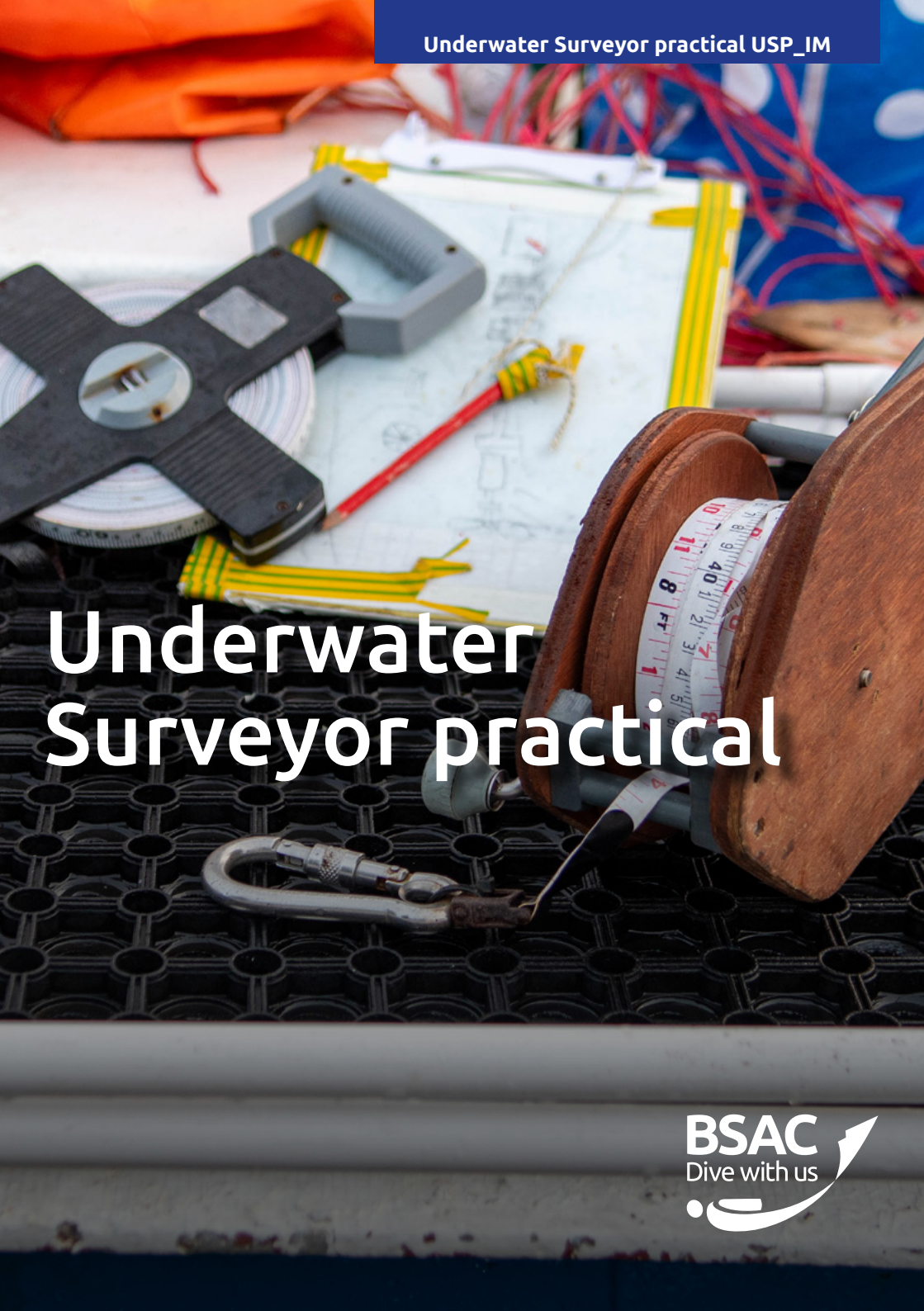


Underwater Surveyor practical

BSAC
Dive with us

Contents

Document change record 3
Underwater Surveyor practical 4
Course aim 4
Qualification awarded 4
Contents 4
Duration 5
Entry level 5
Instructor qualifications 5
Achievement targets 6
Equipment 6
Student competence 8
Venue 9
Roles and responsibilities 10
Prior to course 11
On the day 12
Course debrief and the way forward 13
Award of qualification 14
Survey equipment familiarisation 16
Aim 16
Contents 16
Skills performance standards 19
The transect 19
The Quadrat 23

Survey dives 1 & 2 26
Aim 26
Dive briefing 26
Scuba diving example - Suspected old native oyster reef site 27
Snorkelling example - Nursery native oyster restoration site 30
Site risk assessment 36
Dry run 36
SEEDS brief 38
Buddy check 39
Dive management 40
Survey techniques 40
Dives 42
Surface work 43
Dive debrief 43
Collation of data after dives 45
Upload data to an online portal 47
Skills performance standards 48
Timetable 49
Glossary 50
Underwater board template for transect 53
Example of a completed survey board 54

Document change record

Date published	Document Version Number	Page(s) affected	Description of changes	Author
22/2/2024	v1.0	All	New course	Jane Maddocks

Go back

Underwater Surveyor Practical

Course aim

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

Qualification awarded

On completion of both the Underwater Surveyor eLearning theory and this practical course, students will gain the BSAC Underwater Surveyor Skill Development Course (SDC) qualification.

Contents

The Underwater Surveyor course consists of:

- **One dry lesson to familiarise students with survey equipment**
- **Two underwater survey dives where students 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.

Entry level

All students must:

- **Be a minimum of Ocean Diver or Snorkel Diver**
- **Have completed the Underwater Surveyor eLearning theory**
- **Be current BSAC members**

Care is needed to make sure that survey dives are conducted within the qualification and experience limits of the divers.

Instructor qualifications

All instructors must:

- **Be a minimum of a BSAC Open Water Instructor**
- **Have completed the Underwater Surveyor eLearning theory or possess relevant experience/qualifications from other agencies or professional background**
- **Be current BSAC members**

Go back

Achievement targets

At the end of this module students 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**

Equipment

Each instructor and student will need snorkelling or scuba equipment appropriate to the planned dive.

The instructor also needs appropriate equipment for the surveys to be conducted which may include:

- **A selection of open and gridded quadrats**
- **Transect lines (surveyor tape measures)**
- **Reel + Surface Marker Buoy / DSMB**

- **Rulers/metre sticks/callipers**
- **Handheld GPS/GPS tracker***
- **Spare lead weights and clips**
- **Mesh dive bag**
- **Lifting bag**
- **Underwater camera***
- **Secchi disk**
- **Hand corer and plastic zip lock food bags**
- **Underwater slate/notepad/board**

(**Note:** *It is recommended to use the prepared slate provided herein for the transect survey.*

This can be printed and then laminated in matt vinyl pouches. It is possible to write on a matt vinyl pouch with a pencil.)

This form has a lot of detail for use underwater. It may be useful for students to write up their boards for the essential underwater information. They can then complete the form when they are back on the surface.

A computer with access to the internet is required to collate data afterwards.

*Students can be encouraged to bring their own GoPro/waterproof camera and GPS device (sports watch or phone in waterproof case).

Go back

Student competence

It is expected that the student is already confident and competent to dive or snorkel to the limits of their current qualification. This will provide the basis for their skills to be extended to undertake underwater surveys.

Less experienced divers may not necessarily yet have all the skills for a particular underwater survey task (e.g., launching a delayed SMB underwater) so care needs to be taken to ensure they are not expected to undertake tasks for which they have not yet received training.

Therefore, instructors may need to dive with the less experienced students to demonstrate a technique in addition to the dry run. This is especially the case where deployment of shot line, use of reels as shot line and laying tape measures or lines is required.

For example, when laying a transect things to teach could be:

- **Preparation of the shot line (see later information on the Dry Run)**
- **Operation of the tape measure or reel, including how to lock and release the reels**
- **Reading the tape measure using mm**
- **Operation of certain clips**
- **Finning position while line laying to minimise risk of entanglement**

Where possible, instructors should do a short underwater demonstration of laying a transect line.

Venue

This module requires a site that has a suitable area on the deck of a hard boat or ashore to enable planning and dry runs of the intended underwater surveys to be conducted.

Skill practice required in this module requires reasonably sheltered surface conditions. Ideally, the site should avoid low visibility (less than 3m horizontal) and any significant water movement in order to ensure students can focus on achieving the necessary skills.

For a snorkelling event, a maximum depth of 2m is required.

For a diving event, the depth of site can vary depending on the nature of the survey. For more complex surveys, particularly those involving datums, then it would be prudent to practice first in shallow water, approximately 6m-10m.

Ideally, the course should gather data for a real project, and so a venue in the sea is preferred.

However, inland freshwater sites can also be used, but the choice of surveys practised should be chosen to suit the site, focusing on freshwater marine life and features.

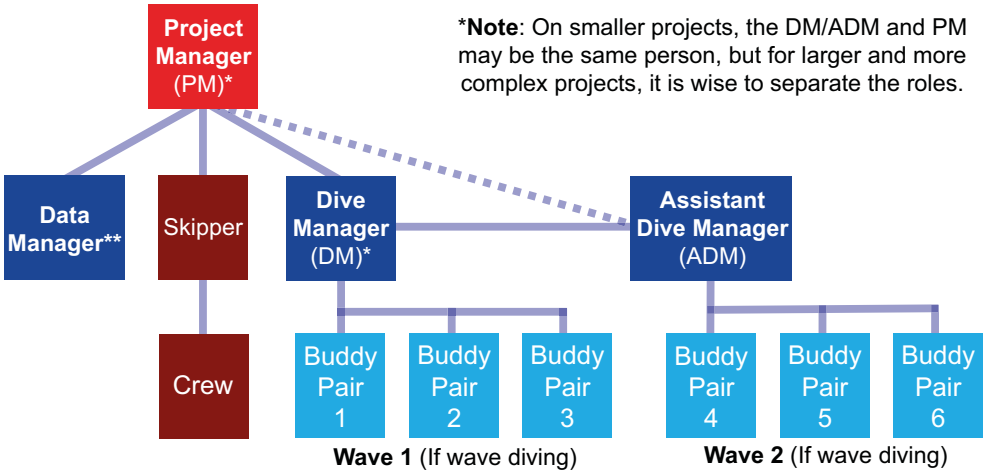
There should be a dry area that can be used as a classroom for data collection.

Go back

Roles and responsibilities

The nature of the team will vary depending on whether you are shore diving or boat diving and the nature and size of the project.

A well-organised and manned underwater survey project team operating off a UK hard boat, for example, can be structured as follows:



**This could be a non-diver e.g. Marine Scientist. On smaller projects this role could be delegated to one or two of the divers. The is no point gathering data on the dive if it isn't properly collated afterwards and fed to the project database

The Project Manager is more focussed on the execution of the underwater surveyor project. They should be checking that the divers know what they are doing. This role could be a non-diving scientist from the project you are supporting. Close liaison between the Project Manager, boat skipper/cox and Dive Manager is essential.

The Dive/Snorkel Manager's main focus will be the safety of divers while they are in the water. They need to liaise with the skipper, divers and the Project Manager and Data Logger.

If the Dive/Snorkel Manager wishes to dive, they should ensure a good

handover to an Assistant Dive Manager, including both the dive and the project (perhaps delegated to the Project Manager).

The Data Logger is a key role. Their function is to collate the data and ensure it is appropriately stored immediately or as soon as possible after the divers have surfaced. This role could be done by anyone (including non-divers) familiar with the project data logging protocol.

The Project Manager and Data Logger will be remarkably busy, so may be a non-diving role.

Each buddy pair is responsible for carrying out the scuba or snorkel dive safely in accordance with BSAC safe diving guidance. They are also responsible for conducting their particular survey and reporting back accurately.

On smaller teams, individuals may be multitasking. Care is needed to ensure that dive safety is not compromised because divers are overloaded.

The skipper's primary concern is the wellbeing of everyone onboard the boat and may be assisted with the crew. From a project perspective, they can help by accurately placing shot lines and providing their coordinates. They need to be fully involved in all the discussions about what is happening, when and where.

Prior to course

In advance, the lead instructor should:

- **Ensure that all students have completed, or are completing, the Underwater Surveyor eLearning theory**

Go back

- **Check students are medically fit to dive; check qualifications, BSAC membership and level of experience**
- **Confirm that students have the equipment they need and if they are planning to bring any survey equipment**
- **Produce a detailed plan for the two survey dives**
- **Assemble the survey equipment that they will require**

On the day

Before starting the training, the lead instructor should assemble the team in a suitable dry area and:

- **Introduce the instructor and venue staff. Highlight roles and responsibilities of the entire team to help ensure project success.**
- **Provide a safety briefing for the venue. This might be delegated to the vessel skipper or staff of the venue or local organiser.**
- **Remind people of the objectives of the Underwater Surveyor course and why what they are doing is important.**
- **Briefly run through timings for the day.**

Course debrief and the way forward

After training is complete, the lead instructor should gather the team together and:

- **Review what surveys have been accomplished.**
- **Highlight what data has been collected and how it could be used.**
- **Highlight what information has been uploaded.**
- **Thank everyone for the efforts during the course.**
- **Let everyone know that they are now qualified BSAC Underwater Surveyors, and their electronic records will be updated shortly.**
- **Go around the group and ask them what went well on their surveys and what they might change in future (i.e., what didn't go so well!).**
- **You could also ask what project, if any, they are thinking of supporting. Instructors should participate in this but go last.**
- **Tell students about other courses which can extend their ability to use survey skills e.g., BSAC Wreck Diver and Nautical Archaeology Society's Foundation Courses.**
- **Thank everyone once again for attendance.**

Go back

Award of qualification

To ensure the qualification is awarded, instructors should complete the application form on the BSAC website.

Survey equipment familiarisation

Survey equipment familiarisation

Aim

This session provides an opportunity for students to see what equipment is available for their surveys, see and touch the equipment for real and receive a brief reminder on how the survey equipment works.

It is also the opportunity to run through problems with kit and resolve them before entering the water. If the equipment does not work on the surface, it will not work underwater!

Contents

Students should have completed the online training session so should be familiar with a range of survey equipment.

It is also an opportunity for you to see what equipment students have brought along themselves.

Run through the range of surveys and equipment associated with them plus remind people how they are used and one or more ‘top tips’ for their use e.g., extra clips and line for attaching survey equipment. Items marked * can be considered optional but improve the quality of the survey.

Go back

Survey technique	Equipment	Top tips
Presence **Difficulty rating:** Positioning ★☆☆ Equipment ★☆☆ ID skills ★☆☆ **Timed** **Difficulty rating:** 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.
Photography **Difficulty rating:** 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).
Transect survey **Difficulty rating:** Positioning ★★☆ Equipment ★★☆ ID skills ★★☆ **Video transect** **Difficulty rating:** 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

Quadrat survey **Difficulty rating:** 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.
BRUV **Difficulty rating:** Positioning ★★☆ Equipment ★★★ ID skills ★☆☆	• Video camera • Frame • Bait • Watch/dive computer • GPS*	Capturing some of seabed in image makes video more interesting.
Mapping **Difficulty rating:** 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.
Habitat health **Difficulty rating:** Positioning ★★☆ Equipment ★★☆ ID skills ★★☆	• Combination of quadrat and transect	Ideal for when we have located a specific site.

Go back

Skills performance standards

Familiarisation At the end of this module, students should have had the opportunity to familiarise themselves with a range of survey equipment. This should specifically include equipment associated in setting up a transect and a quadrat.

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, for instructors to spend most time during familiarisation on this technique, ensuring that a complete dry run encompassing every detail is carried out.

Demo each step and get students who are responsible for that particular step to mimic to ensure they know what to do. Where possible, instructors should do an underwater demonstration of this technique.

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.

Lay it out on the ground / deck of the boat and verify everyone understandeds how it will be deployed. 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. Highlight how the GPS reading will be taken and the need to reduce the distance between the shotline launch position and the GPS receiver to confirm accuracy.

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

Some students will 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 to brief for neutral buoyancy and ensure tidy equipment that does not impact the seabed.

A key briefing point is for students to check the direction they 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 the students will be swimming in.

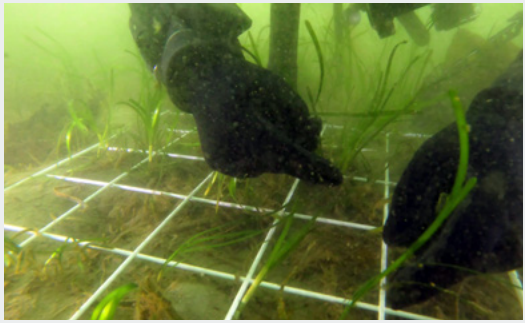
If possible, lay out the full length of tape in the right direction. This may not be possible on the deck of a boat, in which case, consider doing this on shore beforehand if possible. It is good for students to get a sense of the full-scale survey. The length of the transect will depend on the sampling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

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 students will find carrying the weight difficult.

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 buddy pairs understand the choreography.



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

Go back

Step 6: Recovery

This should be relatively straightforward, but it is worth running through the process to make sure it works. Point out 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.

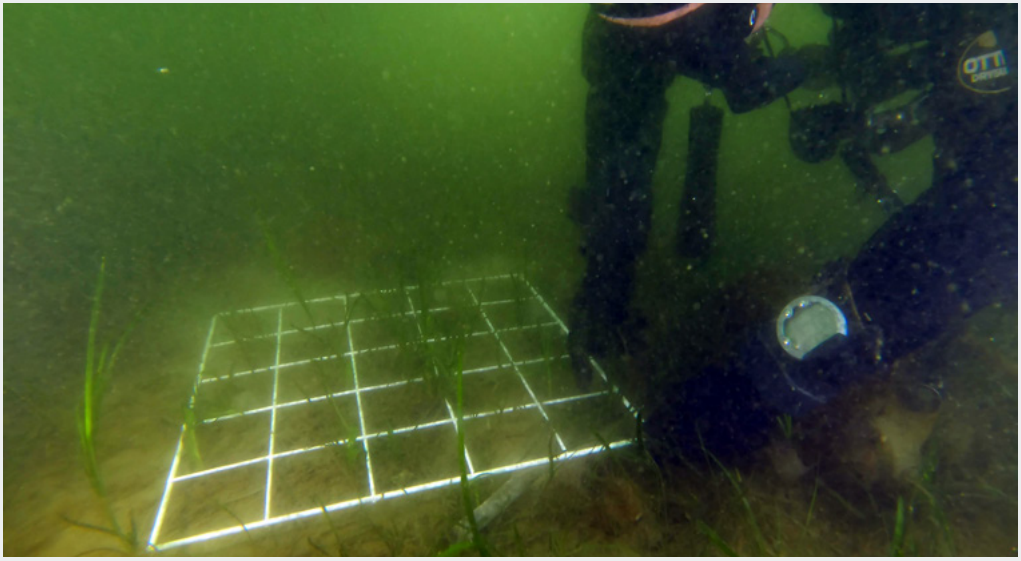
The quadrat

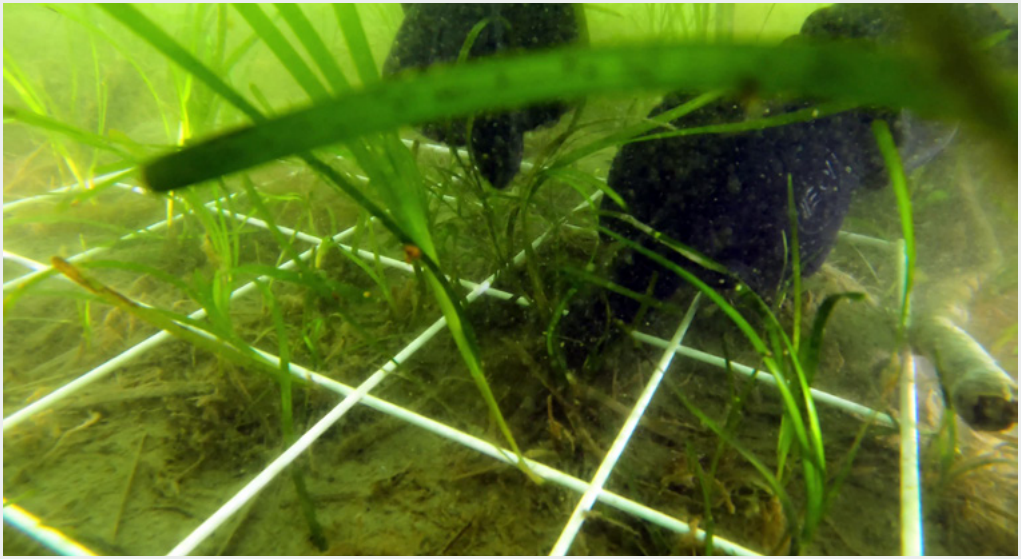
This is a basic piece of equipment which has variations on a theme.

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

Survey dives 1 & 2

Aim

The aim of the two survey dives is for students to complete two different types of underwater surveys, at least one of which will use a transect, preferably in the form of a laid tape measure.

Dive briefing

Instructors should have worked out in detail how they want to undertake the survey in advance so that any major issues with the plan are identified and rectified before the briefing and survey kit can be pre-mustered ready for the dry run.

For survey work, the dive briefing and dry run will take longer, especially for complex surveys where multiple buddy pairs might be undertaking different tasks.

It is critical to ensure everyone precisely understands what they need to do and has exercised that in detail on the surface. The briefing and the dry run are your opportunity to ensure the students can do the survey and that any problems are identified and resolved before you enter the water.

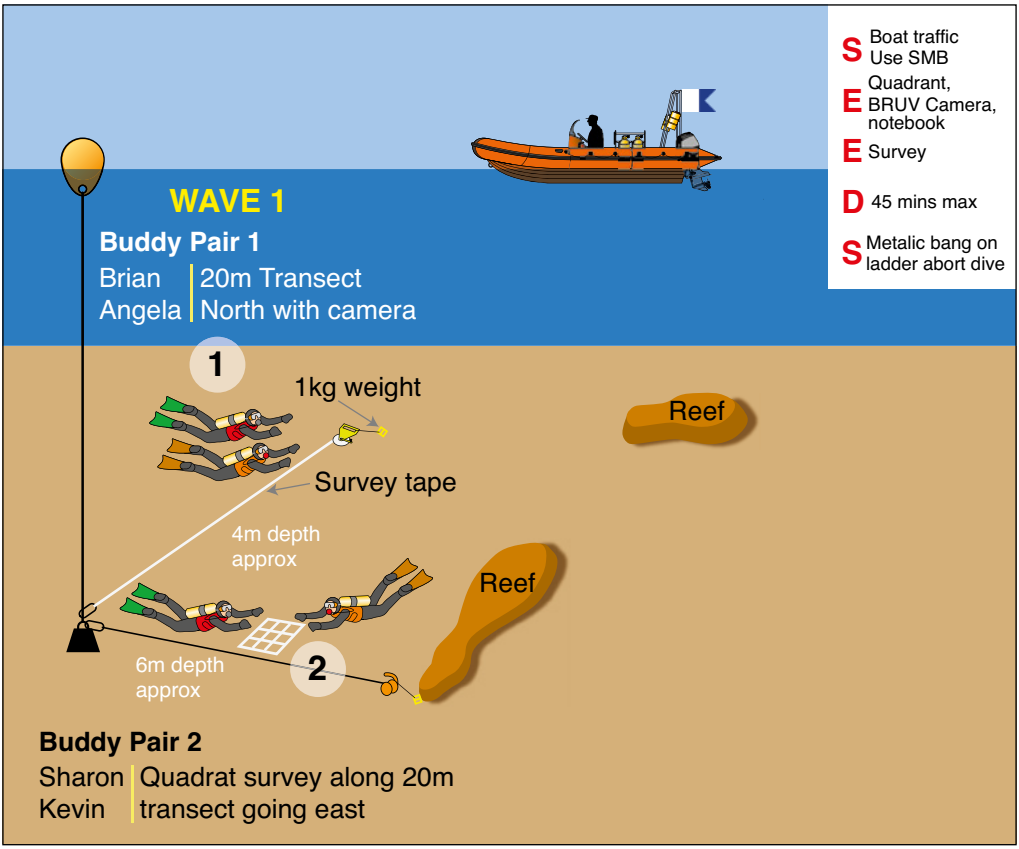
Go back

It is helpful to draw a sketch or a series of sketches (a bit like a movie storyboard) to show graphically each step of the survey. If you can draw a plan view and a stickman or stick diver / snorkeller that's all you probably need. Use a whiteboard or a notebook.

An alternative is to do a coached walk-through of the technique.

Scuba diving example

Suspected old native oyster reef site



The accompanying briefing to divers (under ‘Exercise’ element of SEEDS) might go like this:

“For Wave 1, Buddy Pair 1 and 2 will be diving and Buddy Pair 3 and 4 will be surface cover. Maximum allowed dive time is 45 minutes.

The skipper will place the shotline in the required location in a water depth of about 10m and the Data Logger will confirm and record the location of the shot line.

Buddy Pair 1

- **Lay your 30m tape measure transect in a northerly direction.**
- **Use your compass to take a reciprocal bearing once it is laid to check direction (i.e., it should be due south).**
- **Use your video camera to slowly scan the entire length of the transect to a distance of approximately 0.5m either side, taking care not to disturb the seabed.**
- **Once the scan is complete, use your slate/board to record presence / absence of native flat oysters within 0.5m of the tape and the distance and offset from the tape measure.**
- **Recover the tape measure, unclip from the shot line and return to the surface.**

Buddy Pair 2

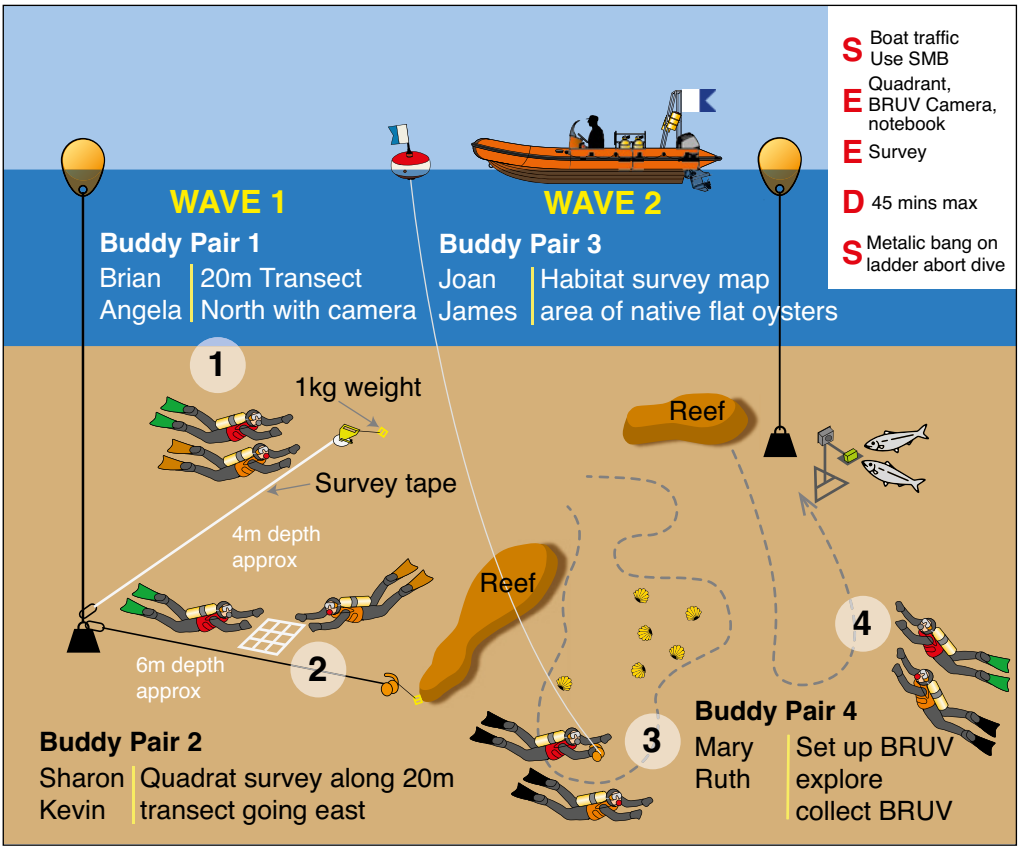
- **Jump in and attach your tape measure to the shot line.**
- **Lay the tape measure to the east.**
- **At internals of 0,10, 20 and 30m either side, deploy the 0.5m x 0.5m quadrat and record the number of native flat oysters and their shells.**
- **Recover the tape measure and return to the surface.**

Go back

On the surface, we will have a quick debrief from the Wave 1 dive team in case we need to amend plans for Wave 2.

The baseline plan for wave two is as follows.

The skipper will deploy to the other reef again in 10m.



Buddy pair 3

- **Deploy with a GPS tracker located within their SMB.**
- **Map the extent of the area where large native oyster shells have been found.**
- **Use your slate/board to note the timing of any sightings**

Go back

of significant aggregations so we can back calculate the position.

Note: Remember to keep the line to the SMB as tight as possible to ensure the GPS is tracking as close as possible to your current position. Note that on previous reconnaissance dives we expect to find these from 17m up to 4m.

Buddy pair 4

- **Prepare and deploy the BRUV at the base of the shot line, making sure the BRUV can be retrieved from the surface if necessary.**
- **Head down the slope to conduct a reconnaissance presence/absence survey for native flat oysters well away from the camera system. Leave the camera running undisturbed for at least 30 minutes on the seabed.**
- **Return to the camera and recover the BRUV.**

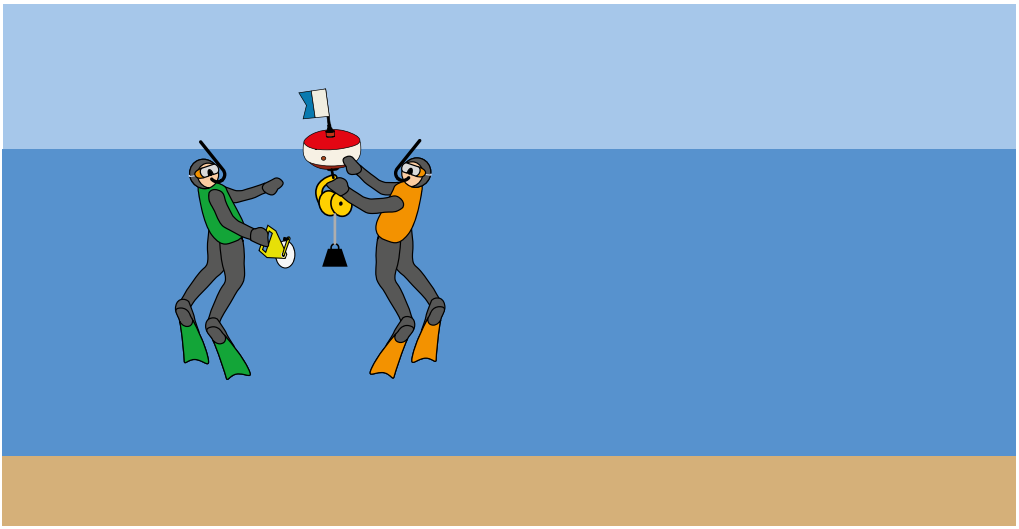
Snorkelling example

Nursery native oyster restoration site

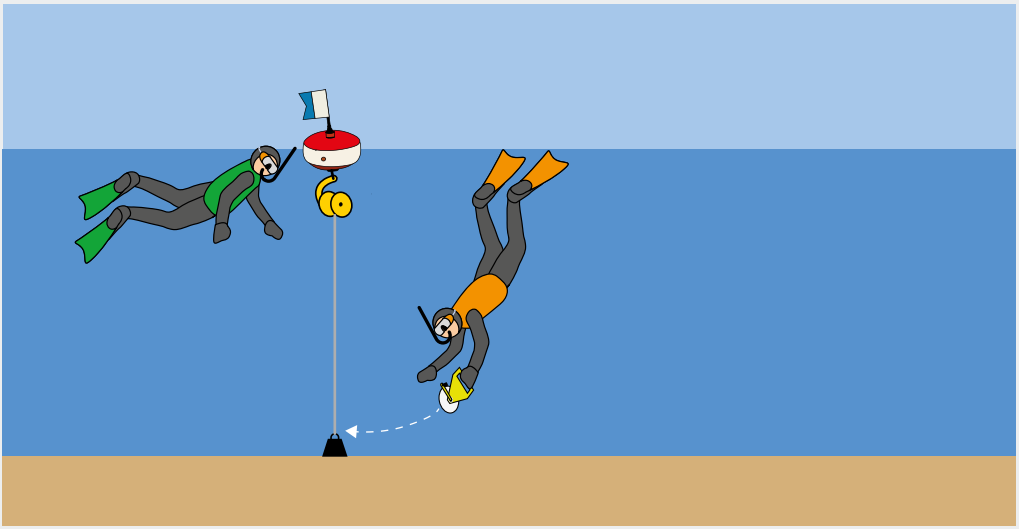
The snorkel dive brief for “Exercise” element of SEEDS might go something like below. Note some safety points are emphasised again where appropriate.

There are a number of buddy teams, each doing the same task in a slightly different location. At least one buddy pair is to remain on the surface to provide surface cover.

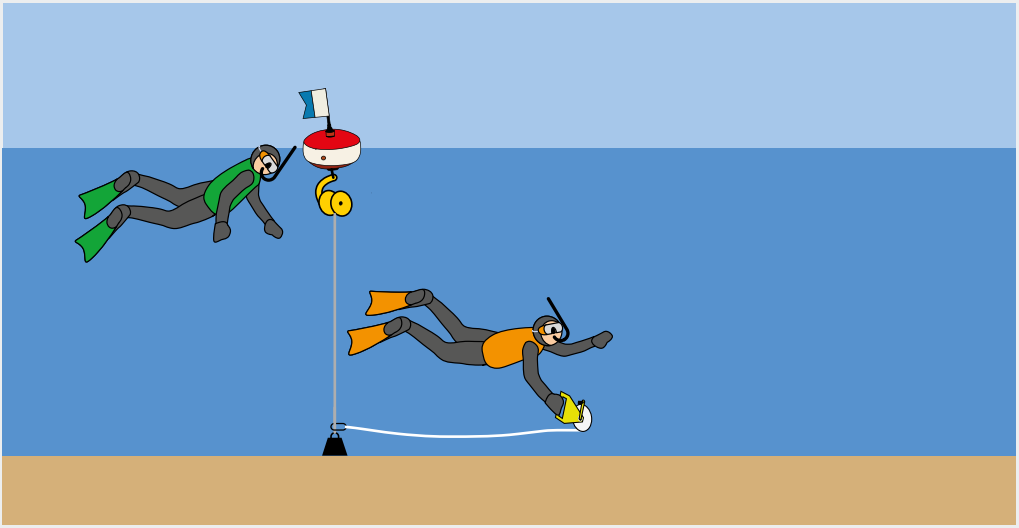
As the snorkellers are working with weighted lines, it is essential they have immediate access to line cutters, not knives. Knives will be too slow for this. A sharp line cutter is essential.



- **Snorkellers 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.**



- Snorkeller 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.

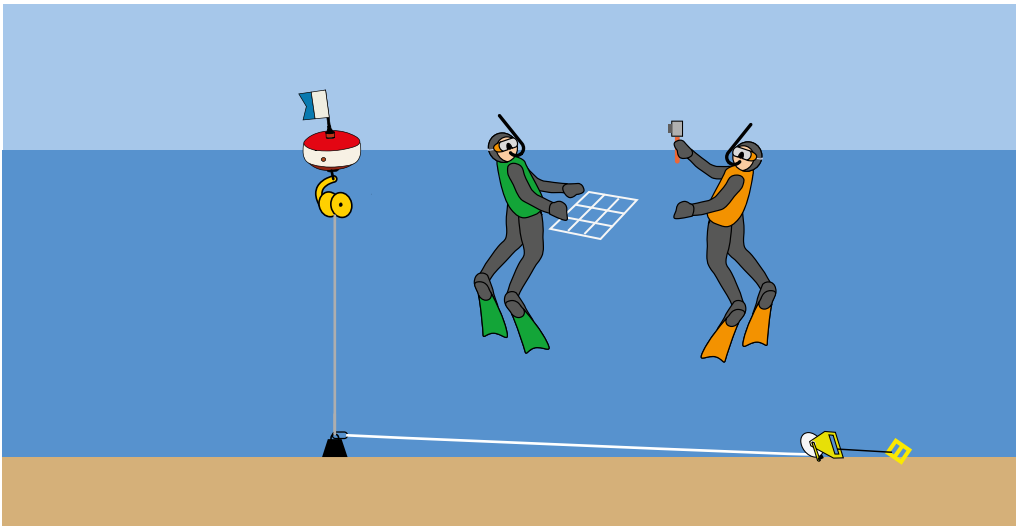


- The snorkel diver clips the tape to the shot line weight and

Go back

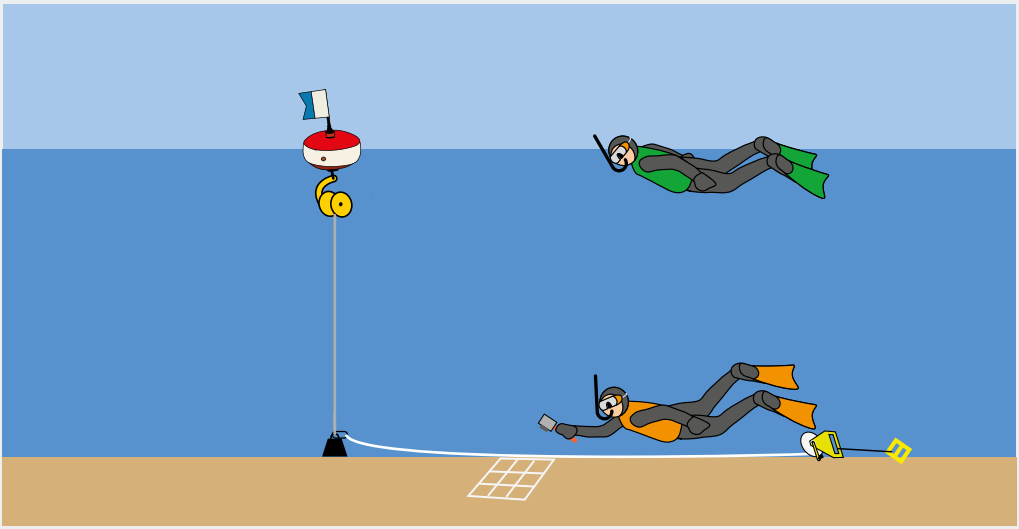
reels out the tape measure perpendicular to the shore, remembering to tension the line at the end.

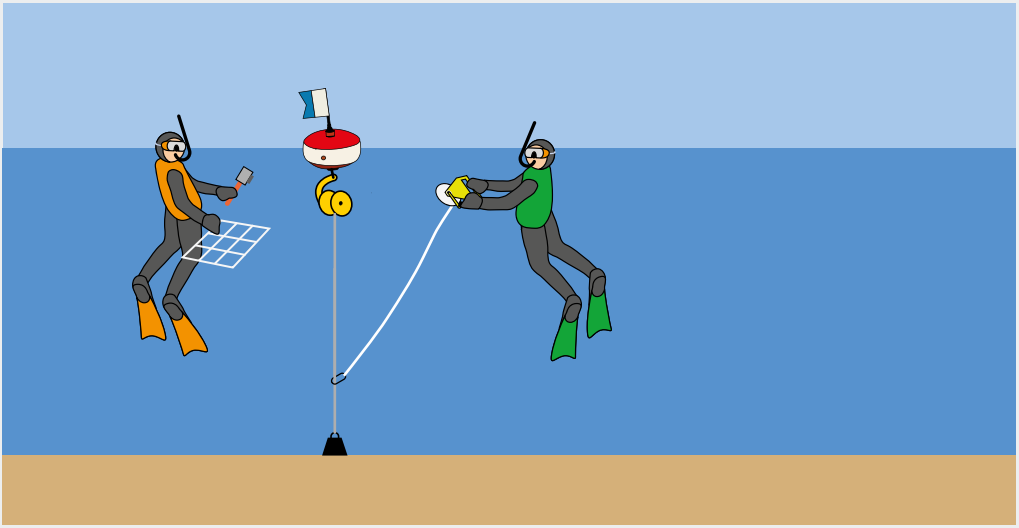
» Depth will be only 1-2m so you can be on the surface for much of this task.



» Once the tape measure transect and datum are laid, snorkellers will then place a quadrat in 5 different positions along each side of the transect at 0m, 7.5m, 15m, 22.5m and 30m, taking a burst of 5 seconds steady video footage of the entire quadrat. 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.

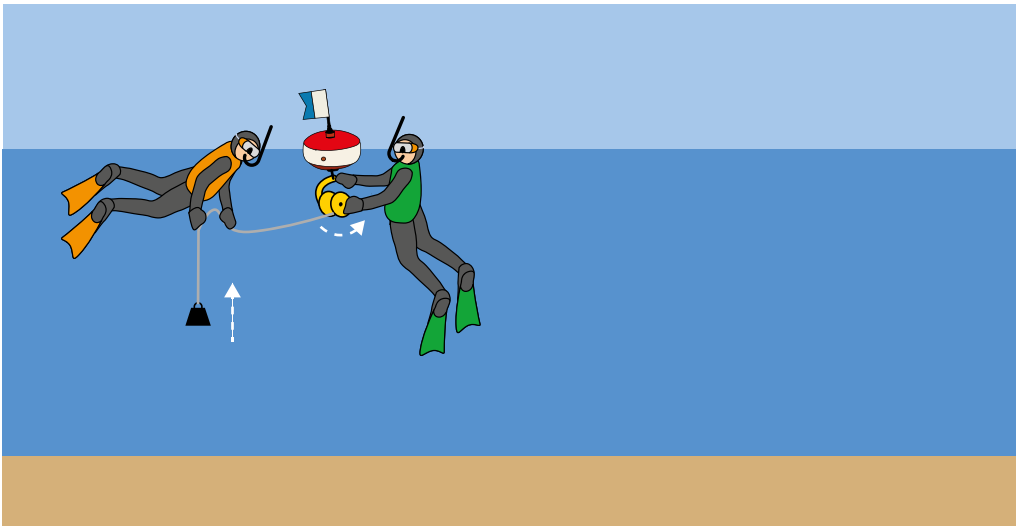
» Take it in turns to lay the quadrat and capture video and be the safety snorkeller.



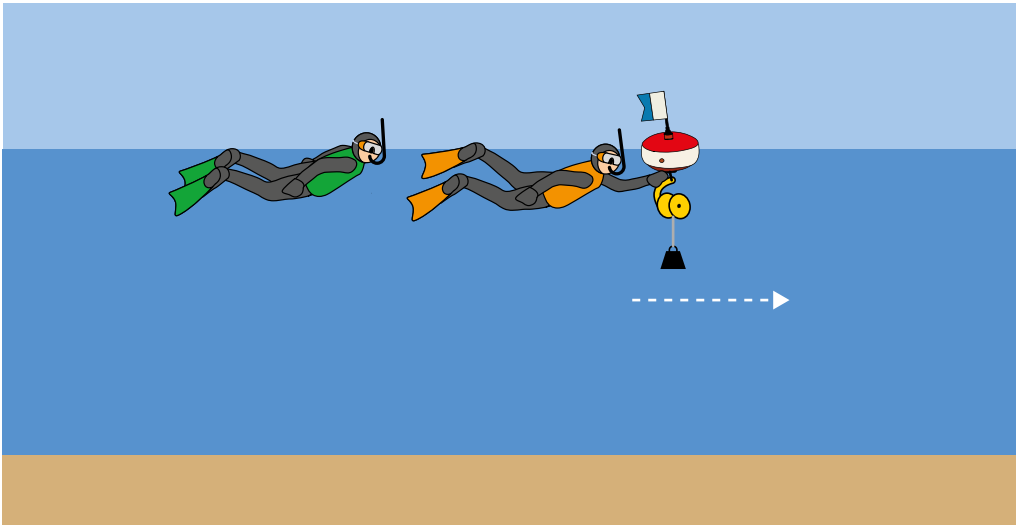


» **At the end of the survey, recover the tape measure. Connect this to the buoy to save having to carry it. Recover the camera and quadrat (clipping to the buoy so they do not get lost).**

Go back



» 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

Students 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.

Dry run

The survey task is then best explained and confirmed with a dry run on the surface. It is a critical part of the process to ensure a successful and safe survey and an essential learning opportunity and involves the team walking through (literally) each step of the plan to ensure that they understand what is required.

It is important that this is done thoroughly and logically, step by step, as it could be the demo for what happens underwater.

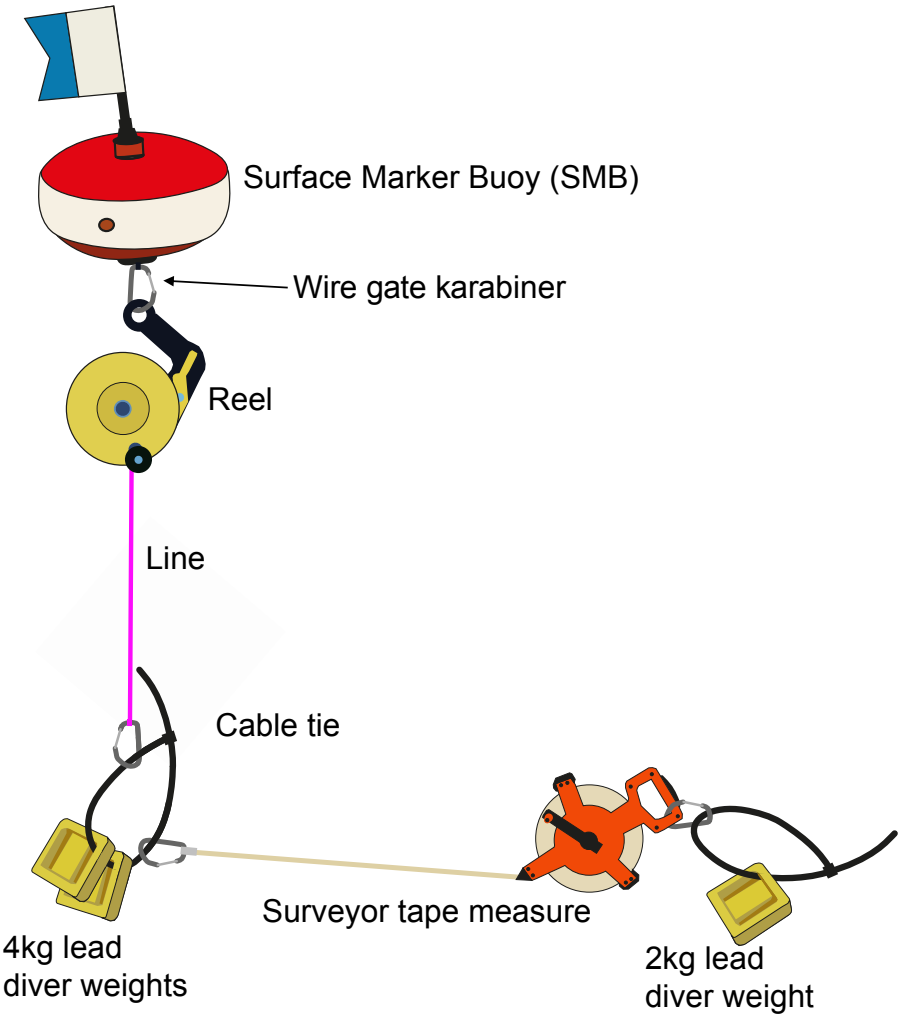
Pay attention to small details which cause issues and correct them (e.g., clips too fiddly, missing equipment, users not sure how to use equipment, prepared forms work).

Familiar equipment used in a slightly different way should also be checked. Also, users might be familiar with the operation of individual items of kit, but the novelty in how they are assembled could cause issues if not checked out beforehand. For example, a reel and SMB can be reconfigured, as shown in the figure below, to be used as a surface deployable (and recoverable shot line).

Ensure any survey-specific signals are discussed and resolved.

If something is a problem on the surface, then fix it on the surface before going underwater.

Go back



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

Where multiple buddy pairs are involved, ensure each pair knows their role, particularly if the outcome of one group of divers' activity can impact on another group of divers' activity.

Remind divers they need to be aware of ensuring they hold neutral buoyancy and avoid disturbing the seabed (especially the bit you are surveying!) to avoid kicking up silt and reducing visibility and damaging what they 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.

- **Answer any questions that the students have**
- **Ensure all completed training is recorded in student records**

SEEDS brief

Before each scuba or snorkel dive, the 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.

Choose a location where the students are comfortable so that they are able to fully focus on the briefing.

Go back

- **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 students 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

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 as students can observe from the surface how well or otherwise the survey work is ongoing and support the Dive Manager and fellow divers.

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.

Instructors are not expected to dive with every single student underwater but should use their judgement to assess if any individual or pair are likely to benefit from an underwater demonstration of laying a transect or other survey methods or needs instructional support underwater, e.g., an instructor may choose to lead a less experienced Ocean Diver.

Survey techniques

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

- **Transect survey**
- **Transect and quadrat survey**

Go back

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

Checklists and templates to aid planning are available in the course material to both students and instructors.

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.

Instructors should endeavour to conduct at least 4 different surveys during the course, split between different buddy pairs. For example:

Buddy Pair	Survey Dive 1	Survey Dive 2
1	Habitat mapping (using a GPS in a buoy)	Transect – presence/ absence
2	Transect with video	Habitat mapping (using a GPS in a buoy)
3	Habitat mapping (using a GPS in a buoy)	Transect with quadrat
4	Transect – health with quadrat and camera	Habitat mapping (using a GPS in a buoy)

Note: *Most groups will probably not use a BRUV survey in practice for most projects, but it remains a useful technique, and if the course is linked to a project that uses them, then it is worth considering using a BRUV in the course. The BRUV shown in the eLearning material is easy to build and use.*

Students should have undertaken at least two different surveys and had exposure to others via witnessing briefings and dry runs.

Each student should conduct at least one dive involving a transect.

Dives

Where possible, the more complex survey techniques on this course should be conducted in shallow water of 6-10m or less when on scuba. The maximum depth for snorkelling surveys should be approximately 2m.

Dives of about 30 – 45 minutes should be sufficient to conduct survey dives to fit in with the overall timetable for the day.

Some of the simple surveys, such as presence / absence surveys, can be deeper depending on the experience and qualifications of the scuba divers.

Go back

Surface work

Instructors 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.

Instructors should also encourage students to measure the underwater visibility using a Secchi disk. Prior to divers entering the water would be a sensible time to do this, so divers can then relate the turbidity they experience underwater to an actual measurement.

Dive debrief

Gather the survey team after data has been collated. Conduct a debrief using the REAP format. Check that everyone had an enjoyable dive regardless of the degree of survey success.

Although it is better to debrief the dive while it is still fresh in students' minds, if students have got cold during the dive, decide whether it is better to remove protective clothing before or after the debrief.

- **Review**
  - **» Review what the plan was by referring back to the original sketch or plan.**
  - **» Go round each buddy pair and ask them to talk you through the dive, what went well and what data they collected, what didn't go so well and what would they do differently next time.**

- **Encourage**
  - **Praise good performance.**
  - **Provide support if things haven't gone so well.**
- **Assess**
  - **Based on the debrief from the divers, offer constructive feedback to enable students to identify areas for improvement.**
  - **Provide guidance on how these improvements can be achieved.**
- **Preview**
  - **Identify any particular common issues that different buddy pairs have had and how they can be overcome on the next dive.**
  - **Answer any questions that the students have.**
  - **Ensure all completed training is recorded in student records.**

Note: *Instructors will assess student performance largely on the basis of what they delivered (the quality of the data) unless they were on the dive itself.*

Corrective instruction is likely to be provided by coaching methods on the surface. It is particularly important, therefore, to identify any key issues occurring after the first dive where, particularly with divers new to survey, there are likely to be the greatest number of learning points. There is also the opportunity for another dry run, but with the hindsight of any issues arising from the first dive. Additionally, the instructor could also have the option to work with another team if in-water coaching is required. For this course, it is expected that most issues can be resolved at the dry run stage.

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.

Instructors should ask for some volunteers so they can delegate and be seen to delegate the role of Data Manager.

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, instructors should have 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.

Instructors should keep the nature of the data collection simple. 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 students have been encouraged to bring their own laptops then, as buddy pairs, assisted by the instructors, they can start data entry practice.

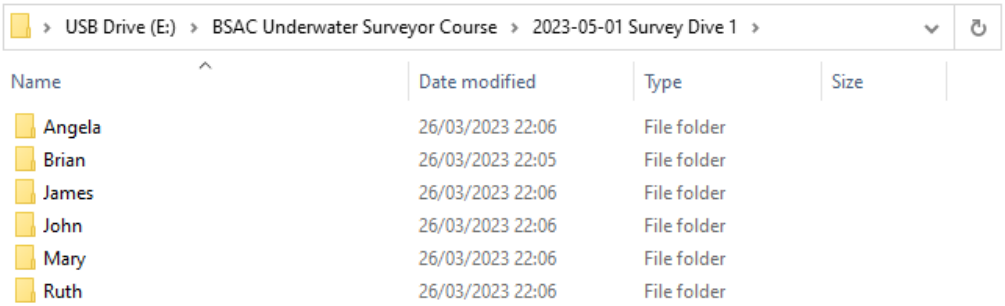
Following de-kit and debrief, there may be additional data to collate. For example, photographs and videos taken on the survey dive and a scan of any notes made during the debrief.

If possible, and if time allows, it can be useful to download and review videos and photographs before the 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.

Go back

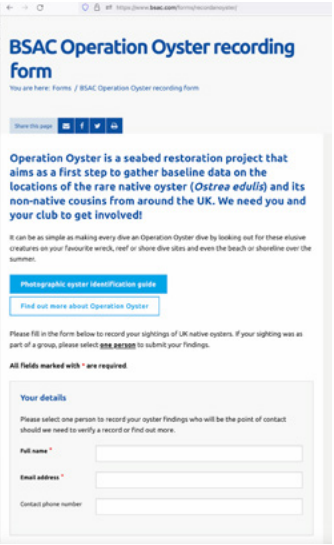
Note that divers with more complex cameras may not wish to open them until the last dive of the day simply because of the time required to prepare them for the next dive.

Instructors should prepare a logical folder structure to store the data. An example is shown below. Note the format of the date in the folder is Year-Month-Day as this helps sort data into chronological order.



Upload data to an online portal

Instructors should introduce at least one online portal to demonstrate to students how their data can be uploaded during the event. This means that access to the internet is required, and it may be necessary to 'hotspot' your smartphone to gain access if a local Wi-Fi service is unavailable.



Chose a simple form relevant to your project if possible. It is suggested that the following are used.

- **Operation Oyster - www.bsac.com/recordanoyster**
- **Seagrass Survey - www.bsac.com/forms/seagrass-survey-form/**

Students should enter their relevant data under the supervision of an instructor.

Where the instructor is convinced that the data collected is valid, then a submission is appropriate. However, for most students 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 is ready before trying to upload it.

Skills performance standards

At the end of this module, students should be sufficiently competent to self-assess in an informative way following the principles of REAP in the water conditions that they have experienced.

Planning Students should have played an active role in the planning, dry run, and safe implementation of a survey dive. They should have demonstrated an awareness of the overall site risks both from a dive point of view and a survey point of view and taken appropriate mitigations.

Survey techniques Students should have completed surveys using two different techniques, one of which should involve a transect.

Go back

Post dive review Students should have played an active role in the dive debrief, including an accurate and honest assessment of the survey.

Data collection Students should have played an active role in ensuring they collate their data and ensuring this, fed back and uploaded some data to an appropriate data collection portal.

Timetable

Below is a typical timetable but this should be adapted to specific circumstances.

Time	Event
0800	Instructor briefing
0815	On-site introductions
0830	Familiarisation with survey equipment
0900	Muster dive and survey equipment for dive
0915	Dive 1 briefing
0930	Dry run
0945	Survey Dive 1
1130	De-kit
1145	Collate data from first survey dives
1215	Debrief on first survey dives
1230	Lunch
1300	Upload data to online portal
1330	Dive 2 briefing

1345	Dry run
1400	Survey Dive 2
1545	De-kit
1600	Collate data from second set of survey dives
1630	Debrief on second set of survey dives
1645	Upload data to online portal
1715	Course debrief
1730	The way forward

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: *Magallana gigas (formerly 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.

Go back

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 _____

_____

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

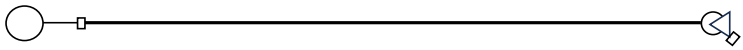
Transect Start Position (lat / long or W3W): ///listings.user.including Start Depth (metres): 6

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

Go back