Effects of Spices on Sea Life in the Puget Sound.

My experiment and science fair experience.

By: Kavya Varkey
The Idea.

- Science Fair
- Cooking
- Health
- Environment
- Local
Spices in the Puget Sound?

Every holiday season spices such as cloves cinnamon and vanilla are deposited in the waters of the Puget Sound. These spices in the water are due to holiday baking. They make their way to the Sound when dishes are washed, cookies and cakes are thrown away and feces are flushed. The waste water treatment plant is currently unable to filter the minute particles of spice, so they eventually make their way to the waters.

Research has been done at the UW to prove that there are amounts of cinnamon floating in the water. They have even been able to find the amount deposited throughout Thanksgiving week. My experiment was to find out if this careless depositing of spice is affecting sea life.
My Question

How do holiday spices used in baking effect the waters of the Puget Sound and the fish and other organisms inhabiting it?
Hypothesis.

If the daphnia are placed in cinnamon and vanilla extracts, then their heart rates will go up according to the amount added, more extract means higher heart rate, because both spices are considered stimulants. Cinnamon will be stronger because it has much stronger effects on living organisms than vanilla, and vanilla extract does contain alcohol which might contribute to a lower heart rate because alcohol can be a depressant.
<table>
<thead>
<tr>
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<th>Materials</th>
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<tr>
<td>1</td>
<td>Daphnia Magna, 1 culture (30 daphnia)</td>
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<tr>
<td>2</td>
<td>Sterile petri plates, at least 30</td>
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<td>3</td>
<td>Cinnamon infusion, (cinnamon sticks, water)</td>
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<td>4</td>
<td>Diluted vanilla extract</td>
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<td>5</td>
<td>Water</td>
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<td>6</td>
<td>Beaker</td>
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<td>7</td>
<td>Pipette</td>
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<td>8</td>
<td>Gloves</td>
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<td>Goggles</td>
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<td>10</td>
<td>Dissecting microscope</td>
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<td>11</td>
<td>Plastic wrap for extracts</td>
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<td>12</td>
<td>Cups for excess water</td>
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<td>13</td>
<td>masking tape for labels</td>
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<td>14</td>
<td>Marker</td>
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<td>15</td>
<td>Pen</td>
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<td>16</td>
<td>Stopwatch</td>
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<td>17</td>
<td>Cups for extract</td>
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<td>18</td>
<td>Strainer</td>
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<td>19</td>
<td>Kettle</td>
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Procedure

1. Put on gloves, goggles, wash hands and take any other safety precautions
2. Make extracts with the spices
3. Make labels for all petri plates
4. Pour 10 ml of water into each dish
5. Using the pipette, place one daphnia in a plate and suck out all the water leaving just the daphnia wet so that it can't swim around
6. Place dish under dissecting microscope and zoom and focus until the daphnia's heart is visible
7. Once heart is located, set the stop watch for one minute
8. Start the watch and start counting the beats
9. When using an extract, use as many drops as labelled and then suck out the remaining water and extract solution
10. After the beats are counted, record
11. Repeat this process for all the petri plates
Data for Water Control.
Cinnamon
Vanilla
I concluded that certain aspects of my hypothesis were correct. After collecting my data, I concluded that the cinnamon was slightly more potent than vanilla. The fastest heart rate that I observed when using cinnamon was 197 beats per minute, and that was with three drops of extract. The fastest heart rate that I observed with vanilla was 194 beats per minute with 2 drops of extract. With cinnamon, there is a direct correlation between the amount of cinnamon and the heart rate. Whereas, with vanilla, I didn’t see a clear correlation between the amount of extract and the heart rate.

In the cinnamon graph I found that the line had some really drastic changes. It had the highest and the lowest point of any other graph. What was strange was that at two drops of extract, the heart rate seems to drop. However, at one and three drops, the heart rate goes up.

During my research, I learned that high intake of cinnamon can be harmful to pregnant or breast-feeding human mothers. I tried to see if this applied to pregnant daphnia as well. Interestingly, I found that the heart rate of pregnant daphnia was steady, and I concluded that they did not react to the increased doses of cinnamon as I had initially expected.

I was able to prove my hypothesis correct, in that the cinnamon was stronger and had a larger impact on the daphnia’s heart rate.
Future Studies

- To build off of this experiment, larger fish could be tested on for more than just heart rate but also changes in behavior and eating habits.

- Another project related to this one, would be finding out how the spices are accumulating and predict the amount of spices that might be found in the waters in later years.
Jaqui Neibauer
Jaqui Neibauer

- Went to college at the UW
- Now works at the school of Oceanography as a marine biologist with Richard Keil
- I met with her to discuss my experiment
- She showed me some of her data from her findings of spices in the Puget Sound
Her experiment vs. mine

Hers

- Her's was about the amount of spices in the Puget Sound
- She used tested water from the Puget Sound
- She used big fancy tools

Mine

- Mine was about the effects it had on the sealife
- I used water that I had infused with certain amounts of cinnamon or vanilla
- I used one dissecting microscope
The End