

## Animal Adaptations – Lesson 1

### Life in the Water

#### **Lesson Objectives:**

- After participating in an interactive presentation and observing several species, the students will be able to identify animals' physical characteristics and behavior that help them to survive in their environment.



#### **Materials:**

Biofacts  
Pictures  
Power point presentation  
Live animal (animal encounter)

### Animal Adaptations for Life in the Water

In order to survive in various types of habitats, living organisms need to be able to fulfill their basic needs, which are food, shelter, and water. Animals have specific physical traits and behaviors, which properly equip them to overcome the challenges encountered in their habitat, and help them to subsist and reproduce.

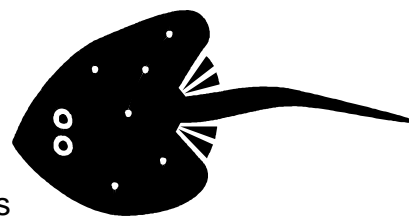
Animals that spend a good amount of time in the water, such as ducks and flamingos for example, have webbed feet. This type of adaptation aids the ducks to swim, and is very helpful for flamingos to find support when they wade in shallow water, or stay afloat when they steer toward new sources of food.

This lesson will highlight some zoo animals that live in the water: the stingray and the animal species in the Amazon & Beyond Flooded Forest fish tank.

#### **STINGRAYS**

##### **What are stingrays?**

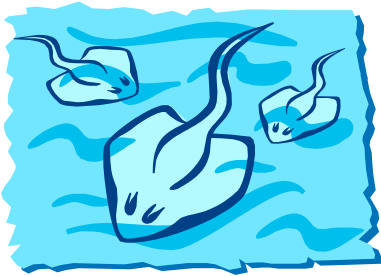
Stingrays are a type of cartilaginous fish related to sharks. They are characterized by a flattened shaped body and a long tail. Stingrays are unique elasmobranchs with pectoral fins being part of the sides of their body. The gill openings are located on its ventral side. There are about 200 species of stingrays in the order Myliobatiformes, which includes the, sixgill stingrays (Family Hexatrygonidae), stingarees (Family Urolophidae), river stingrays (Family Potamotrygonidae), giant stingarees (Family Plesiobatidae), whiptail stingrays (Family Dasyatidae), butterfly rays (Family Gymnuridae), cownose rays (Family Rhinopterae), eagle rays (Family Myliobatidae), and devil rays (Family Mobulidae). Their average lifespan is 15-25 years.



### What are the different types of stingrays?

There are two general kinds of stingrays - the "benthic" (or bottom) stingrays and the "pelagic" (or swimming) stingrays.

Benthic rays, such as the Atlantic stingray, are often found buried in the sand. They usually have a rounded or "diamond-shaped" body and their stings, when present, are located near the middle or lower third of their "tail." Just like mostly bottom feeders, these rays generally feed on worms, clams, shrimp, crabs, snails and occasionally fish.



Pelagic rays, such as the manta ray and the spotted eagle ray, are more active swimmers and their bodies resemble a bat with open wings. Pelagic stingrays have stings that are located close to the body, just behind their pelvic fins. Like bottom rays, most pelagic rays also feed largely on bottom-dwelling organisms. The devil rays, however, are mainly plankton feeders and use paddle-like cephalic or "head" projections to take water rich in plankton into their mouths.

### Where do stingrays live?

Stingrays can be found in both marine habitats and freshwater throughout the world. Most of the river stingrays of the Family Potamotrygonidae live permanently in freshwater and would not be able to survive in marine habitats. Other stingrays live mostly in saltwater. However, many species are "euryhaline" or capable of living in waters of a wide range of salinity. Therefore, these species can often be found in freshwater habitats for extended periods of time.

### What is the sting?

The "sting", a venom part of a stingray, is a spine or modified **dermal denticle** (the scales of sharks and stingrays). It has two ventral channels filled with tissue that produce venom. The venom is a protein-based toxin that causes great pain in mammals and may also alter their heart and breathing rate. However, it can be inactivated by exposure to high temperatures. For this reason, immersing the wound in hot water or applying heat compress is recommended as an initial first aid treatment for victims of a stingray injury, prior to obtaining medical care. The location of the sting on most pelagic stingrays is near the base of the tail. This may discourage predators from biting the animal near its vital organs. The sting of most bottom-dwelling stingrays, on the other hand, is located further away from the body, making it a more efficient defense for the animal. The sting is their defense mechanism. The stingray act of striking is an involuntary survival reaction when it feels threatened, and not a senseless act of aggression.

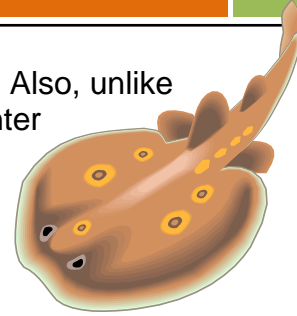
### Do all stingrays have "stings"?

No. Some stingray species do not have stings, such as some of the butterfly rays and devil rays. Also with no presence of stings are other "ray" species that belong to different orders, such as the sawfish, electric rays and the skates.

### What is the difference between a stingray and a skate?

Skates, such as the clearnose skate, do not have venomous barbs, but many

of them do have sharp thorns on their tails and dorsal surface. Also, unlike stingrays, skates primarily live in marine habitats and rarely enter brackish or freshwater environments. The most prominent difference between the two groups is that all stingrays give birth to live young while skates reproduce by laying eggs in leathery capsules sometimes called mermaid's purses.



**FRESHWATER STINGRAYS AT THE ZOO** (*Potamotrygon sp.*) Adapted for freshwater, these rays are usually found in streams and rivers in S. America. They can measure from 8 to 48 inches in diameter, plus the tail length. Their dark coloration on top of their bodies helps them to camouflage, and they often burrow slightly on the muddy bottom of the rivers. Their eyes are located on top of their heads. That gives them a view of the organisms above them while they are hidden in the substrate. Since their eyes are on top of their heads, they have to rely on their sense of smell, touch and other special senses to find food. The mouth is located on the white or light gray underside of the body their diet consists of fish, worms, crustaceans, clams, crabs, shrimp and mollusks, found on the bottom of the river. They all have fairly long tails that have a barb with venom. **Defense adaptations:** Besides camouflage, the river stingray uses its ability to lash out with its tail, to try to sting the potential predator with one of its spines, which contain venom producing glands.

**Stingrays in the zoo touch tank** - They are all male freshwater stingrays that came from Pittsburgh Zoo, in Pennsylvania. The largest of them is a full-grown stingray. We can tell that they are males because they have 2 fins under their tails called CLASPERS. The BARBS (stings) are made of keratin (same as our nails). At the zoo, the barbs are clipped regularly, as they grow back. They are fed a fish called smelt, and occasionally, krill.

### **AMAZON & BEYOND FISH TANK**

This large zoo habitat in the Amazon area holds 48,000 gallon of fresh water. Some of the species present in this exhibit includes a reptile, the giant side-necked turtle, and several types of fish, such as the butterfly peacock bass, spotted peacock bass, red-tail catfish, pacu (related to piranas), and red hooks.

Animals in this exhibit are fed twice a week. The diet of the turtles and the pacu consists of primarily vegetables. The other species in this tank eat krill, night crawlers (a kind of earthworm), and small fish.

**Giant side-necked turtle** (*Podocnemis expansa*)- This species is found in S. America rainforest rivers, and has a domed, but somewhat flattened shell and legs and webbed feet as adaptations for swimming. Its oval shaped shell may measure 3.5 ft long, and it weighs up to 100 lb. Females giant side-necked turtles gather in groups sometimes of up to 100 individuals and each one lay 60 to 170 round soft-shelled eggs. The eggs are laid at night in holes dug on sandbanks. The females, then, return to their feeding grounds. Only about 5% of the young survive predation, mainly by nocturnal birds, such as black vultures. The hatchings are only 2 in long and head straight to the water.

These turtles are predominantly herbivores, eating fruits, flowers, roots, and aquatic plants. They became endangered due to over hunting for food and their oil. Their lifespan is from 16 to 25 years in captivity.

### **Pacu (or Tambaqui)** (*Colossoma macropomum*)

This type of fish may reach 3 ft in length. The pacu is a South American freshwater fish found in the Orinoco and Amazon River basins. Its life cycle is closely correlated to the annual pattern of rainy and dry seasons in this geographic area. The adult occupies the rivers and streams during the dry season and moves into the flooded forest areas when the rains come, where it gorges itself on fruits and seeds produced by the variety of forest plants. During these periods of abundance, the pacu develops reserves of fat to sustain itself when food is scarce. Because of its diet, the adult pacu is considered a “frugivore”. Their lifespan is up to 28 years

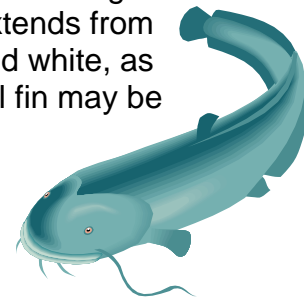
### **Fun Facts!**

- The pacu has large, broad molars and strong jaws to grind and crush seeds.
- The flesh of the pacu has a light and fruity taste and is highly valued by the Amazon fish industry. So it is heavily fished in the wild.
- This hardy species is farmed in aquaculture facilities in South America.
- The pacu is related to the piranha.
- This fish has been observed leaping out of the water for low-hanging fruit.

### **Red tailed Catfish** (*Phractocephalus hemiliopterus*)

Found in South America, in the Amazon and Orinoco River basins. They can grow over 3 feet and weigh over 80 pounds. It is an elongated catfish with a rounded snout. Three pairs of barbels are located around the mouth. The base body color is light black and little dark spots can be seen on the head. A wide, white band extends from the caudal peduncle to the tip of the snout. The belly is black and white, as are the fins, and the caudal fin is red. The upper tip of the dorsal fin may be orange to red.

Red-tailed Catfish are omnivorous but prefer meaty foods. As juveniles, they will generally eat all kinds of live, fresh, and flake foods. Life span: 20 years.



### **Butterfly Peacock Fish** (*Cichla ocellaris*)

Common names - Butterfly peacock, peacock bass

Description - Body shape similar to that of a largemouth bass; color highly variable, but generally golden with three black vertical bars that tend to fade and are possibly absent in older fish; black spot with a yellow-gold halo on the caudal fin.

Range - Introduced by FWC in large coastal canals of southeast Florida in 1984; low water temperatures and intolerance of saltwater prevent this species from becoming abundant outside of coastal Miami-Dade and Broward counties. Native range lies within the Amazon River basin of South America.

Habitat- Successful in warm, slow flowing canals, ponds, lakes, deep rock pits, and lateral canals; frequently found in shady areas around bridges, culverts, canal intersections, bends, dead ends, and near fallen trees; spawns and often feeds in shallow water adjacent shorelines with overhanging vegetation; cannot tolerate water temperatures below 60°F.

Spawning behavior – Typically spawn from April through September with a peak in May and June; both adults prepare a flat, hard surface near shore, laying from 4,000 to 10,000 eggs; young are protected by both parents, usually for several months; males develop a ‘nucchal’ hump on foreheads when reproductively active.

Feeding behavior – Feed almost exclusively on fish; tend to use great speed to catch prey; typically feeds only during daylight hours; this fish has helped reduce the number of undesirable exotic fishes, especially the spotted tilapia.

Development - Grow rapidly to 12-14 inches during the first 16-18 months, after which they become much heavier. A 17-inch fish will weigh approximately three pounds while a 19-inch fish will weigh up to five pounds. Their lifespan is not known, but available data suggests approximately six years.

Sporting quality - Most popular sportfish in southeast Florida coastal canals where it generates millions of hours of fishing sports for thousands of anglers who spend millions a year to catch them.

Value – It is consumed as source of food, but the real value of this fish is in its use for controlling over-abundant exotic forage fishes and its sporting qualities; therefore FWC encourages anglers to catch and release these fish, especially those longer than 14 inches.

Information from:

[www.georgiaaquarium.org](http://www.georgiaaquarium.org)

[www.mote.org](http://www.mote.org)

[www.centralpark.com](http://www.centralpark.com)

<http://myfwc.com>

<http://animals.nationalgeographic.com/animals/fish/stingray.html>

[http://www.worldwildlife.org/ogc/species\\_SKU.cfm?gid=76](http://www.worldwildlife.org/ogc/species_SKU.cfm?gid=76)

<http://bioweb.uwlax.edu>

<http://animaldiversity.ummz.umich.edu>

<http://nlbif.eti.uva.nl>

<http://gendmics.senescence.info/species>

[www.demjr.npg.de](http://www.demjr.npg.de)

### Sunshine State Standards Grades K-12<sup>th</sup>

LA.A.1.1, LA.C.1.1, LA.C.2.1, LA.C.3.1, LA.D.2.1, SC.H.3.1, SS.A.1.1, SS.B.1.1, SS.B.2.1, SS.D.1.1, VA.A.1.1, VA.E.1.1, VA.B.1.1, VA.C.1.1, VA.E.1.1 LA.A.1.2, LA.A.2.2, LA.C.1.2, LA.C.3.2, SS.A.1.2, SS.A.6.2, SS.B.1.2, SS.B.2.2, SS.D.1.2, VA.A.1.2, VA.B.1.2, VA.C.1.2, VA.D.1.2, VA.E.1.2, LA.A.1.3, LA.A.2.3, LA.C.1.3, LA.C.2.3, LA.C.3.3, LA.E.2.3, SC.G.1.3, SC.H.3.3, SS.A.1.3, SS.A.6.3, SS.B.1.3, SS.B.2.3, SS.D.1.3, VA.A.1.3, VA.B.1.3, VA.C.1.3, VA.E.1.3, LA.A.1.4, LA.A.2.4, LA.B.2.4, LA.C.1.4, LA.C.2.4, LA.C.3.4, LA.E.2.4, SC.G.1.4, SC.H.3.4, SS.A.5.4, SS.B.1.4, SS.B.2.4, SS.D.1.4, VA.A.1.4, VA.B.1.4, VA.C.1.4, VA.E.1.4.

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