



Top Predator Effects on Mesopredator Consumption

Grades: 3-5

Learning Objectives: Students will

- a. define the vocabulary terms
- b. identify several marine creatures and explain the role of each in marine ecosystems
- c. describe marine ecosystem biodiversity and symbiosis

Next Generation Science Standards: 3-LS4-2, 3-LS4-3, LS2.A, LS2.C, LS2.D

Ocean Literacy Scope and Sequence: Principle 5

Vocabulary and concepts: food web, predator ecology, trophic cascade, meso-predator release, consumptive and non-consumptive effects

Background: The game plays out as if you are a mesopredator hunting within a marine ecosystem of your choosing (i.e., a tropical Nassau grouper or a subtropical/temperate red drum hunting for prey within a coral or oyster reef, respectively). You will hunt for food in your ecosystem six times for 45 seconds each. At the end of each hunt or round, count your successful meals. Now remember, there are large, top predators that also live in your ecosystem which could make a successful hunt difficult – this is because you are trying to avoid becoming a meal yourself! To observe how these top predators may affect how much you, a mesopredator, can hunt and eat, you will set-up the ecosystem without and with predators. Record your successful hunts per round and review if there are any differences without and with predators!

This is a modified version of National Geographic Education's Resources: 'The Importance of Sharks: You Do the Math!'. D. Nelson, A. M. Cowan, and J. Brown. ([https://www.nationalgeographic.org/activity/the-importance-of-sharks-you-do-the-math-/](https://www.nationalgeographic.org/activity/the-importance-of-sharks-you-do-the-math/)).

Before Activity: Have students watch 'The Power of Predators – Ecology' with Dr. Enie Hensel to review core concepts and terms regarding marine predator ecology. Video time: ~35 minutes.

Activity Preparation: Print and cut out playing cards, boards, and worksheet.

Deck = 34 total cards. 4 habitat cards. 4 top predator cards. 26 prey fish cards.

Boards = 3 boards. 1 hunting habitat area. 1 meso-predator stomach. 1 top predator stomach.

Note: if you do not have a printer, this game is possible with a normal deck of cards. Make # cards prey, Aces the apex predator cards, and Kings as habitat cards.

Directions: This game is best when you play 6 rounds.

Round 1 = Predators absent.

- a. **Shuffle the deck that contains 26 prey fish and 4 habitat cards.**
- b. Place all cards face down in front of the player as well as the stomach boards.
- c. Set a timer for 30 seconds and player begins flipping and collecting cards prey cards
- d. Once the player (mesopredator) has five prey items, it's considered a full meal and the pile of five cards gets placed onto the mesopredator stomach board. Five cards = 1 successful meal.
- e. If the player picks up a habitat card, it is simply set aside. Not taken as prey (food) or has any impact on the player except taking up precious hunting time.
- f. After 30 seconds, record how many meals the player successfully 'ate'.

Round 2 = Predators present

- g. **Shuffle the deck that contains 26 prey fish and 4 top predator cards.**
- h. Repeat steps b-d in Round 1.

- i. If the player picks up a predator card, then any prey cards currently flipped/in the player's hand must now go into the apex predator stomach board on one of the 'meal' discard piles. The player loses the opportunity for completing that meal but lives on to keep hunting. *Most often, top predators' prey escape but they may lose the opportunity to hunt themselves or even puke their meal as a distraction.*
 - j. If the player turns over a predator card and doesn't have any prey cards, the player simply discards the predator card off the board. *This represents a non-consumptive encounter, where time interacting with a predator takes away time from the mesopredator hunting.*
 - k. After 30 seconds, record how many meals the player successfully 'ate'.
2. Repeat until you have completed 3 replicates of each round (with and without a predator present) for a total of 6 rounds.
 3. Record the total number of full 'meals' the mesopredator or player received per session in the chart.

Post Activity: Discuss or have students answer the following.

1. Were the average number of meals different for the mesopredator with and without a shark present?
2. What do you think would happen to the mesopredator's prey population overtime if there were no sharks? How about the mesopredator's population?
3. As the mesopredator, did you notice if your predation method, i.e., the way you collected cards, changed in any way? Why do you think this was the case? Can you relate this to a non-consumptive effect a shark may have on a grouper or red drum in nature?
4. Did the results match your prediction? Explain.
4. Were there any prey cards left in your sessions with a shark? What does this tell you about the importance of sharks?

Activity Sheet

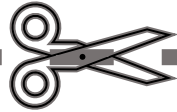
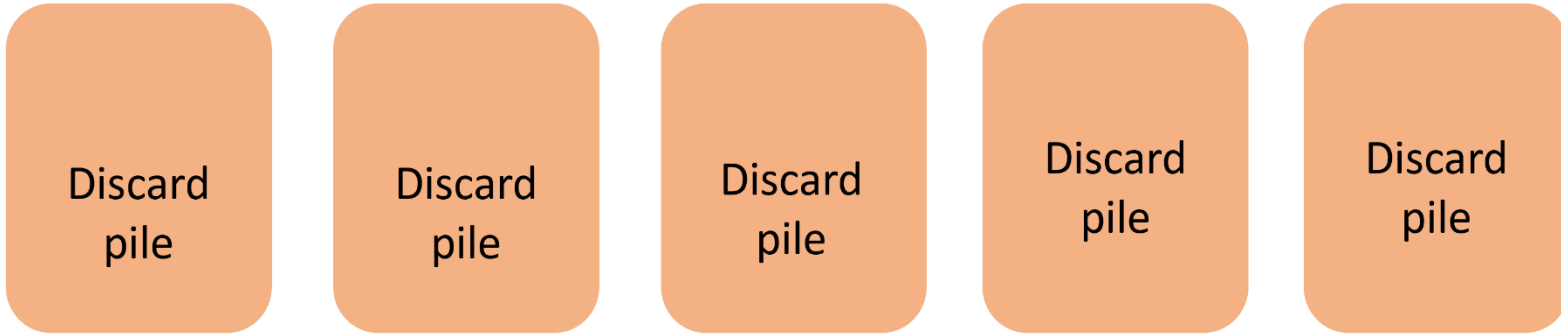
Record the total number of full 'meals' the mesopredator or player received per session

Number of Successful Meals				
	Session 1	Session 2	Session 3	Average
Without an apex predator				Add numbers in each row and divide by 3
With an apex predator				

Follow Up Questions

1. Were the average number of meals different for the mesopredator with and without a shark present?
2. What do you think would happen to the mesopredator's prey population overtime if there were no sharks? How about the mesopredator's population?
3. As the mesopredator, did you notice if your predation method, i.e., the way you collected cards, changed in any way? Why do you think this was the case? Can you relate this to a non-consumptive effect a shark may have on a grouper or red drum in nature?
4. Did the results match your prediction? Explain.
5. Were there any prey cards left in your sessions with a shark? What does this tell you about the importance of sharks?

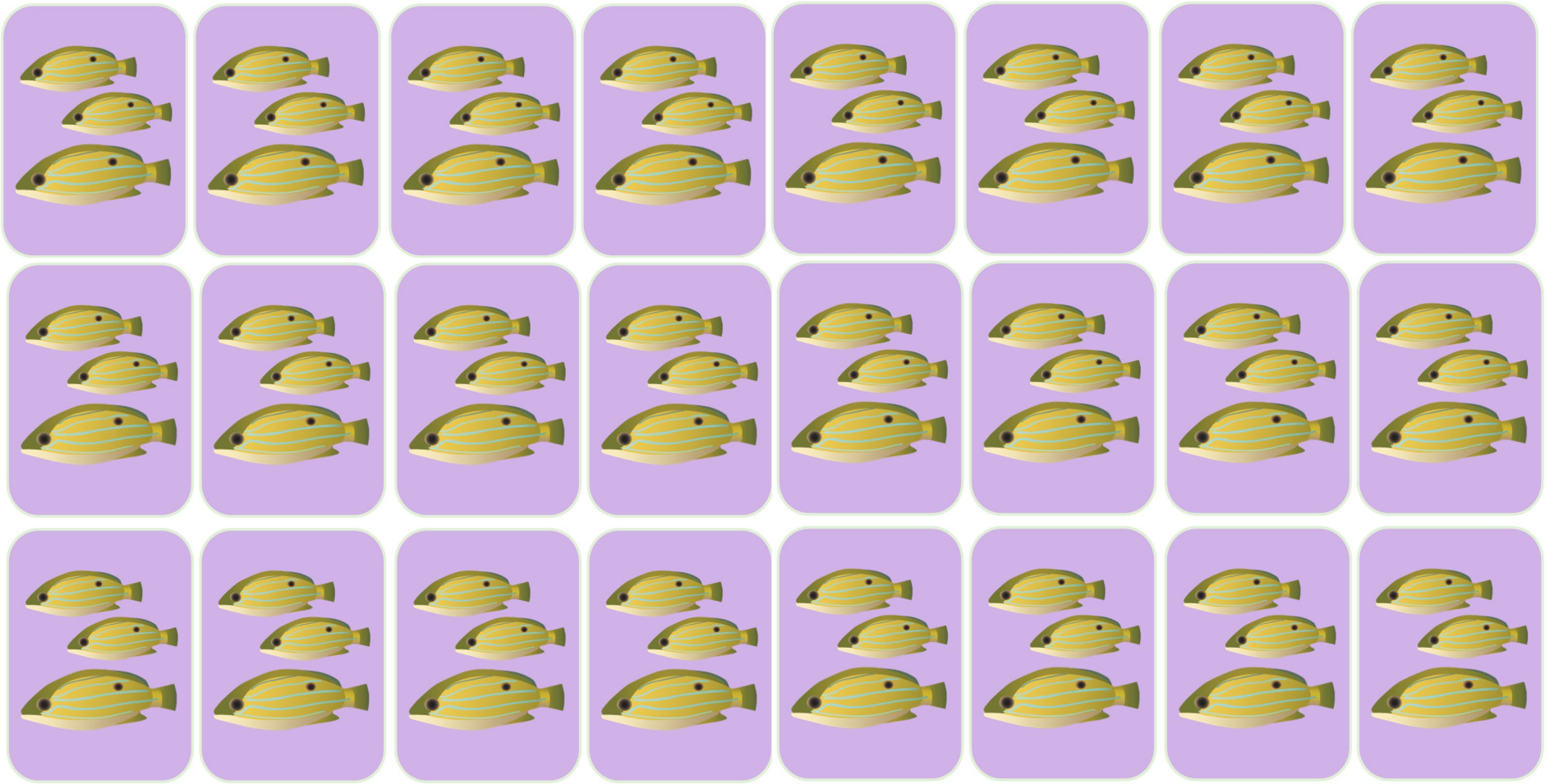
Top Predator Stomach



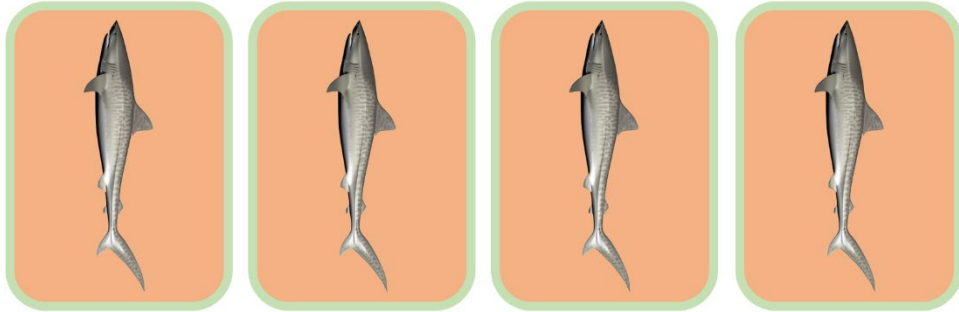
Mesopredator Stomach



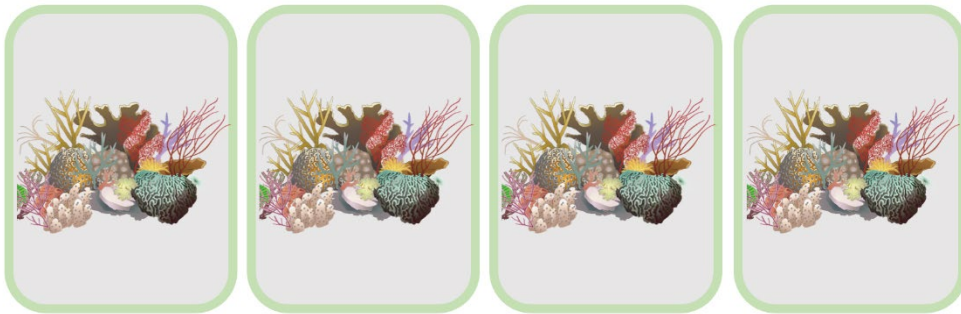
PREY CARDS – Grunts eat invertebrates in coral reef, seagrass, and mangrove ecosystems. They swim in large schools at night to hunt for prey.



TOP PREDATOR – Tiger Sharks roam and migrate to many ecosystems. Within seagrass and coral reefs they can hunt big fish like grouper

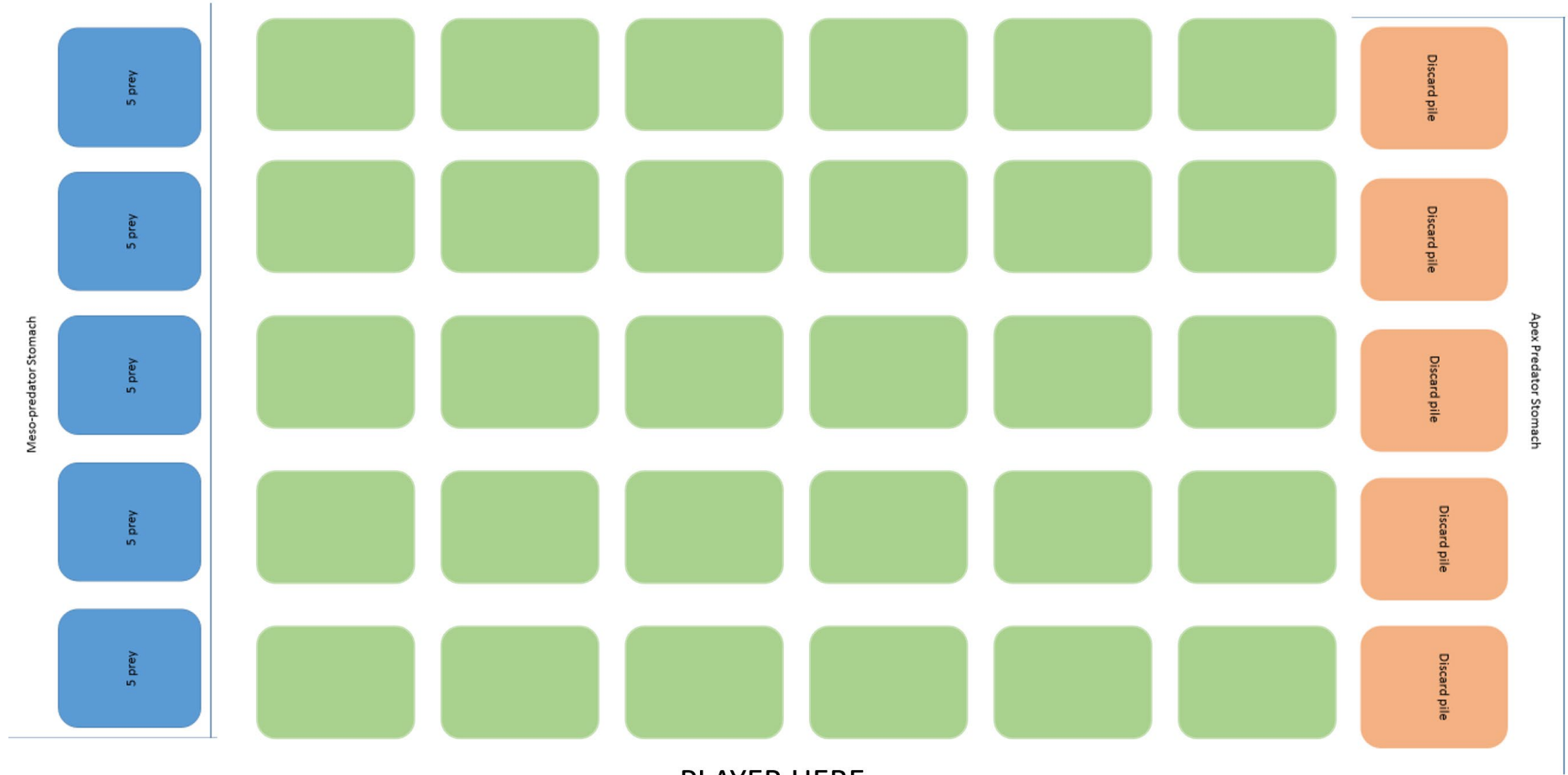


ECOSYSTEM – Coral reefs are structurally complex habitats that provide a hub for many fishes, invertebrates, and plants to live, rest, and/or eat



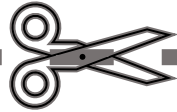
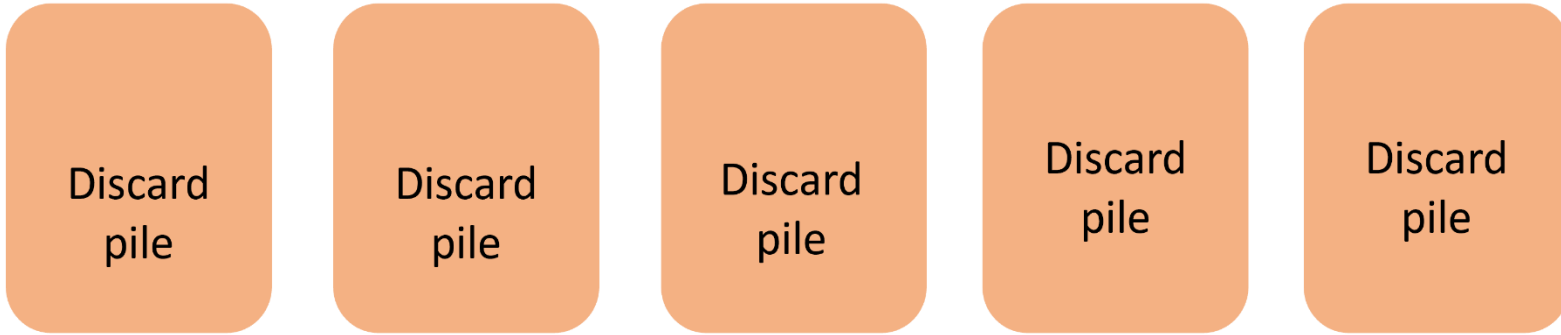
MESOPREDATOR – Nassau grouper. A large piscivore that live in coral reef and seagrass ecosystems. As a piscivore, Nassau grouper eat small fish, like grunts, and they also eat invertebrates such as crabs.

EXAMPLE SET UP



PLAYER HERE
SET UP

Top Predator Stomach



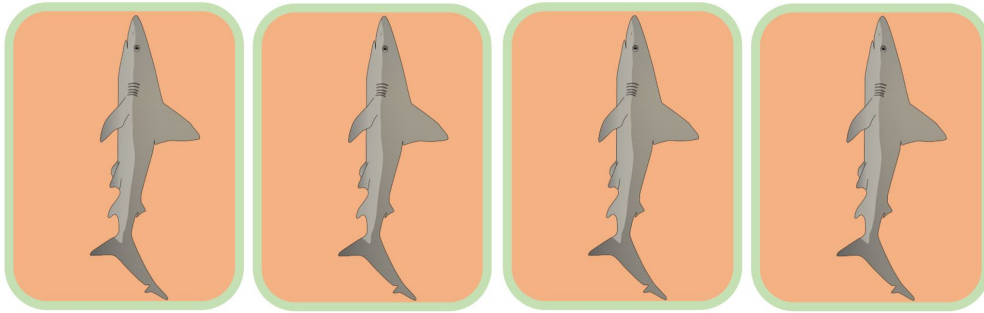
Mesopredator Stomach



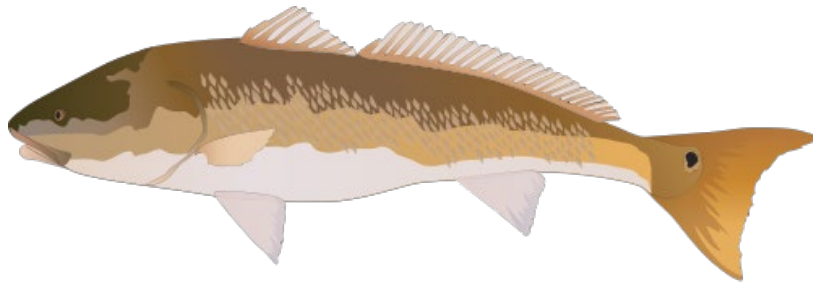
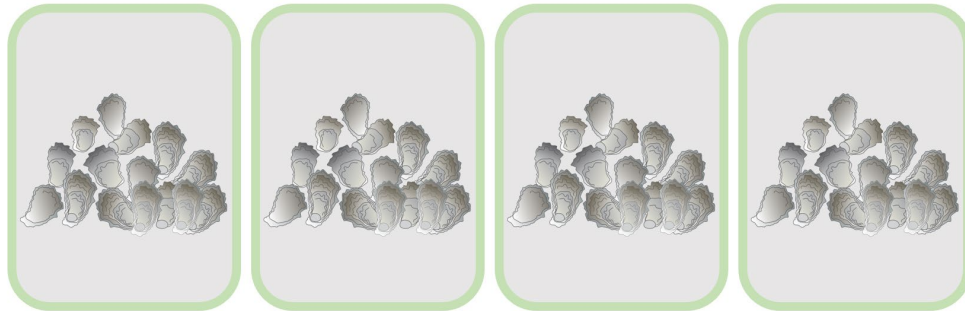
PREY CARDS – Atlantic menhaden are an important filter feeder and link between plankton and upper level predators.



TOP PREDATOR – Sandbar sharks are a medium sized shark that roam estuaries like the Chesapeake Bay and feed on bottom-dwelling fish, like young red drum, and invertebrates.

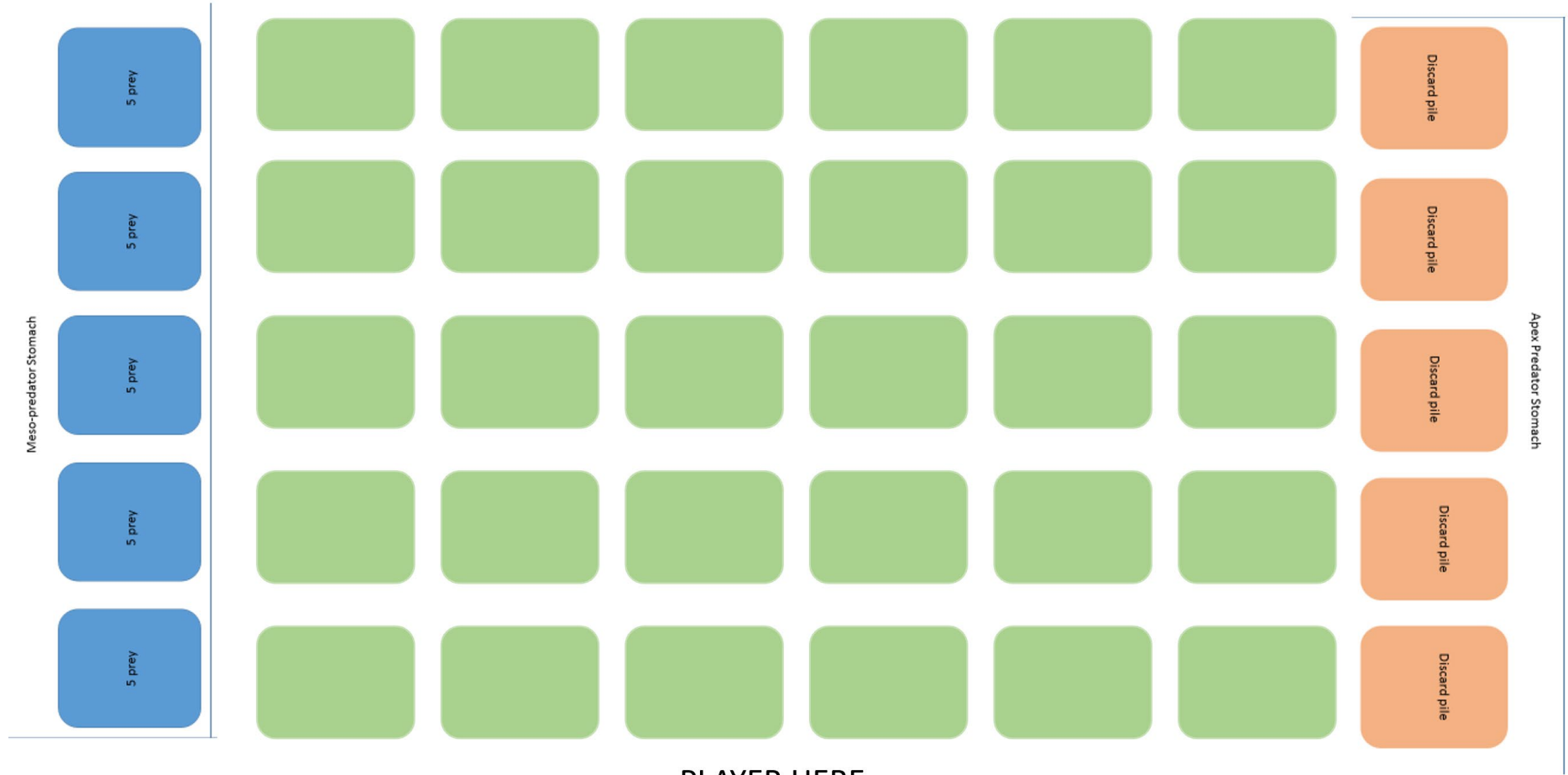


ECOSYSTEM – Oyster reefs create important habitat for hundreds of other marine species and filter and clean the surrounding water. Species like mussels, barnacles, and sea anemones settle on them, creating abundant food sources for commercially valuable fish species.



MESOPREDATOR – Red Drum. A large piscivore that live in subtropical and tropical ecosystems like mudflats, oyster reefs, and marsh creeks. Red drum prey upon smaller fish such as anchovies and menhaden, as well as crabs and shrimp.

EXAMPLE SET UP



PLAYER HERE
SET UP