Higher Environmental Science Assignment

Aim

To see how pH affects species.

Underlying environmental science:

I'm finding out if pH affects species present in my school pond and a local river by measuring the pH of both and then identifying organisms present in the water. This is important because if species are not in the right pH they could die which could impact on the biodiversity of the pond and could cause problems for other organisms in that area.

Rainfall is acid around pH 5.6.

PH can vary in different types of water due to things like the geology in the area, the plants present, how the land is used, and acid rain. The water pH can change over the day due to respiration taking place at night and producing more carbon dioxide so more acid water, but getting less acid when photosynthesis uses up the carbon dioxide dissolved in the water. (FSC)

Most organisms have a well-defined range of pH tolerance. If the pH falls below the tolerance range, death will occur due to respiratory or osmoregulatory failure. Low pH causes a disturbance of the balance of sodium and chloride ions in the blood of most aquatic animals. At low pH, hydrogen ions may be taken into cells and sodium ions expelled. (LEO)

Species richness is the number of different species represented in an ecological community, landscape or region. It is simply a count of species, and it does not take into account the abundances of the species or their distribution. (Wikipedia)

Method

To collect my data I used kick sampling in a local river and sweep net sampling in the school pond to find out what species were present. I measured the pH of the water using pH paper, comparing the colour against the colour scale.

Data:

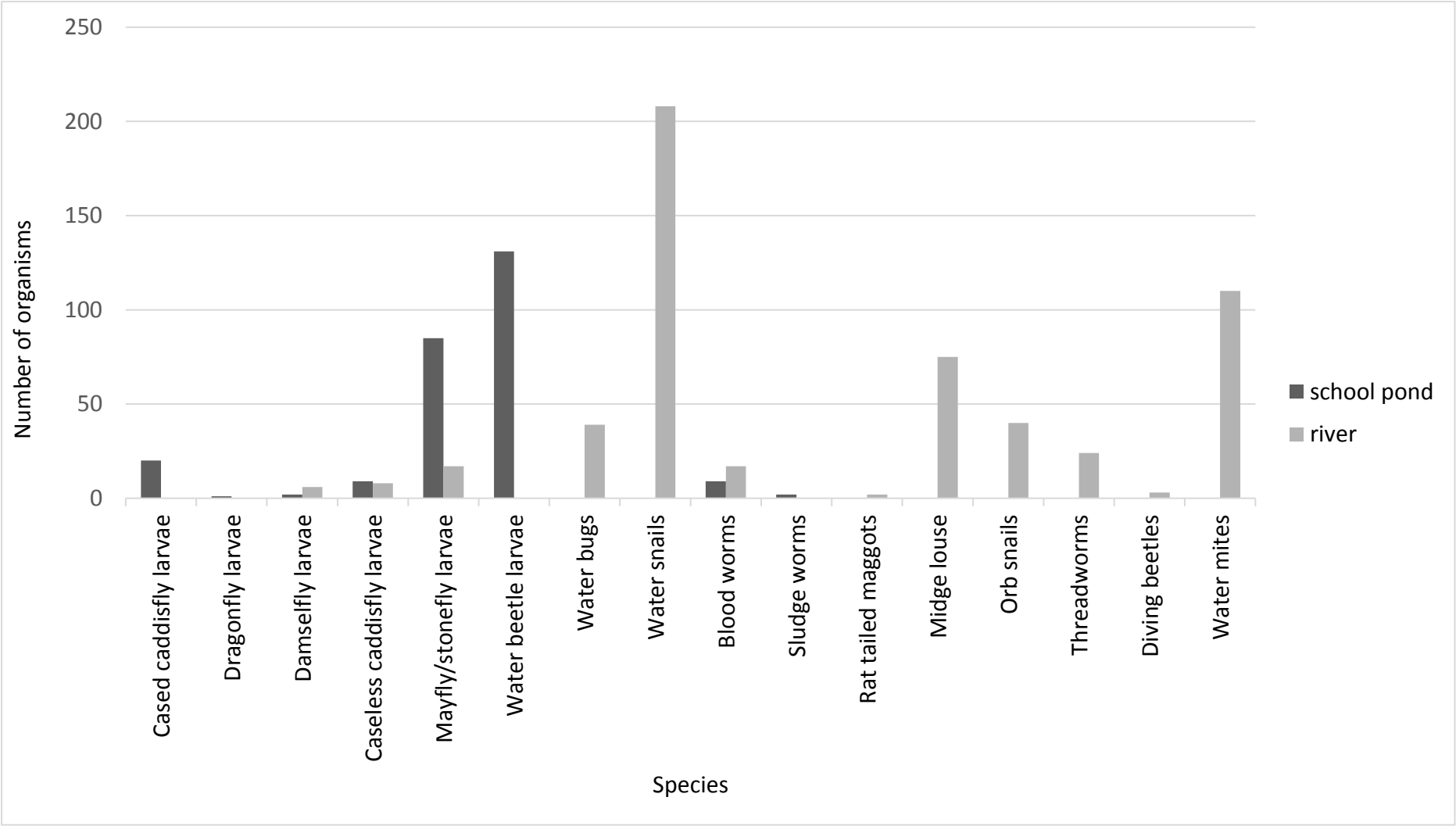
Data 1: sweep net sampling results from the school pond

Species	**Sample 1**	**Sample 2**	**Sample 3**	**Sample 4**	**Total number of each species**	**Mean**
Cased caddisfly larvae		2	9	9	20	5
Dragonfly larvae		1			1	0.25
Damselfly larvae			1	1	2	0.5
Caseless caddisfly larvae			9		9	2.25
Mayfly stonefly larvae	30	15	20	30	85	21.25
Water beetle larvae	129		1	1	131	32.75
Blood worm	3	2	4		9	2.25
Sludge worm	1			1	2	0.5
Total in sample	**163**	**20**	**44**	**42**	**269**	
pH	6.0	6.0	5.0	6.0		5.75

Data 2: kick sampling results from the river

Species	**Sample 1**	**Sample 2**	**Sample 3**	**Sample 4**	**Total number of each species**	**Mean**
Damselfly larvae	2	3	1		6	1.5
Caseless caddisfly larvae		5	2	1	8	2
Mayfly stonefly larvae	5	4	5	3	17	4.25
Water bugs	8	20	3	8	39	9.75
Water snails	55	92	30	31	208	52
Blood worm	3	3	3	8	17	4.25
Rat tailed maggot			2		2	0.5
Midge louse	20	26		29	75	18.75
Orb snails	16	7	10	7	40	10
Threadworms	20		4		24	6
Diving beetle			3		3	0.75
Water mite	30	10	35	35	110	27.5
Total in sample	**159**	**170**	**98**	**122**	**449**	
pH	6.0	6.0	5.0	5.0		5.5

I have used a bar graph to display the water sampling results.



Analysis

Water health score

The health of the water can be checked by giving a score if an organism is present [Opal]. A species that prefers a high oxygen content is given a high score of 10, and one that prefers a low water oxygen content is given a low score of 1, and one that can survive in either is given a score of 5.

Organism	Quality index	Pond present?	Pond score	River present?	River score
Cased caddisfly larvae	Score 10	Y	10		
Dragonfly larvae	Score 10	Y	10		
Alderfly larvae	Score 10				
Damselfly larvae	Score 10	Y	10	Y	10
Caseless caddisfly larvae	Score 10	Y	10	Y	10
Mayfly/stonefly larvae	Score 5	Y	5	Y	5
Water beetles and/or larvae	Score 5	Y	5		
Water bugs	Score 5			Y	5
Pond skaters	Score 5				
Water shrimps	Score 5				
Water snails	Score 1			Y	1
Water slaters	Score 1				
Worm-like animals	Score 1	Y	1	Y	1
Total score			51		32

A health score of 31 or more means that the pond is very healthy.
A score of 6-30 means it is quite healthy.
A score of 0-5 means the pond could be improved.

Both of the scores are above 31, meaning they are both classed as very healthy. The school pond has a higher health score than the river, with more of the 10 mark organisms, meaning it is healthier than the river.

Conclusion

Both the pond and river are classed as being very healthy. More organisms were collected from the river than from the pond but the pond had more of the higher scoring organisms than the river.

The data I gathered shows that there was not enough evidence to tell us that pH effects species richness in the pond and river as the pH was the same in both. This means there could be another abiotic factor such as light intensity or temperature that could also affect species richness in the pond and river.

Evaluation

Sweep nets were to collect organisms from the edge of the school pond and kick sampling was used standing in the river. This means that different species could have been picked up by each one. To compare them properly we should have used the same sampling technique for both.

There is a big difference for water beetle larvae in the pond sampling, with sample 1 collecting 129 and 0 or 1 in the other samples. This affects the total number of organisms found in the pond and also the mean.

The pH paper I used measures to 1 pH unit so I couldn't tell if there were any real differences in pH only that all fall between pH 5-6.

References

[1] FSC – pH in ponds and lakes FSC pH in ponds and lakes
http://www.lifeinfreshwater.org.uk/Web%20pages/ponds/Abiota%20Ponds/pH.htm

[2] LEO EnviroSci Inquiry – organisms and pH tolerance
http://www.ei.lehigh.edu/envirosci/enviroissue/amd/links/wildlife3.html

[3] Wikipedia – species richness
https://en.wikipedia.org/wiki/Species_richness

[4] OPAL water survey booklet
https://www.opalexplorenature.org/sites/default/files/7/image/WATER%2016pp%20booklet.pdf