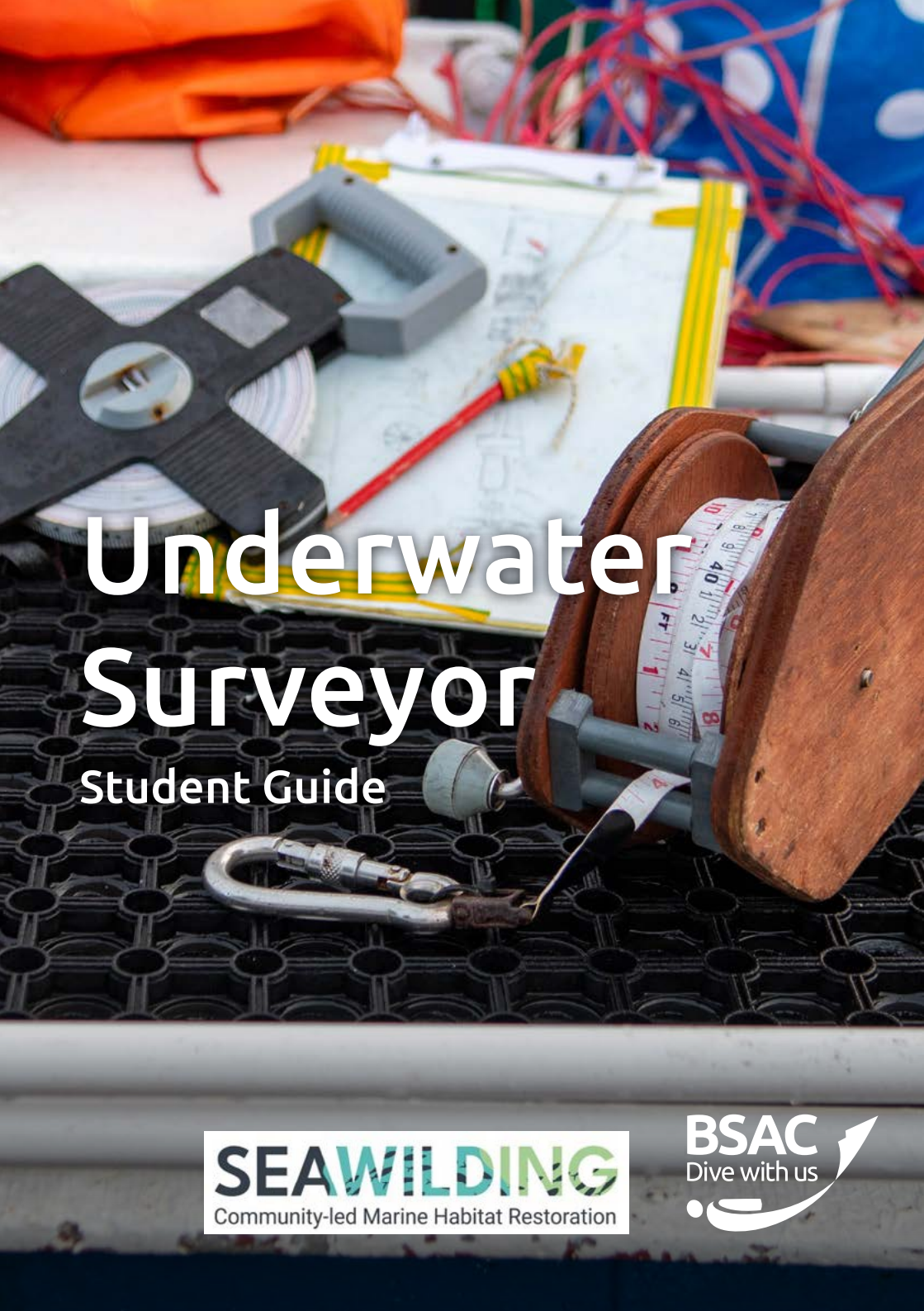

Underwater Surveyor

Student Guide

SEAWILDING
Community-led Marine Habitat Restoration

BSAC
Dive with us

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Introduction

Welcome to the BSAC Underwater Surveyor eLearning course, produced and presented by Seawilding. The aim of this eLearning course is to enable you to get involved in protecting the ocean and its habitats, by providing you with the skills to use a variety of survey techniques while snorkel or SCUBA diving it will enable you to play a valuable part in ocean science and conservation.

Course aims

This eLearning course, along with the accompanying practical training provided by your BSAC Centre or Club, will provide you with the skills and techniques to undertake valuable underwater surveys.

Whether collected by snorkel or scuba (hereafter referred to as diving), the data you collect will help to make decisions that lead to the preservation and possibly restoration of important ocean habitats.

Each time you enter the water you have the possibility of making a contribution to marine science.

The aim of this eLearning training is to enable you to get involved in protecting the ocean and its habitats, by giving you the skills and techniques, as well as the confidence and opportunities to make a difference.

We hope it will also make your diving more enjoyable and fulfilling by adding a purpose to your diving.

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Marine surveying and community science

Learning about our oceans is the first step in protecting them and the species that live there, and which ultimately supports human life on earth. But with so little known about our oceans, there is a whole world of underwater discoveries out there waiting for you.

The oceans cover 2/3rds of our planet, but we know more about the moon. In fact the moon has been mapped to a resolution of 7m, while the best deep sea maps have a resolution of 4.8km. Some deep sea expeditions find that 4 out of 5 species they come across were previously unknown to science.

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Although not to the same degree, something similar can be said about our coastal waters. Compared to the level of understanding of terrestrial ecosystems, little is known about the marine environment. How much can we really say we know about the habitats and species living below the waves?

Despite a lack of understanding of the consequences, underwater resources have been exploited for generations. There is much to still be learned; habitats to discover, their extent to map and their health and status to monitor.

As divers and snorkellers we are perfectly placed to discover this knowledge. By collecting data in a rigorous way, we have the best chance of our voices being heard and our contributions making a difference.

Seawilding

Who are Seawilding?

Seawilding is at the forefront of marine habitat restoration in the UK and are pioneering the community-led approach to Native oyster and seagrass restoration from their base in Loch Craignish in the heart of Argyll, Scotland.

They are returning over 1 million Native oysters to the waters of Loch Craignish. In 2020 Seawilding began the first seagrass restoration project in Scotland. Seawilding is training members of the community to be involved in all aspects of restoration, from surveying and monitoring to seagrass seed harvesting and planting, to rearing and nurturing juvenile Native oysters for release.

As part of the mission to achieve restoration at a meaningful scale, Seawilding is working alongside other coastal community groups in sharing knowledge to support communities in achieving their own restoration successes.

British Sub-Aqua Club (BSAC)

About us

The British Sub-Aqua Club, or BSAC, is the National Governing Body for snorkelling and scuba diving in the UK. Our President is HRH Prince of Wales. We are the biggest dive club in the world with an extensive community of clubs, centres and members

We work to

Develop our own training and safety recommendations, making diving safer for all. BSAC plays a major role in safeguarding UK waters and marine life, and we are proud to protect our British underwater heritage.

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BSAC partners with schools for education and works with them to deliver Duke of Edinburgh (D of E) training. With partnerships such as Seawilding, diving and snorkelling plays an important and increasing role in monitoring the marine environment. However, while not everyone may have the desire or inclination to enter the water, there is a lot of valuable information that can be gathered from shore. Data gathered through citizen science projects, and made accessible to scientists, helps us understand climate change and the environmental issues that effect us all. This is why BSAC and Seawilding have created the Underwater Surveyor course to help you gather this important information.

Purpose of the Underwater Surveyor course

During this course you will learn:

- **How you will be helping the oceans**
- **How to survey safely**
- **Survey skills and techniques, ranging from easy to advanced**
- **What equipment you'll need**
- **What to do with your survey data**

- **What opportunities there are to get involved in survey projects**
- **Why biosecurity is so important and how to dive in a biosecure way**

How the information you gather will be used

The data that you collect will help scientists to understand more about the ocean, enable policy makers to legislate for positive change and bring people and the underwater world closer together.

It is exciting to think what positive changes your data will bring about!

Similar citizen science projects have led to exciting discoveries and huge steps forward in conservation. The following are just a few examples of what data collected by citizen scientists like you have achieved:

- **Discovery of previously unknown habitats**
- **Designation of protected marine areas**
- **Instigation of the 5p plastic bag charge**
- **Banning of plastic in ear buds**
- **Proving that seahorses live and breed in the UK**
- **Changes in plastic manufacturing processes**
- **Discovery of species previously thought to be extinct**

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Summary

The aim of this eLearning course is to enable you to get involved in protecting the ocean and its habitats, by providing you with the skills to use a variety of survey techniques while snorkel or SCUBA diving, you will be able to play a valuable part in ocean science and conservation.

In this introduction module we have looked at:

- ✔ **Course aims**
- ✔ **Marine surveying and community science**
- ✔ **Seawilding**
- ✔ **BSAC**
- ✔ **Purpose of the Underwater Surveyor course**
- ✔ **How the information that you gather will be used**

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How you will be helping the oceans

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How you will be helping the oceans

The data that you collect will play a vital part in protecting the oceans that we all love. In this module you will learn about some of the threats facing the ocean but also how, by collecting data during your dive, you can help combat them and be a positive force for the ocean.

Module contents

The aim of this module is to understand how human pressures are affecting the health of the ocean and the role that data which marine scientists, including you, collect is vital for protecting the future of ocean health.

In this module we will look at:

- **Biodiversity and ecosystem health**
- **Threats facing the ocean**
- **Why science and data are important**
- **The value of citizen science data**
- **Why your data is important**
- **Summary**

Biodiversity and ecosystem health

To understand the present we need to understand the past. This is sometimes called the ‘baseline’, unfortunately the past is murky, with a lot of incomplete or missing data.

Baseline

We may never be able to regain a full picture of the past, but we can do our best by delving through old archives, looking at historical catch landings, or running habitat suitability models. By not knowing the past state prior to human influences, we run the risk of thinking that the current state is the natural or ideal state.

This is what is known as a shifting baseline. As a person can only look back within their own lifetime, we can be tricked into complacency thinking that everything at present is as it should be. The baseline can slowly shift with each generation without it being perceptible to those at the time.

While we can’t change the past, the present is the next best time to establish the current baseline to the best of our ability. It’s by learning more about the present that we can best protect the future from past mistakes and ensure the marine environment is there to be enjoyed by the next generation.

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Protection or Restoration?

What is the best way to protect an ocean habitat? Should it be left alone, or should we intervene? This is not always an easy question to answer.

Nature is surprisingly resilient and adaptable. If left alone and given time there is a good chance an ecosystem can repair itself. Often the best thing we can do is to remove the negative pressures that are stressing the environment, (such as overexploitation, habitat damage, or pollution, to name but a few) and allow for natural regeneration.

But this is not always the case, and when degradation is so severe it may reach a tipping point where the environment is unable to regenerate on its own and human intervention is required in the form of active restoration.

Restoration activities can be broken down into reinforcing existing compromised areas and reintroductions to lost areas. The former being preferable and more likely to succeed.

Restoration is not without risk, and there are countless examples with humans interfering with nature having unintended negative consequences, the most obvious example being attempting to solve one problem by the intentional introduction of an invasive

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predator which results in an even bigger problem once that species spreads uncontrolled. The number one priority of any restoration project is to cause no further harm.

Active restoration can be extremely costly compared to passive regeneration. That does not mean it should not be attempted, but that it should form part of the decision making process.

Restoration is vitally important where it is necessary but understanding and protecting what we have is important too.

Food web

One indicator of ecosystem health is a fully functioning Food Web. This means there is the optimum balance and amount of both predators and prey.

Humans have a habit of removing the top predators in an ecosystem, allowing certain prey species to thrive and leading to habitat loss or modification.

One terrestrial example is when wolves were removed from Scotland, deer were able to multiply unchecked. Their constant grazing of young shoots meant forests were unable to regenerate, leading to the barren hillside we see today.

This is also at work in the sea. During the days of the fur trade, sea otters were hunted for their pelts and were nearly wiped out along the Pacific coast of North America from California to British Columbia. With this predator removed, sea urchins multiplied and wiped out entire kelp forests all along the coast.

It's not just apex predators that are vulnerable. With the exploitation of the oyster fishery in the 19th century, vast oyster reefs were removed. Without their water filtering, turbidity increased in our estuaries and the sediment deposited on the seabed created barren mud flats that supports little life.

Threats facing the ocean

Most of the threats to marine habitats are caused by humans (Anthropogenic)

These include:

Introduction of invasive species

These cause harm to native species.

Pollutants

e.g. agricultural, industrial, human waste and pharmaceutical agents.

Habitat loss

Coastal areas are being dredged, reclaimed, built on, and developed.

Climate change

Warming waters, species moving northward, coastal erosion, extreme weather events.

Ocean acidification

CO_2 dissolved in the oceans is literally dissolving shells and corals.

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Eutrophication

Nitrate and phosphate from fertilisers and animal poo trigger algae blooms. Bacteria feeding on the algae use up oxygen in the water, creating oxygen depleted dead zones devoid of life.

Introduction of Invasive Species

A non-native species is a species that has been introduced, either intentionally or accidentally by humans. Many of these arrived from overseas on ships' hulls and in ship ballast and bilge water.

When a non-native species causes significant negative impacts they are classed as invasive. These negative impacts can be environmental/ ecological, economic, or societal.

Some of the ways invasive non-native species can cause harm to native species include:

- **Prey on native species**
- **Spread diseases that natives species are vulnerable to**
- **Compete for food/space**
- **Damage the native habitat**

Invasive species will be discussed further in the Biosecurity module.

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Pollutants

Decades of industrial pollution has left a legacy of toxic chemicals and heavy metals in our seas and marine sediments.

The UK's only resident Orca pod will soon be extinct with only two ageing males left, the females having been rendered infertile due to high levels of PCBs. In Norway, high levels of heavy metals in the organs of crabs mean care is needed in processing to avoid contaminating the meat used for human consumption.

In 2021 a mass mortality event of crustaceans in the North Sea may have been linked to the release of the toxic chemical Pyridine released during dredging works in the Tees estuary. There are queries currently being made into the chemicals released by fish farms for a possible link to inhibiting the development of the larvae stage of shellfish.

Other forms of pollution include human waste, which contain pharmaceutical compounds and cause bacteria outbreaks when discharged untreated into our waterway. Plastic items can be ingested by marine creatures either harming them directly and causing death by trauma or preventing feeding. Additionally small micro plastics and toxic chemicals in the plastics are ingested and enter the marine food chain. Studies show that humans ingest more than 250g of plastic per year this way.

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Quiz 1

1. **Invasive species harm the local ecosystem by?**
2. **Industrial pollutants from decades of use remain in our oceans. True or false?**

Answers on page 191

Habitat Loss

According to the World Economic Forum, almost ¾ of the world population lives within 50km of the coast. It's not surprising therefore that they state that only 15% of the world's coastlines remain in their natural state.

Coastal areas are being dredged, reclaimed, built on, and developed for all sorts of human uses, all to the detriment of the previous marine occupants.

To feed that increasing coastal population, overfishing has led to smaller catch sizes and catching species lower and lower down the food chain. Ever more destructive and desperate methods are being deployed, including bottom dredging and trawling, electro-pulse fishing, and intensive farming of carnivorous fish.

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Only 15% of the world's coastlines remain in their natural state

https://www.weforum.org/agenda/2022/02/ecologically-intact-coastlines-rare-study/

Climate change

Climate change is placing long term threats on our oceans but also having more immediate effects

Sea creatures, such as corals, are struggling to adapt to slowly warming waters. Sudden heat waves are also a problem. Scientists estimate that between 1 and 10 billion seashore animals died during the two week-long heatwave in Western Canada in 2021. As sea temperatures rise, mobile marine species are migrating northward and claiming territory occupied by species that are struggling to adapt.

According to a recent study, of the ¾ of the world's population lives within 50km of the coast, roughly

10% (or 634 million) people live less than 10m above sea level. This puts them at risk of rising sea levels and storm events.

Sea level rise and coastal erosion are quickly altering habitats. Strong storm events with destructive wave energy and heavy rainfalls are altering the salinity and turbidity of coastal waters.

634 Million People at Risk from Rising Seas

https://www.npr.org/templates/story/story.php?storyId=9162438

Climate change

https://www.capitaldaily.ca/news/it-smelled-like-death-one-year-after-the-heat-dome-killed-billions-of-marine-animals-scientists-watch-for-signs-of-life#:~:text=More%20than%20a%20billion%20seashore,billion%20in%20the%20months%20that

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Ocean acidification

Another consequence of climate change is ocean acidification.

The oceans absorb a huge amount of the CO_2 that we've been pumping into the atmosphere, up to a third of our emissions in recent decades. This has shielded us from the worst effects of climate change, but this ocean carbon sink is reaching capacity and dissolved CO_2 is increasingly being converted into carbonic acid. This acid dissolves and weakens the shells of shellfish and coral skeletons as well as affecting the ability of fish to breathe underwater.

As oceans absorb CO_2 at a faster rate, bigger challenges emerge

https://www.weforum.org/agenda/2019/03/oceans-absorb-co2-challenges-emerge/

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Eutrophication

More nutrients in the water may sound like a good thing, however it can lead to oxygen depleted dead zones through a process called eutrophication.

One of the pollutants entering our coastal waters is agricultural run-off. It contains nutrients in the form of nitrate and phosphate from fertilisers and animal poo. These nutrients trigger algae blooms. Bacteria feeding on the algae use up oxygen in the water, creating oxygen depleted dead zones devoid of life.

What is eutrophication?

https://oceanservice.noaa.gov/facts/eutrophication.html#:~:text=the%20nation's%20estuaries.-,Harmful%20algal%20blooms%2C%20dead%20zones%2C%20and%20fish%20kills%20are%20the,to%20estuaries%20and%20coastal%20waters.

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Why science and data are important

Scientists are striving to find answers to solve these environmental problems and publish results that could reverse the threats facing our oceans.

Their results are used by politicians and decision makers in designing policy and legislation on environmental protection. They also inform the public, who in turn can pressure their elected representatives for change.

If a study's sample size is too small then it could lead to erroneous assumptions being made. What scientists need is more data about our oceans. But gathering data in the marine environment is costly and time consuming and so scientists are limited in how much data they can gather. This is where you come in.

The value of citizen science data

Citizen, or Community science has revolutionised data collection in recent years and is a solution to one of science's biggest truths; that more data generates more accurate results. An army of data gathers, each gathering small pieces of data, equals lots of data.

There is of course the old adage, garbage in equals garbage out, so ensuring that you as an underwater surveyor are able to collect of the highest standard is of utmost importance. This is one of our key motivations for creating this Underwater Surveyor course.

BSAC divers are in a great position to bring skilled, safe, enthusiastic, and talented people to the realm of citizen science.

Scientific equipment, once cumbersome and astronomically expensive, is now both portable and affordable, allowing you to collect data that would have once been the preserve of specialised scientists.

Becoming involved in citizen science projects allows you to build awareness of the issues affecting your local ocean environment and community, enabling local connections and the ability to take ownership of these issues. By becoming a stakeholder, you gain a voice in the decision making process.

Through these processes, citizen science projects have already facilitated some big wins for ocean conservation including designation of protected marine areas and banning of some single use plastic products.

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Why your role is important

Creating change starts with individual action, like a falling pebble starting a landslide.

Undertaking a marine survey as part of your dive can be motivating and rewarding, providing a purpose for your dive.

It's great to collect data for science and help protect the marine environment, but the main reason I do underwater surveying is because it is FUN! If you need another reason, if they know you're doing it for a good cause, your loved ones may even let you go diving more often.

Quiz 2

1. **The power of citizen or community science is that a large amount of data can be collected by many people each gathering small pieces of data. True or false?**

2. **Creating change starts with?**

Answers on page 191

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Summary

In this module we have covered:

- ✔ **Biodiversity and ecosystem health**
- ✔ **Threats facing the ocean**
- ✔ **Why science and data are important**
- ✔ **The value of citizen science data**
- ✔ **Why your data is important**

End of module test

1. The best time to establish the current baseline is?
2. Of the two types of restoration, which has a better chance of success?
3. A fully functioning food web has?
4. Overexploitation of oyster reefs in the 19th century led to?
5. Industrial pollutants from decades of use remain in our oceans? True or false?
6. According to the World Economic Forum, how much of our coastline is in its natural state?
7. According to a recent study, roughly how much of the world population lives less than 10m above sea level?
8. Excess nutrients from agricultural runoff is creating?
9. Results from scientific studies can be utrilised by politicians and decision makers in designing policy and legislation on environmental protection? True or false?
10. The power of citizen or community science is that a large amount of data can be collected by many people each gathering small pieces of data? True or false?

Answers on page 191

Safe surveys and the law

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Safe surveys and the law

Whether you are diving or snorkelling, your safety and that of your buddy is the priority when engaged in any surveys in or under the water. It is also of paramount importance to the project itself that resolution and management of incidents should they arise takes precedence over any data collection activity. It is also important to ensure that any underwater survey activities are undertaken in compliance with the law and any other regulations that might apply.

Module contents

In this module we will introduce some key safety considerations when undertaking survey dives to keep you, your buddy and the rest of the team safe. We will also look at some aspects of the law that you will need to be aware of when participating in citizen science project dives.

We will look at:

- **Buddy and trio diving.**
- **Task fixation.**
- **Key safety equipment.**
- **Marking of divers.**
- **Surface cover.**
- **Local considerations.**
- **Legal considerations**
- **Summary**

Safe surveys and the law

Introduction

Whether you are diving or snorkelling, your safety and that of your buddies is the priority when engaged in any surveys in or under the water. It is also of paramount importance to the project itself as resolution and management of incidents should they arise take precedence over any data collection activity.

It is also important to ensure that any underwater survey activities are undertaken in compliance with the survey law and any other regulations that might apply.

As qualified divers and snorkellers you already have training to keep you and others around you safe. This means that you are trained to manage all parts of the dive yourself, and to resolve the problems that might occur within the limits of your qualification.

It is therefore important to ensure that any underwater surveying you participate in is within your qualification and experience.

BSAC's Safe Diving Guide is an excellent reference guide and is freely available to divers whether trained through BSAC or other agencies and covers everything you should need to know about Go Diving, Gas, Equipment, Dive Management, Decompression, Seamanship, Medical, Military Diving, Others and The Divers Code of Conduct.

Safe diving guide - British Sub-Aqua Club

https://www.bsac.com/safety/bsacs-safe-diving-guide/

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Just because you are conducting an underwater survey does not mean that you are allowed to neglect good practice. You have a duty of care to yourself and your buddy.

The buddy system means that you operate as a unit, with each diver or snorkeller taking some responsibility for the safety of the other(s).

Buddy and trio diving

Before every dive everyone should be clear who is going to lead the dive, and how you will be positioned underwater and who is doing what in terms of any tasks underwater. If snorkelling, you should take turns to dive so that one snorkelling buddy is on the surface at all time.

Diving in buddy pairs is preferable to diving in a three or more as a key issue in diving with three people or more is the distraction factor, which can affect either the identification of a developing problem or its subsequent resolution. The task loading when diving in threes is increased and requires that all three divers are capable of coping.

That said, if diving in a group of three is required it is even more important to ensure that the dive plan is understood and agreed by all divers prior to entering the water, and that all divers consciously and conscientiously monitor both of their buddies.

Trio diving is generally for more experienced divers or those familiar with each other.

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Task fixation

It is possible for those involved in an underwater survey or associated task that they can neglect their own safety or that of their buddy.

It is important to remember that it is no good completing a task or completing the survey if you or your buddy introduce unnecessary risk, have an incident or do not make it back safely to the surface.

It is important to be disciplined and stay within agreed dive parameters (available gas, dive time) and not ignore risks that might be developing (cold, increasing water movement, poor visibility).

It is particularly important for snorkellers when they dive to ensure they do not push their breath hold diving limits too far.

For some dive surveys it can be useful to delegate one of the buddy pair to be the ‘safety diver’ with a focus on ensuring gas checks are completed, bottom time limits observed whilst the other focusses on the detail.

For example, in some surveys a diver might be providing flood lighting (from above this is often called ‘angel lighting’) for their buddy see what they are surveying /photographing, and it might make sense for them to take on the role of safety diver as well given they can use light signals to communicate quickly with their buddy.

Safety Equipment

Exactly what safety equipment is required will depend to some degree on the nature of the survey and the location where it is being conducted.

Two key risks are:

- **Entanglement**
- **Not being seen on the surface**

These can be mitigated by a suitable knife/cutter and surface detection aids respectively.

Knife / Cutter

A lot of surveys involve laying of lines / tape measures and so the risk of entanglement is increased particularly in poor visibility. A good underwater knife / cutter is therefore an essential piece of safety equipment for divers and snorkellers alike so they can cut themselves or their buddy free from any entanglements.

Surface detection aids

BSAC recommends that you think about carrying one or more surface detection aids to make you more visible to boats and to rescue aircraft. As well as a Surface Marker

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Buoy (SMB) or Delayed Surface Marker Buoy (DSMB), useful detection aids include:

- **Torches**
- **Strobes**
- **Fold-up flags**
- **Signal mirrors (polished stainless steel – not glass)**
- **High-power whistles (various mouth-powered 'storm whistles', and direct-feed-powered air horns)**
- **Radio distress beacons**

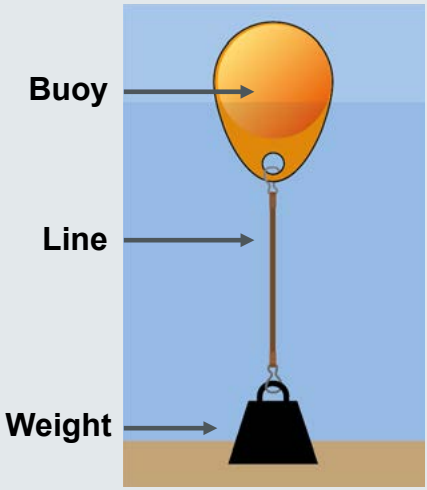
There are several types of radio distress beacons available for diver location in an emergency

- **Personal locator beacons (PLBs)**
- **Emergency Position Indicating Radio Beacons (EPIRBs)**
- **Submersible transmitter/ receivers**

Marking of divers

Knowing where your divers or snorkeller are at all times is of paramount importance particularly if you are the Dive Manager / Supervisor in charge of the overall dive operation or the Diver Coxswain in charge of the boat.

From an underwater survey point of view, it may also be important to be able to mark your divers so that you know exactly where the underwater survey has been conducted.



Shotlines

Use a heavy duty shot line for ascent and descent. A shot line from the surface is one of the safest ways of divers ascending and descending. A shot line is often used to mark a particular survey site, especially if you intend to return to it.

Shot weight provides an underwater datum for divers. Provided divers or snorkellers are not moving too far away from the shot line then this is a good way of marking their overall position.

The buoy on the surface is a marker for the surface cover and location for a GPS or transit fix of the site.

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Delayed SMBs

Surface marker buoys are another way of marking a diver position whilst they roam freely underwater.

Snorkellers should also use these to mark their position. Larger buoys are often equipped with handles and attachment points to hold onto to rest. Some have pockets for accessories.

A water resistant GPS tracker can be attached to some surface marker buoys so that the diver's position can be tracked. This could be useful if trying to survey the perimeter of a particular habitat underwater.

Delayed surface marker buoys are an essential safety item for divers. The are typically used to mark a diver's position at the end of the dive before they surface. They can also be used for signalling.

There is a convention that a single DSMB means "situation normal" but a red DSMB and a yellow DSMB on the same line indicates a problem. If you plan on using this system you should make sure that everyone on the boat, including the skipper or coxswain, is aware of the situation.

If you plan to use an alternative signalling method, ensure all are aware of the meaning and the action to take if it is deployed.

For underwater water surveying a delayed surface marker can be used to mark the end of an underwater datum line or a particular feature of interest so that it can be accurately positioned on the surface using GPS or transits. However, it is good practice to use dedicated delayed surface marker buoys for surveying rather than a diver's own delayed surface marker buoy that they may need later to signal their own ascent or problem.

Underwater dive trackers

Under water diver trackers are available but are usually cost prohibitive for the average citizen science project. Nevertheless, they can very accurately position divers underwater which may be helpful if your underwater survey needs to be positioned particularly accurately.

Surface cover

Having dedicated surface cover means that an incident is more likely to be spotted quickly, and help may be quicker to arrive

As a minimum the surface cover should know exactly where they are and how to raise the alarm in the event of an incident. It also means that routine management of those undertaking an underwater survey can be appropriately managed and supported.

Ideally, the surface cover should be a trained Dive or Snorkel Manager and be trained and practiced in the role. Dive Managers are

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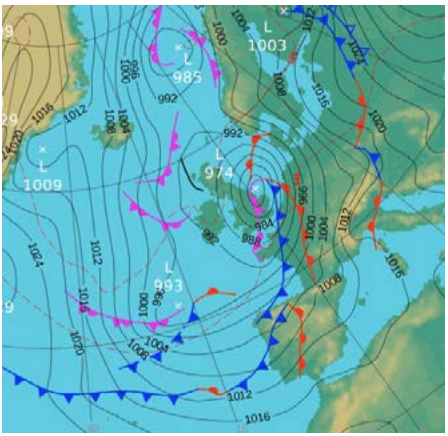
typically qualified BSAC Dive Leader or above or if snorkelling then a Snorkel Dive Manager. They would typically delegate some tasks or responsibilities to assistants. A central part of the role of a dive or snorkel manager is assessing the risks involved and mitigating them as necessary.

Local considerations

Standard risk factors can include weather, waves and tide, other surface traffic, timing and causes of delays (eg. sunset, developing problems), snorkelling/diving restrictions.

These may all adversely impact desired underwater surveying activities if not properly considered and planned for.

Poor weather (generally wet and cold) can sap your team's energy and morale.



Younger people in particular might not realise how cold they actually are or are getting. It may be necessary to shorten or abort diving activities early and return to base to change, get dry and rewarm.

In hot weather, heat exhaustion is a risk particularly if wearing a drysuit.

There is usually plenty of water around to dip in and out of to help to stay cool (particularly as the water evaporates from the drysuit). Wear

a suitable hat, sunglasses and apply high factor sun cream to protect from sun burn. Remember to stay hydrated but not overly so.

Increased wave height

Increased wave height will make snorkelling uncomfortable and for any surface cover in a boat, increase the risk of seasickness and potential increase time and fuel required to return to base.

An unexpected change in the direction or strength of tide

This could see divers or snorkeller scatter in the wrong direction affecting the lay of datum lines and ultimately sweeping people and potentially kit being dragged off the survey site.

Other water uses

There may well be yachts, motorboats, jet skis, paddle boarder and other surface traffic. Ensure a code A “Divers Down” flag is flown on the site when divers or snorkellers are in the water. Do not assume that everyone knows what it means and be prepared to intervene to protect those in the water.

Timing can also be important

Unless you deliberately plan to dive at night, the sunset will be a limiting factor on your survey day. Unexpected problems with kit or surveys may also delay your planned survey activity or necessitate an earlier start to complete it in a timely manner.

Go back

The nature of the survey itself might also constrain the nature of the survey, for example, limited no-stop dive time due to depth, qualifications of those diving – particularly those with less diving/ snorkelling experience.

Local restrictions

There may also be local restrictions on snorkelling and diving. For example, in some harbour jurisdictions such activity may be banned unless formal permission has been granted.

Other legal considerations

When undertaking Underwater Surveys there are two key pieces of legislation in the UK to consider:

The Diving at Work Regulations 1997 which applies to those diving for “hire or reward” and Marine and Coastal Access Act 2009 and similar Acts created a new system of marine management throughout the UK.

Whilst this section focusses on UK law other legal frameworks are likely to exist and impact on any underwater surveys overseas. You should check local requirements from a reputable source before undertaking your own survey dives.

Generally underwater surveys might be managed by organisations and commercial diving centres / school who already has the necessary permits and permissions. In which case you should confirm these are in place and follow their rules and guidance in contributing to the survey.

Go back

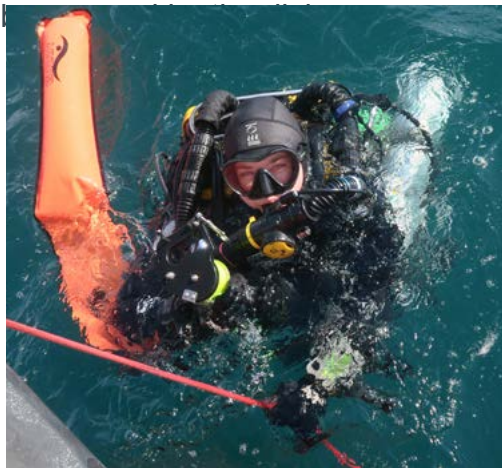
Diving at Work Regulations in Practice

It is possible to have both professional (paid/rewarded) and volunteer (paying/recreational) on the same project but there are extra considerations for both parties

Most likely is that a commercial dive centre that teaches recreational diving, may be organising an event, or a professional diving instructor might be asked to support a branch or club project, in which case the centre or profession diving instructor will need to be complying with DWR 1997 regulations as well as ensuring diving is conducted within BSAC safe diving guidelines.

If a volunteering sports diver wants to participate in a professional paid survey

If they are being paid to undertake a survey, then even as a volunteer then they must have certain minimum HSE recognised qualifications and a valid HSE diving medical and [illegible] contractor's insurance.



The DWR 1997 regulation have helpfully summarised into different Approved Codes of Practice (ACOP) to help interpret and apply them in practice. The Recreational ACOP and the Scientific and Archaeological ACOPs are the most likely codes these divers will be operating to.

A commercial centre or self-employed professional instructor should also have additional insurance which is different (and more expensive) than the usual volunteer diver's third party insurance that is included in BSAC membership.

On an entirely volunteer citizen science project – HSE rules should not apply

For clarity this course is primarily aimed at volunteer divers working on citizen science projects in their own time for fun at their own expense and so BSAC safe diving guidelines are the key framework to be operating within.

MCAA Licensing Bodies

Under the Marine and Coastal Access Act 2009 (MCAA) marine licence is required for certain activities that involve depositing or removing a substance or object in the UK Marine Area

Broadly, this includes the area below the mean high water springs mark and in any tidal river to the extent of the tidal influence. It is important to understand how these licensing requirements might affect Underwater Survey activities.

Marine and Coastal Access Act 2009

Activities requiring a license could include:

Activities could include for example removing samples of marine life or seabed samples or depositing native flat oysters or planting seagrass. If the project, you are participating in is doing such activities then they should have a marine license to do so.

Go back

The bodies who issue licenses in the UK:

The bodies responsible for issuing the license in the UK are the Marine Management Organisation (MMO) in England, Natural Resource Wales (in Wales), Marine Scotland (in Scotland) and Department for Agriculture and Rural Affairs in Northern Ireland.

The procedures for acquiring a license may differ slightly from location to location.

Some activities even if exempt may still need to be notified

In some instances, even for an activity that is exempt from requiring a license it may still be necessary to fill in an online form to notify the relevant marine license issuing authority that an extent activity is taking place. More detail guidance on marine licenses can be found online:

Do I need a marine licence?

https://www.gov.uk/guidance/do-i-need-a-marine-licence

Apply for a marine licence

https://www.gov.uk/apply-marine-licence

BSAC Survey Guidance agreed with MMO

If you are just undertaking underwater surveys, then BSAC as the National Governing Body for the Sport in the UK has provided guidance following consultation with the MMO to agreed activities relevant to recreational divers that do not need a marine license.

Activities relevant to recreational divers that do not require a marine license are:

Shot Lines

The MMO consider that shot lines can be considered as temporary markers. Temporary markers (deployed and left unattended in excess of 24 hours and less than 28 days) are exempt but require notification to the MMO. Temporary markers (or shot lines) deployed for less than 24 hours are exempt and no notification is required. Temporary markers (or shot lines) deployed for more than 28 days require a marine licence.

Temporary marker buoys

The MMO considers that marker buoys deployed in excess of 24 hours and less than 28 days are exempt from requiring a marine licence, but

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notification is required. Marker buoys deployed for more than 28 days require a marine licence.

Temporary moorings

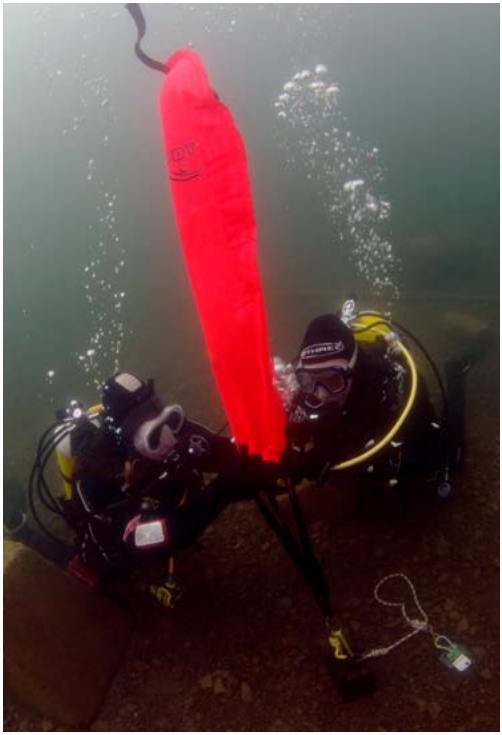
The MMO consider that a marine licence would be required for any temporary mooring laid by a dive boat. A single licence application for temporary moorings can be made to cover multiple sites and for extended periods of time provided sufficient evidence is supplied with the application for a full assessment to be made.

Surface Marker buoys (SMBs and DSMBs)

You do not need a licence to deploy either delayed surface marker buoys (DSMB) or permanently inflated surface marker buoys (SMB) to mark the position of divers.

Lifting bags

Lifting bags of less than 100kg total lifting capacity for the object may be used without a marine licence to recover items that have been on the seabed for less than 12 months, such as shot weights, datums, lost diving equipment etc



Emergency situations

You do not need a licence to use any distress flare, smoke float or similar pyrotechnic substance, provided that it is either a genuine emergency, or you are training for an emergency situation.

Survey lines and datum

You do not need a licence for survey lines and datums deployed by hand.

Marine litter picks

The collection of contemporaneous marine litter using lifting bags or by hand (to a weight limit < 100kg) does not require a marine licence.

Quiz 1

1. **What local considerations are there for planning snorkelling or diving underwater survey?**
2. **As a volunteer diver you should follow BSAC Safe Diving Guidelines? True or false**

Answers on page 192

Go back

Go back

Summary

In this module we have covered:

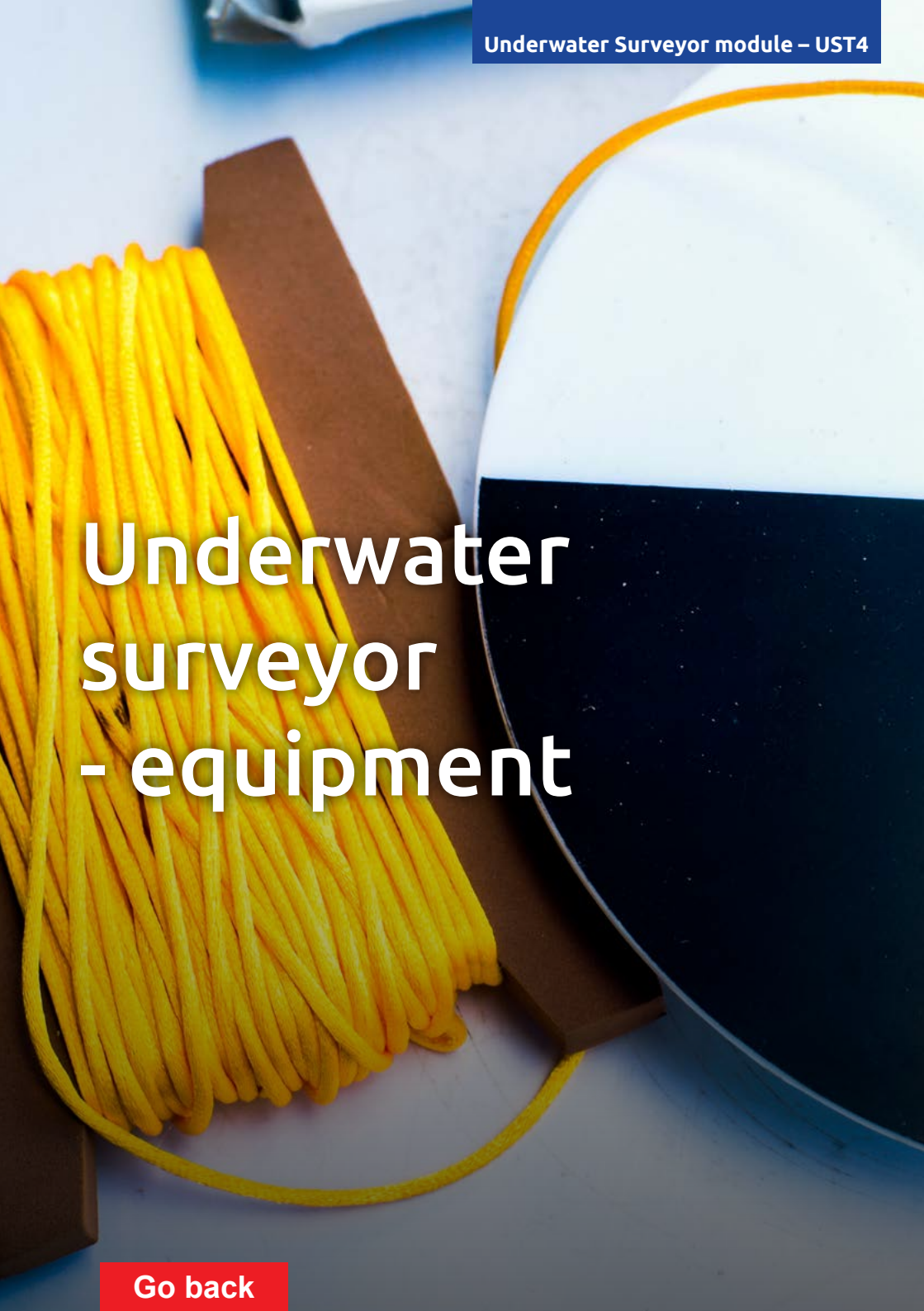
- ✔ **Buddy and trio diving.**
- ✔ **Task fixation.**
- ✔ **Key safety equipment.**
- ✔ **Marking of divers.**
- ✔ **Surface cover.**
- ✔ **Local considerations.**
- ✔ **Legal considerations**

Go back

End of module test

1. What would you do if you discovered that the underwater survey was beyond your diving limits experience?
2. Where can you find reliable detailed safe diving guidance?
3. You are out on an underwater survey. How could reliably signal to other water users that diving or snorkelling operations are underwater?
4. As a volunteer diver who is paying their own way to participate in an underwater water survey do the Diving at Work Regulations apply to you?
5. As a volunteer diver you should follow BSAC Safe Diving Guidelines.? True or false?
6. What is the MCAA in the UK??
7. Do you need a marine license to conduct and underwater survey that involves taking samples from the seabed?
8. You plan to do an underwater survey well outside a harbour, well away from the shipping and mooring areas but still within their jurisdiction. Would you need a dive permit or formal permission from the harbour authority?
9. What does DSMB stand for?
10. What should the surface cover be?

Answers on page 192



Underwater surveyor - equipment

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Underwater surveyor - equipment

Sport divers conducting surveys will generally be supporting citizen science projects which normally have limited budgets. Fortunately, a lot of the equipment required to undertake key underwater surveys is already standard diving equipment or readily available from a hardware store online.

Module contents

In this module we describe how your standard diving equipment can be used for underwater surveys and what additional equipment can be obtained to enable an effective survey.

We will look at:

- **Standard diving equipment**
- **DIY survey equipment**
- **More specialist equipment**
- **Metrics**
- **Equipment used to measure different metrics**
- **Summary**

Underwater Surveyor - equipment

Introduction

Standard equipment that can you used as part of a survey includes: - Knife/Cutter, Underwater Torch, Underwater Slate / Notepad, Dive Computer / Dive Timer, Compass, Reel and Delayed Surface Marker Buoy and Reel and Surface Marker Buoy, Spare Lead Weights, Mesh Dive Bag, Clips, Lifting Bag, Underwater Digital Stills/Video Camera.

Standard equipment

Knife/cutter

These are essential safety items, particularly when there are more tapes and lines in the water than a normal dive.

Underwater torch

In a survey context, torches can be used to illuminate subjects under survey and note pads in low light conditions. Like on any normal dive can be used for signalling and attracting attention (e.g., slow circle = are you OK / I'm OK, flashing torch or rapid movement of beam = I need your attention / emergency) and illuminating hand signals.

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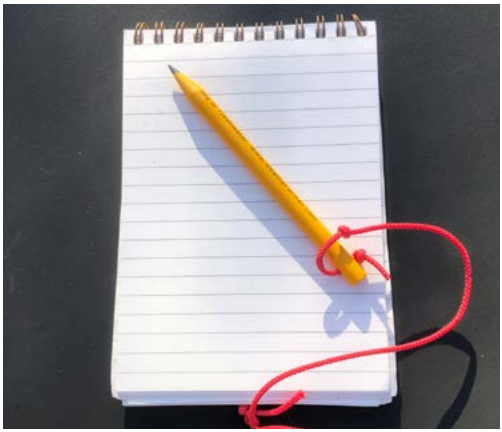
Angel lighting is a technique where a buddy illuminates the subject from above (or the side). This is not only helpful to illuminate what your buddy might be surveying but can be particularly helpful to avoid backscatter on photographs / video in more turbid water.

Flood lights as opposed to spotlights (most dive torches) are generally better as they provide a more even light and some makes of dive torch enable the diver to adjust the beam angle between spot and flood mode.

On torches where light levels are adjustable it may be necessary to adjust (up or down) the light output or reposition the camera angle to avoid white out on the image.

Underwater Slate



These are readily available and typically used in a diving context to record backup decompression slates or for communicating underwater where divers have something to say that cannot be easily communicated by hand signals.

They can clearly also be used to record simple survey data. It is helpful to have a spare pencil with the slate in case one breaks. Take care to write clearly and not too small, which is not as easy as it sounds when wearing gloves.

On the surface the information on the slate can be transferred manually to a database or other recording sheet. Taking a photograph with your camera is a good way to save a backup of the content of the slate.

Underwater the slate can be used to determine a scale of an object.

Bespoke, DIY slates may be printed and laminated and taken underwater. This have the advantage of a standard format that can be tailored to record the data exactly as required, standardising how different divers collect the information and aiding data capture and transfer to computer on the surface.

Compass

This basic piece of equipment is often used to confirm the direction of a datum line from a known point or general orientation of a site and any particular features (e.g., the reef runs east/west with marine life on the north side).

Compasses that are inbuilt into dive computers should be calibrated in accordance with the procedure in the manual.

Handheld compasses that can be held directly in front of the user tend to yield more accurate readings than those attached to a hose or strapped to a wrist, as it is easier to check that the compass is level and thus free to rotate plus viewing errors are reduced.

Compass readings can be effected by magnetic signatures from nearby ferrous metal (e.g., a shipwreck in abandoned anchor) or magnets on diver equipment such as those often used to attach an octopus regulator hose.

Compasses read magnetic bearings so remember to convert to a true bearing if required by considering the local magnetic variation.

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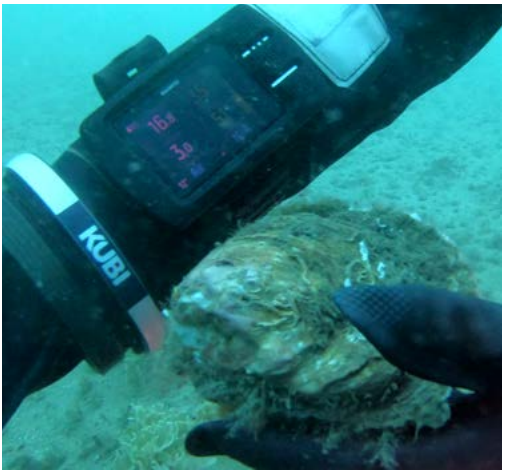
Dive Computer / Timer



These provide details of depth, time and often water temperature which are basic details required for many underwater surveys. It is often helpful to use them for scaling objects underwater if you place them alongside the feature of interest.

Taking a photograph of the underwater object or fauna next to the screen of the dive computer provides information so that subject, depth, time and often temperature all in a single image.

Temperature gauge accuracy can vary a little and you may need to allow a little time if moving through thermoclines for the temperature reading to stabilise. Typically, temperature gauges are within +/-1% of true temperature so specialised equipment will probably be required if a project requires greater accuracy.

Depths are based on a pressure sensor which is usually calibrated for freshwater meaning that actual depth in seawater would be slightly shallower than indicated (1000/1025=0.7%) However, the difference is probably negligible for most underwater survey work.

Delayed Surface Marker Buoy (DSMB)

Apart from the usual safety use in marking a diver, these can be used to mark the start of an underwater datum line or mark a significant find for another team of divers to come back and survey.

The reel can be configured in two different ways. With the reel configured to be on the surface with the addition of a weight into a simple shotline that can be quickly deployed at the desired location on the surface. However, it is harder for the diver to pay out more line if required (e.g., due to the rise of the tide or increase in current).

If the reel is at the bottom, then the dive can adjust the length of line out more easily. The reel can be attached to a suitable weight to hold it in position.

Surface Marker Buoy (SMB)

Surface Marker Bouys (as opposed to Delayed Surface Marker Buoys) are useful for area surveys and stowing equipment.

As described before this combination is very useful if the location of divers needs to be accurately tracked using a GPS in the SMB or on a following boat. As water depth increases then the

Go back

accuracy of the dive location may reduce as the scope or length out of line increases to enable the diver to tow the SMB through the water.

For snorkel divers larger surface marker buoys with storage compartments also serve as a means to stored underwater survey equipment. With the reel at the surface, a shot line can again be deployed in the desired position so there is a fixed reference datum, which is capable of being moved if required.

Spare weights and clips

Spare weight are particularly useful for stabilising datum lines on the seabed (whether a reel or tape measure) and making up simple shotline. If weights don't have integrated clips already, then other clips can be quickly attached using strong cable ties to allow them to be attached to various lines.

Mesh Bag

These are very convenient for storing the survey equipment to enable it to be sent safely down a shot line to the survey divers, rather than requiring them to carry it on themselves thereby increasing task loading, affecting buoyancy/trim and increasing clutter and drag. Once divers have finished the survey, the survey equipment can be collected back the bag which is turn can be sent to the surface on a lifting bag or attached to the shotline for subsequent recover.

Lifting Bags

Useful for sending survey equipment or shot weights to the surface after use. Note that the use of lifting bags is governed by law in the UK and a license to use them is required for some activities although for most sport diving activities a license is not required. BSAC has produced guidance on this.

Marine Management Organisation (MMO) releases updated marine licensing guidance

https://www.bsac.com/news-and-blog/mmo-releases-updated-marine-licensing-guidance/

Underwater Digital Stills / Video Camera

Although not quite 'standard diving equipment' many sports divers do seem to have some sort of camera. A small digital stills camera or small action type video cameras can provide very high quality images cost effectively. Used in conjunction with underwater lighting you can get some very helpful images.

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If you wish to extract still photographs then clearly a stills camera will generally provide a better quality, higher resolution image. Still photographs can be obtained from the video footage but in this case it is important remember to move the camera very slowly or hold it steady in front of the subject for a few seconds to reduce the risk of a blurry image.

The smaller video cameras will usually be fixed focus so that care is required not to get too close to the subject being photographed otherwise your images may be out of focus and useless.

Let's now look at the equipment that is not standard diving kit but is readily available from online or a local hardware store and with little or no modification be used underwater and relatively low cost.

Other items such as handheld GPS systems and turbidity measurement equipment are a little more specialised but can be procured online.

DIY equipment

Heavy duty shot line

These are normally part of the equipment associated with a dive boat to provide the means of getting divers and their equipment to the survey site.

There is usually a heavy weight (10-20kg) with thick, generally buoyant line (10-12mm diameter). The polyform buoy on the surface should have enough buoyancy to counteract the weight so that if the shot line is too short, the whole system simply floats away and can be recovered rather than sinking.

When undertaking survey work it may be that a top tensioned buoys is used so that the buoy on the surface is forced as close as possible to be vertical above the site of interest. The greater the wave and current acting on the shot line the greater the shot line will be from vertical.

Tape measure

Surveyor's tape measures provide cost effective and robust means to measure distance underwater. They can may excellent baselines or jackstays that guide divers between two points. The end of the tape measure would normally be clipped to the shot line or datum weight before the tape is reeled out in the required direction, tensioned and secured with a small weight. The direction of the line can be checked with a hand held compass and bearing adjusted and recorded accordingly.

With the addition of some carabiners / clips at either end tape measures can be clipped to D-rings on diver's equipment.

The tape measures usually have some metal fittings which may corrode but being mostly plastic construction, they should last quite a while even in and out of a seawater environment.

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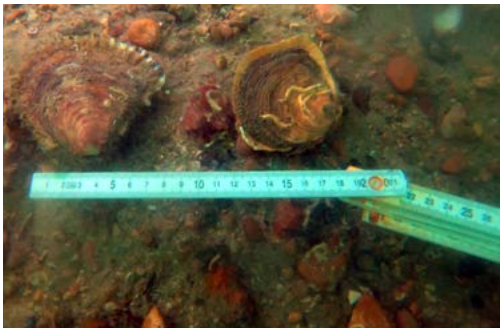
Plastic measuring calipers

These are useful for measuring small and more complex shapes object such as the size of shellfish or crustaceans (lobsters/crabs). They can be more precise than a ruler but the plastic ones suitable for underwater use are not necessarily as robust as a ruler.



Quadrat

Typically, in 0.5m x 0.5m size with 100mm mesh increments, these are used to define the boundary within which a count of particular marine life or other objects can be counted.

DIY quadrat

These can be made from plastic pipe, pipe fittings, bungy and tape with some optional lead fishing weights or other suitable ballast inserted into the pipe to provide some ballast. The equipment can be folded up for transport to and from the survey site and then re-assembled.

DIY core sampler

Some projects may need seabed core samples to be collected. A simple core sampler can be constructed from suitable plastic pipe with end caps. A typical size is 50mm (2”) diameter. The end caps must be refitted underwater to keep the contents of the core with the tube until it is recovered on the surface.

Plastic zip lock food bags

Can be used to store marine life or seabed samples and seal in moisture content (and odour!)

More specialist equipment

GPS Tracker

There is usually a GPS on the dive boat that can be used but if divers are using an SMB then a hand held GPS unit can be attached to the SMB to track the position of the SMB and therefore the divers. The track data can be downloaded later. Even if the hand held unit is water resistant it is wise to store it in a waterproof bag. Before you start logging ensure the unit has fresh batteries or is fully charged.

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Salinity measurement

Average seawater salinity is about 35 g per kg of seawater. Salinity can be measured using handheld salinity test meters that are simpler dunked into the seawater sample to test it.

Portable Salinity Refractometers require only a few drops of seawater to measure salinity levels.

Both devices are readily available from online stores but the project where you are doing the underwater survey is likely to have this equipment if this metric is being monitored.

Turbidity measurement

These are three ways this is often measured:

Secchi disk

This is a black and white quartered disk (200mm diameter for freshwater and 300mm diameter for seawater). The operate lowers it on a tape measure into the water until they see it disappear at which point the record the distance from the tape measure to the surface. This is a very simple piece of equipment and is often homemade.

Transparency tube

These are useful if the water is too shallow for the secchi disk. Instead a sample of water is poured into a calibrated glass tube with a mini-secchi disk or cross hairs at the base. Water is poured in unit the user can no longer see the base at which point the reading of the side of the glass tube is taken.

The measurement in cm can be converted to more scientific units of turbidity: Nephelometric Turbidity Units (NTU) using a table.

Understanding transparency tube measurements

https://extension.psu.edu/understanding-transparency-tube-measurements

Check out the scientific literature.

Hand held light measurement instrument:

These are more specialist pieces of equipment and require a small sample of the water to be poured into the device. These devices are reasonably expensive and unlikely to be often seen by sports divers in the field.

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Metrics

The exact data to be collected, or metrics, will depend on the nature of the project.

The Native Oyster Restoration Alliance (NORA) have produced a monitoring guide with 30 metrics that can be measured at various stages of the project.

Many of these require laboratory rather than field equipment to measure, usually on samples obtained by divers and provided to scientists with specialist skills and equipment.

Let's look at an example of the sort of data that can be collected and what equipment you are likely to need.

https://nativeoysternetwork.org/wp-content/uploads/sites/27/2021/11/European%20Native%20Oyster%20Habitat%20Monitoring%20Handbook_WEB_Final.pdf

The table on the next page lists the key metrics that are easier to measure and more likely to be encounter in citizen science projects.

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Metric	Underwater Torch	Underwater Slate / Note pad	Dive Computer / Dive Time	Datum Line (Shotline, reel +DSMB)	Reel and SMB	Compass	Tape Measure (used as a jackstay)	Quadrat	Calipers	Core Sampler	Underwater Stills / Video Camera	Salinity Test Meter	Turbidity Meter	GPS
Project Footprint and Habitat Area (m^2)		X			X									X
Shell Cover (m^2 per m^2)	O	X		X	X	X	X	X			O			
Oyster Density Qty per m^2	O	X		X		X	X	X			O			
Oyster Size Frequency Qty per size	O	X					X		X		O			
Water Temperature Celsius (°C)		X	X											
Salinity (parts per thousand or psu)		X										X		
Turbidity (cm or NTU)		X											X	
Invasive Non-Native Species (INNS) Density per m^2	X	X				X	X	X			X			
Growth Rate mm/year		X							X					
Animals in the seabed (Infaunal)	X	X								X				
Animals and plants on seabed (Epifaunal)	X	X									X			
Animals and fish passing through area	X	X									X			

Quiz 1

1. A knife / cutter is an essential piece of safety equipment that should be taken on all dives including survey dives? True or false

2. What does infaunal mean?

Answers on page 193

Go back

Summary

In this module we described how your standard diving equipment can be used for underwater surveys and what additional equipment can obtained to enable an effective survey.

We looked at:

- ✔ **Standard diving equipment**
- ✔ **DIY survey equipment**
- ✔ **More specialist equipment**
- ✔ **Metrics**
- ✔ **Equipment used to measure different metrics**

End of module test

1. What can an underwater slate be used for?
2. What is Angel lighting??
3. A delayed surface marker buoy can be configured to be used as a datum marker and either controlled from the surface or at the seabed by the diver? True or false?
4. What advantages does an SMB offer over a DSMB for survey work?
5. What is the advantage of using a caliper to measure an oyster compared to a ruler?
6. You can preserve a small core sample by first capping of the ends underwater and then on the surface sealing the whole tube in a suitable plastic bag?
7. What pieces of equipment can be used to measure turbidity?
8. Even if a handheld GPS unit can be stored in suitable plastic back for additional security against water ingress? True or false?
9. A tape measure and quadrat are very simple, cheap and versatile pieces of survey equipment that can be use on many different types of underwater survey? True or false?
10. Which units is turidbity measurted in?

Answers on page 193

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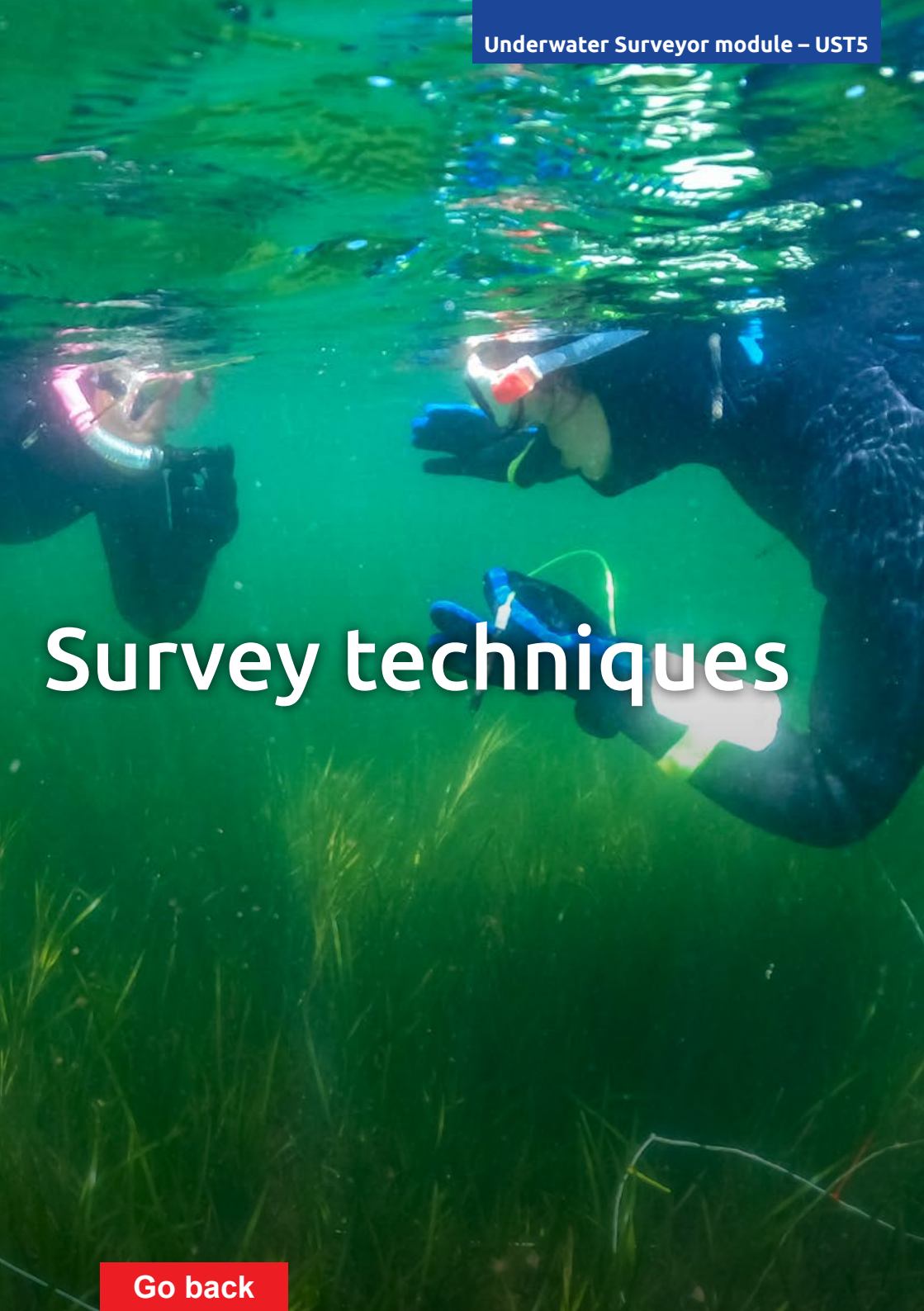

Survey techniques

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Survey techniques

In this module you will learn how to undertake a variety of underwater survey techniques. These techniques can be applied to a variety of 'missions'. Missions might be organised by BSAC, such as Operation Oyster, where data from many locations around the UK is required.

Alternatively individual clubs, centres, interest groups or individuals can set up their own missions which are relevant to their area of coast. All of the techniques can be undertaken by snorkel or SCUBA diving.

Module contents

Module 5 will guide you through the range of survey techniques you can use during your dives.

For each technique we will cover:

- **The equipment required**
- **How to do the survey**
- **Survey steps**
- **Techniques video**
- **Mission applications**
- **Summary**

Introduction to survey techniques

The aim of this module is to give you a toolbox of survey techniques that you can apply to a variety of different survey missions.

Some of the techniques are quite straight forward, allowing you to get started with your surveying quickly.

Some provide more of a technical challenge, which you will enjoy rising to as your survey skills develop.

Although we will cover a range of techniques in this eLearning, you can take your time learning to put one or two at a time into practice.

You will collect more valuable data and become a better surveyor by getting familiar and confident with one technique before moving on to another.

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List of survey techniques

The following survey techniques will be covered in detail:

- **Presence/Absence survey**
- **Underwater photography survey**
- **Timed survey**
- **Transect survey**
- **Video transect**
- **Transect & quadrat survey**
- **Baited Remote Underwater Video (BRUV) survey**
- **Habitat mapping**
- **Habitat health**

For each survey technique the following will be covered:

- **Equipment required**
- **How to do the survey**
- **Technique video**
- **Missions the technique can be used with**
- **Additionally, survey checklists and template survey forms are available in the resources section of this eLearning**

Difficulty ratings

The difficulty of a survey depends on a number of factors. For example some may have a low technical difficulty to carry out, but require more skill in species ID or vice-versa.

The difficulty falls broadly into the following categories:

Accuracy with positioning

Does the accuracy of your survey location refer to a general area, transect lines, individual quadrat or a precise, pinpoint location?

Equipment complexity

How much equipment does the survey require you to use underwater and how complicated is that equipment?

ID skills

A survey of one easy to identify species, such as seagrass requires less in the way of ID skills compared with a survey that requires the identification of many different species, such as nudibranchs.

Quiz 1

1. Can you name three techniques that can be used for underwater surveys?

Answers on page 194

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Presence/Absence

Go back

Presence/Absence

Introduction

The bedrock of understanding the marine environment is recording which species are present or absent.

This section will cover how to conduct a species presence/absence survey. This type of survey is easiest if you start by focusing on a small number of species.

Difficulty rating: Presence

Positioning

Equipment

ID skills

Green = Easy, **Orange** = Moderate, **Red** = Difficult

Go back

Equipment required

To conduct a presence / absence survey you will need the following survey equipment:

Writing slate and pencil

This can be a tethered board or wrist mounted. It is sometimes helpful to mark up your board with headings of what you need to record beforehand.

Camera

Not necessary but helpful to provide evidence of species seen. See photography section for more details on underwater photography.

GPS device

You will need to record the GPS location of the survey area. You can use the GPS on your watch or phone to do this, ask the dive organiser or boat skipper, or find the co-ordinates from an online resource such as Google maps after your dive.

Watch / dive computer

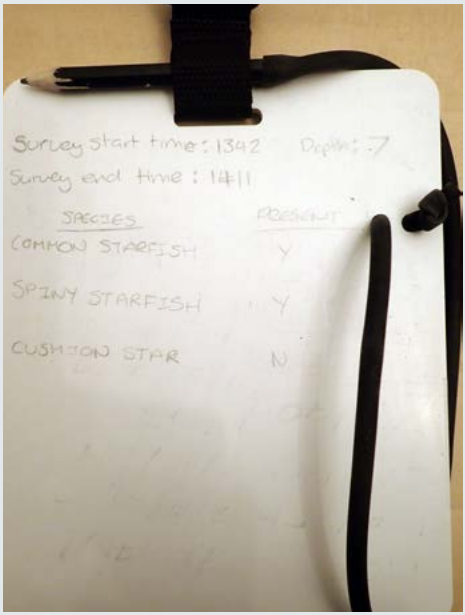
You will also need to record the time and depth of your dive. If you are SCUBA diving, you should be able to find this information on your dive computer. If you are snorkelling, a waterproof watch, rated to the depth you will be diving is adequate for recording the time of day and duration of your dive.

How to survey

Now we will look at how to conduct your presence / absence survey in the water.

In this technique, you will look to identify the species you find during your dive.

You could choose to record every species that you see, create a pre-determined checklist of species of interest (such as priority or invasive species) or look for whether a specific target species is present.



You will need to be able to identify the species that you aim to record, the fewer species - the easier the ID.

As we're only looking to determine if a certain species is present, there is no need to count the species you find.

If you see species that you are not confident in identifying in the field, take photos to help you ID them when you are back at home or to get assistance in identifying.

Remember - it can be as important to scientists to know what is not present as well as what is.

Go back

Survey steps

1. Mark up your dive slate with the species of interest (optional). Record the start time on your slate.
2. Undertake your dive, marking on your slate and taking photos of the species seen (optional).
3. Upon completion of your dive, record your end time, gps coordinates, and take a picture of your dive slate before the data gets smudged.
4. Record and submit your data as described in the module 6 “Submitting your Data”.

Mission applications

The presence / absence survey technique is ideally suited to the following missions:

- Operation Oyster
- Great Seagrass Survey
- Invasive species tracking
- Big Seagrass Snorkel
- Sea lice tracking

Quiz 2

1. Recording what you looked for but didn't find can also be valuable data. True or false?
2. Name two pieces of equipment that you will need to use when surveying?

Answers on page 194

Go back

Underwater photograpy

Go back

Underwater photograpy

Introduction

Underwater photography is a great tool for species identification and to create a biodiversity record.

This section will cover how to use underwater photography to aid your surveying, or as a stand alone survey technique.

Photography is a really useful tool if you are recording a larger variety or species, encounter species that you aren't able to ID in the water or are recording changes over time. You could even create your own image library of all of the species in your area and share it online.

Difficulty rating: Photography

Positioning 

Equipment 

ID skills 

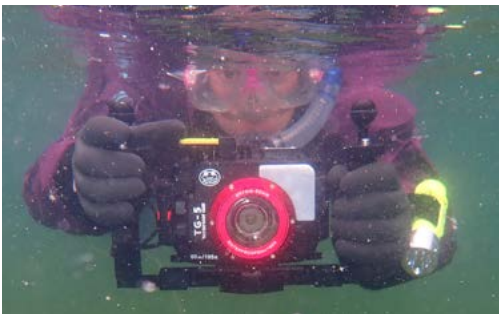
Green = Easy, **Orange** = Moderate, **Red** = Difficult

Go back

Equipment required

To conduct a photography based survey you will need the following survey equipment:

Camera



This doesn't need to be a top end underwater camera. Sometimes the more simple the camera is to operate, the easier it is to get pictures of species before they swim away.

You want to be able to get close up shots to help with species ID, so a Gopro isn't ideal for this unless you have a macro lens attachment. We like the Olympus Tough TG5/TG6 range for underwater surveying.

Make sure your camera's waterproofing is rated for the depth you will be using it at or you are using an underwater housing that is.

Watch / dive computer

If you are snorkelling, a standard waterproof watch, rated to the depth you will be diving is adequate for recording the time of day and duration of your dive. If you are SCUBA diving, you should be able to find this information, along with depth of dive on your dive computer.

GPS device

You will need to record the GPS location of the dive site. You may use the GPS on your watch or phone to do this, ask the dive organiser or boat skipper, or find the co-ordinates from an online resource such as Google maps after your dive.

How to survey

Now we will look at how to conduct your underwater photography survey.

The survey method is relatively easy to conduct as you can follow your normal dive routine, taking pictures of species as you go.

The more complicated your camera, the more complicated the technique will be.

It is much easier if you become familiar with how to use your camera first on the surface and then underwater before attempting an underwater survey.

You could choose to photograph every species that you see, creating an exhaustive list of species present at that location at that time. Alternatively you could create a pre-determined checklist of species of interest (such as priority or invasive species) and photograph the ones that you find during your dive.

The beauty of photographing species is that you can ID them following your dive. In this case it is helpful to get photos from a number of different angles. We will cover more on how to ID species later.

Go back

Survey steps

1. Double check your survey equipment, ensuring your camera has sufficient battery and storage for the dive.
2. Start your dive and make your way to the area to be surveyed.
3. As you swim through your survey area, take photos of all the species encountered, both common and rare, whether you can ID them or not. Difficult species may need photos from multiple angles.
4. When out of the water, take note of the dive duration, max depth, and water temperature if available. Also note the GPS location of the survey area if not done so earlier or if the area surveyed was different than planned.
5. When back at home, identify the species you are able to, access assistance for the species you're unsure of (see next module "Submitting your Data"), and upload the images to your image library.

Mission applications

Underwater photography techniques are ideally suited to the following missions:

- Great Seagrass Survey.
- Invasive species tracking.
- Big Seagrass Snorkel.
- Monthly monitoring.
- Sea lice tracking.
- Great Underwater Easter Egg Hunt.

Quiz 3

1. The beauty of photographing species is that you can ID them following your dive. True or false?
2. Name two mission application you can use a camera for?

Answers on page 194

Go back

Timed survey

Go back

Timed survey

Introduction

Make your recordings more valuable by quantifying them. It is more helpful to know that you saw 5 wrasse during a 10 minute survey, compared to knowing that you saw 5 wrasse during your dive.

This section will cover how to conduct a timed survey. Timed surveys can be used as a stand alone technique or combined with other techniques such as photography.

Difficulty rating: Timed

Positioning

Equipment

ID skills

Green = Easy, **Orange** = Moderate, **Red** = Difficult

Go back

Equipment required

To conduct a timed survey you will need the following survey equipment:

Writing slate and pencil

This can be a tethered board or wrist mounted. It is sometimes helpful to mark up your board with headings of what you need to record beforehand.

Watch

This may be separate from your dive computer as you will need to see the time of day that you start and finish your survey and set a timer for your survey. This may be different from the start and finish time of your dive.

Camera

Not mandatory but will provide proof of the species seen and help with any difficult IDs.

GPS device

You will need to record the GPS location of the dive site. You may use the GPS on your watch or phone to do this, ask the dive organiser or boat skipper, or find the co-ordinates from an online resource such as Google maps after your dive.

How to survey

Now we will look at how to conduct your timed survey.

Conducting a survey over a specific length of time makes your data especially valuable to scientists.

You can choose to record the number of a specific target species, eg wrasse, a selected check list of species, or everything that you see.

The shorter the list of species you are counting, the easier the survey will be to conduct and the fewer species you need to be able to identify.

You will need to be able to time a specific window, eg 10 minutes, during your dive to conduct your survey, rather than recording the whole length of your dive.

Try to avoid covering the same area twice and duplicating observations.

We recommend using a separate watch for this so that you can display your usual dive information on your dive computer.

Go back

Survey steps

1. Pre-mark your dive slate with a list of the species to be recorded.
2. Decide on the duration of your survey, eg 10 mins.
3. Begin your dive.
4. Once at the survey start point, start your timer.
5. Record the start time and depth of your survey.
6. Use a pre-marked dive slate to record the number of each species seen using a tally.
7. Take photos of each of the target species to provide evidence of their presence.
8. You can take photos of species you don't recognise to ID later.
9. Record the finish time and depth of your survey.
10. Upon completion of your dive record the gps coordinates of your survey and take a picture of your dive slate before the data gets smudged.
11. Record and submit your data as described in the next module "Submitting your Data".

Mission applications

Timed survey technique are ideally suited to the following missions:

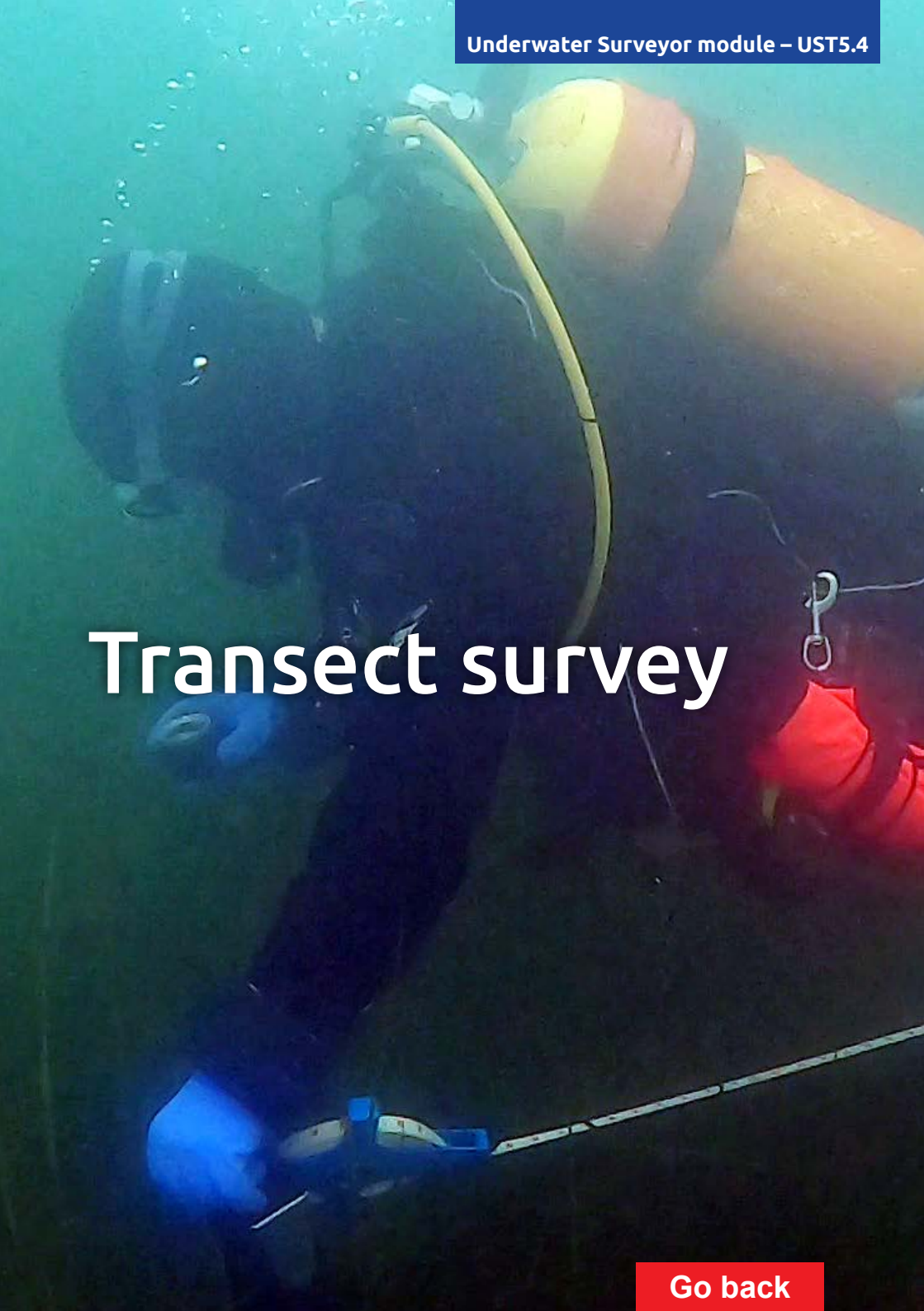
- **Operation Oyster**
- **Great Seagrass Survey**
- **Plastic Pollution Survey**
- **Great Underwater Easter Egg hunt**
- **Seeing Stars**

Quiz 4

1. **A timed survey can be a useful method to add to your toolbox when surveying a sparsely spaced species such a native oysters, which have an annoying habit of constantly falling outside your quadrats. True or false?**
2. **For your timed survey you must use a camera. True or false?**

Answers on page 194

Go back



Transect survey

Go back

Transect survey

Introduction

A staple survey techniques used by scientists worldwide.

This section will cover how to conduct a line transect survey. This type of survey is liked by scientists as you gather data from a reproducible length of seabed.

Difficulty rating: Transect survey

Positioning ★★☆

Equipment ★★☆

ID skills ★★☆

Green = Easy, **Orange** = Moderate, **Red** = Difficult

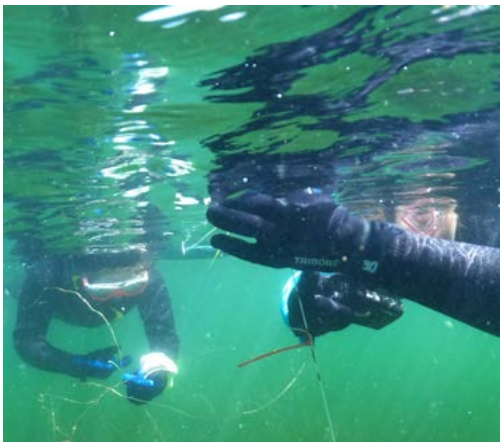
Go back

Equipment required

To conduct a transect survey you will need the following survey equipment:

Dive reel

This will form your transect line. It should be marked or cut to the length of your survey transect, often 25 or 50m.



1kg dive weight

You will want to weight the end of the survey line, a 1kg dive weight is sufficient for this.

Writing slate and pencil

This can be a tethered board or wrist mounted. It is sometimes helpful to mark up your board with headings of what you need to record beforehand.

Camera

Useful to provide proof of the species seen and help with any difficult IDs.

Watch / dive computer

If you are snorkelling a waterproof watch, rated to the depth you will be diving is adequate for recording the time of day and duration of your dive. If you are SCUBA diving, you should be able to find this information, along with depth of dive on your dive computer.

Compass

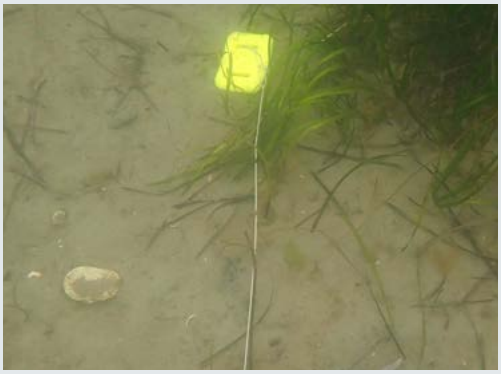
To determine the direction of the transect line.

GPS device

You will need to record the precise gps position of your transect, ideally with the gps position of the start and end points, or with the start position and a compass direction and distance.

If you're diving and towing your gps at the surface, you can leave it on track recording mode, and determine the position of the transect by comparing the start and finish times of the transect to the gps track.

How to survey



Now we will look at how to conduct your transect survey in the water.

Conducting a survey over a specific distance makes your data especially valuable to scientists as it gives a more accurate picture of the abundance of a species and reduces the urge to go hunting out the species you are looking for.

It is more helpful to know that you saw 5 grey sea slugs an a 20m transect, compared to knowing that you saw 5 grey sea slugs during your dive.

Go back

As with the presence or absence survey you could choose to record the number of a specific target species, a selected check list of species, or everything that you see.

The shorter the list of species you are counting, the easier the survey will be to conduct and the fewer species you need to be able to identify.

As your surveying becomes more advanced you can combine using a quadrat with your transect survey.

Survey steps

1. Pre-mark your dive slate with a list of the species to be recorded.
2. Decide on the length of your survey, eg 25m.
3. Begin your dive.
4. Once at the survey start point one diver lowers the weighted end of the survey reel to the seabed.
5. Record the start time, depth of your survey and compass heading of your transect line.
6. One diver swims on a compass heading laying down the transect line.
7. The buddy follows the transect line using the pre-marked dive slate to record the number of each species seen using a tally. Record species 1m either side of the transect line.

8. Take photos of each of the target species to provide evidence of their presence.
9. You can take photos of species you don't recognise to ID later.
10. Record the finish time and depth of your survey.
11. Upon completion of your dive, record the gps coordinates of the start of your transect.
12. Take a picture of your dive slate before the data gets smudged.
13. Record and submit your data as described in the next module "Submitting your Data".

Mission applications

The transect survey technique is ideally suited to the following missions:

- **Operation Oyster**
- **Oyster Investigation**
- **Plastic pollution survey**
- **Seeing Stars**

Go back

Quiz 5

1. During a transect survey it is common to record sightings from how many metres either side of the transect?
2. Your transect line should be marked or cut to the length of?

Answers on page 194

Video transect survey

Go back

Video transect survey

Introduction

A video transect is a simple survey technique to undertake that records a lot of species data which you can analyse after your dive or get help with analysing. The video provides verifiable evidence of the presence of species.

This section will cover how to conduct a video transect. Video transects are useful for collecting a wide range of data.

Difficulty rating: Video transect

Positioning

Equipment

ID skills

Green = Easy, **Orange** = Moderate, **Red** = Difficult

Equipment required

To conduct a transect survey you will need the following survey equipment:

Dive reel

This will form your transect line. It should be marked or cut to the length of your survey transect, often 25 or 50m.

1kg dive weight

You will want to weight the end of the survey line, a 1kg dive weight is sufficient for this.

Writing slate and pencil

This can be a tethered board or wrist mounted. It is sometimes helpful to mark up your board with headings of what you need to record beforehand.

Camera

Useful to provide proof of the species seen and help with any difficult IDs.

Watch / dive computer

If you are snorkelling a waterproof watch, rated to the depth you will be diving is adequate for recording the time of day and duration of your dive. If you are SCUBA diving, you should be able to find this information, along with depth of dive on your dive computer.

Go back

Compass

To determine the direction of the transect line.

GPS device

You will need to record the precise gps position of your transect, ideally with the gps position of the start and end points, or with the start position and a compass direction and distance.

If you're diving and towing your gps at the surface, you can leave it on track recording mode, and determine the position of the transect by comparing the start and finish times of the transect to the gps track.

How to survey

Now we will look at how to conduct your video transect survey in the water.

You will need to decide how long you want your transect to be. This could be a predetermined number of metres, eg following a transect line or counting your fin strokes. Alternatively it could be a specific length of time, eg 5 minutes.

You may choose to follow a feature during your survey, swim in a straight line or follow a compass bearing. If you follow a compass bearing, one of the buddy pair should use the compass while the other buddy operates the camera.

By setting your video camera's clock correctly before the start of the survey the start and finish time of the survey should be recorded with your video file. If you are not sure if your camera records this data, record it from your watch.

You can undertake more than one video transect during a dive.

Survey steps

1. Check your camera batteries are charged and that it has enough storage space.
2. Set the clock on your camera.
3. Start your dive and swim to your survey location.
4. Start recording the video and start your timer.
5. Swim for the predetermined distance or time (on a compass heading if this is part of your survey).
6. Stop your timer and video recording.
7. Upon completion of your dive, record the gps coordinates of the start and end points of your transect.
8. Record and submit your data as described in the next module "Submitting your Data".

Mission applications

The video survey technique is ideally suited to the following missions:

- Oyster Investigation
- Great Underwater Easter Egg Hunt
- Seagrass health
- Great Seagrass Survey
- Plastic pollution survey
- Seeing Stars

Quiz 6

What should the minimum weight be used at the end of the transect?

Can you name at least two mission applications?

Answers on page 194

Quadrat survey

Go back

Quadrat survey

Introduction

Surveying with quadrats can be undertaken as a stand alone activity or as part of a transect.

This section will cover how to conduct a quadrat survey. This type of survey is used to count the number of, or coverage, of a species in a specific area.

Difficulty rating: Quadrat survey

Positioning

Equipment

ID skills

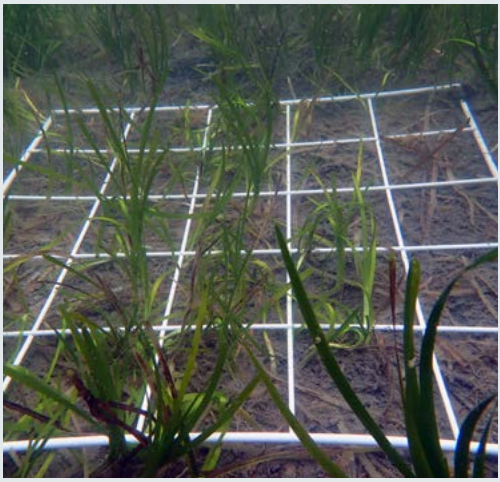
Green = Easy, **Orange** = Moderate, **Red** = Difficult

Equipment required

To conduct a quadrat survey you will need the following survey equipment:

Quadrat

50cm x 50cm is the most common quadrat size. Your quadrat might be gridded or open depending on what you are surveying. A gridded quadrat makes it easier to calculate percentage cover of a species, while an open quadrat can be easier to swim with or place over tall species such as seagrass or kelp.

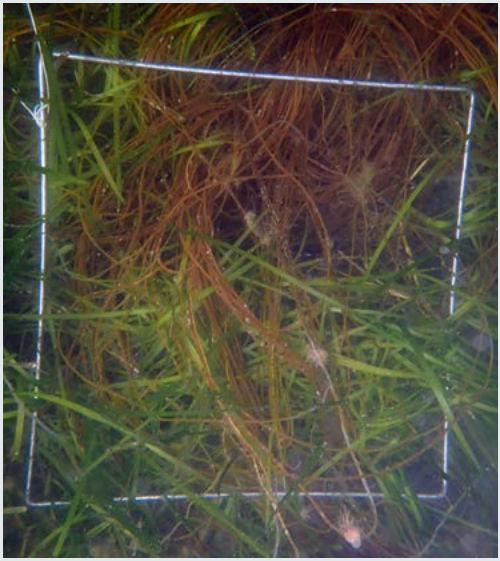


Writing slate and pencil

This can be a tethered board or wrist mounted. It is sometimes helpful to mark up your board with headings of what you need to record beforehand.

Camera

Useful to provide proof of the species seen and help with any difficult IDs.



Go back

Watch / dive computer

If you are snorkelling a waterproof watch, rated to the depth you will be diving is adequate for recording the time of day and duration of your dive. If you are SCUBA diving, you should be able to find this information, along with depth of dive on your dive computer.

GPS device

Ideally you would record the individual position of each quadrat. If you're diving and towing your gps at the surface, you can leave it on track recording mode, and determine the position of the quadrat by comparing recorded quadrat times to the GPS track.

How to survey

Now we will look at how to conduct your quadrat survey in the water.

Using a quadrat for surveying provides another way of making your survey more quantifiable and rigorous.

Quadrats can be distributed randomly during your survey, alternatively they can be placed at intervals, eg every 2m along a transect line.

As with the presence or absence survey you could choose to record

the number of a specific target species, a selected check list of species, or everything that you see. Quadrats are a useful way of recording the cover of a species such as kelp or seagrass.

The shorter the list of species you are counting, the easier the survey will be to conduct and the fewer species you need to be able to identify.

As your surveying becomes more advanced you can combine using a quadrat with your transect survey.

Survey steps

1. Pre-mark your dive slate with a list of the species to be recorded if appropriate.
2. Decide on how many quadrats you want to survey, eg 5 and how you will distribute your quadrats, eg randomly or on a transect.
3. Begin your dive.
4. Once at the survey start point record the start time and depth of your survey.
5. Lay out a transect line as described in the previous section if you are using one.
6. Place your quadrat on the seabed and take a photograph of it as a record.
7. Record the number or percentage cover of the species in your quadrat on your slate.

Go back

8. Take photos of each of the target species to provide evidence of their presence.
9. You can take photos of species you don't recognise to ID later.
10. Continue for the remaining quadrats.
11. Record the finish time and depth of your survey.
12. Upon completion of your dive, record the gps coordinates of your survey area.
13. Take a picture of your dive slate before the data gets smudged.
14. Record and submit your data as described in the next module "Submitting your Data".

Mission applications

The quadrat survey technique is ideally suited to the following missions:

- **Oyster Investigation**
- **Kelp health**
- **Seagrass health**
- **Invasive species tracking.**
- **Monthly monitoring**

Quiz 7

1. A common size of a quadrat is 50cm x 50cm. True or false?
2. What are the two main types of quadrat?

Answers on page 194

Go back

Baited remote underwater video survey

Go back

Baited remote underwater video survey

Baited remote underwater video (BRUV)

Capture more timid and mobile underwater creatures on video.

This section will cover how to conduct a remote underwater video survey. BRUV surveys are good for recording mobile species such as fish, which can be scared off by the presence of divers.

Difficulty rating: BRUV

Positioning

Equipment

ID skills

Green = Easy, **Orange** = Moderate, **Red** = Difficult

Go back

Equipment required

To conduct a BRUV survey you will need the following survey equipment:

Waterproof video camera

A GoPro works very well for BRUV surveying as it has a wide field of view and can run for an extended period of time.

Frame

You will need a frame to hold your camera steady, usually on the seabed, as well as to hold the bait in front of the camera. It could be as simple as a GoPro clamped to a dive weight.

Bait

Usually fish off cuts. Mackerel is the preferred fish but a tin of oily fish would do.

Watch / dive computer

If you set the clock of your camera, all necessary time data will be recorded in the file metadata.

GPS device

You'll want to record the exact location of your BRUV, as you'll be leaving it unattended for some time and will want to be able to find it to retrieve it later.

How to survey

Now we will look at how to conduct your BRUV survey in the water.

A BRUV survey involves deploying the frame with attached camera and bait to an area of interest, leaving the BRUV unattended while the video records for a set time, then returning to collect the BRUV at the end.

Decide where you want to undertake your BRUV survey, ideally the video would capture the seafloor as well as a habitat of interest such as a rocky reef or kelp forest as that can be more interesting than a video of the murky water column.

Consider how long you want to leave your camera running, often between 40-60 minutes is desirable.

Consider how the survey fits within your dive plan, as you'll not want to disturb the area you're filming.

Consider how you will re-locate and retrieve the BRUV following the survey. You may want to collect it at the end of your dive, considering remaining bottom time and dive profile, or you may choose to attach a floating line and float so that you can find and retrieve it from the surface following your dive.

Go back

Survey steps

1. Set up your camera: ensure your camera batteries are charged and that your camera is on the correct settings for recording your BRUV video, the higher the resolution and frame rate the better to assist in identifying fish species.
2. Set up your BRUV: attach the camera and secure the bait.
3. Position your camera, most likely this will be on the seabed.
4. Record the GPS location of your BRUV.
5. Run your BRUV.
6. Swim out of the area to avoid disturbing the mobile species you are hoping to record.
7. Return at the end of the allocated time and retrieve your BRUV equipment.

Mission applications

The BRUV survey technique is ideally suited to the following missions:

- Kelp health
- Seagrass health
- Monthly monitoring
- Sea lice tracking

Quiz 8

1. What does BRUV stand for?
2. BRUVs can capture species that are otherwise scared off by divers in the water? True or false?

Answers on page 195

Go back

Habitat mapping survey

Go back

Habitat mapping survey

Introduction

Map the area and extent of crucial habitats.

This section will cover how to conduct a habitat mapping survey. This type of survey works well with habitats with distinctive boundaries such as kelp or seagrass.

Difficulty rating: Mapping

Positioning ★★★

Equipment ★★★

ID skills ★☆☆

Green = Easy, **Orange** = Moderate, **Red** = Difficult

Go back

Equipment required

To conduct a habitat mapping survey you will need the following survey equipment:

GPS device

You will need to record your GPS location as you swim around the perimeter of the survey site. If you are snorkelling at the surface, you can use a GPS enabled waterproof watch attached to the back of your mask strap. If you are deeper or are using a different GPS device you can tow it at the surface inside a tow float or SMB.

SMB

See above.

Camera

To provide proof of the habitat that you are recording.

Writing slate and pencil

To make any notes about what you see.

Watch / dive computer

If you are snorkelling a waterproof watch, rated to the depth you will be diving is adequate for recording the time of day and duration of your survey. If you are SCUBA diving, you should be able to find this information, along with depth of dive on your dive computer.

How to survey

Now we will look at how to conduct your habitat mapping survey in the water.

In order to undertake a habitat mapping survey you need to be confident in identifying the habitat that you want to survey.

This survey requires accurate work with a GPS device. As GPS signals can't penetrate underwater, the device will need to be able to follow you on the surface of the water.

For this reason habitat mappings are more easily undertaken by snorkel or in relatively shallow water.

It is a good idea to familiarise yourself with the operation of your GPS on the surface. You can even trial the technique by walking around an area on the beach before your dive.

Before your dive you will want to decide on, and test, a method for your GPS device to follow you on the surface, such as controlling the length of your dive reel to your SMB so that it is as directly above you as possible.

We have found that when snorkelling it works well to attach a GPS watch to the back of one diver's mask strap. This person will snorkel on the surface, guided by their buddy who can dive deeper and verify the boundary if needed.

Go back

Alternatively you may need to use a tow float or SMB with your GPS inside. You will need to make sure that the GPS is adequately waterproofed and that the length of the tether is sufficient to reach the surface.

You will need a way of downloading your GPS track following your survey. Apps designed for tracking outdoor activities such as STRAVA work well for this and allow you to download your track as a gpx file.

Survey steps

1. Swim to and identify one edge of the habitat.
2. Ensure that your device has a GPS signal, start recording your track and begin the survey.
3. You can mark the start position of the survey with a weighted float/ SMB in order to help you navigate back to it.
4. The buddy with the GPS should swim as closely as possible on the boundary of the habitat. Sometimes this can be hard to identify, in this case the other buddy can check around the area and act as a guide.
5. Keep the GPS as directly above you as you can.
6. Take photos of the habitat to provide evidence of its presence.
7. Follow the edge of the habitat until you return to your start point. This is easier to identify if you have marked it with a weighted float/ SMB.
8. Stop recording the track on the GPS and save.

9. Record the time and depth of your survey.
10. Record and submit your data as described in the next module "Submitting your Data".

Mission applications

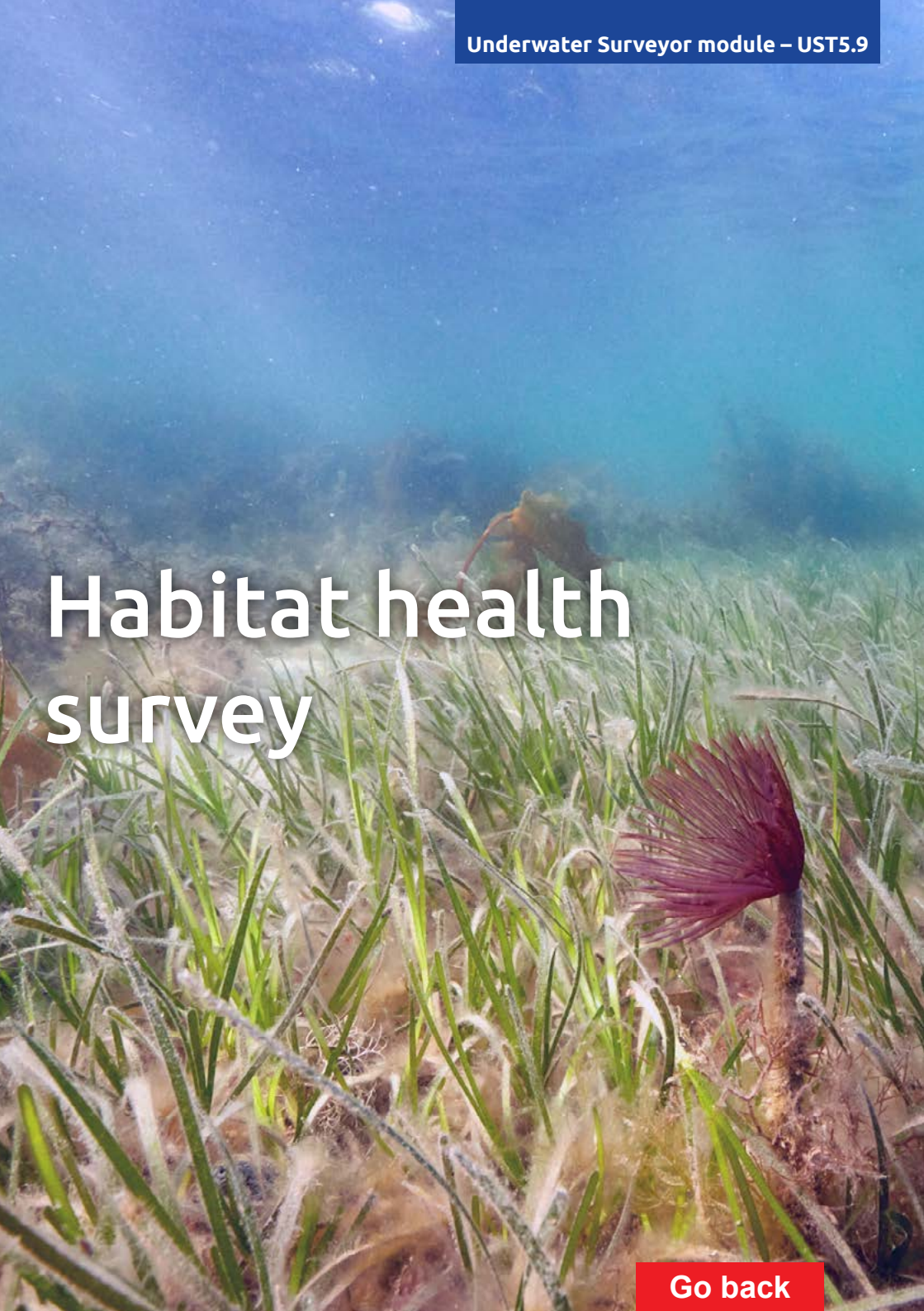
The habitat mapping technique is ideally suited to the following missions:

- **Seabed mapping.**
- **Kelp health.**
- **Great Seagrass Survey.**
- **It is a good next step to carry out if a suspected seagrass bed has been highlighted by a Shore Surveyor survey.**

Quiz 9

1. **When mapping a habitat, it is important to keep the gps device positioned over the habitat boundary. True or false?**
2. **A GPS can receive a signal underwater, so you can wear the device while diving. True or false?**

Answers on page 195



Habitat health survey

Go back

Habitat health survey

Introduction

An in depth investigation of crucial ocean habitats.

This section will cover how to conduct a habitat health survey. This type of survey is best used once you have located a specific habitat that you want to investigate.

There are many variables that you may wish to record, which will be different for different habitats, and we will touch on examples of these variables in this section. It is also helpful to revisit the site and record changes in habitat health over time.

Difficulty rating: Mapping

Positioning

Equipment

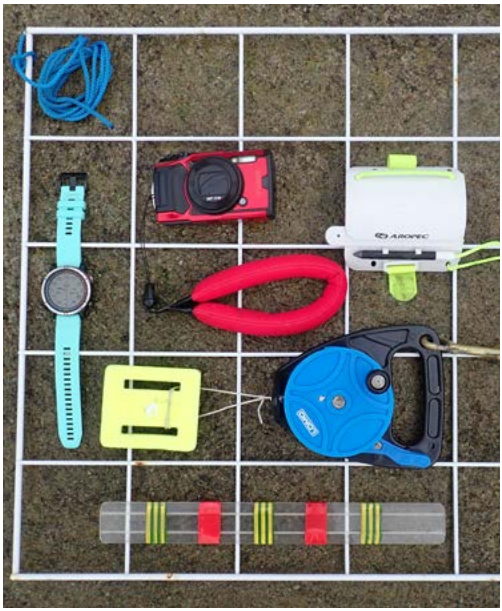
ID skills

Green = Easy **Orange** = Moderate **Red** = Difficult

Go back

Equipment required

To conduct a habitat health survey you will need the following survey equipment:



Habitat health surveys usually follow the same lines as either a quadrat or transect survey and so require the same equipment.

Quadrat

50cm x 50cm is the most common quadrat size. Gridded or open, depending on what you are surveying.

Writing slate and pencil.

Camera

To provide proof of the species seen and help with any difficult IDs.

Watch / dive computer

For recording the time of day and duration of your dive.

GPS device

To record the GPS location of the dive site.

Dive reel

For transect line.

1kg dive weight

To weight one end of the survey line.

You may require other specific equipment depending on your survey, such as a ruler for measuring height of seagrass or size of oysters.

How to survey

Now we will look at how to conduct your habitat health survey in the water.

The habitat health survey is a more advanced and in-depth investigation of your habitat.

It is likely that you will have discovered the location of and mapped your habitat prior to doing a habitat health survey.

There are a variety of variables that you might choose to measure depending on what aspect of health and what type of habitat you are looking at. Eg height of seagrass blades, counting the number of seagrass seeds or flowers, measuring the size of oysters, cover of kelp or counting shellfish spat that have settled on shells.

You will need to decide if you want to use a transect or quadrat method to help add rigour to your habitat health assessment.

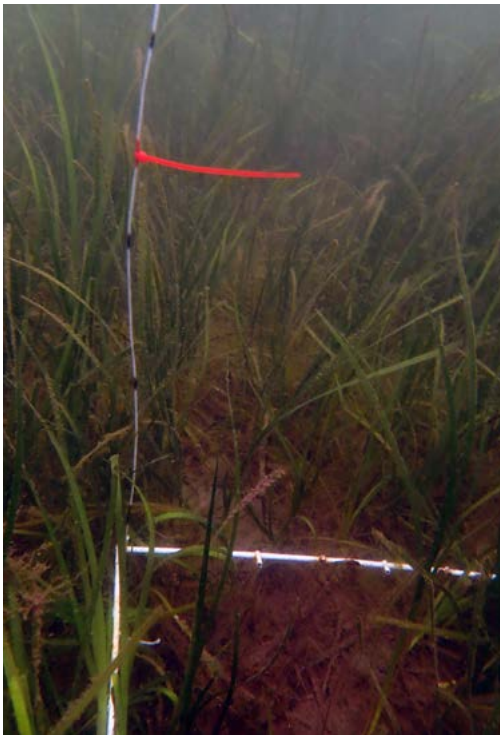
Habitat health surveys are even more valuable if they are repeated over time, for example seasonally or annually.

Go back

If you do this it is good to try and conduct them at the same time each year to reduce the effects of seasonal variability.

Depending on the size of your habitat you may decide to set up a specific station or GPS coordinates that you return to for each survey for repeatability.

Survey steps



1. Decide on what and how you want to survey.
2. Begin your dive and swim to your survey location.
3. Once at the survey start point record the start time and depth of your survey.
4. Conduct your survey investigating the variables that you have chosen. For example, a seagrass survey may involve measuring some or all of: percentage cover, canopy height, shoot density, blade width, and number of reproductive structures (flowers or seeds).
5. Take photos of the habitat which will provide a record of its overall appearance at that time.
6. Take photos of any relevant target species to provide evidence of their presence.
7. You can take photos of species you don't recognise to ID later.

8. Record the finish time and depth of your survey.
9. Upon completion of your dive, record the gps coordinates of your survey area.
10. Take a picture of your dive slate before the data gets smudged.
11. Record and submit your data as described in the next module "Submitting your Data".

Mission applications

The habitat health survey technique is ideally suited to the following missions:

- **Kelp health**
- **Seagrass health**
- **Operation Oyster – reproduction**

Quiz 10

1. Can you list two examples of habitat mapping surveys?

Answer on page 195

Go back

Summary

You have now seen nine different techniques that you can implement during your survey dives.

In this module we looked at:

- ✔ **The Equipment required for each survey**
- ✔ **How to do the survey**
- ✔ **Survey steps**
- ✔ **Technique videos for each survey**
- ✔ **Mission applications**

End of module test

1. The survey techniques in this module can be undertaken by snorkel or SCUBA? True or false?
2. In the Presence/Absence survey method, you have the option to record?
3. One output of the Species Photography method could be?

Answers on page 195

Submitting your data

Go back

Submitting your data

Conducting your dive survey may be the fun part of the process, but in order for your important observations to contribute to conservation, they need to be shared in a way that makes the data accessible to scientists and policy makers.

Module contents

This module will take you step by step through the data recording and submission process to ensure that the observations that you make will make a difference.

In this module we will look at:

- **Locating survey forms and resources on the BSAC website**
- **Recording your data in the water**
- **Completing your survey once ashore**
- **How to upload your data via the BSAC portal**
- **Biological Recording Schemes: iNaturalist & iRecord**
- **Help with species ID**
- **Dealing with mapping files**
- **Summary**

Locating survey forms and resources on the BSAC website

On the BSAC Underwater Surveyor portal, you will find the link to survey form templates.

These templates contain the data that need to be collected for a typical survey for each of the survey methods described.

If you are taking part in a mission it will have its own survey form prepared and available to you. Survey templates can be modified for your specific survey requirements or customised with your club's logo etc.

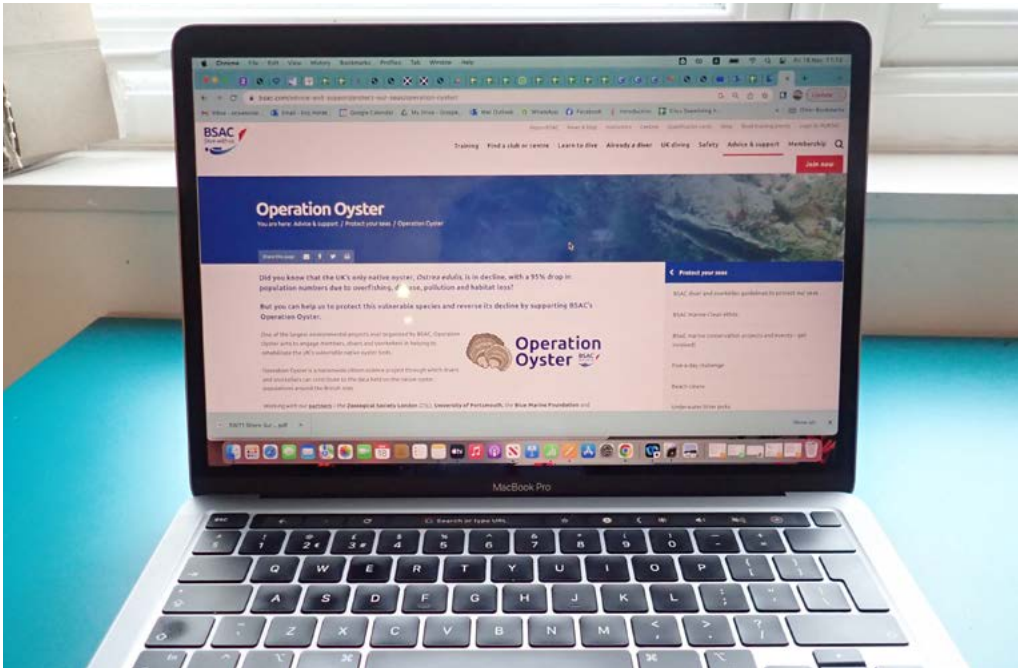
Resources including the survey form templates can be found here:

Underwater Surveyor - Resources

https://www.bsac.com/training/online-learning/bsac-elearning/sdc-elearning/underwater-surveyor-elearning-area/underwater-surveyor-resources/

Or use QR code

Go back



Recording your data in the water

There is nothing worse than getting home and submitting your findings only to find out that you forgot to record a crucial piece of data.

Start by confirming what data is required before you start your dive. Before your dive you should consider how you will record that data, be it on a dive slate, with photographs or some other way.

If you are using a dive slate it is a good idea to pre-draw a table of the data to be recorded.Some data such as depth and length of dive can be recorded from your dive computer.

You will also need to record the gps coordinates of your dive or survey, this may be by using a swim float or SMB containing a gps recording device, or using the dive boat's gps.

Module 5 describes each survey technique in detail and can be reviewed before starting a survey. You will find a checklist for each survey method along with survey form templates included in the resources for this course. Click the link - Survey checklists

Survey checklists

https://www.bsac.com/training/online-learning/bsac-elearning/sdc-elearning/underwater-surveyor-elearning-area/underwater-surveyor-resources/

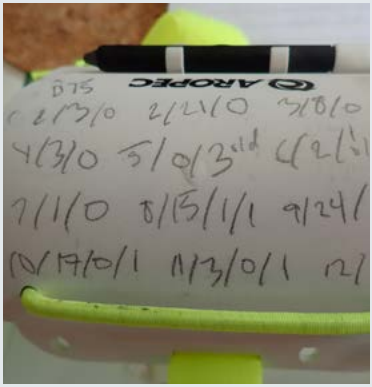
Or use QR code

Completing your survey ashore

One of the first things you should do when ashore, possibly after drying off and warming up, is take a photo of the data on your dive slate.

It's a lesson hard learned by returning home from an exciting survey only to find that somewhere between the shore and home the slate got smudged and the data lost.

Once at home it is best to deal with your data as soon as possible. That could involve looking up identifications in your favourite ID guides or posting challenging IDs online.



Go back

Consolidate your observations, either by completing a paper survey form, entering the data directly onto the online mission portal on the BSAC website, or submitting observations to the biological recording schemes.

What's important is that your survey data gets saved to avoid it getting misplaced or deleted. You may want to file away paper copies of your survey forms to backup digital files.

If you store survey data digitally, carefully consider the file structure and file naming system so that you can easily identify survey data at a later date.

How to upload your data via the BSAC portal

Seawilding and BSAC have teamed up to create a series of survey missions that are of current scientific interest that we are involved in gathering data for.

These provide excellent ways for you to get involved with surveying and collect data that will help important projects right now. These missions include finding hidden seagrass beds and unearthing unknown oyster populations.

Details of the missions are covered in Module 7 - Survey Missions. Data from these missions are collected directly on the BSAC web portal and we encourage you to get involved.

Navigate to the data entry page on the BSAC website

Data entry

https://www.bsac.com/training/online-learning/bsac-elearning/sdc-elearning/underwater-surveyor-elearning-area/

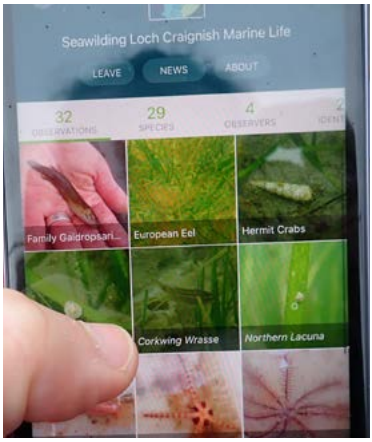
You will find an online form which enables you to enter your data and upload photos and gpx files.

Complete all of the mandatory fields and as many of the optional fields as you can. Press submit and that's your data submitted!

Go back

Biological recording schemes: iNaturalist & iRecord

When submitting a simple biological record or wildlife sighting, as opposed to a technical survey using transects and quadrats, using an online platform designed for that purpose, such as iNaturalist or iRecord can be a good option.



This allows your data to go through a verification process.

Your data is then automatically included in the national databases of the National Biodiversity Network (and their NBN Atlas), the Marine Biological Association, and the Biological Records Centre.

This allows scientists to see and access your data You can view your data as well as other peoples via these portals.

Some portals such as iNaturalist allow you to create an account, giving you access to all of your records, or even the ability to start an image library or project for your club.

The data you will need to submit is:

- **Date of sighting**
- **Species name**
- **Certainty of identification**
- **Image to be verified**
- **Location (to as accurate a resolution as you can)**
- **Any comments or notes**

https://uk.inaturalist.org/

https://irecord.org.uk/

Help with species ID

You don't need to be able to identify everything in the sea to play a vital part in ocean conservation. That said, the more you get involved in surveying, the more likely you are to find yourself learning more and wanting to develop your ID skills further.

Look at learning to identify underwater species as a journey, where you build up your skills gradually over time, rather than putting pressure on yourself to learn everything at once.

Fortunately there are lots of resources, as well as helpful people, to help you with your ID journey. These include ID books, web resources, online courses, and access to experts through Facebook groups.

One key to getting positive identifications of difficult species is getting good photos from various angles. These will help you look up the species yourself, and they can be shared with experts and the community for verification.

There are many great ID books available, both general marine ID guides and specialist guides focussing on groups such as nudibranchs or sea squirts.

Many online resources are freely available and some allow you to upload your photos for professional or peer recommendations.

There are some great groups on social media that can help with identification. It is helpful if you know which family phylum your species belongs to so you can ask directly the group that specialises in that phylum.

Identification Websites:

https://www.ispotnature.org/communities/uk-and-ireland

https://uk.inaturalist.org/

Or use the QR codes

Go back

Specialist Social Media Groups:

- **Seasearch Identifications.**
- **NE Atlantic Cnidarians.**
- **NE Atlantic Nudibranchs.**
- **NE Atlantic Tunicata.**
- **NE Atlantic Porifera.**
- **NE Atlantic Cirripedia.**
- **NE Atlantic Bryozoa.**
- **Crustacea of the NE Atlantic.**
- **Echinoderms of the NE Atlantic**
- **Seaweeds of the NE Atlantic.**
- **Crustacea of the NE Atlantic & NW Europe.**
- **Mollusca of the NE Atlantic & NW**
- **British Marine Mollusca**
- **UK Cephalopod report**
- **European Sea Slugs Reports**
- **Isopods and Myriapods of Britain and Ireland**

This list focuses on the Northeast Atlantic including the UK and Europe, similar groups can be found for other regions of the world.

Dealing with mapping files

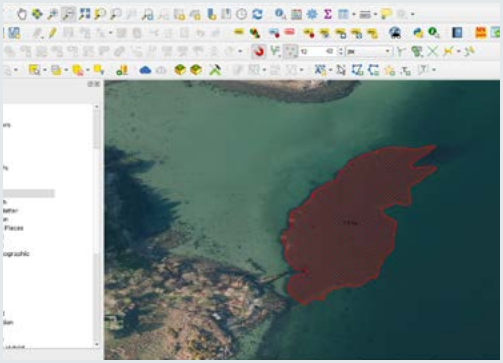
This section deals with mapping a habitat boundary using your GPS device to create an accurate record of the current size of a marine habitat.

When mapping a habitat boundary, you will be using the track function on your gps device. Before surveying check that the device or app settings have the track resolution set to high resolution and that you can save and export the track file.

The most common type of track file a
There are many software programs that can view and edit . gpx files, both freely available and paid.

Activity recording apps such as STRAVA can be used to share and export tracks recorded on a fitness watch or phone.

Graphical Information Services (GIS) software that scientists use can be used by keen amateurs, QGIS is a popular free option although it is time consuming to learn.



A simpler option is to use Google MyMaps to view and share your habitat maps. You can drag and drop your tracks into the map page and view them overlaid on a satellite base map.

If your track file is a bit messy, you may wish to tidy up your track file by creating an enclosed polygon of your mapped habitat.

The software can then calculate the area of these polygons, and thus the area of the habitat you've mapped.

In QGIS and MyMaps, you can add all your individual habitat mappings together into one project.

You can then make the data available to others by exporting and uploading the maps, sharing the links or making the pages public, or even embedding into a webpage.

Go back

Quiz 1

1. **What is the most common file format for GPS tracks?**
2. **Can you list two ways of viewing and editing habitat maps that are freely available?**

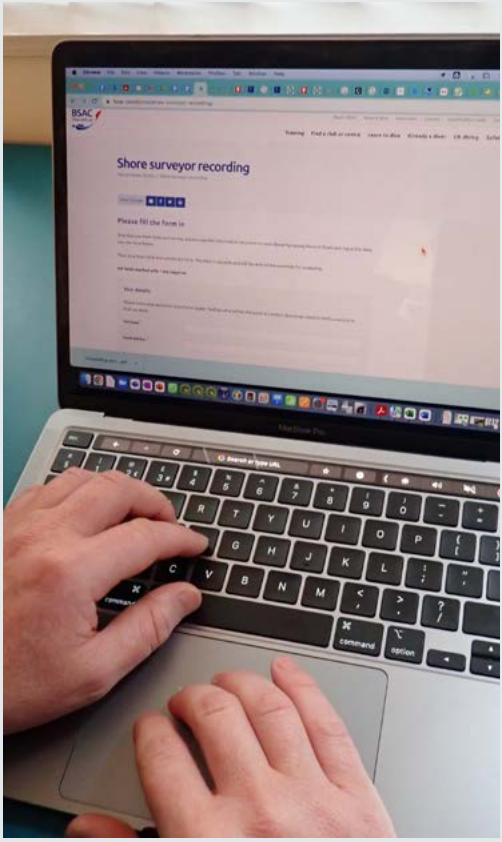
Answers on page 196

Summary

This module has covered the sometimes daunting but important aspect of surveying - uploading your data. If you are new to underwater surveying we recommend starting with some of the more simple survey missions such as the Big Seagrass Snorkel or Operation Oyster where you can easily upload your data right on the BSAC website.

In this module we looked at:

- ✔ **Locating survey forms and resources on the BSAC website**
- ✔ **Recording your data in the water**
- ✔ **Completing your survey once ashore**
- ✔ **How to upload your data via the BSAC portal**
- ✔ **Biological Recording Schemes: iNaturalist & iRecord**
- ✔ **Help with species ID**
- ✔ **Dealing with mapping files**



Go back

End of module test

1. Like a good dive, a good survey starts with?
2. You can submit a biological record or wildlife sighting to?
3. What is the minimum a biological record should include?
4. Both iSpot and iNaturalist are tools to help ID a species? True or false?
5. Submitting a sighting to iRecord allows your photo to be
6. There are groups on social media dedicated to marine species ID? True or false?
7. Surveying is fun, but to make sure your data can be used by others, it is important to?
8. Divers and clubs are encouraged to contribute to the BSAC/ Seawilding Missions by uploading their survey data to the BSAC Portal:? True or false?
9. When you've finished your dive and are safely back ashore, you should?
10. What is GIS?

Answers on page 196

Survey missions

Go back

Survey missions

So, now you have the skills and knowledge to be an Underwater Surveyor, you'll want to put them into practice and contribute to the protection of our marine environment.

Module contents

This module will introduce you to some of the current missions that you can join in with right now as well as missions that are planned for the future. It will also provide you and your Club or Centre with inspiration for planning your own missions.

In this module we will look at:

- **Introduction**
- **Operation Oyster**
- **Oyster investigation**
- **Great Seagrass Survey**
- **Great Underwater Easter Egg Hunt**
- **Seeing Stars**
- **Future missions under development and ideas for your group to develop**

Module content

Additionally we will look at:

- How to join an existing mission
- Starting your own mission
- Summary

Introduction

Missions are ways to put your survey skills to use answering some particularly important questions about the ocean around you.

Go back

Operation Oyster

Operation Oyster is BSAC's first mission, which aims to gather baseline data on the locations of the threatened native oyster (Ostrea edulis) and its non-native cousins from around the UK.

Outcome:

To identify locations of native oysters as a first step to protecting or restoring this important marine species. Sites identified by Shore Surveyor surveys can be further examined by SCUBA and snorkel using the Underwater Surveyor survey method.

Applicable survey techniques:

Presence / Absence survey.

Location:

UK wide

Oyster investigation

Expanding on Operation Oyster discoveries, Oyster Investigation surveyors will further investigate native oyster populations and their demographics, providing key information on their health and viability.

Outcome:

To build up a more accurate picture of the population and health of native oysters around the UK and support restoration efforts. Oyster number densities and size ranges* will be recorded using the survey methods below.

Applicable survey techniques:

Timed survey, Transect survey, Quadrat survey, Habitat health survey.

Location:

UK wide

***Note:** sizes will give an estimation of ages and whether they are of breeding age. As native oysters are protandrous hermaphrodites and can change sex through their lifecycle, so we don't need to record their sex.

Go back

Great Seagrass Survey

Seagrass is an amazing underwater habitat which not only produces oxygen that we breathe but protects coastlines, absorbs carbon and provides a home to many ocean species.

Outcome:

Unfortunately, not much is known about seagrass, in fact we don't even know where most of the seagrass in the UK is! SCUBA diving, snorkeling or strolling by the sea, you can help discover the hidden seagrass by taking part in the Great Seagrass Survey.

Applicable survey techniques:

Presence / Absence survey, Underwater photography, Timed survey.

Location:

UK + international

Great Underwater Easter Egg hunt

Join your fellow divers for an easter egg hunt with a difference.. Recording eggs is a good indicator of the health of the ocean ecosystem and the species within it. Annual surveying provides a snapshot of the underwater ecosystem as well as an indicator of change over time.

Outcome:

Record as many eggs (and what species) as you can find on your underwater Easter egg hunt.

You may find pretty and mysterious looking eggs including:

- **Paddle worms**
- **Squid and Cuttlefish**
- **Shark and Skate cases**
- **Nudibranchs**
- **Whelks**
- **Fish, and many more**

Applicable survey techniques:

Underwater photography, Timed survey.

Location:

UK + international

Go back

Seeing Stars

Starfish, also known as sea stars, and urchins are great fun to see and are also keystone predators of a balanced ocean food web

In unchecked numbers they can predate on and decimate natural species, but they are also susceptible to diseases. Sea star wasting disease (SSWD) has recently been recorded in UK waters for the first time, and could be an early indicator of climate change and ecosystem collapse to come.

Outcome:

Record how starfish and urchins (both part of a group of spiny creatures called echinoderms) are faring in UK waters and record any evidence of Sea Star wasting disease.

Applicable survey techniques:

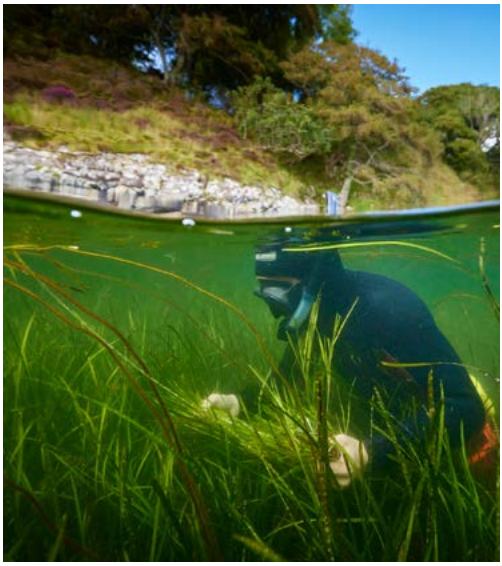
Times survey, Transect survey, Underwater photography

Location:

UK wide

Go back

Future missions



There are ideas for future BSAC missions that are under development, but can also be taken forward by interested clubs, groups or individuals.

Mapping Important Habitats & Carbon Sinks

Seagrass & Kelp Forests are important habitats and blue carbon sinks, and are in need of a nationwide baseline.

Seagrass & Kelp Forest Health Check

Delving deeper into seagrass and kelp forest health.

Invasive species tracking

Monitoring and reporting the spread of invasive species.

Sea lice tracking

Sea lice are abundant on fish farms, but have spread to wild fish stocks.

Monthly monitoring

Building from a single survey, repeated surveying adds value and rigour.

Plastic pollution survey

Recording observed macroplastics and sampling water and sediments for microplastics.

Go back

How to join an exiting mission

The missions currently on the BSAC website are a great place to start your underwater surveying journey.

They utilise relatively straightforward techniques and have been designed to help you collect data that is urgently required by current conservation projects.

You can see details of all of the live and planned missions here:

https://www.bsac.com/training/online-learning/bsac-elearning/sdc-elearning/underwater-surveyor-elearning-area/

or use the QR code

You may have a great idea for a data collection project, or maybe there is a specific aspect of your local coast that you feel warrants extra attention or investigation. These are great reasons to consider starting your own mission.

The more data that can be collected for a mission the better, so it is good to get your club or centre involved with the mission. Start by deciding what it is you want to record or investigate.

Think about which survey techniques will work best,

Go back

experiment to see which work best in practice. Use the data recording templates on the BSAC resource section link to help you plan your data collection.

Think about how you want to share your data. It may fit with an existing BSAC mission, alternatively iNaturalist provides a good platform for groups to store and record all of their species images. If you are technically minded you could design your own data collection platform.

Do some trial surveys to hone your collection and data upload techniques.Train up your survey group.

Get surveying.

Quiz 1

1. **BSAC missions are a great way to get started, but you can also start up your own mission for an issue that is important to you and your local area. True or false?**

2. **Can you name two eggs you find in the Great Underwater Easter Egg hunt?**

Answers on page 197

Summary

Biosecurity is closely linked with the spread of invasive non-native species, known as (INNS). The negative impacts of invasive species can be environmental, economic, or societal.

In this module we looked at:

- ✔ **Introduction**
- ✔ **Operation Oyster**
- ✔ **Oyster investigation**
- ✔ **Great Seagrass Survey**
- ✔ **Great Underwater Easter Egg Hunt**
- ✔ **Seeing Stars**
- ✔ **Future missions**
- ✔ **How to join an existing mission**
- ✔ **Starting your own mission**

Biosecurity

Go back

Biosecurity

As an Underwater Surveyor, you must ensure your data collection activity does not contribute to spreading any invasive species or diseases.

Module contents

Biosecurity is closely linked with the spread of invasive non-native species, known as INNS. The negative impacts of invasive species can be environmental, economic, or societal

In this module we will look at:

- **Introduction**
- **Why biosecurity is important**
- **Measures you can take**
- **Check, clean, dry**
- **Reporting INNS**
- **Summary**

Introduction

A non-native species is a species that has been introduced, either intentionally or accidentally by humans.

For marine species, many have arrived from overseas on ships' hulls and in ship ballast and bilge water. When a non-native species causes significant negative impacts they are classed as invasive. We need to make sure that our surveys do not contribute to the spread of invasive species or diseases.

Why biosecurity is important

Some of the ways invasive non-native species can cause harm to native species include:

- **Prey on native species**
- **Spread diseases that natives species are vulnerable to**
- **Compete for food**
- **Damage the native habitat**
- **Invasive species are the main driver of biodiversity loss globally**

Go back

Measures to take

Invasive non-native species are harming the native ecosystem and costing billions of pounds to the UK economy. Once an invasive non-native species becomes established, it can become nearly impossible to eradicate.

As in many things in life, prevention is much better (and cheaper) than the cure. We can all play a part in preventing the spread of invasive species by following simple biosecurity measures.

Remember, not all invasive species are visible to the naked eye. The protozoan parasite Bonamia ostrea, believed to have originated in the USA, and which has caused mass mortality of native oyster populations across Europe since the 1970s, is microscopic.

Aquaculturists use disinfectant to protect against pathogen spread, and the GB Non-native Species Secretariat recommends that we dry our equipment for a minimum of 48 hours before using it at another site.

How do invasive non-native species affect the marine enviroment?

https://www.youtube.com/watch?v=44TDyUJ9u18

Go back

Check, Clean, Dry

A very successful campaign called Check, Clean, Dry sums up how you can avoid being the spreader of invasive species or marine diseases when you are surveying or diving:

CHECK

your equipment, boat, and clothing after leaving the water for mud, aquatic animals or plant material. Remove anything you find and leave it at the site.

CLEAN

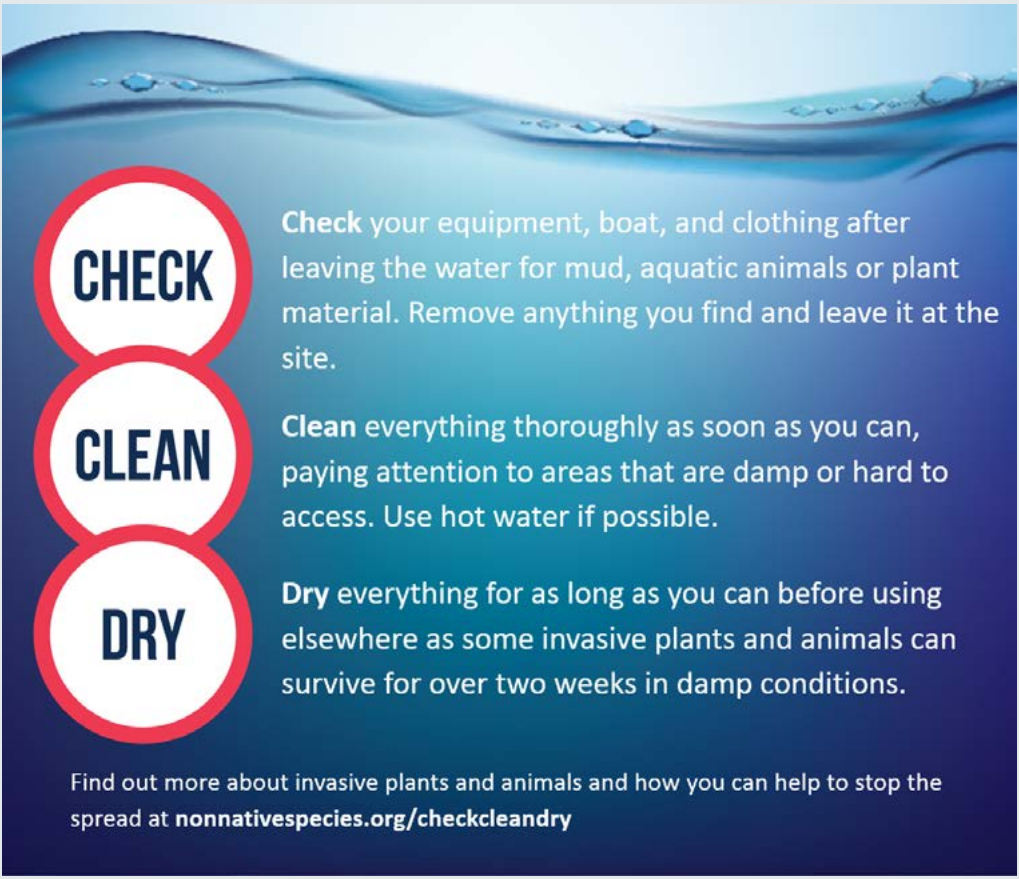
everything thoroughly as soon as you can, paying attention to areas that are damp or hard to access. Use hot water if possible.

DRY

everything for as long as you can before using it elsewhere as some invasive plants and animals can survive for over two weeks in damp conditions.

www.nonnativespecies.org

We understand that the above doesn't sound easy if you're on let's say a multiday liveaboard dive holiday. If your dive plans include diving in different bodies of water without the chance to fully check, clean, and dry your equipment between dives, you



can consider using a different set of equipment for each different water body.

Alternatively, if carrying duplicate equipment isn't practical, then use of a specialised disinfectant which is approved by DEFRA and widely used in the aquaculture industry is advised, such as Virkon Aquatic®. Always follow the directions and warnings marked on the packaging to ensure effectiveness and personal safety.

The directions will likely be along the lines of: "Thoroughly wet all surfaces and equipment with the solution. Leave for 10 minutes and then rinse. Avoid contact with skin and eyes." As these disinfectants

make use of some powerful chemicals, it is important to take appropriate precautions. Take care to spray all your equipment including tanks, fins, and hoses.

If you're taking part in an organised event, the event organisers should have a biosecurity plan in place, which as a participant you must comply with and can ask to see.

Reporting INNS

As surveyors we can aid in detecting invasive species and reporting them to the relevant authorities.

This is important as it could allow authorities to make a rapid response before a species becomes established. Invasive species can be recorded on our underwater surveys.

They can also be reported directly at:

Enter non-native species records

https://www.irecord.org.uk/enter-non-native-records

Or more information can be found at

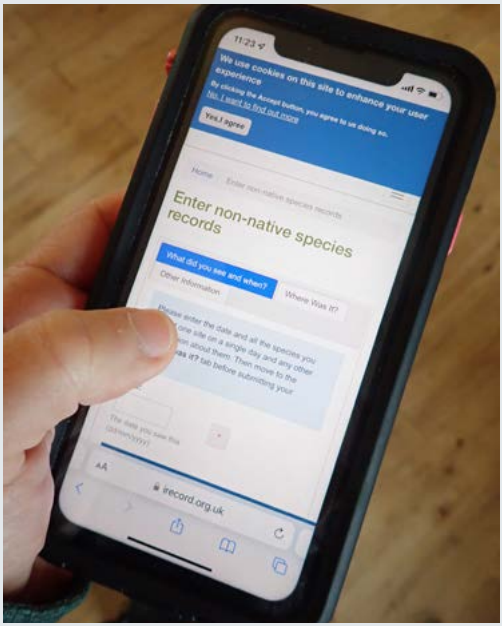
Recording

https://www.nonnativespecies.org/what-can-i-do/recording/

Quiz 1

1. **Many marine non-native species have arrived from overseas on ships' hulls and in ship ballast and bilge water. True or false?**
2. **How much do invasive species cost the UK economy annually?**

Answers on page 198



Summary

Biosecurity is closely linked with the spread of invasive non-native species, known as (INNS). The negative impacts of invasive species can be environmental, economic, or societal.

In this module we looked at:

- ✔ **Introduction**
- ✔ **Why biosecurity is important**
- ✔ **Measures you can take**
- ✔ **Check, clean, dry**
- ✔ **Reporting INNS**

Go back

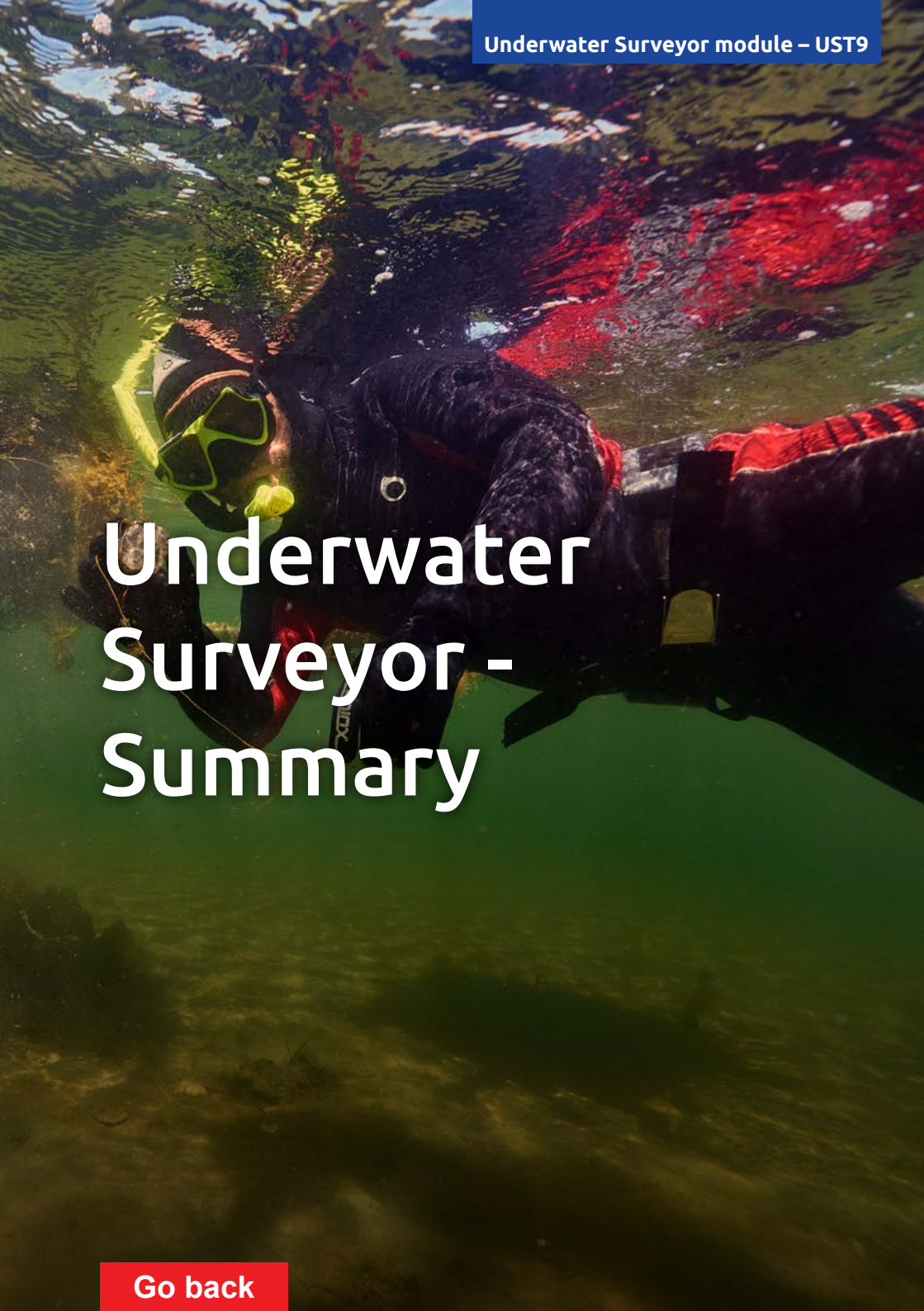

Go back

End of module 8 test

1. A non-native species is?
2. One of pillars of responsible surveying is causing no damage, this includes making sure that we do not contribute to the spread of invasive species or diseases? True or false?
3. The GB Non-native Species Secretariat has created a campaign that we recommend all surveyors adhere to is?
4. Dry everything for as long as you can before using it elsewhere as some invasive plants and animals can survive for over two weeks in damp conditions. The minimum recommended drying time is?
5. Organised events should have a biosecurity plan? True or false?
6. Invasive species recorded on your survey can be reported directly at?
7. Only species that are visible to the naked eye are of concern to us? True or false?
8. Established invasive species are easily eradicated? True or false?
9. It is better and cheaper to prevent invasive species becoming established than it is to eradicate them:? True or false?
10. Which disinfectant is approved by DEFRA?

Answers on page 198

Go back



Underwater Surveyor - Summary

Go back

Underwater Surveyor - Summary

Before you set out to put your new-found Underwater Surveyor skills into practice, let's just take a moment to reflect on what we have done.

Module contents

Congratulations on reaching the end of this Underwater Surveyor eLearning! Let's have a quick recap of what you have learnt during the course.

In this module we will look at:

- **Learning outcomes**
- **Survey techniques**
- **Missions current and future**
- **Get involved!**

Learning outcomes

Having completed this eLearning you should now understand:

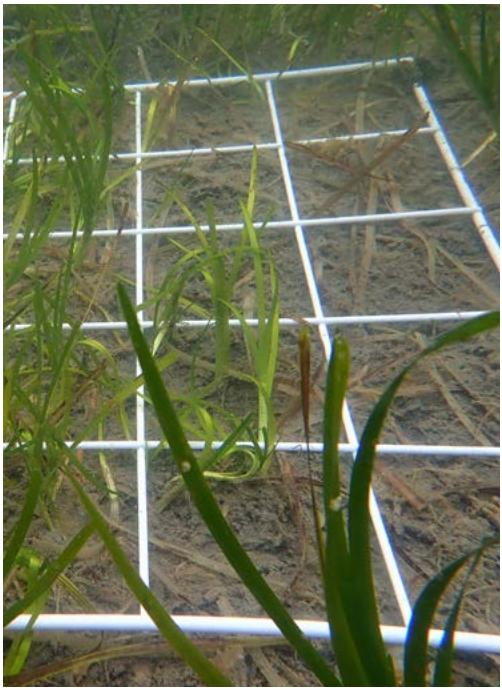
- ✔ Why biodiversity is important to a healthy ocean ecosystem
- ✔ Why data and your role in collecting it is important
- ✔ How to undertake a variety of underwater survey techniques
- ✔ How to record your data while you are in the water
- ✔ How to submit your data including missions data to BSAC
- ✔ What survey missions BSAC are running and how to join in.
- ✔ The importance of biosecurity and the measures that you should take while surveying

Go back

Survey techniques

During this eLearning course we have provided you with a toolbox of survey techniques including:

- ✔ Presence/absence survey
- ✔ Underwater photography survey
- ✔ Timed survey
- ✔ Transect survey
- ✔ Video transect
- ✔ Transect and quadrat survey
- ✔ BRUV (Baited/non-baited Remote Underwater Video)
- ✔ Habitat mapping
- ✔ Habitat health



Missions current and future

There are lots of exciting data collection missions that you can get involved with right now. But keep your eye on the BSAC website and SCUBA magazine as more mission opportunities will become available.

- ✔ Operation Oyster
- ✔ Oyster investigation
- ✔ Great Seagrass Survey
- ✔ Great Underwater Easter Egg Hunt
- ✔ Seeing Stars
- ✔ Habitat mapping
- ✔ Kelp / seagrass health
- ✔ Invasive species tracking
- ✔ Sea lice tracking
- ✔ Monthly monitoring
- ✔ Plastic pollution survey

Go back

Get involved

A big thank you to you for participating in this eLearning. All that's left for you to do now is take part in a practical survey training session and then get out there and start surveying and saving the ocean!

End of module quiz answers

BSAC
Dive with us

Go back

UST2

Quiz 1 answers

1. Prey on native species; Spread diseases that natives species are vulnerable to; Compete for food/space; Damage the native habitat
2. True

Quiz 2 answers

1. True
2. Individual action

End of module quiz answers

1. Now
2. Reinforcement
3. The optimum balance and amount of both predators and prey
4. Barren sediment that supports little life
5. True
6. 15%
7. 10%
8. Oxygen depleted dead zones
9. True
10. True

UST3

Quiz 1 answers

1. Weather, sea conditions, tidal height ,tidal currents, other surface traffic, timetable for the day, external restrictions on activities.
2. True
4. No
5. True
6. Marine and Coastal Access Act
7. Depends – seek further advise from the MMO
8. Probably – contact the harbour authority for further advice
9. Delayed Surface Marker Buoy
10. Ideally, the surface cover should be a trained Dive or Snorkel Manager and be trained and practiced in the role.
11. If you are confident, you can now take the real theory module quiz below this flip book.

End of module quiz answers

1. Advise the dive manager / supervisor and ask if the plan can be adjusted to remain within limit
2. The BSAC website
3. Fly a code A ‘divers down’ flag

Go back

UST4

Quiz 1 answers

1. True
2. In / under the seabed

End of module quiz answers

1. Provide scale in a photograph. Communicating with other divers. Recording project data.
2. Lighting provided by your dive buddy from above or to the side of you whilst surveying or taking photographs
3. True
4. A GPS can be more easily mounted in a SMB to allow tracking of the divers or snorkeller route. SMB can often have storage compartments for survey equipment
5. It enables you to get a more precise measurements of complex shapes
6. True
7. Secchi disk or transparency tube
8. True
9. True
10. Cm or Nephelometric Turbidity Units (NTU).

UST5

Quiz 1 answers

1. Presence/Absence survey, Underwater photography survey, Timed survey, Transect survey, Video transect, Transect & quadrat survey, BRUV survey, Habitat mapping, Habitat health

Quiz 2 answers

1. True
2. Slate and pencil, Camera, GPS device, Watch/dive computer

Quiz 3 answers

1. True
2. Invasive species tracking, Great Seagrass Survey, Monthly monitoring, Sea lice tracking, Great Underwater Easter Egg Hunt

Quiz 4 answers

1. True
2. False

Quiz 5 answers

1. 1 metre
2. 25 or 50 metre

Quiz 6 answers

1. 1 kg
2. Oyster Investigation, Great Underwater Easter Egg Hunt, Seagrass health, Great Seagrass Survey, Plastic pollution survey, Seeing Stars

Quiz 7 answers

1. True
2. Gridded, Ungridded

Quiz 8 answers

1. Baited Remote Underwater Video
2. True

Quiz 9 answers

1. True
2. False

Quiz 10 answers

1. Measuring the height of sea grass blades, Counting the number of seagrass seeds or flowers, Measuring the size of oysters, Recording epiphyte cover on kelp, Counting shellfish spat that have settled on shells

End of module quiz answers

1. True
2. All the species present, Selected species of interest
3. An image library shared on Flickr or iNaturalist

UST6

Quiz 1 answers

1. .gpx
2. QGIS, Google MyMaps, Spotify, Adobe

End of module quiz answers

1. A plan
2. iRecord and iNaturalist
3. Date of sighting. Species name. Image.Location.
4. True
5. Expertly verified. Added to national databases like the NBN Atlas. Accessed by scientists
6. True
7. Share it in a way that makes the data accessible to scientists and policy makers
8. True
9. Get warm and dry, Take a photo of your dive slate before it gets smudged. Collate all your data from various devices together so the data doesn't get lost. Make sure you haven't missed any pieces of data, such as recording the survey location
10. Graphical Information Services software

Go back

UST7

Quiz 1 answers

1. True
2. Paddle worm, Squid and Cuttlefish, Shark and Skate cases, Nudibranchs, Whelks, Fish
3. BSAC Mission Portal
4. True
5. True
6. Native oysters are protandrous hermaphrodites and can change sex through there lifecycle
7. True
8. True
9. True
10. Sea Star Wasting Disease

End of module quiz answers

1. True
2. Collaboratively by BSAC and Seawilding

UST8

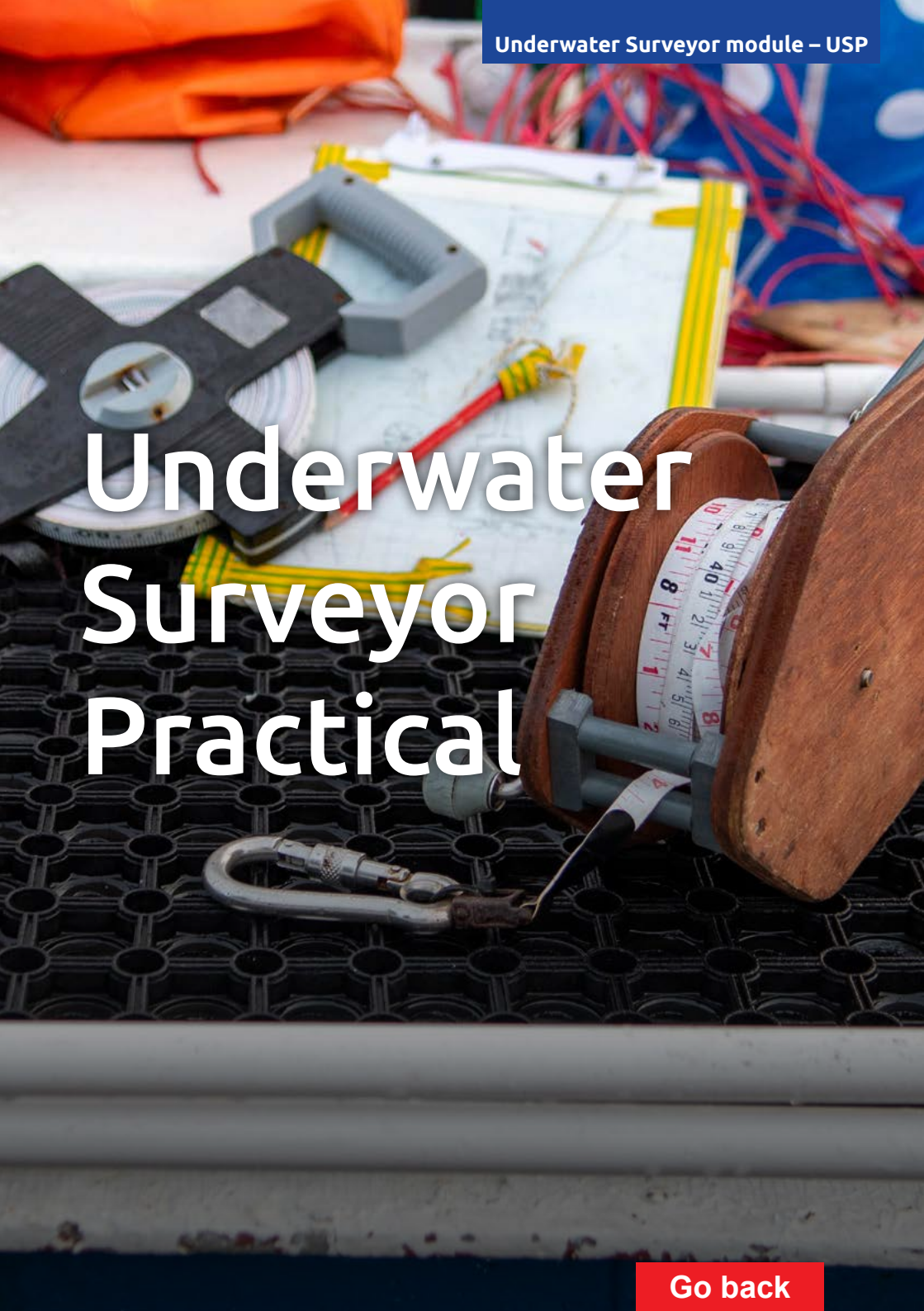
Quiz 1 answers

1. True
2. Billions

End of module quiz answers

1. A species that has been introduced, either intentionally or accidentally by humans.
2. False
3. Check, Clean, Dry
4. 48 hours
5. True
6. https://irecord.org.uk/enter-non-native-records
7. False
8. False
9. True
10. Virkon Aquatic®.

Go back



Underwater Surveyor Practical

Go back

Underwater surveyor practical

Course aim

This course builds on the Underwater Surveyor eLearning theory by allowing you to develop your underwater survey practical skills in a supervised setting. It can be completed using either scuba or snorkelling equipment.

Contents

The Underwater Surveyor course consists of:

- **One dry lesson to familiarise yourself with survey equipment**
- **Two underwater survey dives where you will complete two different types of surveys, one of which is to use a transect**
- **Supervised data entry in support of a meaningful project outcome e.g., Operation Oyster or Great Seagrass Survey**

Duration

The practical takes place over 1 or 2 days.

Go back

Achievement targets

At the end of this module you should have:

- **Planned at least one underwater survey**
- **Ensured that risks are properly assessed and mitigated**
- **Completed at least one dry run of the survey to verify that their plan should work**
- **Undertaken an underwater survey and recorded some data**
- **Collated the data and submitted the data to an appropriate database**
- **Objectively reviewed and assessed their survey**

Survey equipment familiarisation

Go back

Survey equipment familiarisation

Aim

This session gives you an opportunity to see what equipment is available of how all the equipment works. Familiarising yourself with the kit, and doing a dry run of your survey method will make sure it all works underwater.

Contents

You should have completed the online training session so you will have been introduced to a range of survey equipment. It is also an opportunity to see what others on the course have brought with them.

During the run through you will be shown again how they are used, and the important extra information about clips and other ‘top tips’ for making it all work.

Survey technique	Equipment	Top tips
Difficulty rating: Presence Positioning ★☆☆ Equipment ★☆☆ ID skills ★☆☆ **Difficulty rating:** Timed Positioning ★☆☆ Equipment ★☆☆ ID skills ★☆☆	• **Slate/board** • **Dive Computer/ Watch** • **GPS*** • **Camera***	Absence can be as important as presence Pre-prepare slate/ board. Timing of when you saw them on the dive could be helpful to correlate against the GPS log.
Difficulty rating: Photography Positioning ★☆☆ Equipment ★★☆ ID skills ★☆☆	• **Camera** • **Notepad*** • **GPS***	Double check the camera – especially seals and battery life. Metadata in the images can contain useful information e.g., time, date and sometimes GPS coordinates (for surface photographs of buoy locations).
Difficulty rating: Transect survey Positioning ★★☆ Equipment ★★☆ ID skills ★★☆ Difficulty rating: **Video transect** Positioning ★★☆ Equipment ★★☆ ID skills ★☆☆	• **Dive reel or tape measure** • **2kg dive weight** • **Slate/Board** • **Watch/Dive Computer** • **Compass** • **Camera***	This is a core survey technique worldwide. Best to lay in direction of tide rather than cross tide. Ensure camera images are in focus which for some fixed focus cameras means avoiding getting too close.

Go back

Difficulty rating: Quadrat survey Positioning  Equipment  ID skills 	• **Quadrat folding and not folding** • **Camera** • **Slate/board** • **Watch/dive computer**	Prepare a slate/board in advance. Recording position of quadrat and location. Shorter the list of things to survey, the simpler the survey and greater the chance of success.
Difficulty rating: BRUV Positioning  Equipment  ID skills 	• **Video camera** • **Frame** • **Bait** • **Watch/dive computer** • **GPS***	Capturing some of seabed in image makes video more interesting.
Difficulty rating: Mapping Positioning  Equipment  ID skills 	• **GPS** • **SMB** • **Camera*** • **Slate/board*** • **Watch/dive computer**	Ensure GPS is above water! Extraction of data can be a bit fiddly if you're not tech savvy. It's helpful to have a sketch of the dive to supplement the GPS information and help identity the data set you need to extract.
Difficulty rating: Habitat health Positioning  Equipment  ID skills 	• **Combination of quadrat and transect**	Ideal for when we have located a specific site.

Items marked * can be considered optional but improve the quality of the survey

The transect

The transect is a baseline skill for any underwater surveyor. It involves laying a lightly tensioned datum line or, better still, a tape measure (which by nature is pre-calibrated and marked) in a known direction.

This sounds simple, but it requires know-how and skill to execute well.

It is important therefore that you spend some time getting to grips with this technique. Make sure you do a dry run, working out how to attach the transect line, run out the line out and attach it at the target distance, so you can use the line as a reference.

Step 1: Deploy the shot line

When the course is shore-based, then the reverse buoy line method works well. When working from a boat, then boat deployed shots, as normal diving practice, works well. Boat deployment means that an accurate GPS position can be taken from the boat.

Assemble the actual shot line to be used to mark the start of the transect. Highlight length of line used, size of weight, attachment points for connecting the transect line and clips used to do so.

Go back

In sensitive areas, it may be necessary to lower the shot line slowly to the seabed, but in other areas, this may be impractical, and a more conventional deployment will be required. Take the GPS reading, making sure the line is as taut as possible to make it as accurate as it can be.

If taking a photograph of the shotline launch position, use a mobile phone in order to download the GPS position metadata. It may be prudent to keep the phone in a waterproof bag on a lanyard.

Step 2: Deploy survey equipment

If appropriate, consider sending your survey equipment (tape measure, slates, additional weights) down the line in a mesh bag. Divers tend to want to clip things to them, which may be appropriate for a simple transect, but if used, a mesh bag can avoid unnecessary encumbrance.

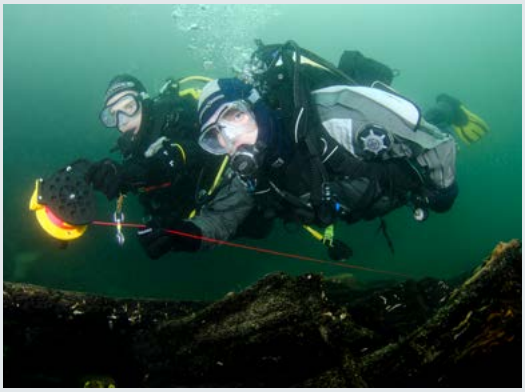
The mesh bag can then be attached around the shotline using a large karabiner or short rope and dropped down the shot line so that the equipment is waiting for divers on the bottom. It is important to avoid any chance of the bag dragging on the seabed.

Step 3: Attach the datum line to the shot line

Check that it is actually possible and easy to connect the clip at the end of the tape measure or line to the shot weight or line. This sounds obvious, but divers tend to use odd clips they have lying around, which may be difficult to operate with gloves or too small to attach to the line.

A useful technique is to turn back the tape and clip onto the tape rather than the line. It is easier to release after the transect is completed. Snap hooks and spring shackles should be large enough to unclip from the tape or the line easily.

Step 4: Laying the line



You might have done line laying before as a technique for navigating safely around wrecks or in poor visibility and so should be aware of finning technique and arm's length deployment to minimise the entanglement risk.

It is important you have neutral buoyancy and ensure tidy equipment that does not impact the seabed.

Check the direction you are heading before setting off using the compass. It is helpful for one diver to concentrate on going the right way while the other follows, laying the line and keeping a light tension on the line.

Where there is a stronger tide on the survey site, then consider laying the line with the tide, as this will make laying the line and subsequent surveying easier.

Although compass work is basic it is surprising how many sport divers forget this skill through lack of practice! You may need a revision session covering the directions you will be swimming in.

If possible, lay out the full length of tape in the right direction. This may not be possible on the deck of a boat. In which case, consider doing this on shore beforehand if possible. It is good for you to get a sense of the full-scale survey. The length of the transect will depend on the sampling strategy used so should be as close to target length as possible.

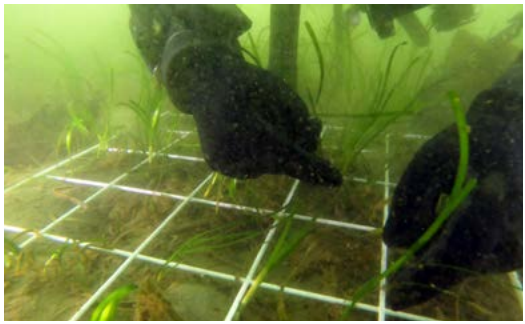
Go back

Once the full length of line is laid, check the heading of the line with a back bearing (reciprocal) and move the line left or right accordingly, ensuring there is light tension.

Secure the tape measure with a 2kg weight or a tent peg, if on softer sediment, so that tension is maintained. Some of you will find carrying the weight difficult so get your buddy to help.

Step 5: Conducting your survey

This is the opportunity to check the equipment being used for the survey. This could be as simple as checking the video camera lights and battery with a physical walk through of the survey to ensure your buddy pairs understand the choreography.



If using pre-prepared slates/boards, this is an opportunity to check they are all present and correct and you are familiar with them.

It may well be that multiple dive pairs use the same datum line. Ensure everyone gets the opportunity to work through their task.

Step 6: Recovery

This should be relatively straightforward, but it is worth running through the process to make sure it works. You should be briefed that if it is necessary to surface for an emergency, the equipment is not important and, in most cases, can be recovered from the surface from the boat, although there could be a bit of tidying up to contend with afterwards.

The quadrat

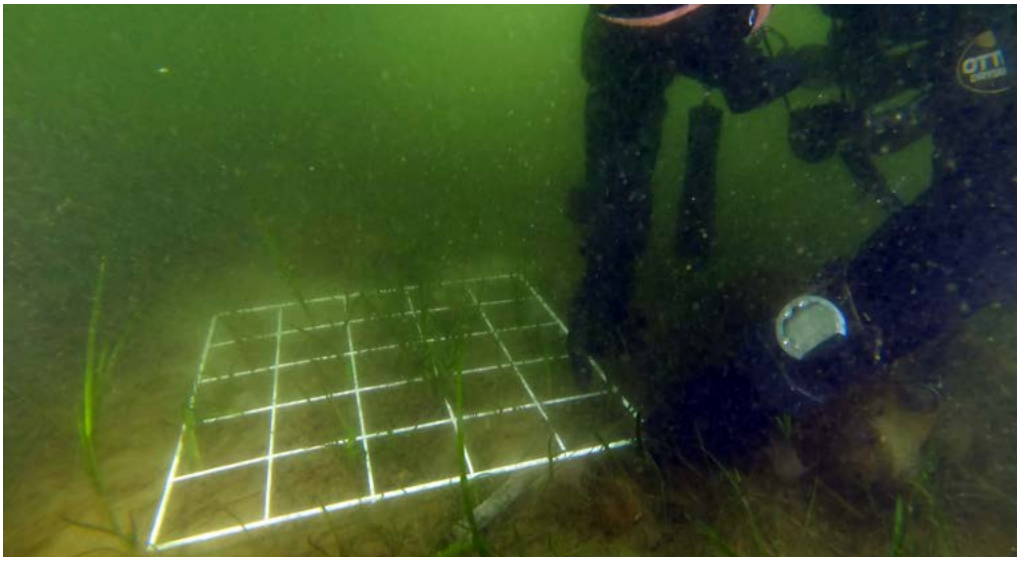
This is a basic piece of equipment which has variations on a theme.

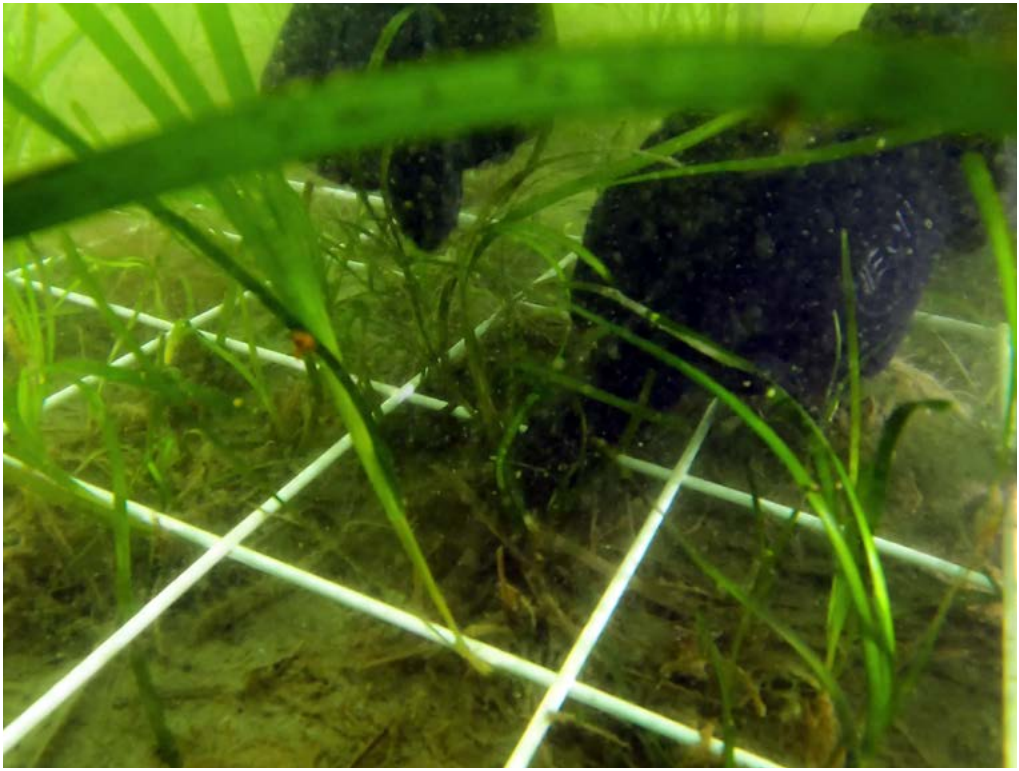
Typically, these are about 0.5m x 0.5m and are available from companies that supply geography field work equipment to schools.

Ideally show each of the types of quadrat, highlighting the pros and cons of each:

- **Folding quadrat (often homemade from PVC plumbers' pipe and bungy)**
- **Segmented quadrat – very useful for detailed counts but harder to lower over seaweed/seagrass**
- **Open quadrat – easier to place over seaweed/ seagrass. The addition of a marker string/bar can aid counting**
- **A square, with one side missing, is even easier to place over seaweed/seagrass. This has three sides; the open end being slid under the plants, so they are not disturbed or damaged during counting and measuring**

Go back





Survey dives 1 & 2

Go back

Survey dives 1 & 2

Aim

The aim of the two survey dives is for you to complete two different types of underwater survey. At least one of them will be a transect survey, preferably in the form of a laid tape measure.

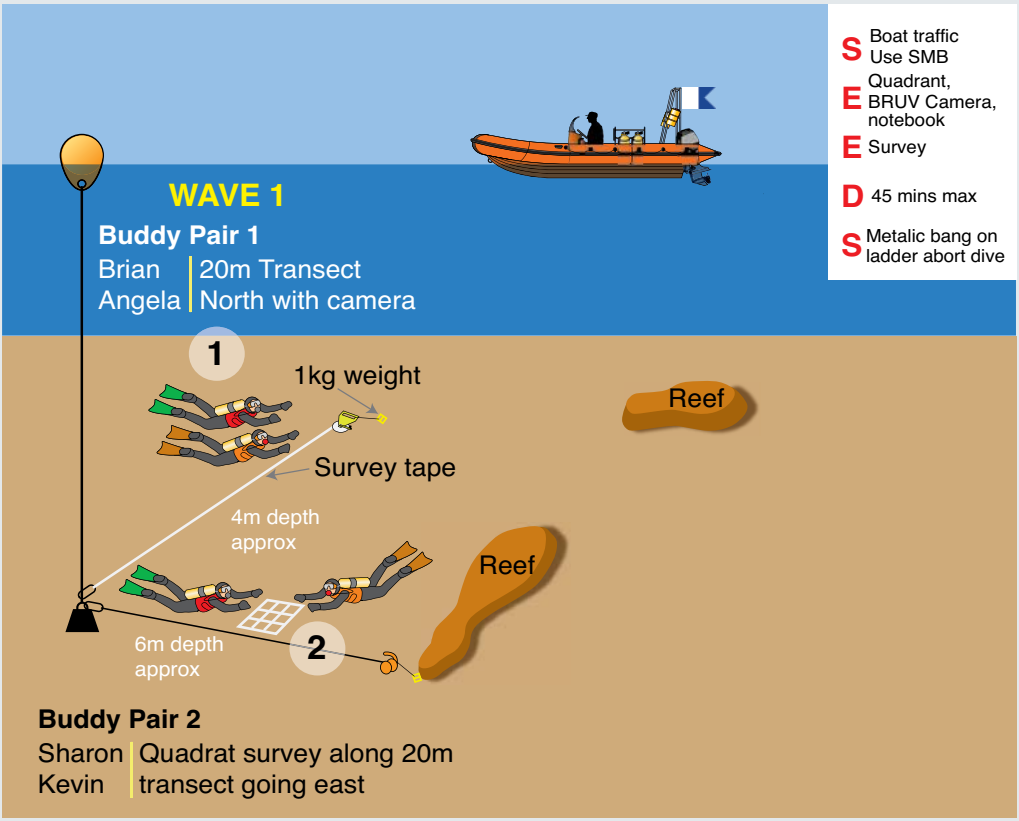
Dive briefing

Your instructors will have worked out in detail how they want the survey to work, and the ki will be ready for you. You should expect the dive brief and dry run to talk a bit longer than normal. It is critical that you understand what you need to do, so use the dry run as an opportunity to get all the details ironed out.

It is helpful to record on your board the stages of your survey as a reminder of what and how you are going to do things underwater.

Scuba diving example

Suspected old native oyster reef site



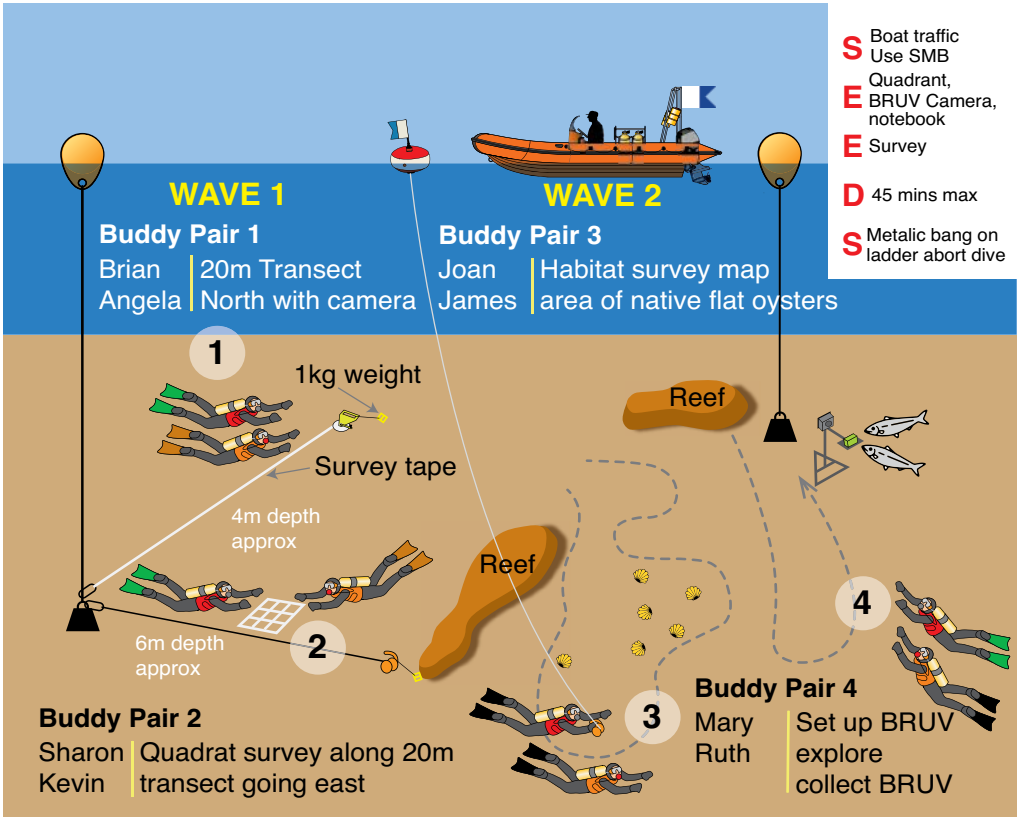
Your brief may include (image of suspected old native oyster reef site is fine) because this will help clarify the details of your task.

The brief will also include task specific information such as:

- **Clip tape to shot**
- **Lay a tape to 20m North**
- **Once laid check direction using a reciprocal bearing South**

Go back

- **Use the video to scan the length of transect 0.5m each side of the tape**
- **Once complete use your slate/board to record presence/absence of native oysters**
- **Recover the tape**
- **Unclip from shot line**
- **Surface**



Of course it may get more complex than this if several teams are working on different surveys! The briefing and dry runs are so important for you all to succeed at your individual task.

Snorkelling example

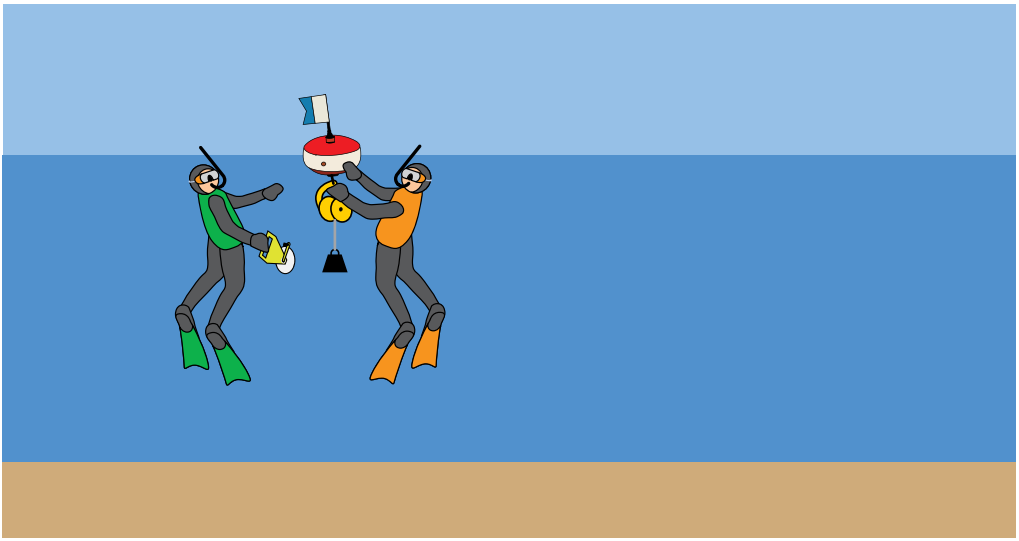
Nursery native oyster restoration site

There may be several snorkel teams surveying at one time. You should expect to be reminded about carrying a sharp and fast cutting tool (knives are a bit too slow) and be reminded about the one up one down safety rule.

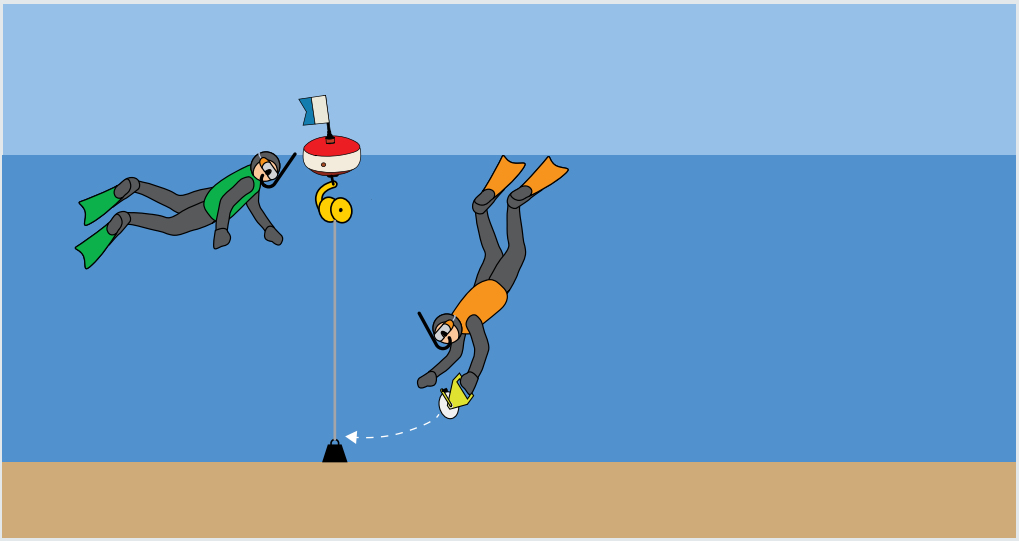
You should expect the brief to cover:

- **The organisation of the survey**
- **Equipment to take with you**
- **Reminder about shot line deployment with SMB**
- **Time when shot goes down marked on board/slate**
- **Clipping onto the shot**
- **How quadrats are to be deployed**
- **Videos to be made**
- **Recovering the equipment**

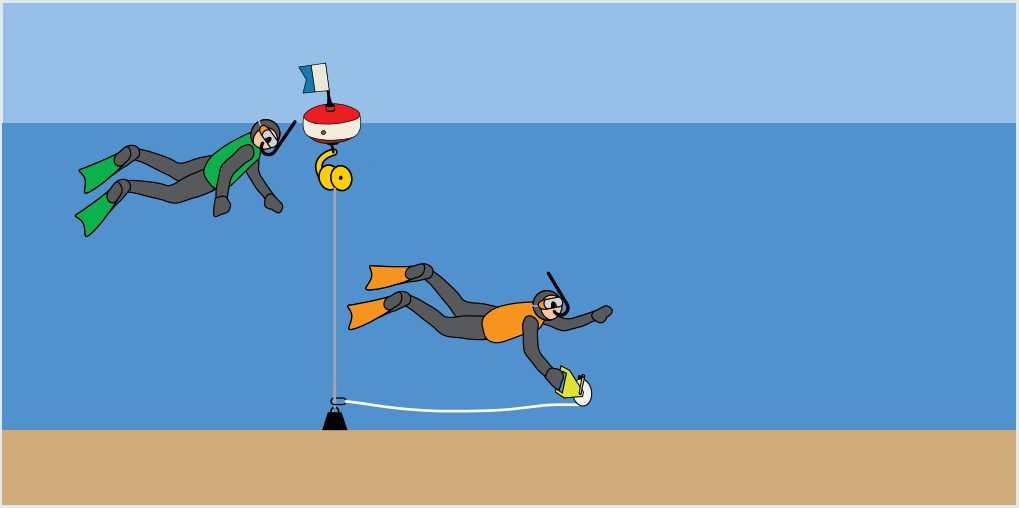
Go back



- **Your buddy pair will swim out with the shot line constructed from a surface marker buoy (equipped with a tracker in a waterproof bag) and a diver's reel mounted upside down, handle clipped to the reel and clip on the line attached to a couple of 2 kg weights. The inflated smb takes the weight of the line.**
- **Deploy your shot line.**
- **Make a note of the time when the shot is deployed in position so the position from the GPS data file can be obtained later.**

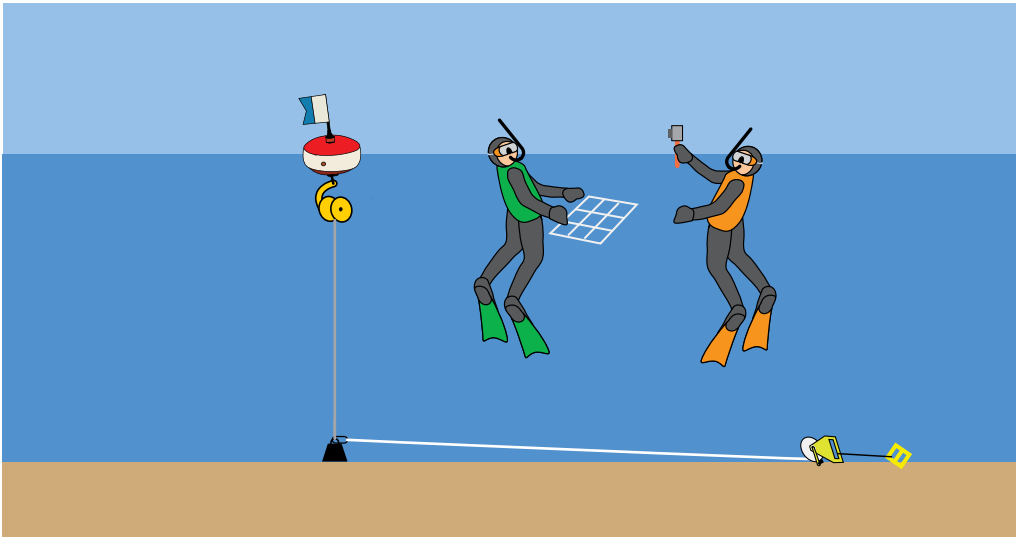


- **One of you then surface dives with a weighted 30m tape measure.**
- **The weight is about 2 kg and is used to stabilise the tape measure on the seabed (alternatively a tent peg could be used). The buddy will monitor the snorkel diver from the surface.**

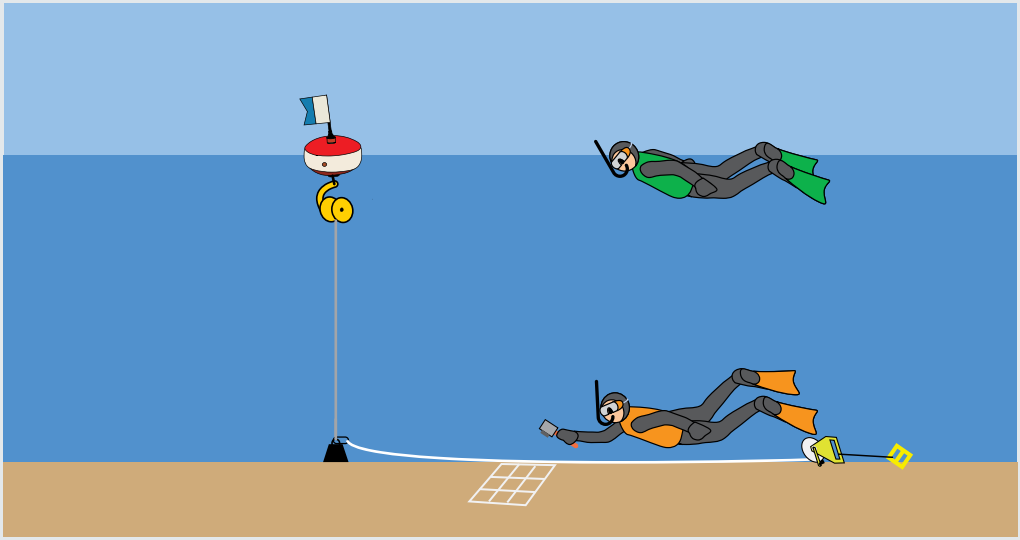


Go back

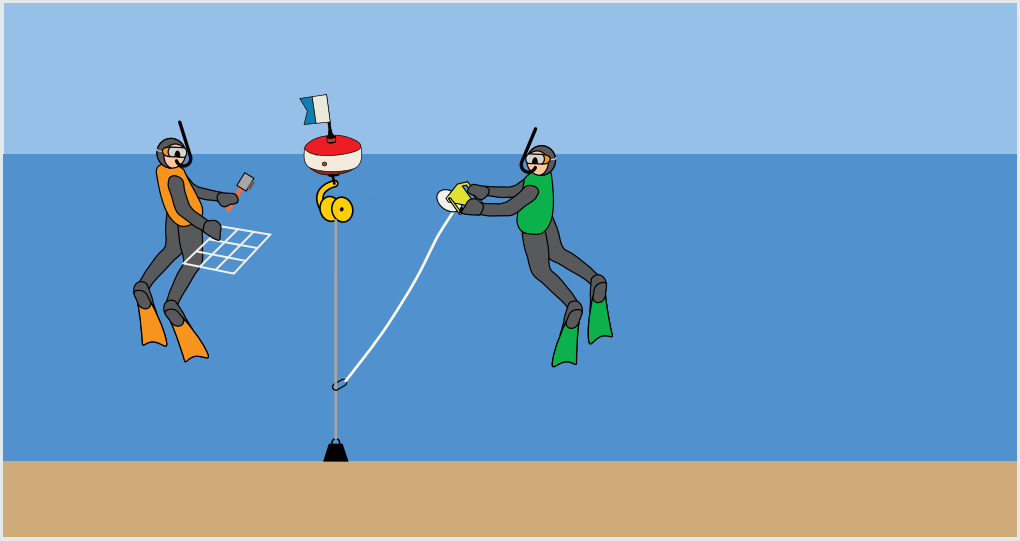
- **One of you clips the tape to the shot line weight and reels out the tape measure perpendicular to the shore, remembering to tension the line at the end.**
- **Depth will be only 1-2m so you can be on the surface for much of this task.**



- **Once the tape measure transect and datum are laid, you then place your quadrats along the tape as you have been briefed. If taking video make sure your you fill the screen with your image of the quadrat, showing the distance along the tape measure as well. Make sure the quadrat fills as much of the image as possible on the viewing screen at the back of the camera and is square onto the quadrat, and the distance along the tape measure is visible. There should also be a clear distinction between each side's images.**



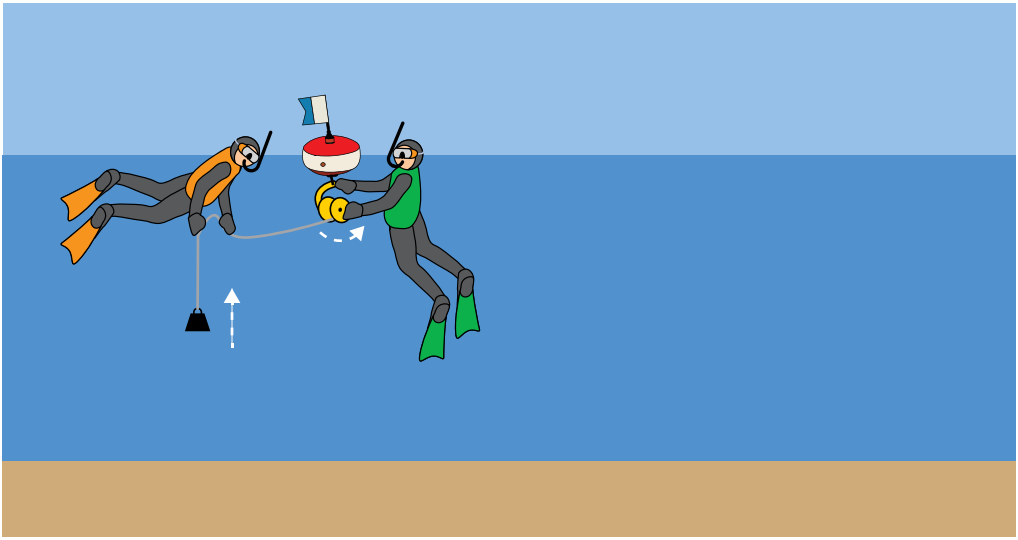
- **Take it in turns to lay the quadrat and capture video and be the safety snorkeller.**



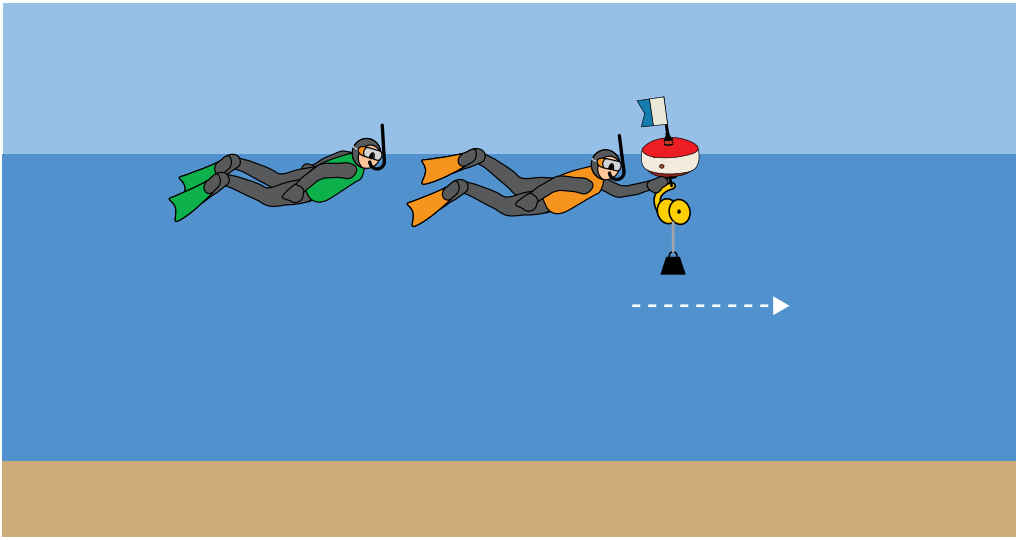
- **At the end of the survey, recover the tape measure. Connect this to the buoy to save having to carry it.**

Go back

Recover the camera and quadrat (clipping to the buoy so they do not get lost).



- **When recovering the 4kg shot line, one snorkeller pulls the line to the surface while the other reels in the line.**



- **Both snorkellers then help push the shot line system supported under the SMB back to the shore.**

Site risk assessment

You should be invited to consider risks at the survey site and offer suggestions as to what they can do to mitigate them.

A pre-prepared risk assessment can be used as a checklist but should be updated based on a dynamic risk assessment at the site.

Do not assume something will work; verify that it does, even if it means taking a little longer.

Make sure you and your buddy know your role. Be aware that one group of divers' activity can impact on another group of divers' activity.

Remember you need to be sure of being neutrally buoyant and avoid disturbing the seabed (especially the bit you are surveying!).

Consider which direction the tide will be running for the actual survey. Working into a gentle tide when surveying can be helpful by keeping the area in front of the diver being surveyed relatively clear of disturbed silt.

Working across tide can be very challenging for maintaining a straight datum line and also position in the water column.

Go back

SEEDS brief

Before each scuba or snorkel dive, your Dive Manager/Snorkel Manager should cover all elements of a SEEDS brief in a logical sequence appropriate to the local conditions and the survey you are undertaking. The brief should cover these points:

- **Safety**
  Cover the key safety points for the dive site itself, e.g., surface traffic and expected conditions underwater, before highlighting any particular safety points relating to the survey task. The brief will be slightly different for snorkellers as opposed to divers. Particular safety points for snorkellers are the 'one up, one down' principle for surface diving and ready access to line cutters.

- **Equipment**
  Remind students to take any key safety equipment required first and check students have it (e.g., Delayed SMB, knife/cutter, torch) and confirm that everyone has the required safety equipment, including snorkel vest for snorkellers.

- **Exercise**
  It is helpful for other buddy pairs but essential for the Dive Manager to have an overview of the whole plan. If necessary, provide a brief reminder to the group of which buddy pair is doing what and confirm the key dive parameters (max depth and max time).

- **Discipline**
  Remind everyone about avoiding task fixation and to remember to look out for their buddies.

- **Signals**
  Cover any abort dive signal to be issued to the group.

Buddy check

Buddy pairs should conduct their own buddy checks before entering the water and double-check they understand the plan and their role in the survey.

Dive Management

Your instructors should ensure that snorkelling and diving is conducted in accordance with BSAC Safe Diving Guidance and appropriately dive managed.

Diving in two waves rather than a single wave is encouraged if possible.

The first wave can brief the second wave on the conditions encountered and the success or otherwise of the surveys undertaken so far. This is really important to ensure the effectiveness of the data gathering.

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Survey techniques

The range of Underwater Survey Techniques covered in the course is detailed below:

- **Transect survey**
- **Transect and quadrat survey**
- **Presence/absence survey**
- **Underwater photography survey**
- **Timed survey**
- **Video transect**
- **Habitat mapping**
- **Habitat health**
- **Baited Remote Underwater Video (BRUV) survey**

When setting up the BRUV, the scientific protocol is to make sure the bait is enclosed in some sort of mesh or container and cannot be accessed by marine life. It is the smell that does the work. The artificial feeding of fish is not acceptable in most projects.

Checklists and templates to aid planning are available in the course material for you.

Surface work

You should obtain accurate GPS positions of marker buoys using a vessel or handheld GPS. Try to make these as accurate as possible, for example, by dropping the shot line over the side of the boat closest to where the GPS antenna is to minimise any positioning error.

Dive debrief

Whether you have been diving or snorkelling once you have finished collecting the data you should be involved in the debrief. This should cover all that you have achieved, all that went really well, and anything that you think could have gone better so:

- **What you did well**
- **What you could improve**
- **How you can achieve the improvements**

Go back

Collation of data after dives

In order for divers to be good citizen scientists, they need discipline to collate data collected on the dive and report back appropriately. On some projects, you might be fortunate to have a non-diver on the project who is solely responsible for collecting the data. However, it is, most likely is that a fellow diver may need to take on the role.

In its most basic form, this can involve collating handwritten copies of dive log sheets, survey slates / boards but also photographing and the like or interviewing divers and recording divers' findings in paper or electronic form. While the nature of data will vary depending on the project, it is likely to involve the use of a computer and or a smartphone.

As a baseline plan, if you volunteer for this role you should have access to a laptop computer with access to the internet and a solid-state hard

drive or USB of an appropriate size to store data for outputs of the project.

For example, immediately after each dive use a smartphone to photograph:

- **Copies of completed diver slates (each clearly labelled with their name and the date and time)**
- **A copy of the completed dive log sheets, ensuring dive time in and out are accurately completed**

These can then be transferred electronically to a laptop computer and USB drive later. If you have brought your own laptop you can start data entry practice.

Following de-kit and debrief, there may be additional data to collate. For example, photographs and videos taken on the survey dive and a scan of any notes made during the debrief.

If possible, and if time allows, it can be useful to download and review videos and photographs before your next survey dive. That way, if there is a problem with them then there is an opportunity to repeat the survey on the next dive. Alternatively, they may identify something that changes what you would like to do for the next survey.

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You should enter the relevant data under the supervision of an instructor.

Where the instructor is convinced that your data collected is valid, then a submission is appropriate. However, it might be better to use a data recording form and complete it, but not submit the results.

Data portals have different requirements and most have a means to attach documents, photographs, and videos etc. Check that the required data are ready before trying to upload it.

Glossary

Carbon capture: This is a term usually referring to technologies that can combat climate change by reducing carbon dioxide emissions. Certain natural and currently damaged habitats such as seagrass beds are able to capture carbon.

Carbon sequestration: This term is often used interchangeably with carbon capture and refers to a natural or artificial process by which carbon dioxide is removed from the atmosphere and locked away in solid or liquid form. For example, shells of native flat oysters remaining on or in the seabed, sequester carbon within their shells.

Biomass: This usually refers to naturally recurring products from sewage, plants, animal waste and forests burnt to generate energy. However, it can also refer to the amount of marine life. For example, a healthy reef can have a large amount or biomass of fish swimming around it. Restoring seagrass meadows and native oyster reefs is, therefore, expected to ultimately increase the amount of biomass of marine life in the water.

Blue carbon: This refers to any carbon stored in the sea. This could be in the vegetation around coastlines (such as mangroves and marshes) or seagrass meadows.

Eutrophication: This refers to excessive levels of nutrients in a body of water. Run off from farmer fields can contain fertilisers. The excess nutrients cause dense growth of such things as algae which in turn reduce oxygen levels, which can kill fish.

Acidification: This refers to the uptake of carbon dioxide into the oceans, causing them to become more acidic. Since the industrial revolution, roughly one-third to one-half of the carbon dioxide released by human activity is thought to have been absorbed by the ocean. Acid can dissolve shells, and so a higher level of seawater acidity will increase the rate at which shell material is dissolved, impacting the health of such things as coral reefs and marine creatures with shells.

Transect: This describes a line across a habitat. This could be a tape measure or marked rope laid in a particular direction. Marine life on either side of this line is then surveyed. A transect is a fundamental and widely used technique for underwater surveying.

Quadrat: This is a basic piece of survey equipment comprising a simple frame often 0.5m x 0.5m in size, which is used to mark an area of the seabed for a detailed survey. They can contain further wires or lines to mark off smaller areas within the frame or can be collapsible.

GPS: This refers to the Global Position System, a satellite-based system that is used to determine position on the surface of the earth. There are plenty of low-cost GPS trackers available in a variety of different devices, e.g., outdoor handheld receivers for hiking and cycle computers. Most smartphones contain GPS signal receivers. Standard accuracy of positions is typically better than 2.5m.

Data: Refers to facts and statistic collected for reference or analysis. The exact nature of what data is required and why will depend on the nature of the project. Data is plural and so referring to ‘These data’ is appropriate.

Native flat oyster: This species (Ostrea edulis) is the only one native

to our seas. Populations have declined by 95% since the mid-19th century and they are a target species to restore. They have an amazing capability to filter water (circa 200lt per day) and create reef systems that can stabilise the seabed and improve biodiversity.

Pacific oyster: Crassostrea gigas is the commercially fished species introduced to UK waters when native stocks had been depleted. They can be found in the wild, particularly in shallow water and on harbour walls.

Seagrass: The two main species in the UK are Zostera marina and Zostera nolti. Seagrass plays a role in combating climate change, ensuring food security, protecting coastlines, ensuring biodiversity, controlling disease and filtering water. However, populations have declined in the UK by as much as 92%. They are two target species to protect and restore.

Survey: A process of examination and recording an area and quantifying (counting) its features. Conducting underwater surveys is time consuming and careful planning is required to ensure the best possible use is made of relatively short periods that snorkellers / divers will be actually surveying.

Underwater board template for transect

Surveyor Details

Name: _____

Email: _____

Dive Buddy Name: _____

Location Details

Area (ie: general region/body of water): _____

Survey Site (ie: specific beach/bay/site name): _____

Survey Details

Date: _____ Survey Start Time: _____ Survey End Time _____ Duration: _____

Transect Start Position (lat / long or W3W): _____ _____ Start Depth (metres): _____

Transect End Position (lat / long or W3W): _____ *End Depth (metres)*: _____

Transect Length (metres) _____ Transect Compass Direction (degrees or cardinal points) _____

Water Temp: _____ Visibility: _____

Distance from datum										
1										
2										
3										
4										

Distance from datum										
1										
2										
3										
4										

Filename of photographs (zip file) _____

Make and Model of camera (if used) _____

Make and model of GPS (if used) _____

Any other comments _____

_____

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Example of a completed survey board

Surveyor Details

Name: A. Diver

Email: adiver@bsac.com

Dive Buddy Name: A. N. Other

Location Details

Area (ie: general region/body of water): Solent, Isle of Wight, UK

Survey Site (ie: specific beach/bay/site name): Osborne Bay

Survey Details

Date: 1 Jun 23 Survey Start Time: 10:00am Survey End Time 11:00pm Duration: 1 hr

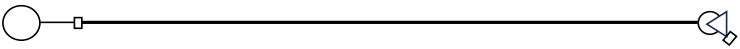
Transect Start Position (lat / long or W3W): ///listings.user.including Start Depth (metres): 6

Transect End Position (lat / long or W3W): ///blackouts.intervene.internet *End Depth (metres):* 6

Transect Length (metres) 25 Transect Compass Direction (degrees or cardinal points) SW

Water Temp: 17°C Visibility: 5m

Distance from datum	0m	5m	10m	15m	20m	25m				
1 Zoestra marina shoots	25	5	0	33	27	42				
2 Anemonia viridis	1	0	1	1	2	2				
3										
4										



Distance from datum	0m	7.5m	12.5m	17.5m	22.5m					
1 Seagrass Shoots	5	10	0	29	15					
2 Snakelock Anenomes	0	0	0	2	0					
3										
4										

Filename of photographs (zip file) 2023-06-01 Survey Photo.zip

Make and Model of camera (if used) Gopro 7

Make and model of GPS (if used) Used GPS in iphone - OS Map

Any other comments Some sizeable native flat oysters (Oestra edulis) approx. 10-12cm width found in amongst seagrass. Permission obtained to dive in this area from EH and KHM

Underwater Surveyor qualification record book

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Underwater Surveyor qualification record book

These pages can be printed off and used to record completion of theory and practical lessons.

Practical lessons do not have to be completed in a single session. Once each individual skill has been achieved, then the lesson can be recorded as completed.

Underwater Surveyor elearning theory modules

Code	Description of Training	Date	Instructor's signature and number
UST1	eLearning Theory Lesson **Underwater Surveyor - Introduction**		 No:
UST2	eLearning Theory Lesson **How will you be helping the oceans**		 No:
UST3	eLearning Theory Lesson **Surveying safely and within the law**		 No:
UST4	eLearning Theory Lesson **Underwater surveyor equipment**		 No:
UST5	eLearning Theory Lesson **Survey techniques**		 No:
UST6	eLearning Theory Lesson **Submitting your data**		 No:
UST7	eLearning Theory Lesson **Survey missions**		 No:
UST8	eLearning Theory Lesson **Biosecurity**		 No:
UST9	eLearning Theory Lesson **Underwater Surveyor - Summary**		 No:

Underwater Surveyor practical modules

Code	Description of Training	Date	Instructor's signature and number
USP1	Dry Practical Lesson **Survey equipment familiarisation**		 No:
USD1	Open Water Lesson **Survey Dive 1**		 No:
USD2	Open Water Lesson **Survey Dive 2**		 No:

Record of qualification

Completion date	

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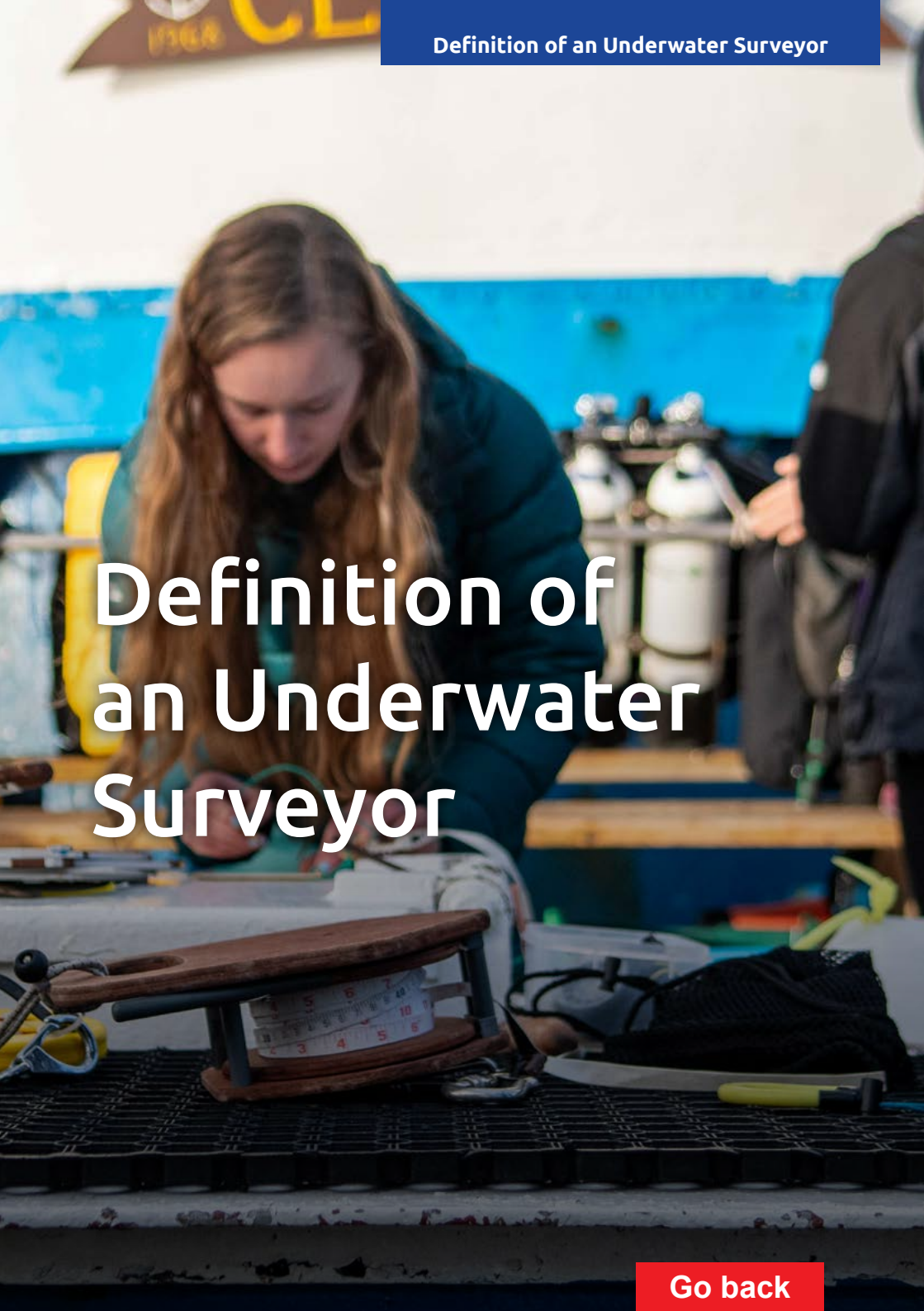

Definition of an Underwater Surveyor

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Definition of a Underwater Surveyor

An Underwater Surveyor is defined as a diver or snorkeller who;

- Has the ability to undertake survey dives/snorkels using a variety of survey techniques
- Can support a survey project by understanding which survey skills are useful for a particular purpose
- Understands why accurate data recording is essential
- Has the knowledge and understanding to be able to extend their survey experience by taking part in a range of survey types.
- Understands that by recording and verifying their survey experience they can use their survey skills and knowledge to record evidence for possible accredited scientific diver status in accordance with ISO or EUF requirements.
- Can conduct their survey dives or snorkels within BSAC safe diving practices recommendations.

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Qualification card application

BSAC photo-ID qualification cards are a universally accepted and convenient proof of qualification.

Obtaining your QCard (qualification card)

Once you have successfully completed all the training your instructor will be able to apply for your QCard online.

Please be aware that you must supply the following information to them:

- Your full name
- Your BSAC membership number
- A digital passport-style image (from your phone)
- The Unique Reference Number (URN) which came with your course pack

Not received a qcard?

It can take time to produce qcards but if you haven't received yours within 3 weeks then please email qcards@bsac.com with the following information

- Your full name
- Your BSAC membership number
- The QCard you are expecting, i.e Underwater Surveyor
- The name of the instructor who submitted the application
- The completion date of the training

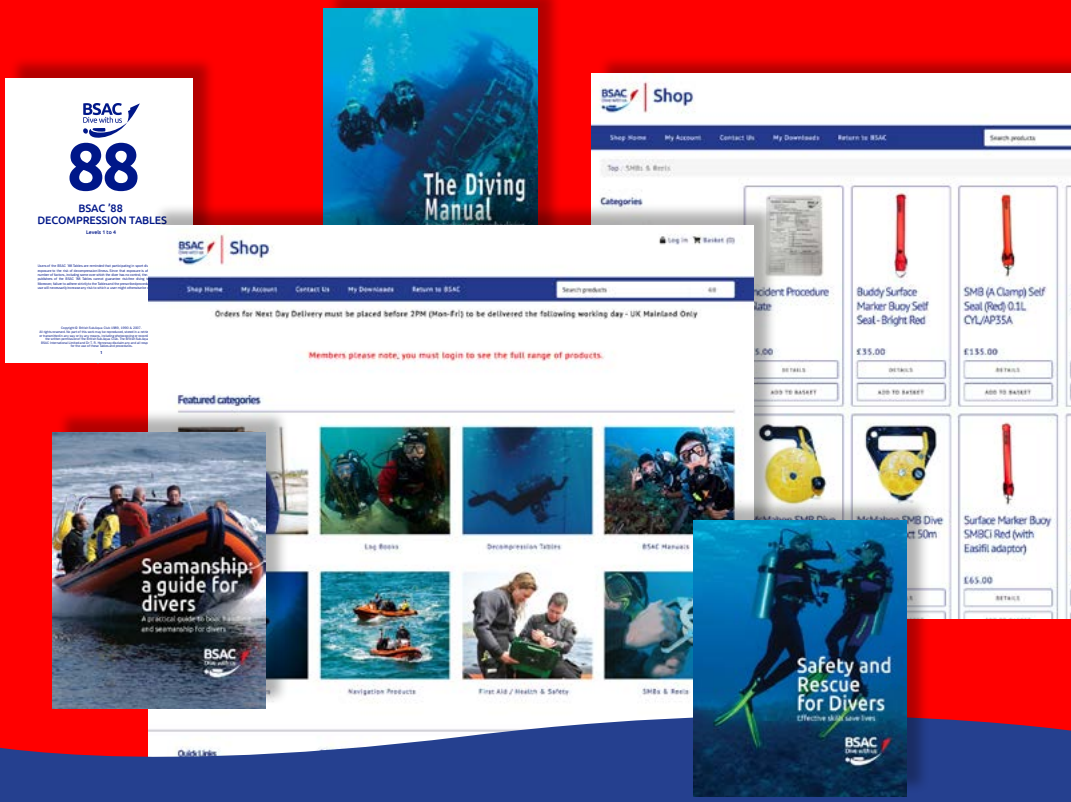
The authors of the Underwater Surveyor course

Eric Holden and **Katherine Knight**, creators of the Underwater Surveyor course, manage a seagrass restoration project on the west coast of Scotland, where they provide marine habitat survey training. They are CMAS Advanced Scientific Divers and BSAC Advanced Snorkel Instructors.

Andrew Hunt is a professional engineer with decades of experience in the field of subsea engineering. He is also a BSAC First Class Diver, National Instructor and long serving NDC member with a passion for expedition diving. He co-authored elements of the Underwater Surveyor Course. He also initiated BSAC Operation Oyster, a project to support restoration of native flat oysters, a project which will benefit from having divers properly trained in Underwater Survey techniques.

Jane Maddocks MA (Maritime Archaeology). Specialises in underwater survey methods, 35 years working with the Oceanography Department diving team surveying marine life.

Shop online at **bsac.com/shop**



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Let's grow the love of British diving together

BSAC
Dive with us

After your course...

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Go diving... with the support of your club, you will be able to encounter a fascinating variety of wildlife and shipwrecks in seas, rivers, quarries, lochs and lakes. Plus, you will be able to dive anywhere in the world with your internationally-recognised qualification.

Progress your diver training...you can quickly move onto your next grade in BSAC's Diver Training Programme.

We recommend for your next course

Marine Life Appreciation

To start the course, discuss your options with your Training Officer/Diving Officer of your branch, your Regional Coach or local BSAC Partnership Centre...

To book and pay for your Skill Development Course simply click on the link to get going...

bsac.com/events

Other projects you may like

Investigate some more marine life survey opportunities with:

The Great Seagrass Survey - www.seawilding.org
The Marine Conservation Society - mcsuk.org
Seasearch - www.seasearch.org.uk
Cornwall Wildlife Trust - cornwallwildlifetrust.org
Ocean Conservation Trust - oceanconservationtrust.org
Shark Trust - sharktrust.org
The Seahorse Trust - www.theseahorsetrust.org
Scottish Wildlife Trust (Living Seas project) - scottishwildifetrust.org.uk

For a more in-depth science read go to

marinedatascience.co/data/

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Notes

Document change record

Date published	Document Version Number	Page(s) affected	Description of changes	Author
31/3/2024	v1.0	All	New course	Katherine Knight, Eric Holden, Andy Hunt, Jane Maddocks


Enjoy your
diving...
BUDDY

Keep in touch

To know more about BSAC membership and keeping in touch, contact:

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+44(0)151 350 6201 | **membership@bsac.com**

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Diving Resources Team

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