Fun & Learning in the real world

An educators' guide

Design
ICT
History
Research
Geography
Solutions
INVESTIGATION
SCIENCE
Application
Maths

Hampshire & Wight Trust for MARITIME Archaeology

The Hampshire & Wight Trust for Maritime Archaeology

The Hampshire and Wight Trust for Maritime Archaeology (HMTMA) promotes interest, research and knowledge of maritime archaeology and heritage. The Trust runs a programme of research led fieldwork involving professional archaeologists, volunteers and students. The results of this work are widely disseminated through an innovative programme of education and public outreach including talks, activity days, learning initiatives, workshops, in-school sessions, learning outside the classroom sessions, exhibitions, publications and educational resources.

The Heritage Lottery Fund

The Heritage Lottery Fund (HLF) sustains and transforms a wide range of heritage through innovative investment in projects with a lasting impact on people and places. As the largest dedicated funder of the UK's heritage, with around £205 million a year to invest in new projects the HLF are also a leading advocate for the value of heritage to modern life.

From museums, parks and historic places to archaeology, natural environment and cultural traditions, HLF invest in every part of our heritage. The HLF has supported more than 30,000 projects allocating £4.5 billion across the UK.

The Archaeological Atlas of the Two Seas

Some of the material in this booklet has been collected as part of the Archaeological Atlas of the 2 Seas (A2S) project. The A2S project involves archaeologists, students and volunteers from England, France and Belgium working together to research, investigate, survey and promote underwater sites within the southern North Sea and the English Channel. HWTMA is working in partnership with the Association for the Develoment of Maritime Archaeological Research (ADRAMAR) and the Flemish Heritage Institute (VIOE). Funding for the A2S project has been provided by the European Regional Development Fund (ERDF) through the INTERREG IVA 2 Seas Programme.

About this Educators' Guide

This guide has been produced by the Hampshire & Wight Trust for Maritime Archaeology as part of a Heritage Lottery Funded project called *Engaging New Audiences*. This project aims to bring the fascinating world of maritime archaeology to as many people as possible through a range of resources, activities and events. This Educators' Guide provides information and activity ideas that can be used to enhance learning in formal and informal settings.

HWTMA's Maritime Bus is another output from the HLF Engaging New Audiences Project. The exhibition style vehicle takes maritime archaeology resources and handling collections right into the heart of communities. For further information see:

www.hwtma.org.uk/maritimebus

What's so special about maritime archaeology?

Archaeologists study people of the past through objects and clues they leave behind on the environment, from the first stone tools in Eastern Africa 2.6 million years ago to modern 20th century battle sites.

The archaeological process is long and complex, from desk-based research, recording, survey and (where necessary) excavation, through analysis and interpretation to publication and dissemination.

Archaeology incorporates many skills and specialisms including survey, photography, illustration, conservation, finds processing, specialist knowledge in artefact types or materials (for example bones, guns, metals and woods) plus a whole host of scientific techniques.

In short, archaeology, as a science and a humanities subject, has something to offer just about everyone.

While most archaeologists specialise in a geographical area or chronological period, maritime archaeologists specialise in sites and artefacts which have a relationship with water. This can include the sea, rivers, lakes and canals as well as sites that are not anywhere near water, such as ship-burials or maritime representations and iconography.

From shipwrecks, flooded occupied areas and sunken aircraft, to coastal defences, submerged prehistoric landscapes, grave stones, harbours and ports, maritime archaeology is everywhere! It offers unparalleled opportunities for enthusing, engaging and educating people of all ages and backgrounds and this Guide aims to show you how.

How to use this Educators' Guide

This booklet has been separated into themes and topics that are easily related to the National Curriculum as well as popular subjects and projects in informal learning.

This symbol indicates that supporting materials or activities can be found on the internet. A suggested search term is provided for your convenience. We have chosen this approach to avoid issues associated with changing URLs.

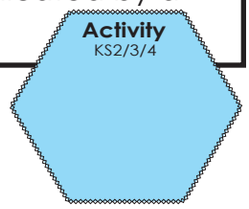
This symbol indicates that supporting materials in the form of downloadable worksheets, a glossary, images and other resources are available from our web site at:

www.hwtma.org.uk/educatorsguide

Photocopy me!

For your convenience, specially designed, photocopy friendly, black and white activity sheets are provided throughout this guide and indicated by a black border down the outer edge of the relevant page.

Suggestions for activities are highlighted in blue polygons with a recommended key stage indicated below each title.



Each section begins with a yellow summary table detailing content and types of resource available, followed by a page summarising themes, content and curriculum links.

Description
Title of page/section

Page	Photocopy Me!	Activity	Download	WWW link
	✔	✔	✔	✔

Interpretation

Page	Description	Photocopy Me!	Activity	Download	WWW links
6	**About this Section**				
7	**Timelines**		✔	✔	✔
	A great starting point for looking at the past				
8	**Interpretation: types of evidence 1**	✔		✔	
	Looks at different types of evidence used by historians and archaeologists. Introduces evidence types (documentary, artefacts, ecofacts).				
9	**Interpretation: types of evidence 2**	✔		✔	
	Looks at different types of evidence used by historians and archaeologists. Introduces evidence types (primary, secondary). Develops an understanding of different evidence types.				
10	**What is archaeology?**	✔	✔	✔	
	Introduces artefacts and considers what they can tell us about people of the past. Develops an understanding of how an archaeologist uses evidence.				
11	**What is maritime archaeology?**	✔		✔	✔
	Introduces differences between maritime and land archaeology. Develops an understanding of different site types in archaeology.				
12	**Tools of the trade**	✔		✔	✔
	Introduces tools used in maritime and land archaeology. Develops an understanding of equipment used by archaeologists on land and under water.				
	Top 3 links:				
A	Check out HWTMA's *Grace Dieu* animation for an overview of an archaeological site from creation, use, loss, discovery to protection. www.hwtma.org.uk/gracedieu		✔		
B	Science & Technology section of this booklet (Page 13-20)		✔	✔	✔
C	Create a time capsule (see Activity on Page 23)		✔		✔

About this section: Interpretation

This section is about:

History Using evidence

Facts & Theories **Archaeology**

INTERPRETATION

It provides an introduction to:
- the passage of time and chronological frameworks
- the way we find out about the past
- the types of evidence that historians and archaeologists work with
- what artefacts can tell us about people of the past
- the similarities and differences between maritime and land archaeology

The following concepts are introduced:
- Timelines
- Documentary evidence
- Artefacts
- Ecofacts
- Primary evidence
- Secondary evidence
- Site types
- Archaeological equipment

Downloads are available from: www.hwtma.org.uk/educatorsguide

Background

This section covers how we look at the past and how historians and archeologists form interpretations about the past. It explores some of the language and concepts commonly used by historians and archaeologists and provides some fun activities along the way!

Timelines

Timelines are popular educational tools that help people understand the passage of time, chronological relationships and history. Check out the following timeline resources.

Activity

KS2/3/4

Objective: develop chronological understanding through timelines.

Follow the suggestions and use the resources on this page to look at existing timelines. Encourage students to create their own timeline spanning their whole life, several generations of their family or an even longer period of time.

View existing timelines

Search online for 'bbc history timeline' - timelines on subjects of archaeology, British history and world wars.

Make your own timeline

Useful free online timeline creators can be found by searching for: 'teachnology timeline' and 'timerime timeline'. As new resources frequently become available, a search for 'free online timeline maker' is advised.

Download the Timeline template and create your own paper timeline.

This timeline is available as a full-colour fold-out in HWTMA's children's activity book *Dive into History, Dig into Dredging*, available from HWTMA: www.hwtma.org.uk/childrenspublications

Hampshire & Wight Trust for MARITIME Archaeology

Interpretation: types of evidence: Part 1

Archaeology: it's rubbish!

History: it's all in the past!

Historians and archaeologists both study the past. The difference between them is in the type of evidence they use.

Historians study **documentary evidence** to form their conclusions about the past.

Archaeologists primarily use **artefacts** to form their conclusions about the past.

Archaeologists also study **ecofacts.**

Documentary evidence:
Written or paper-based evidence plus photographs, film and sound recordings.

Artefact:
Something that has been made or altered by a human being.

Ecofact:
A natural object, not made or altered by a human being, that can provide information about how humans lived. For example a sea-shell found on an inland site might tell us that people had been to the coast and brought back a shell. Plant seeds, pollen and animal bones are other examples of ecofacts.

The following pieces of evidence have been found relating to a ship that sank in 1940. See if you can put each item into the correct category in the form below**: button, animal bone, animal bone with butchery marks, piece of string, grass seed, film footage showing the sinking of the ship, an interview with a survivor recorded the day the ship sank, WW2 ration card, a modern documentary about the sinking of the ship, pollen, stone hand axe, tree branch, worked timber with tool marks, dung beetle.**

Documentary Evidence	Artefact	Ecofact

Sometimes things are discovered on archaeological sites that can be very hard to explain. From the list above of types of evidence relating to a ship which sank in 1940, which items seem out of place to you? How might they have got there?

Interpretation: types of evidence: Part 2

Evidence about the past can also be split into **Primary Evidence** and **Secondary Evidence**:

Primary Evidence:
Original materials that were created at the time of the event or period being studied.

Primary evidence isn't distorted or filtered by interpretation.

Secondary Evidence:
Something that was created after the event, for example an account, commentary or discussion of evidence.

Secondary sources of evidence often refer to information originally presented elsewhere.

A ship called *Felix* was wrecked on 20th May 1860 in the Solent, UK. Put a tick, or colour in the correct box in the table below to show what sort of evidence each item is. The first one has been done for you:

NB Most types of evidence in the list below can have ticks in two boxes!

Type of Evidence	Primary	Secondary	Artefact	Documentary	Other
Button from crew member's jacket (found on the wreck in 2011)	✔		✔		
Pocket watch belonging to passenger (found on the wreck)					
Receipt for purchase of a book (found on the wreck)					
Book about the wrecking of the ship written in 2008					
Letter from passenger to mother (owned by mother)					
Photograph of passenger on the ship (found on the wreck)					
Photograph of passenger taken in 2009					
Ticket for passage on the ship (found on the wreck)					
Barrel of wine (found on the wreck)					
Sack of grain (found on the wreck)					
Piece of coal (found on the wreck)					
Newspaper article about the wrecking from 20th May 1860					
Photograph of the ship taken in 1859					
Sound recording of survivor speaking about memories (2009)					
TV programme about the sinking made in 2004					

You can find more information, fun stuff and test what you have learnt by searching online for 'what is history'.

What is Archaeology?

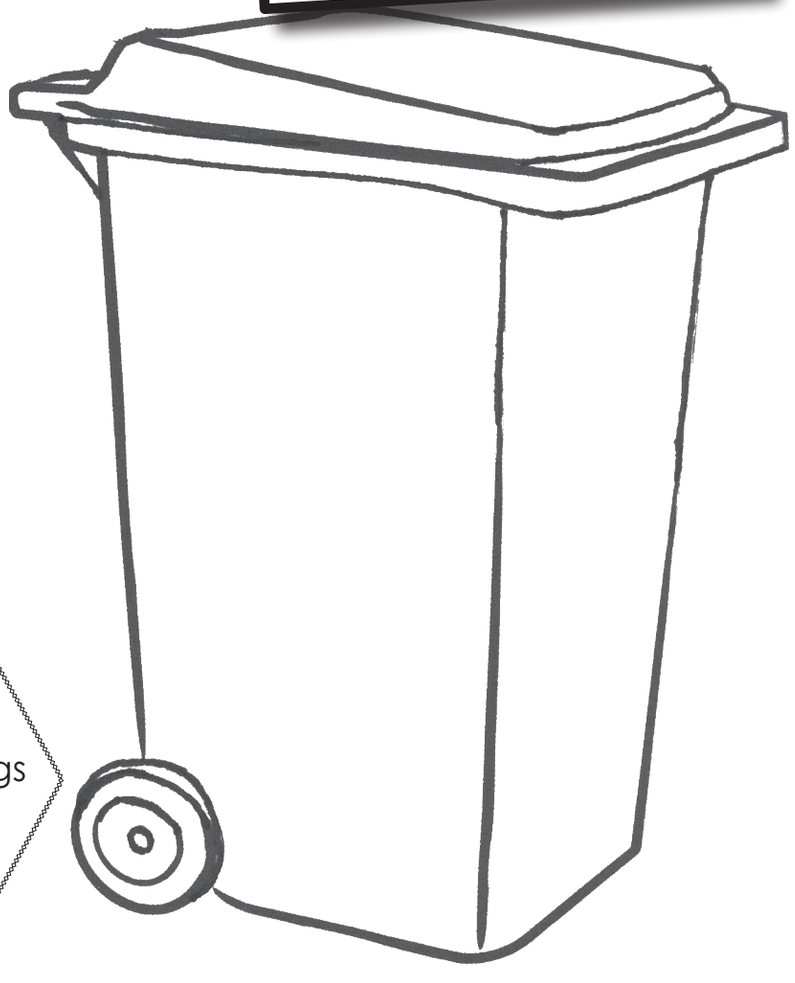
Archaeologists look for 'things' that have been left behind by people in the past. These 'things' can be very large, like a building or monument, or very small, like a coin or button. Anything made, or changed in some way by a human being is called an **artefact**.

By looking closely at **artefacts**, archaeologists can discover how people made and used them and this can tell us how people lived in the past. While archaeologists are often looking at artefacts, It is *people* that archaeologists are really interested in.

Artefact:
Something that has been made or altered by a human being.

Archaeology is rubbish!

More often than not, archaeologists are looking at rubbish; things that people have accidentally lost or deliberately thrown away.



What would an archaeologist in the future be able to work out from the things you throw away?

Activity
KS2/3/4
Using the empty wheelie-bin, try and list or draw all the things that you and your family throw away during a week.

Archaeologists in the future will look at my family's rubbish and think that:

What is Maritime Archaeology?

Archaeologists usually specialise in a particular area (geographical location) or time (chronological period). Maritime archaeologists , however, specialise in anything that's wet (or damp)!

This can include sites that are under water or close to water. Sometimes, however, the sites aren't even wet or close to water anymore. For example, ship remains have been found in the middle of city centres, where there used to be a river or coastline that has long since been buried due to land reclamation.

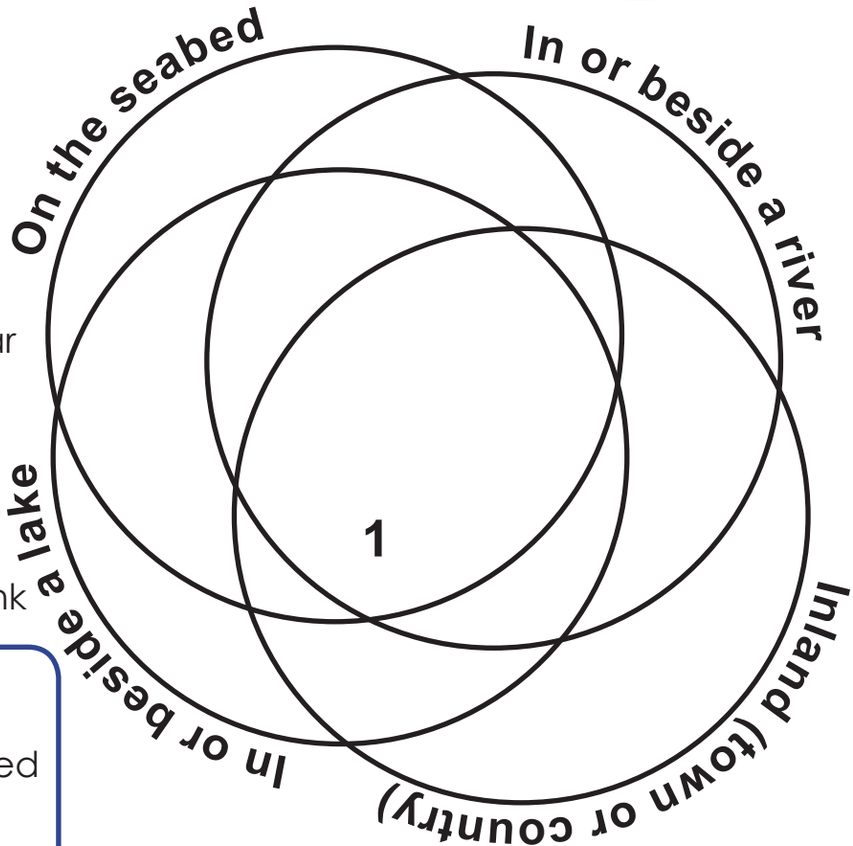
Land reclamation:
When new land is created on areas that used to be sea or river beds.

Search online for:
1) 'Newport Ship' to find out about the 15th century ship found in the city of Newport.
2) 'Dover bronze age boat' to learn about the 3,550 year old boat found in the town of Dover.

Maritime archaeologists can find themselves investigating lots of different types of archaeological site. Take a look at the list of site types below and think about where you might find such a site. Put the number of the site type into the correct place on the venn diagram.

Site Types

1. Crashed aircraft
2. Shipwreck
3. Abandoned ship/boat
4. Ancient settlement
5. Fish-trap
6. Port buildings
7. Hoard of coins or similar
8. Human remains
9. Jetty/wharf
10. Ship burial
11. Rubbish pile (midden)
12. Artificial pond
13. Second world war tank



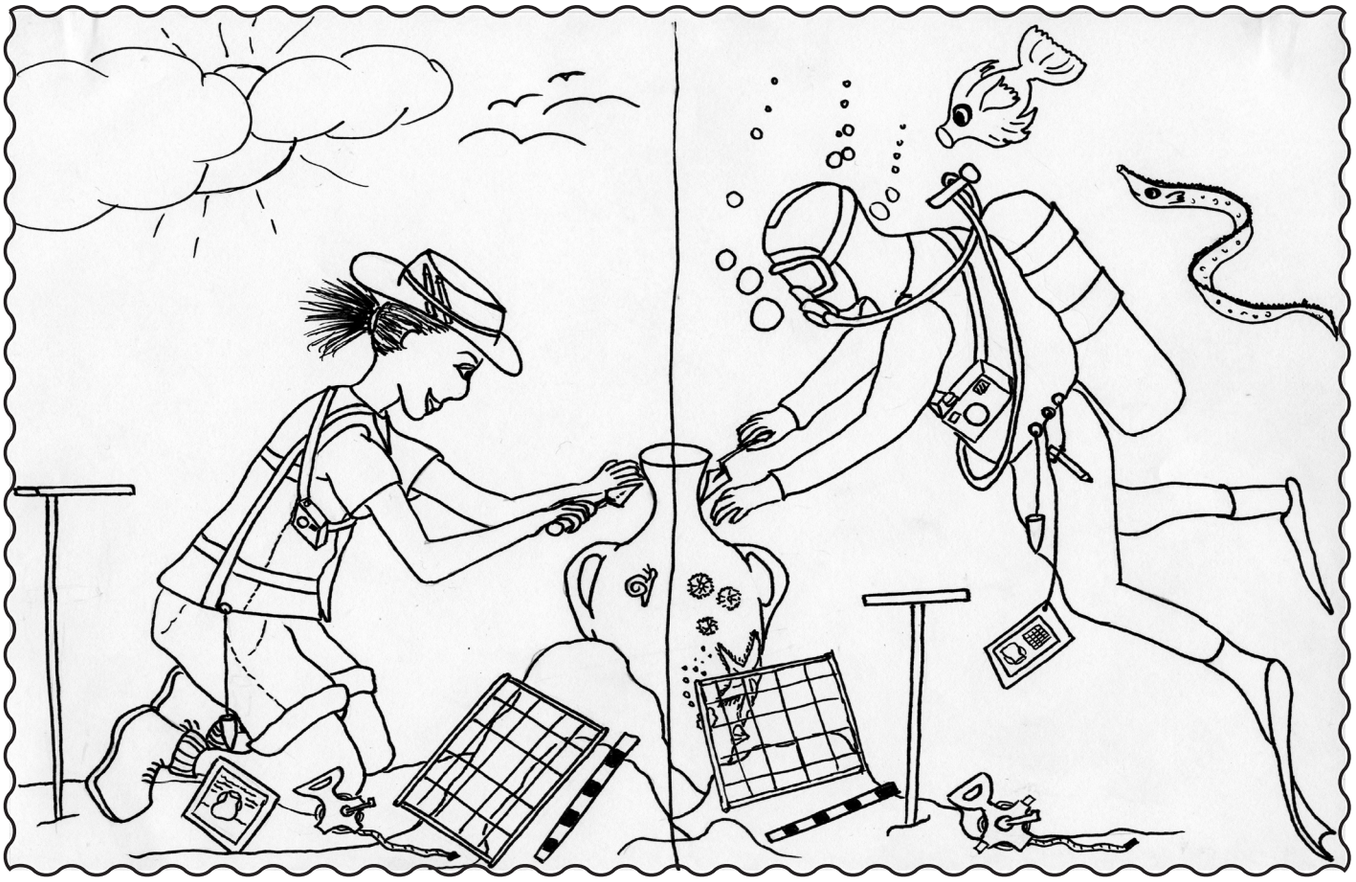
Where is maritime archaeology?
As you've probably figured out from this exercise, maritime archaeology can be found just about anywhere!

Photocopy me! Photocopy me! Photocopy me!

Tools of the trade

Archaeologists, whether working under water or on land, use many of the same tools. The pictures below show archaeologists working under and above water. Can you match the descriptions to the equipment in the picture?

- **Scale Pole**
  Divided into equal sized sections for example every centimetre, to show the size of something when it is photographed.
- **Camera**
  For making a photo record of your site and discoveries.
- **Pencil**
  For writing notes and drawing plans.
- **Auger**
  A 1 meter hollow tube attached to an extendable metal pole that is pushed into the ground to collect core samples of earth for environmental study.
- **Tape measure**
  For measuring size, length and distance of items and areas.



- **Planning Frame**
  Divided into equal squares (usually 10cm^2) to enable rapid drawing of features.
- **Trowel**
  Small tool for carefully excavating mud off an object or area.
- **Drawing board & paper**
  For writing notes and drawing plans. The underwater version is similar to tracing paper and is commonly called permatrace.

Challenge!

A more challenging version of this worksheet is available from HWTMA's website at: www.hwtma.org.uk/educatorsguide

Science & Technology

Page	Description	Photocopy Me!	Activity	Download	WWW links
14	**About this Section**				
	DIVING TECHNOLOGY				
15	**What and how does a diver breathe under water?**		✔	✔	
	Introduces cylinder/tank, regulator, compressed air				
16	**What does a diver see under water?**		✔		
	Introduction to how water affects light and colour				
17	**How does a diver move under water?**		✔		✔
	Introduces buoyancy, Archimedes Principle & SCUBA equipment				
	MARINE GEOPHYSICS TECHNOLOGY				
18-20	**Acoustic (sound) survey techniques**		✔		✔
	Introduction to Side-scan Sonar survey Introduction to Swath Bathymetry survey Introduction to Remotely Operated Vehicles (ROVs)				
	Top 3 links:				
A	See Tools of the Trade Photocopy Me! worksheet (Page 12)	✔		✔	✔
B	Use the *Invincible* online GIS platform (see Page 23)		✔		✔
C	See more bathymetry images on Page 31				✔

About this section: Science & Technology

This section is about:

Engineering
Technology **Science** ICT
APPLICATION
Solutions
Geography

It provides an introduction to:
- The underwater environment
- Diving physics
- Acoustic (sound) survey techniques
- Underwater remotely operated vehicles

The following concepts are introduced:
- Buoyancy - Archimede's Principle
- Refraction
- Survey techniques
- Geographical Information Systems (GIS)

Downloads are available from: www.hwtma.org.uk/educatorsguide

Background

Extracting information from underwater environments can be difficult and costly. However, given the right conditions, underwater environments can result in excellent preservation, particularly of materials that often do not survive well on land sites. This is one of the reasons that underwater archaeological sites and finds can provide a unique and invaluable contribution to our knowledge of the past.

A range of underwater search techniques and equipment are used in maritime archaeology. Many have either been adapted from equipment and approaches used on land sites, or adopted from other disciplines and industries, such as offshore oil and gas. This chapter explores technology and innovation through methods, technologies and equipment which are vital components of maritime archaeology.

What and how does a diver breathe under water?

To survive under water a diver needs to be able to breathe. To enable this divers either use equipment where the air is supplied from the surface, via hoses (surface supplied diving), or SCUBA equipment. SCUBA stands for Self Contained Underwater Breathing Apparatus but that acronym has become so familiar, scuba is now a word in its own right, meaning equipment for diving comprising a cylinder (tank or bottle) of air with breathing apparatus attached.

TANK

The SCUBA tank or cylinder contains normal air, just like the air we breathe on the surface. The only difference with the air in the tank is that it has been filtered to remove any impurities and also compressed. When the air is compressed it removes any water, which prevents the tank from rusting. As a result, when the diver breathes the air in the tank, it feels very dry and can cause dehydration if you're not careful.

COMPRESSION

The air in a scuba tank is compressed. If it wasn't compressed a diver would have to carry an enormous (too big to move!) tank around with them! When you open the valve at the top of a tank, the air in the cylinder, being compressed, is under pressure and comes out very quickly (and noisily!). For this reason a diver needs a **Regulator,** that regulates the speed at which the air comes out. The regulator ensures that the air comes out of the cylinder at an appropriate rate for the diver to breathe.

REGULATOR

The Regulator is made up of two separate but equally important parts.

The first stage of the regulator is attached to the diver's air tank, its most important job is to transform the high pressure compressed air that is trapped inside the tank to slower-flowing air that the diver can breathe. The first stage is connected to a second stage with a hose.

The second stage of the regulator is what the diver has in their mouth. When the diver breathes in, a valve opens and gives the diver as much air as they need. When the diver exhales the valve is closed and no air can escape from the tank . When a diver breathes out, the air that was in their lungs comes out as bubbles on the side of the mouth piece and rises to the surface. The second stage valve is called an on-demand valve as it only supplies air when the diver demands it (i.e. when they breathe in).

Activity

KS2/3/4

Objective: to see, feel and develop an understanding of the type of equipment required for breathing under water.

Friends, family or local dive clubs are often happy to bring their diving equipment for 'show & tell' type sessions. Feeling the weight of the equipment on land is a great introduction to discussing buoyancy.

Download the SCUBA Diving Equipment information sheet and worksheet at: www.hwtma.org.uk/educatorsguide

What does a diver see under water?

The human brain understands colour, light and distances by interpreting the reflection and bending of light.

Light waves behave differently under water compared to on land and this can result in a diver misjudging colour, size and distance under water.

Size and distance under water

As light passes from one medium to another (e.g. from air to water) it bends due to the different densities of each medium. This is called refraction. Before any light reaches the diver's eyes, it must first travel through the water and the glass and air in the diver's face mask. As the light transfers from one medium to the next, it bends (refracts).

This makes objects under water appear to be bigger and/or closer than they actually are. For example, an object that is 4 metres away may appear, to the diver, to be only 3 metres away. Alternatively the diver may judge the distance correctly but believe the object to be 25% bigger than it actually is. Each diver will interpret the refracted light slightly differently.

Activity

KS2

Objective: to recognise the effects of refraction.

Put a straw or pen in a glass of water and consider how the brain interprets what it sees. The part of the object submerged seems to be closer and bigger. How do you think this affects the diver's ability to work under water? Discuss...

Colour under water

When light from the sun enters water it is not able to penetrate very far. This is because water is more dense (compact) than air. Light is actually a spectrum of different colours and some colours are able to travel further through the dense water than others.

The first colour to disappear is red. Red disappears after only a few metres. The colours that can travel deepest are blue and green. In clear waters blue can travel down to about 40 metres.

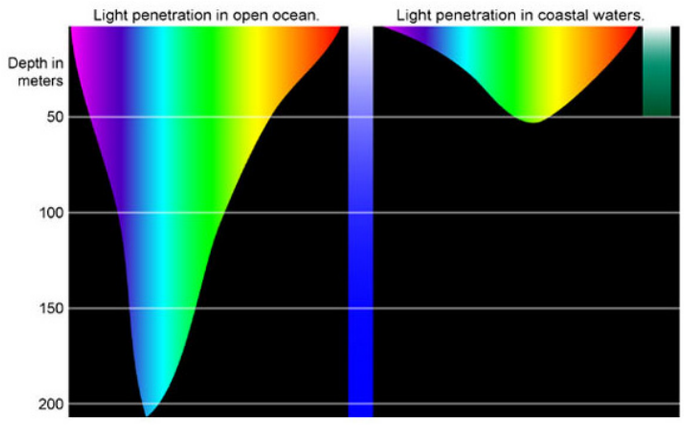


Image courtesy of NOAA

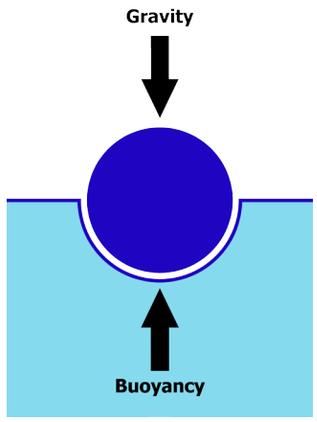
This means that when diving, red objects below 4 or 5 metres appear to be grey or black in colour.

Knowing how light and colour behave under water is particularly important when taking underwater photographs, especially in an archaeological context when it is important to capture as much detail as possible.

Diving photographers use extremely bright underwater torches so the true colours can be captured in a photograph.

How does a diver move under water?

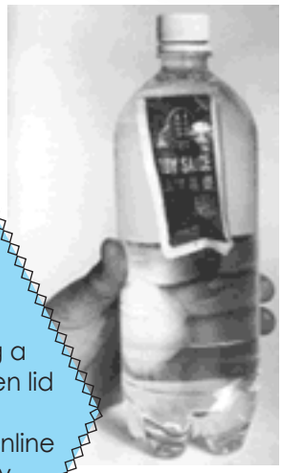
One of the essential skills a diver must master is to control their buoyancy under water. They do this by adjusting the amount of air in a special jacket called a Buoyancy Control Device (BCD). When air is added to the jacket, the diver goes up, when air is released from the jacket, the diver goes down in the water.



Buoyancy: the upward force that a fluid exerts on an object.

Archimedes Principle: Any object wholly or partly immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the object.

Subtle adjustments can be made to a diver's buoyancy by merely breathing in and out. As a diver breathes in, their lungs fill with air and the diver rises in the water slightly (as when air is added to the BCD). When the diver breathes out, air is expelled from the lungs and the diver sinks slightly in the water.



Activity

KS2/3/4

Objective: to demonstrate the principle of buoyancy.

Cartesian diver experiment using a large clear plastic drink bottle & pen lid (or similar):
Excellent resources are available online to guide you through this activity.
Search for:

'Cartesian Diver NOAA' or 'physics.org cartesian diver'

Fins

Divers wear fins (not flippers!) on their feet. These enable them to move around in the water by gently kicking their legs. The fins mean that the diver doesn't need to expend much energy to move under water.

Archaeologists working under water have an advantage over archaeologists working on land because they are able to float above the archaeology without damaging it!

Divers come in all different shapes, sizes (and densities!). When in the water some displace a significant weight of water and are positively buoyant, meaning they float. Others displace an amount of water that weighs less and they are negatively buoyant so that they would tend to sink. However, when wearing a wetsuit or drysuit (not to mention a tank full of air!) a diver will displace significantly more water. As the suit doesn't weigh much, the net result is that the diver becomes more buoyant.

Divers must therefore wear a weight belt to enable them to sink beneath the surface.

Typically a diver would wear between 4 and 12 kg of weight on a belt, depending on the size of the diver and the type of dive suit they're wearing.

Seeing beneath the waves

One of the challenges of working under water is the ability to see what you're working on. This is true both in terms of limited visibility over short distances as well as the problems associated with understanding what the seabed looks like over a large area.

While little can be done about limited visibility over short distances (here we are at the mercy of the elements), science, engineering and technology have helped overcome the second problem by developing a number of tools that enable us to 'picture' large areas of the seabed.

Such tools are used by a range of industries working in the marine environment, for example the offshore oil and gas industry, defence agencies, renewable energy industry, research and exploration and, of course, maritime archaeology.

These tools and approaches make an interesting educational case study incorporating science, technology and some very impressive looking images of the seabed and what can be found on it.

Acoustic (sound) survey techniques

Side Scan Sonar

A side scan sonar sends a fan of sound down to the seabed. When the sound pulses are returned from the seabed (this is called the echo) a side scan sonar calculates the strength of the echo. The strength of the echo depends on the material properties and shape of the seabed and anything lying on it. Rock, gravel, wood and metals reflect stronger signals than sand and silt and are therefore recorded as higher intensity areas on the sonar image.

Acoustic shadows occur alongside objects that stand proud of the seabed. They can provide important information about the shape and nature of an object on the seabed.

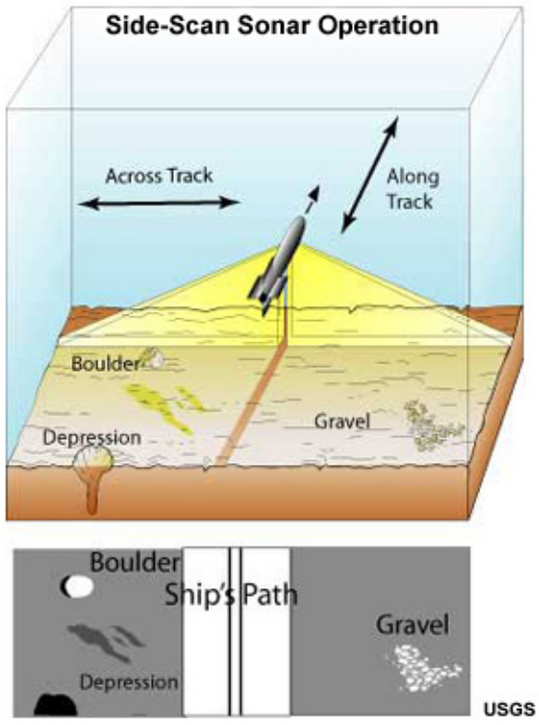


Image courtesy of COMET

A side scan sonar is typically mounted within a towfish which is towed behind a survey vessel as shown above.

Side scan sonar image of World War II bomber on the seabed. Courtesy of Wessex Archaeology

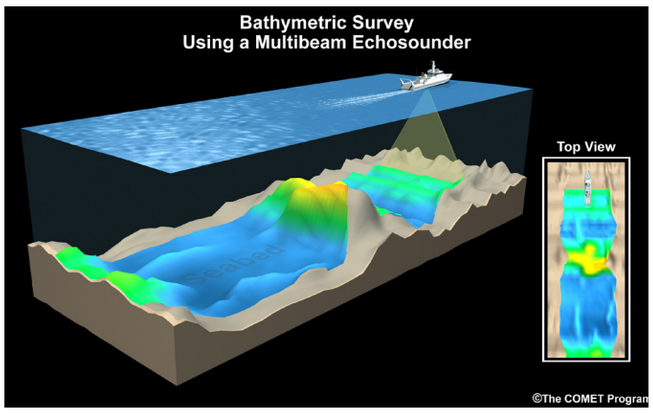
Acoustic (sound) survey techniques continued

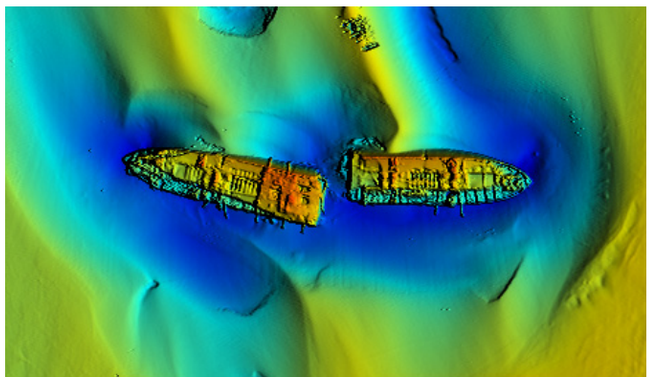
Bathymetric Survey

Bathymetry is the measurement of depth in water. A Bathymetric Survey will determine the profile of the seabed.

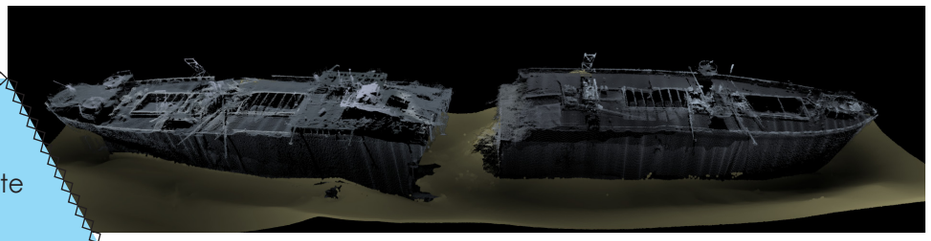
A multibeam swath system emits a swath (fan) of acoustic (sound) pulses in the form of a thin strip, below and to the side of a survey boat. It does this up to 50 times a second as the boat moves forward.

The pulses are returned from the seabed to the swath system providing information about the depth (bathymetry) of the seabed.





Top right: courtesy The COMET Project
Right: swath bathymetry survey of SS Montgomery *wrecked in the Thames Estuary in 1944.*
Lower right: sonar of SS Montgomery *survey from 2006. Courtesy the Maritime & Coastguard Agency.*



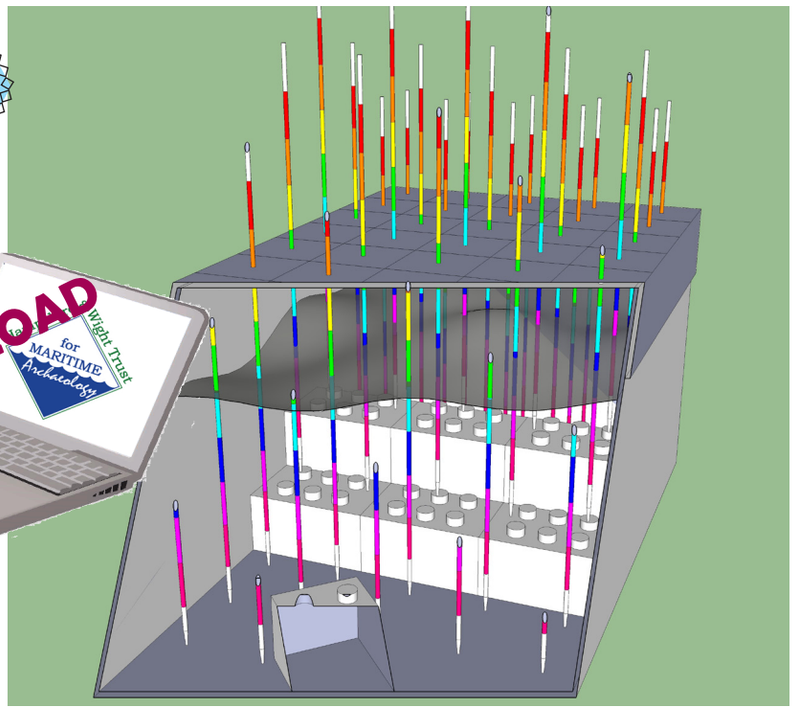
Activity

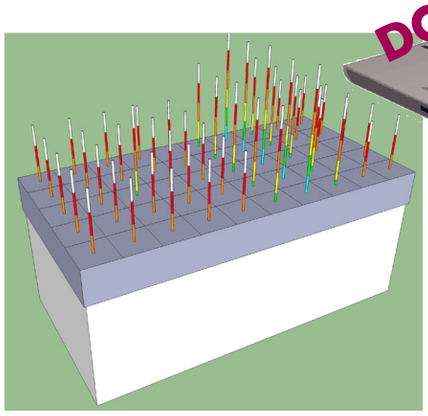
KS2/3/4

Objective: to demonstrate the principles behind bathymetric survey.

What you need: long kebab sticks with colour changes at every centimetre, shoe box with lid, graph-paper, steps made from lego, sand (optional).

What to do: see right and download full instructions.





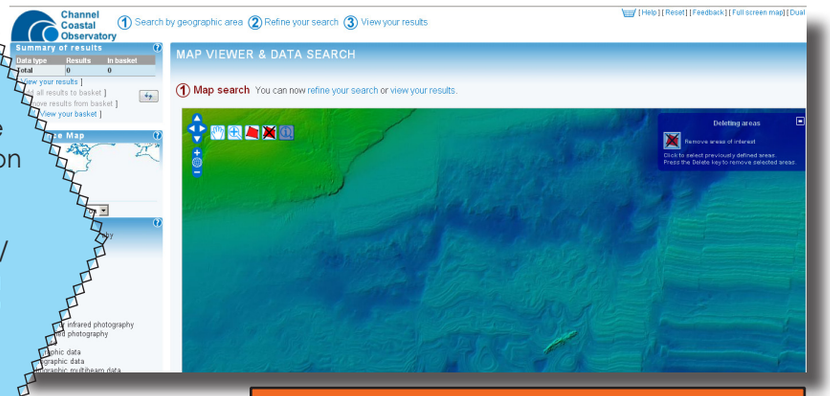
Acoustic (sound) survey techniques continued

Activity

KS3/4

Objective: navigate around bathymetric data using a free online Geographical Information System (GIS).

Go to www.channelcoast.org/
Click on 'Map Viewer & Data Catalogue' then 'View Maps'
Make sure the box next to 'Hydrographic (multibeam) data 2009' is ticked.
Zoom right in and pan around to explore!



There is a shipwreck on the seabed south of Durlston Point (south of Swanage, Dorset). Use an online map and the Channel Coastal Observatory website to help you find the wreck.

Activity

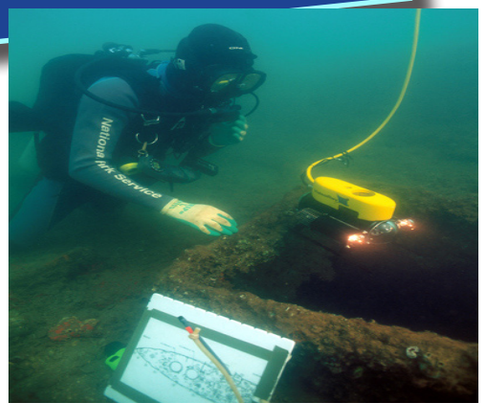
KS2/3/4

Objective: learn to recognise different types of survey image and the features they can reveal.

Search Google Images for:

1) 'side scan sonar shipwreck'
2) 'swath bathymetry'
(see page 17)

Find out about the wreck and how it relates to WWI by searching online for 'Kyarra Dorset'



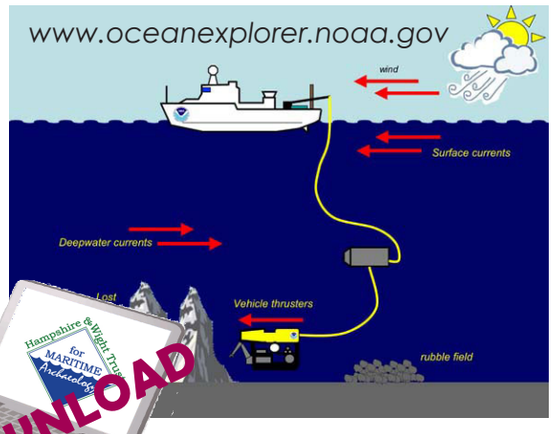
www.pastfoundation.org/Arizona

Remotely-controlled underwater explorers

Remotely Operated Vehicles (ROVs) are used to explore areas inaccessible to divers due to depth, size or temperature. A specially trained ROV pilot controls the ROV from on board a ship. Video cameras built into the ROV enables the pilot to see what the ROV 'sees'.

Interesting facts:

- The deepest an ROV has ever been is 6.8 miles!
- ROVs can be as small as a shoe box or as large as a house!
- A large ROV costs about £6 million!
- It takes 7 weeks of training to qualify as an ROV pilot.



Download the 'Design your own ROV' worksheet at:
www.hwtma.org.uk/educatorsguide

Enquiry & Investigation

Page	Description	Photocopy Me!	Activity	Download	WWW links
22	**About this Section**				
	Shipwrecks as time capsules		✔		✔
23	How shipwrecks tell stories and help us learn about the past.				
24	**Research Skills**	✔	✔	✔	✔
	How shipwrecks can form the focus of some great research projects. How to find a shipwreck close to you.				
25	Shipwreck Detectives Worksheet				
	Shipwreck Survey: maths in practice	✔	✔	✔	✔
26-28	Datum Offset Survey technique Trilateration Survey technique Planning Frame survey technique Shipwreck survey: Planning Frame worksheet				
	Top 3 links:				
A	Interpretation: types of evidence Part 1 & 2 (Page 8 & 9)	✔		✔	
B	Check out HWTMA's *Grace Dieu* animation for an overview of an archaeological site from creation, use, loss, discovery to protection. www.hwtma.org.uk/gracedieu		✔		✔
C	Climate Change section (Page 29 - 35)	✔	✔	✔	✔

About this section: Enquiry & Investigation

This section is about:

History ICT
Geography
Research Application
INVESTIGATION Maths

It provides an introduction to:
- Archaeological evidence & interpretation
- Research, enquiry and investigative skills
- Geometry
- Simple 2-dimensional (2D) survey techniques

The following concepts are introduced:
- Time capsules
- Local shipwreck research
- British colonisation & expansion

Downloads are available from: www.hwtma.org.uk/educatorsguide

Background

This section looks at a number of methods and techniques used in archaeology, both in the field and during desk-based research.

It shows how skills learnt at school are applied in the field and provides some exciting and engaging contexts within which to practise the use and development of such skills.

Shipwrecks as time capsules

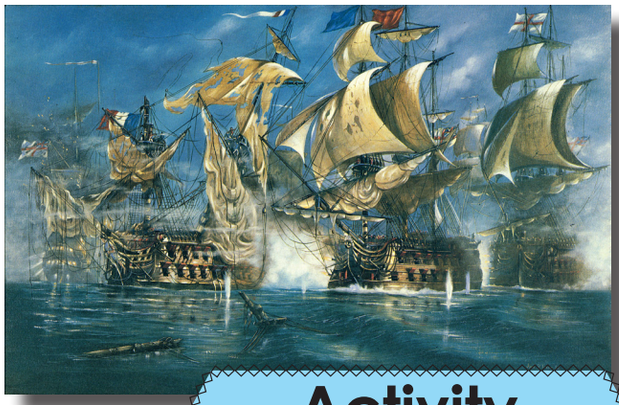
Shipwrecks provide unique sources of evidence for understanding our past, as they capture the single moment in time when the ship sank. When a ship sinks, it contains a contemporary collection of material from the ship's fittings, cargo, spares, equipment and galley items, to the clothes, food and personal possessions of the crew. Such collections of material are very rare in archaeology which usually involves digging up sites and material that people have discarded or abandoned. This has resulted in shipwrecks being compared to time capsules.

For these reasons, shipwrecks can provide a fascinating focus for cross-curricular work incorporating geography, history, economics, literature and lots of fun!

Despite the catastrophic nature of the wrecking process and the often dynamic environment under water, careful study of shipwreck sites by archaeologists can often reveal much about why and how a ship sank, its identity, last voyage and the lives and fate of the crew.

Case Study: HMS ***Invincible***

HMS *Invincible* was a French warship, captured by the British at the Battle of Cape Finisterre in 1847. The following year, having set sail from Portsmouth bound for Nova Scotia, a calamitous series of events resulted in HMS *Invincible* running aground on a sand bank in the Solent.



HMS Invincible

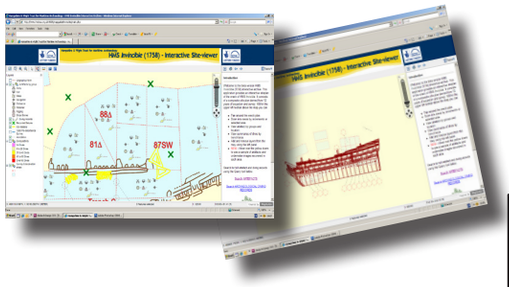
The wreck of Invincible was rediscovered in the 1970s since when it has been the object of an extensive excavation and research project by a small and dedicated team of enthusiasts. The fascinating story of *HMS Invincible* and a digital version of the archaeological archive are freely accessible online.

An interactive site viewer enables a budding maritime archaeologist to undertake a virtual tour around the archaeological plan of the site, seeing where the divers excavated and discovered artefacts and zooming in to view images of some of the amazing finds.

www.hwtma.org.uk/HMSInvincible

Artefacts to look out for:

Leather hat, waistcoat, military buttons, tar covered rigging, leather bucket, wooden tankards, square plats and bamboo writing set.



Activity

KS2/3

Objective: create a time capsule to use as a discussion point about understanding material culture.

What you need

A good plastic, wooden or metal box, lots of everyday items to put inside the box.

What to do

Discuss what items would most accurately represent day-to-day life for your students. Put the items (or laminated pictures of the items) in the box. Bury your home made time capsule in the school grounds and then decide on the day it is going to be uncovered (a month, a year, 5 years, 25 years later). Ask the students who are uncovering it to imagine they are archaeologists. What can they deduce from the contents of the time capsule?

Research Skills

Research skills are an essential component of many jobs, hobbies and pastimes. The following case study provides an opportunity to develop research skills by looking at the circumstances surrounding a shipwreck. Through their research, the budding archaeologist/historian will make some fascinating discoveries about colonisation, survival and history on a global scale.

Background information

A shipwreck was discovered in the sea off Bermuda in 1958 which was identified as the *Sea Venture*. The *Sea Venture* set sail with 6 other ships from Plymouth, destined for North America on June 2nd 1609. It was taking desperately needed supplies and people to the struggling British colony in Jamestown, Virginia.

In July 1609 the *Sea Venture* was hit by a very bad storm and began to take on water. After several exhausting days the ship was deliberately run ashore off Bermuda with the result that all 150 people on board survived. The survivors built two small ships from local timber and what could be salvaged from the *Sea Venture*. In May 1610 the remaining survivors arrived in Jamestown, only to find the community, greatly reduced and on the brink of starvation.

Bermuda is Britain's oldest remaining British overseas territory. This is a direct result of the wrecking of the *Sea Venture* and three British *Sea Venture* survivors who were found on Bermuda in 1612. ***See related activity on page 25.***

Coat of Arms of Bermuda featuring the wrecking of the Sea Venture

In 1610 William Strachey wrote a personal account of the Sea Venture's wrecking which is available online in the original and modern-language versions. Search for 'William Strachey'.

Strachey's account of the sinking of the Sea Venture and subsequent survival of its passengers is said to have been the inspiration for Shakespeare's *The Tempest*.

Find a local shipwreck

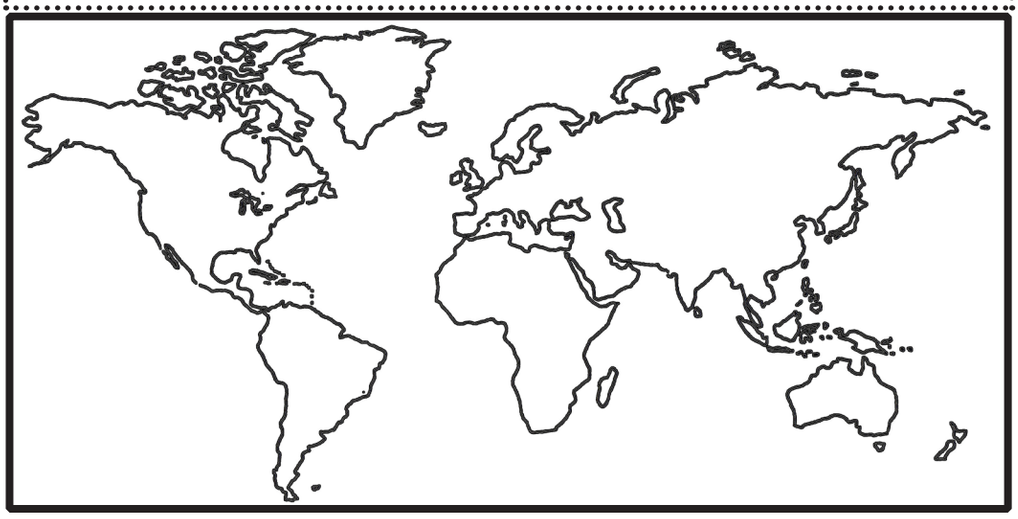
Pastscape is a website which lets you search the National Monuments Record, English Heritages's public archives comprising 400,000 records of archaeological sites in England and its territorial waters. You can search Pastscape for a shipwreck near you by doing an Advanced Search. Specify the County and District of interest and set the following criteria:
Search Themes: Maritime
Specific Monument Type: wreck
You can also set a date criteria if you are interested in wrecks from a certain period.
Have fun searching!

www.pastscape.org.uk

Hampshire & Wight Trust for MARITIME Archaeology

Shipwreck detectives!

A shipwreck was discovered in the sea off Bermuda in 1958.



Use an atlas, library books or an online map to help you mark Bermuda on the world map.

The Bermudan shipwreck was identified as a ship called the *Sea Venture*. Search online to see if you can find the answers to the following questions:

Where did the Sea Venture leave from?

When did the Sea Venture leave?

Where was the Sea Venture going?

Why was the Sea Venture going there?

When did the Sea Venture get shipwrecked?

Why did the Sea Venture get shipwrecked?

How many of the people on board survived the wrecking of the Sea Venture?

What happened to the survivors of the Sea Venture?

Shipwreck Survey: maths in practice!

Archaeological survey involves using simple measuring and geometry techniques to produce a scale drawing/plan of a physical site. These simple 2-dimensional (2D) survey techniques can form the basis of some fun and interactive sessions involving maths, teamwork, recording and communication skills.

Archaeological survey is extremely important. An accurate site plan enables us to understand chronological and geographical relationships between groups of material and build up a picture of how the site was created, used and lost or abandoned. By repeating a site survey at a later date archaeologists can monitor change and establish measures to help preserve a site. If a site is destroyed, the archaeological site plan may be the only remaining evidence and on its own can provide a great deal of useful information. Full instructions and downloadable recording forms for the following are available at: www.hwtma.org.uk/educatorsguide

Datum Offset survey

The Datum Offset survey method is based on simple geometry involving right-angle triangles.

Creating the "archaeological site"

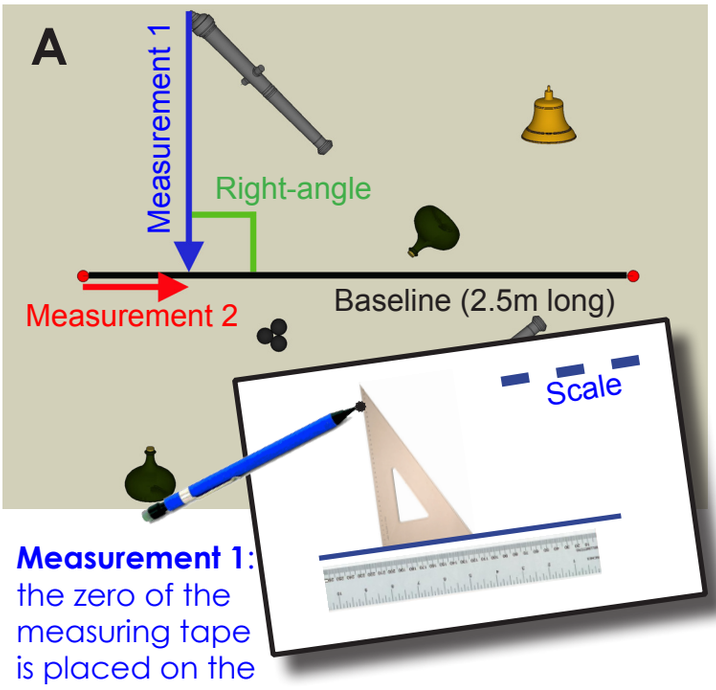
Place a group of artefacts on the floor as indicated in diagram A. Lay a baseline through the centre of your site. The baseline can be a steel tape, an ideal length for the baseline is 2.5m.

Activity

KS3/4

Objective: understand geometric concepts through Datum Offset & Trilateration survey.

What you will need:
Baseline: steel tape (2cm width stands up nicely on its own).
1 x 5m measuring tape
Artefacts (objects)
Recording forms.



Measurement 1: the zero of the measuring tape is placed on the point being surveyed (in diagram A, the rear end of the cannon). The measuring tape is extended down to the baseline so that it crosses the baseline at an angle of exactly 90 degrees. The measurement (end of cannon to baseline) is read off the tape and recorded. Measurement 2: from the zero end of the baseline to the point on the baseline where the previous tape crossed it (see A).

Use a flexible tape measure for taking the survey measurements. For each point surveyed, two measurements are taken (see diagram A).

Drawing up

These measurements are then reproduced at an appropriate scale on a piece of paper. If you have a 2.5m long base line and use a scale of 1:10 (1cm on paper = 10cm on site) the baseline will be 25cm long on the drawing, which fits nicely on a piece of landscape A4 paper. Use a ruler and a set square to plot the survey points as shown.

Continuing the survey

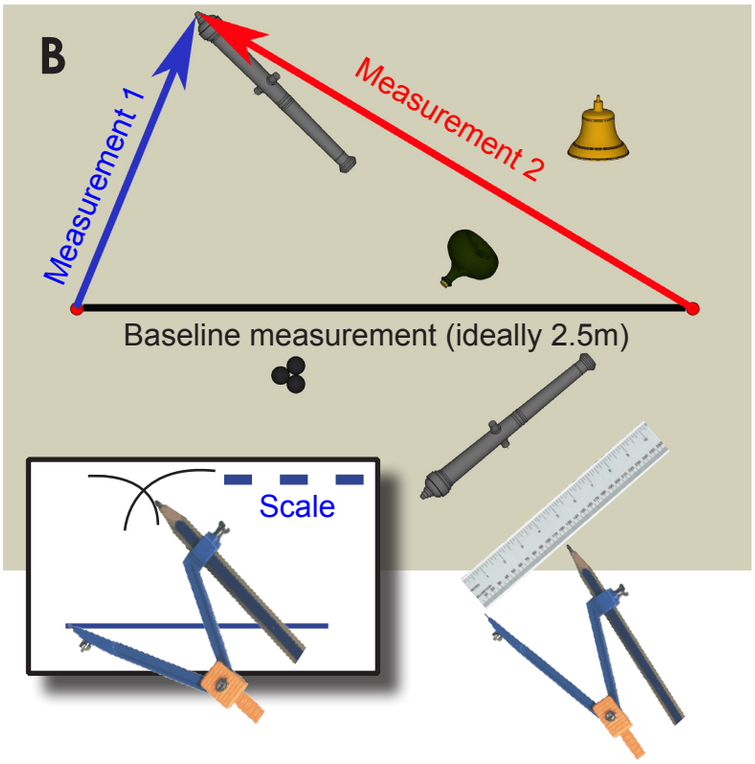
The number of points surveyed will depend on what research questions the survey is trying to answer. For a very rapid basic survey, a single survey point indicating the middle of each artefact may suffice. For the site in diagram A, the orientation of the cannon may help determine the layout of a ship. To survey the cannon's orientation, a minimum of two points on the cannon must be surveyed, i.e. the front and rear end.

Trilateration survey

The Trilateration survey method is based on simple geometry involving obtuse triangles. Set up an "archaeological site" and baseline as indicated for Datum Offset survey method.

With the trilateration method, the baseline forms the base of a triangle and the length of the baseline must be known. To keep the scale calculations simple, a baseline of 2.5m is ideal.

For each point surveyed, two measurements are taken, one from each end of the baseline (as shown in diagram B).



Drawing up

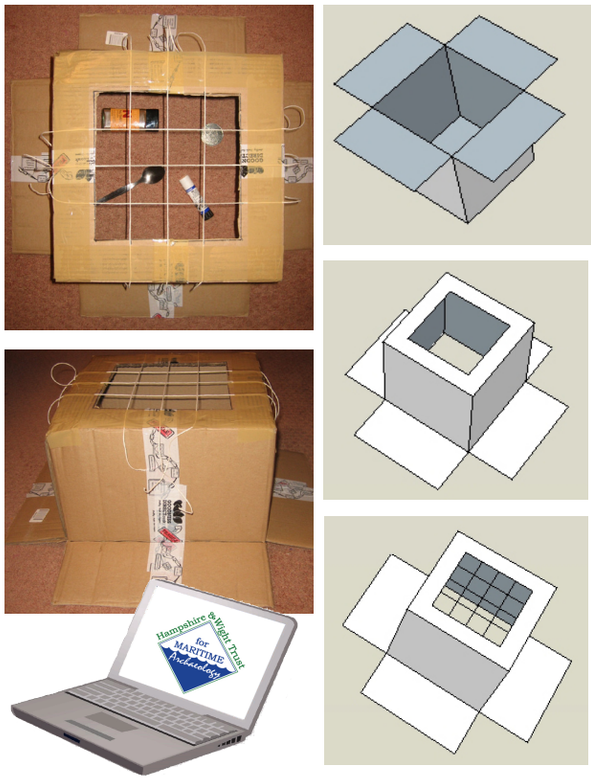
Using a scale of 1:10 use a set of compasses to reproduce Measurement 1 to scale (e.g. 1cm on paper = 10cm on site). With the compass point on the end of the baseline, draw a small arc on the page. Repeat for Measurement 2. The two arcs intercept on the paper at the point that has been surveyed.

As with the Datum Offset survey, the number of points surveyed will be dictated by the nature of the research questions the survey is attempting to answer (see **Continuing the survey** Page 26).

Planning frame survey

A planning frame is a square frame, sub-divided into a grid of smaller squares. A planning frame is placed over an area of a site and the archaeologist draws what they see in each square, onto a paper-version of the grid. It is a fast and simple way to produce an accurate, scale drawing, particularly useful for small collections of artefacts or features.

It is important that the archaeologist is looking directly down onto the planning frame to avoid parallax error, so working with Planning Frames is an excellent way to introduce this subject. To find out how archaeologists overcome issues associated with parallax error in the field, use the search box on: www.hwtma.org.uk and type in 'parallax error'.



Make your own planning frame in 20 mins. Full instructions at: www.hwtma.org.uk/educatorsguide

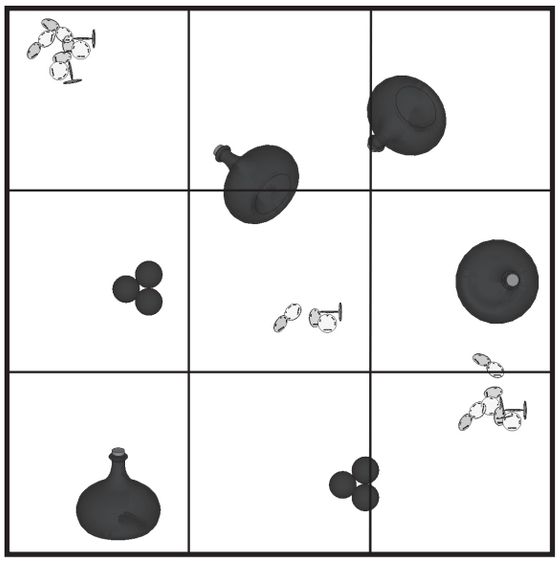
Enhance these activities with a roll-out shipwreck! Search: www.hwtma.org.uk for 'roll out shipwreck'. You can also search for more maths activities there!

Hampshire & Wight Trust for MARITIME Archaeology

Shipwreck Survey!

Planning frame

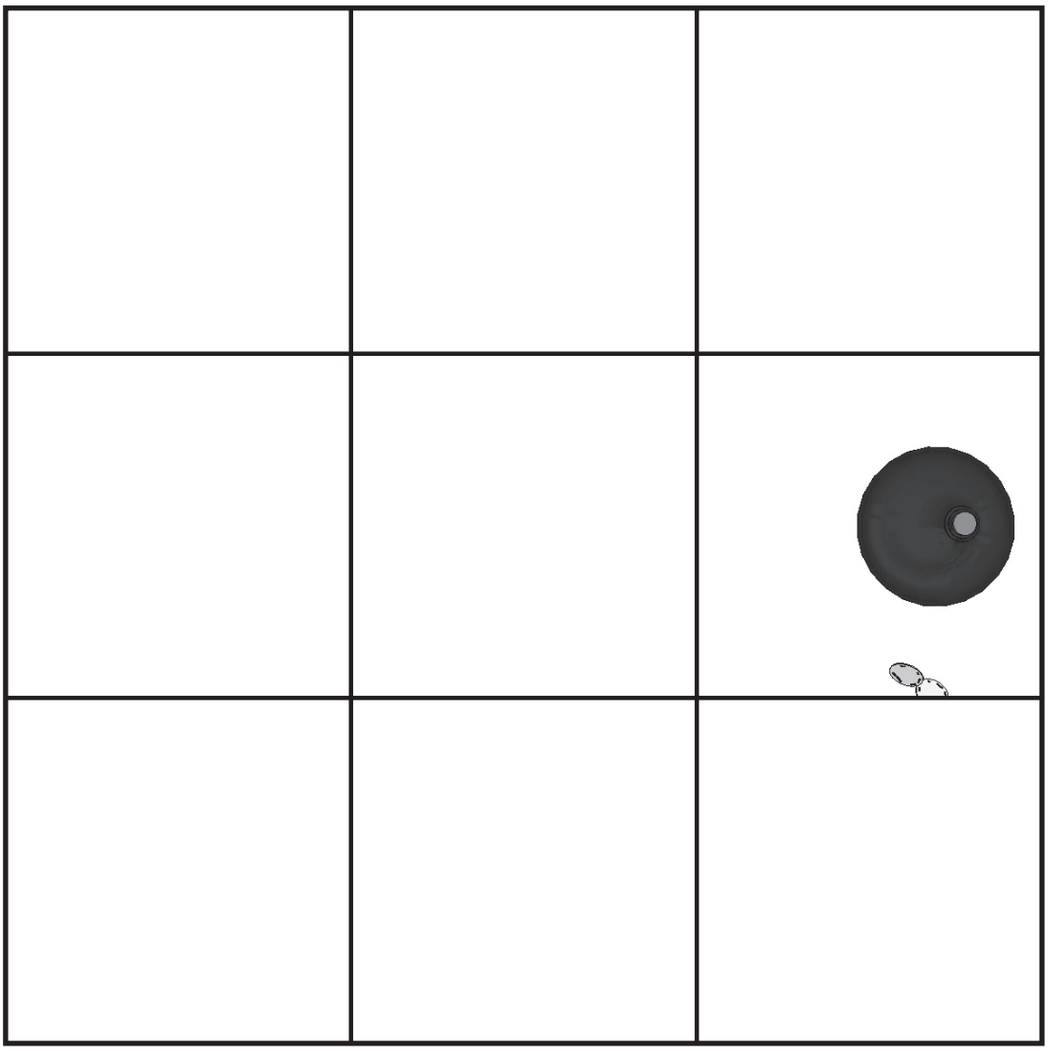
A planning frame helps archaeologists produce a scale-drawing of a small area, quickly and accurately.



The archaeologist places the planning frame over an area (for example a small collection of objects). Using a paper version of the planning frame grid, the archaeologist then draws what they see in each of the squares.

The archaeologist MUST look directly down on to the planning frame from above and maintain this viewpoint the whole time. This is to avoid parallax error.

See if you can plan the artefacts (left) onto the grid below.



Climate Change

Page	Description	Photocopy Me!	Activity	Download	WWW links
30	**About this Section**				
31	**Climate Change: past, present & future**		✔		✔
	Introduces that fact that climate change is not a new phenomenon				
32	**Prehistory under the sea**	✔		✔	
	How archaeologists are shedding light on prehistoric climate change				
33	**Submerged prehistory: Bouldnor Cliff case study**		✔		✔
	How prehistoric climate change can help us understand current and future environmental changes.				
34	**Discovering prehistory worksheet**	✔		✔	
35	**Spot the difference worksheet**	✔		✔	
	Top 3 links:				
A	Types of Evidence 1 (Page 8)	✔		✔	
B	What is Maritime Archaeology (Page 11)	✔		✔	✔
C	Explore underwater landscapes online. See Activity at the top of Page 20.		✔		✔

About this section: Climate Change

This section is about:

History Application
Climate change **Environment**
GEOGRAPHY Science

It provides an introduction to:
- Long-term climate change
- Prehistoric archaeology
- The Mesolithic period

The following concepts are introduced:
- Glaciation
- Changing sea levels
- Population movements
- Coastal change
- Early technology

Downloads are available from: www.hwtma.org.uk/educatorsguide

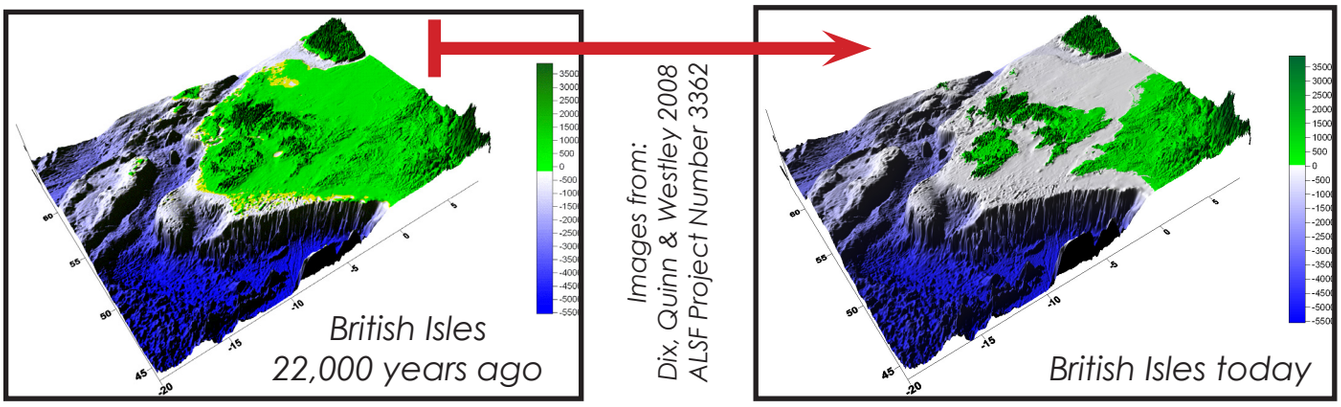
Background

Climate change is undoubtedly a hot topic but it's not a new one. This section shows how looking at past climate change can help us develop a better understanding of the implications and processes involved. This enables us to make informed choices for a sustainable future.

Climate Change: past, present and future

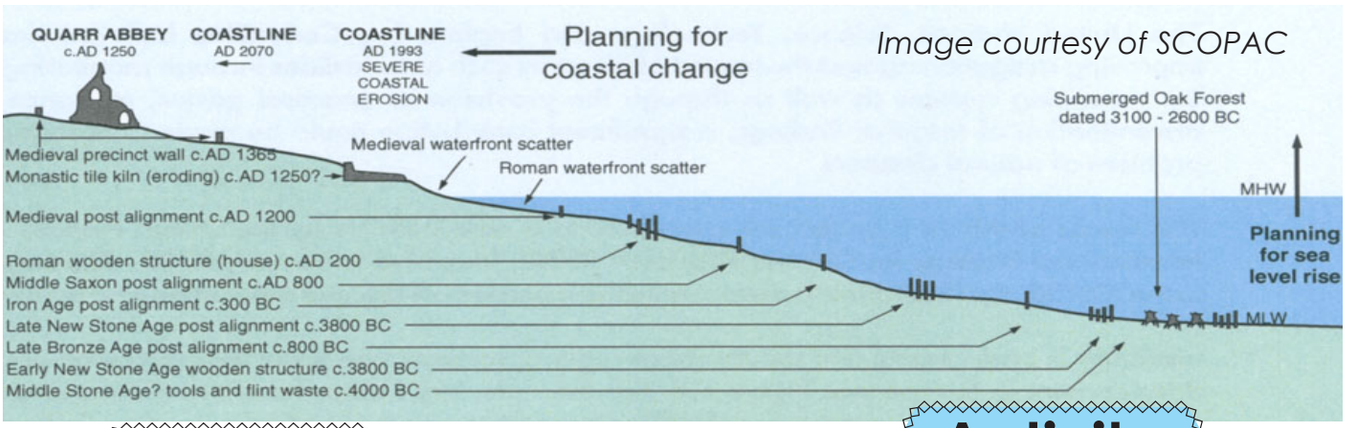
We can learn about climate change today and in the future by looking at climate change in the past. The images below show how Britain used to be joined to continental Europe during the Devensian glaciation (most recent ice age) when sea levels were approximately 100m lower than today's.

Approximately 8,000 years ago, the ice was melting and sea levels rose, creating the English Channel and the Solent.



For full sequence of images like those above, search online for: 'ads alsf 3362 theme 1' and see *Theme 1 Reconstruction sub-landscapes* (PDF) page 52 & 53.

Stone Age people lived close to water (exploiting it for food and transport). Each time the sea levels rose, populations had to pack up and move inland. Such movements can be traced in the archaeological record and provide a record of climate change in the past that can help predict the future.



Activity

KS2

Objective: think about how humans lived during the Stone Age.

'Surviving the Stone Age' is a short animation produced by children and well worth a watch! Search for 'Winchester how to survive the stone age animation'.

Activity

KS2/3/4

Objective: develop an understanding of climate change fluctuations since the time of the dinosaurs.

Check out the British Geological Survey website for their 'Climate Change Through Time' free lesson plans and resources! Search online for 'British Geological Survey climate through time'.

Hampshire & Wight Trust for MARITIME Archaeology

Prehistory under the sea!

From time to time, the most curious things are found under the sea, for example:

Can you guess what these are?

A) _____

B) _____

C) _____

Before the end of the most recent ice age (Devensian glaciation) Britain was joined to continental Europe and almost entirely covered by an enormous ice sheet. Sea levels were approximately 100 metres lower than they are today and what was to become the English Channel was a vast expanse of low-lying ground, riddled with fast-flowing rivers and inhabited by animals such as woolly mammoths.

About 8,000 years ago, the ice began to melt and sea levels rose, creating the English Channel and the Solent. The ancient river valleys where our ancestors used to live became submerged.

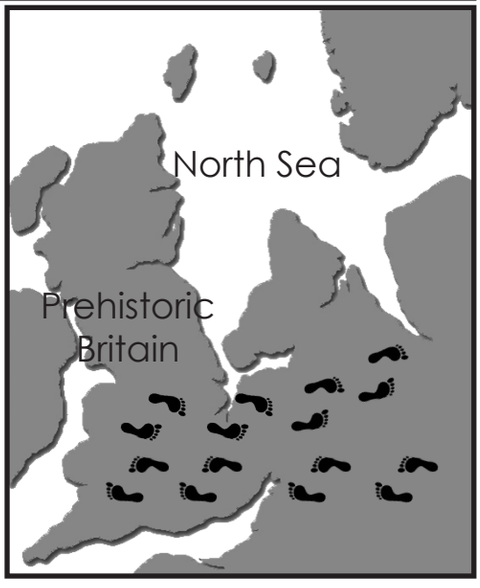
Sometimes, the submerged landscapes reveal clues about animals and people that used to live there. Clues like those shown above have been found by fishermen and dredgers extracting sand and gravel from the seabed for use by the construction industry.

Why do you think these things are found on the seabed?

_____

_____

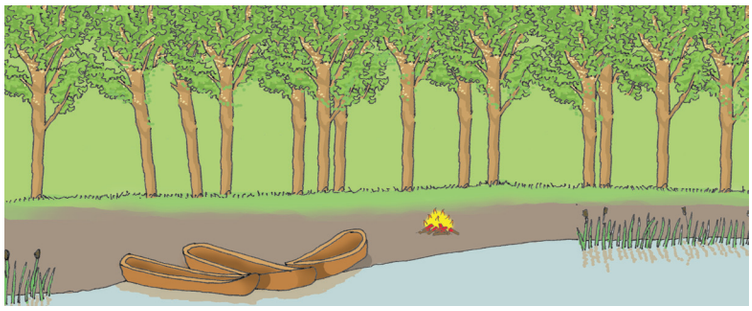
_____



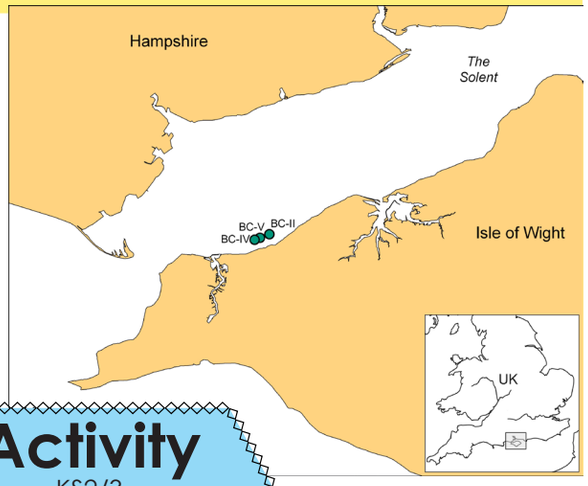
Answers: A) stone tools, B) Mammoth's tooth, C) Hippopotamus's skull

Submerged prehistory: Bouldnor Cliff case study

Approximately 12m metres below the surface of the sea, off the north-west coast of the Isle of Wight, a Mesolithic landscape (from about 8,000 years ago) is eroding out of the seabed. The site is gradually being swept away by natural processes and maritime archaeologists are working on this site to discover all they can before it disappears forever. Search online for 'Bouldnor Cliff' for further information.



Artist's impression based on archaeological evidence from Bouldnor Cliff site.
© Winchester City Council



Climate change: then and now

Bouldnor Cliff is significant not only because it can shed light on how our ancestors used to live but also as an indicator of prehistoric climate change.

The archaeological work at Bouldnor Cliff has revealed evidence of people using stone tools, string, working wood and roasting hazelnuts approximately 8,000 years ago. This site is now 12m below the surface of the water, providing a clear representation of the effects of climate change during that time. By considering how climate change and rising sea levels affected our ancestors and their environment, we gain a better understanding of the potential impacts of climate change in the future.

This message goes beyond simply presenting predictions of what could happen in the future by demonstrating that past climate changes had a dramatic effect on human populations and the way they lived and that modern changes are likely to have a similar impact on the way we live in the future.

Activity

KS2/3

Objective: develop an understanding of what influences where people choose to live.

Compare old and new maps. How many of our first settlements are near rivers, lakes and seas? Discuss why. Using local maps consider whether or not stone age people could have lived near you?

Check out the Teach Climate Change website for free teaching resources (searchable by Key Stage, Subject and Climate Change Category). Search online for 'Teach Climate Change Classroom Resources for Teachers'

Assessing the Evidence

From large pieces of worked wood to the tiniest grains of pollen, maritime archaeologists are able to build a picture of life at Bouldnor Cliff in the Mesolithic period, 8,000 years ago. The Photocopy Me! worksheets on pages 34, 36 and 37 look at some of the evidence and what it can tell us.

Activity

KS2/3

Objective: develop an understanding of the limitations and opportunities of Stone Age technology and the environment.

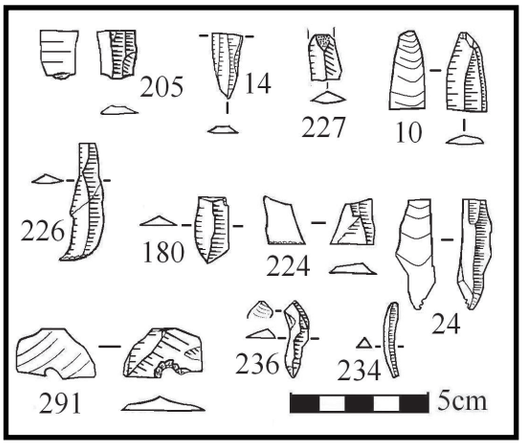
Search online for 'stone age bread recipe'. Discuss what stone age people would use in place of kitchen utensils. Compare results with modern bread in a taste test.

Discovering Prehistory

The famous maritime archaeologist Professor Archie O'Logy and the Hampshire & Wight Trust for Maritime Archaeology (HWTMA) have been working on an underwater site that is 12m deep in the Solent, off the north coast of the Isle of Wight.

The site is called Bouldnor Cliff and dates to the Mesolithic period (that's about 8,000 years ago!).

During his work the Professor has made some amazing discoveries. What do you think these things could tell us about the site and what people may have been doing there in the Mesolithic period, 8,000 years ago?



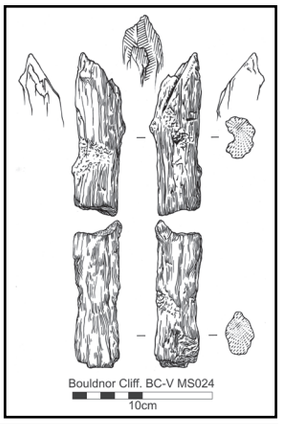
Stone Tools - worked flints have been found on the seabed at Bouldnor Cliff. The first one was found when a diver was watching a lobster digging a hole in the seabed. The diver noticed that the material the lobster was excavating included worked flints.
A lobster archaeologist! (HWTMA's first Crustacean volunteer!).

Some of the worked flint seems to have been burnt, why might this be do you think?

This could tell us: _____

_____

Worked wood - the marine silts of the Solent have resulted in excellent preservation of wood at Bouldnor Cliff. It is even possible to identify tool marks on the wood which show how the wood was cut and formed!



This could tell us: _____

_____

Nuts and plants - plant and small animal remains have been found on the site, along with roasted hazel nuts and small quantities of burnt wood.

This could tell us: _____

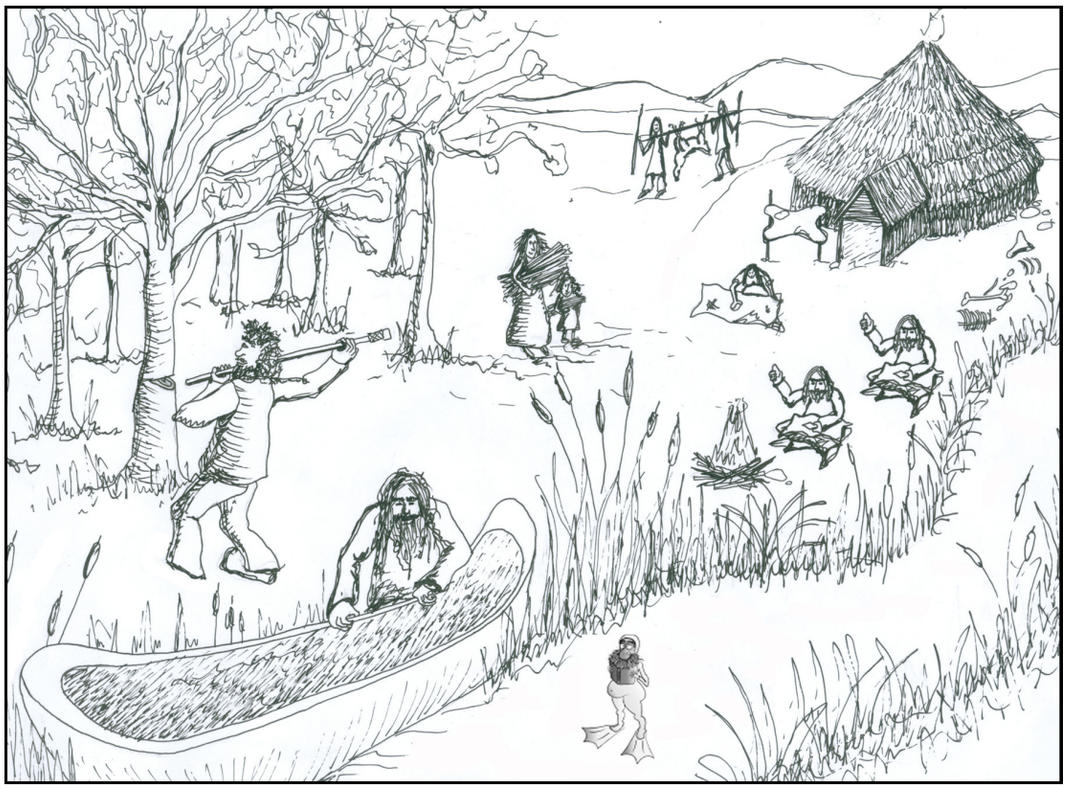
_____

_____

Answers at: www.hwtma.org.uk/educatorsguide

Spot the difference!

Around 8,000 years ago, people lived on the edge of a river as shown in the pictures below. When the sea levels rose at the end of the last ice age, this settlement site flooded and now lies approximately 12m below the surface of the sea to the north of the Isle of Wight.



This site is called Bouldnor Cliff. It was inhabited during the Mesolithic period approximately 8,000 years ago. There are 10 differences in the two pictures, can you spot them all?

FAQ Page

HWTMA's Professor Archie O'Logy answers some questions that he is frequently asked :

Have you ever found treasure?

Yes!
Anything we find that has been made or used by people in the past is treasure, from the simplest piece of worked wood to a whole ship! These are special treasures which help us understand more about the people of the past.

What do you use for writing and drawing under water?

We use normal plastic propelling pencils and a plastic-like paper (similar to tracing paper) called permatrace or drafting film. The permatrace is taped to a plastic board and the pencil is tied onto the board as well.

Have you ever found a body?

Sometimes archaeologists do find human remains, usually in the form of bones. It would be quite unusual to find a whole body.

Have you ever seen a shark?

Yes,
but not while working around England (sharks prefer warmer waters!). The biggest shark I've seen was on a submerged prehistoric landscape site in the Red Sea.

What's the most exciting thing you've found?

That's very difficult to answer! I think it would have to be a jacket I once found on an 18th century wreck. I could imagine someone wearing it over 250 years ago!

Have you ever found a dinosaur?

No,
archaeologists study people from the past and when the dinosaurs roamed the earth there were no people. We leave dinosaurs to our friends the 'Palaeontologists'.

What Next?

This guide has been produced by the Hampshire & Wight Trust for Maritime Archaeology with generous funding from the Heritage Lottery Fund.

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To find out more about our projects, publications, products and services please contact us via the details below.

www.hwtma.org.uk

For latest news, events, information and resources.

Publications

HWTMA publish a range of publications for audiences of all ages and backgrounds. Please see our website for further information:

www.hwtma.org.uk/shop

Maritime Bus

Bringing state-of-the-art resources and exhibitions right to your door!

www.hwtma.org.uk/maritimebus

Underwater Archaeology Centre

HWTMA's museum on the Isle of Wight. A great place for learning about the sunken history of the Solent through hands-on activities, DVDs, interactives and exciting multi-media displays.

www.underwaterarchaeologycentre.co.uk

Fun & Learning in the Real World
An Educators' Guide

Who is it for?
As the title suggests, this booklet is for educators. We mean this in the broadest sense, from school-based teachers, home educators, life-long learning practitioners, youth group and special interest group leaders, to parents, carers and anyone with a yearning for learning!

What does it do?
It provides background information, plug-and-play worksheets, activity ideas and signposting to a whole host of resources.

What's it about?
It focuses on showing how traditional subjects, learnt in school and at home, are applied in the real world. With an emphasis on the marine environment and maritime archaeology, this guide aims to make learning more fun!

Hampshire & Wight Trust for MARITIME Archaeology

The Hampshire & Wight Trust for Maritime Archaeology
National Oceanography Centre
Room W1/95
European Way
Empress Dock
Southampton
SO14 3ZH

Telephone: 02380 593290
Fax: 02380 593052
Email: info@hwtma.org.uk
Web: www.hwtma.org.uk

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