
- <https://www.khanacademy.org/science/ap-biology/ecology-ap/community-ecology/a/niches-competition>
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- <https://ucmp.berkeley.edu/cnidaria/ctenophora.html>
- <https://faculty.washington.edu/cemills/Ctenophores.html>
- <http://www.pasadenaaudubon.org/?q=youngbirders>

Thank You for reading this month's edition of "News for the Dedicated Zoologist"! I hope you enjoyed it.



Hang on, there's a bit more!

If you would like to ask a **zoology related** question to be featured in "Your Questions, Answered", what you need to do is simple!

News For the Dedicated Zoologist Request Information

Name: _____

Question: _____

Email (also optional): _____

Please give this piece of paper to Morgan Gaskell **or** send the information to biologyislife@50-50.com **or** fill out this Google Form:

<https://forms.gle/XzCdmzkLyncKEVB7A>

Answers- Label the Fish Fins!

- A. Dorsal fin
- B. Adipose fin
- C. Pectoral fin
- D. Anal fin
- E. Caudal/tail fin



We Love Your Questions, keep them coming!

Backyard Sighting!



Oct 17, 2020

Phidippus adumbratus

A jumping spider in the family Salticidae and all in all a really cool!

Answers- Name the Animal!

The animal on page 8 is a Pacific tree frog (*Pseudacris regilla*).

NEWS FOR THE DEDICATED ZOOLOGIST

"Those who dwell among the beauties and mysteries of the Earth are never alone or weary of life."

-Rachel Carson

Marine biologist and conservationist

Shout-out to everybody who donated to my *Dian Fossey Gorilla Fund International* fundraiser! Thank you so much! And, shout-out to any new subscribers! Welcome to the NDFZ ecosystem (it's a thing now)!

NFDZ subscription form still open! Please fill out this form!

Go to: <https://forms.gle/5Jnf8c7QrgXBEYyy8>

3D printed News for the Dedicated Zoologist coasters are still being printed! They're pretty nice! See form for details!