

## New Segment!

### ZOOLOGY DEBUNKERS

Clearing away some  
misconceptions

(replacing *From the Field*)



**ENDANGERED  
SPECIES OF THE  
ISSUE**  
MOUNTAIN GORILLA



**WEIRD AND  
INTERESTING  
ADAPTATIONS**  
EPAULETTE SHARK



**EXPLORING  
DIADROMOUS FISHES  
MIGRATIONS JUST  
WAITING TO HAPPEN!**  
Ct. from Quarantine issue #4

# NEWS FOR THE DEDICATED ZOOLOGIST

## Let's End The Illegal Wildlife Trade

The illegal trade of wildlife is a very sensitive topic to people like myself. It is one that sparks fear, sadness, and anger in every photo, no matter the animal subjected to such crimes. I write about this topic in hopes of spreading awareness and to bring justice to the animals who's lives have been taken to fulfill a poacher's satisfaction for only a moment. Animal poaching is serious, and the world must realize this sooner than later, before it is too late.

The illegal wildlife trade affects millions of individuals, thousands of species, and generates billions of dollars each year worldwide. Whether that's the illegal trade of exotic "pets" or the skinning and selling of meat belonging to critically endangered species. People on all permanently inhabited continents, with an emphasis on Asia and Africa, seek the illegal wildlife trade as a way to supply income to their families. It comes with great profit, fetching tens of thousands of dollars per piece. It also comes at a great cost not only towards the poacher if they are caught, but to the wildlife and environments it harms. With an estimated 30,000 species of plants and animals being poached for food, medicine, clothing, etc, we



can't afford to lose a single individual. We are in Earth's 6th mass extinction, and humans are leading it.

The illegal wildlife trade hits every species affected hard. Some of the most in danger include the elephants, rhinos, tigers, gorillas, pangolins, sea turtles, and a variety of exotic birds. Each are affected in different ways, but all revolve around a couple major aspects of the wildlife trade. These are: the poaching for trophies, fur, bones, ivory, hands, shells, scales, bodily fluids, and meat, as well as the capture for pets, zoos, and other entertainment.



At around 10,000 individuals each year, the pangolin is the most trafficked mammal, and perhaps the most trafficked animal in the world. If you don't know already, pangolins are the only scaled mammal in the world and inhabit the forests, savannas, shrubland, and grasslands of Asia and Africa. These animals are mainly sought

after for their scales and meat, but also for blood and fetuses. In Asia, pangolins are primarily used for medicinal properties, none of which are scientifically proven to actually work. The scales, which are basically hardened pieces of keratin, are ground up and turned into pills thought to subside ailments such as arthritis and cancer. Scales are also consumed, thought of as a delicacy in parts of China and Vietnam. In Africa, pangolins are mainly poached for their meat, and are added to the menu at bushmeat markets.

Two other highly poached animals are the elephants and rhino species of Africa and Asia. Elephants are hunted for their tusks made of ivory, while rhinos are hunted for their horns made of keratin. Both are used for traditional Chinese medicine and as a carving material. Once again, horns and tusks are not scientifically proven to have any medicinal properties, despite the thought that they can lower fevers, treat gout, bone tumors, ulcers, etc. Thousands of elephants are poached every year. For example, it is estimated that around 20,000 individual African elephants are poached annually. Put into perspective, that's about 56 individuals a day. South Africa, which has been hit the hardest when it comes to rhinos, saw some 1,000 rhinos killed annually from 2013-2017. According to *Save the Rhino*, a rhino is killed every 10 hours.

A business that generates an estimated 23 billion dollars a year globally will not be easy to stop, as poaching can form the foundation of income in many countries. However, we can take a step forward in this fight by doing our part to prevent it. Whenever on vacation, be very careful about what you buy as souvenirs. Dried sea stars or seahorses at beach side stands, ivory sculptures, and caged exotic birds are some of the relatively less obvious. While tiger rugs, gorilla hands and heads, are surely the more gruesome and identifiable ones. Always remember to ask what you are looking at before you buy something. Reporting any signs of illegal wildlife trade and writing to governments about your concern are also great ways to help end the trade. Of course spread awareness, because we just can't get enough.

## Iconic Wildlife of the 50 States



### Washington: The Olympic Ermine

The Olympic ermine (*Mustela erminea olympica*) is a subspecies of the short tailed weasel (*Mustela erminea*) that lives exclusively in the Olympic Peninsula of Washington State. The key difference that separates this subspecies from its northern hemisphere counterparts is the Olympic ermine's fur, which does not turn white during the winter months. Instead they boast their brown fur and yellowish underside throughout the entire year. The Olympic ermine inhabits most sections of mountains, from the lowland forest to the subalpine zone. They can also swim, making them very common in areas surrounding water bodies. Olympic ermines are strong and agile carnivores, being able to hunt prey much larger than themselves. They tend to reside in the burrows made by their prey, often rodents such as squirrels, chipmunks, and even snowshoe hares. In the event that the ermine hunted more than it could eat, it will store the kill for the later.

## Interesting Reads

### The Biology of Caves

<https://www.nps.gov/ozar/learn/education/cave-biology.htm>

### 7 Ways You Can Help Stop the Illegal Wildlife Trade

<https://www.ecohealthalliance.org/2017/10/7-ways-you-can-help-stop-the-illegal-wildlife-trade>

### Red Gum Lerp Psyllid- an invasive species of California

<https://cistr.ucr.edu/invasive-species/red-gum-lerp-psyllid>

## Don't Miss This!

Learn about Akashinga, an all-female anti-poaching patrol in Zimbabwe, Africa with National Geographic's new short film at:

<https://youtu.be/WUYQS4oI9mw>

Or click on the image below if viewing as a PDF:



## Upcoming Events

September 4: National Wildlife Day

September 5: World Vulture Day

September 22: World Rhino Day

September 26: Save the Koala Day

October 3: Butterfly and Hummingbird Day

October 4: World Animal Day

October 6: World Badger Day

October 8: National Salmon Day

October 21: Reptile Awareness Day

## Your Questions, Answered!

Remy asks: "Why do tide animals decide to live in the tides even though it's a brutal environment?"

When microscopic life, such as plankton or algae die, they will sink to the ocean floor and decay, becoming nutrient rich organic matter. The same can be said for fish, who float to the surface and then sink to the ocean floor when air is no longer sufficient enough to keep them afloat. This decaying matter doesn't just sit there though. Waves, currents, and tides are constantly cycling these nutrients throughout the water column. Waves carry these nutrients with them as they approach surf zones and beaches. As waves approach the shore, it will slow down due to friction against the shallower bottom. The wave will crash onto the shore, and on the tide animals living there. This makes survival in the surf zone tough, but remember those nutrients that the wave was carrying? Many tide animals are filter feeders, who consume those nutrients while staying stuck to rocks. So while living in the surf zone certainly has its difficulties, it's also where all the nutrients end up, for a brief period of time that is.

### Nature Poll

Would you rather travel to outer space, or the deep sea?

Answer here: <https://forms.gle/GpXeRjLHbUU25q7n9>



← Deep Sea

Outer Space ↓



Last Issue:  
Definitely and eventually planting native plants tied, 2-2.



## Endangered Species Spotlight

### Mountain Gorilla

The mountain gorilla (*Gorilla beringei beringei*) is one of two subspecies of the critically endangered eastern gorilla (*Gorilla beringei*). The other subspecies is the eastern lowland gorilla (*Gorilla beringei graueri*). Though not critically endangered like its close relative, the mountain gorilla is still labeled as an endangered species on the IUCN Red List.



The mountain gorilla inhabits the forests of the Virunga Mountains, a chain of extinct and active volcanoes bordering Rwanda, Uganda, and the Democratic Republic of the Congo. Mountain gorillas inhabit some 25 square miles of this vast forest, with 2/3 of that being in the Congo's Parc National des Virungas, 30,000 acres in Rwanda's Parc National des Volcans, and the remainder in Kigali Gorilla Sanctuary in Uganda. They live in the 1,400 to 3,800 meter elevation range of the mountains. Due to the cooler weather at such elevations, the mountain gorilla has much thicker hair when being compared to its close relative, the eastern lowland gorilla. Other prominent features that distinguish the two include the mountain gorilla's shorter and broader hands and feet, more expanded nostrils, shorter arms, longer palate, a broader chest girth, and a more pronounced sagittal crest. The sagittal crest is a bone ridge running along the midline of the skull at the sagittal suture. In terms of diet, the mountain gorilla has a rather diverse palate, feeding on bamboo, bracket fungus, and a variety of mosses, ferns, grasses, shrubs, tree bark, fruit, vines, and very occasionally, insects.

I would say the person most associated with mountain gorillas is Dr. Dian Fossey. This American scientist spent an astounding 18 years studying the wild mountain gorilla population of Rwanda. Dian Fossey was one of three female scientists studying primates in order to assist famed paleoanthropologist, Dr. Louis Leaky, in his endeavors to discover the evolutionary similarities between humans and other great apes. Dr. Jane Goodall famously studied the wild chimpanzees of Gombe National Park in Tanzania, while Dr. Birutė Galdikas studied the orangutans of Tanjung Puting Reserve in Borneo. Affectionately known as *The Trimates*, each female scientist focused on the behavior of their selected primate and often branched off from Leaky's work. Dian Fossey not only went out in the field nearly daily to study the different gorilla groups, but also headed an anti-poaching patrol within the mountain gorilla's range after government appointed park rangers failed to do so. This anti-poaching patrol, which was supported by Dian's *Digit Fund*, was very successful in protecting the mountain gorilla population and is still very much alive today, even 42 years later. While the goals of the patrol remains the same, the name of the *Digit Fund* has been changed to *The Dian Fossey Gorilla Fund International*, in memory of Dian Fossey, who was brutally murdered in 1985 for reasons not completely known.

During the publication of Dian Fossey's only book *Gorillas in the Mist*, there were 242 mountain gorillas living in Africa. Thanks to the tireless work of Dian Fossey, *The Dian Fossey Gorilla Fund International*, other conservation organizations, and the governments of Africa, the mountain gorilla population in December of 2019 was 1,063 individuals. Though this increase by 439% is without a doubt exciting, gorillas still face multiple threats, from the poaching of heads, feet, and hands, to deforestation and human encroachment. Despite the avoidance of Dian's prediction that mountain gorillas would go extinct in the same century they were discovered in, gorillas still have a long way to go before they are no longer considered threatened with extinction. It is people like you who can make the necessary changes to keep this species alive.

If you would like to make a donation to *The Dian Fossey Gorilla Fund International*, please visit <https://gorillafund.org>. Thank you!

## Zoology Destinations

### Discovering Our Local Species

Okay, I (might) know what you're thinking: quarantine is still ongoing, and I still can't escape my house to view wildlife! I get it, which is why I'm going to talk about national parks here for the time being. There are all sorts of online resources when it comes to national parks: the National Park Service website (see below), National Geographic, and a multitude of videos on YouTube. Point is, maybe you can't go hiking or adventuring outside of your home in person, but there are plenty of ways to do so virtually. So hop on board the Virtual National Park Exploration Train, as we learn about the national parks that are right at the touch of your keyboard and mouse!

### 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>

### Joshua Tree National Park

Joshua Tree National Park is the cohesion of two nearby deserts, the Colorado and Mojave, and a small mountain range by the name of Little San Bernardino Mountains. Together, these three environments, each with their own environmental pressures and rewards, challenge organisms to adapt to their surroundings in order to survive.

Joshua Tree boasts beautiful mountains, perfect for rock climbing and hiking, as well as a vast array of plant and animal life. Of course, the Joshua tree is the namesake of the park. Being endemic to the Mojave Desert, the Joshua tree is the largest member of the yucca genus. Only reaching maturity at 60 years old, the Joshua Tree can live for over 500 years in a stable ecosystem. Their main pollinators, the yucca moth, can be seen pollinating the plant at night when the flowers open. The yucca moth will pollinate the flowers of the Joshua Tree and will, in turn, lay their eggs on the flowers. Though the pollination of the Joshua Tree and the laying of yucca moth eggs are both crucial to the balance of an ecosystem, the Joshua Tree Genome Project suggests a different standpoint. Yucca moths have been observed on multiple occasions as hacking the system of pollination. They will wait for other moths to pollinate the Joshua Tree flowers and then lay the eggs and avoid doing the dirty work. There is also evidence that Joshua trees will detach their flowers if they are too heavily infested with yucca moth larvae that feed on its seeds. This could otherwise be harmful to the plant, raising the possibility that fruit produced will lack seeds and therefore decrease the chances of a new individual Joshua tree.

In addition to the Joshua Tree and yucca moth, various wildlife species inhabit the park. Ranging from lichens and cactus to desert kangaroo rats and the California tree frogs. Yes, you read that right, Joshua Tree National Park is home to two species of amphibians- the red-spotted toad and the California tree frog. Both species thrive well after a heavy abundance of rain, a factor that can vary greatly from year to year. As you can see, Joshua Tree National Park would be a fantastic place to travel to, but with coronavirus out there right now, best to stick to the links provided down below!



Location: 74485 National Park Drive Twentynine Palms, CA 92277 (average 130 miles from L.A.)  
 Joshua Tree Visitor Center: 6554 Park Boulevard, Joshua Tree, CA 92256 (average 147 miles)  
 National Park Service Website: <https://www.nps.gov/jotr/index.htm>  
 Photos and Multimedia Website: <https://www.nps.gov/jotr/learn/photosmultimedia/index.htm>

# Exploring Diadromous Fishes

Continued from Quarantine issue #4



In the previous issue of *News For The Dedicated Zoologist*, I left you all at the cliff hanger of “how are diadromous fish actually able to transition from salt to fresh water?”. Maybe you couldn’t wait and decided to do your own research, maybe you didn’t. Regardless, here it is, what you all may have been waiting for! So let’s jump right in and start the migration to the understanding of diadromous fish evolution! Get it?

Let’s ponder the “how”, *how* are fish able to adapt to fresh and salt water, *how* are they able to complete these migrations? Before we answer those questions, we must first address the “what”, what is required of a diadromous fish if they are to make the transition between water types?

Salt is important for the body. It plays a pivotal role in nerve and muscle function, regulating fluids, and maintaining blood pressure. As in any organism, a balance of salt is necessary and too much can be detrimental. Diadromous fish are no different. Each water type has its own struggles when it comes to regulating this balance. For life in freshwater, the fish needs to actively take in salt via the gills. Then, it has to excrete water via the kidneys to prevent the salt content from becoming too diluted. The opposite is true for saltwater life. Excess salt that has been ingested is excreted via the gills and kidneys in order to prevent the body from becoming too salty.

Now, the “how”. For the transition from fresh to salt water, a smolt (that is a fish ready to migrate) will drink lots of water. Urine production will drop dramatically. Finally, chloride cells act as a molecular pump that will begin pumping sodium out of the body instead of in. Enzymes located on the membranes of these chloride cells by the name of  $\text{Na}^+/\text{K}^+$  ATPase are what gets this task done.  $\text{Na}^+/\text{K}^+$  ATPase is an enzyme that can actually be found on every cell. Its roles vary, but its function remains the same: regulate osmotic equilibrium and membrane potential by maintaining a specific concentration of sodium outside of the cell, and a specific concentration of potassium inside of the cell.

But why go through all this trouble in the first place? Evolutionarily speaking, scientists aren’t sure why some fish are diadromous and some are not. It was thought that it had to do with the fish’s habitat, but recently, there appears to be no correlation. One study, whose goal was to determine the evolutionary advantages, found that diadromy may be linked to a species wanting to increase genetic diversity by preventing inbreeding. However, because of their reliance on both salt and freshwater, we must take great care in making sure our watershed is a safe place for these fish to thrive.

## Can You Recall?

Try out this trivia to see how much you know about diadromous fishes!

1. What does it mean to be a diadromous fish?
  - a. To be capable of being male and female
  - b. To be able to live in fresh and salt water
  - c. To only have a range spanning half the Earth
2. Are salmon an anadromous or catadromous fish?
  - a. Anadromous
  - b. Catadromous
3. Which fish is potamodromous?
  - a. Black grouper
  - b. Smelt
  - c. Lake sturgeon
4. True or false? The river goby is an oceanodromous fish.
  - a. True
  - b. False
5. Mutton snapper are an example of which type of fish?
  - a. Catadromous
  - b. Potadromous
  - c. Oceanodromous
6. True or false? All members of the eel genus *Anguilla* are catadromous.
  - a. True
  - b. False
7. Which is the best example of an anadromous fish migration?
  - a. Being born in freshwater algae and then migrating to a coral reef
  - b. Being born in a kelp forest and then migrating to a freshwater limestone lake
  - c. Migrating from one rock to another

Find the answers on page 12!



## Prehistoric Animal of the Issue: *Archaeopteryx*

I'm sure you have heard people make the statement: "Birds are living dinosaurs.", and it's true. That pigeon you saw in the city, or that sparrow in your backyard, are all living relatives of the dinosaurs. So how did this all come about? Where did it all start? Let's take a trip back to prehistory about 160 million years ago, 94 million years before the dinosaur's extinction.

It is currently believed by the paleontological community that birds evolved from a clade of dinosaurs called the theropods. The first theropod dinosaur was likely *Eodromaeus*, which evolved some 230 million years ago. This marked the beginning of dinosaurs characterized by their hollow bones and three toes. Sound familiar? Both theropod dinosaurs and birds share these characteristics. The theropod clade contains all carnivorous dinosaurs, from the infamous *Tyrannosaurus rex* and *Spinosaurus*, to the *Velociraptor* and *Compsognathus*. Theropods are considered to be the most biodiverse of any saurischian dinosaurs- remember, the lizard hipped dinosaurs I mentioned in issue #6? And it's no surprise, these dinosaurs were built for speed and agility, combined with a muscular body frame and serrated teeth.

It wasn't until the 1960s when paleontologists discovered *Deinonychus* that they began to make the connection between birds and dinosaurs. *Deinonychus* had feathers! Today, birds are the only class in the kingdom *Animalia* that have feathers, making this one of their key characteristics. So if this dinosaur had feathers, does that support the idea that birds did indeed evolve from dinosaurs? Scientists had to know! The similarities kept popping up with each discovery. Then came what the paleontologists were looking for- a prehistoric animal that had all the qualities of a bird. This dinosaur was named *Archaeopteryx*, and likely evolved some 150 million years ago. *Archaeopteryx* is now considered to be the first bird, but it was not the first dinosaur to have bird-like qualities. The gradual evolutionary diverge likely began 10 million years before the evolution of our fine bird friend, likely a result of certain theropods evolving from fast-running, ground dwelling dinosaurs to small, flying ones. This change could have been triggered when smaller theropods decided to take to the trees for food, protection, or both. With more discoveries in the field, paleontologists discover extra pieces to the prehistory puzzle, ones that can either support what we already know, or introduce something never before seen. Dinosaurs were thought of as huge reptile-like monsters in the 1800s, but now we know even humble dinosaurs like *Deinonychus* and *Archaeopteryx* had feathers, paving the way for a path that led to modern birds.



## So how did birds manage to survive the Cretaceous-Tertiary Extinction Event 66 million years ago?



Likely caused by a combination of natural disasters including an asteroid impact in Mexico's Yucatán Peninsula and incredible volcano activity, the Cretaceous-Tertiary Extinction was able to kill off the leading animal group of the time- dinosaurs, which had dominated Earth for over 140 million years. Named after the time period that it ended and the one it started, the Cretaceous-Tertiary Extinction didn't manage to kill off the birds. The asteroid and volcano activity likely created so much smoke in the air, that it covered up the sun for a prolonged period of time, inhibiting plants from growing well. Plants play a vital part in an ecosystem, providing food for herbivores, which in turn supply food for the carnivores. But because of the birds' small size they had a smaller demand for food. They also had more varied diets and the ability to fly to areas with better living conditions. Today, the avian cousins of dinosaurs are a very diverse class- containing over 11,000 species covering all parts of the Earth.

# Games

## Critically Endangered Animal Word Search

H A C B Y Q D H Q A V C M U P O A P S A J C E S S K L A L L  
P R K Z L X M C T L N A F H B R S K W T M O W P U X M N E I  
Q J X A A A F A B L R A I J W G I K D I B C C N N U K T E A  
W G O D F K C F O B Z L H H S A O L A U K O Q C D J U O N U  
D R D X M I C K L L I P V R W N V A C Q Y N E T A Q Q P A Q  
E A J Z Y C S E R P I E G L V U H N A A W N R X P M F E E N  
J T Z A L G D D P H O A T J S T Y O T V S M Q Q A L B U P A  
T S A Q D G Q I E P I T R Q R A W A O Z F P M D N U S N O Y  
Y A S K E D N P Q M I N N M B N R S Y D T S X R G W Q I R A  
V J J C S E V R F F E I O G A K F M A X E C F B O R M E U L  
C Z K J E N G A A F R D B Q C U Y M F I F D Z C L L L S E A  
V O U A I A O N Q A O R A O A Q G S X K G J V A I S Y D V M  
E F G U X C M M M O S N R I O O W Y U I J A D U N F J H K I  
V L R I S U R A M U G L E T D O I K D R A P O E L R U M A H  
E C Q W S Q T C T O A I V A W N Y Y Q Y S S H P N T J L W K  
Q S U S R D Y X M R C N A S S A U G R O U P E R I E U W T B  
H Q E H E L V N T E C A D A P O A M N D P T K U X F Y R R X  
A L L I R O G N R E T S A E T R U E W E E V I L K E B B E S  
J I P Y A M E X O L Y Z J E L Q C Z G K J S S R A U U T E N  
E X Z I J C W L A H K K W U C Y K S T Z V D M Z M S P D L M

VAQUITA	ORGANUTAN	SUNDA PANGOLIN	GUAM RAIL
AMUR LEOPARD	NASSAU GROUPER	HIMALAYAN QUAIL	PIED TAMARIN
COMMON SKATE	HOODED VULTURE	EUROPEAN EEL	MAOPA DACE
MARbled GECKO	EASTERN GORILLA	FAN MUSSEL	CENTRAL ROCK-RAT
TOPE	DIADEMED SIFAKA	SAOLA	SAIGA
PHILIPPINE EAGLE	ADDAX	TRUE WEEVIL	BLACK RHINO

## Zoology Term of the Issue

### Passerine, adjective

The term passerine is used to describe birds that have adapted to perching. They have done so by evolving feet that are perfect for clinging on branches. These feet have three toes facing forward and another facing backwards, called the hallux. Passerine birds have been grouped together in the order *Passeriformes*. Other than specialized feet, members of *Passeriformes* also have a distinctive bony palate, wing musculature, etc. All songbirds are placed in this order, such as warblers, titmice, finches, and sparrows, as well as larger birds such as crows, ravens, and oxpeckers. As you can see, passerine birds are very diverse. In fact, it is thought that they make up over half of all bird species.



## Name the Animal!



This animal is a marsupial, part of the infraclass *Marsupialia*.

This animal's closest relative is the kangaroo, both being part of the genus *Macropus*.

Similar to their kangaroo cousins, the males of this species will "box" with one another in order to establish social dominance.

This species is native to eastern and southern Australia, as well as parts of Tasmania. However, it has also been introduced to parts of New Zealand, Scotland, England, Ireland, and France.

You can find this species in tropical savannas, temperate grasslands, and temperate broadleaf and mixed forests.

This animal can reach a top speed of around 40 miles per hour when jumping.

This animal is crepuscular, meaning it is active during dawn and dusk.

This species is generally solitary, but mobs of around 30 individuals can live together too. Grooming and play amongst individuals with similar rankings will take place as well.

Babies are called joeys.

Hint! Take a look at the coloration of the animal and the location of that color.

**Find the answer on page 12!**



# Invertebrates of the Issue:

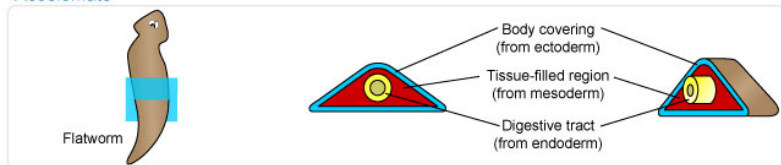
## Classification: *Platyhelminths* and *Nematoda*

*Platyhelminths* (“platy” meaning “flat” and “helminth” meaning “worm” in Greek) are a phylum of invertebrates that are characterized by their flattened body, bilateral symmetry, and simple, yet groundbreaking, internal anatomy. *Platyhelminths*, better known as flatworms, include the parasitic tapeworms and flukes, as well as the free-living planarians. Though they don’t have the most complex anatomy of the invertebrates, flatworms did mark the transition from primitive body plans to more complex ones. Take a look at the Cnidarians, your jellyfish, anemones, etc., their bodies are divided into two layers- the ectoderm and endoderm, with each containing its own specialized cells. Animals that have bodies with two layers are diploblastic. Flatworms are triploblastic, and are characterized by three layers, the endoderm, *mesoderm*, and ectoderm. The mesoderm contains cells specializing in muscular tissue. This muscular tissue enables platyhelminths to move around with ease. Even the endoderm and ectoderm are more specialized than that of the Cnidarians. We see these layers becoming the nervous and excretory systems in the flatworms. Interestingly, all succeeding phyla share the mesoderm and the similar organ systems with the *Platyhelminths*.

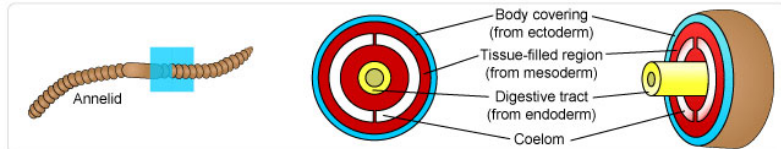


*Nematoda* (“nema” meaning “thread” in Greek) are a phylum of invertebrates better known as nematodes or roundworms. They include some 25,000 species of ascarids, hookworms, filariae, pinworms, and whipworms. Many of these classes are parasitic- such as *Ascaris lumbricoides* from *Chromadorea*, better known as the giant roundworm. This species not only grows to reach lengths of 14 inches, but is also one of the few nematodes to parasitize humans. There are also many nematodes that parasitize plants- about 10% of known species. These include the soybean cyst nematode, root gall nematode, and the northern root-knot nematode, to name a few. Parasites aside, nematodes are pretty cool animals! Unlike the *Platyhelminths*, nematodes have a complete digestive system, that is a distinguished mouth and anus. Nematodes (and Rotifers) are pseudocoelomates, otherwise known as blastocoelomates. What does this mean? At its simplest, this means that the body cavity is not lined with mesodermal cells, as seen in coelomates (think mollusks, arthropods, chordates, etc.). Because of the lack of mesodermal cells, the organs are surrounded by a fluid that serves as nutrient and oxygen transport. Lacking mesodermal cells doesn’t necessarily mean no mesoderm, which nematodes do have. Instead, it refers to the absence of a peritoneum, which covers the coelom in true coelomates. The peritoneum separates the body cavity from the fluid in the body. Regardless, nematodes are super cool! The differences in the internal anatomy of invertebrates just goes to show you how far life on Earth has come!

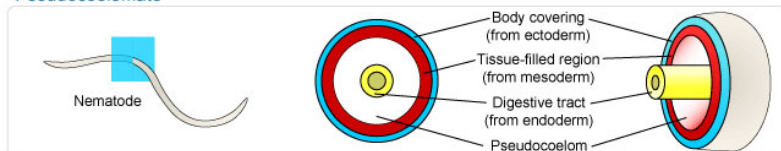
Acoelomate



Coelomate



Pseudocoelomate



Dept. Biol. Penn State ©2002

## Zoology Debunkers: Hemotoxin Versus Neurotoxin

In issue #10 of NFDZ, we discussed the differences between poison and venom- two different toxin delivery methods. This time, we will discuss hemotoxin and neurotoxin- toxins that affect the body in two different ways.

The Greek root *hemo* means blood, as seen in the words hemoglobin, hematology, and hemophilia. Can you guess what the word *hemotoxin* means? If you thought: toxin that affects blood, you would be right! Hemotoxin is a form of toxin delivered by snakes, such as pit vipers, copperheads, cottonmouths, and rattlesnakes. The toxin is injected into the bloodstream by fangs, which are connected to a venom sack in the back of the snake's head. The snake can actually control the amount of venom they inject with the help of muscles located near the glands. Hemotoxin targets the victim's circulatory system, specifically the red blood cells. It can disrupt the clotting of blood that leads victims to bleed out excessively, damage tissues when they don't receive enough oxygen, and lead to the collapse of organs and organ systems.



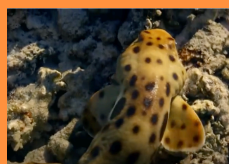
The root *neuro* is derived from the Greek word *neuron*, relating to the nervous system. It comes as no surprise that neurotoxin is toxin that specifically affects a body's nervous system. Neurotoxin can be found in porcupine fish, pufferfish, cobras, black widow spiders, honey bees, and more. As you can see, neurotoxin is much more prevalent in the animal kingdom than hemotoxin. There is a wide variety of toxins that fall under the neurotoxin category. For example, pufferfish, blue-ringed octopus, and the tropical goby produce tetrodotoxin, black mambas produce calciseptine, and scorpions produce agitoxin. The main goal of a neurotoxin is to disrupt neurotransmitters by blocking reception sites or lessening their production. Neurotransmitters are particles that relay messages between the brain and the rest of the body via neurons. Neurotoxins have affects ranging from blocking calcium and potassium channels, to preventing neural synapses- that is the transfer of electric activity from neuron to neuron. Whichever way you look at it, hemotoxin and neurotoxin play a pivotal role in the lives of animals.

### Weird & Interesting Adaptations

**Name:** Epaulette shark (*Hemiscyllium ocellatum*)

**Weirdest Features:** Ability to breath air and travel on land!

**Purpose:** Unless you are a tide animal, getting stuck at low tide is a dangerous thing. Meet the epaulette shark, an animal that not only has the ability to breath air, but also the ability to travel on land! By slowing down their breathing and heart rate, as well as limiting blood flow to the brain, this shark is able to survive on land for around an hour after taking its last breath underwater. Afterwards, the epaulette will maneuver itself back to the ocean by "walking" on its pectoral fins. This technique gives the shark more time to hunt for prey such as crabs and worms.



## Resources

- <https://www.aljazeera.com/ajimpact/numbers-illegal-wildlife-trade-threatens-species-190813200335875.html>
- <https://www.savetherhino.org/rhino-info/poaching-stats/>
- <https://www.ecohealthalliance.org/2017/10/7-ways-you-can-help-stop-the-illegal-wildlife-trade>
- <https://www.nps.gov/olym/learn/nature/short-tailed-weasel.htm>
- <https://www.iucnredlist.org>
- <https://www.surfertoday.com/surfing/why-do-waves-break>
- <https://gorillafund.org>
- <https://joshuatreegenome.org/archives/2016/03/what-is-the-deal-with-joshua-trees-and-yucca-moths/>
- <https://www.nps.gov/jotr/index.htm>
- <https://bmcevolbiol.biomedcentral.com/articles/10.1186/s12862-019-1492-2>
- [https://evolutionnews.org/2015/08/how\\_salmon\\_adju/](https://evolutionnews.org/2015/08/how_salmon_adju/)
- <https://www.nhm.ac.uk/discover/why-are-birds-the-only-surviving-dinosaurs.html>
- <https://www.nhm.ac.uk/discover/how-dinosaurs-evolved-into-birds.html>
- <http://animalia.bio/red-necked-wallaby>
- <http://tolweb.org/Passeriformes>
- <https://manoa.hawaii.edu/exploringourfluidearth/biological/invertebrates/worms-phylo-platyhelminthes-nematoda-and-annelida>
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- <https://biologydictionary.net/pseudocoelomate/>
- <https://www.thoughtco.com/how-snake-venom-works-4161270>
- <https://faculty.washington.edu/chudler/toxin1.html>
- <https://www.oceanicsociety.org/blog/1774/the-shark-that-can-walk-on-land>

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





Hang on, stay a bit longer!

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](mailto: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-necked wallaby (*Macropus rufogriseus*).

**We Love Your Questions, keep them coming!**



## 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

### Page 6 Can You Recall?

1. b. Fresh and salt water
2. a. Anadromous
3. c. Lake sturgeon
4. b. False, amphidromous
5. c. Oceanodromous
6. a. True
7. a. Coral is saltwater only

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I also designed these 3D printed News for the Dedicated Zoologist coasters that you might like! See form for details!

### Word Search Answers

H A C B Y Q D H Q A V C M T F G A P S A J C E S E K L A U L  
P R K Z L X M C T L N A F H B S K W T M O W P U X M N E I  
Q J X H A F F A B L R A I J W G I K D I B C C N M U K T E A  
W G O D E K C F O B Z L H H S A O L A U K O Q C D J U O N U  
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E X Z I J C W L A H K K W U C Y K S T E V D M E M S P D L H

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