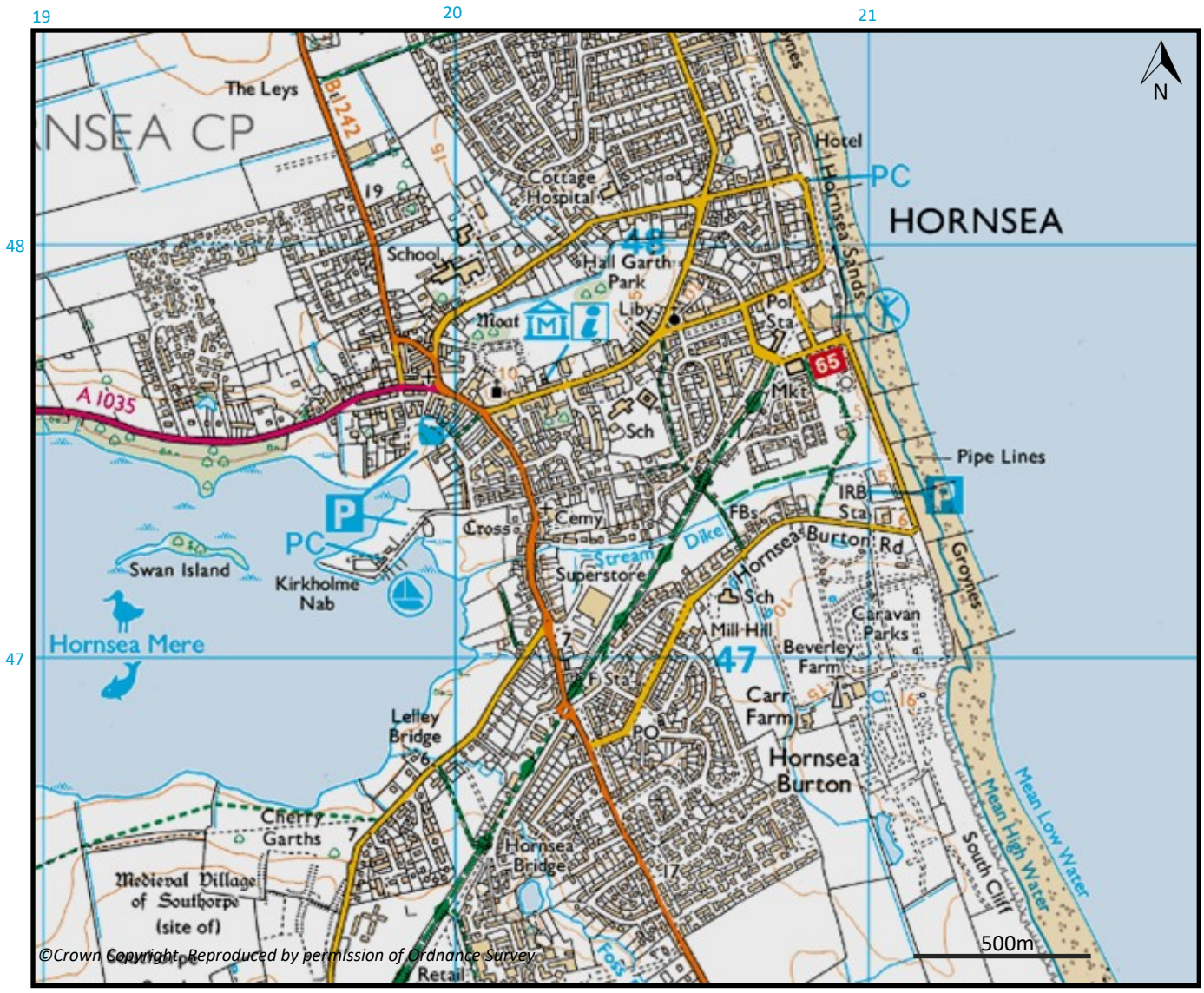
Cranedale Centre

Coastal Management

for Independent Investigation

Location: Hornsea, East Yorkshire



Site Points	Grid Reference	Latitude/Longitude
Hornsea Main	TA 210 477	53.911392 , -0.15879750
Hornsea South Cliff	TA 213 466	53.902037 , -0.15495658

Location: Hornsea Main

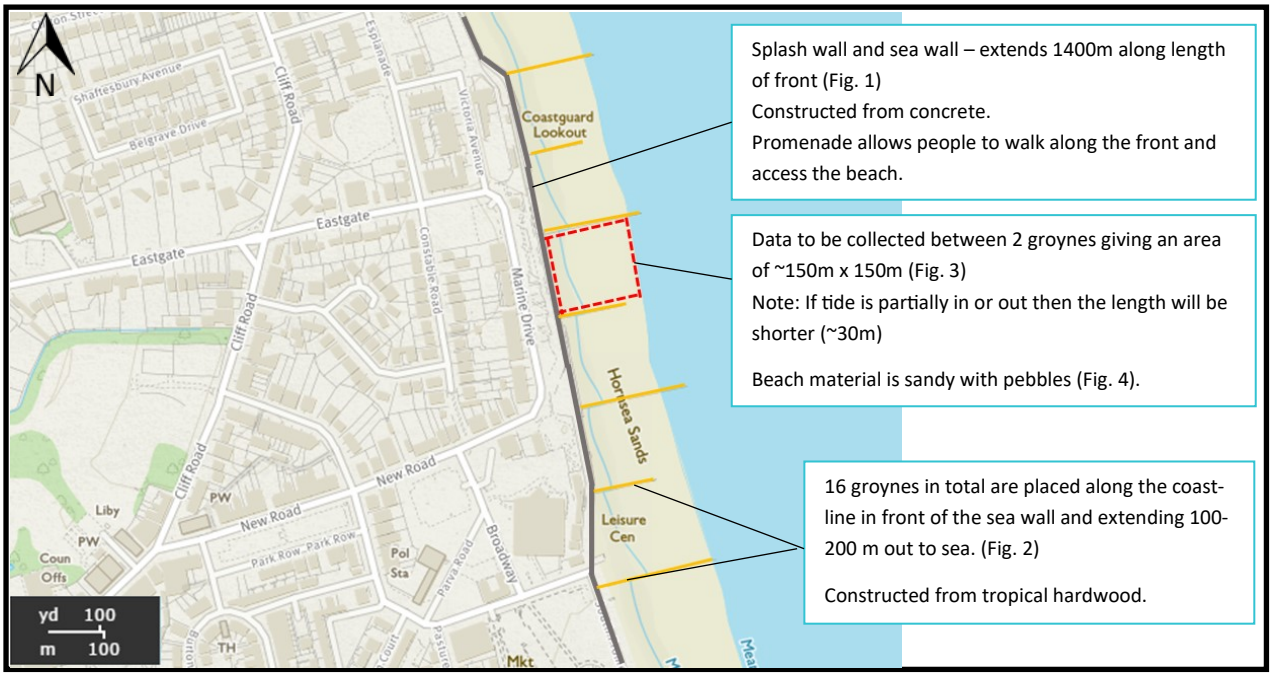


Figure 1: A view from the sea end of a groyne back to the sea wall and splash wall.

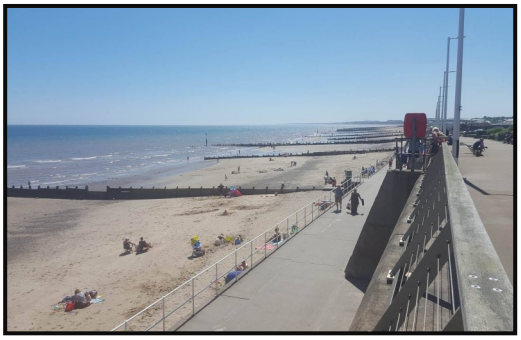


Figure 2: A view from the top of sea wall overlooking the study area.

Figure 3: A view from the top of a groyne towards the sea, overlooking a typical study area.

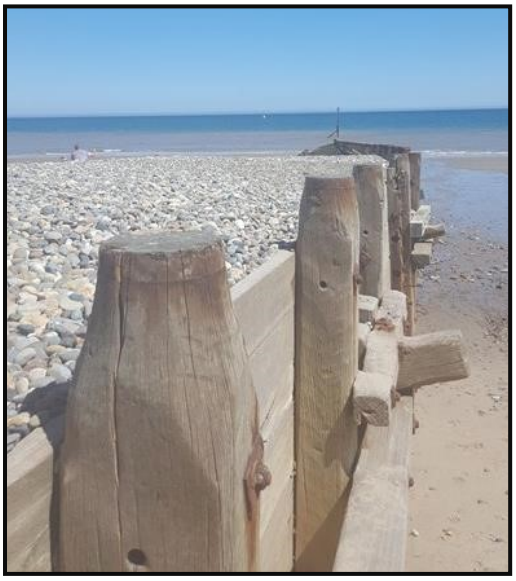


Figure 4: Sediment either side of a groyne

Location: Hornsea South

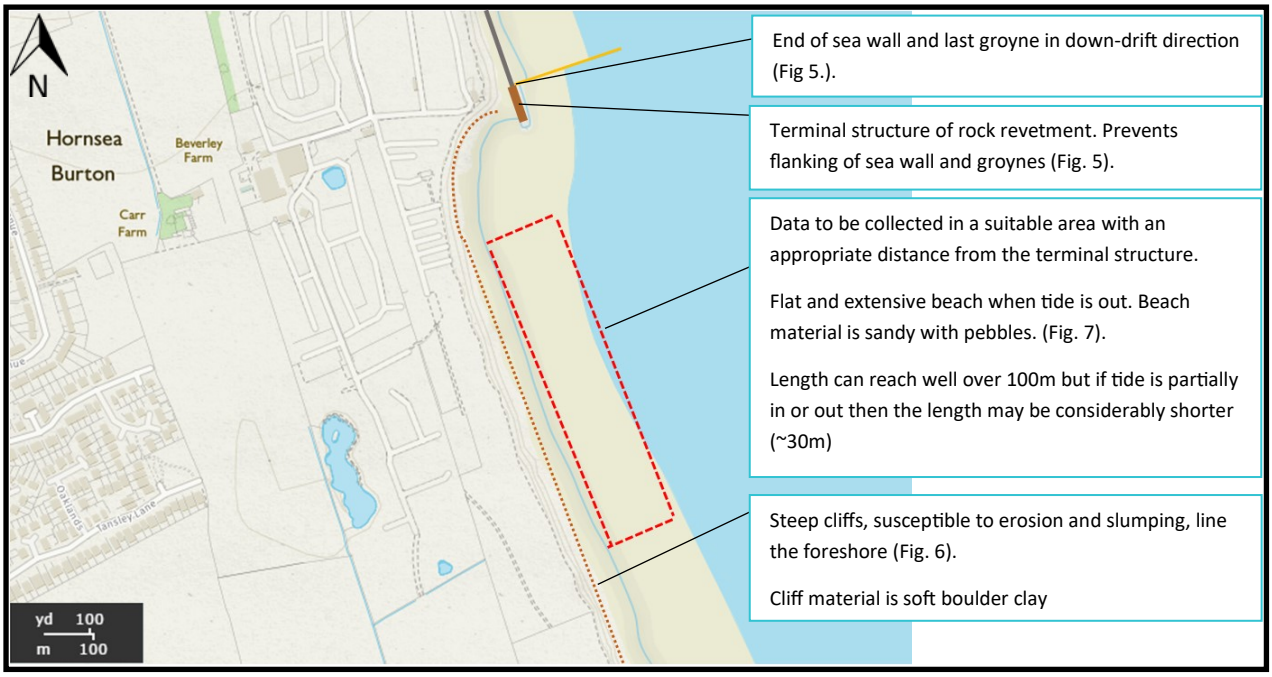


Figure 5: Looking back northward where the terminal structure and last groyne can be seen.

Figure 6: Evidence of erosion and unstable cliffs with processes such as slumping visible.

Figure 7: A view southward looking across to the study area. An extensive beach can be revealed when the tide is at its lowest point.

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Background information:

Context to study

The Holderness Coast is the fastest eroding coastline in Europe. One factor which causes this rapid erosion is that the Holderness Coast is formed from boulder clay. This is a soft material deposited during the last glacial period between 115, 000 and 10,000 years ago. Another factor is the large fetch between Norway and the UK. This causes large dominant waves from a north-easterly direction that have lots of erosive energy. The effects of the erosion has had massive impacts along the Holderness coastline with some areas receiving funding for hard engineering strategies while others have been left to retreat naturally. We will visit 2 locations at Hornsea on the Holderness coast. "Hornsea Main" is managed with hard engineering while "Hornsea South" has No Active Intervention.

References to background theory and data collection

East Riding of Yorkshire Council (2016) *Coastal Explorer*. Available from: http://www.eastriding.gov.uk/coastalexplorer [Accessed 15th July 2016].

French, P.W. (2001) *Coastal Defences: Processes, problems and solutions*. London: Routledge. Available from: https://books.google.co.uk/books?id=sZmEAgAAQBAJ&printsec=frontcover#v=onepage&q&f=false [Accessed 15th July 2016]

Jones, A., Duck, R., Reed, R., & Weyers, J. (2000) *Practical Skills in Environmental Science*. Essex: Pearson Prentice Hall.

Sorensen, R.W. (2006) *Basic Coastal Engineering*. 3rd ed. New York: Spring Science + Business Media Inc. Available from: https://books.google.co.uk/books?id=IL0CXGQjPlAC&printsec=frontcover#v=onepage&q&f=false [Accessed 15th July 2016].

Syllabus Links

AQA
Coasts as natural systems – inputs, outputs, stores, flows, dynamic equilibrium and positive/negative feedback
Systems and processes – sources of energy, sediment sources, cells and budgets, geomorphological processes, weathering, erosion and transportation
Coastal Management – human intervention, hard and soft engineering approaches, shoreline and ICZ management

OCR
Coastal landscapes as systems – input processes outputs, flows of energy and material, sediment cells, influences on the system (winds, waves, geology), sources of sediment
How human activity intentionally and unintentional causes change in the landscape system – coastal management, impacts on sediment budget, effect on coastal landforms, consequence of changes.

Edexcel
The Sediment Cell Concept (sources, transfers and sinks) to understand the coast as a system
Rapid coastal retreat causes threats to people at the coast – influence from human actions
Management of coastlines to meet the needs of all players – effects, approaches (hard and soft engineering), policy decisions and conflicts.

EDUQAS
The operation of the coast as a system – inputs, outputs, stores and transfers, sediment cells
Coastal processes as a vital context for human activity – positive impacts (tourism) and negative impacts (erosion), and management strategies.
The impact of human activity on coastal landscape systems – positive and negative impacts on coastal processes

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A typical data collection day

Timings	Content	
9.15 – 10.00	Get ready to go, collect lunches To Hornsea main – park at Floral Hall Café	
10:10—10:20	Walk 500m to protected area of beach (between 2 central groynes)	
10:20—10:30	Field introduction – welcome to Hornsea, set scene, discuss intended impacts and processes, general safety. School and CC staff to remain on beach and check progress with each group	
10:30 – 1.40	Student data collection – students with similar titles/techniques to work in groups of 2-4. Within this time there will be the opportunity for students to travel with Cranedale Staff to Hornsea South to collect data if required.	
1:40 – 1:55	Pack up and back to minibus Potential options for remainder of day (high tide constraints) • Visit Mappleton and Skipsea to discuss other management strategies • Visit Flamborough Head to discuss coastal processes and complete sketch (looking at geo may have complications due to tide needing to suit individual investigation • Return to centre to secure data and begin follow up. • If the tide is particularly unfavourable, data collection could be done over two consecutive afternoons.	

NOTE: subject to change depending on tides. Although every endeavour will be made to accommodate different tide times, some days may have very limited beach access.

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Data Collection:

Appropriate and achievable factors that could be measured:

Physical Factors:

- Beach profile/gradient
- Sediment size
- Sediment shape
- Sediment sorting
- Turbidity of waves
- Wave frequency
- Longshore drift

Human Factors:

- Land Use Mapping
- Environmental Impact Assessment of management strategies

Factors that cannot be measured:

- Wave velocity – unable to enter the sea due to health and safety reasons
- Students will not be able to work at or on the cliff, again due to health and safety reasons.

We apologise but for ethical reasons we are unable to accommodate the use of questionnaires on this day.

It is highly recommended that all students record the latitude and longitude of study sites/ data collection locations.

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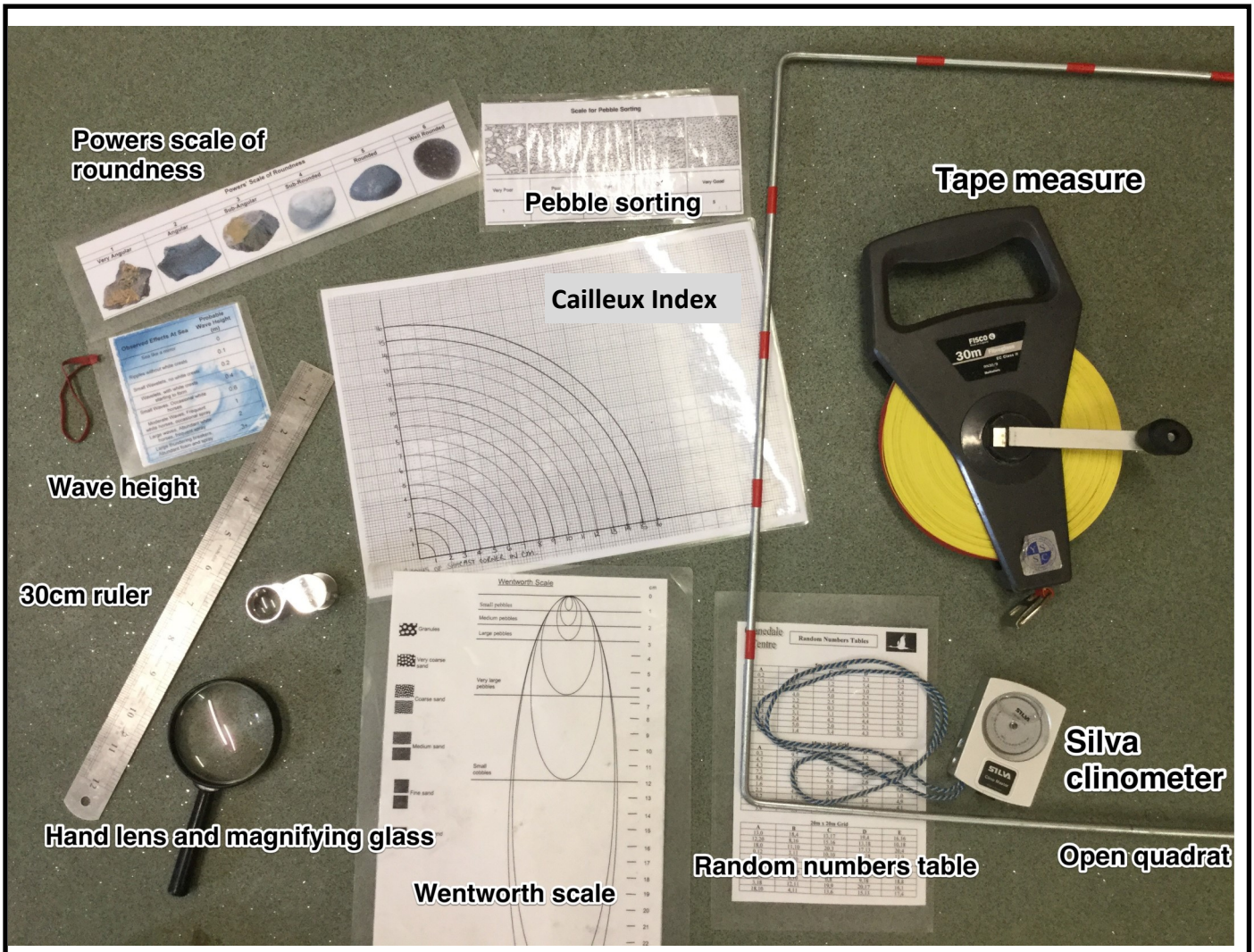
A Standard kit bag (per group of 2-4 students) will contain:



List of equipment included :

- Silva clinometer
- 30m tape measure
- 30cm ruler
- 50 x 50cm open quadrat
- Powers scale of roundness laminate
- Wentworth scale laminate
- Cailleux index laminate
- Sediment sorting laminate
- Random numbers table laminate
- Wave height laminate
- Hand lens

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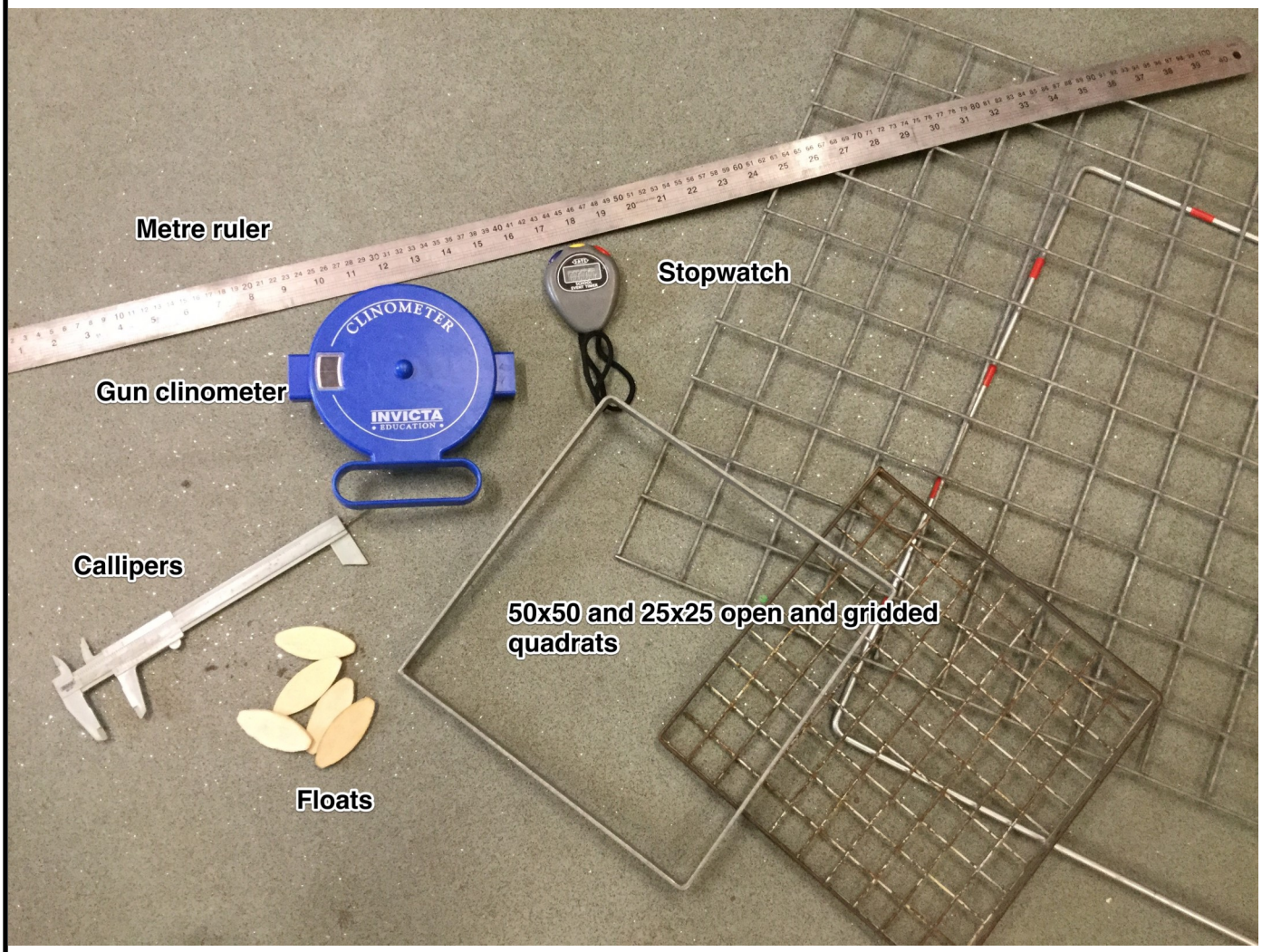
A Standard kit bag (per class group) will contain:



List of equipment included :

- Gun clinometer
- Metre ruler
- Callipers
- 25 x 25cm quadrats (mixture of gridded and open)
- 50x50cm gridded quadrats and open
- Floats—dog biscuits
- Stop watch

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Key to Choosing an Appropriate Sampling Strategy

Systematic - Transect

YES

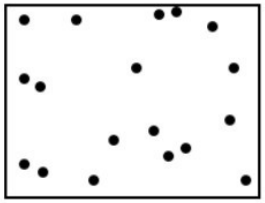
Are you investigating change along an environmental gradient?

NO

Is the area homogenous (all the same)?

YES

Random

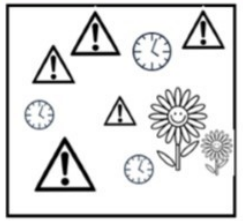


NO

Are you taking very few samples where there are severe restrictions, safety issues or time constraints?

YES

Opportunistic

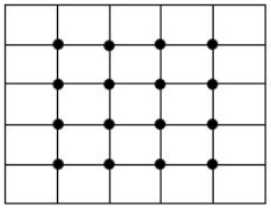


NO

Can you assess the proportions of distinct environments?

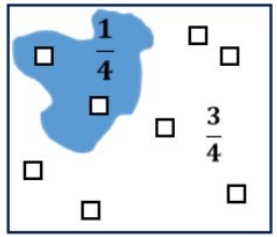
NO

Systematic - Grid



YES

Stratified



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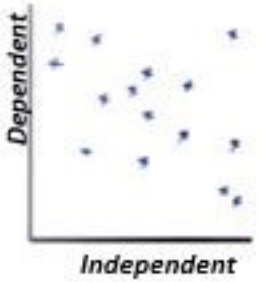
CHOOSING THE RIGHT STATISTICAL TEST

Are You

Investigating the relationship between two continuous variables?

E.g. As the environment changes, does this affect the abundance of a species?



Spearman's Rank Correlation Coefficient

- ⊕ 10 pairs of readings are sufficient, though 20 set of data are better
- ⊖ S.R.C.C. misses non-linear relationships

Looking for a difference between two averages?

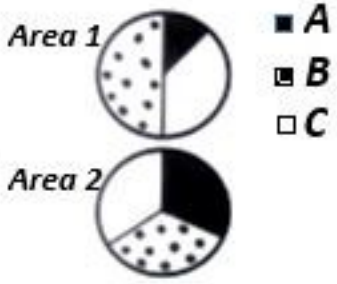
E.g. Does area 1 have smaller values than area 2, on average?

Mann Whitney U Test

- ⊕ Only needs between 5-20 pairs of readings
- ⊕ There is no assumption of a normal distribution
- ⊖ The test looks for a difference between two medians, not means.

Looking for differences in proportions?

E.g. are there different proportions of species A, B & C in two areas



Chi Squared χ^2

- ⊕ χ^2 easily analyses data in the form of counts.
- ⊕ Allows analysis of categorical data.
- ⊖ The calculation requires 'expected values' to be greater than 5, which is difficult to work out during data collection