

Investigate the Factors Effecting the Distribution of Living Organisms in Freshwater Ponds

Hypothesis

My aim is to investigate the factors effecting the distribution of living organisms in freshwater ponds. I think the abiotic factors, which will effect this, will be:

- Temperature
- pH levels (% of hydrogen ions)
- Light intensity
- Conductivity
- Chemicals from acid rain
- Fertiliser (pollutants)
- Oxygen levels
- Carbon dioxide levels
- Space and shelter

I think the biotic factors, which will effect the distribution of living organisms, will be:

- Influence of people
- Predators
- Prey
- 'Food' availability
- Plants - producers
- Competitions between organism for example food, space and 'mates'. Either intra specific competition or inter specific competition. Intra-specific competition occurs when two or more individuals of the same species strive to obtain the same resources, which are of limited supply. Inter-specific competition is the same as intra-specific but the conflicts are of different species.

Although all the abiotic and biotic factors would effect the distribution of living organisms, I think the 3 main factors, which will effect the distribution the most are:

1. Conductivity
2. Oxygen levels
3. Light intensity

This is because the brackish water in the freshwater pond probably contains the most common sea salt, sodium chloride, which is also known as common table salt. To measure the salinity of the water we can conduct electricity through the water and measure its conductivity. Sea salts are called electrolytes because, when dissolved, their charged ions enhance the ability of water to conduct electricity. So if there were a high level of ions in the water then the conductivity reading would also be high because of the extra ions conducting the extra electricity. Now by using a submerged electrode to measure conductivity we can produce quick and accurate results. Conductivity is measured in parts per 1000. The dissolved ions are need for the plants health, if it does not get the sufficient amounts of minerals and nutrients this will cause deficiency symptoms. If the mineral content were low then the plant would become unhealthy because it is not functioning correctly and therefore could not produce glucose and oxygen.

The oxygen levels are the percentage of oxygen dissolved in the water. When taking a reading, the results can either tell us:

- i) Living organisms are using the oxygen to respire, the equation for aerobic respiration is:



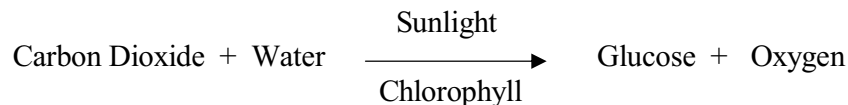
So respiration is the process of converting glucose, produced by the green plants, into energy, which occurs in every cell. As one can see in the equation carbon dioxide will be released and this will be used by the plant to produce glucose and oxygen. So there is a continuous cycle of carbon dioxide and oxygen being used. The energy produced is used for growing and repairing cells and without this energy the living organism could not survive. If there is a low level of oxygen in the water then respiration will still take place but not aerobic but anaerobic respiration. This means that there is no oxygen available and it is not the best way to convert glucose into energy as it does not produce nearly as much energy, the equation for it is:



If oxygen in the water stays at a low level then soon the living organisms will die.

- ii) Decaying matter is using the oxygen and releasing carbon dioxide in the process
- iii) Bacteria which decomposes the organic matter, for example dead leaves and faeces, also uses the oxygen and produces carbon dioxide in the process.
- iv) There is a low rate of photosynthesis, if this happens then the living organisms would be in a serious situation. This is because if the oxygen levels are low and there are a lot of living organisms in the water then anaerobic respiration might take place, which will kill them.

In a freshwater pond there will be green plants and animals. The green plants will be the producers and they will provide glucose and oxygen for the animals, which are habituating there. It will produce this by a process called photosynthesis, the equation for it is:



So for this equation the main elements needed for photosynthesis are carbon dioxide, water, sunlight and chlorophyll. If one of these elements were not present then the process can not take place. Carbon dioxide will be present at the pond because there is 0.03% of the compound in the air and it is soluble in water so there will be a sufficient amount of carbon dioxide in the water. Water will definitely be present because it is a freshwater pond. Chlorophyll will be present in the plant itself, it is found in the chloroplasts and the green substance gives the plant its colour. It will absorb the energy in the sunlight and use it to combine carbon dioxide and water to produce glucose and oxygen, which is only a by-product. However at the pond sunlight may not be present at all areas of it because of shade. Therefore I think that in these shaded parts there will be no photosynthesis taking place. If this happens then no glucose will be produced by the plant and the by-product, oxygen will not be present in the water. If this occurs in the shaded areas then a living organism can not survive so therefore they will go to the more sunny areas in the pond. However if the pond is surrounded by tall trees then the majority of the pond would be shaded therefore if the plants can not get enough sunlight then the rate of photosynthesis would be slow. This would then jeopardise the quality of living for the living organism. Temperature is connected with light

intensity because thermal energy and light both come from the sun. The rate of photosynthesis can be affected by temperature. At about the temperature of 45 degrees Celsius the heat destroys the chlorophyll enzymes. However I don't think that this will be a major factor in this investigation as the mean temperature is 10.6 degrees Celsius in the Isle of Wight.

Conductivity means how many ions are dissolved in the water the main salt in the sea is sodium chloride, which constitutes about 85% of the sea salts. Some others are magnesium, calcium and potassium. These minerals are essential for healthy growth in the plant. If the plant is not healthy then it can not photosynthesise

Salinity varies from nearly zero in continental waters to about 41 parts per 1000 in the Red Sea, a region of high evaporation, and more than 150 parts per 1000 in the Great Salt Lake. In the main ocean, salinity averages about 35 parts per 1000,¹
