KINGDOMS AND CLASSIFICATION

Grades 7-8

STUDENT JOURNAL

This journal belongs to:

THE GOOD AND THE BEAUTIFUL

INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Kingdoms and Classification* science unit. It contains all the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the science journal.

The *Kingdoms and Classification* lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.

TABLE OF CONTENTS

EXTENSION

Instructions:

1. Read the information below.
2. With the help of DNA, scientists are better able to classify animals. Write two or three sentences explaining to someone who hasn't studied DNA and classification why it is important to distinguish differences between animals.

DNA and Classification

In the 18th century, scientists began using a system of organism classification developed by Carl Linnaeus. At that time classification was based primarily on the appearance of organisms or their ecological locations. Since that time new developments in science, primarily in DNA, have made it possible to determine even more accurately the relationship between certain organisms.

Changing Classification

All living organisms contain DNA. Scientists can now utilize the process of DNA sequencing to see the relationship between organisms. The more closely related organisms are, the more sequences they have in common. Even more importantly, sequencing helps scientists determine distinctively when a new species has been discovered. Due to these newer developments, classifications of some organisms have changed. An example of changing a classification and the discovery of new classifications is found in cyanobacteria. Previously thought to be blue-green algae, ***cyanobacteria*** are single-celled microscopic organisms found naturally in all types of water. Like plants, they use sunlight to make their food. DNA sequencing allowed biologists to definitively classify this organism more accurately.

DNA Barcode

With an established database of DNA sequences in place, scientists have been able to create what is known as a DNA barcode for each species. Similar to the barcode a grocery clerk scans to add the price of an item to your total automatically, DNA barcodes are a short section of DNA sequence for a given species that allows scientists to quickly identify and determine the taxonomy of a species without evaluating its entire genetic code.

Giraffes

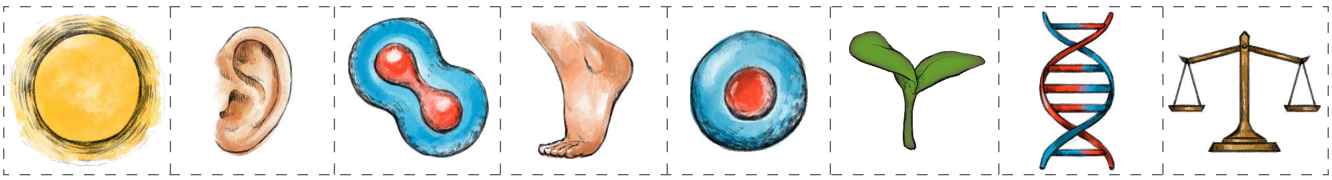
A giraffe is another organism that has been reclassified due to DNA findings. Prior to 2016 all giraffes were believed to be one species. Giraffes had not been extensively studied before this time. In 2016, through DNA analysis, scientists discovered that giraffes actually comprise four very different species.

This discovery was made by taking skin samples from more than 100 giraffes in Africa. DNA was extracted from each sample. After a comparative analysis, scientists were able to classify giraffes into four new groups: *Giraffa giraffa*, *Giraffa tippelskirchi*, *Giraffa reticulata*, and *Giraffa camelopardalis* (commonly named southern, Masai, reticulated, and northern giraffe respectively). This discovery has had a great impact on the preservation of these threatened species. Because these groups are so genetically diverse, they are not able to mate with one another. Conservationists now understand that they must have giraffes with the same DNA barcode together. DNA sequencing is a remarkable tool for correctly classifying living things and seeing the connections between them.

Can you "spot" any differences?

Lesson 1

CHARACTERISTICS OF LIFE ICONS



Lesson 2

PARTS OF A CELL

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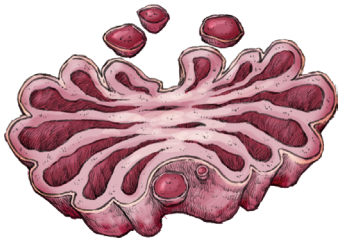
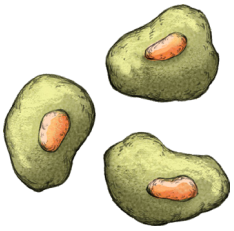
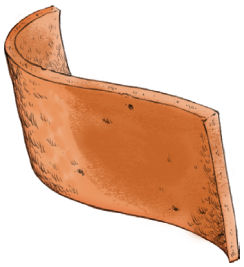
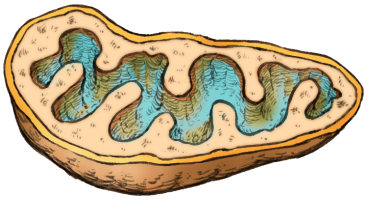
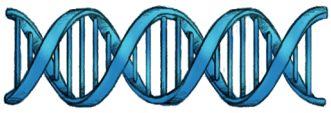
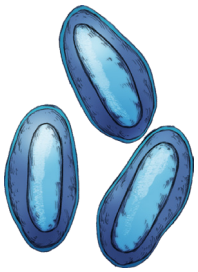
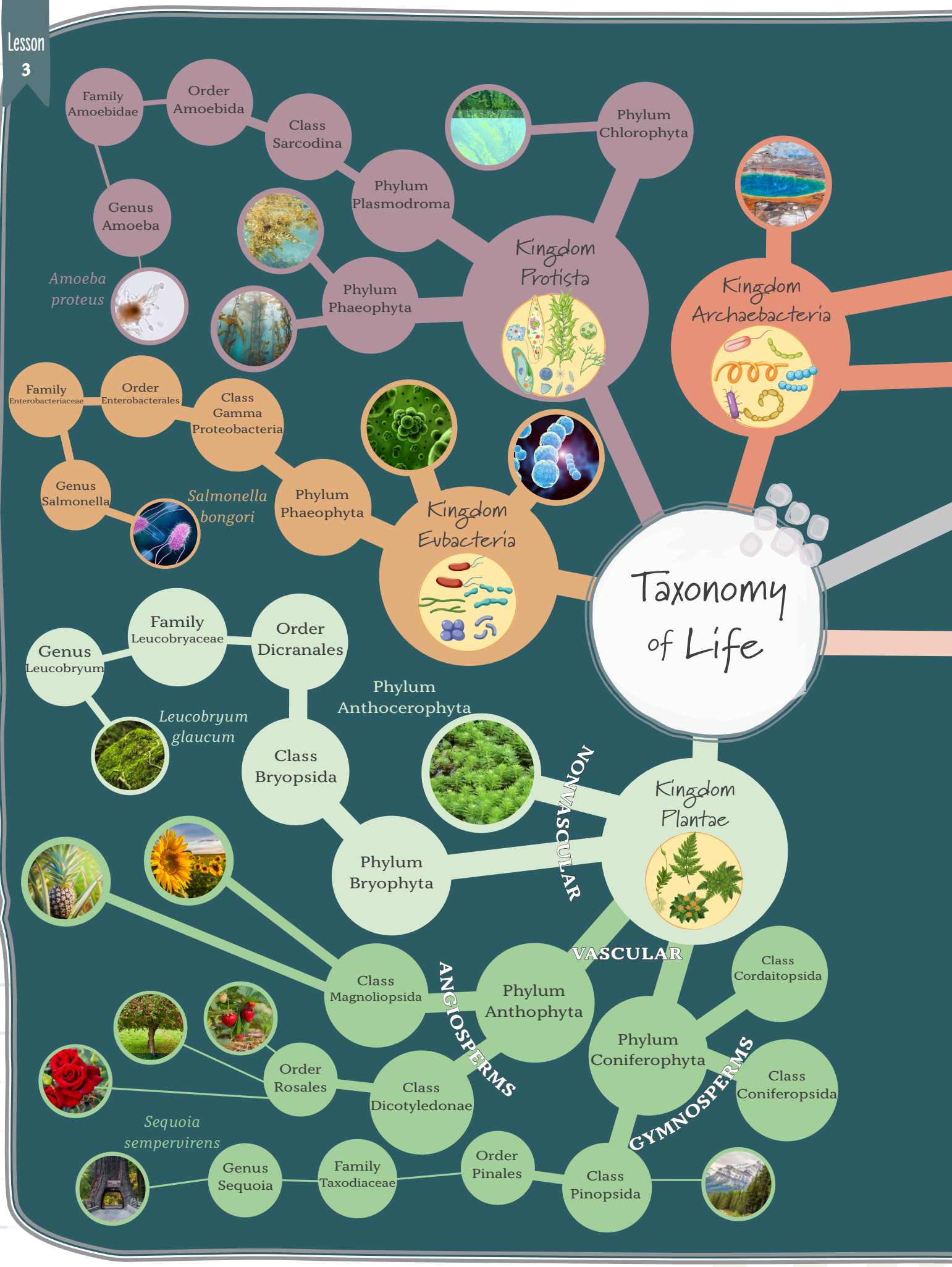
		
		
		


Taxonomy of Life
Kingdom Protista
Phylum Chlorophyta
Phylum Plasmodroma
Class Sarcodina
Order Amoebida
Family Amoebidae
Genus Amoeba
Amoeba proteus
Phylum Phaeophyta
Kingdom Archaebacteria
Kingdom Eubacteria
Phylum Phaeophyta
Class Gamma Proteobacteria
Order Enterobacterales
Family Enterobacteriaceae
Genus Salmonella
Salmonella bongori
Kingdom Plantae
NONVASCULAR
Phylum Bryophyta
Class Bryopsida
Order Dicranales
Family Leucobryaceae
Genus Leucobryum
Leucobryum glaucum
Phylum Anthocerophyta
VASCULAR
Phylum Anthophyta
ANGIOSPERMS
Class Magnoliopsida
Class Dicotyledonae
Order Rosales
Phylum Coniferophyta
GYMNOSPERMS
Class Cordaitopsida
Class Coniferopsida
Class Pinopsida
Order Pinales
Family Taxodiaceae
Genus Sequoia
Sequoia sempervirens


Kingdom Fungi
Phylum Basidiomycota
Phylum Ascomycota
Class Euascomycetes
Order Eurotiales
Family Trichocomaceae
Genus Penicillium
Penicillium marneffei
Phylum Zygomycota
Kingdom Animalia
INVERTEBRATES
Phylum Porifera
Phylum Cnidaria
Phylum Mollusca
Class Cephalopoda
Order Octopoda
Family Octopodidae
Genus Thaumoctopus
Thaumoctopus mimicus
Phylum Annelida
Phylum Arthropoda
Class Crustacea
Class Insecta
Class Arachnida
VERTEBRATES
Phylum Chordata
Class Aves (birds)
Class Amphibia
Class Chondrichthyes
Class Reptilia
Class Mammalia
Order Primate
Order Cetacea
Order Carnivora
Family Mustelidae
Genus Enhydra
Enhydra lutris
Family Felidae
Genus Panthera
Panthera tigris

EXTENSION

Instructions:

1. Read the information below.
2. Imagine you are a taxonomist who studies amphibians. Create an hourly schedule for your day starting at 8:00 AM and ending at 5:00 PM.

A Day in the Life of a Taxonomist

What do you think the day of a taxonomist would be like? Do you think they sit in a museum looking at specimens under a microscope? Perhaps they spend a lot of time writing about what they have found. Actually, in a given day they may do all of these things or one of these things. Each day is different but filled with study and discovery!

The purpose of taxonomists is to organize and classify the world around them. Most will choose a specific area to focus on, such as fish or parasites. Much of the life on Earth has been organized, but sometimes corrections to groupings need to be made and new species are found and need to be classified. The first step for a taxonomist is to find organisms to study.

To begin his or her day, a taxonomist may go out in the field to collect organisms. For example, parasite taxonomists gather small mammals, from which they can collect parasites. As with other scientists, specimens are collected during a field expedition where taxonomists spend days, or even weeks, in a specific area, collecting what they can to bring back to a laboratory for storage.

Once study material has been collected, either from the field or from storage, taxonomists work to identify the organisms. Taxonomists must be like detectives and ask questions like "How is this organism different than other similar organisms?" "How does this organism live?" "Where did it come from?" and "Does its DNA match an existing species?" To find the answers to these questions, taxonomists will look at the organism's appearance, anatomy, DNA, and cells (under a microscope) and will consider where it came from. With all this information, they can identify the species as one already classified or give the new species a name and classify it.

At this point they will continue to evaluate the organism and will describe it in writing and by drawing pictures of its external and internal features. When the mystery of the organism is solved, they will write their findings in a scientific paper and publish the paper in magazines or research journals.

There are many reasons these publications are useful. For example, fishermen will often contact taxonomists to determine the correct species of their catch for legal paperwork and market worth. Developers putting in a new shopping center might contact a taxonomist to determine the species of a resident animal before they can begin building. And conservationists need to know specific species to track their numbers and determine changes in population. To identify a species correctly, there must be documentation on that species—documentation that comes through published findings of taxonomists around the world.

New Species

FIND

To find new species, taxonomists go out in the field and collect unfamiliar organisms. Sometimes new species are found by scientists in other fields or even by common citizens.

IDENTIFY

Once found, an organism must be identified. This is done through DNA analysis, microscopic examination, and the study of the organism's overall appearance. If the organism is unique, as in the case of a new species, it is given a name.

DESCRIBE

Taxonomists describe the creature by drawing its internal and external structures and writing down its characteristics and unique features.

PUBLISH

All the information about the new species is compiled into a scientific paper and published to benefit the entire scientific community.

Agar Plate Bacteria Collection Recording Sheet

DATE COLLECTED: _____

Bacteria Collected From: #

My Prediction

My Results

Date:

Bacteria Collected From: #

My Prediction

My Results

Date:

Bacteria Collected From: #

My Prediction

My Results

Date:

Bacteria Collected From: #

My Prediction

My Results

Date:

Control: #

My Prediction

My Results

Date:

PROTIST MICROSCOPE LAB

Drawing

Date _____

Specimen Observed

_____

Notes _____

_____

_____

_____

_____

_____

Drawing

Date _____

Specimen Observed

_____

Notes _____

_____

_____

_____

_____

_____

EXTENSION

Instructions:

1. Read the information below.
2. Imagine you are a scientist studying bioluminescence. Write a paragraph about what you hope to achieve with bioluminescence and how it could benefit mankind. Include two sentences on how you will conduct your research—working in a lab, diving deep into the ocean, etc.

Bioluminescence: The Language of Light

If light could talk, what would it tell us? The rhythmic green flashes of a firefly might say, "Hello," and "How are you?" The sudden cloud of light coming from shrimp in the ocean might send the message "Stay away!" A fish swimming through a sea of plankton elicits an alarm of light that sounds, "Help!" In the darkness of night or the deep ocean, many creatures produce their own light in order to find food and protect themselves from predators.

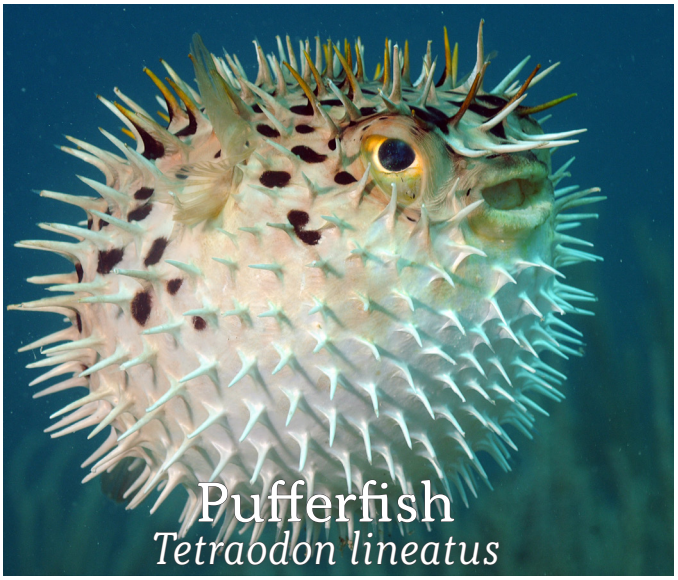
The amazing chemical process behind the glow of fireflies, some fungi, and many deep-sea creatures is known as ***bioluminescence***. The exact chemical compounds may differ by species, but in most cases when two chemicals come in contact with each other and oxygen within the creature's body, they react, and a byproduct is light. For example, fireflies have two compounds in their bodies: luciferin (a light-emitting compound) and luciferase (a substance that promotes chemical reaction). When oxygen is introduced to these compounds, the abdomen of the firefly begins to glow. Other creatures, such as the angler fish, do not produce their own light but rather trap bioluminescent bacteria within folds of skin. The resulting glowing orb is the perfect lure for food.

Light in the darkness is a powerful tool for evading predators. Dinoflagellates are marine plankton that swim in great clouds. When a predator disturbs them by swimming too close, they will glow to attract a larger predator to eat the animal trying to eat them! This is known as the bioluminescent burglar alarm. The fire shooter squid ejects blobs of light when threatened by a predator, instead of clouds of ink, to confuse and scare a predator while the squid swims away.

While fireflies glow green or yellow, most creatures in the ocean produce blue light. This is because blue light is the easiest to see at long distances, and therefore it is the most effective color at attracting prey from far away or sounding an alarm. Most creatures in the ocean can only see blue light. Some fish use color blindness to their advantage. By producing red light instead of blue, they are able to look for their prey without being seen by predators.

Bioluminescence is amazing, but it is surprisingly more common than we might realize. It is estimated that 80-90% of creatures in oceans are able to create light, most of which we have yet to discover! Scientists are working to harness this natural production of light by recreating in a lab the chemical reactions that take place within bioluminescent creatures. The potential benefits are numberless. For example, by creating bioluminescent trees, we could have lights along our highways that don't require electricity. Flashlights might no longer require expensive batteries but shine with their own bioluminescent lights. What benefits can you think of for natural light production?

Animal Field Journal: Vertebrates



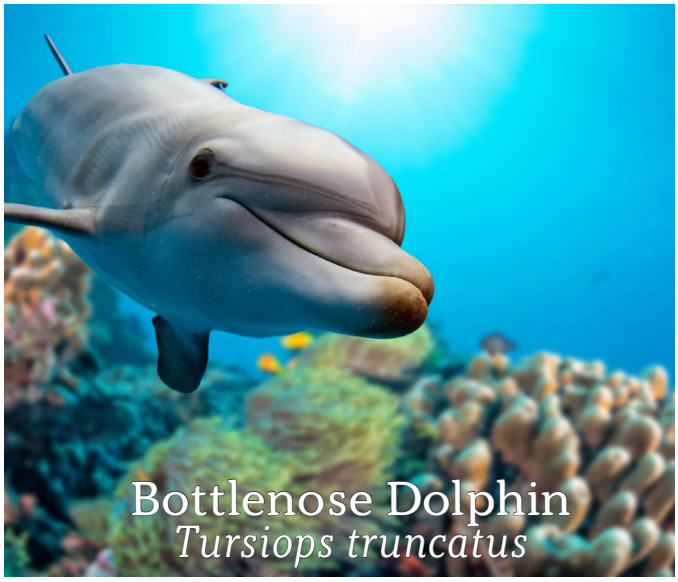
Pufferfish
Tetraodon lineatus

Poison Dart Frog
Oophaga pumilio

Chameleon
Chamaeleo chamaeleon

Ruby-Throated Hummingbird
Archilochus colubris

Dusky Leaf Monkey
Trachypithecus obscurus



Bottlenose Dolphin
Tursiops truncatus

Animal
Field Journal

Animalia
Arthropoda
Insecta
Coleoptera
Lampyridae
Photinus

While many underwater creatures can produce their own light through bioluminescence, these small beetles are one of few on land to do so. On summer nights in warm climates, they will use these lights, created by a chemical reaction, to find a mate.

GLUE CARD HERE

Animalia
Porifera
Demospongiae
Haplosclerida
Petrosiidae
Xestospongia

This creature is called home to many animals and looks more like a rock than an animal. It eats by pumping the water around it through its walls and filtering out nutrients. With a width up to 2 meters (6.5 feet) across, these giants are capable of pumping, filtering, and cleaning a lot of water.

GLUE CARD HERE

Invertebrates

Animalia
Cnidaria
Scyphozoa
Semaeostomeae
Cyaneidae
Cyanea

Glowing in the ocean is a creature with over a thousand tentacles that can grow to 37 meters (120 feet) long! It lives in cold waters near the surface and dangles its tentacles below to catch its prey. Like others in its phylum, it has stinging barbs that can kill unsuspecting fish that swim too close.

GLUE CARD HERE

Animalia
Echinodermata
Echinoidea
Echinoida
Strongylocentrotidae
Strongylocentrotus

These spiny relatives of sea stars live in rocky, shallow water near the shore. Eating primarily algae and the base of kelp, these tiny creatures can have a big impact on water ecosystems. These invertebrates can eat away the bases of an entire kelp forest, but predators keep their population in check.

GLUE CARD HERE

Invertebrates