



Lesson Time

4, 60 minute classes

Essential Question

What are the adaptations of manta rays and how do they help rays survive?

Materials

Internet/ Device

Recyclable materials

Poster board

Glue/scissors

Copies of Infographic for each group

Objectives- Students Will

Explain 3 types of manta ray behavior

Explain which adaptations enable survival

Florida State Standards

Science Standard: SC.5.L.17.1

Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

NGSS CrossCuttingConcepts

Systems and Systems Models

5C's

Communication

Creativity

Collaboration

Background Information

Adaptations, physical characteristics:

Manta rays have the largest brain size for their body size of all fish. 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 are **countershaded**, dark on top and lighter underneath. The dark dorsal surface makes the mantas blend in with the ocean below if viewed from a predator above, If viewed from a predator below, the white belly will camouflage with light from the sun. Manta rays can be identified by the coloration and spots on their ventral side. They can have a maximum disc width (wingspan) of around twenty-nine feet and weigh around 5,000 pounds. They do not have a stinging barb on tail.

Manta rays filter food particles out of the water using rows of tiny plates in their gills. When they are ready to eat, they unroll the fins by their mouth to help funnel the plankton into their mouth. They swim with their mouth open and chest cavity extended to allow for water and food to flow through. Manta rays have a "tooth band" which is made up of thousands of little teeth, though they do not use their teeth to eat. Manta rays eat plankton, small fish, krill, and crustaceans.

Adaptations, behavior:

Mantas feed in several ways: barrel rolling (somersault), filtering food at the surface, and skimming the bottom. They also "stack" on top of each other. The leader of the stack will eat, and then another manta ray will lead. Other interesting behaviors include breaching (possibly to attract a mate).





Vocabulary:

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

Breach: to jump out of water

Cephalic Fin: fin extending from either side of a manta ray's mouth (Cephalic=head)

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

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

Adaptations, behavior: con't

Manta rays also exhibit patience in allowing humans to cut off fishing hooks and gear. They also can exhibit inquisitiveness towards swimmers and diver

Teacher Preparation:

1. Make copies of Rubric
2. Make copies of Infographic for each group
3. Foam posterboard from Dollar Store helps to anchor and guide the art piece for size and gluing
4. Assist students in collecting appropriate trash (no glass bottles, nothing sharp or that requires wire cutters)





Procedures:

Assess Prior Knowledge. Show Introductory Video if needed. <https://www.youtube.com/watch?v=tC06JYwpmDE>

Step 1: Engage: Inquire

Ask: *"What types of adaptations do you think manta rays have?"*

Think - Pair- Share- *"How do these adaptations help animals survive?"*

Step 2: Explore: Infographics

Individual work

Fill out **K** on KWL Chart. Fill out **W** on KWL Chart

Students will analyze infographics to obtain information about manta ray adaptations.

Fill out **L** on KWL Chart

Step 3: Explain: STEAM Challenge Research Sheet

Partner/ Team Work

Students will need to pick an adaptation to showcase in their art. Students will need to discuss with their team the type of adaptation and how it helps the manta survive. Fill out "STEAM Challenge Research Sheet."

Step 4: Elaborate: Build

Team Work: Teams will create a Manta ray out of recyclables. Students should search their recycling bins at home to create a ray. They will need about 2-3 days in class (60 min each) to build the ray. If teacher doesn't have glue guns, students may need to bring them in. If possible to purchase, a foam board helps anchor the project and help students understand what size it needs to be. If students choose an adaptation that is a behavior, for example stacked feeding, one group can make one manta and another group can make another and then display them together.

Step 5: Evaluate: Scientist statement

Individual work: Each student will write a "Scientist Statement" that will be posted with their piece of art. Other students will read this and this will show the teacher what they learned about their ray. Students can do a gallery walk, art show, post on class website, etc. The class is encouraged to "publish" their work in some way.

Linguistically diverse learners:

Provide opportunities for student to use preferred language.

Adapt Scientist Statement rubric/requirements as needed.





KWL Chart on Manta Rays

Name _____

K

What do you **KNOW** ?

What do you know about how manta ray adaptations help them to survive?

W

What do you **WANT** to know?

L

What did you **LEARN**?

What adaptations help manta rays survive?



KWL Chart on Manta Rays- Teacher KEY

Name _____

K

What do you KNOW ?

What do you know about how manta ray adaptations help them to survive?

Answers will vary from how they eat, to where they live, being large for protection from predators etc.

W

What do you WANT to know?

Students may write about anything from feeding to where they live to human interactions

L

What did you LEARN?

What adaptations help manta rays survive?

Manta rays are curious, they feed in different ways, they spend time at cleaning stations. Their mouth fins help them collect plankton, any information from the infographic is acceptable.



WHAT DO MANTAS DO?

-Adpatations - Behaviors for Survival -

BE CURIOUS:
MANTAS ARE
CURIOUS WITH
DIVERS.
THEY ARE
PATIENT AND WILL
ALLOW DIVERS TO
CUT OF FISHING
HOOKS

FEED TOGETHER:
"STACK" FEEDING - WHERE THE
LEADER GETS PLANKTON AND
THEN THEY SWITCH POSITIONS,
CYLCONE FEEDING (SPIRAL) AND
TRAIN FEEDING

BREACH:
JUMPING OUT OF
WATER
(POSSIBLY TO
ATTRACT A MATE?)
SCIENTIST DO NOT
YET KNOW WHY



**STAY
HEALTHY:**
MANTAS CAN
SPEND
ANYWHERE
FROM 30
MINUTES
TO 8 HOURS
GETTING
SHARK
WOUNDS
CLEANED AND
PARASITES
REMOVED

Average time:

26 min

longest time:

8 hrs

at a cleaning
station

**HANG OUT WITH
"FRIENDS" :**
TOGETHER THEY PLAY
AND SEARCH FOR
FOOD.
FEMALES TEND TO
HAVE LONG TERM
BONDS WITH OTHER
FEMALES.
MALES DO NOT HAVE
MANY STRONG BONDS
WITH OTHER MALES



A group of

Mantas

is called a

SQUADRON



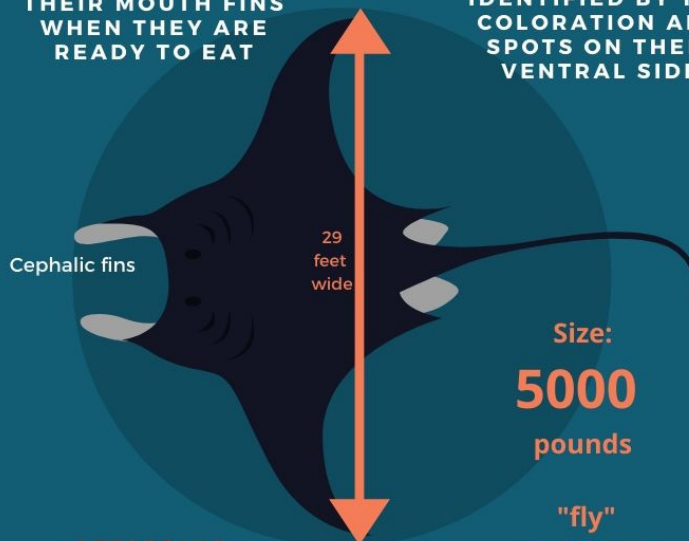
WHAT ARE MANTAS?

-Adaptations - Physical Characteristics for Survival-

FILTER FEEDERS:
MANTAS FEED BY
BARREL ROLLING,
FILTERING
PLANKTON AT THE
SURFACE AND
SKIMMING BOTTOM

THEY UNROLL
THEIR MOUTH FINS
WHEN THEY ARE
READY TO EAT

CAMOUFLAGE:
DARK ON TOP AND
LIGHT UNDERNEATH
TO BLEND INTO
OCEAN
(COUNTERSHADING)
MANTA RAYS CAN BE
IDENTIFIED BY THE
COLORATION AND
SPOTS ON THEIR
VENTRAL SIDE



Size:
5000
pounds

"fly"
(Swims) at
9 mph

OFFSPRING:
MANTA'S HAVE A 1 YEAR
GESTATION WITH ONE
LIVE PUP

FEMALES ARE ABOUT 10
YEARS OLD WHEN THEY
ARE READY FOR
OFFSPRING, THEY WILL
HAVE PUPS EVERY 2-5
YEARS

HABITAT:
YOUNG MANTAS SPEND A
LOT OF THEIR TIME IN
SHALLOW WATER WHERE
THERE ARE LESS
PREDATORS

Manta rays have
the largest brain
size for their size
of all fish.



STEAM Challenge Research Sheet

Name _____

Use this sheet to plan for your Manta Ray model:

NOTES From Infographic

SKETCHES for Model



RESOURCES

Manta Rays breaching: <https://www.youtube.com/watch?v=EAhCKoVxDZs>

Fishing line removal: <https://www.youtube.com/watch?v=Et2IFPN8W14>

Feeding: https://www.youtube.com/watch?v=gjjeS-_HI_Q

Use: <https://animaldiversity.org/> for your research

IDEAS for Materials



STEAM Challenge: Trash Art Adaptations

Name _____



Scientist Statement Rubric

Paragraph 1:

Scientific Information

Classification of ray including scientific name, habitat, photo of ray _____ pts

Information on ray limited, includes scientific name, photo included _____ pts

Missing scientific name or most classification, photo included _____ pts

Paragraph 2:

Adaptation fact about manta ray

Included interesting *additional* fact about ray _____ pts

Included adaptation fact about ray _____ pts

Fact missing _____ pts

Paragraph 3:

How you created model

Described how you created model and materials you used _____ pts

Described how your created model OR materials you used _____ pts

Explanation of model and materials missing _____ pts

Grammar, Spelling, Punctuation

Complete sentences, correct spelling, and punctuation _____ pts

1-2 errors in grammar, spelling, punctuation _____ pts

3-4 errors in grammar, spelling, punctuation _____ pts

Engineering Extra Credit

Created a moving part to your manta ray art _____ pts

Comments:

Total Points _____

Sample student work:



White Tiger



Scientist Statement

The White Tiger's typical habitat is tropical forests, mangrove swamps, and moist jungles. Their scientific name is *Panthera Tigris* it is nearly a different colored version of a bengal tiger.

Its adaptations are powerful jaws, they have the best sense of smell, and their fur coat protects them from cold and hot weather. They have very powerful jaws and an amazing sense of smell. These adaptations makes the white tiger a great hunter. The white tiger has many adaptations such as nocturnal hunting, passion, daring, and fearlessness.

We made our animal out of cardboard from the trash. The legs have pop cans in them to help them stand up. You can pull the red string to make its tongue move. It is always fun learning something new about an amazing animal. I hope I get to do something like this again.

Sources: <https://prezi.com/i4qtcspaoc1c/adaptations-of-the-white-tiger/>
<https://www.quora.com/How-many-white-tigers-are-there-in-the-world>
https://en.wikipedia.org/wiki/White_tiger



MARINE MEGAFUNA FOUNDATION

SCIENTIST SERIES FOR STUDENTS *Grade 5*

Module 2 Trash Art Adaptations

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Grant provided by:



We value your feedback!

Please fill out this Teacher Evaluation form at shorturl.at/zlJT4
As a Thank You, your class will receive a
Manta ray Adoption Certificate!

We'd love to see your lessons in action!

Please send an email to florida@marinemegafauna.org
and tag us in social media.



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Marine Megafauna Foundation

Resources:

<https://researchers.mq.edu.au/en/persons/robert-perryman>

<https://www.youtube.com/watch?v=mMDq2Oup2eI>

<https://marinemegafaunafoundation.org/blog/underwater-listening-stations-track-reef-manta-rays-in-mozambique/>

Zoom meeting, Jessica Pate, May 1, 2020

<https://phys.org/news/2019-08-manta-rays-social-bonds.html>

<https://www.nationalgeographic.com/animals/fish/group/manta-ray/>

https://link.springer.com/article/10.1007/s00265-019-2720-x?mc_cid=1d16d8c60d

