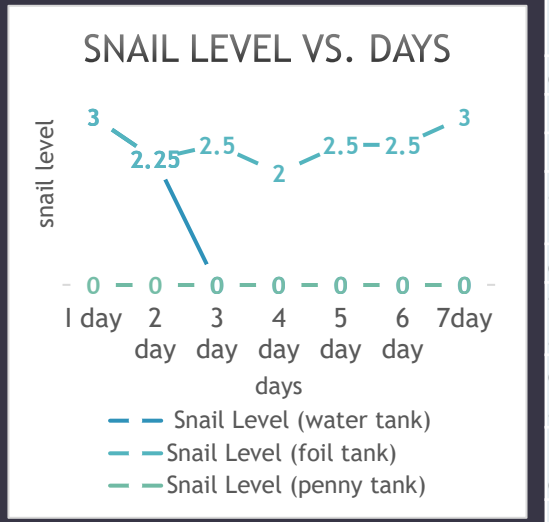
The Effects of Pollutants (zinc & lead) on Nerita Melanotragus and Water Quality

Research Question

the purpose of this project was to determine if metal from coins and foil influences water quality to the point where it affects snail behavior.
If snails are exposed to contaminated water, will they exhibit tell-tale behavior of death in comparison to snails in uncontaminated water?

Data Analysis & Results



	Water Tank	Foil Tank	Penny Tank
copper	0	0.5	10+
hardness	50	50	120
pH	8.2	6.8	9
ammonium chloride	250	250	250
carbonate	120	40	240
total alkalinity	180	40	240
cyanuric acid	10	10	10
residual chlorine	0.5	0	0
lead	0	0	200

Methodology

Data was collected each day for the snails and each week for the water. The water went through various tests of parameters shown in tables concerning water quality. Snails went under daily observation with notes being recorded to then be added to tables concerning snail behavior. Snail behavior like eating habits, movement, and whether or not they were active was focused on in their analysis.

Interpretation & Conclusions

The results of this experiment create a contradiction to the answer to the question that it was based on. Yes, some evidence found in the penny tank proves that the snails could be used to indicate copper pollution (among other contaminants) however lack of these signs found in the foil tank, where the snails remain alive as well as in the water tank, but the snails die suggest that perhaps these snails react to only certain pollutants and therefore can't be a reliable indicator species in some environments.

Introduction

Nerita Melanotragus snails

- Aka black nerite snails
- fresh water, bottom feeders

In this experiment these snails were used to study behavior in a contaminated environment (either from pennies or tin foil)

- Draw a conclusion on whether or not this species of snail could be used as indicator species in how they react to contamination in comparison to snails in uncontaminated water.

Water tests were taken at the end of every week and daily observations were made

- This data was then put into tables and graphs supporting this experiment

Background Research

Researchers have found that there are some behavioral changes to snails in contaminated water have occurred in the past

- moving to the surface of the water
- less eating
- less movement

This research suggests that these creatures can be considered indicator species

- Indicator species: organisms that give you hints about what type of environment they are living in

Question/Problem and Predictions

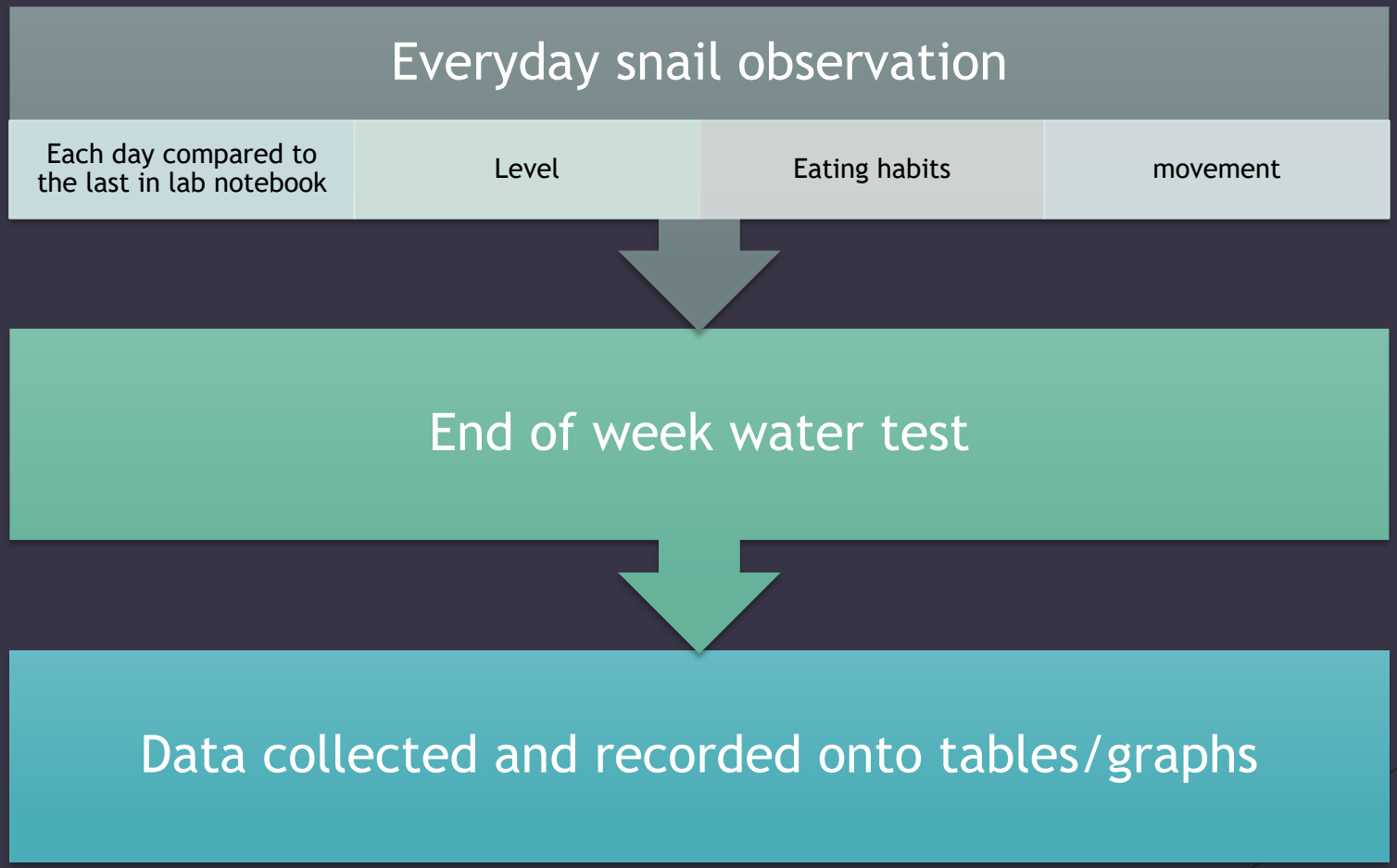
This experiment was conducted with a purpose to find an answer to whether black nerite snails can be used as indicator species by judging their behavior in contaminated water in comparison to the behavior of those living in uncontaminated water.

I predicted that yes, the snails' behavior will be a tell-tale sign of discomfort or health between the tanks, over the course of three weeks.

Investigative Methods or Procedure: Week 1

1. conduct research on the perfect, and most available freshwater snail to use in this experiment
   - Black nerite snails were chosen
2. Tanks were prepared
   - One foil, one penny, one water tank
   - Filled with spring water
3. Observation on snails everyday
   - Their eating habits
   - Level in tank (0-4)
   - Movement (frequency, to where, etc.)
4. data was collected and put into tables/graphs at the end of the week

Investigative Methods or Procedure: Week 2/3



Week #1

- Results explained in diagram 1: the graph displays the location of the snails in the tank relative to the day of the week; as the day increases the snails in the coin tank increase in level; as the day increases the snails in the foil tank are fluctuating; as the day increases the snails in the water tank fluctuate
- Results explained in diagram 2: measuring the snail behavior throughout the week, the table describes each tanks average snail eating habits, location in the tank, and how often it moves

	Water tank	Foil tank	Coin tank
Location	2-3 level	1-3.5 level	3-3.5
Eating Habits	don't eat much	don't eat much	don't eat much
Moving Habits	move slowly throughout the day movement getting less frequent	move slowly throughout the day movement getting less frequent	move slowly throughout the day movement getting less frequent

Diagram 1

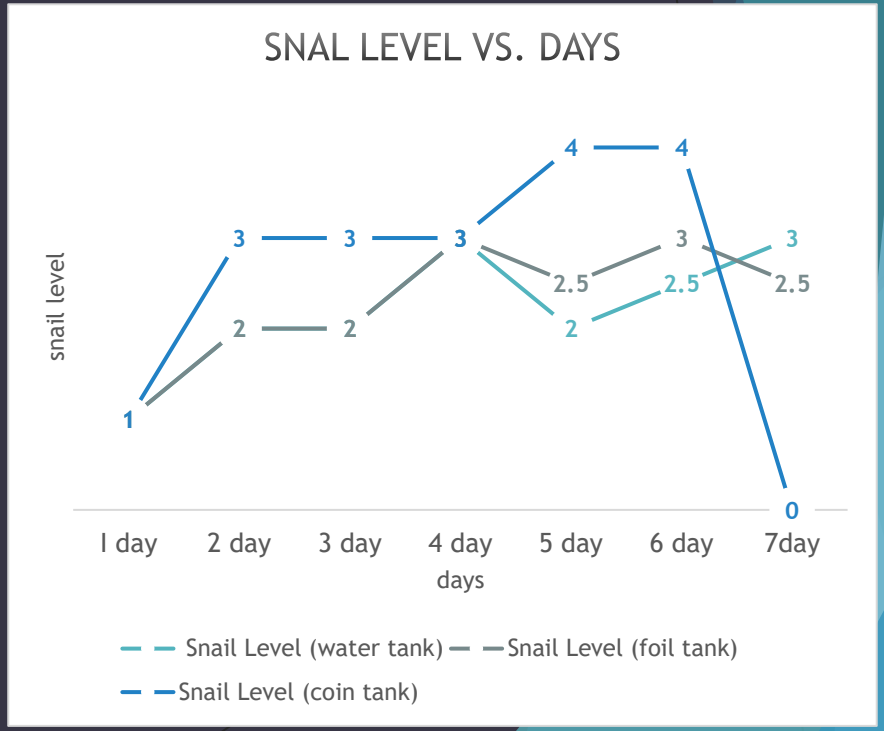


Diagram 2

<- Foil tank

<- Penny tank

<- Water tank

Diagram 1: the three tanks containing materials: (spring) water, 30 pennies, 3 ft^2 of aluminum foil

Diagram 2: the snails in the penny tank on day 6, day before death

Diagram 3: the two snails in the penny tank dead

Week #2

	Wter Tank	Foil Tank	Penny Tank
Location (level)	2-3 .	3	level 0 (dead)
eating habits	eats some of the palet	eats some of palet	no eating (dead)
moving habits	move daily	move daily	stay in one spot (dead)

Diagram1 (left)

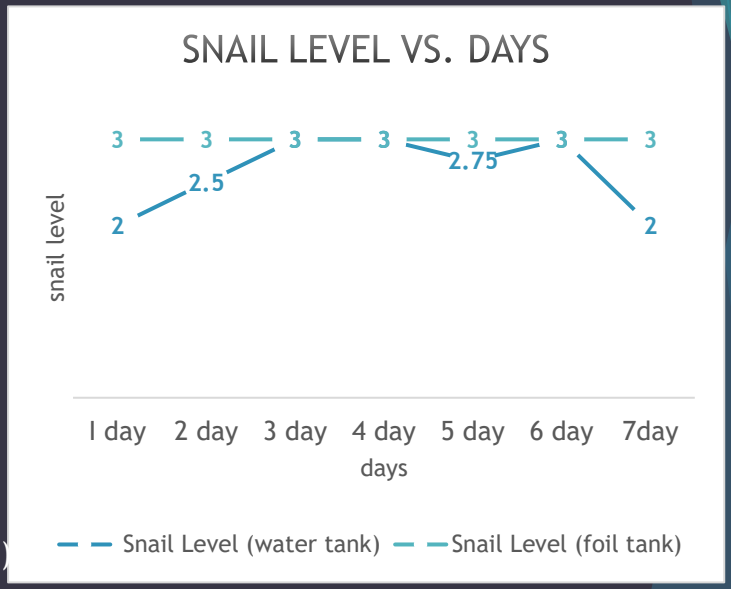


Diagram2 (right)

- The results represented in diagram one show that the snails apart of this experiment are appearing to slow in every aspect: eating and moving. The table also explains that no further data can be taken from the snails of the penny tank, for it was proven in the first week the pollution of the pennies were too much for the snails to have survived
- Diagram two is lacking the third line (penny snails) representing the snails lack of existence. From the data the fact that the foil snails stay on one level through the course of the week can be extracted. The data collected from the water snails proves that there is a lot of movement between levels but never below 2 or above 3. **note**: the levels of the snails are averaged among the two of them.
- In diagram 3: the results of the water test for week two shows little difference between the tanks, but there, nonetheless. The most surprising piece of data is the hardness for the penny sank. As well and the pH, carbonate, and total alkalinity, respectfully. The mentioned categories show the most divergence from both the water and foil tanks. This evidence could be helpful in the discovery of how much harm can be done to snails in pollution and/or still water.

	Water Tank	Foil Tank	Penny Tank
copper	0	0.5	3
hardness	50	50	250
pH	7.6	7.2	8.2
ammonium chloride	250	150	150
carbonate	80	120	240
total alkalinity	120	120	240
cyanuric acid	10	10	10
residual chlorine	0.5	0	0
lead	0	0	20

Diagram3 (left)

Water test (week 2) (right)

Water tank week 2 (above) in comparison to foil tank (right)

Foil tank week two (abovwe in comparison to water tank (left)

Week #3

	Wter Tank	Foil Tank	Penny Tank
Location	level 0 (dead)	2-3.	level 0 (dead)
eating habits	no eating (dead)	eats some of palet	no eating (dead)
moving habits	no movement (dead)	barely move from day to day	stay in one spot (dead)

Diagram 1

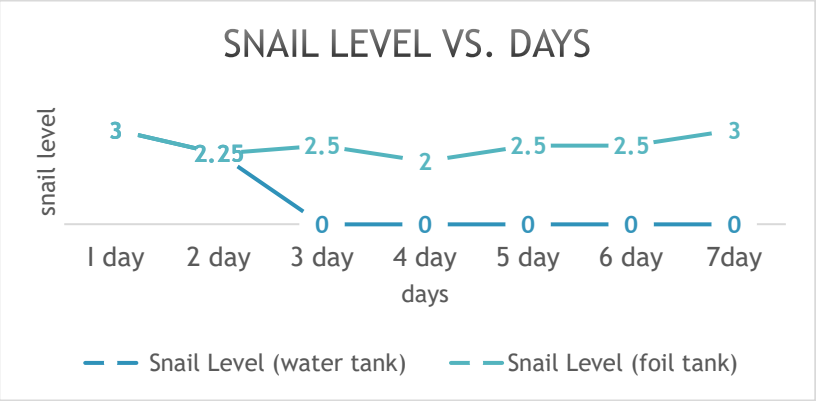


Diagram 2

	Water Tank	Foil Tank	Penny Tank
copper	0	0.5	10+
hardness	50	50	120
pH	8.2	6.8	9
ammonium chloride	250	250	250
carbonate	120	40	240
total alkalinity	180	40	240
cyanuric acid	10	10	10
residual chlorine	0.5	0	0
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Diagram 3

- In diagram 1 the overall behavior of the snails over the third week suggests slower movement and more death, specifically to the snails in the water tank. Over the course of three weeks, it's evident that there is much of the same behavior in the foil tank
- Diagram 2 shows the level in which the snails move to over the course of the week. The average of the remaining snails keeps an overall consistent level; however, there is more differentiation over the three weeks the sudden drop of the snails in the water tank signifies their death.
- According to diagram 3, the most change over the past 3 weeks seems to come from the copper tank and its data on the amount of copper and lead. This is a giant increase from last week.

A picture containing snails of the foil tank with a turquois substance beginning to form on its shell

A picture containing the foil tank and the visible state of its water. Snails can be spotted in the far-right corner. As the picture portrays, the water line has gone down. It is unknown why.

A picture containing the dead snails of the water tank

Final Conclusions

- By conducting research on how different creatures can be used as indicator species, a warning of pollution could be easily caught in an ecosystem.
  - How much pollution
  - How long the creatures have been affected
  - Getting a head start on clean up before further destruction is made
- If this experiment were to continue:
  - Further observation on snails in foil tank for at least another week
  - Another trial with new snails, new water, new polluters (same type just not used), etc.

- Snails in penny tank showed evidence to support the hypothesis: If snails are exposed to contaminated water, will they exhibit tell-tale behavior of death in comparison to snails in uncontaminated water?
  - Above surface level
  - Less eating
  - No movement
- Snails in water tank died but no show of the same behavior
  - Foil snails are still alive
  - Movement
  - Eating
  - No consistent level
- Black netrite snails show changes in behavior when in distress by pollution emitted by pennies
- Still water is not the best habitat for snails because of lack of filtration
  - The mix of food and waste in a settled environment with no movement

Data Analysis/Error Possibilities

Results could have come out different if I used a different brand of aluminum, or specifically aged pennies, or different mixture of water

The impact diet might have had on the snail's survival could have interfered with the times of death and/or behavior

Lighting of the setting the experiment took place could have had an affect on how the water test was read

Work Cited

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- All pictures taken of the experiment site was taken by me, Izabel Castillo