

An investigation into the covering behaviour of the Purple sea urchin (*Paracentrotus lividus*)

Results

Introduction

We both live in North Clare and are not very far from the sea. As a result, we are interested in marine biology and love exploring on the seashore. During the summer we were on Doolin shore and were examining the rock pools at low tide. We found a lot of sea urchins (*Paracentrotus lividus*) in the rock pools on the shore.

These sea urchins live in small hollows in the rock pools. We noticed that a lot of the urchins had shells or stones or seaweed on top of them. We then wondered why they had these shells on top of them and decided to investigate what research has been done on this.

In Spiddal the sea urchins are not in pits like in Doolin but are found under stones in the rockpools. Some were attached to these stones. We were surprised when we found that even though some sea urchins were upside down under a stone, they still had items covering them.

Aims

The aims of our project are:

- To see what % of sea urchins have a covering on them and what covering they are using.
- To see if this % changed over time.
- To see if light influences their covering behaviour.
- To compare our lab results with those from the shore.

Methods

We did our research both on the shore and in the lab. The shores we did our research on were Doolin and Spiddal.

On the shore in Doolin we selected 10 rock pools and counted all the sea urchins in each pool. We then noted how many are covered and what they are covered with. In Spiddal we recorded what 15 sea urchins were covered with as we collected them.

For the laboratory part of our project, we used the 15 sea urchins of similar size collected in Spiddal. We had 10 identical plastic basins. These contained 1000 ml of seawater collected from the shore. We placed 3 of each of the following in each of the basins - a small pebble, mussel shell or limpet shell and seaweed equal distance from the sea urchin. We chose these as these were the items that were normally found covering the sea urchins on the seashores.

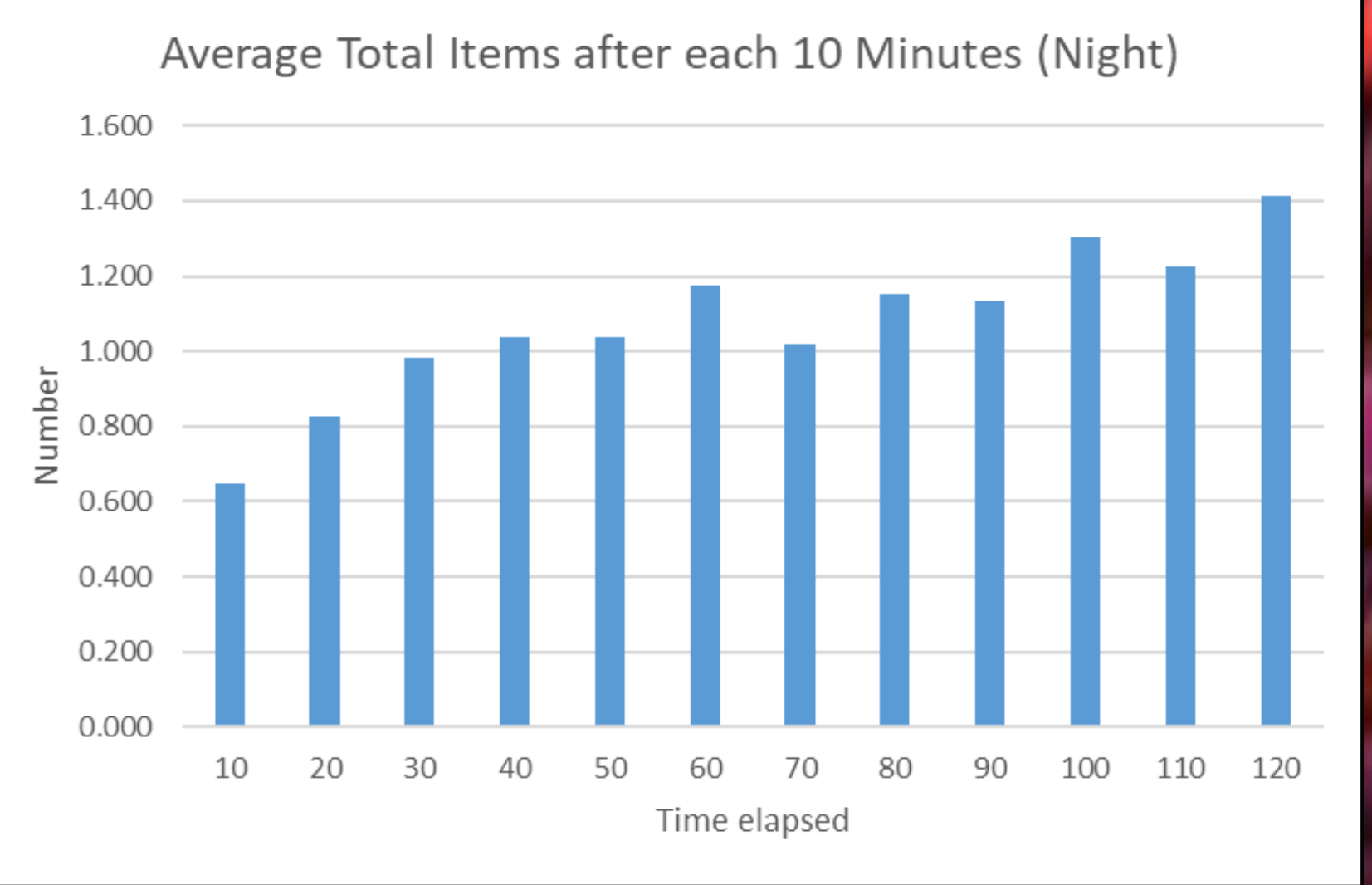
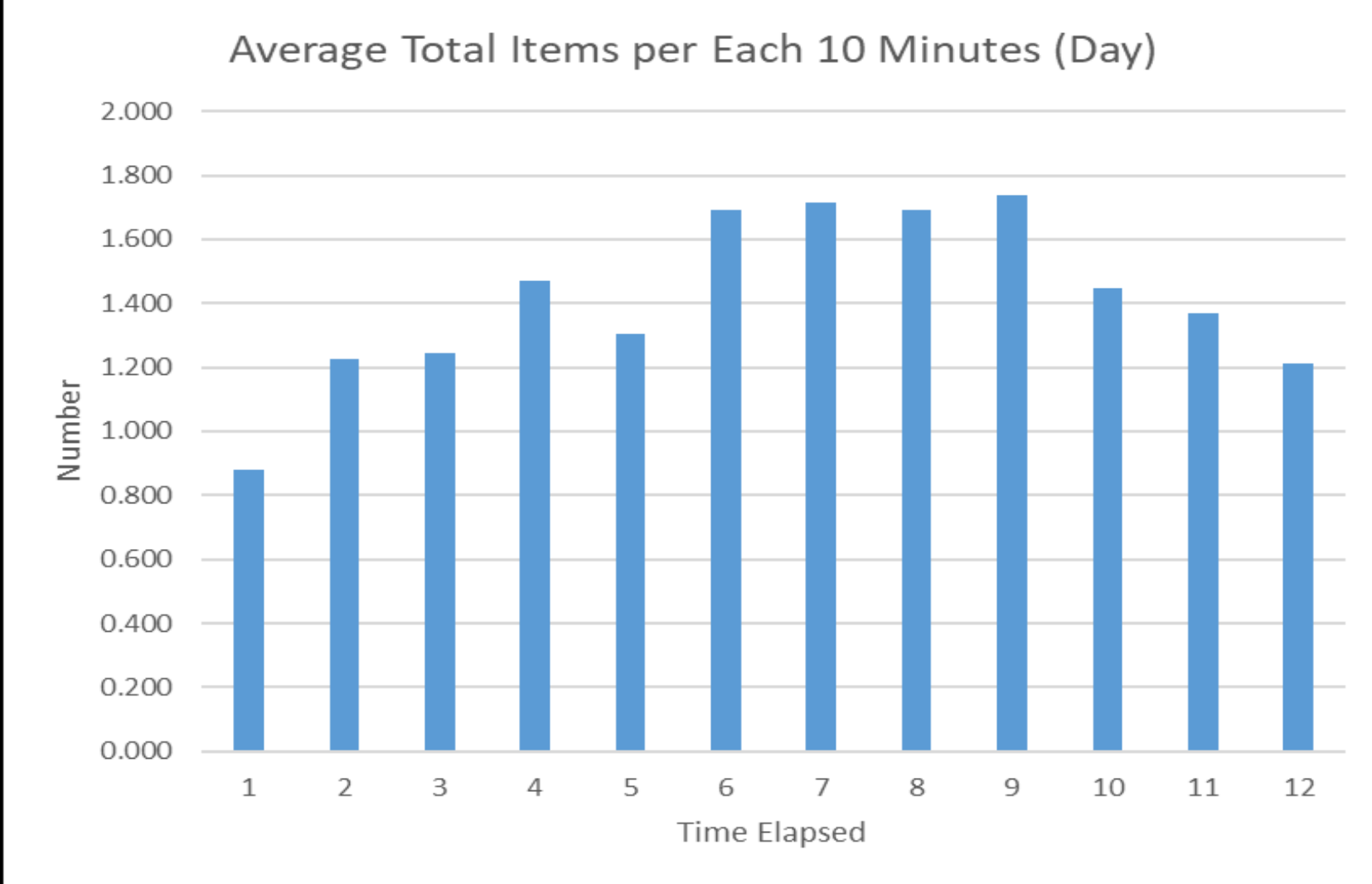
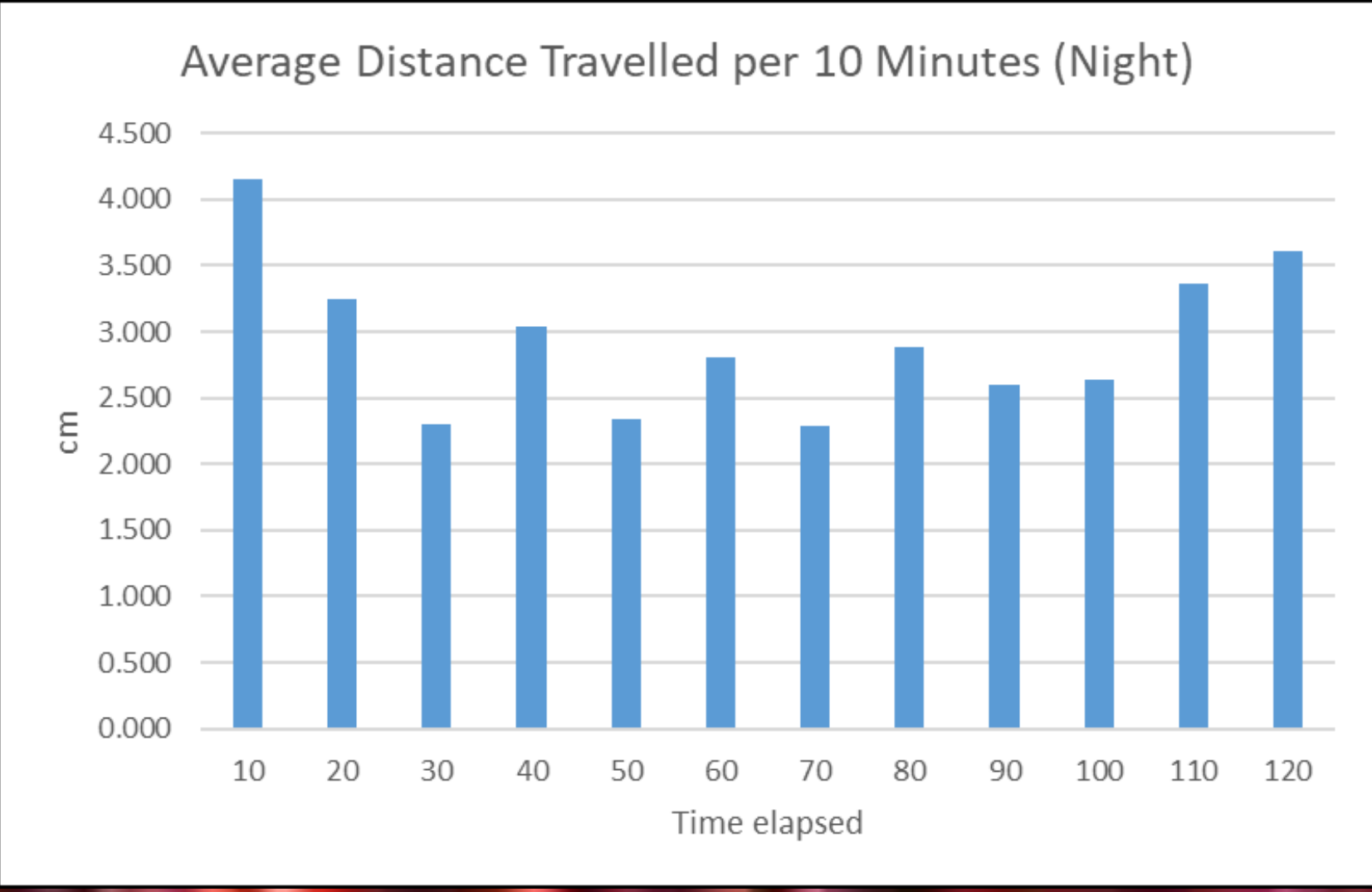
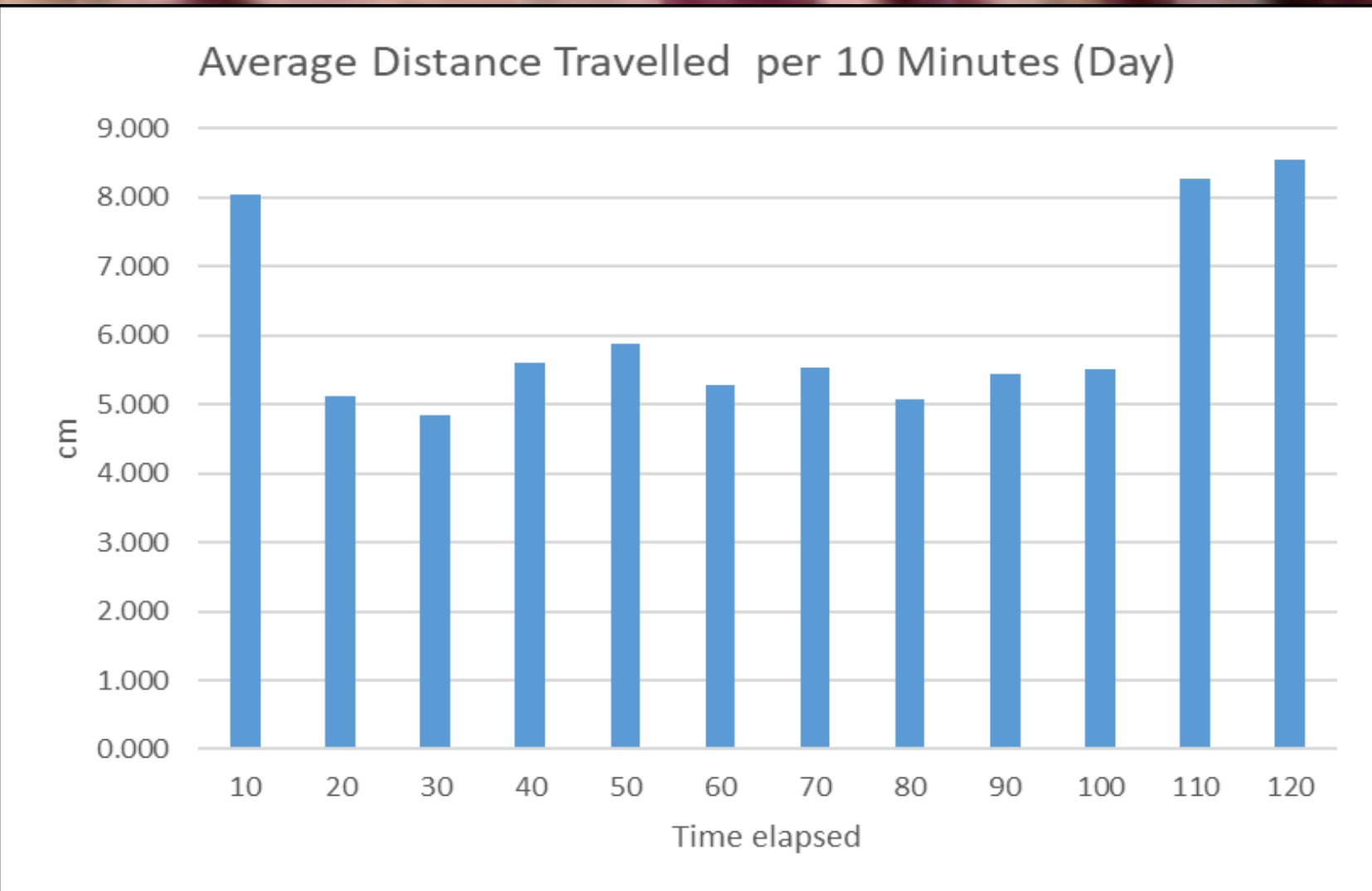


One of the basins that had just been set up.

To start the experiment, one sea urchin was placed into the centre of each of the 10 basins. Observations were made every ten minutes over a 2 hour period. We recorded the following data:

- The distance moved in centimetres since the last observation.
- If an urchin had a covering, what covering did they have.
- If an urchin was touching an object and what type of object it was.

Each trial was carried out 7 times both during the day (light) and also at night in darkness in the laboratory.



One of the things we looked at was the rate of covering of the sea urchins. We did this twice in Doolin and only once in Spiddal when we were collecting the sea urchins. The sea urchins in Spiddal had much more covering items on them than in Doolin. This might be because the rockpools in Spiddal were very large and there were lots of material available to cover themselves with. The results we got for Spiddal are given in the following table.

Number	Stones	Shells	Seaweed	Total
1	8	1	1	10
2	4	3	3	10
3	9	2	1	12
4	7	1	1	9
5	11	1	1	13
6	12	2	4	18
7	8	1	2	11
8	6	2	2	10
9	1	0	6	7
10	5	2	3	10
11	6	2	2	10
12	6	2	5	13
13	2	3	1	6
14	5	3	3	11
15	6	2	2	10

The results we got for our two surveys of the rockpools in Doolin are given in the following tables.

Doolin	Number	Number covered	Doolin	Number	Number covered
1	5	3	1	5	2
2	10	6	2	10	7
3	5	3	3	5	4
4	7	7	4	7	5
5	17	17	5	17	14
6	18	8	6	18	11
7	10	5	7	10	7
8	3	1	8	3	1
9	5	2	9	5	3
10	8	4	10	8	5

We surveyed the same pools in Doolin both times. As you can see the covering rate is 67% and 63.64% in Doolin while it is 100% in Spiddal. Because of exposure to the waves there was not as much material available to the sea urchins in Doolin for covering themselves.

Conclusions

Our first aim was to see what % of sea urchins have a covering on them and what covering they are using. When we looked at them in Spiddal we found that all the sea urchins we came across had a covering on them. They all had multiple coverings. In Doolin between 60% and 70% had a covering and this did not change much over time.

In order to see if light influenced the urchin's covering behaviour, we ran the lab experiments during both the day and night. With these results we discovered that the urchins are more active during the day. This is probably because during the day they're more in a hurry to cover themselves from the sun or predators. During the night in the first 10 minutes on average the urchins moved 3.604 cm whereas during the day they moved 8.536 cm. This is a significant difference.

Also, when we ran ANOVA's regarding both distance travelled and number of coverings it showed that there were significant differences between the day and night results.

We were also looking to compare our lab results with those from the shore and we found that a lot of the sea urchins took on a covering quite quickly. Some had done this in the first ten minutes after a trial began.

The sea urchins in Spiddal had a lot more covering items than in Doolin. This might be because the rock pools in Spiddal were very large and the urchins were under larger stones. 100% of them were covered but in the two times we went to Doolin 67% and 63.64% were covered.

In our lab trials about 70% would have had a covering on them. This would be in line with what we found in Doolin.

ANOVA's

We ran ANOVA's in SPSS to see if there were significant differences in how the sea urchins behaved in relation to day and night and in relation to elapsed time. The results we got are shown in the following tables.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.447	11	3.95	2.905	0.001
Within Groups	1563.521	1150	1.36		
Total	1606.968	1161			
Total number of covering objects by time elapsed					

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.108	1	18.108	14.363	0.000
Within Groups	1520.461	1206	1.261		
Total	1538.569	1207			
Total number of covering objects by Day/night					

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	593.038	11	53.913	1.858	0.041
Within Groups	33341.211	1149	29.018		
Total	33934.250	1160			
Distance travelled by time elapsed					

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2585.847	1	2585.847	95.603	0.000
Within Groups	31348.402	1159	27.048		
Total	33934.250	1160			
Distance travelled by Day/night					

As you can see from the tables above there are significant differences in how the sea urchins behave between day and night and in relation to elapsed time.