FIELD TRIP TO A SHINGLE BEACH

AIMS:

- **HOW HAVE WAVES AND TIDES SHAPED THE BEACH?**
- **HOW DO PLANTS AND ANIMALS SURVIVE IN THIS HOSTILE ENVIRONMENT?**

OBJECTIVES:

i) To investigate the effects of waves and tides on the beach, transporting, depositing and/or eroding the shingle. To discover where the shingle is likely to have come from.

ii) To use a transect to survey the profile of the beach from the sea inland, to show how the berms and storm beach, the strand lines of debris thrown up by the waves, and the different sizes of beach material relate to wave and tides.

iii) To plot the position of plants and animals on the transect, to investigate their adaptations to the shingle habitat, and to note how these organisms modify the habitat.

iv) To consider methods of conservation and protection for the rare and vulnerable plants and animals.

SAFETY: Remember – the sea can be a dangerous place. Always follow your teacher's instructions.

A. OBSERVATIONS OF WAVE ACTION FROM THE WATER'S EDGE

1. ARE THE WAVES CONSTRUCTIVE OR DESTRUCTIVE TODAY?

a) Observe the swash and backwash, using distinctive floats such as dog biscuits. Which seems faster and more powerful?

b) Estimate wave length and wave height. (If it is possible to see the waves passing along the side of a groyne or breakwater, this will help considerably.)

c) Estimate the frequency of the waves, i.e. the number per minute.

d) How does the beach angle being formed at the moment compare with that of the rest of the beach, which must have been formed under earlier tide and wave conditions?

2. WHAT IS THE DIRECTION OF LONGSHORE DRIFT TODAY?

a) Using a compass, measure the direction of the swash and backwash, by watching the floats.

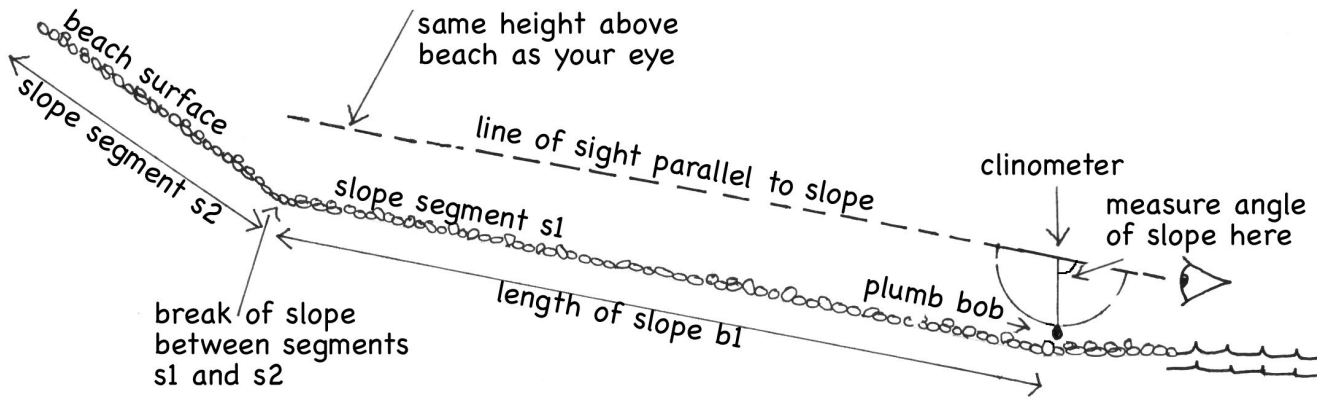
b) Measure the direction of the wind by holding up a flag, looking at peoples' hair etc. Is the wind direction the same as the swash direction? If it is not, what is likely to be the explanation?

c) Is today's direction of drift that which usually occurs? What is the evidence for the normal/prevalent direction of drift?

d) What are the pebbles made of? Suggest where they might have come from.

B. SURVEY OF THE BEACH

Diagram 1. Slope segments and angles of slope



3. MEASURING BEACH ATTRIBUTES

Study Diagram 1, which explains the method of surveying. Make sure you understand what a **slope segment** is, and that you can identify the start and finish of the segments as you move up the slope. Set up a transect and for each slope segment measure and record:

a) The angle of slope, using the clinometer.

b) The length of slope, using the tape.

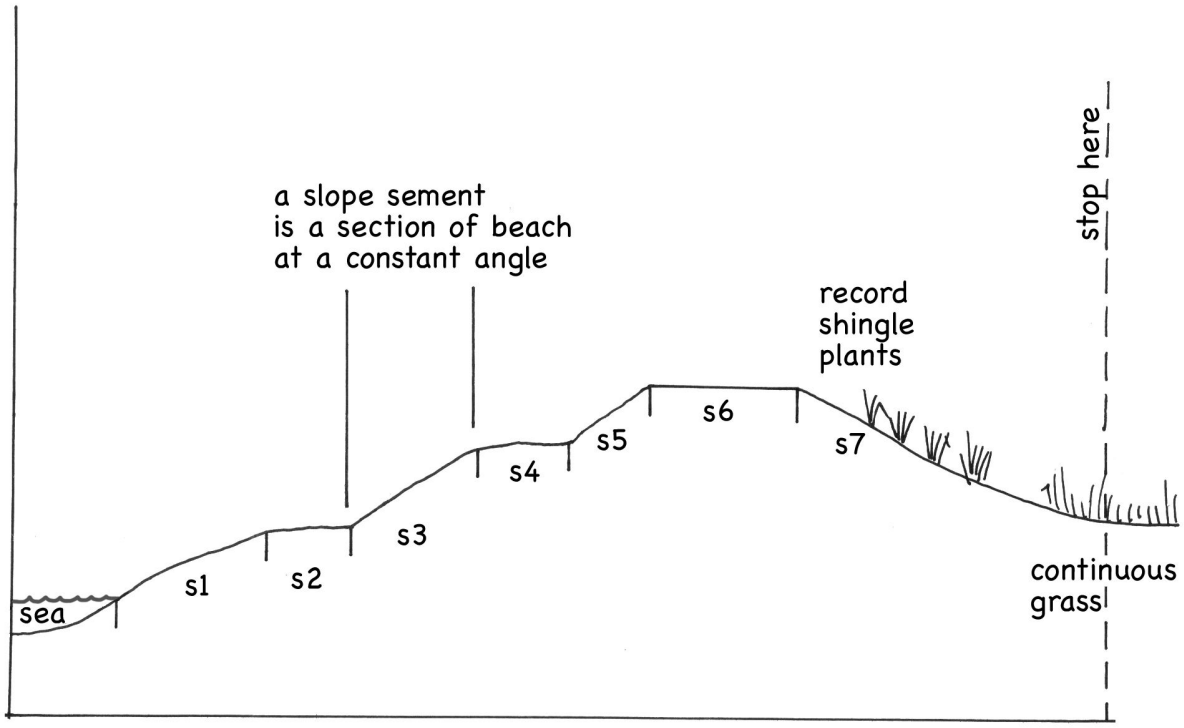
c) The average size of a sample of 10 pebbles from the centre of each segment, measuring the longest diameter, using a ruler.

d) Any strand line debris, seaweed and other flotsam, how wet and fresh they look. (The lines of debris, and how fresh they are, indicate recent tide levels.)

e) Any growing plants or animals. Indicate their position on the slope segment.

f) Continue the transect beyond high water mark to the back of the beach or to the point where continuous vegetation cover has developed.

Diagram 2. segments and course of transect



4. RECORDING YOUR RESULTS

a) Record the results of your transect in a table (**Table 1**) similar to the example shown, which is designed for a beach that happens to have 11 segments:

Table 1: survey results ←Towards the sea Towards the land→

Slope segment	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Angle of slope											
Segment length (m)											
Sizes of 10 randomly chosen pebbles											
Average size											
Seaweed and other debris											
Plants and their adaptations											
Comments on the segment. What tide level does it correspond to?											

5. PRESENTING YOUR RESULTS

a) Draw up the transect profile to scale on graph paper. It may be useful to double the angles to make the differences more apparent.

b) On the profile, show the average size of the pebbles for each segment, lines of seaweed or other debris, and any plants that you find.

c) Label any berms, storm beaches (above berms), and last night's high tide level on your profile.

6. ANALYSIS AND CONCLUSION

From your completed graph of your transect results, answer the following:

a) How does the size of pebbles vary with distance from the sea, and in relation to the ridges? Try to explain any patterns of distribution that you observe.

b) How does the pattern of growing vegetation relate to the ridges?

c) How do you explain the pattern of berms and storm ridges? Hint: think about wave action at different seasons and effects of Spring and Neap tides.

d) Make an overall conclusion to the beach survey, also considering what may happen to the beach in the future.

C. BIODIVERSITY STUDY

Now you have a profile of the beach, the ecosystem can be investigated more thoroughly. Remember this is a very rare, fragile community, surviving only in very difficult conditions. **PLEASE TREAT WITH CARE!**

7. WHAT PLANTS AND ANIMALS ARE PRESENT?

a) Using information on the BAR website and other suitable guides, identify the species and list them in TABLE 1.

8. WHY IS THIS SUCH A HOSTILE ENVIRONMENT FOR PLANTS AND ANIMALS? DOES IT IMPROVE WITH DISTANCE FROM THE SEA?

a) Complete **Table 2** below comparing the amounts of soil and other organic matter, water and shelter available to plants at different distances from the sea. Are some species found nearer the sea than others?

Table 2: environmental changes with distance from the sea

ZONE	Humus – soil development	Water supply	Shelter	List 3 species in this zone
Nearest the sea				
Intermediate				
Furthest from the sea				

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9. HOW DO THE PLANTS AND ANIMALS SURVIVE?

a) Carefully investigate how the plants and animals survive in the shingle habitat. Then complete **Table 3** noting the adaptations of the plants for their survival in the shingle environment (tick boxes and add other comments).

Table 3: plant adaptations

Species adaptations	**Deep roots**	**Waxy leaves**	**Hairy leaves**	**Succulent**	**Low growing in winter**	**Makes many seeds**
Fill in reason		Reduces water loss from the leaves			Reduces wind blast	
SPECIES						
Yellow Horned-poppy						
Sea-kale						
Curled Dock						
Yellow Stonecrop						

Using the "Shingle Survivors" leaflet and websites such as that for BAR:

b) Construct a food chain (or a web) for the shingle organisms you have seen.

c) Write a newspaper report or an article for a wildlife magazine, emphasising the problems of survival for shingle plants and animals. State what you consider are the main threats for the shingle ecosystem. Give your ideas on how can it be conserved and protected.