Manta Ray Teacher Information

Classification of Manta Rays
Kingdom Animalia
Phylum Chordate
Class Chondrichthyes
Subclass Elasmobranchii (sharks, rays, skates)
Order Rajiformes (rays, sawfish, skates)
Suborder Myliobatidae
Family Mobulidae (Devil Rays)
Genus Mobula
Species birostris (giant) and alfredi (reef)

General Information on Rays:
Rays and sharks are closely related and belong to a group of fish called elasmobranchs. While bony fish (and humans) have a skeleton made from bones, rays and sharks have a skeleton made from cartilage. Cartilage is a more flexible material and is what makes up our noses and ears. Sharks and rays have 5 or more gill slits on each side (sharks) or underneath (rays). Bony fish, such as tuna and grouper, have one gill cover on each side.

There are many different types of rays including stingrays, electric rays, butterfly rays, round rays, manta rays, guitarfish, and sawfish. There are about 630 species of rays. Most rays are benthic (living on the seafloor) and can be seen covering their body with sand. Others are pelagic and swim in the open ocean. Many, but not all rays have a stinging venomous barb on their tail.

Rays give live birth and are found in all ocean basins throughout the world. There are also freshwater rays.The diet of rays can include small fish, plankton and crustaceans.

Manta Ray Lifespan and offspring:
Manta rays are slow growing fish with long life spans. Gestation is one year and they will have one offspring (pup). The pups are born at 6 ft across. Generally, females will then take off two to five years to restore their energy. Sexes are separate and they have internal fertilization. The male has a pair of "claspers" near the base of its tail that aid in reproduction. Scientists use the relative size of claspers to determine approximate age of the male manta ray. Some studies suggest that rays reach sexual maturity at around eight to ten years of age. Their lifespan is around forty years. No one has observed a manta ray birth in the wild.

Distribution:
Manta rays are migratory animals who move according to where their food is located. They can be nearshore or in the open ocean. They inhabit subtropical to temperate waters

Manta Ray Biology:
Manta rays have the largest brain of all fish relative to their size. They have a highly developed sensory system. Their eyes are located on their "head" which also includes cephalic fins that unroll when feeding. Underneath they have five gill slits on each side. Manta rays can be identified by the coloration and spots on their ventral side. They have a maximum disc width (wingspan) of around twenty-two feet and can weigh around 5,000 pounds. They do not have a stinging barb on tail.

Behaviors:
Manta rays exhibit social behaviors such as playing together and searching for food. Females tend to have long term bonds with other females. Male manta rays do not have many strong bonds with other males. In an MMF study of 500 manta rays over five years it showed two separate but connected communities. One community was made up of mature females and one community was a mix of males, females, and juveniles. Other interesting behaviors include breaching which is when the manta ray jumps out of the water. No one knows for sure why manta rays breach, but it could be to attract a mate, get rid of parasites or communicate with mantas that are far away. They also have many different feeding behaviors, including barrel rolling and "stack" feeding where the leader gets plankton and then they switch positions. Manta rays also exhibit patience in allowing humans to cut off fishing hooks and gear. They also can exhibit inquisitiveness towards swimmers and divers.

Diet:
Manta rays are filter feeders, meaning they strain food out of the water by swimming around with their mouths open. When they find a patch of food, they unroll their cephalic (head) fins to help funnel the plankton-rich water into their mouths. They swim with their mouth open and chest cavity extended to allow for water and food to flow through. The food gets trapped in the manta ray's gills and then the manta can swallow it. Manta rays do have teeth, but they are very small and they don't use them for feeding. Manta rays eat plankton, small fish, krill, and crustaceans. Mantas feed different ways: barrel rolling (looping in circles), filtering food at the surface, and skimming the bottom for plankton that settled. Manta ray individuals sometimes "stack" behind one another while feeding. The one in front gets the most plankton via filter feeding with its giant gaping mouth, but they switch places as they swim so each gets a turn in the leader position. Research by MMF has shown that mantas in different locations around the world have different feeding habits. Mantas in Indonesia tend to spend more time near surface while mantas in Ecuador tend to spend more time in deeper waters when feeding.

Threats to Manta Rays:
Manta rays were listed as threatened in 2018 under the Endangered Species Act. Manta rays are traded internationally for use of their gill plates in Chinese medicine and eaten for their meat as well. All rays face habitat loss and destruction. Manta rays face many threats similar to all marine life; they consume micro and macro plastics while feeding. They face harassment from humans and boats, and get tangled in fishing lines and hooks. They also face commercial fishing dangers such as nets and being caught as an unintended species (by catch). Few national and international conservation measures are in place for manta rays. This is concerning due to the fact that they migrate into differently "owned and managed" waters. Their predators are sharks, orcas, and humans.

VOCABULARY:

Adaptation: A physical characteristic or behavior that allows an organism to be best suited for its environment and survival

Benthic: An organism living near the seafloor

Breach: To jump out of water

Cephalic Fins: A fin extending from either side of a manta ray's mouth

Chondrichthyes: Class of fish with skeleton made of cartilage

Clasper: Male structure near tail to aid in reproducing

Cleaning Station: An area on the reef where animals visit to be cleaned of parasites and dead flesh by small cleaner fish and shrimp

Consumer: An organism that eats producers (cannot make its own food)

Countershading: Type of coloration that is dark on top and light on the bottom

Critical Habitat: An area where an animal performs important roles in their life cycle such as mating or giving birth

Denticles: Small teeth that make up skin on rays and sharks

Elasmobranch: Sharks, rays, and skates

Disc Width: The distance between the tips of each pectoral fin of a manta ray

Dorsal: Back or top side of the ray

Dorsal Fin: Fin located on the top or back side of a fish

Juvenile: An individual not ready to mate

Krill: Small, shrimp-like crustacean

Macroplastic: Plastic items larger than 5mm

Marine Protected Area (MPA): A part of ocean that limits or restricts human interactions to conserve the natural ecosystem. It is like an underwater National Park.

Microplastic: Plastic items smaller than 5 mm

Ocean Zones: Differing depths where certain types of plants and animals live

Osteichthyes: Class of fish with skeleton made of bones

Pectoral fin: Side fin, balances the animal and propels it in the water

Pelagic: An organism living in open ocean

Physical Characteristics: Observable features of an organism

Phytoplankton: Microscopic plants which live in sea water

Plankton: Organisms that are unable to swim against a current

Producer: An organism that can make its own food and is eaten by consumers
Venomous: Secreting venom through barb on tail

Ventral: Underside (or belly) of an organism

Water Column: Vertical section of water from the sea floor to the surface

Zooplankton: Microscopic animals

Resources:

Marine Megafauna Foundation https://marinemegafaunafoundation.org/
Manta Matcher Database of manta ray photographs for identification
https://www.mantamatcher.org/overview.jsp
Marine Megafauna Foundation Videos, Video Clips and Presentations by MMF researchers
https://www.youtube.com/user/MarineMegafauna

Literature Cited:

Last, Peter, Naylor, Gavin et al. Rays of the World (January 15, 2017).

Websites:

https://www.fisheries.noaa.gov/species/giant-manta-ray
https://www.mantaidpalau.org/biology-behavior.html