The Effects of Light Intensity On *Artemia* sp. Site Selection

ABSTRACT:

This paper reports the effects that different ranges of light intensities have on the *Artemia* sp. Through previous studies, it is known *Artemia* sp. are found living in waterbodies with very high salinities such as hot, temperate zones, along coastlines and inland. A choice experiment was conducted to determine whether or not substantial exposure to sunlight would incur this effect on *Artemia* sp. locations. This experiment was formed to test the null hypotheses: Light intensity does not have an effect of the *Artemia* sp. site selection, or to determine the alternate hypotheses: Light intensity has an affect on the *Artemia* sp. site selection. Two trials were performed with different variances of light. *Artemia* sp. were selected at random to be placed in water with an intensity pallet positioned on top. The first trial included twenty-five *Artemia* sp. replicates selecting between a variance of light from 3 regions of different brightness (52 lux, 1384 lux, and 3400 lux). A second trial was conducted to resonate if *Artemia* sp. are actually affected by light, as they were placed in 3 other ranges of light intensities (1270 lux, 2300 lux, and 4520 lux). Results have shown that light intensity does not have an affect on *Artemia* sp. site selection as all replicates had shown an interest in different exposures of light. As a result, no specific trend could be determined after comparing both trials. These findings fail to reject our hypothesis, suggesting that *Artemia* sp. site selection is not affected by different intensities of light.

DISCUSSION:

For this experiment the null hypothesis is that light intensity does not have an effect on *Artemia* sp. site selection; while the alternate hypothesis is that light intensity does have an effect on *Artemia* sp. site selection. It was predicted that *Artemia* sp. would only accommodate to settings in high, brighter light intensities, as they live in areas with direct and constant exposure to the sun. Such as subtropical temperate areas, where it is easy to access food that is grown in exposure to the sun (Emslie [ ]).Through statistical analysis, our results enable us to fail to reject our null hypothesis for both trials as no obvious trend was observed. This is due to the fact that *Artemia* sp. selected different light intensities.

The Chi-square tests were used in the statistical analysis of our data. For the first trial, we found no overall trend existing within our data as the choices calculated were essentially even. Majority of the *Artemia* sp. were found to swim in the lightest region in the first trial. However, there was only a difference of one *Artemia* sp. between the medium and darkest light choices, which in this case, is not very significant. The *Artemia* sp. were always found swimming close to the edges of the arena, and were at most times swimming with immense speed. Throughout the second trial, the light

intensities were changed (1270 lux, 2300 lux, and 4520 lux.) However, this second trial showed somewhat of a trend. Also, in this trial, most *Artemia* sp. chose the darkest region, and a minimal number of these *Artemia* sp. chose the lightest region. Again, there was no great discrepancy present among these closely related numbers and these numbers provided minimal significance to our observations. Therefore, both trials have enabled us to believe that our data is insignificant. On another note, *Artemia* sp. swam from region to region, moving in circular motions near the edges of the arena.

In search of accurate results, the temperature was kept constant throughout our experiment. To ensure this, we constantly monitored it with a thermometer keeping it at 24 degrees Celsius. It was later realized that in everyday life, the temperature of waterbodies changes arbitrarily throughout the day (Dhaheri 2013). Hence, the constant temperature in our experiment in comparison to day to day temperature may have affected our results. This is also true for salinity, as we kept a constant salinity of 30ppt in our experiment, whereas salinity varies throughout the day in actual life. However, the abiotic factor that ecologically and physiologically impacted our experiment most is the light intensity. This is due to the fact that the lamps used in our experiment are of a different light intensity compared the sunlight exposure that *Artemia* sp. are surrounded by in their everyday life. *Artemia* sp. are not surrounded by sunlight throughout every second of everyday, and often experience a change in light from day to night. Also many aquatic organisms require a cycle of day and night light for optimum health, which may be why the *Artemia* sp. did not react or respond to the different areas of light intensity right away. They are exposed to a mix of daytime and nighttime light exposures throughout each day, so this does not place the *Artemia* sp. in an unfamiliar setting as a result of the different exposures of light (Tepoot 1998).

Many sources of biological variations may have also impacted the results, such as sex, colour, length, age, and health. During the span of two minutes, each *Artemia* sp. had to select a site with a source

of light. It was not considered that the movement and speed of *Artemia* sp. could vary depending on more physically healthy, younger and fit *Artemia* sp. (Warren 1930). This could have affected our results as the *Artemia* sp. moved at different speeds in the petri dish under the different light intensities. Our results, however, were not essentially consistent. The *Artemia* with a higher speed swam from region to region, whereas the slower *Artemia* remained closely under one region of the intensity pallet.

Artemia sp. generally have big complex-shaped eyes made of ommatidia (cones), which contain glycogen and cuticle. As per research conducted, it was assumed that these eyes were used to detect light in order site sources of food. This was not confirmed from our experiment as high light intensity was not favoured where these sources of food are located. Through further research after the experiment it was found that they can detect extremely low light intensities of their inhabitant, as the cones shrink and the glycogen lens increases in length. Nilsson (1981) supports this as he argues that the *Artemia* sp. complex eyes are adjusted for prime performance in the dark. Also, it was once believed that *Artemia* sp. swam upside down through the usage of their appendages responding to light (Emslie[ ]). However, this assumption is not true. Through further research it is found that this aids in locomotory motion and food particles are collected through this method (Sorgeloos 1999). This can be confirmed due to the fact that sources of food for *Artemia* sp. are found at the top of lakes, connected to rocks.

A similar study conducted by Bradley (1984) found that *Artemia* sp. tend to move closer to areas of dark light intensity. This complies with the slight trend in our second trial, as most *Artemia* chose the darker region of the petri dish. However, this result contradicts the original prediction of *Artemia* sp., experiencing positive photoaxis made by (Aiken 1995). Nilson (1981) supports this, as studies have shown *Artemia* sp. move away from light (negative photoaxis). As per observations

conducted by Nilson, it is questionable that when *Artemia* sp. are in surroundings with a reduced amount of light, there is increase in diameter of the distal part of the rhabdom.

Another study performed on another crustacean, similar in species (the spiny lobster), helps conclude that, as Rochow (1994) found, the light intensities experienced by tiny crustaceans cannot be explained by just a single phenomenon. Each individual organism differs which leads to a different amount of light exposure being accepted amongst all different types of crustaceans, including Artemia.

CONCLUSION:

The results enable us to fail the rejection of the null hypothesis H_0, stating that light intensity does not have an effect on the *Artemia* sp. site selection. *Artemia* sp. are surrounded by both, dark and light intensities everyday as they experience the occurrence of day and night. Therefore, our experiment did not force *Artemia* sp. to experience anything out of the ordinary due to the fact that their bodies are accustomed to deal with the different exposures of light.

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