

## **Biodiversity: The Good, The Bad, and The Ugly**

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### **Introduction**

Why should a repulsive, disgusting, animal that makes my life either more difficult or may even put my life in danger exist? Why can't all animals in this world be pleasing to behold, or at least not bother me in my life? Have you ever asked this question, why does this animal exist? What on earth is the reason for this animal? I have asked these questions and my students have also asked these questions. I have often been at a loss to answer them. There are some animals that I value precisely because they feed on the animals I detest! Alas, should I have such a lofty perspective merely because I am a human? Perhaps, by examining the intricate structure of such animals, their amazing adaptations, developed over time with such precision to insure survival, I might be persuaded to give them a nod. Not really ready to accept them, but perhaps begrudgingly allow them to co-exist in this crazy world, and even admire their audacity to exist.

Working in a Title 1 school with a population of 440 students, on the outskirts of the city of Wilmington, Delaware, has been challenging. As of 2014-2015, we had a low income population of 39.3%. Our diversity, as of 2014-2015, included 13.1% African American, 21.7% Hispanic, 1.7% Asian, and 6.2% multi-racial. My school district has chosen to increase the inclusion of English Language Learners and students with special needs into their neighborhood schools starting in the 2015-2016 school year. The English Language Lerner population in my school has increased from 6.7% in 2014-2015 to 18.4% in 2015-2016. English Language students receive some support from an English Language Lerner tutor either twice a week or 4 times a week for thirty minutes, depending on their English Language Lerner scores from the beginning of the year. Previously, English Language Lerner students in my district had an option to attend a specialized English Language Learner school, and many of them chose this option. The special education population in my school was 9.4% for 2014-2015, but that has also increased this year due to increased district inclusion of special education students. Some of these students receive additional support in reading and math from a special education teacher outside of the classroom, and the rest receive support from dual certified classroom teachers within the classroom.

Given the increased amount of students with special needs, I need to make sure that I make science accessible to all within the regular education classroom without additional teacher support. The best way to do this is to make sure that the students can connect with

what they are learning. If at all possible, connections should be made to the student's home countries, languages, and previous experiences. For the most part, all of my students love science, particularly when it involves animals!

Another challenge in the science classroom has been the decrease in time given to teaching science. The other core subjects and remedial periods have forced a reduction in time allocated for science to about 40 minutes, two times a week.

Our state is currently developing new science units that meet the Next Generation Science Standards. I am on the state team that is developing the units. I will be piloting one of the units this fall, the Structures of Plants and Animals unit. In addition to addressing different performance expectations, the manner of science teaching has been adjusted to meet the goals of the new science standards. I plan to include the same type of instruction in the unit I am writing for DTI. In addition, this unit will complement and extend the Structures of Plants and Animals Unit that I helped to develop for the state of Delaware.

## **Rationale**

I want to extend and enhance the current science unit which is an adaptation of the Foss Science Kit: Structures of Life. I helped to develop the adaptation to align the science unit to the Next Generation Science Standards. Students will have to observe and analyze the structures and their functions of certain animals which many find unappealing. They will also have to note the animal behaviors in their analysis, as much as they can without having the animal to study. In the process of analyzing the animals, students will be using research and writing standards from the Common Core State Standards to publish their findings.

## **Background**

Animals are amazing creatures. Most scientists believe that animals exist because they have not been eliminated by other animals, climate, or human activity. Our environment changes. Lately, it is changing dramatically. CO<sub>2</sub> levels and temperatures have increased dramatically, (see Appendix C). Most believe that the two changes are related. As human populations have increased they have destroyed animal habitats to accommodate their own. Over-fishing and pollution are just two of the problems that have caused the degradation of animal habitats.

Animals have to adapt in order to survive. Animal adaptations can be morphological, physiological, or behavioral, according to Dr. Jack Bartley in seminar. Morphological adaptations involve the animal's structures such as the giraffe's long neck to reach leaves. Physiological adaptations are body changes such as when your pupils dilate to accommodate bright light or hormonal changes during maturation. Finally, behavioral adaptations are activities animals engage in to help them survive, such as forming flocks and herds,

or being an ambush predator. Adaptations are a natural ongoing process to adjust to changes in our world that take place over many years. Due to the dramatic environmental changes, animals must make increased adaptations if they are to survive. Since adaptations typically take place over many years, animals will not be able to adapt quickly enough to survive in the changing environment, and they will become extinct.

Many animals are disliked by people either because they are dangerous or pesky or they have habits or appearances that are not particularly appealing. Some of these animals have become more pesky to humans lately due to changes in climate. Some animals have become endangered due to human activity or climate change. They have not been able to adapt quickly enough. Others continue to survive well for now, but will that continue?

For instance, humans invented DDT to eradicate mosquitoes. It not only did not eradicate mosquitoes, it had disastrous affects to the eggs of bald eagles and pelicans. By eliminating DDT and protecting and sheltering birds that were affected, the birds survived. We need to look at all of our animals, particularly those that we think are pesky, ugly, or dangerous, and make informed decisions whether to help them survive or not. We cannot expect them to keep making adaptations that usually take many years. On the other hand, are there some that we should not protect? Are there some animals that we should eliminate? How do we decide? Should we decide? Should we do anything?

## Potential Animals to Study

### *Squid*

One animal that is not particularly appealing is the squid. Not the octopus, but the squid, not even the elusive giant squid. What is squid good for besides calamari or bait? However this interesting animal, with a rather disgusting appearance is often overlooked for its more interesting relatives. Squid actually have 8 arms and 2 tentacles. The tentacles are longer than the other eight arms. Squid have acquired the morphological adaptation of these longer tentacles to grab their food and bring it to their mouths. Speaking of mouths, most people do not realize that squid actually have a small beak at their mouth to break open shells of their prey! They have large eyes in proportion to their bodies, which are good in the darker areas below the ocean surface. Along each of the arms are little suction cups, useful to holding on to their prey. Like most ocean dwellers, they have a pair of gills to extract the oxygen from the water. Among their interesting behaviors is a manor of jet propulsion through the water. They suck in water through a body part, like a straw, called a siphon, and then shoot it out to propel themselves through the water. While they are considered a mollusk and are related to clams, their shell is internal and resembles cartilage. They have an interesting physiological and behavioral adaptation of emitting an ink-like substance to deter their predators. Some squid can even change the color of their bodies with the ultimate camouflage! Are we feeling the love yet?

## *Sharks*

Sharks have some amazing morphological adaptations that enable them to survive. They have streamlined bodies that enable them to swim efficiently. The body shape also decreases noise when they swim, enabling them to sneak up on prey. Shark bodies have specialized scales on their bodies that feel like sandpaper. They protect the shark and are replaced as needed. Sharks do not have bones, they have cartilage instead which is lighter than bone, to increase flexibility and minimize the energy needed to swim and stay off the bottom. Unlike bony fish, sharks do not have a swim bladder for buoyancy. They have excess fat in their livers, (physiological adaptation), that helps them float with no effort. Yet sharks can swim and change direction quickly due to their pectoral fins. Sharks are famous for their dangerous, sharp teeth that are replaced as needed. Finally, sharks are camouflaged in the ocean. Dark on the top and light on the bottom, creates the perfect camouflage in the ocean, allowing them to blend in with their environment.

Physiologically, sharks have many sensory organs on their snouts that sense prey, inner ears that sense movement, and senses in their scales that sense quick movements. All of these adaptations help sharks locate prey.

Behaviorally, sharks are considered intelligent hunters. The Great White Shark hunts both day and night. It hunts a wide variety of prey. When attacking a large mammal, the shark usually attacks quickly from the bottom of the prey and then retreats quickly, waiting for the animal to bleed to death before retrieving it for food.

Sharks are animals that are often feared by people, especially people who like to enjoy recreation in the oceans. There are over 450 species of sharks, however only three are likely to attack people: the Bull Shark, the Great White Shark, and the Tiger Shark. In fact, the Basking Shark and the Whale Shark only eat plankton! There have been 92 shark attacks logged for 2015 by October 20. However, according to the New York Times, in 1992, 50-75 attacks could be expected. It does seem as if the attacks have increased.

Why do sharks attack people? Murray Suid and George Burgess give four possible reasons. The first reason is that people disturb the shark, such as a fisherman who tangles with a shark while fishing. The next is a mistaken attack by the shark who is investigating the human as prey- usually swimming away after attacking. The next attack is a deep-sea attack by sharks that swim in the deep and randomly attack divers. And the last attack involves hitting the victim and then biting the victim. Unfortunately for the victim, due to the shark's teeth structure of many rows of rather sharp teeth, the bite is often very serious for the human victim.

Many of the over 450 species of sharks are endangered or getting close to being endangered. Why? There is over fishing and accidental entanglement in fishing nets, habitat destruction, and poisoning from dangerous, toxic items thrown into their water homes.

Asian cultures enjoy shark fin soup. The fins are often harvested and then the shark is discarded. Because sharks are slow growing and have a low reproductive rate, these activities have been devastating for the shark populations. In addition, due to global warming, water temperatures have increased. Sharks are no longer comfortable living in water they lived in before, so they have had to move. In many cases, this has put them into areas where people are fishing, boating, and swimming. The sharks' prey are also moving due to the warmer water temperatures. In addition, due to warmer waters, humans are spending more time in waters where sharks live. Scientists believe that the sharks are also somewhat confused and stressed by the climate changes. They believe that shark reproduction rates, already low, have diminished, possibly as a result of their stress.

So why should we protect sharks if they are dangerous to us? Sharks are at the top of their food chain. They keep many of the other animals in their ecosystem from increasing too much. Actually, it is believed that sharks often tend to consume prey that are weak, eliminating the weak animals from the ecosystem. In addition, sharks help preserve other habitats such as the sea grass in Hawaii. Turtles in Hawaii feed on the sea grass. However, tiger sharks eat the turtles. If the sharks cannot eat the turtles, the turtles will overgraze the sea grass, possibly eliminating it. So, the sharks are important to many parts of the various food chains in which they participate.

### *Leeches*

Could there be a more disgusting animal to imagine than a leech? I'm quite sure that most people shudder to imagine a leech attached to their bodies, extracting some of their blood. However, not all leeches are parasites. They eat small water animals such as insect larvae, aquatic worms, and snails. But the leeches we will consider are the parasitic ones. They do not seek out humans though. They actually prefer fish, mammals, and frogs, and sometimes snapping turtles they find in shallow water.

Leeches are actually a segmented worm or annelid. They have suckers on the front of their narrow body to hold on to their host animal. On the back of their body is another sucker to help them move. They have specialized jaws that can break the skin of the host animal.

Physiological adaptations include glands that produce a slime that makes them slippery so the host animal cannot remove them easily. They inject an anesthetic into the animal they choose, as well as an anticoagulant to keep the animal's blood from clotting. They also have a very slow digestion. In fact, they can last a year between meals.

Leeches live in ponds where their prey frequent and they actively seek out prey while in the water. While they can cause harm to smaller animals, they usually do not harm larger animals. They are important to the ecosystem they exist in as they are a food source for turtles, ducks, and other birds. An absence of the leech may cause one of these

animals to go hungry. Are leeches bothered by warmer waters? Not yet apparently, but that could change. However, water habitats, especially wetlands, are diminishing.

### *Ticks*

Apparently, ticks have a very long line of ancestors, dating back to the dinosaur days. They haven't had to adapt very much since then either. Ticks have morphological adaptations to attach to another animal, burrow their heads under the skin and drink blood. Their mouths have hooked probes which makes it hard to remove them. Some are very small in size and extremely flat, such as deer ticks and the juveniles of the Lone Star Tick, called seed ticks.

They often carry diseases to their hosts, such as Lyme's Disease, Rocky Mountain Spotted Fever, and even a disease that can paralyze the host animal. While the diseases are very pesky to humans, dogs, and cats, most ticks don't transmit the diseases, particularly if they are removed promptly. So what good could possibly come from ticks in the ecosystem? Well, they serve as a food source, even though they are small! In addition, they help control the populations of other animals by killing them. Yes, ticks, in a mass attack! The attack is not coordinated, but 50,000 were counted on a giraffe that was killed! Are ticks suffering from increased CO<sub>2</sub>, temperatures or loss of habitat? Not really. They can live almost anywhere!

### *Fleas*

Fleas have some excellent morphological and behavioral adaptations to enable them to survive quite well in their environments. They are very small, about the size of a pin. They have tiny, amazing structures that allow them to latch onto an animal's fur or hair and permeate the skin. They have strong back legs that allow them to jump 100 times their height. This allows them to jump from animal to animal in order to find a place to infest. Their body shape also allows them to move well through their host animal's hair or fur.

Because they need humidity to survive and warmer temperatures, they will probably increase their population with increased climate temperatures. Fleas undergo metamorphosis as they mature. Female fleas and juvenile fleas both need blood. Females need blood to reproduce and then lay up to 2,000 eggs at a time! In addition, the period of time from egg to adult is only about three weeks. The bite of a flea usually produces an allergic type reaction on the animal being bitten, so the animal often scratches the bite. Unfortunately, sometimes fleas also carry tapeworms with them that can infest the host animal as well. Flea larvae are scavengers in their ecosystem and feed on dead vegetables, insects and even fecal matter. So, they help clean up the world!

### *Bed bugs*

Bed bugs are truly revolting. Their small, flat body, only about 5-7mm long, help them fit into small places in beds and bed frames. They are definitely pesky to humans! But while annoying, they do not carry diseases. They do bite their hosts which can cause annoying allergic reactions. They are difficult to remove from an area of infestation without exposing the area to toxic chemicals. Scientists cannot find any reason to keep them in the environment and frequently try to find ways to eradicate them from the environment. In fact, bedbugs were nearly eradicated twenty years ago, but with increased international travel, bedbugs emerged again in the United States. Some spiders do eat bed bugs, but it is not a primary food for them and they could easily survive without them. Most humans are quick to remove spider webs, when, perhaps they could help relieve them of bed bugs. Have environmental changes affected the bed bugs? No!

### *Mosquitoes*

Three thousand species of mosquitoes inhabit our world. Out of these, three species are responsible for spreading some of the deadliest diseases. All three of these spread filariasis, and encephalitis. The Anopheles also spreads malaria. The Culex also spreads the West Nile Virus, and the Aedes also spreads yellow fever and dengue. While mosquitoes are pesky and dangerous to humans, they prefer to bite birds, cattle, and horses.

The female mosquito has an amazingly tiny mouth, adapted to bite through skin, inject an anticoagulant into the blood to prevent clotting, while sucking blood. The blood the female takes is used as protein for eggs, not food. Mosquitoes get their food from plant nectar. So the mouth parts are useful for getting nectar as well. Their wings are quite helpful for flying to find animal hosts.

Viruses and other diseases either attach to the female while she is sucking blood or infiltrate the female's saliva which then infects the animal. Mosquitoes have amazing physiological adaptations that alert them to potential host animals. They can sense CO<sub>2</sub> which has been exhaled by the animal, as well as body odor, temperature and movement.

While mosquitoes are pesky and dangerous, they have a use in the ecosystem. They are the food source for numbers of animals, including bats, fish, birds, dragonflies, and frogs. However, scientists suspect that mosquito populations will increase in the areas they already inhabit and their numbers will go up in the next several years in areas in which they are now scarce due to global warming. Previous methods to limit mosquitoes have had limited success and often disastrous side effects, such as with DDT which was supposed to limit mosquitoes and actually injured several bird species.

### *Snakefish*

Snakefish are an invasive species to the United States. They are native to Northern China and Russia and were probably introduced into North America when imported live as a food source. While there are perhaps 40 species of snakefish, the Northern Snakefish is perhaps the one most adapted to successful life in the North America.

The fish has a longer body than most fish, resembling a thick snake. While its fins have no spines in them, it can still manage to move across land into alternate water sources by using the fins. The fish have large mouths with rows of teeth.

Snakefish can actually survive outside of water for limited periods of time. This has increased the spread of the fish from one water source to another. They reproduce rapidly. Snakefish are very active predators, out-competing many native species of fish. Juvenile snakefish prey on zooplankton, larvae, small fish, and crustaceans. Populations of these animals have been threatened by the introduction of the snakefish. Adult snakefish eat various larger fish, crustaceans, small amphibians, reptiles and some birds and mammals. Possession of live Snakefish or transportation of them across state lines has been banned in the United States since 2002.

Snakefish are not a valuable addition to the current ecosystems because they compete with native species for the same food sources. The snakefish have advantages, such as having few predators in the United States. Consequently they are depleting food supplies for native species, causing the native species to starve. Rarely are invasive species acceptable additions to their new environments. While many in Asia and Africa enjoy the snakefish as a food source, scientists have advised the public to only eat limited quantities of the Northern Snakefish, a species discovered in the Potomac River in Washington, D.C., due to the toxicity of pollution in the river. So, they are not even a viable food source in America! Fishermen have been advised not to release any snakefish that they catch back into the water in an effort to eradicate the population. In order to try to eradicate the snakefish from North America, the possession of live Snakefish or transportation of them across state lines has been banned in the United States since 2002.

## **Strategies**

The Next Generation Science Standards are based on three dimensional learning. They should integrate the standards and Practices, Core Ideas, and Crosscutting Concepts. I have listed the standards which are basically performance expectations in Appendix A. The Crosscutting Concepts that apply to these standards are: identifying cause and effect relationships, and understanding how a system works by identifying its components how they interact. The students will be applying the standards. They will be using some of the practices to apply the standards. The process of justifying an animal using their adaptations will necessarily involve applying cause and effect relationships. The other crosscutting concept involves understanding the animal as a system that needs all of its structures



and functions to survive. The whole idea of survival using adaptations necessarily employs the use of this concept.

As I mentioned previously, my class is composed of students with various reading abilities. Specifically, I have a number of English Language Learners and special education students with various abilities to comprehend written text. As a result, I need to provide support for students. My students will work in groups of two to three for research and when they read text. The groups will be intentionally formed to provide reading support to students who need it. I use various protocols for students reading text together. One such protocol is to let the students take turns reading a paragraph and then the other student summarizes what the first student read.

### Structured Think-Pair-Share

Students experience some phenomena, or view a video, or read a text and respond. The time period is short, about 5 minutes for each part. First students respond individually, and write down their response. Then they meet with a partner, listen to their partner, and then write down their partner's response. And finally, they write down their new response. The response may change from their original response, based on listening to their partner or it may remain the same. The written format holds the students accountable. I use a worksheet, (see Appendix D).

### Other Differentiated Instruction Strategies

Many of the animals for research have YouTube videos for research. This can be very useful for students that have limited reading abilities. Some of my English Language Learners and special education students will benefit from some sources that are not complex text.

### Vocabulary Activities

Vocabulary is important when addressing a subject, particularly in science where content specific vocabulary may be significant. While there may be particular vocabulary in the content websites and articles, the vocabulary for this topic is limited. This vocabulary should be explicitly taught before any other activities. The vocabulary to be taught is: adaptations, structures, functions, and behaviors. Other vocabulary must be handled as encountered by individual student groups.

### Activities

Start with a phenomena. Look on YouTube and find a video of a mudskipper. To enhance the effect of the phenomena, I show the video without sound or explanation. Then pro-

vide the students with a structured pair-share activity, see appendix D. Let the animal set the stage for the rest of the unappealing animals that they will observe.

### Squid dissection

Start with a squid as an animal to investigate. Start with student questions, possibly a think-pair-share. Show squid pictures to students and videos from YouTube. Let students work in groups to formulate questions that they have about the squid's structures and behaviors.

Dissect a squid, or watch a virtual squid dissection on the internet, website included in Appendix B. This is an easy dissection for elementary school children. All you need are some tweezers and scissors. It is helpful to have plastic gloves and paper plates. The key to a successful activity is to totally enclose everything into a strong plastic trash bag and deposit it into the trash immediately following the activity. Scissors and tweezers need to be immersed in soap as well. Otherwise, your room will stink! There are numerous procedures for a squid dissection on the internet that you can use. You want to be sure that the students notice the unique structure adaptations that the squid has such as suction cups on the arms, "ink" that is used as a defense, two gills, the beak in the mouth, and cartilage in the body. If the students are careful they can remove the cartilage, also called the "pen" and write with it using the "ink". Students can determine whether their squid is male or female by checking for the gonads.

After the dissection, give the students an article to read with a partner, about squid or direct them to an online article if you have computers, to enhance their understanding of what they observed. Let the students use the summary reading protocol. Discuss the dissection and article as a group, creating a labeled diagram model of the squid, showing both internal and external structures. List the prominent structures and discuss their functions. Be sure to direct the discussion to analyzing the purpose of the structure and labeling it as an adaptation that the animal uses for survival.

### Research

Students will pick one of the suggested "icky" animals to research. The students are looking for adaptations that the particular animal has, particularly in regard to their structures and behaviors. Animals could include: ticks, mosquitoes, snakes, leeches, snakefish, or any other unappealing animals. In order to expedite the research process, I usually post good, accessible websites on a wiki or a website such as that the students can access. Please see the suggested student websites in appendix B.

### Communicate

Students design a poster or a commercial promoting their chosen “icky” animal along with a supportive opinion paper. They will use their research of their animal’s unique adaptations which are visible in their animal’s structures and behaviors. The poster or commercial and opinion paper should use persuasive strategies to promote their animal.<sup>i</sup> Students have used these techniques when they wrote their opinion writing pieces in English Language Arts previously.

If you have access to video recording, the students could compose a commercial instead of a poster.

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## **Appendix A**

### Next Generation Science Standards

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

### Scientific and Engineering Practices:

Asking questions and defining problems

Planning and carrying out investigations

Analyzing and interpreting data

Developing and using models

Engaging in argument from evidence

Obtaining, evaluating, and communicating information

### Common Core State Standards

CCSS ELA-Literacy.4.RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

CCSS ELA-Literacy.RI.4.9: Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

CCSS ELA-Literacy.W.4.1. Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

CCSS ELA-Literacy.W.4.7. Conduct short research projects that build knowledge through investigation of different aspects of a topic.

## Appendix B

Good Websites for Student Research

Mudskipper: <https://www.youtube.com/watch?v=KurTiX4FDuQ>

Squid: <http://www.nhptv.org/natureworks/nwep6f.htm>.

Sharks: <http://www.kidzone.ws/sharks/facts8.htm>  
<http://www.worldwildlife.org/species/shark>  
<http://www.sharksider.com/types-of-sharks/>

Leeches: <http://www.biokids.umich.edu/critters/Hirudinea/>  
<https://www.youtube.com/watch?v=4QJt2BYkdiw>  
<https://www.youtube.com/watch?v=l-3OPL3Ryao>  
<http://www.pbs.org/wnet/nature/bloody-suckers-leech-therapy/11360/>

Ticks: [https://www.youtube.com/watch?v=0g\\_lt0FcQag](https://www.youtube.com/watch?v=0g_lt0FcQag)  
[http://www.cdc.gov/ticks/life cycle and hosts.html](http://www.cdc.gov/ticks/life_cycle_and_hosts.html)

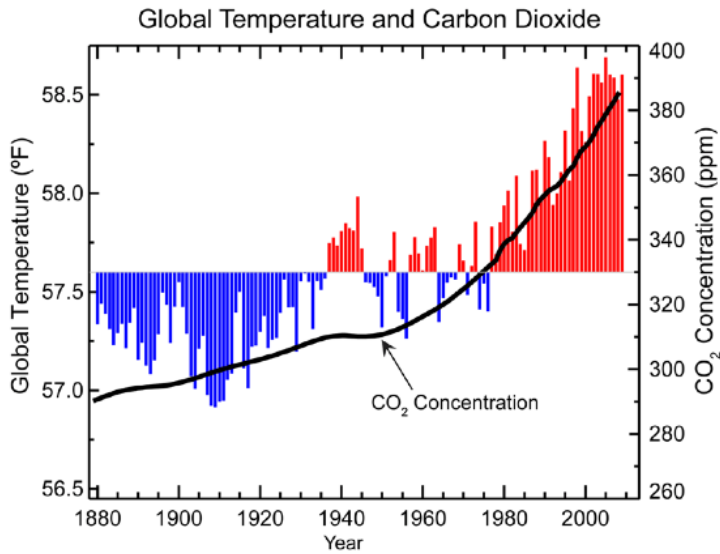
Fleas: <http://extension.entm.purdue.edu/publichealth/insects/flea.html>  
Bed bugs: <https://www.youtube.com/watch?v=WfKCcSPCOQo>  
<http://www.webmd.com/skin-problems-and-treatments/guide/bedbugs-infestation>

Mosquitoes: <https://www.youtube.com/watch?v=CjHm2zKiTs0>  
<http://animals.howstuffworks.com/insects/mosquito.htm>  
<http://www.nature.nps.gov/biology/ipm/>

Snakefish: <https://www.youtube.com/watch?v=nmU7etSYYqI>  
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## Appendix C

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## Appendix D

Structured Think-Pair-Share: Mudskipper video

After watching the video, record what you think the animal is and what interesting structures you noticed. Note any structures that you think are used differently by this animal than other similar animals.

This is my thinking now....	This is what my partner thinks
This is what I think now	

Notes

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- 31 "NYIS." NYIS. Accessed October 25, 2015.
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33 "Persuasive Techniques in Advertising." Accessed December 13, 2015.  
<http://www.readwritethink.org/files/resources/.../PersuasiveTechniques.pdf>.

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Curriculum Unit  
Title

Biodiversity: The Good, The Bad, and The Ugly

Author

Ellen Shackelford

**KEY LEARNING, ENDURING UNDERSTANDING, ETC.**

Animals make adaptations over time to survive. Some animals are making adaptations recently due to climate change. Some animals may not be able to make adequate adaptations quickly enough to survive changes in the environment due to climate change. Unappealing animals survive because they have made adequate adaptations to survive, not because they are appealing.

**ESSENTIAL QUESTION(S) for the UNIT**

What are adaptations? What kind of adaptations do animals have? How have adaptations changed recently due to climate change? What kind of adaptations do unappealing animals have?

**CONCEPT A**

Adaptations are changes that animals make over time to survive.

**CONCEPT B**

Animals are making adaptations due to climate change.

**CONCEPT C**

Unappealing animals have interesting adaptations.

**ESSENTIAL QUESTIONS A**

What are adaptations?  
What kind of adaptations do animals have?  
How do animals make adaptations?

**ESSENTIAL QUESTIONS B**

How have adaptations changed recently due to climate change?  
Are all animals making new adaptations due to climate change?

**ESSENTIAL QUESTIONS C**

What sort of adaptations do unappealing animals have?

**VOCABULARY A**

adaptations, morphological adaptations, physiological adaptations, behavioral adaptations

**VOCABULARY A**

climate change

**VOCABULARY A**

survival, invasive species

ADDITIONAL INFORMATION/MATERIAL/TEXT/FILM/RESOURCES

Various youtube videos related to animals studied