

Investigation Title(s):

A range of options associated with coastal processes, such as longshore drift, or depositional features, with options for beach surveys. Also coastal management at nearby Westward Ho!

Location:

Pebble Ridge and Westward Ho! North Devon

**Target Audience:**

Many options for fieldwork from KS3, through GCSE to A level NEA investigations

Logistics (access, parking, toilets etc):

The Ridge can be accessed by minibus by any one of three tracks, though coach drivers may look nervously at the rough terrain and narrow gateposts and prefer deploying a group at a bus stop in Westward Ho! village.

The village boasts public toilets on Westbourne Terrace near the slipway and a Tesco's Express (extremely popular with students suffering from too much spending money). The village green can be accessed on foot along Golf Links Road, which is a great spot for free time or packed lunch.

Pebble Ridge Road provides access to the proximal end of the Ridge near to the Adventure Golf and Go Kart tracks. Sandymere Road provides access to the Northam Burrows Country Park information centre via a moderately well -maintained access path from the small car park to the beach. Burrows Lane allows access to the furthest distal region and Greysands Beach at the tip of the spit with a view of the Skern mudflats and the Taw Torridge estuary. Tolls are required April-October.

Geographical Concepts Underpinning Investigation):

It is thought that Pebble Ridge was formed by a one-off event in the distant past, likely to be a significant cliff collapse similar to The Gore at Buck's Mills to the West. Thousands of tonnes of pebbles trapped at cliff height due to past eustatic change were suddenly re-released back into the sediment cell, drifting eastwards along the Bideford Bay, before forming a spit at the Taw Torridge estuary. The source material for all deposition is the rugged Hartland Peninsular – itself worthy of a visit.

The pebbles show sediment sorting - large/rough pebbles at the proximal end, with small/smooth pebbles found at the distal. However, the sediment budget is running at a deficit with the ridge losing pebbles faster than it gains them. The landform retreats at roughly 1.5m a year. Worse still is the historic landfill site buried beneath the dunes at Greysands. If this waste is released into the ocean it would likely lead to the closure of every tourist beach between Land's End and the Severn estuary. Most punishing are the winter storms which brutalise the ridge; in late 2019 roughly 8m was lost overnight.

The current strategy is 'Hold the Line', which sees a consortium of stakeholders scrambling each winter to replenish the ridge.

Reviewer:

Thomas Humphreys (Lead Fieldwork Tutor, Skern Lodge)

(tom@skernlodge.co.uk)



Data Collection Opportunities:

Field sketches. My favourite location for this is astride the benches at Seafeld at the base of the Kipling Tor cliffs

Coastal management. Westward Ho! town boasts several generations of sea wall (i.e. flat vs concave), rock armour, groyne, as well evidence of soft engineering in the form of beach replenishment.

Longshore drift. A bright apple thrown to the waves allows for good measurements, though the beach has a significant tidal range so walking from the ridge to the shoreline may be timely on neap tides.

Beach profiles. I find that three to four sites are good, evenly spaced over 1000m. Ridge morphology change is significant until the dunes at Sandymere, wherein the pebbles are buried by sand.

Pebble characteristics. width and length measurements are quick and easy to harvest as are angularity categorisations according to the Powers Scale. Systematic sampling is good again here.

**Data Presentation, Analysis, Statistical Applications:**

Coastal management. Analysis can be superimposed on aerial photography of the area obtained from Google Earth

Longshore drift. Similarly, clever use of GIS can allow for data to be displayed in an interesting way (e.g. a choropleth map of where LSD is strongest).

Beach profiles. Nothing beats a hand-drawn cross section lovingly drawn on graph paper! Care should be taken to ensure scales are the same across all plotted sites, which allows for easy comparison and estimation of ridge height and volume. Enterprising students have coupled this data with future sea level data to predict areas vulnerable to overtopping.

Pebble characteristics. Widths and lengths can find their way onto scatter plots with angularity categories represented using pie charts. Both sets of data can be fed to statistical analysis to explore the strength of a relationship against distance along (lateral sorting) or across (vertical sorting) the ridge. Spearman's and Chi squared are most appropriate here.

Evaluative Issues:

Though Pebble Ridge pleasingly adheres to textbook predictions of sediment sorting, the coastal management of beach replenishment can mean that pebbles are sorted artificially. In the winter, diggers often distribute sediment from areas of resilience to weakness. A cohort of fieldworkers harvesting data in January or February may collect data that reflects this.

Favourable pebble selection can also catch students out, with students electing 'easy' pebbles to survey. A conversation on pragmatic sampling may be beneficial, as well as hypothesis bias.

Human error accounts for remaining evaluative issues; conversations around Powers Scale categorisation proves to be fertile ground for subjective data review.