SEA TURTLE PATROL

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Grade Level
4th Grade

Subject Area
Math & Science

VA SEA is a collaborative project between the Chesapeake Bay National Estuarine Research Reserve, the Virginia Institute of Marine Science's Marine Advisory Program, and Virginia Sea Grant. The VA SEA project is made possible through funding from the National Estuarine Research Reserve System Science Collaborative, which supports collaborative research that addresses coastal management problems important to the reserves. The Science Collaborative is funded by the National Oceanic and Atmospheric Administration and managed by the University of Michigan Water Center.

Title: Sea Turtle Patrol

Focus: Collecting data on nesting sea turtles and graphing data.

Grade Level: 4th Grade Math & Science

VA Math Standards:

4.4 The student will
a) demonstrate fluency with multiplication facts through 12 x 12

4.8 The student will
a) estimate and measure length and describe the result in U.S. Customary and metric units

4.14 The student will
a) collect, organize, and represent data in bar graphs and line graphs;
b) interpret data represented in bar graphs and line graphs

VA Science Standards:

4.1 The student will demonstrate an understanding of scientific and engineering practices by

b) planning and carrying out investigations
- take metric measurements using appropriate tools

c) interpreting, analyzing, and evaluating data
- organize and represent data in bar graphs and line graphs
- interpret and analyze data represented in bar graphs and line graphs
- compare two different representations of the same data (e.g., a set of data displayed on a chart and a graph)

d) constructing and critiquing conclusions and explanations
- use evidence (i.e., measurements, observations, patterns) to construct or support explanations and to make inferences

Learning Objectives:

- ✓ Students will make observations about nesting sea turtles and measure lengths of the turtles.
- ✓ Students will count turtle eggs and practice their 10 x multiplication facts.
- ✓ Students will consider how temperature and month of the year influences sea turtle nesting and hatchling sex ratios.
- ✓ Students will represent and interpret their sea turtle data using bar and line graphs.
- ✓ Students will be introduced to sea turtle friendly conservation behaviors.

Total length of time required for the lesson:

90-120 minutes total class time; Advance preparation of lab materials – 1-2 hour(s), Lab setup – 5 minutes, Introduction – 10 minutes, Night Patrol–20 minutes, Lecture – 15 minutes, Dawn Patrol – 20 min, Class Graphing – 15 min Discussion – 15 minutes, Breakdown and clean-up – 10 minutes.

Key words, vocabulary:

- **Carapace:** top side of the shell of a turtle.
- **False Crawl:** when a turtle comes ashore to lay eggs but goes back to the ocean without depositing them in the sand.
- **PIT tag:** (passive integrated transponder) implanted microchips that are activated close to a special antenna that records the identity of the tag (like microchips in pets or EZPass).
- **Barnacles:** crustaceans related to crabs, lobsters, and shrimp that attach themselves to hard substrates.
- **Flipper Tag:** metal piercings with a unique letter/number combination that are put into a turtle's flipper to help identify it.
- **Hatchling:** a young animal that has recently emerged from its egg.

Background information:

All species of sea turtles are threatened or endangered, meaning they are at risk of extinction. This is due to the large number of threats sea turtles face including illegal human poaching, nesting beach degradation, pollution, predation, climate change, and fisheries bycatch. Therefore, scientists are interested in monitoring the populations of sea turtles around the world to better understand whether population sizes are increasing or decreasing over time. One of the most common monitoring approaches scientists use to understand sea turtle populations are daily dawn and night patrols during prime sea turtle nesting seasons. During night patrols, scientists collect data on any sea turtle that comes onto the beach to lay her eggs, including the turtle's measurements and tagging information. Sea turtles that aren't already tagged will receive flipper and PIT tags, to keep track of individual turtles over their lifetime. During dawn patrols, scientists will inventory nests that have already hatched to determine nest success by counting how many hatchlings successfully came out of each nest. Using this data, scientists can estimate how large the sea turtle populations are as well as understand other aspects of nesting sea turtle behavior.

Students will mimic a typical night patrol by measuring three sea turtles, recording flipper and PIT tag numbers, and "tagging" a turtle of their own. Students will also mimic a dawn patrol by counting sea turtle eggs in 2-3 nests and graph their data as a class to interpret when peak sea turtle nesting periods occur and observe how temperature influences sea turtle sex ratios. Finally, students will be introduced to sea turtle friendly conservation practices.

Materials & Supplies:

- Paper and laminator
- Rulers or Calipers
- 200-300 ping pong balls (consider getting two different colors, or marking each with "M" or "F" for male and female respectively). Alternate options: 2 colors of pompoms or balled up sheets of paper.
- 16-22 brown paper bags
- Dry erase markers
- White board/chalk board/smart board
- *Optional*: Phone camera for QR code scanning
- *Optional*: Red light flashlights/flashlights covered with red cellophane

Classroom Set up:
Students should work in groups of 2 – 4 students, with a table, rulers/calipers, and enough space on their desks or on the floor to count up to 36 ping pong balls. Set up however best for this.

Depending on your classroom size, this activity can work either in 6 groups of maximum 4 students (see table 1 for classroom setup) or in 9 groups of maximum 4 students (see table 2 for classroom set up). Groups can be as small as 2 students. If you have an uneven number of students create larger groups for the groups that get 3 nests (see table 1 or 2).

Each group will be assigned one of the following months: May, June, July, August. Each group will receive three turtles to measure for night patrol, and 2 or 3 nests to inventory during dawn patrol. The eggs within the nests will have male to female ratios corresponding to the month of the group (see tables below). Create each nest by randomly selecting a number within the ranges provided in the table for male and female eggs and placing them in a brown paper bag. Mark ping pong balls with a sharpie using "M" for male and "F" for female (or use different colored ping pong balls to denote the sex of the eggs).

Table 1. Six groups of 2-4 students each

Group #	Month	# of turtles	# of nests	Male eggs in each nest	Female eggs in each nest	TOTAL eggs in each nest
1	May	3	3	4 to 6	3 to 6	7 to 12
2	June	3	3	2 to 4	5 to 8	7 to 12
3	June	3	3	2 to 4	5 to 8	7 to 12
4	July	3	2	0 to 2	7 to 10	7 to 12
5	July	3	3	0 to 2	7 to 10	7 to 12
6	Aug	3	2	3 to 5	4 to 7	7 to 12
Total:		15	16	30 to 62	82 to 130	112 to 192

Table 2. Nine groups of 2-4 students each

Group #	Month	# of turtles	# of nests	Male eggs in each nest	Female eggs in each nest	TOTAL eggs in each nest
1	May	3	2	4 to 6	3 to 6	7 to 12
2	May	3	2	4 to 6	3 to 6	7 to 12
3	June	3	3	2 to 4	5 to 8	7 to 12
4	June	3	3	2 to 4	5 to 8	7 to 12
5	June	3	3	2 to 4	5 to 8	7 to 12
6	July	3	3	0 to 2	7 to 10	7 to 12
7	July	3	2	0 to 2	7 to 10	7 to 12
8	July	3	2	0 to 2	7 to 10	7 to 12
9	Aug	3	2	3 to 5	4 to 7	7 to 12
Total:		27	22	40 to 84	114 to 180	154 to 264

Teacher Preparation:

Prepare lesson activity by printing and laminating 3 loggerhead turtles for each group. Create 2-3 sea turtle nests per group. Your students will be put into groups based on month of the year – May, June, July & August – and the group's month will determine how many and which nests they will collect data on.

Label ping pong balls "M" for male or "F" for female using a marker (alternatively use two different colored ping pong balls corresponding to male or female). You will need to label more female eggs than male (see table 1 or 2 above).

To create one nest: The goal is to have nests with different numbers of eggs (from 7 to 12 eggs in each nest). Refer to table 1 or table 2 to determine how many male and female eggs to put in each nest based on each group's month, and place that many male and female marked ping pong balls into a brown paper bag.

For example: Group number 3 is a June group that receives 3 different nests (paper bags filled with ping pong balls). To create these three nests, you can put 2 male eggs and 6 female eggs in one bag, 4 male eggs and 7 female eggs in another bag, and 4 male eggs and 5 female eggs in the last bag. Any combination of male: female eggs will work if it follows the ranges provided in the tables above (so for group 3: 2-4 male eggs per nest, and 5-8 female eggs per nest).

Tip: Once you have created a nest, label the outside of the brown paper bag with the month or group number it corresponds to for easier classroom setup.

Each group should have:

- Example "Shelly" turtle (page 11)
- 1 copy of the untagged turtle (i.e., no QR code/flipper tags found on page 12)
- 2 different laminated tagged sea turtles (print out multiple copies of the 6 tagged turtles provided on pages 13-18 and distribute them across the groups)
- Rulers/Calipers
- 2-3 nests (depending on the group's number- see table 1 or 2)
- Sea Turtle Night Patrol Data Sheet
- Sea Turtle Dawn Patrol Data Sheet
- Phone camera for QR scanning (optional)
- Red light flashlights/red cellophane covered flashlights (optional)
- Dry erase marker/pencils for drawing tags

Procedure:

1. **Engagement**

Begin the PowerPoint, *Sea Turtle Patrol* (slides 1-8)

2. **Night Patrol Activity**

- Break up your class into either 6 or 9 groups of 2-4 students and assign each group a month: May, June, July, August (according to table 1 or 2). Within each group 1-2 roles (depending on group size) should be assigned to each student: Data Recorder, Tag Reader, Measurer(s).

- Each group should have 3 turtles (one of which is untagged found on page 12) and 2-3 nests with male: female ratios based on the month/group number they were assigned (see table 1 or 2 for specific materials distribution by group).
- Place each turtle on top of a nest. If a group has only two nests, place the third turtle on the student's desk without a nest underneath it to indicate that this turtle has "false crawled" (so for example in table 1: groups 4 and 6 will each have a turtle that false crawls because they get 2 nests instead of 3). Explain to students the concept of a false crawl and let them know that if they have a turtle without a nest underneath it, then that turtle has false crawled.
- A turtle is considered to "false crawl" if they come on to the beach to nest but do not leave a nest behind, this would be more likely to happen if a turtle gets scared by someone's white light or if there are people nearby making a lot of noise. Therefore, to reinforce sea turtle friendly conservation practices, it is very important that the students work as quietly as possible (whispering to each other) so as not to scare their turtles away from nesting. *If any group gets too rowdy during the night patrol activity, take one of their nests away*.
- Let students know that they are not to touch the nests during this activity, as the eggs need to incubate! They should only be working with the sea turtles during this activity.
- Turn the lights off (optional) and ask students to fill out their night patrol data sheets by measuring each of the three turtles using rulers or calipers and reading their flipper and PIT tags. To better portray what night patrol is like, have students use red light flashlights and explain that turtles are very sensitive to other colors of light but not red (this is because red wavelength is the longest/lowest energy and does not penetrate very deep into the ocean).
- Have each group come up with a new name for their untagged turtle and draw on flipper tags onto the turtles (using dry erase marker if laminated for reuse, or pencil if not laminated). Make sure they record this turtle's new tags on their datasheets (they can come up with the numbers and letters) and write in the comments section "new turtle" as well as the name they picked out for it.

3. Dawn Patrol Activity

- Collect all the sea turtles and night patrol datasheets from the students.

Continue the PowerPoint, *Sea Turtle Patrol,* from slide 9 until slide 13.

- With the lights on, have students fill out their dawn patrol datasheets by opening their nests one at a time and counting how many female and male eggs are inside each nest, and recording that on their Dawn Patrol data sheet.

4. Class Graphing Activity

- On your whiteboard/chalkboard draw X and Y axes for graphs 1 & 2 (see below). On both graphs' X axes write the months: May, June, July, August (see below). If your classroom is equipped with a smartboard, then use slides 14-17 for the graphing exercise.
- Also draw 3 tables on the whiteboard (see page 6) and ask a representative from each group to write the number of total male, female, and overall total eggs they counted from all of their nests combined. Total up all the eggs for any months that had multiple groups assigned to it, and as a class represent the overall total number of eggs as a line graph (graph 1 below), and the male and female eggs as a bar graph (graph 2 below).
- Ask a representative from each group to go up to the board and draw a bar for the number of female and male eggs in each month from the total calculated in tables 2 and 3. OR pages 19-20

include printable graph axes if you would like groups to create their own graphs after filling out the three tables as a class.

Draw these tables on the board and have a student from each group fill in the blanks for the total number of male, female, and overall number of eggs summed across all of their nests. As a class add up the totals across all groups (right columns). If using smartboard can project slide 12 or 13 of "Sea Turtle Patrol" Presentation

Table 1.

Month	Total eggs by group	TOTAL EGGS
May	____ (+ ____)	
June	____ + ____ (+ ____)	
July	____ + ____ (+ ____)	
August	____	

Table 2.

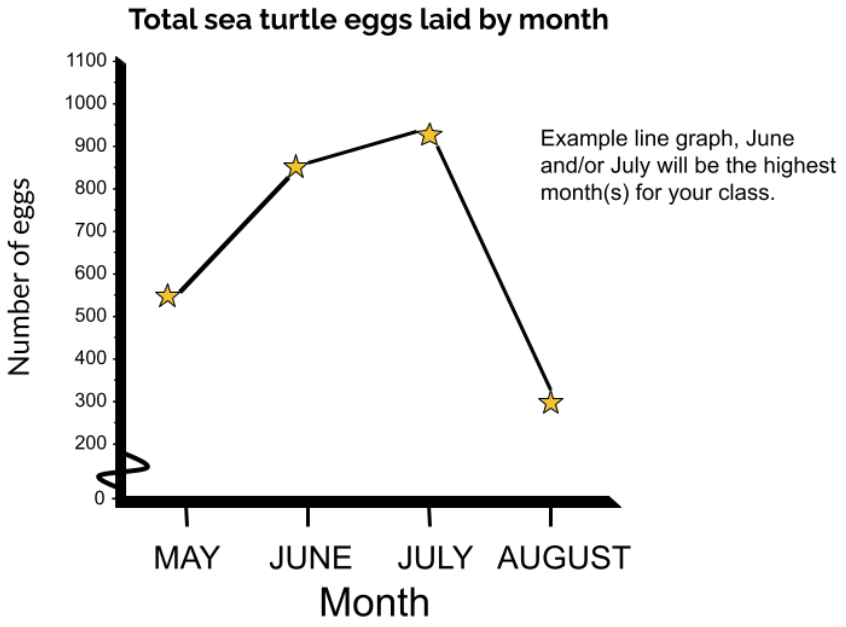
Month	Male eggs by group	Total male eggs
May	____ (+ ____)	
June	____ + ____ (+ ___)	
July	____ + ____ (+ ___)	
August	____	

Table 3.

Month	Female eggs by group	Total female eggs
May	____ (+ ____)	
June	____ + ____ (+ ___)	
July	____ + ____ (+ ___)	
August	____	

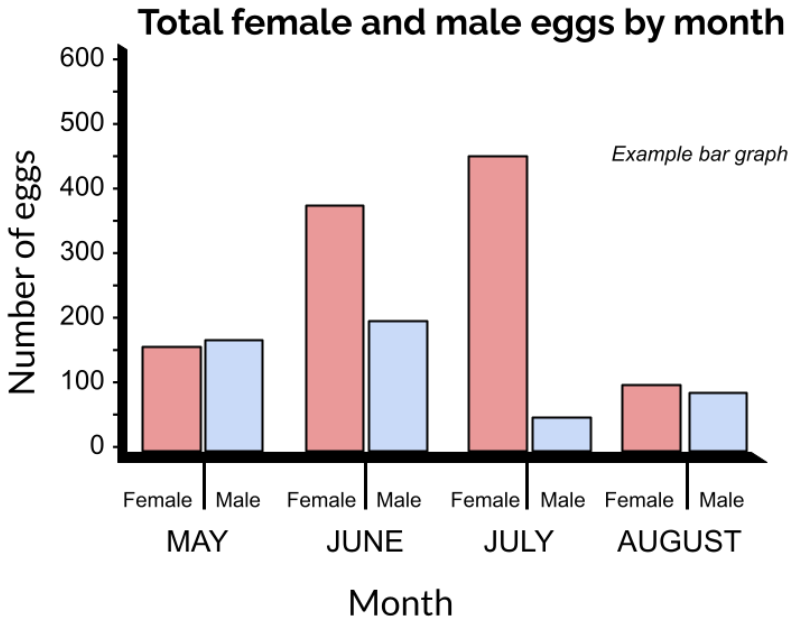
*****Include lines in parentheses if your class is split into 9 groups, do not include if 6 groups.

Draw axes and labels of graph 1 on board OR on smartboard project slide 14 or 15 of "Sea Turtle Patrol" Presentation:



TIP: If you have 9 groups, your y-axis will need to go up to 1100, but if you have 6 groups your y-axis only needs to go up to 800.

Draw axes and labels of graph 2 on board OR on smart board present slide 16 or 17 of "Sea Turtle Patrol" Presentation:



TIP: If you have 9 groups, your y-axis needs to go up to 900 but if you have 6 groups your y-axis only needs to go up to 600.

5. **Discussion**

- Using the two graphs to guide your discussion, ask students questions such as:
  - Which month had the most eggs laid?
  - Which month is the most important for sea turtle nesting?
  - What do you notice about the number of female hatchlings across the four months?
  - What do you think is causing this trend in female to male hatchlings?
  - If the summers get hotter in the future, what do you think will happen to the number of male hatchlings?
  - What is something you learned today about sea turtles?
  - What would you research about sea turtles given what you learned today?
- Present slides 18-19 of *Sea Turtle Patrol* presentation

6. **Bonus (if time and materials permits):** During night patrol or at the end of class, have each group select one of their already tagged turtles and scan each group's turtle's QR code to get the turtle's names. Project the turtle's history for the students to observe and discuss. Explain to students that some turtles travel very far distances to lay their nests, while many turtles will lay their nests on the same few beaches every time and will even find their way back to the beach where they hatched from 30 years ago! Turtles can lay 4-8 nests in one season (300-800 eggs a year, which is why some groups may have had the same turtle) and can nest every 2-3 years.

Assessment

Collect students' data sheets and assess participation and performance based on these data sheets and full-class graphing activity.

References

https://conserveturtles.org/information-about-sea-turtles-why-care/

http://www.seaturtle.org/nestdb/

https://www.fisheries.noaa.gov/feature-story/what-can-you-do-save-sea-turtles

Acknowledgments

Support for the lesson plan was provided by Virginia Scientists & Educators Alliance.

Sea Turtle NIGHT Patrol Data Sheet **Date:** _____

Data Recorder: _____ **Tag Reader:** _____

Measurer(s): _____

	Left Flipper Tag	Right Flipper Tag	PIT Tag +Name	Carapace length	Carapace width	Head width	Nest # OR False Crawl	Comments
Ex.	*ABC123*	*XYZ456*	*QR123 45678 Shelly*	*145mm*	*67mm*	*22mm*	*Nest #___ False Crawl*	*Shark bite on left front flipper, barnacles on*
1							*Nest #___ False Crawl*	
2							*Nest #___ False Crawl*	
3							*Nest #___ False Crawl*	

Sea Turtle DAWN Patrol Data Sheet
Patrol Member Names: _____
Date: _____

Circle month nests were laid: May June July Aug

Nest #	How many male eggs?	How many female eggs?	How many total eggs?
1	__ x 10 =___	__ x 10 =___	__ x 10 =___
2	__ x 10 =___	__ x 10 =___	__ x 10 =___
3	__ x 10 =___	__ x 10 =___	__ x 10 =___
Total			

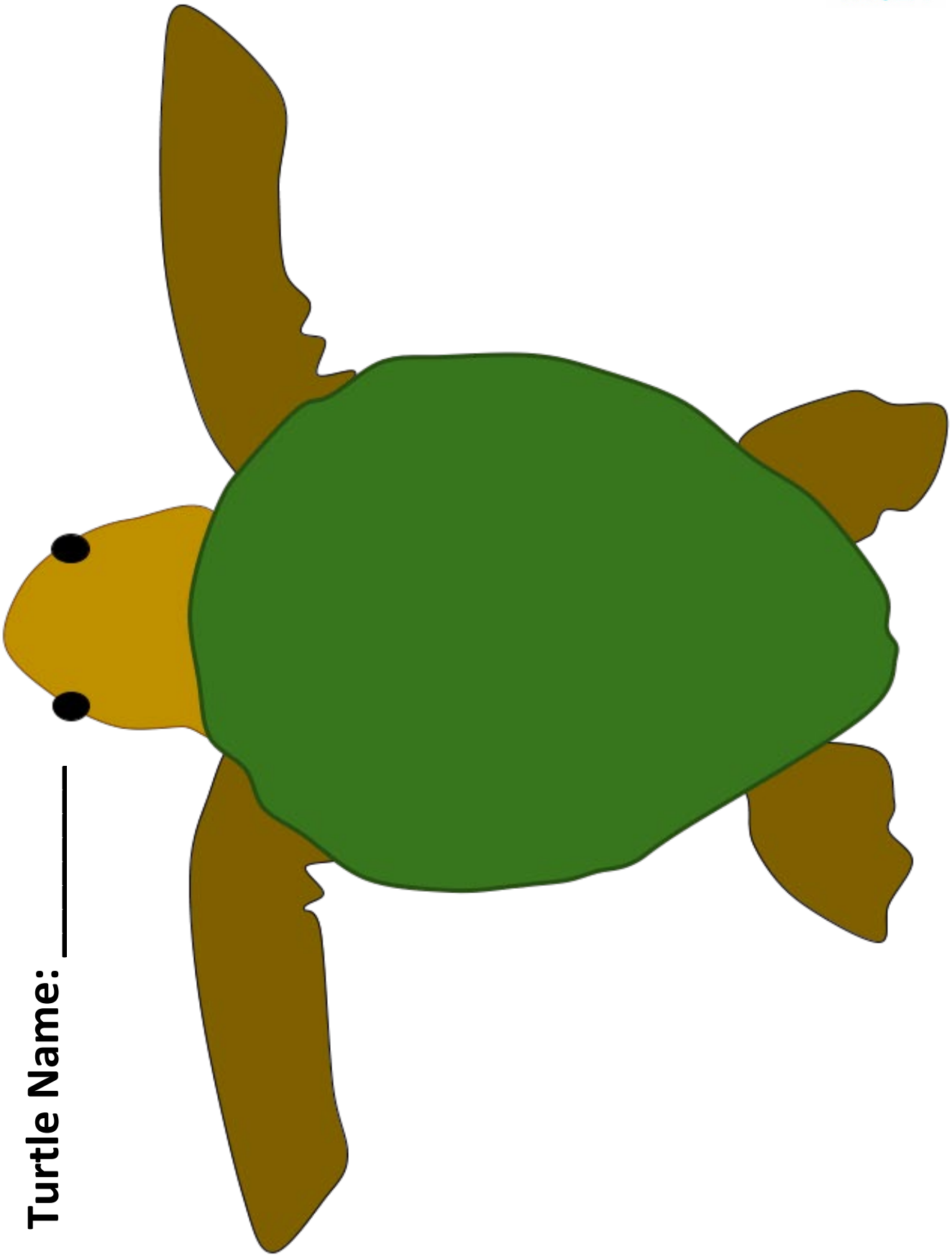
Sea Turtle DAWN Patrol Data Sheet
Patrol Member Names: _____
Date: _____

Circle month nests were laid: May June July Aug

Nest #	How many male eggs?	How many female eggs?	How many total eggs?
1	__ x 10 =___	__ x 10 =___	__ x 10 =___
2	__ x 10 =___	__ x 10 =___	__ x 10 =___
3	__ x 10 =___	__ x 10 =___	__ x 10 =___
Total			

EXAMPLE
"Shelly"
PIT tag # if your classroom cannot scan QR codes
Right flipper tag
Scan QR code for PIT tag #, turtle name, and nesting history
barnacle
Head width
Left flipper tag
Shark bite
Carapace width
Carapace length
XYZ456
QR12345678
ABC123

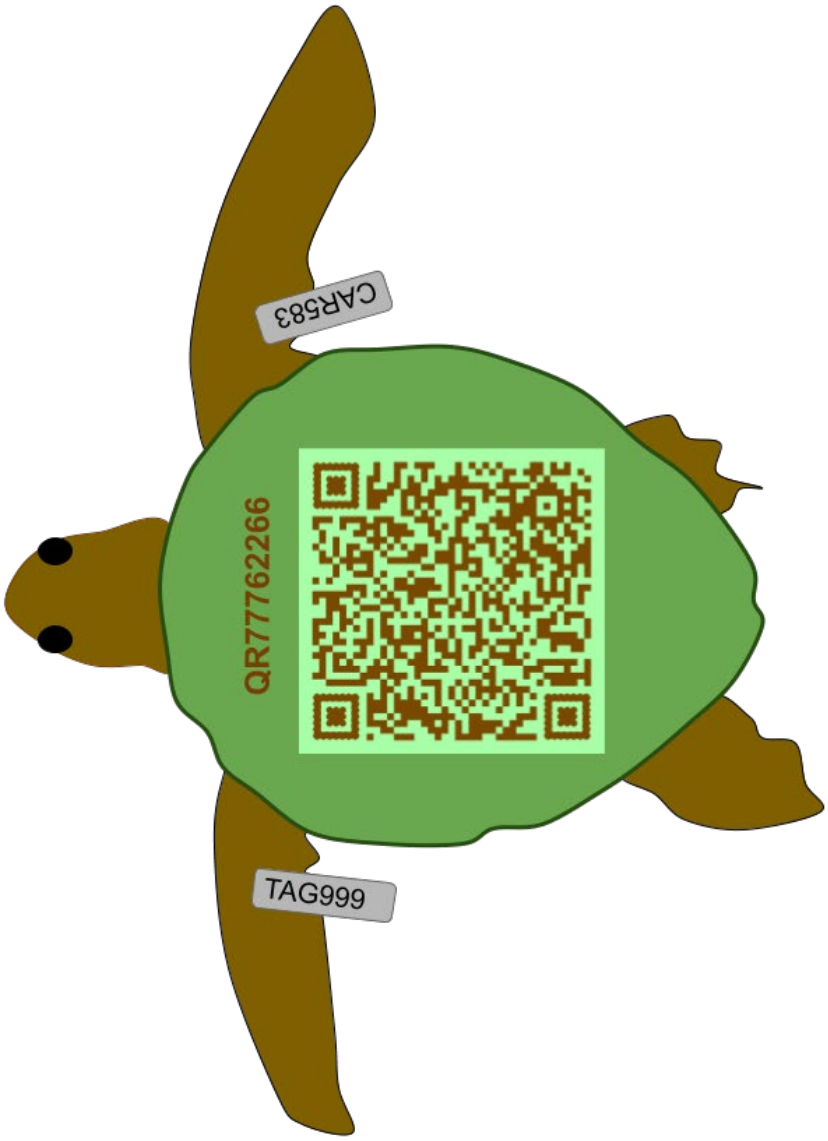
Turtle Name: _____



Turtle Name: Tootsie

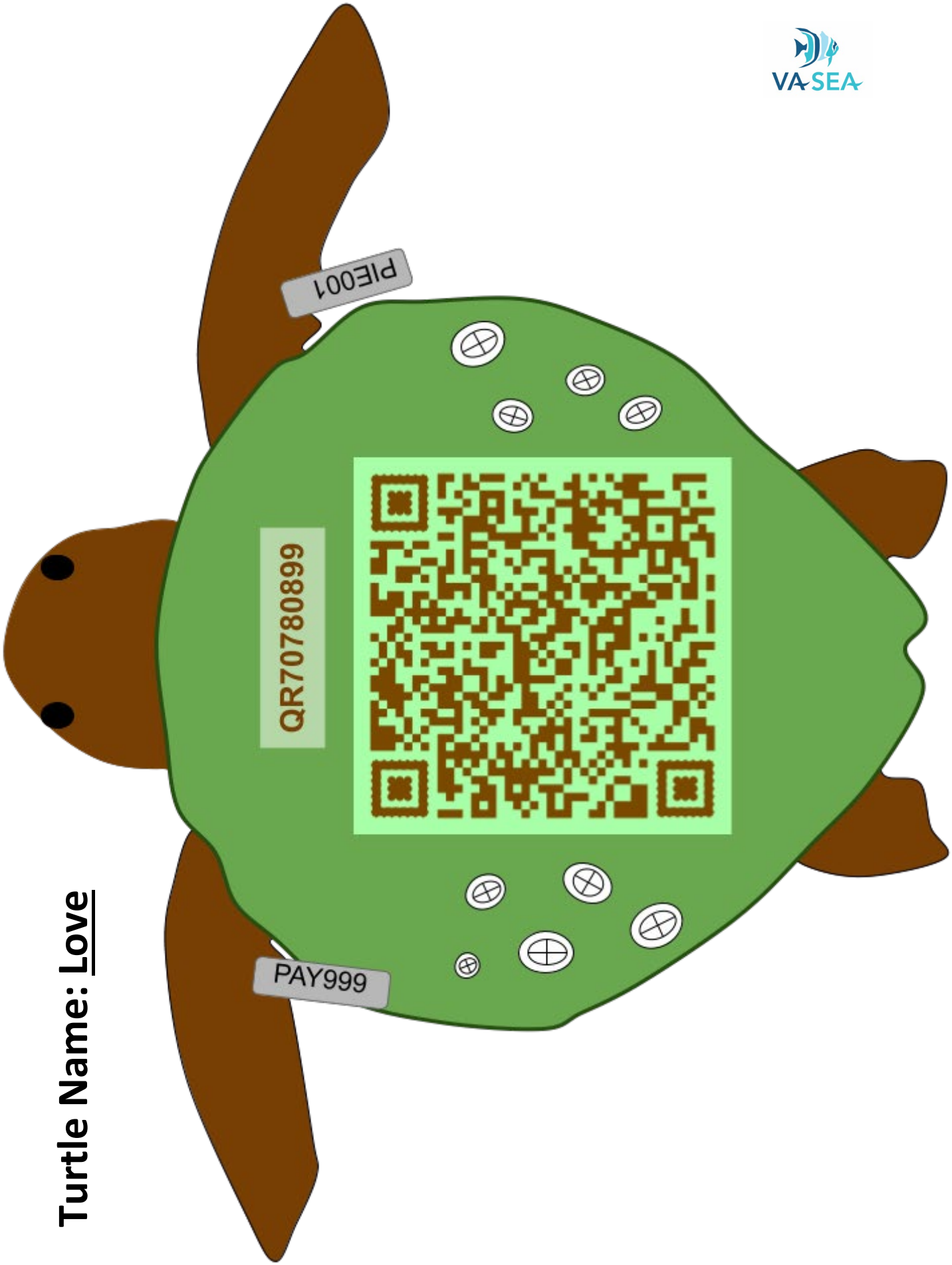
Turtle Name: Betty

Turtle Name: Lucky



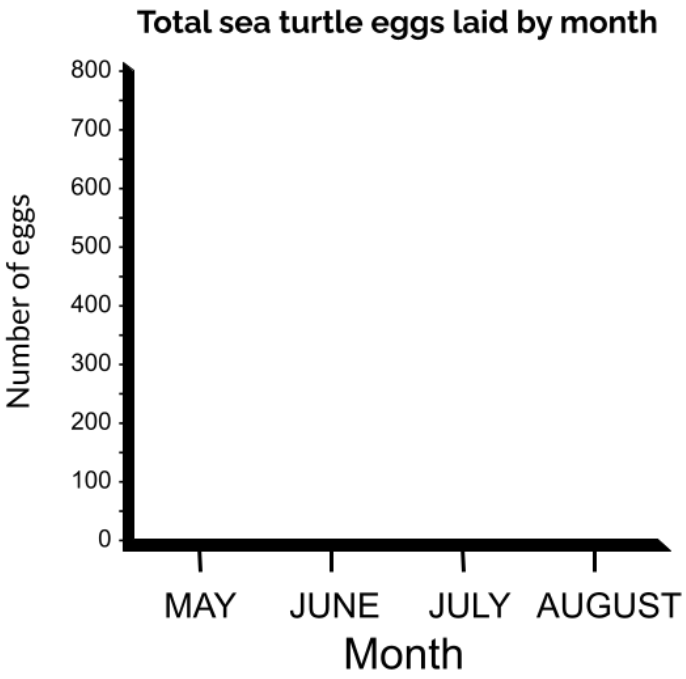
Turtle Name: **Barnacle Girl**

Turtle Name: Peach
SAP870
QR44070331
RAT564

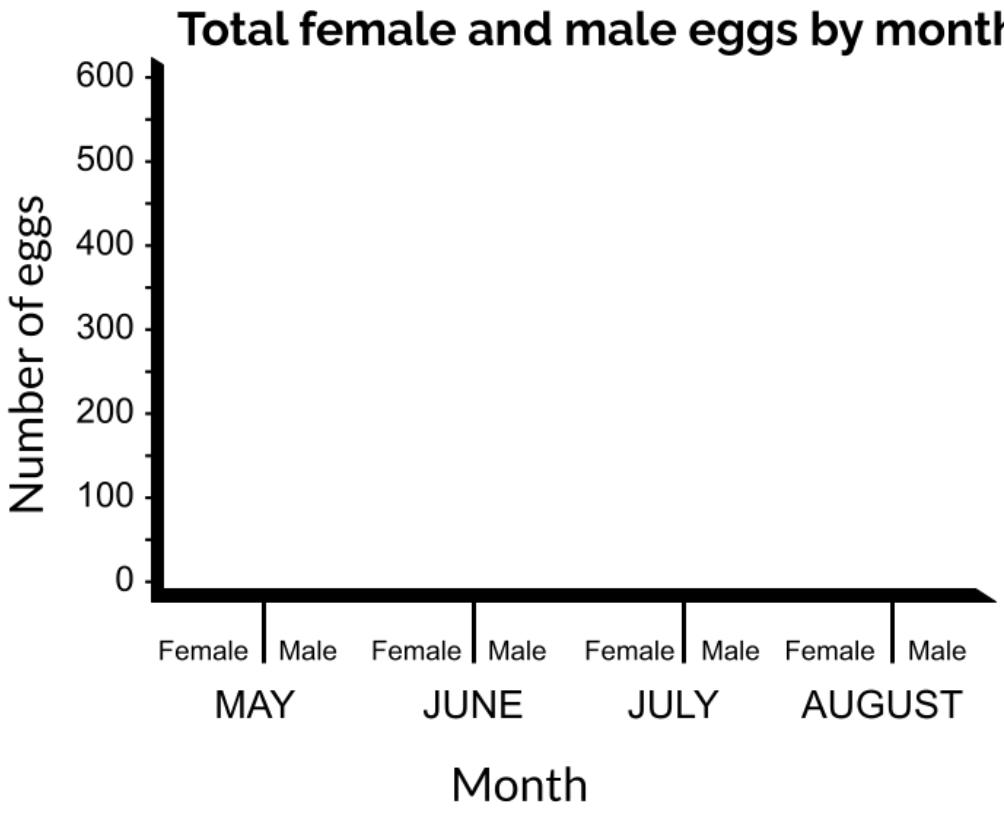


Turtle Name: Love

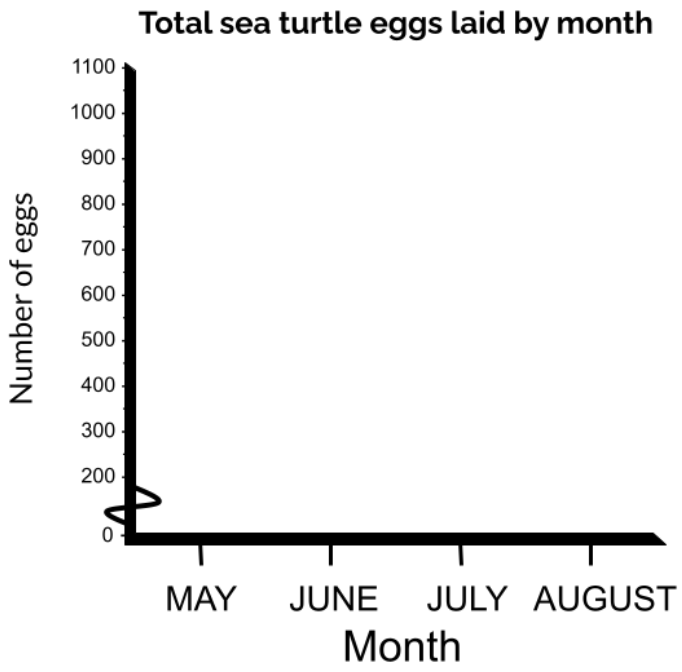
Line graph for 6 groups:



Bar graph for 6 groups:



Line graph for 9 groups:



Bar graph for 9 groups: