Explore the Seafloor

History
Teacher's Pack

What can the seafloor tell us about World War Two

This teacher's pack contains activities and suggestions designed to complement the teaching of a case study on marine research at Key Stage 3.

Marine
Aggregate Levy
Sustainability Fund
MALSF

Wessex Archaeology

WA Head Office
Portway House, Old Sarum Park
Salisbury, Wiltshire SP4 6EB
Tel: 01722 326867
splash@wessexarch.co.uk
http://ets.wessexarch.co.uk

Case Study

What can the seafloor tell us about World War Two?

This teacher's pack contains activities and suggestions to complement the teaching of a case study on marine archaeological research, focusing on World War Two at KS3. The case study aims to support the curriculum by providing a real-life example of history and archaeology in the workplace. It was developed as part of the Explore the Seafloor project, funded by Marine Aggregate Levy Sustainability Fund (MALSF).

This case study comes from the research undertaken as part of a Regional Environment Characterisation (REC) survey. In 2008, MALSF commissioned research into four main dredging regions in the United Kingdom – the Thames, South Coast, East Coast and Humber. These studies involved experts from universities, survey companies and heritage organisations to investigate the archaeology, geology and ecology of the seafloor. The aim of the studies was to ensure that we use the sea sustainably, without damaging its natural or physical heritage.

Using this teacher's pack

This pack provides background information to accompany a PowerPoint presentation on the case study, which can be downloaded from web address http://ets.wessexarch.co.uk/teachers/history/

The Explore the Seafloor project has produced an interactive website (http://ets.wessexarch.co.uk/), full of interesting resources and more information about each REC. In addition, there are many ways to develop this lesson beyond Explore the Seafloor. Through this pack, colour-coded boxes will indicate opportunities to use our resources, where to find out more and possible discussion topics.

Blue	**Activity or resource**
Green	**Find out more**
Red	**Film**
Yellow	**Discussion**

The following resources are available to download from web address http://ets.wessexarch.co.uk/teachers/history/

E-Games

1. Be a Seafloor Explorer

Interactive Whiteboard Lessons

2. What did you find on the seafloor?
3. Primary or Secondary sources
4. Interpreting geophysics

Film

5. Exploring an aircraft wreck

PDF

6. Activity Sheet 1: Interpreting geophysics
7. Activity Sheet 2: Airman's clothes
8. Activity Sheet 3: Case Study Review

Films are downloadable from the website or you can watch them online at YouTube and Vimeo - links to channels available on the lesson webpage.

Check out our Resources page http://ets.wessexarch.co.uk/resources/ for more material to use in your lessons.

Learning Outcomes

- Understanding that there is evidence on the seafloor for WWII
- Develop knowledge and understanding of WWII
- Develop the ability to ask relevant questions and investigate them using a range of sources
- Explore different methods for researching the past
- Develop the ability to critically analyse and evaluate a range of historical and archaeological evidence
- Understand how historians and archaeologists form interpretations
- To be able to discuss why it is important to know about and protect archaeological evidence on the seafloor

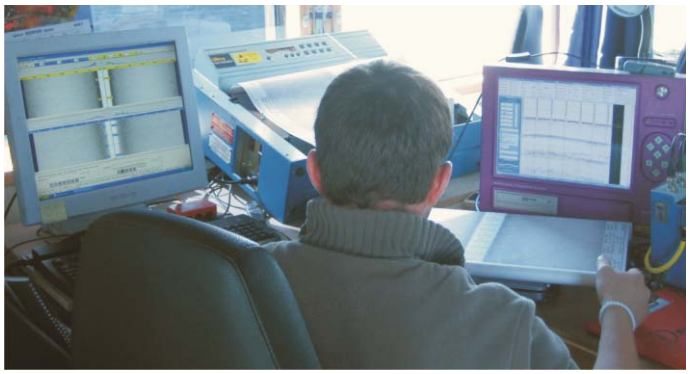
Case Study

What can the seafloor tell us about World War Two?

This provides background information to support a PowerPoint presentation or case study PDF, which you can download from http://ets.wessexarch.co.uk/teachers/history/

What is an REC? [Slide 3]

This case study comes from the research undertaken as part of a Regional Environment Characterisation (REC) survey. A REC is a regional assessment of the geology, ecology and archaeology of the seafloor using information gathered through desk based assessment, geophysical data and sampling surveys.



The website http://ets.wessexarch.co.uk/ allows you to explore the results for four of the REC study areas. – South Coast, East Coast Humber and Outer Thames Estuary.

Activity - Online E-Game: Be a Seafloor Explorer

Find out more -

Useful Background information:
Explore the Seafloor South Coast REC Summary
http://ets.wessexarch.co.uk/recs/southcoast/

Original South Coast REC Report
http://www.cefas.defra.gov.uk/alsf/projects/natural-seabed-resources/rec-0802/final-report.aspx

Wrecks at Sea: Research in Context
http://www.cefas.co.uk/media/463755/monograph6-web.pdf

South Coast REC Archaeological Research [Slide 4]

This lesson focuses on the South Coast REC and the archaeological research undertaken within the wider study. The South Coast seafloor is rich in archaeology. The aim of the research was to create maps showing the distribution of underwater archaeological sites and identify areas where there is a strong possibility of finding archaeological material. This will inform marine planning. When industries make applications to government authorities for licenses to use an area of the sea, for example for dredging, the authorities can ensure that the work is undertaken responsibly, taking into consideration our underwater heritage.

What can you find on the seafloor? [Slides 5 - 8]
Archaeologists study the material remains of the past to understand how people lived. Archaeological material from the seafloor can range in date from the Lower Palaeolithic (970,000 BP - Before Present) to World War Two.

Submerged prehistoric landscapes [Slide 5]
In the ancient past, the South Coast study area was dry land, and at times prehistoric people lived there. Using a variety of techniques, archaeologists can reconstruct what the landscape once looked like. Archaeological artefacts such as mammoth teeth and prehistoric stone tools have been found on the seafloor.

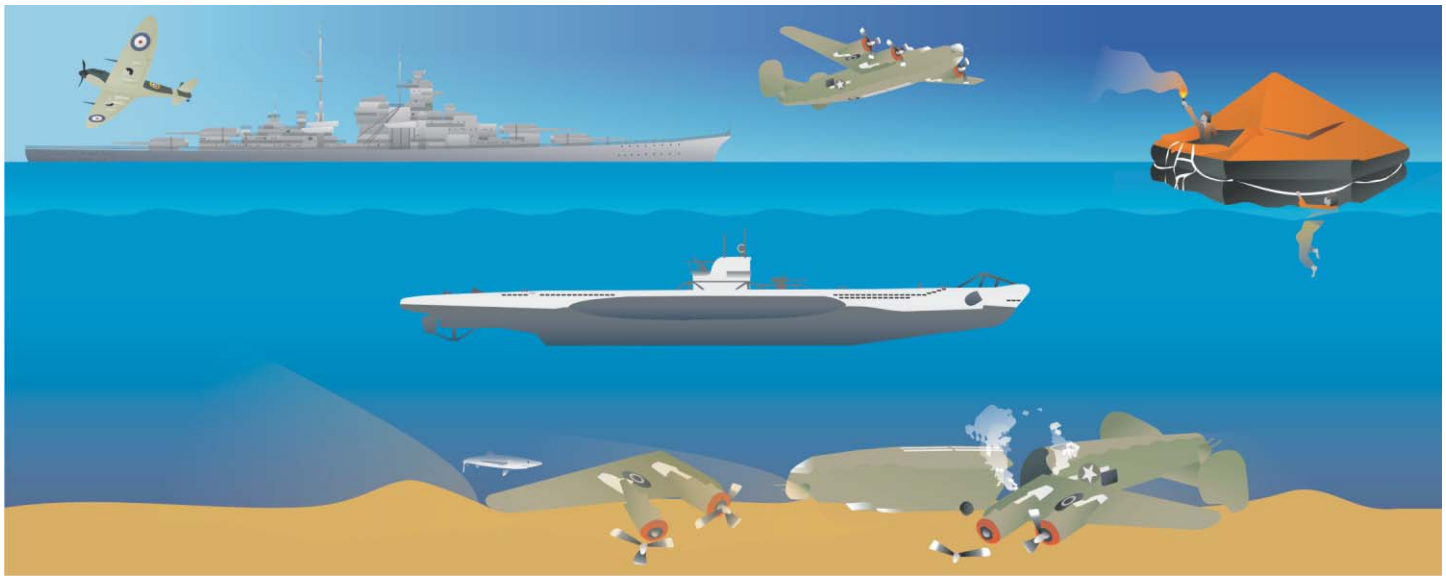
Find Out More - Download our Geopgraphy Lesson: How did climate change affect prehistoric people?

Maritime Archaeology [Slide 6 and 7]
The majority of archaeological material found on the seafloor relates to Britain's long maritime history. As Britain is an island, people have been using boats since prehistoric times for transport, trading and as defence against attack by sea. There are hundreds of thousands of shipwrecks around our coastal waters. Shipwrecks are like time capsules – they contain lots of information about what everyday life was like at the time they sank.

Activity - Interactive Whiteboard Lesson: What did you find on the seafloor?

World War Two [Slide 8]
This lesson will focus on the REC results for World War Two. There is a lot of archaeological evidence relating to this period on the seafloor. These include ship, submarine and aircraft wrecks and artefacts, even potentially unexploded bombs! On the coastline we can find archaeological evidence, which relates to what was going on at sea, for example ship harbours, anti-aircraft gun sites, and coastal defences such as pillboxes. These can tell us more about the role of ships and aircraft in World War Two.

Discussion - Why is there a lot of WWII evidence found on the seafloor?



The REC Methodology [Slide 9]

There are three main stages to the REC. In any research project, the methodology must suit the aims of the project, but also take into consideration schedule and budget. A REC survey covers a large area and therefore does not aim to provide detailed information but rather an overview of the whole area.

Stage 1	Collecting Data	• Fieldwork – Geophysical survey • Desk Based Assessment
Stage 2	Results - Using the data	• Creating maps • Final report
Stage 3	Recommendations	Highlighting what is special about the South Coast REC study area.

Stage 1: Collecting data [Slide 10]

There are two main ways that the archaeologists collected data, through their own fieldwork and through reviewing information already available.

Often when people think about underwater archaeologists they think of a SCUBA diver on the seafloor. Working in an underwater environment is a challenge. When excavation does occur it is largely a process of uncovering material buried in seafloor sediments, for example ship and aircraft wrecks. Divers will survey ship or aircraft wrecks to record their structure and artefact positions in detail. However, this is a small percentage of their work. It is impossible for divers to examine every part of the seafloor. Not only is it expensive and very time-consuming, the often low visibility in British waters makes it difficult to see.

Fieldwork: Geophysical survey [Slide 11]

Fieldwork involves collecting original data for the purposes of the research aims. Fieldwork for the REC is multidisciplinary involving a range of different scientific specialities.

Geophysical Survey is an important element of marine archaeological research. It is used to create images of the seafloor by collecting information about its physical properties. Many companies that specialise in this field employ marine geophysicists and geologists who collect and interpret the information.

The REC used a variety of **sonar survey techniques**, which use sound waves, and **magnetometry survey**, which measures magnetic changes. Different techniques have different purposes. For example, magnetometry is useful for finding World War Two ships which are made of iron, but not so useful for finding older wooden ships.

Sonar Techniques [Slide 12]

Sonar systems emit sound waves, which travel through the sea and reflect back up when they meet either an obstruction or the seafloor surface. Archaeologists used three techniques:

Sidescan Sonar – this measures the intensity of the returned sound wave, which can indicate hard surfaces (reflect sound) compared to soft surfaces (where less sound is reflected). Areas of no return, where there is no reflection, are shown as shadows, which are the most useful for interpreting shipwreck features as they indicate where something rises up from the seafloor.

Multibeam Bathymetry Sonar – this measures the time it takes for sound waves to travel to the obstruction or seafloor and return. It provides accurate depth measurements resulting in the creation of 3-dimensional images of the seafloor and wrecks. The slide image is of a German submarine.

Sub-Bottom Profiler – the sound waves on this technique penetrate the seafloor and record a section (or profile) of what the seafloor looks like underneath the surface. This time the soundwaves reflect back when there are changes in the seafloor sediments. This technique is particularly useful for discovering prehistoric landscapes that are now buried, for example ancient river channels.

Find Out More - Download our Physics Lesson: How do we map the seafloor?

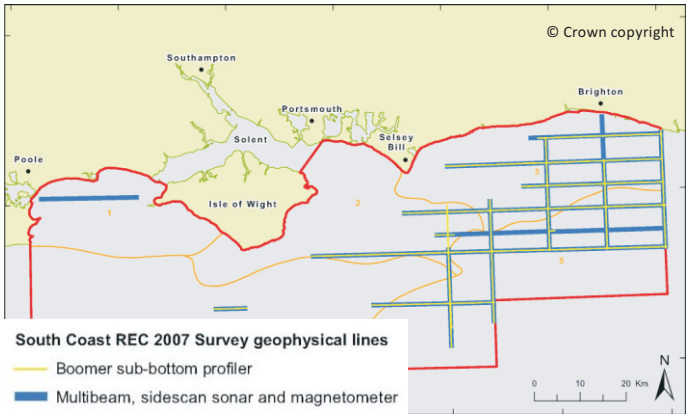
Marine Careers
http:/ets.wessexarch.co.uk/resources/marinecareers/

Results Vary [Slide 13]

When processing the data collected to create images of the seafloor, many different factors are taken into consideration which can affect the results, for example, the strength of the sea currents. The results also vary depending on why you are surveying. For example, surveying a known wreck for more information can produce a very detailed image, but will take a long time and be very expensive. In most cases the geophysical images show a lump or a bump, known as an **anomaly**. It is rare to get a detailed image like the plane in this slide. It takes expertise to be able to tell if an anomaly is a wreck or a geological feature, such as an outcrop of rocks.

Spotting the gaps [Slide 14 and 15]

The marine geophysicists work from a boat, which travels in transects (lines) to and fro across the water, collecting information usually over several kilometres. The REC covers 5600 km^2; therefore they cannot survey the entire study area so instead they do a representative portion. This is still a large amount and so a less detailed survey was undertaken. Slide 14 shows the geophysical transects taken. It highlights that only part of the study area was surveyed, this was due to a lot of bad weather during the allocated time for fieldwork. The solution was to look at information for previous surveys, undertaken for a variety of reasons, to fill in the gaps, shown on Slide 15.



Discussion - What do the lines on Slide 14 represent? Do they provide a representative coverage of the study area? What are some of the considerations and issues when undertaking fieldwork?

Desk Based Assessments (DBA) [Slide 16 - 25]

DBAs are often the first step for archaeologists, both on land and sea, when asked to assess an area for archaeology. This assessment is required as part of the planning process for certain activities that could affect archaeology underneath the ground or on the seafloor, for example, before installing an offshore wind farm. It allows archaeologists to assess the potential of finding archaeology in that area, based on what is already known for that locality. This helps decide what needs to be done next, to ensure that the archaeological material is recorded before construction takes place, or to prevent the work happening in very special situations.

A DBA collects and **summarises in a report** archaeological information about a defined area, in this case the REC. This includes any relevant research already undertaken and other sources of information about the archaeological material for the study area. Often an area, particularly a large one, has been subject to lots of archaeological investigations. A DBA is useful as it brings together many individual pieces of work into one place so people can reference it easily. This information is usually created by a variety of different organisations for a variety of different reasons. Again, like the survey, the detail the DBA goes into is affected by time, money and the aims of the project. Often DBAs will tell where you can find information, with a brief summary of what it is and its significance, rather than repeat ALL the information in a new report.

Historical sources for wrecks [Slides 17 to 21]

Archaeologists not only examine the physical evidence but they also study a range of historical evidence that can add to their understanding of the past.

The first thing they do is look to a variety of national and local government organisations that hold many types of primary and secondary sources of information.

Activity - Interactive Whiteboard Lesson: Primary or Secondary sources

The National Monument Records (NMR) records tell us how many ships and aircraft were lost, and in which general area (although this is generally inaccurate due to the technology available at the time for recording positions). The United Kingdom Hydrographic Office (UKHO) gives information on the wrecks that have been found on the seabed. Taken together, these provide an idea of the survival of wrecks, the potential for finding more and how many there could be. In the table on Slide 19 there are more historic records of aircraft wrecks in the NMR than physical obstruction records of aircraft wrecks in the UKHO.

Source of information	What it contains
English Heritage - National Monument Record (NMR)	The national public archive: 10 million photos, plans, drawings, reports and publications on architecture, archaeology, listed buildings, aerial photographs and social history
Historic Environment Records (HER)	Regional level public archive
Sites and Monument Records (SMR)	Contains records relating to archaeology and buildings, often developed into the wider HER
United Kingdom Hydrographic Office (UKHO)	Contains records on any physical obstructions found on the seafloor, this includes records of known locations of wrecks

Discussion - Why are there more National Monument Records for aircraft wrecks than United Kingdom Hydrographic Records? What does this tell us?

Find out more - Visit English Heritage's online NMR - Pastscape. http://www.english-heritage.org.uk/professional/archives-and-collections/nmr/

Visual and oral sources [20-21]

The archives not only hold written information but also visual information, such as photographs. For World War Two **Oral history** is a another important source of information.

Discussion - Why is oral history an important source of information for World War II?

Find out more - Visit BBC's People's War website http://www.bbc.co.uk/ww2peopleswar/BBC's People's War memory

Archaeological Evidence for World War Two aircraft [Slides 22 - 31]

Whilst the REC archaeologists did not dive or collect finds, they still had archaeological evidence available to them to study. For this section, we will examine the evidence for World War Two aircraft found in the South Coast study area.

Strategically the use of aircraft during World War Two made this a completely different war from any previously. Britain now needed to fight in the skies, as well as on land and by sea, for example at the Battle of Britain in 1940. On the seafloor, you can find evidence of these battles that raged in the skies above Britain's coastal waters, such as the remains of aircraft shot down during battle as well as various types of ammunition. However, the records of losses of World War Two aircraft are relatively vague. There are many reasons for this including the technology available in 1940 for recording positions. Archaeologists play an important role in identifying locations of WWII aircraft wrecks.

Discussion - Why do most South Coast aircraft wrecks on the seafloor date to World War Two?

Finding Artefacts [Slides 23 - 24]

Protocols set up with industries that work in Britain's coastal waters allow these industries to report any discoveries of archaeological artefacts found on the seafloor to archaeologists, who in turn report anything of significance to authorities such as English Heritage. The British Marine Aggregate Producers Association's (BMAPA) Marine Aggregate Protocol for the Reporting of Finds of Archaeological Interest started in 2005 and is the longest-running protocol. Dredgers sometimes pull up artefacts along with the marine aggregate, including pieces of World War Two aircraft. If they discover many finds in one place, this can indicate a ship or aircraft wreck. When this happens, authorities place an exclusion zone in that

area to prevent industries working there and destroying the archaeology. However, when a plane ditches into water and breaks up, the pieces can spread out for miles, so sometimes this is difficult to assess. **Ditching** means landing on water, for most aircraft it means crashing as they are not meant to land at sea.

Find out more - Explore the Marine Aggregate Industry Protocol website http://wessexarch.co.uk/projects/marine/bmapa/

Discussion - Why might ditching be an issue for identifying the location of an aircraft wreck?

Past Projects: Wrecks on the Seabed [Slides 25 - 30]

Past research projects are an excellent source of information, as they look at smaller areas within the overall REC study area in more detail.

One source of information is a research project called "Wrecks on the Seabed" which was funded by English Heritage through the Marine Aggregate Levy Sustainability Fund (MALSF) and undertaken by Wessex Archaeology. This project explored the best methods and techniques for gathering archaeological information about ship and aircraft wrecks on the seafloor that are at risk of damage from dredging.

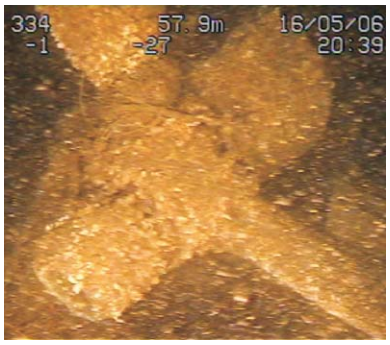
Using a Remotely Operated Vehicle (ROV) [Slide 27] and Geophysical Interpretation [Slide 28]

One of the wrecks investigated through the Wrecks on Seabed project was picked up as an anomaly on a geophysical survey, the image is shown on Slide 26. Archaeologists initially thought it was a wooden shipwreck but a ROV was sent down to film the wreck and check. The ROV survey showed the wreck to be metal and a plane, rather than a ship. The new interpretation was overlain on the existing geophysical results image. As you can see from Slide 28 the wreck is badly broken up.

Activity [Slide 28] - Interactive Whiteboard Lesson: Interpreting geophysics And/OR
Activity Sheet 1: Interpreting a wreck

Photographing the plane [Slide 29-30]

The parts of the aircraft identified during the ROV survey were used to identify the type of plane as a **Consolidated B-24 Liberator**, which was a World War Two bomber [Slide 29]. The ROV filmed images of a flying jacket in the wreck, which helped to identify its nationality as American. The type of jacket also gave a date to the site [Slide 30]. The jacket was issued 1947, which suggests this plane crashed after the end of the war. However, it may be a prototype, produced between 1942 and 1945. It is strange for clothes to survive on the seafloor they usually rot away. However, when textiles are kept in anaerobic conditions, where no air can reach them they can be preserved. While some of the wreck is now revealed on the surface of the seafloor, this tells us that for a long time it was buried.



Clothes as evidence [slide 31]

People do not often think of clothes as archaeology but they are still material evidence and can tell you a lot about a person. You can use Activity Sheet 2 to discuss what an airman's clothes can tell us about flying in the Royal Air Force (RAF) during World War Two.

Film - Exploring an aircraft wreck

Activity - Activity Sheet 2: What can clothes tell us about being a World War II airman?

Diving [Slide32]

Like ROV surveys, diving is a good way to confirm geophysical results and to survey and record wreck sites in detail. You can watch an example of archaeologists diving a World War Two plane, a Dornier 17 German bomber, at the RAF Museum website. This aircraft is not in the REC study area, but the film is useful for showing what archaeologists do in this situation.

Find out more - Royal Air Force Museum Dornier 17 dive film
http://www.rafmuseum.org.uk/cosford/conservation-centre/dornier-17-conservation-project.cfm

Note: you will need access to YouTube to view the film

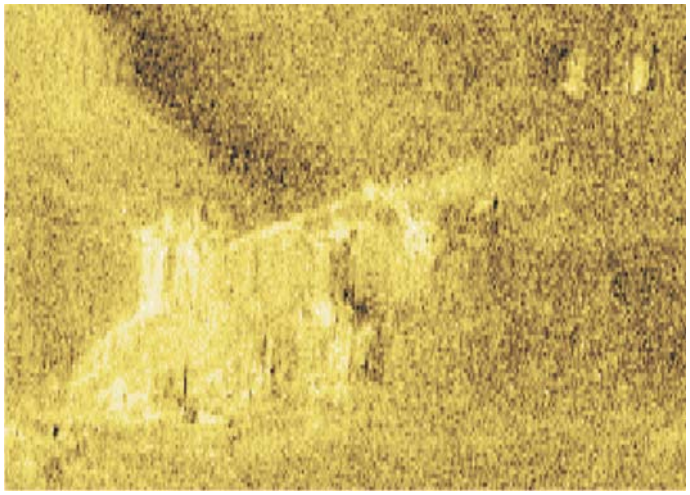
Stage 2: Results [Slide 33]

GIS stands for Geographic Information System. GIS takes data with a known geographic position and places it on a map. It allows you to view, analyse and interpret data to reveal relationships and patterns. Geographically-referenced information from different sources can be added to one GIS to gain a greater understanding about an area. The RECs produced four WebGIS to make their data available to the public.

Find out more - South Coast REC GIS links
http://www.southcoastrecgis.org.uk/sc/

Geophysics results [Slide 34]

For the South Coast REC study area, archaeologists identified many anomalies from geophysical survey images that could be ship or aircraft wrecks. As the geophysical survey only covered part of the whole study area, there are probably many more undiscovered wrecks on the seafloor. Archaeologists compared the approximate location information of known historical records with the anomalies. By doing so they were able to identify some wrecks, for example a German U-boat. The archaeologists could not find historic records for most of these anomalies, so many could be completely new discoveries. Not all anomalies can be positively identified as a wreck site. In cases where it is unclear they are listed as potential sites and the and the report advises that further research will be needed to confirm this.



Geophysical survey has been excellent for identifying shipwrecks that date from the 19th century onwards, but not so good for detecting earlier ships. This is because later ships are constructed primarily from metal, so they preserve better underwater, are easier to find, and a record is usually kept somewhere about their sinking. Older, less substantial wooden ships or boats do not preserve as well, or they become buried under the seafloor over time. Historical records did show that there are shipwrecks in the study area dating to before the 19th century.

Examples of WWII wrecks reported include a German U-boat, the HMT Inverclyde warship and a New Zealand bomber.

Discussion - How is geophysical survey useful for finding WWII wrecks? Why?

Aircraft Results [Slide 35]

Using GIS, a map was produced showing the location of known aircraft wrecks. An anomaly was identified close to the location recorded by a National Monuments Record of a plane crash. The crash was of a **BF455, Short Stirling Mark III** four-engined heavy bomber lost while returning from a raid on Frankfurt on the night of 10–11 April 1943. The aircraft, part of the 75 (New Zealand) Squadron based at Newmarket, had been damaged by flak. It was attacked by night fighters and was forced to ditch, reportedly about 3 miles off Shoreham-on-Sea. All of the crew were subsequently rescued. It may be that the anomaly found near the recorded location of the crash site is the remains of this plane, but more research is needed. Aircraft are quite difficult to identify on the geophysics. However, it is possible that some anomalies that have been identified as shipwrecks might actually be aircraft wrecks.

Stage 3: Recommendations [Slide 36]

One of the tasks for the South Coast archaeologists was to assess the importance of individual ship and aircraft wrecks. There are several criteria for assessing historical importance, which depend on the wreck's potential for telling us about the past; some sites are so important that they are protected by law.

Criteria for assessing importance:-

- **Period** - The date of the wreck

- **Rarity** - In the case of World War II there were rapid changes in both ship and aircraft technology. In some cases, a type of ship or aircraft was only around for a short time before the invention of a new version and many were taken apart to build newer versions. Sometimes wrecks are the only examples left of their type and can tell us a lot about how technology has changed. For example, the Short Stirling bomber was the first of the RAF's four-engined heavy bombers to enter service and is now 'extinct'. As a result, if this anomaly is found to be part of a Short Stirling, then even if it is in a bad condition it is of very high archaeological importance.

- **Documentation** – the importance of a wreck may be enhanced by the associated historical information. Often it is the stories attached to the wreck and the part it played in history that makes it important.

- **Group value** - can it be associated with other wrecks, for example evidence of a battle with lots of shipwrecks?

- **Survival and Condition** – is this a good surviving example of a particular type of wreck?

- **Vulnerability** – is this wreck in particular danger of being destroyed by sea-based actvities such as dredging?

- **War Graves** – During WWII, many ships and aircraft sank, and some are the final resting place of those who fought or worked in them. These are protected places, as they are war graves.

- **Diversity** – several interesting features rather than one single very important reason for highlighting its importance.

- **Potential** – when not a lot is known about a wreck but potentially it could be something important.

Aircraft wrecks that survive intact are very rare, although the Dornier 17 aircraft (outside the South Coast REC area) is one important example. Experts from the RAF Museum may raise the Dornier and conserve it in the museum. However, in most cases such structures are safer remaining on the seafloor, providing they are not at immediate risk, as raising and preserving is expensive and likely to cause damage to the craft. Recommendations therefore rarely suggest excavation and raising a wreck. Additionally, ship and aircraft wrecks often become localised habitats for sealife, which should not be disturbed.

Discussion [Slide 37]

- What can the seafloor tell us about WWII?

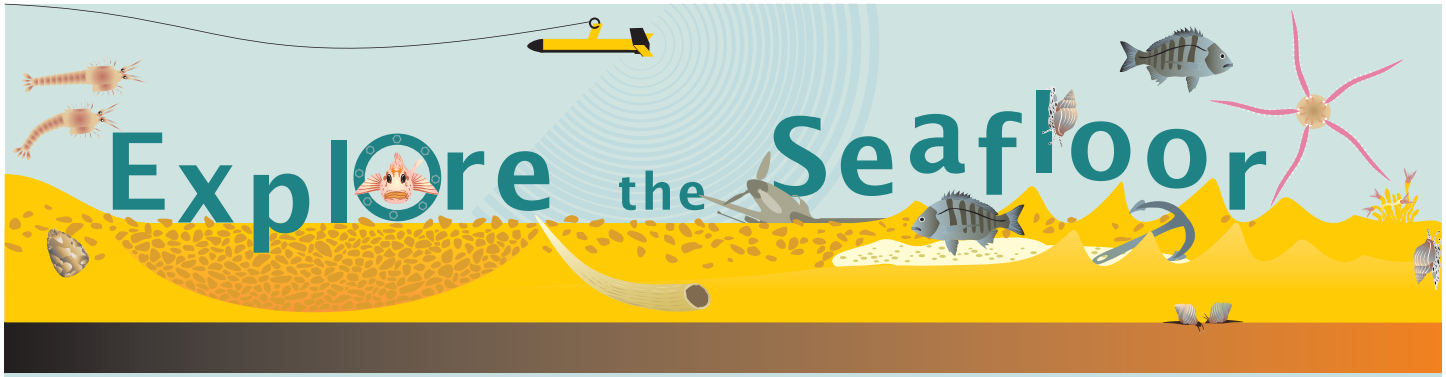
- Name the different ways and sources that archaeologists used to find out about aircraft wrecks on the seafloor

- Discuss some of the advantages and disadvantages of these methods for collecting evidence about WWII
  - Marine geophysical survey
  - Historical sources
  - Diving wrecks

- Why might an archaeologist assess a WWII shipwreck as being of high importance?

- Do you think it is important that we research the archaeology of the seafloor? Why?

Activity - Activity Sheet 3: Case Study Review



WESSEX ARCHAEOLOGY LIMITED.
Registered Head Office: Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB.
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk
For more information about us visit:
www.wessexarch.co.uk