Name _____ Date _____ Period _____

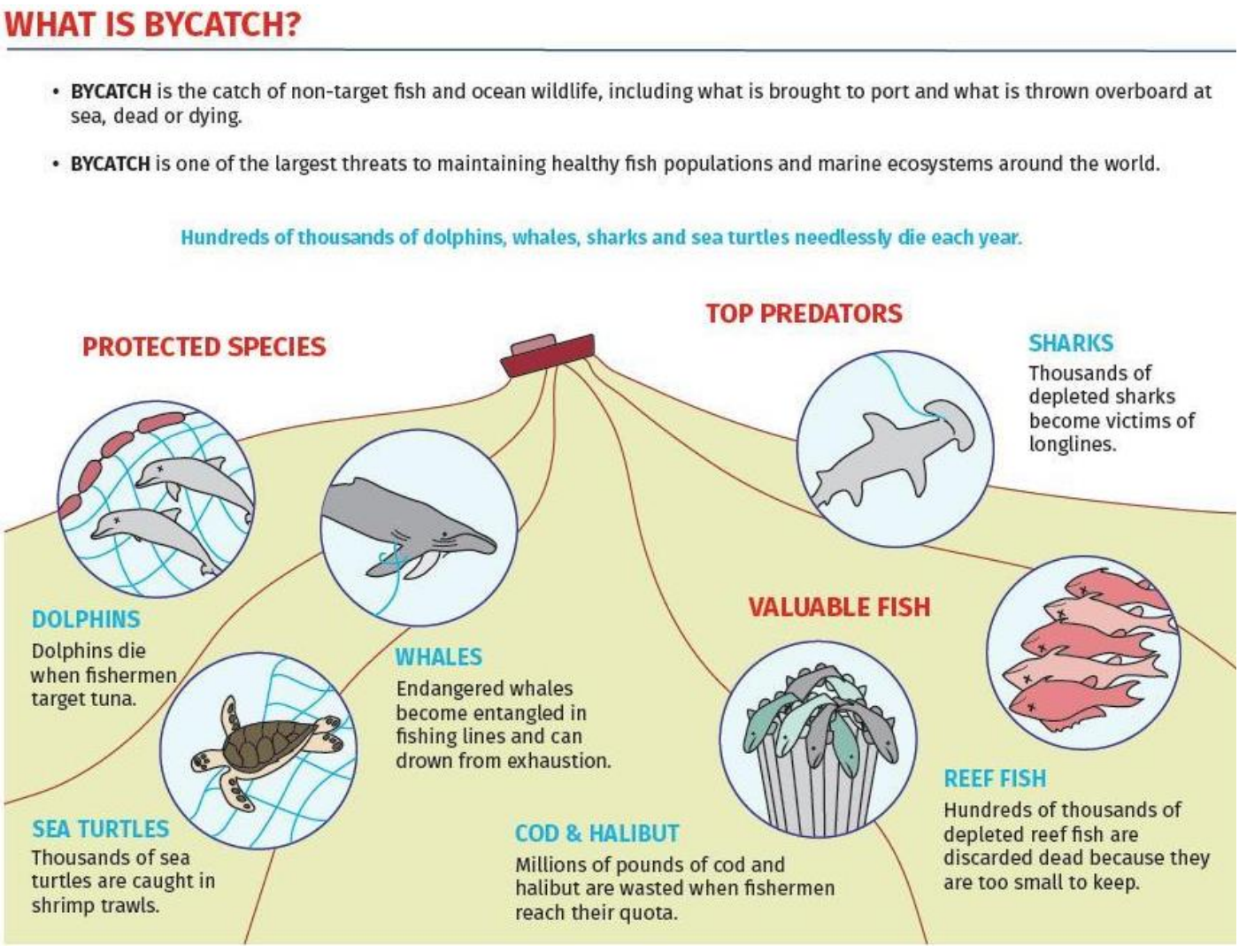
Lab: Catching the Wrong Species

HONORS BIOLOGY: UNIT 9

BACKGROUND: Research estimates that as much as 40% of the seafood caught worldwide is discarded, while countless sharks, whales, dolphins, birds, sea turtles, and other animals are unintentionally killed or injured by fishing gear (Kledji- an et al. 2014). This capture of non-targeted species—known as bycatch—is a worldwide challenge to maintaining sustainable fisheries and protecting endangered species. In fact, two billion pounds of bycatch is discarded annually in the United States.

In this activity, students will use a use and develop models to design, engineer, and test solutions to bycatch in the tuna fishery. Students will collect and use data to optimize their design and consider how their model might look in real life.

Key Terms:
- ***Target Species*** – The species that the fisher seeks to catch.
- ***Non-target species*** – Unwanted species found in the same waters
- ***Bycatch*** – Non-target species caught in fishing gear



Taken from: http://static.nsta.org/files/tst1409_25.pdf
and http://www.tamdistrict.org/cms/lib8/CA01000875/Centricity/Domain/986/CatchingTheWrongSpecies.pdf

Science and Engineering Practices to Keep in Mind

- Developing and Using Models
- Analyzing and Interpreting Data
- Using Mathematics and Computational Thinking
- Constructing Explanations (for science) and Designing Solutions (for engineering)

Goals of this Activity:

- Discuss the need for sustainable fishing in the world's oceans
- Design, evaluate, and refine a solution for reducing bycatch
- Relate your model design to real life

Pre-Reading:

Read the provided article and complete the associated reading questions.

Getting Started:

Your teacher will demonstrate the core simulation by providing an opportunity for the class to witness nonspecific fishing. Lab groups will then be tasked with designing, engineering, and testing, fishing nets that are more selective. Lab groups will be judged, among other criteria, by how good a job their solutions do at catching only their assigned fish.

Available Materials

- paper cups
- small paper cups
- coffee filters (basket style)
- frozen treat sticks
- small paper plates
- aluminum foil
- masking tape
- transparent tape
- scissors
- pipe cleaners
- deli containers
- other classroom materials

"Species" Key:

- dried garbanzo beans = ***shrimp***
- red beans = ***squid***
- white beans = ***herring***
- marbles = ***tuna***
- table tennis balls = ***dolphins***

Procedures

*The purpose of this activity is to **EXPLORE**. Because of this, there are very few specific procedural steps. Remember that your goal is to create a net that catches your specific species of fish with as little bycatch as possible.*

My Group's "Target Species": _____

1) **Engage**: Choose one student in your group to be the "fisherman" and send them up to the front of the room . The fishermen will dip their paper cup into the ocean (bucket) without looking and scoop a cup-full of "catch". The fisherman will return to their desk and pour out the catch onto a paper plate. Using that data, fill out the table on the next page:

Bycatch engineering design data table.

Students use this table to record testing results from each prototype. Their goal: Design the best net to reduce the % of non-target species caught and exclude dolphins.

	# individuals of target species caught	# individuals of non-target species caught	Total # individuals caught	% target species (# target/ total #)	% non-target species (# non-target/ total #)	Types of non-target species caught
Original Net						
Prototype 1						
Prototype 2						
Prototype 3						

2) **Explore**: Engineer a fishing net to reduce bycatch in our model ocean (bucket). You may use any/all of the materials that are available in the front of the room, or any additional materials that you may feel would be useful (if available). You will have 45 minutes to sketch, build, test a prototype net, and make improvements upon that net. Your teacher will alert you when there are 15 minutes left until your final net is due.

3) **Explain**: Each group will have 2-3 minutes to explain your engineering process that led to your final prototype to the class. Then each group will dip their net into the "ocean" for their final net test. Quickly count your "catch" and return the "seafood "to the bucket. In addition to recording your data in the "Final Design Solution" on your data table, complete the group table on the board. Answer the questions below.

- Describe your most successfully designed net. What about it makes it good at catching just your target species?

- In what ways did your prototype change from the first to the final design? Why?

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4) **Elaborate**: In your group, in paragraph form, address the following question: Discuss how most successful designs could be created in real life (out of nets and lines rather than pipe cleaners and coffee filters). What would it look like? Consider cost, safety, ease of deployment, reliability.

5) **Evaluate**: Bycatch is just one issue in the larger issue of sustainable fishing. As a lab group, name a few ideas that would address the issue of overfishing. Why is managing fishing in a global ocean such a challenge?

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