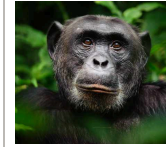




GALLS
BEAUTIFUL
PARASITISM



ZOOLOGY
DESTINATIONS
GLENDALE NARROWS
RIVERWALK



ZOOLOGY DEBUNKERS:
PRIMATE
CLASSIFICATION PART 1

NEWS FOR THE DEDICATED ZOOLOGIST

Marine Plastics: A Recyclable Hazard

During the summer of 2019, my grandpa was making the crossing from Honolulu, Hawai'i to Juneau, Alaska in his 46 foot long sailboat. He saw lots of cool wildlife— harbor seals, humpback whales, and bald eagles, to name a few. What he also saw, was humanity at its worst. On June 18, after being out on the water for 6 consecutive days, my grandpa had reached the middle of what has been called the Great Pacific Garbage Patch. More than twice the size of Texas and three times the size of France, the Great Pacific Garbage Patch is a mass collection of man-made materials comprising mainly of plastics in the North Pacific Ocean.



So how did trash start collecting in the ocean like this? It all has to do with gyres and the Coriolis Effect. Gyres are vast systems of circulating ocean currents, largely formed due to strong winds caused by Earth's rotation and landmasses. The formation of gyres also has to do with the Coriolis Effect, a force that causes gyres to move clockwise in the northern hemisphere and counter clockwise in the southern hemisphere as oppose to a "straight" line. Earth has five major gyres, each with its own massive garbage patch. There is one in the Indian Ocean, two in the Atlantic, and two in the Pacific. The Great Pacific Garbage Patch is the largest of the five, and it comes as no surprise that its accompanying gyre is also the largest in the world. The entire garbage patch

contains an estimated 100,000 tons of plastic! That amounts to about 1.8 trillion individual pieces of plastic, or about 230 pieces for each human on Earth! This number is only a fraction of the much, much larger whole. There are an estimated 5.25 trillion pieces of plastic in our oceans as of 2020. In one year alone, some 8.3 million tons of plastic ends up in the ocean. By 2050, it is thought that the number of pieces of plastic will exceed the number of fish, according to United Nations.



Did you know marine litter does direct damage to over 600 species? Of those 600, 15% are listed as endangered. 100 million marine animals succumb to marine waste every year. 90% of seabirds have ingested plastics. Albatross for example, are found dead on beaches. When their internal cavity is cut open, plastics and other trash come pouring out. The Laysan albatross in particular has been affected in

extreme ways. On Midway Atoll, a 2.4 square mile piece of land in the North Pacific Ocean (2,000 miles from Great Pacific Garbage Patch), up to a million albatross gather to nest. Upon arriving at a nest, parent albatross will feed their young a multitude of brightly colored plastic pieces, namely bottle caps and cigarette lighters. In fact, a recent study by the Monterey Bay Aquarium concluded that 97.5% of albatross chicks had ingested plastics that had accumulated over time. Plastics, 5 tons of it, are fed to Laysan albatross chicks every year. Because adult albatross are able to regurgitate the plastics they accidentally consume, most of the birds that die are chicks. The case of the albatross is a sad one, and I'm going to tell you now, they are not the only animals being affected.

100,000 *reported* animals become entangled in plastics every year. Fish of the North Pacific consume around 12-14,000 tons of plastic annually, some of which become food for humans. Another cause for concern is microplastics, small fragments of plastic under 5 millimeters in length. Of the 5.25 trillion pieces of plastic in the ocean, microplastics make up 92% of the total. They also end up in the bodies of marine life, where they sit and release harmful chemicals as time elapses. Some microplastics are the result of larger pieces of plastic degrading and breaking down into smaller ones. Others are in the form of microbeads, small pieces of plastic, such as polyethylene, polypropylene, and nylon, found in health and beauty products such as toothpastes, soaps, and sunscreens. Microbeads have been banned in the United States, Canada, and the U.K., while countries such as China, Australia, and India are working to phase out their use as well.

Ocean pollution is a serious issue, and more needs to be done to resolve it. Because, as we have learned, this isn't just the story of plastic straws, cups, and containers washing up on beaches. It's the story of sea turtles and seals being choked to death with the plastic rings you find holding sodas together, and fish mistaking microplastics for food. This story ultimately ends with humans. Only we can start to take action and work to clean up our oceans. Only we can do what is right to protect marine habitats and wildlife. Millions and millions of years ago, life started in the oceans, will it end there too?

Iconic Wildlife of the 50 States



Arizona: Ringtail (cat)

Though they are not endemic to Arizona, the ringtail (*Bassariscus astutus*), sometimes called the ringtail cat, is the state mammal of the Grand Canyon State. Arid habitats with a local water source makes places such as Eaton Canyon in California, Yosemite National Park, and the deserts of Arizona ideal places for the ringtail to live. Their range also spans throughout Oregon, Nevada, Utah, Colorado, Texas, New Mexico, Oklahoma, Kansas, Baja California, and Northern Mexico. The ringtail is an agile climber, being able to rotate their hind feet 180° in order to climb rocks, trees, walls, cliffs, and yes, cactus. The ringtail is nocturnal, that is being active at night and asleep during the daylight hours. As a result, they have superb eyesight and hearing. Which is a good thing, because having predators such as great horned owls, bobcats, and coyotes require such adaptations! As for the ringtail, their diet consists of fruit, insects, lizards, snakes, small mammals, birds, and eggs. They are listed as least concern on the IUCN Red List.

Interesting Reads

The Great Pacific Garbage Patch

<https://theoceancleanup.com/great-pacific-garbage-patch/>

What is the Coriolis Effect?

<https://scijinks.gov/coriolis/>

This Stunning Photo Project Showcases the Loggerhead Shrike’s Gory Deeds

<https://www.audubon.org/news/this-stunning-photo-project-showcases-loggerhead-shrikes-gory-deeds>

What’s Up With the Weird Mouths of These Finch Chicks?

<https://www.audubon.org/news/whats-weird-mouths-these-finch-chicks>

Don’t Miss This!

Jane Goodall’s Hopecast

https://news.janegoodall.org/2020/12/30/jane-goodall-hopecast-podcast-ep-1-you-are-reason-for-hope/#utm_source=rss&utm_medium=rss

Available on:

- * Apple Podcasts
- * Google Podcasts
- * Spotify
- * Stitcher
- * Castbox

In a recent episode (December 30, 2020), Dr. Jane Goodall reflects on hope, the very thing that drives change. She explains how she has seen “incredible survival through dramatic times” and how hope is what keeps her going, especially through anger and depression during dark times. In this season, she will talk to inspirational people in conservation and gather diverse perspectives on what we can do to heal the planet.



Your Questions, Answered!

Isabela Ghiloni asks: “How Do Bats Use Sound to Locate Prey?”

Bats (order *Chiroptera*), along with other animals such as dolphins, whales, and shrews use echolocation to locate their prey. Many bats species, including the big brown bat and Western mastiff bat, will use echolocation to locate their next meal, namely insects. The big brown bat, common throughout the United States, will echolocate by emitting high pitched sounds not audible to the human ear through their mouth. These sound waves bounce off nearby objects, which in turn bounce back to the bat’s ears, giving it an indication of its prey (or predator’s) location, size, and shape. The enormous-eared horseshoe bat however, will emit sound waves from its nostrils as apposed to their mouth! Not all bats use echolocation in the same way, and some species don’t at all. Fruit bats (family *Pteropodidae*) are frugivores, meaning they eat exclusively fruit. Most do not echolocate at all, but recently, it was discovered that three species use their wings to produce small click sounds. Other bats, such as the Common Asian ghost bat use echolocation to navigate to their roost, where they ambush their prey!

Nature Photography

Yes, I got a camera recently and can now take epic wildlife photos! Photos taken at my home.



Cooper’s hawk



Northern mockingbird

Endangered Species Spotlight

Hawaiian Monk Seal



The Hawaiian monk seal (*Neomonachus schauinslandi*) is one of two earless seals belonging to the genus *Neomonachus*. The other is the Caribbean monk seal (*Neomonachus tropicalis*), a species that was officially declared extinct by the United States in 2008. Side note, for a species to be declared extinct, it has to go unobserved for 50 years, the standard put in place by the International Union for Conservation of Nature. Though not extinct, the Hawaiian monk seal is endangered, with an estimated 1,100 to 1,400 individuals left according to NOAA. Unfortunately, the Hawaiian Monk Seal faces many threats, including reduced food sources, entanglement by trash and other debris, rising sea levels, disease, and human interaction.

Pinnipeds are a group of carnivorous marine mammals comprising of 34 species. Pinnipeds (suborder Pinnipedia) comprises of seals, sea lions, and the walrus. The Hawaiian monk seal is the most endangered pinniped in the United States and one of the most endangered in the world. As their name suggests, the monk seal's range is restricted to the Hawaiian Islands, including the northwestern islands and the main islands. There is also a population residing on Johnston Atoll (also known as Kalama Atoll) some 941 miles (1,514 kilometers) from The Big Island. The Hawaiian monk seal hunts on the sea floor, sand flats, outer reef slopes, offshore banks, and coral reefs, where it preys on small fish, squid, octopus, and crustaceans. The Hawaiian monk seal is also an excellent diver, with a recorded depth of more than 500 meters. However, they usually stay at depths of 60 meters or less. The Hawaiian name for the seal, 'Ilio holo I ka uaua, meaning "the dog that runs in rough water".

Since the 1950's, the Hawaiian monk seal population has been in serious decline in the Northwestern Hawaiian Island part of their range. Beginning in the 1990's on the main Hawaiian Islands however, the population has seen an increase according to the Marine Mammal Commission. The main islands now host 20% of the species' population. One of the many threats Hawaiian monk seals face is food limitation. On the Northwestern Hawaiian islands during the later part of the 1980s, the juvenile survival rate had seen higher mortality rates. While many factors can cause this decrease, evidence of starving and underweight juveniles and pups implies that food sources have become scarce within their range. Efforts to combat this threat began in the 1980's and 1990's. Such efforts and programs were proven successful, but were costly and introduced new dangers. The program has been put on hold recently. In 2014, the Marine Mammal Center based in Kailua-Kona, Hawai'i has made an effort to rehabilitate underweight seals. In addition to food scarcity, entanglement with trash and other debris has also proved to be a serious issue. 300 Hawaiian monk seals have been found entangled in marine debris such as fishing gear since 1982. These are only the documented cases and the total number of entangled and killed seals is unknown. Beach cleanups began in the early 1980's, and in 1996, hazardous debris was removed from the shallow water areas of Northwestern Hawaii's atolls. In addition to benefiting the Hawaiian monk seal, this effort has also helped to improve the populations of other threatened species such as sea turtles, seabirds, fish, crabs, and corals. Entanglement is not as serious of an issue on the main Hawaiian Islands, which has its own prominent threats. Deliberate killing of Hawaiian monk seals since 2009 has raised further concern. Disease is the last issue I will discuss, but there are many more, including human interaction (non-lethal, but not good either), hookings (as in monk seals getting injured or killed by hooks when they take bait off fishing lines), and loss of terrestrial habitat to rear young. Disease, such as canine distemper virus, *Leptospira* (a bacteria), and West Nile virus have raised significant distress in recent years. Many of these diseases are spread by animals not native to Hawaiian monk seal range, such as livestock, rodents, and feral cats and dogs. *Toxoplasmosis* has raised the most concern. This protozoan can infect any warm-blooded animal, but only reproduce within the digestive system of a cat. Feces containing toxoplasmosis can host millions of eggs, and only one is



Zoology Destinations

Quarantine Escape: More wildlife than people

On January 30, my family and I went on a little excursion to Glendale Narrows Riverwalk. This place was not at all new to us, I had collected data for my science fair project here from November, 2019 through pre-Covid March, 2020. My goal was to determine how clean/polluted the water was based on tallying macroinvertebrates (mayflies, water boatmen, gammarus shrimp, etc.) and chemical tests, among other things. While doing my field work, I noticed that lots of bird species also called the river home. This still puzzles me because there are limited food sources and the river bottom is actually concrete. And yet, when I visited the river most recently, I spotted 5 lifers, or birds I have never seen before! Glendale Narrows always has a way of surprising me!

Glendale Narrows Riverwalk

Location

300 Paula Ave
Glendale, CA 91201

(Try to avoid using Apple Maps (you might get lost) and look for Flower Street and a park)

Facility

Bike path, homeless people, avoid going into the water and bring hand sanitizer, try not to touch anything other than the stuff you brought



Greater yellowlegs

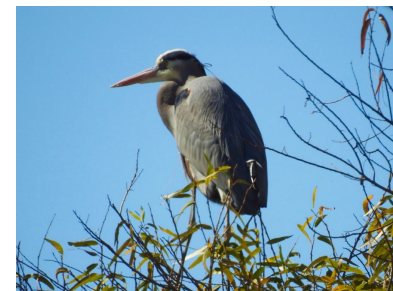
The Los Angeles River, better known as the L.A. River, is a 51 mile waterway. It flows through seventeen different cities before finally draining into the Pacific Ocean. The bottom of the river was paved with concrete in 1938, preventing many species from inhabiting the area. Despite such challenges, wildlife can still sustain itself here, and in surprising numbers! Glendale Narrows is only one such example of urban wildlife at the L.A. River. So, I guess great blue herons and double-crested cormorants, which I've seen along the coast, are now considered "urban", at least at Glendale Narrows. I was at the river for a mere one hour, and spotted about 100 individuals belonging to one of 19 species. The last time I visited Glendale Narrows (which was actually the fourth time), I spotted lots of these long legged shorebirds which I later identified as black-necked stilts. Black-necked stilts are common in the coastal, estuarine, and wetland regions of California, the western interior of the United States, Mexico, and South America. They feed on insects, small crustaceans, snails, and some aquatic vegetation. This all makes sense now, as Glendale Narrows has plenty of that! The black-necked stilts I observed were wading through the river in groups, dipping their heads into the water, using their long bills to scratch their feathers, and standing on one leg during rest position. There were around fifty! I also met my first spotted sandpiper. These guys are so tiny! The one I was following was darting from rock to rock. My other



Black-necked stilts

lifers included the greater yellowlegs, great egret, Cassin's kingbird (*top left*), and white-throated swift. The greater yellowlegs are similar to the black-necked stilts in body shape, both have adaptations that allow them to feed and walk the way they do. The great egret is a tall, white feathered species with an orange bill and yellow and green by its eyes, truly beautiful. The Cassin's kingbird is not a water bird and is you typical passerine. They have a thick, stocky beak with black, grey, and yellow feathers. They are part of the flycatcher family and have a diet consisting of insects and berries. The white-throated swift is also not a water bird, but they are one of the fastest birds in North America. They spend most of their time airborne, rarely coming down to the ground.

Whether you're looking for great blue herons or American coots, snowy egrets or mallards, Glendale Narrows has it all! We spotted great egrets and double-crested cormorants in flight, great blue herons and black-crowned night herons in trees and even an Anna's hummingbird (*top right*) and black phoebe towards the end. It was a lot of fun spending time at Glendale Narrows Riverwalk. I got to try my hand in water bird photography and identification. Everyone in my family had their wildlife spotting skills put to the test, and not because the birds were hidden, but because there were so many, you didn't know where to look!



Great blue heron resting in a tree

Galls: Beautiful Parasitism

It was August 31, 2019. My family and I had gone on a road trip to Kings Canyon National Park. “That’s the weirdest shaped fruit I’ve ever seen!” I thought, approaching a plant with pink masses that resembled fetuses. I puzzled over it as we hiked away from the sequoia grove towards the car. I had never seen anything like it, didn’t even know what this plant with odd fruit would even be called. Later that day, I was running the photos I had taken through an identification app called iNaturalist. I was surprised at the results! It turned out the plant I had photographed was greenleaf manzanita, whose berries look nothing like what I saw. As for those pink masses, they were manzanita leafgall aphids. “What’s a gall?!” I asked myself. I quickly learned that galls were the product of an external stimulus that causes a chemical reaction in the tissue of a plant. Injury and irritation to the plant are such stimuli and are usually attributed to a parasite, such as a nematode, fungus, bacteria, virus, or more commonly, insects. In general, the galls do not do significant damage to the plant. Many people may take the initiative to spray pesticides, but at the gall stage, the insect inside is already protected and spraying would only cause more harm to the environment.



Take the manzanita leafgall aphid for example, which feeds exclusively on manzanitas. This feeding is done by a winged or wingless female, who stimulates the plant to grow the large pink masses I had observed. With protection formed, the female will give live birth to a generation of winged males and females asexually, or without the need to mate with a male. The females of this generation would produce another generation via sexual reproduction with the males. Eggs, this time, are laid at the base of the manzanita and the winged or wingless aphids would walk up to the leaves and branches of the plant. This new generation, like the original aphid, would be capable of asexual reproduction and gall instigation.

This is only one such example! There are lots of insects that cause plants to form galls. The best part is, parasites are so plant specific that you can identify the parasite based on the gall you observe! Let me tell you, there are some pretty weird and pretty cool galls out there. Yes, it’s parasitism, but it’s also beautiful!

Oak Apple Gall Wasp (*Biorhiza pallida*)

Oak trees seem to be particularly susceptible to galls. In fact, next time you are by an oak tree, look up at the branches, you just might find a gall! The oak apple gall is green or yellow with spots when fresh and brown when dried. When fresh, the wasp larva resides in the middle, with veins securing the developing insect in place, as seen in the picture to the right. Often times the gall will fall off the tree after a while. One crazy thing about the oak apple gall is that it is actually a modified leaf. When the wasp injects its eggs into the midline vein, also known as the midrib, of a leaf, a chemical reaction prompts the leaf to develop a shell for the wasp larvae to grow.

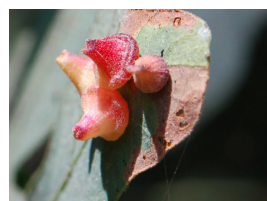


Disc Gall Wasp (*Andricus parmula*)

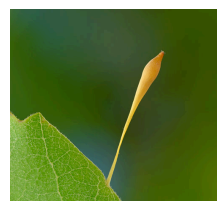
The disc gall wasp is another wasp that induces galls on several oak species, such as white oak, California scrub oak, and valley oak. The galls are up to 3 millimeters in length and are slightly raised in the center and along the circumference. Colors range from orange to yellow to pink. The top will have dark pink streaks or just solid pink.



Spiny gall wasp



Red cone gall wasp



Hair stalk gall

Prehistoric Animal of the Issue

Saber-tooth Cat

In 1973, California was selecting its state fossil. The competition was between the saber-tooth cat (*Smilodon fatalis*), a famous species whose fossils have been found and excavated extensively at Los Angeles's La Brea Tar Pits. Its opponent was the trilobite (class *Trilobita*), an extinct marine arthropod that happens to be one of the oldest known fossils found in California. Each group argued their case, including the Southern California Paleontological Society, which I am a part of. Ultimately, the state fossil became the saber-tooth cat, and what a great choice!

Many people know this species as the saber-tooth tiger, but the saber-tooth cat is, in fact, not closely related to a modern tiger at all. The "saber-tooth" part of the name on the other hand, is very fitting. With teeth measuring at lengths of 7 to 8 inches, the saber-tooth cat was a notorious predator. Hundreds of teeth have been found at the La Brea Tar Pits, along with over 3,000 fossilized individuals. Each specimen hints at what life was like for such a strong predator millions of years ago. Instead of hunting bison and horses across open grasslands the way dire wolves did, the saber-tooth cat likely preyed upon tapir, deer, and ground sloths in forested areas. The species had a rather stocky body, standing 3 feet at the shoulder, 5.5 feet in length, and weighing some 700 pounds. The saber-tooth cat was originally thought to have had lion-like hunting techniques, though new research dismisses this theory. In contradiction to modern day cats, who chase down their prey, body morphology suggests that the saber-tooth cat relied on ambush attacks. The cat would lunge forward and use their strong front legs to grab hold of unsuspecting prey, then sink their teeth into the flesh. Afterwards, they would slash at the prey's abdomen or throat and leave the animal to die, coming back when the job was finished.

The saber-tooth cat became very wide spread, with its range spanning from Canada to Peru. This is attributed to its success as a species, from the prey it chose to hunt, to its body shape and overall adaptability. While the saber-tooth cat appeared in the fossil record some 800,000 years ago during the Eocene epoch, it ultimately went extinct at the end of the Pleistocene epoch some 10-12,000 years ago. During this time, many large prehistoric herbivores that the saber-tooth cat preyed upon were disappearing. Lacking highly specialized prey is likely the cause of the saber-tooth cat's extinction, as well as that of other common predators of the time, including dire wolves and American lions. These species were not able to adapt to new food sources, which highlights the necessity for a species to be flexible and quick adapting in their changing environments.

La Brea Tar Pits, Los Angeles

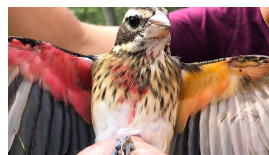
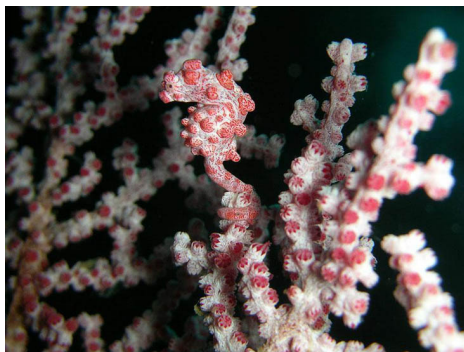
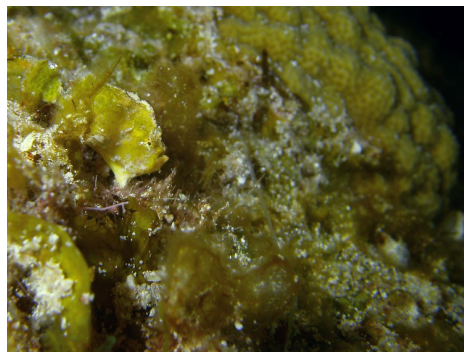
Over 3.5 million fossils have been excavated at La Brea Tar pits, and the work continues. Los Angeles is a science hotspot. Everyday, new fossils are being dug up and new skeletons assembled. The tar pits have been pivotal in the understanding of many ice age species, including the saber-tooth cat, dire wolf, ground sloth, coyote, mountain lion, and brown bear. Upon visiting the tar pits, visitors can immediately detect the strong scent of asphalt, a crude oil that is the result of decaying organic matter being pressurized to the point that it becomes oil. This asphalt is so strong it could trap even large animals such as mammoths and mastodons. Trapped prey becomes the food of predators, who would also get stuck in the asphalt. This may be why around 90% of the fossils found at the tar pits belong to carnivores such as the saber-tooth cat and dire wolf. La Brea Tar Pits not only includes a museum, but also areas where visitors can see science in action. The tar pits are currently closed until further notice due to COVID-19, but please visit their website at <https://tarpits.org>.



Games

Spot the Camouflaged Animal!

Camouflage is an adaptation organisms have evolved in order to blend in with their surroundings. Animals use camouflage for a variety of reasons— to hide their location, identity, and movement from predators and prey. Most animals will match their background, such as the eastern screech owl, who’s feathers resemble tree bark. Others use mimicry. The scarlet king snake has very similar coloration to the coral snake, a venomous species. Below you have a California towhee, frogfish, pygmy seahorse, and snow leopard using background camouflage. Can you find them?



Zoology Term of the Issue

Gynandromorphism, noun

USA Today recently reported on a half male, half female Northern Cardinal discovered in Pennsylvania. The bird was red on its right side like the males of the species and white-yellow on its left as seen in the females. National Geographic also reported a similar situation with a rose-breasted grosbeak also in Pennsylvania during September, 2020. Both of these instances are examples of gynandromorphism, more specifically bilateral gynandromorphism, in which the male and female parts are split right down the middle. Gynandromorphism (“gyne” meaning female in Greek, “andro” meaning male, and “morph” referring to variety) is when an animal has both male and female tissues, often with accompanying observable characteristics. Gynandromorphism can be bilateral, but also mosaic, where characteristics of one sex appear in the location of the other. Gynandromorphism is not limited to birds, occurring in insects, spiders, and crustaceans as well. Gynandromorphs are extremely rare and it is always exciting when one is observed and documented. Many gynandromorphs can go unnoticed, especially if sexual dimorphism is less obvious.

Name the Animal!



This bird is native to the tropical regions of Asia, namely eastern India and southern China.

This bird has been popular among the song bird trade and have since been introduced to other places around the world, including Australia, Singapore, and the United States.

There was a small population that had escaped an aviary in Kendall, Florida in 1960. They have since established themselves throughout southern Florida.

This first recorded sighting of this bird on the Hawaiian island of Oahu was in 1965. It is now very common in that area.

Not to be outdone, Los Angeles also has a healthy population. You can find this species at the L.A. Arboretum.

This songbird will travel in small groups or in pairs.

They tend to live in habitats abundant with weeds (insects) and berries, their main sources of food.

The eggs laid by this species are pinkish in color, complemented with purple-red spots.

This bird has a color in the first part of its name. Preceded by an anatomical feature and the type of bird it is. Three parts!

Find the answer on page 12!

Invertebrates of the Issue

Classification: *Tardigrada*

Tardigrades, also known as water bears and moss piglets, are microscopic invertebrates. They are best known for their ability to cope with extreme conditions. Tardigrades evolved in the Cambrian Era 500 million years ago with other organisms such as, trilobites, the pikaia (first organism with a vertebra-like nerve cord), and echinoderms. Since their evolution, tardigrades have survived all five of the mass extinctions that have led up to the Cenozoic Era, the current era.

Tardigrades efficiently reproduce through sexual and asexual reproduction. They reproduce asexually using parthenogenesis, the ability to reproduce without fertilization, and being hermaphrodites, having the organs for reproduction of both sexes. As mentioned, they also reproduce sexually. In this process, the female tardigrade will lay anywhere between one to thirty eggs which will be externally fertilized by a passing male. The eggs resemble white colored spiky balls and hatch after 30-40 days. The tardigrade undergoes no metamorphosis or larval stage and are instead born looking like miniature adults. The tardigrade grows in size by molting its skin. They use the claws at the end of each of their eight stubby legs for locomotion, as well as for grasping onto plant material. The tardigrade is no more than a millimeter long, but most are half that length. Food sources include nematodes and plant material.

In 2007, a European team of science researchers launched tardigrades into orbit around Earth outside a FOTON M3 rocket for 10 days. They were testing to see how tardigrades would do in the vacuum of outer space. Upon arrival on Earth, 68% of the tardigrades were discovered to be alive. Some of the tardigrades also having produced fertile offspring in space as well. This discovery gave the tardigrade the reputation of being the “toughest animal on Earth”. Other than being able to survive the vacuum of outer space, tardigrades can undertake many more extreme conditions. Tardigrades can survive temperatures of -460 degrees all the way to 302 degrees Fahrenheit. In addition, tardigrades can also withstand 570,000 rads of radiation, 1,400 times more than us humans, and can live at the deep depths of the ocean, about 4.4 miles below sea level.

While these listed habitats of tardigrades seem to be completely out of reach to the average human, tardigrades can be found in the most ordinary places as well. Specimens of moss and lichen can contain tardigrades and other microorganisms. By taking samples of moist moss and lichen, one can find tardigrades under 4x magnification, one of the lowest magnifications of a microscope. Sampling pond water and looking at it under a microscope could also give you the chance of discovering tardigrades as well.

The truth is, tardigrades can live anywhere! By exhibiting a dormant state known as cryptobiosis, or the “tun state”. When not in the cryptobiosis state, tardigrades are as susceptible to the extremes of any environment as any other organism. To elaborate on cryptobiosis, it is a state that tardigrades undergo to protect themselves from surrounding harsh conditions such as a drought or increased levels of pollution and other toxins. During such times, the cells of tardigrades fill with a matrix of a sugar known as trehalose. This matrix prevents DNA, protein, and cell membranes from getting damaged in harsh conditions. Tardigrades can remain in their cryptobiotic state for decades. When rehydrated, the matrix within the tardigrade’s cells dissolve, leaving the tardigrade unharmed. The tardigrades are a fascinating phyla of invertebrates, and surely one of Earth’s most adaptable animals!



Hilarious tardigrade song: <https://www.youtube.com/watch?v=9oSQFNM3P18>

Ted-Ed video: <https://www.youtube.com/watch?v=IxndOd3kmSs>

Zoology Debunkers:

Primate Classification Part 1: Apes

Primates are a diverse order of animals. They evolved some 53-66 million years ago during the later part of the Paleocene Epoch. This is only a few short million years after the Cretaceous–Paleogene mass extinction event, the one responsible for eradicating the dinosaurs. Dinosaurs had dominated Earth for some 165-177 million years. Once they were gone, the age of mammals began. At this time, most mammals resembled prehistoric shrews, but life continued to evolve. Eventually, the primates evolved, giving rise to a new taxonomic order. Primates include the monkeys, prosimians, and apes. Each of these groups diverged even further as they expanded their range. All too often, people confuse monkeys and apes, as well as leave out the prosimians. Let's take a look at these intriguing classifications!

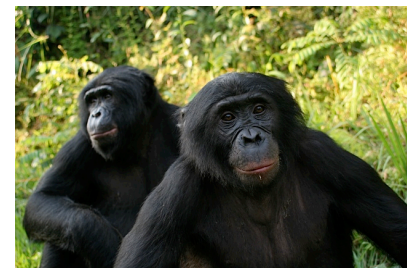


Orangutan
(genus *Pongo*)

Primates share many common characteristics, including prehensile hands and feet, each with 5 toes (called pentadactyly), forward facing eyes, nails as apposed to claws, opposable thumbs, etc. We also see an increase in size and complexity of the cerebral cortex, a part of the brain that handles sight, hearing, smell, and touch, as well as speech, thinking, and memory. Strong emotions and character are prominent in primates. Jane Goodall, for example, observed grieving in chimpanzees and Dian Fossey observed gorilla groups strongly defending infants and other group members. Many animals rely on their sense of smell, but primates focus more on visual sense. Primates also have well-developed clavicles ("collar bones"), allowing for 360° arm rotation. In addition, infants stay with their mothers for relatively long periods of time. This allows young to learn skills needed for later life. Let's explore the apes in further detail!

Great Apes (family *Hominidae*)

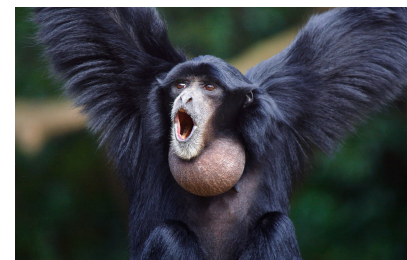
The great apes consist of gorillas, orangutans, bonobos, chimpanzees, and humans. Great apes are larger than other primates in body and brain size and do not have a tail. Chimpanzees are the most genetically similar to humans, sharing 98.6% of our DNA. A common misconception is that humans evolved from chimpanzees. No, we both evolved from a common ancestor around 10 million years ago. Another misconception: gorillas are ferocious animals, as commonly portrayed in movies and video games. No, gorillas are extremely gentle animals and will seldom attack. It is more likely that if a gorilla attacks, they will just be bluffing.



Bonobo
(*Pan paniscus*)

Lesser Apes (family *Hylobatidae*)

The lesser apes consist of the gibbons. This group of primates are smaller than the great apes in body and brain size. They are arboreal, having thin, long arms perfect for swinging through trees. Gibbons live in the subtropical and tropical forests of eastern Bangladesh to northeast India, as well as southern China and Indonesia. The siamang is the largest of the 18 gibbon species and are characterized by the large throat sacs present in both the males and females. Both the gibbon and siamang are capable of some complex vocalizations. I highly suggest you check them out!



Siamang
(*Symphalangus syndactylus*)

Stay tuned for next month's Part 2 of Primate Classification!

Resources

- <https://theoceancleanup.com/great-pacific-garbage-patch/>
- <https://www.condorferries.co.uk/marine-ocean-pollution-statistics-facts>
- <https://news.un.org/en/story/2017/04/556132-feature-uns-mission-keep-plastics-out-oceans-and-marine-life>
- <https://www.condorferries.co.uk/marine-ocean-pollution-statistics-facts>
- <https://ocean.si.edu/ocean-life/seabirds/laysan-albatrosses-plastic-problem><https://www.5gyres.org/microbeads>
- <https://www.desertmuseum.org/kids/oz/long-fact-sheets/Ringtail.php>
- <https://www.fieldmuseum.org/blog/do-all-bats-echolocate>
- <https://www.mmc.gov/priority-topics/species-of-concern/hawaiian-monk-seal/>
- <https://www.fisheries.noaa.gov/feature-story/shining-light-toxoplasmosis-hawaii>
- <http://ipm.ucanr.edu/PMG/GARDEN/PLANTS/INVERT/manaph.html>
- <https://writingfornature.wordpress.com/2013/05/26/things-that-gall-plants-and-parasites/>
- <https://wildmacro.com/index.html>
- <https://cindybinghamkeiser.weebly.com/galls.html>
- <https://www.nationalgeographic.com/science/article/saber-tooth-cats-surprise-fossils-redraw-picture-of-big-cat>
- <https://www.nps.gov/whsa/learn/nature/saber-toothed-cats.htm>
- <https://www.nationalgeographic.org/encyclopedia/camouflage/>
- <https://www.naturalhistorymag.com/features/243168/gynandromorphism#:~:text=Gynandromorphs%20>
- Gaskell, Morgan. 2018, *How Do Tardigrades Survive In Harsh Climates?*
- <https://gorillafund.org/great-apes/>
- <https://news.janegoodall.org/2018/06/27/chimps-humans-monkeys-whats-difference/>

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



Hang on, keep reading!

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: _____

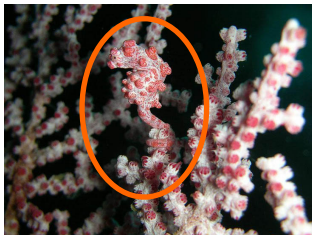
Email (also optional): _____

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- Name the Animal!

The animal on page 8 is a red-whiskered bulbul (*Pycnonotus jocosus*).



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

Backyard Sighting!



Feb 20, 2021
Ruby-crowned kinglet
(*Regulus calendula*)



Marbled godwit (left) and willet (right) seen at Oxnard on Feb 14, 2021.



We Love Your Questions, keep them coming!