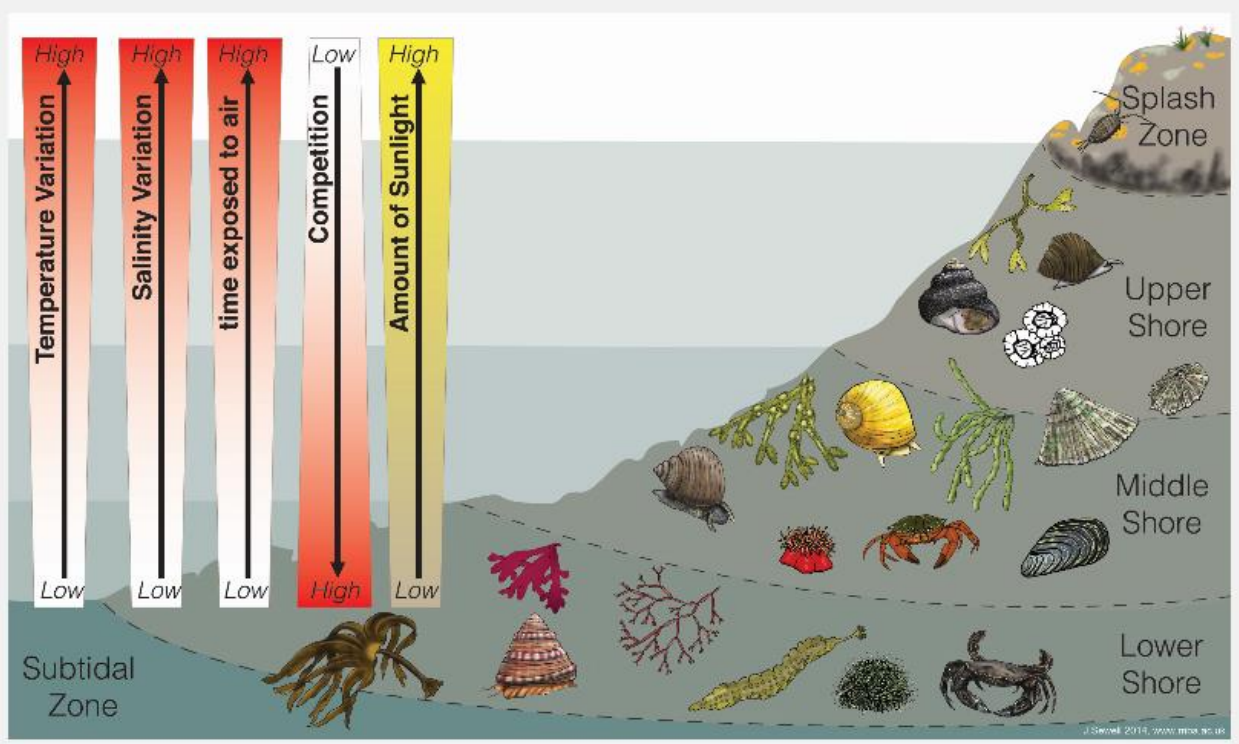
Distribution of species on a rocky shore

Fieldwork was carried out to assess the distribution of different species on a rocky shore.

Underlying environmental science

A shore has lots of different habitats for plants and animals. Two of the most important factors are the type of seabed and the depth of water. Some species are adapted to live on sandy beaches and others to live on rocky shores or in rock pools. Some are found mostly underwater and can only be exposed to air for short periods. Others are able to survive for long periods out of water. Some species need to be covered with water all the time and will be found in rock pools when the tide goes out. Wherever they are found on a rocky shore, the plants and animals are adapted to survive in a wide range of different environmental conditions.

This diagram below shows that a shore can be split into 4 different zones.



Source: Marine Biological Society http://www.mba.ac.uk/fact-sheet-rocky-shore

Each zone on the shore will have a different mix of factors that affect which species can survive there. This is called zonation. When the tide starts to go out many animals can move with the tide but plants are fixed to the rocks and so are stuck in one place. This includes seaweed, which is not a plant or animal. It is algae but looks like a plant and photosynthesises. This means that the plants and animals must be adapted to be able to survive being underwater but also being exposed to air.

Factors that will affect where a species lives on a rocky shore are wind, waves, water temperature and salinity. If it is windy the plants and animals out of water can dry out quickly, but the wind can also cause bigger waves which cause damage to the plants, animals and rocks. Rock pools will also

be affected by wind and by the sun, which will warm up the water and cause evaporation. This will cause the water in the rock pool to become saltier.

The distribution of plants and animals living on a rocky shore can be investigated using a transect and quadrats.

Method

Four of us worked in a group and were each assigned a sampling point on a transect. We used a quadrat to count plant and animal species at four different points on a rocky shore. The quadrat was split into 100 squares using elastic bands, and we counted how many squares a species appeared in in the quadrat. This was done three times at each sampling point.

Raw data

The data from our fieldwork is shown in the tables on the following page. The average for each species was calculated, and rounded to make it easier to plot on a graph.

Key to sampling points:
1 = high zone (furthest away from the water)
2 = upper middle zone
3 = lower middle zone
4 = low zone (nearest the water)

Graph

The average frequency for each species found at each sampling point on the transect was plotted on a bar graph.

Sampling point 1 (pupil A)

Species	Species frequency (%)				
	Q1	Q2	Q3	Average	Average rounded
Barnacles	93	87	95	91.67	92
Limpets	2	1	1	1.33	1
Dog whelks	2	1	2	1.67	2
Wrack	0	0	0	0	0
Pepper dulse	0	0	0	0	0
Gutweed	0	0	0	0	0

Sampling point 2 (pupil B)

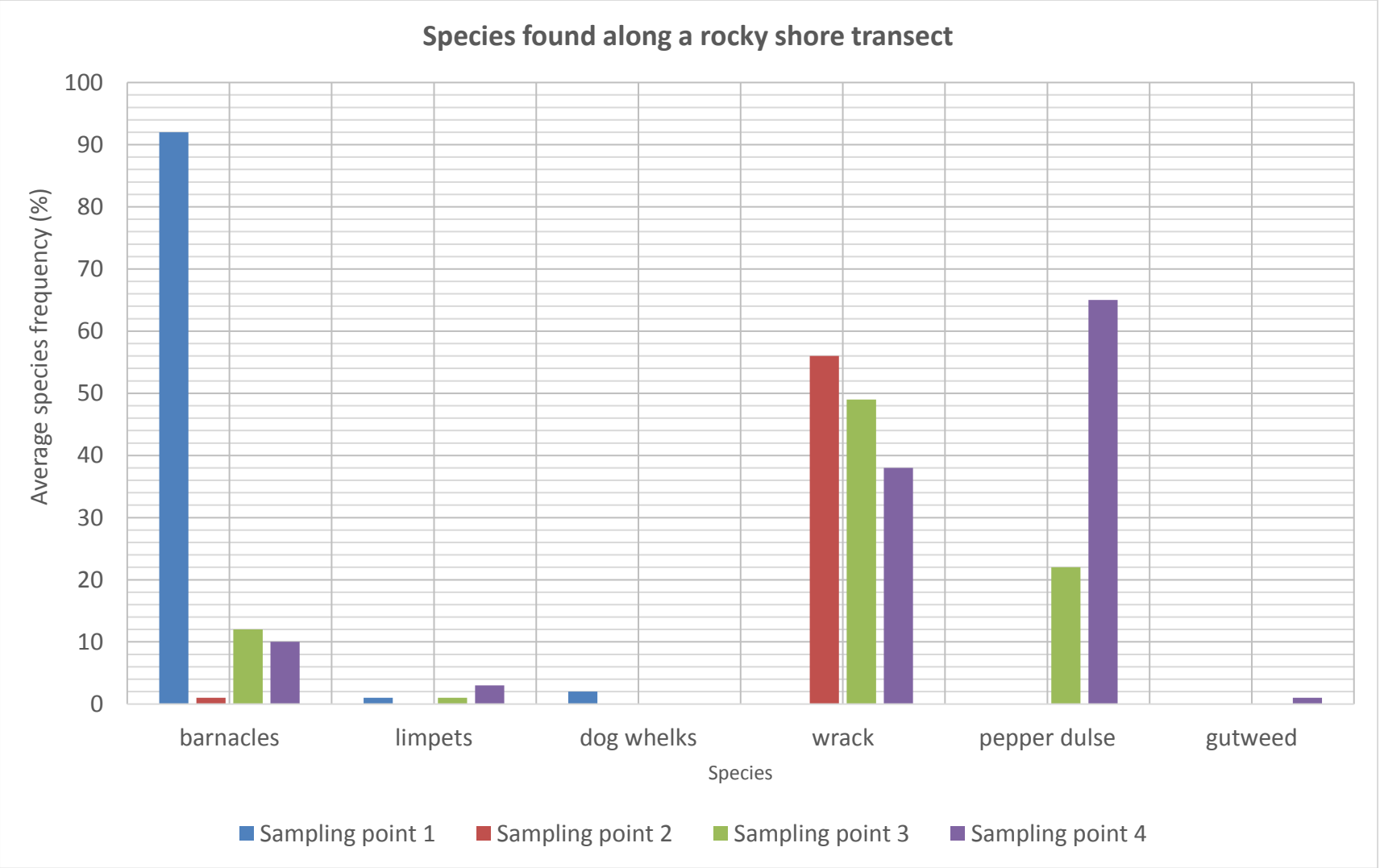
Species	Species frequency (%)				
	Q1	Q2	Q3	Average	Average rounded
Barnacles	1	1	0	0.67	1
Limpets	1	0	0	0.33	0
Dog whelks	0	0	0	0	0
Wrack	59	48	62	56.33	56
Pepper dulse	0	0	0	0	0
Gutweed	0	0	0	0	0

Sampling point (pupil C)

Species	Species frequency (%)				
	Q1	Q2	Q3	Average	Average rounded
Barnacles	12	9	15	12.00	12
Limpets	1	3	0	1.33	1
Dog whelks	0	0	0	0	0
Wrack	36	60	51	49.00	49
Pepper dulse	15	22	29	22.00	22
Gutweed	0	0	0	0	0

Sampling point 4 (pupil D)

Species	Species frequency (%)				
	Q1	Q2	Q3	Average	Average rounded
Barnacles	12	5	14	10.33	10
Limpets	2	2	5	3.00	3
Dog whelks	0	0	0	0	0
Wrack	44	28	41	37.67	38
Pepper dulse	61	70	65	65.33	65
Gutweed	0	2	2	1.33	1


Species found along a rocky shore transect
Average species frequency (%)
100
90
80
70
60
50
40
30
20
10
0
barnacles
limpets
dog whelks
wrack
pepper dulse
gutweed
Species
Sampling point 1
Sampling point 2
Sampling point 3
Sampling point 4

Analysis

The sampling points we used are a close match to the zones shown in the diagram.

The graph shows that the highest frequency of barnacles was found at sampling point 1. This is the sampling point furthest away from the water. This matches with the diagram showing that barnacles live on the upper shore, where they will be exposed to air and sunlight for quite a long time and so have to be adapted to prevent them drying out. Exposure also means they can tolerate a high variation in salinity.

Pepper dulse was mostly found at sampling point 4. This would be the lower shore or intertidal zone shown in the diagram. This is the sampling point closest to the water and shows that pepper dulse survives best under water but can survive short periods exposed to wind and sun. This means it will not have to be so adapted for changes in temperature or salinity or to drying out by exposure to air and sunlight.

Wrack was not found at sampling point 1, the point furthest away from water, but was present in high numbers at the other sampling points. This might mean that wrack cannot survive being out of water for extremely long periods.

There were low numbers of other species, and it is also difficult to compare them with the diagram.

Conclusion

By using a transect and quadrats we were able to count species present at each sampling point to find out where species are found on a rocky shore. Plotting the results on a bar graph showed the distribution of each species, with the highest average frequency showing the zones on the rocky shore that offer the best conditions for barnacles, wrack and pepper dulse. The frequency of limpets, dog whelks and gutweed is too low to be able to show zone differences.

Evaluation

The investigation aimed to find out the distribution of plants and animals on a rocky shore. We learned how to use rocky shore identification guides properly, following paired statements. The species we found were easy to identify but we didn't look at subspecies and these might have shown preference for different zones.

We used the same equipment and method at each sampling point on the transect, which should improve the validity of the results. However, different people assessed each sampling point on the transect. This means that mistakes might have been made in identifying a species or in counting the number of squares where a species was present.

References

Diagram: Marine Biological Society http://www.mba.ac.uk/fact-sheet-rocky-shore

Field Studies Council http://www.theseashore.org.uk/theseashore/Factors%20Affecting.html

Field Studies Council guides for Seaweeds of British and Irish coasts, and Rocky shore name trail (animals and seaweeds in rock pools)

Great British Marine Animals, Paul Naylor, 3rd edition