Methods

This chapter of the handbook provides the specific guidance on how to complete each of the survey methods shown in the method matrix below, explaining what it can be used for, the equipment needed and any other general considerations. Each difficulty level indicates whether the method is considered 'easy', 'moderate' or 'advanced' to carryout, with these descriptors relating to the complexity of each method and the degree of experience required.

Difficulty levels:

- **Easy**

  Can be done by new volunteers

- **Moderate**

  Can be done by volunteers with some experience or volunteers under supervision by someone with experience

- **Advanced**

  Can be done by experienced volunteers with relevant training in using survey equipment .

Method matrix

<table>
<tr><th>Difficulty level</th><th>Intertidal</th><th>Subtidal</th></tr>
<tr><td rowspan="2">Easy</td><td colspan="2">1.1 Species image library</td></tr>
<tr><td>1.2 Photo station</td><td></td></tr>
<tr><td rowspan="2">Moderate</td><td></td><td rowspan="2">3.1 Underwater marine life observation</td></tr>
<tr><td>2.1 Rocky shore zonation</td></tr>
<tr><td rowspan="4">Advanced</td><td>2.2 Rocky shore profile</td><td rowspan="2">3.2 Underwater video transect</td></tr>
<tr><td>2.3 Rocky shore quadrat sampling</td></tr>
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1.1 Species image library

DIFFICULTY LEVEL
EASY

Introduction

Taking photographs of the marine life you find on your local seashore and in the waters will help you to record what species there are in your area. The pictures you take can be stored, displayed and utilised for a range of purposes.

Creating your own species image library involves storing images and recording species or habitat names along with a GPS location. There are several options of online citizen science portals to submit and store your data, or alternatively you can store the data within your own community group.

Species images can also be collated to create a guide of the marine life within your local coasts and waters. This could be valuable to document the biodiversity on your coasts and waters will provide a visual guide to help others find and identify marine life when surveying.

▼ **Yarell's blenny (*Chirolophis ascanii*), common star fish (*Asterias rubens*) and squat lobster (*Galathea strigosa*) hiding in a crevice off Orkney.**

© Lisa Kamphausen/NatureScot

Method

1. Take a photo of a marine species or habitat using a smartphone or digital camera.
2. Ensure the date and time and GPS location of the image is saved.
   - **Using a smartphone:**

     This should be saved automatically with the photograph metadata – check your location services is turned on in your phone settings.
   - **Using a digital camera:**

     Ensure the time and date is set correctly on your camera. Some cameras may have built in GPS ability, if it doesn't use a device with GPS abilities to record your GPS location.
3. Save your image with the associated metadata (date, time, GPS location and who took the photograph and what did they use (i.e. model of smartphone/ digital camera) to a secure place.
4. Identify what species or habitat is in your image.

The GPS location should be in WG84 in decimal degrees (e.g. 57.493723, -4.201847).

Storing images and creating a species image library guide:

We recommend you store, organise and collate your images within your own community group if you want to create a community-led species guide to your local area. Check the copyright permissions of all images before use.

You can submit your species images and records to citizen science portals. Ensure you check the copyright permissions and privacy policies before use. Please see data management, page 1, for more information. You should only submit records via one data storage/sharing route to avoid duplication of records.

1.2 Photo station

DIFFICULTY LEVEL
EASY

Introduction

The purpose of a photo station is to document what you see on your local beaches and shores and any changes to them over time. It is as easy as taking a photo, writing down a little bit about what you saw, and recording your location so that you can find the same spot again in the future and take another picture.

The images you take and supporting information will provide insight into how our coastlines are changing over time. This data is valuable to environmental science generally, but particularly important as it creates a visual record of changes over time. A long-term time series can document biodiversity and geological changes that may have resulted from storm events and coastal erosion, for example, or record natural cyclical changes in habitats. This is where one habitat changes into another and back again over a number of years due to natural predator-prey or grazing dynamics (e.g. between seaweeds and urchins).

▼ Photographers photographing seabirds on the Isle of May National Nature Reserve.
© Lorne Gill/NatureScot

Survey briefing

Purpose

- Create a visual time series of an environment, habitat, or feature
- Observe changes through a time series of images

Overview

1) Choose a suitable and safe vantage point accessible at all times of the year and tides to capture a marine landscape and/or feature (e.g. a rocky shore headland, or a specific boulder).
2) Record your GPS position (GPS can be recorded through a smartphone app) and record the compass bearing of the direction at which your camera is pointing.
3) Record notes on access to the vantage point.
4) Return to the same location on subsequent visits, taking the same image and site information (we suggest you do this seasonally or monthly).
5) When returning to a previous photo station, check your GPS position and compass bearing are the same as the previous photo. Take a photograph of the feature, recording your GPS, the site information and conditions.
6) Over a long-term project, the photographs can be analysed to assess the changes of the habitat and/or feature over time by professionals.

Have you read the getting started chapter?

Ensure you follow:

- Quality control guidelines, page 16
- Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

Equipment

- Photo station recording form, page 1
- Mobile phone or a digital camera
- Hand-held GPS/ Smartphone (if GPS is inbuilt)
- Compass (if not available on a smartphone)

How to setup the survey

1. Choose a suitable and safe vantage point from where you can clearly see your habitat subject/feature. Make sure that the site and frame chosen will give a good level of detail during different seasons and over a long period of time.
2. Record your GPS position (WGS84) in decimal degrees (e.g. 57.493723, -4.201847). This is your fixed point that you should return to each time you take a photograph at the site.
3. Fill out the survey and site information in the photo station recording form.

Technology

Smart phones store the GPS coordinates of a photo at the time it was taken at. This can later be recorded from the photo. Many also have built in compasses, registering this information at the time of taking a photo will give you a second reference of the GPS, the compass bearing of the photo and the elevation that the photo was taken from.

Survey method

1. Take several photographs of a habitat or feature (e.g. this could be a rocky shore headland or your favourite boulder).
2. Record a compass bearing to the middle of your photo (i.e. the bearing from where you are standing to the thing you are taking a picture of) so you know which direction to take the photo the next time you visit.
3. Each time you take a photograph – make notes about what you see on the photo station recording form.

Before you finish

1. Check all survey forms are completed fully.
2. Organise data and follow the data lifecycle – see data management section, page 1. Use the naming convention guidance in the appendix (page 12) for data and photo storage.

Return visits

Return to the exact point of previous trips and use the same methods and compass bearings to retake the same photograph, of the same feature on a regular basis. We recommend seasonal visits or after a big storm event. Remember to take a copy of a previously taken photo of your survey site – this will help ensure you are in the same position and are taking a photograph showing the desired frame.

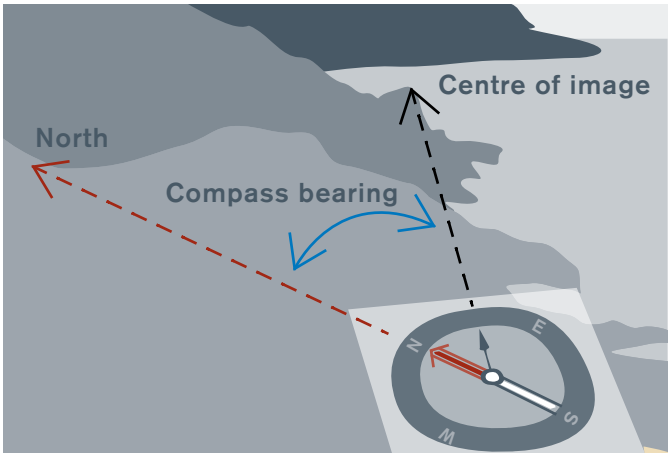
Tips for photography

When taking photos, minimise the amount of sky as this is not of interest.

Include permanent landmarks in your photos if possible to help assist with photo comparisons in the future or by others not familiar with the area.

Refer to previous photos each time to ensure that your return visit photos are captured from the same location.

▲ Loss of intertidal mussels at Caolas an Scarp, Harris.
© Michael Burrows/SAMS



◄ Taking a compass bearing from the centre of the image

2.1 Rocky shore zonation

DIFFICULTY LEVEL
MODERATE

Introduction

Rocky shores along our coastline are important habitats for many different marine plants and animals. In Scotland we have a large number of tide-swept, sheltered rocky shores and these have been classified as a Scottish Priority Marine Feature (PMF), page 1.

The purpose of a rocky shore zonation survey is to determine the different habitats present on the rocky shore by recording the substrate and main marine life cover present in each distinct habitat zone from the top of the shore down to the water's edge. This survey can be repeated seasonally or annually with special attention to recording the exact location of the habitat zone boundaries. Setting up a permanent survey site will allow participants to monitor any changes on the rocky shore.

The important element in the zonation survey is recording the most common and dominant marine life communities on the shore (such as barnacles on the upper rocky shore). If you would like to take this a step further to find and record the rarer marine life on your rocky shore as well, then we recommend using the rocky shore quadrat sampling survey (2.3).

We recommend when surveying a site that you complete the rocky shore zonation survey on three different transect lines within the area. This will better enable the data to be used to find trends by providing more replicates for statistical analysis.

To complement this survey, we recommend you complete the rocky shore profile survey (2.2). This survey records the incline and slope of the rocky shore and l provides physical data to support the biological information captured in the rocky shore zonation survey.

If you want to scientifically interpret the results of your survey effects, you should ensure you have professionals with the skills to do so involved in your survey group. Alternatively, look to team up with a university or academic who can put your work to use.

▼ Intertidal rocky shore transect. Loch Sunart.
© Jon Moore/NatureScot

Survey briefing

Purpose

- Find out what species of marine plants and animals live on rocky shores, and where
- Find out if the distribution of rocky shore seaweed communities is changing

Overview

1) Set up a transect line from the top of the shore to the low tide water line.
2) Record the exact position of this transect line by taking GPS coordinates and a photograph at the start and end point. Work down the line, and 2m either side of it, identifying the dominant seaweed species. These will change as you work down from the upper to lower shores as different seaweeds are adapted to survive in different environments.
3) Use the dominate seaweed canopy to determine the three zones on the shore – the upper shore, middle shore and lower shore.
4) Record the GPS position of each of these zones and the distance on the transect line.
5) Record the shore substrate and what the dominant marine life (such as the seaweeds) is in each zone.
6) We recommend you do this survey three times, setting out three transect lines within your survey site.
7) Optionally, with expertise, time and more survey participants you can build upon this survey with additional more difficult surveys, such as the rocky shore profile survey and the rocky shore quadrat sampling survey.

Have you read the getting started chapter?

Ensure you follow:

- Quality control guidelines, page 16
- Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

Equipment

- Rocky shore zonation recording form, page 3
- Transect line (x3 if three transects undertaken simultaneously)
- Clipboard, paper and waterproof protector
- Camera
- Identification guides
- Compass
- First aid kit
- Tide tables
- Hand-held GPS/ Smartphone (if GPS is inbuilt)

How to set up the survey

1. Select a survey site.
2. Select a survey date – a day with a low tide of 0.4m or less is recommended.
3. Check weather and tides for the survey location and time.
4. Arrive at the survey site two hours before low tide.
5. Fill out the survey and site information in the rocky shore zonation recording form.
6. Lay a transect starting at the high water line (the high tide strand line at the top of the upper shore) towards the sea and the lower shore. The transect should drape down the shore towards the water in a straight line.

Record survey set-up

1. Record the latitude and longitude at the start of the transect, recording the compass bearing looking down the transect and the tape distance.
2. Record the latitude and longitude at the low water level and the tape distance. – It is best to do this when the tide is at its lowest point during the survey (at low tide) so this can be recorded during the survey.
3. You can take a photo of the transect line to jog your memory later on.

How can I tell which the main species are?

A dominant species will be seen without much searching. Looking at the habitat zone, the characterising species will be seen clearly by looking at the area (such as the algae canopy, identifying the seaweed present). A quick look under any algae canopy present will also be useful to characterise any dominant marine life living in or under the canopy. It's what you would say if you wanted to describe the habitat in 5 or 6 words.

Study the zonation of habitats (seaweeds will exhibit banding) on your shore. You are looking to identify the three rocky shore zones: the upper shore, middle shore and lower shore. Each zone will be characterised by a different dominating marine life community.

Zone characteristics:

1. **Upper shore**
   This is the area of the shore that is only submerged with water at extreme high tides. There is often a distinctive black band of lichens, with the appearance of some seaweed such as channelled wrack and spiral wrack. You commonly find rough periwinkles, limpets and barnacles.
2. **Middle shore**
   This zone has an increase in the quantity and variety of seaweeds. Typically seaweeds found are bladder wrack, knotted wrack and pepper dulse. You will also find more animals in this zone, such as dog whelk, top shells, limpets, barnacles and sometimes mussels.
3. **Lower shore**
   The lower shore is almost always submerged and only exposed at extreme low tides. The zone has an increase in red algae such as dulse, Irish moss and coral weed. Saw wrack (or serrated wrack) may dominate the upper part of the lower shore zone and kelps can dominate the lower part of this zone. You typically find more animals in this zone compared to the upper and middle shore, so we highly recommend you survey at the lowest tide possible (low water spring tides) to get fuller access to this zone.

Start at the top of the shore and begin the habitat zonation survey moving down towards the water (if you arrive at the shore two hours before the low tide). If you are delayed beginning the survey, it may be best to start surveying at the lower shore zone, before it gets covered by the tide.

Descriptions should be made of the substrate and main species within a 2m band either side of the transect line.

Survey method

Spend some time looking within a 2m band either side of the transect line for zonation within the seaweed community. For each zone, complete the following:

1. Record the tape distance and GPS position of each zone boundary, taking an image for reference.

   This should be completed at the:

   - Start of the upper shore
   - Boundary between the upper shore and middle shore
   - Boundary between the middle shore and lower shore
   - End of the accessible lower shore

2. Describe the main seabed substrate within a 2m band either side of the transect line.

   This could be

   - *Bedrock*
   - *Boulders*
   - *Cobbles and pebbles*
   - *Sand and gravel*
   - *Mud*
   - *Mixed ground*
   - *Other…*

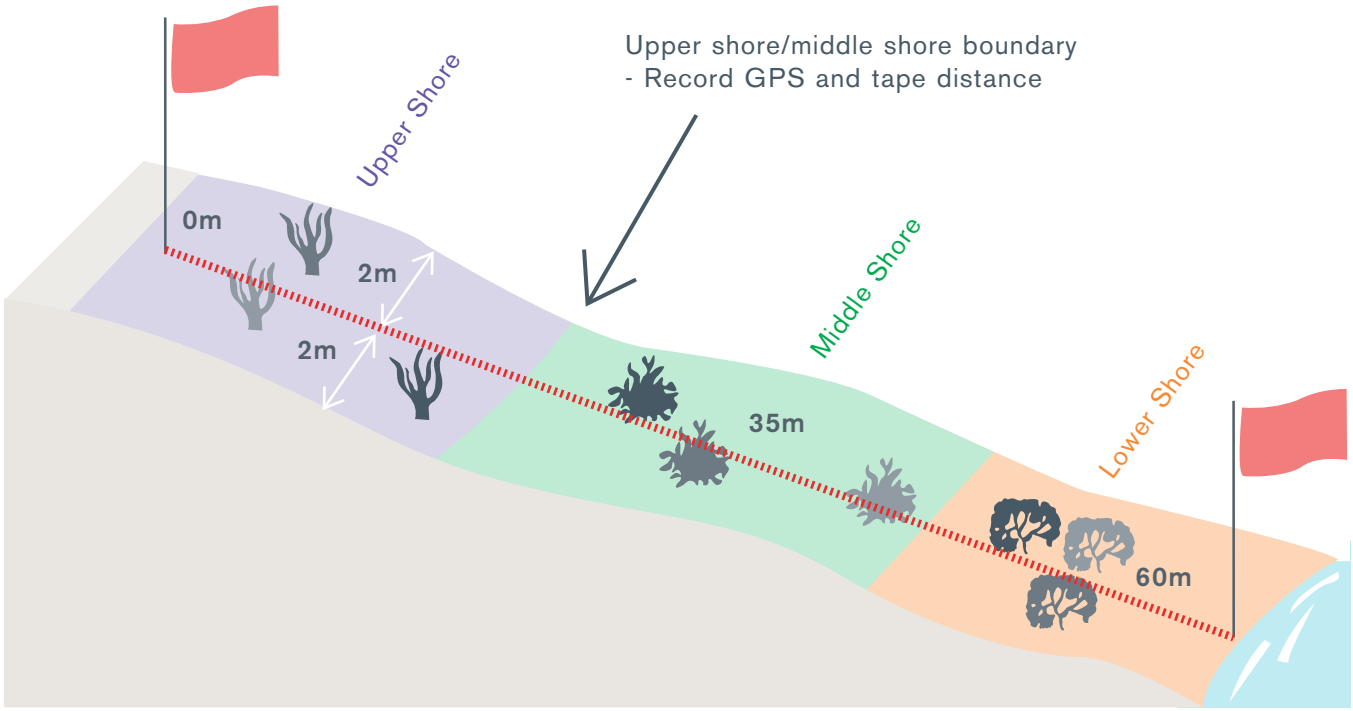
3. Describe the main marine life species within a 2m band either side of the transect line.

   Try to identify all visible species indicating the most dominant species, such as species of seaweed canopy.

4. Within each zone take some images where you can clearly see the substrate and main species.

It is important that you survey the lower shore at low tide.

▼ Rocky shore zonation survey diagram of shore zones within 2m either side of a transect line.



Before you finish

1. Check all survey forms are completed fully.
2. Remove all equipment from site.
3. Wash equipment in freshwater, allow to dry and store properly.
4. Organise data and follow the data lifecycle – see data management section, page 1. Use the naming convention guidance in the appendix (page 12) for data and photo storage.

Complete this survey on three transects within your survey site.

2.2 Rocky shore profile

DIFFICULTY LEVEL
ADVANCED

Introduction

The purpose of a rocky shore profile survey is to specifically collect data on the slope of the shore that you are surveying. This will give you a model of the shore profile which in turn can be used to illustrate the position of marine life on rocky shores.

The slope of the shore contributes to the physical environment that marine life inhabit. The steepness and fluctuations within the slope of the shore affect the environmental conditions and can create different microhabitats on a rocky shore such as rock pools, vertical faces, overhangs or gently sloping rock. On a steep shore there is a smaller area of habitat that will be exposed to the air at low tide, so a smaller area for intertidal species to settle.

As part of a long-term monitoring programme on a rocky shore, a shore profile will provide a base to display the marine life upon and help you to identify if there has been any changes to the marine life community within the permanent monitoring station.

A rocky shore profile can be undertaken on each transect surveyed within the rocky shore zonation survey.

▼ Community group recording shore height measurements at Dunstaffnage, Oban.
© Cecilie Dohm/Fauna & Flora International

Survey briefing

Purpose

– Create a shore profile of the physical gradient of the shore

Overview

1) The aim of this survey is to take measurements of the fluctuations in slope of the rocky shore coastline. This should be done on each transect to provide physical information that complements the biological community data you have already collected.

2) The most important point within this survey is to record low water reference point at the time of low tide and record the exact time of taking this shore height reading.

3) Survey timing. This survey should be completed by two additional surveyors at the same time as the rocky shore zonation survey on the same transect line setup. This is to ensure you can complete the survey at the time of low tide.

4) You will require a minimum of two people to complete this survey; one person to take readings of shore slope from a tripod and a second person to hold the measuring pole. A third person is recommended to assist the survey and communication between the two tasks.

5) This survey is focussed on taking shore slope measurements and requires some data handling mathematics to process the results and create a shore profile. This is a requirement to make data collected on the zonation survey more useful.

6) The surveyors level tripod should be setup higher up the shore than the start of your transect line to allow you to take a measurement of the start of the transect.

7) Take measurements of the shore height by reading the measuring pole height through the tripod viewfinder.

8) On a steep shore, if you're too high to see the top of the measuring pole when looking through the viewfinder, you'll need to move the tripod to measure the shore slope. When doing this it's important that the low water reference point is known, so all stations can be in reference of this. On moving the tripod, you will need to take a measuring pole reading from both tripod stations (where previous readings were taken from and the new tripod location).

9) Once completed, follow the data handling guidelines to produce a shore profile.

Have you read the getting started chapter?

Ensure you follow:

– Quality control guidelines, page 16
– Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

Equipment

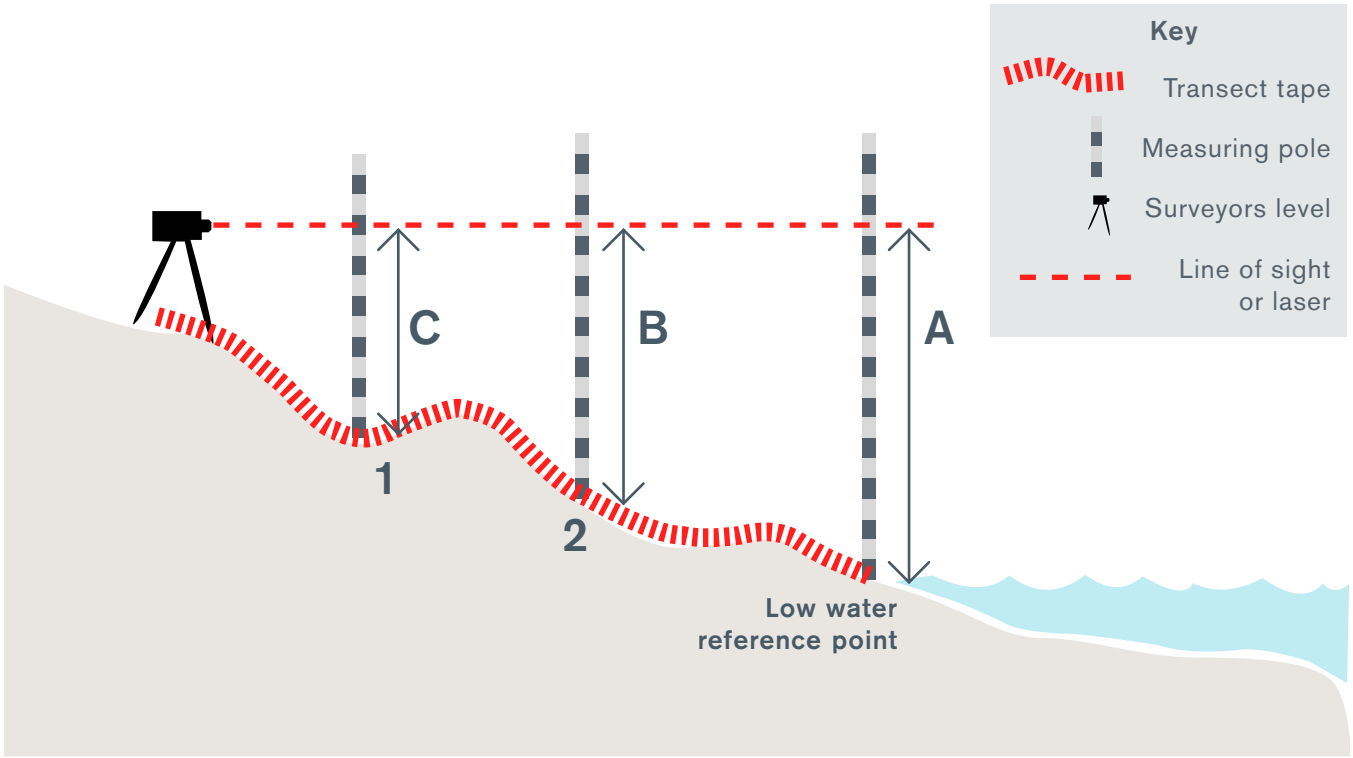
- Rocky shore profile recording form, page 7
- Surveyors level and measuring poles
- Transect line (same transect line used within the rocky shore zonation survey if that survey is undertaken)
- Clipboard, paper and waterproof protector
- Identification guides
- First aid kit
- Tide tables

How to set up the survey

Scenario 1: Gentle sloping shore

If the shore has a gentle slope you will be able to complete measurements of the shore from one tripod station location. The tripod should be placed on the upper shore, above the transect line to record shore slope.

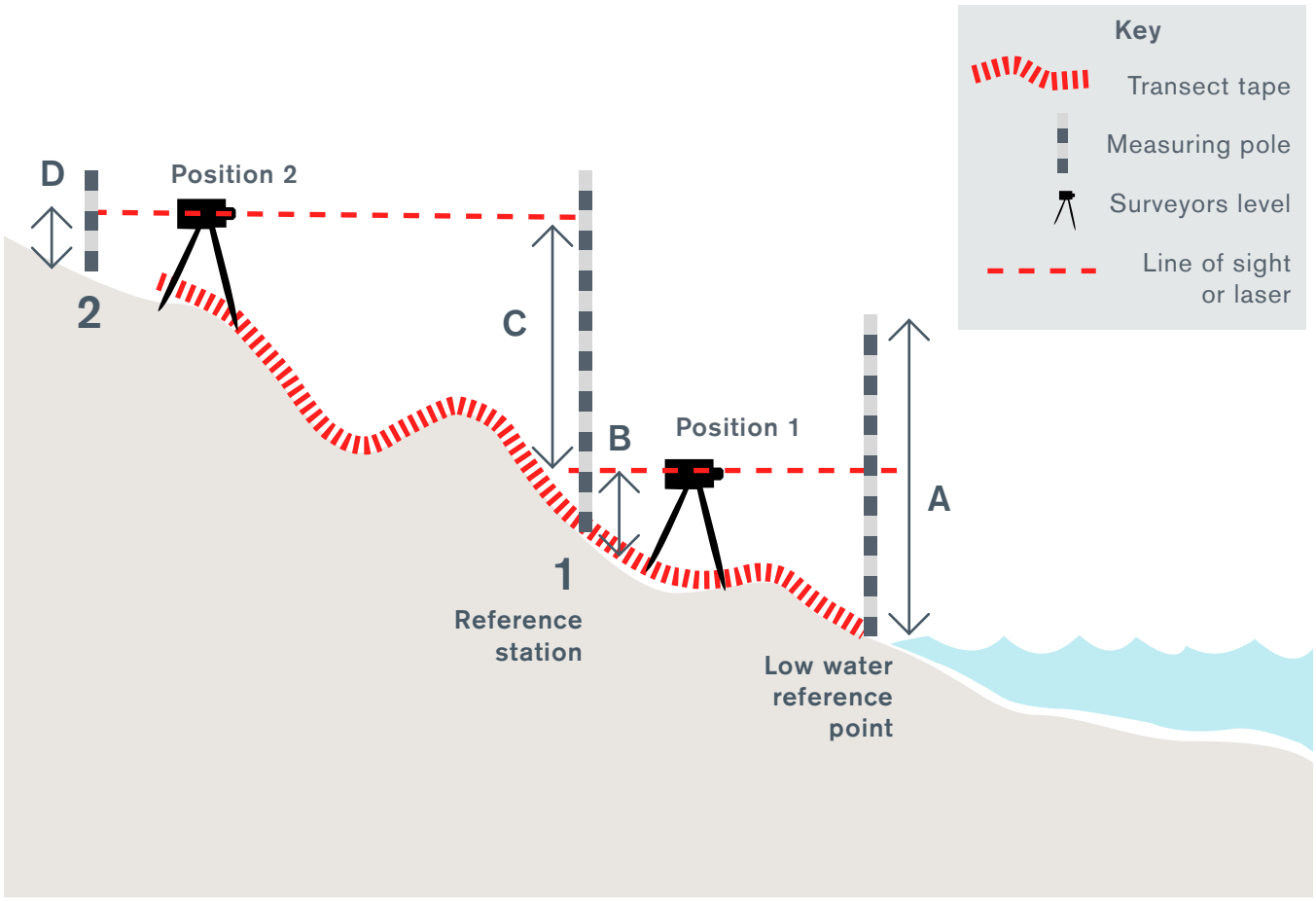
▼ **Gentle sloping shore. Arrows A, B and C indicate the measuring pole height readings. The low water reference point reading should be completed at low tide.**



Scenario 2: Steep sloping shore

If the shore has a steep incline then it will be necessary to move the position of the tripod station to record the shore profile of the full shore. The tripod should be placed on the upper shore, above the transect line to record the upper shore and placed in the middle shore to record the middle to lower shore area.

▼ **Steep sloping shore. Arrows A, B, C and D indicate the measuring pole height readings. In this setup note that measuring pole position 1 has two measuring pole readings – reading B recorded from surveyors level tripod position one and reading C recorded from position two.**



Moving the tripod - Setup scenario 2

If it is necessary to move the tripod you need to take two measuring pole height readings - one from the first tripod location and one from the second tripod location. This needs to be a point on your shore where it is possible to take a measurement from both locations.

1. Take a measuring pole reading of the reference station at tripod position 1.
2. Move the tripod to position 2.
3. Take a second measuring pole reading of the reference station from tripod position 2.
4. Record on the survey form.

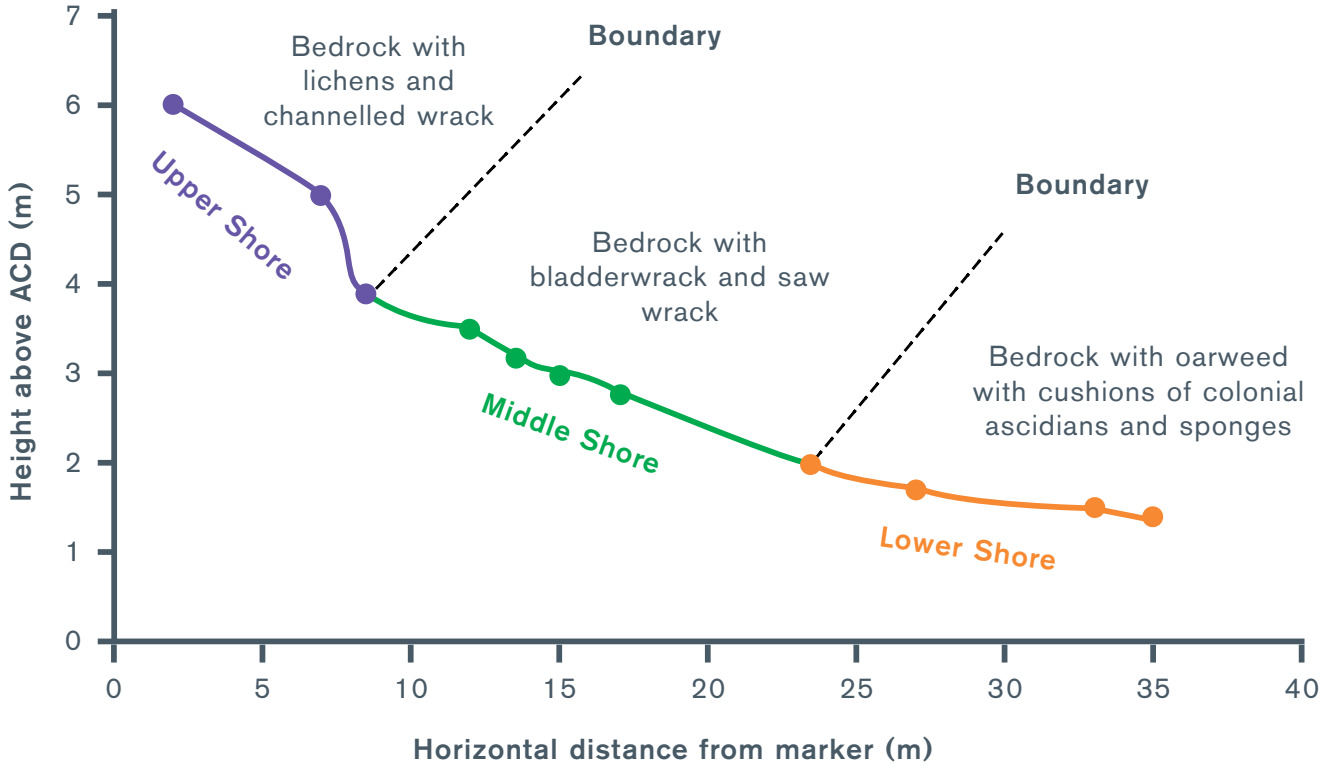
Survey method

All setup scenarios

1. The shore slope readings at the low water reference point should be recorded at the time of low-tide.
2. The survey should be completed on the transect line laid for the rocky shore zonation survey.
3. Set up the tripod and adjust so that the telescope or reading pole is level and the low water reference point is in view.
4. Take a measuring pole height reading of the **low water reference point**:
   - One person at the surveyor level tripod position looking through their gauge towards the measuring pole.
   - A second person should hold the measuring pole at the low water reference point (this should be at the end of the transect at the waterline where the land meets the sea).
   - The person at the tripod station should record the measuring pole height, time of reading, transect line distance and the tidal height (a third person would be useful to assist).
5. Continue to take measuring pole height readings by moving the measuring pole to rocky shore zone boundaries and at points of slope change.
   - Use your judgement to determine where to take additional measurements. Generally, where there is a noticeable change in slope.
   - Record measuring pole height and tape distance.
6. If the tripod requires to be moved position to record all features on the transect see section ***Moving the tripod*** - *Setup scenario 2* for details.

Before you finish

1. Check all survey forms are completed fully.
2. Remove equipment from site.
3. Wash equipment in freshwater, allow to dry and store properly.
4. Complete the data handling to create a shore profile from the survey measurement recordings.
5. Organise data and follow the data lifecycle – see data management section, page 1. Use the naming convention guidance in the appendix for data storage, page 12.



▲ Rocky shore profile.

Data handling to create a shore profile

Create a shore profile using the shore slope measurements recorded by converting the data into height above chart datum (ACD).

Setup scenario 1: Gentle sloping shore

Calculate the shore height above sea level (ASL) for each measuring pole reading.

Calculation:

ASL = height reading — low water reference station height reading.

This should then be transformed into height above chart datum (ACD), this can be calculated by using the tidal height at the time of the low water reference station reading.

Calculation:

ACD = ASL + predicted tidal height

Setup scenario 2: Steep sloping shore

Calculate the shore height for readings from tripod position 1 using the same methodology as *Setup scenario 1: Gentle sloping shore*.

Additionally, calculate shore height above sea level (ASL) for each measuring pole position reading from tripod position 2.

Calculation:

ASL= (reference point height C – height reading) + (Low water reference station reading – reference point height B)

This should then be converted into height above chart datum (ACD), this can be calculated using the known tidal height at the time of the low water reference station reading.

Calculation:

ACD = ASL + predicted tidal height

2.3 Rocky shore quadrat sampling

DIFFICULTY LEVEL
ADVANCED

Introduction

Quadrat sampling is a tool to study the ecology and biodiversity of a habitat. This is a passive form of sampling, done without removing the marine life found and provides a detailed record of species present within a known area while minimising impact to the habitat.

This survey is great to look in detail at a small area of a rocky shore, you will be amazed at the amount of different animals and plants you'll find within a small area.

The abundances and densities of marine animals can be calculated using the number of individuals found in a standardised quadrat area. Species such as barnacles, seaweeds, algae, and colonial animals such as sponges and lichens can be recorded in terms of their percentage cover.

We recommend when surveying a site that you should complete this survey on three different transect lines, with four quadrats surveyed per zone on each transect line (upper, middle and lower shore). This will allow the data to be scientifically analysed to interpret potential trends.

▼ Gridded quadrat made with PVC pipe and string.

© Chris Leakey/NatureScot

Survey briefing

Purpose

- Find out and identify what marine life is living on the rocky shore
- Calculate the abundances of the marine plants and animals you find

Overview

1) Survey timing. This survey should be completed by two additional surveyors at the same time as the rocky shore zonation and the rocky shore profile survey (optional). This is to ensure you can complete the survey within the time of low tide.
2) Work in pairs, with two people recording the same quadrat.
3) Survey four quadrats within each rocky shore zone (upper, middle and lower shore).
4) Survey both the seaweed and marine canopy and the species underneath by gently moving the seaweed to the side.
5) Record the percentage cover of colonial animals and plants and count the number of sessile animals, such as shells and crabs.
6) Use the rocky shore quadrat sampling recording form. We have provided common species you may find in each zone on the survey recording form which you can use as a checklist and add any additional species you find.

Have you read the getting started chapter?

Ensure you follow:

- Quality control guidelines, page 16
- Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

Equipment

- Photo quadrat label template, page 11 (print on laminated paper or on a waterproof dive slate)
- Rocky shore quadrat sampling recording form, page 9
- 50cm x 50cm quadrats
- Hand-held GPS/ Smartphone (if GPS is inbuilt)
- Camera
- First aid kit
- Identification guides
- Clipboard, paper and waterproof protector
- White plastic tray to help identify species

How to setup the survey

You don't need to setup a new transect line for this survey as it can be completed on the same transect lines surveyed in your rocky shore zonation survey.

Quadrats should be placed haphazardly within each habitat zone, within 2m either side of the transect line (i.e. gently drop the quadrat behind you trying not to aim for or avoid specific habitat patches). We suggest you complete four quadrats within each habitat zone. Work in pairs to survey each quadrat.

1. For each quadrat sampled, use the quadrat label template to record the location, transect, zone and the unique quadrat identification number.
2. Photograph the quadrat with the label placed outwith the frame taking note of the time. Take the photo directly above the quadrat, the frame of the quadrat filling the image field of view, minimising shading in the frame and glare. Ensure the edges of the quadrat and the quadrat label are in the image and that it is in focus.

Survey method

A gridded quadrat can help with estimates of percentage cover of all colonial animals. A grid of 25 equal squares within a 50cm x 50cm quadrat should be used. Each square will account for 4% of the quadrat.

You should record all marine life within and underneath the seaweed canopy so percentage cover estimates can total above 100 percent.

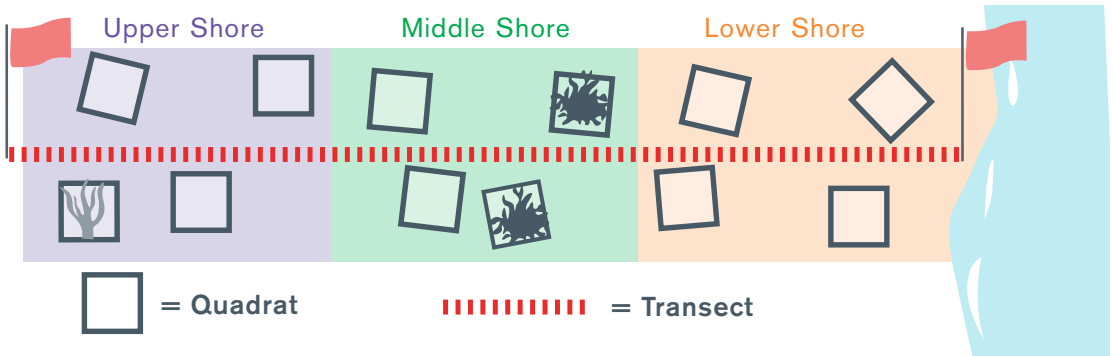
1. Identify all marine life species within the quadrat, ensure you survey the seaweed canopy and then move this aside to survey the marine life underneath.
2. Estimate % coverage of all barnacles, seaweed and algae, and colonial animals such as sponges and lichens in the quadrat. Percentages should be estimated down to 10%, below 10% record P for present.
3. Count individual non-colonial animals (such as shells, dog whelks and limpets).

Additional quality assurance

1. Working in pairs, each person should record data for each quadrat. Before finishing the quadrat, the results should be compared to ensure you both agree and have recorded the same results.
2. After reviewing results, you may continue to complete a new quadrat.

Before you finish

1. Check all survey forms are completed fully.
2. Remove equipment from the site.
3. Wash equipment in freshwater, allow to dry and store properly.
4. Organise data and follow the data lifecycle – see data management section, page 1. Use the naming convention guidance in the appendix (page 12) for data and photo storage.



▲ Placement of quadrats on a rocky shore.

3.1 Underwater marine life observation

DIFFICULTY LEVEL
MODERATE

Introduction

The purpose of this survey is to explore under the surface of the water and record the marine plants and animals present. This survey is designed to complement recreational marine activities such as kayaking and can be used to explore inshore waters using drop down video (DDV) or remotely operated vehicle (ROV) techniques.

With a focus on minimising detailed recordings while in the water, this type of survey will enable you to efficiently create a snapshot of the seabed and marine life you encounter at fixed points within your project area. This survey is great if you want to create an inventory of where marine habitats and species are located and can also identify areas where you may want to target a more detailed survey.

For this survey, you will generally need to get in or on the water and use some kind of camera system such as a polecam, DDV or ROV to take photographs or video recordings of what is under the surface. Alongside your images it is vital to record your survey metadata, so ensure you have the equipment to be able to record your GPS position, time and the depth of each observation.

▼ **Dead mans fingers on Madadh Beag, Loch nam Madadh. *Alcyonium digitatum* on infralittoral bedrock and boulders with jewel anemones and red algae just below the kelp zone.**

© George Stoyle/NatureScot

Survey briefing

Purpose

- Find out the distribution of species and habitats in inshore waters
- Record the exact location of underwater marine life

Overview

1) Get on the water in a kayak or boat using remote camera survey equipment such as a polecam, DDV or ROV systems. In shallow waters (<3m) this survey can also be undertaken using a bathyscope and a waterproof camera.
2) We recommend you lower your camera system in the water for around 2 minutes and record the seabed at each location you want to survey (survey stations). Each survey station will be a new underwater marine life observation record.
3) Record the metadata for each survey station (GPS position, depth, time etc.) - **this is the most important element!**
4) Describe what the seabed looks like including the seabed substrate, marine life cover and any marine species you encounter.
5) We recommend surveyors focus first on recording the observation metadata. If time permits also record what you see on the seabed but descriptions of the seabed can be added later when reviewing the footage.
6) Ensure the underwater marine life observation recording form is fully completed. Organise data using file naming conventions and following the data lifecycle – see data management section (page 1).

Have you read the getting started chapter?

Ensure you follow:

- Quality control guidelines, page 16
- Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

Equipment

- Underwater marine life observation recording form
- Polecam, DDV, ROV system or a bathyscope with a waterproof camera
- Hand-held GPS/ smartphone (if GPS is inbuilt)
- Identification guides
- Clipboards, pencils and waterproof protector or waterproof slate (for use in wet conditions)
- Tide tables
- First aid kit
- Compass (for ROV use)
- Kayak, small boat, or other suitable vessels

How to set up the survey

1. Select a survey date –plan to undertake surveys around slack tide. *This will remove or reduce tidal impact.*
2. Plan the survey location and use the survey plan template to plan survey stations for more advanced surveys, page 5.
3. Check weather and tides for the survey location and time.
4. Prepare survey equipment.
5. Prepare GPS device (WGS84) – Either exact GPS using a GPS device in track mode or the GPS on a smartphone. Ensure GPS is set to record in decimal degrees (e.g. 57.493723, -4.201847).
6. Fill out the survey and site information in the underwater marine life observation recording form.

When using an ROV, follow ROV operational guidance. The ideal setup is to have the GPS position of the ROV displayed as a screen overlay on the video footage. If you do not have a GPS position screen overlay installed, the ROV's GPS position can be estimated. Additional field recording is necessary, see ROV operational guidance (page 5) in the appendix for details.

Slack water

Slack water is a short period of time when there is no tidal movement in either direction, typically one hour either side of high water or low water. This can vary locally though, so make sure to check local information (such as pilot books or tide charts). The time of slack water can be estimated using tide tables.

The absence of tidal movement will remove or reduce drag on polecam, DDV or ROV systems resulting in better quality imagery and more accurate findings. If currents are too strong the camera will not sink to the seabed, or tow you and your boat along with the current at too great a speed to record useful images.

Survey method

1. Follow operational guidance specific to your equipment such as polecam, DDV or ROV.
2. Lower the camera system in the water where you would like to create an observation record, start recording the seabed. You should record footage for no longer than 2 minutes. (we want to capture a snapshot of the seabed at one point, we don't want a long drift covering a large area).
3. Record the **time, GPS position** (WGS84 in decimal degrees) and the **seabed depth** when the seabed is in view.
4. Describe the main seabed substrate and marine life cover.
   Substrate options:
   - Rocky reef
   - Boulders
   - Cobbles and pebbles
   - Sand and gravel
   - Mud
   - Mixed ground
   - Wreckage
   - Other…
5. Describe the main seabed marine life cover.
   Marine life cover options:
   - Kelp forest
   - Kelp park
   - Mixed seaweeds
   - Encrusting pink algae
   - Seagrass bed
   - Maerl bed
   - Tall animal turf
   - Short animal turf
   - Animal beds (please state what type .....) e.g. flame shells, blue mussels
   - Sediment with life apparent
   - Barren sediment.
   - Other… (please state .....)
6. ***Optional step:*** *- Complete if you have additional survey participants.*

   Describe the marine life species present.

   Try to identify all visible species indicating the most dominant species. Please provide an estimate of the number of each species over the survey area in terms of a known area (e.g. Queen scallop: 1 per 1m²). If unable to determine, indicate P for present.

   This could include - seaweeds, sponges, starfish, brittlestars, feather stars, sea urchins, anemones, hydroids, sea slugs, bivalves, crabs, bryozoans, sea cucumbers, sea squirts, fishes.

Before you finish

1. Check all survey forms are completed fully.
2. Remove equipment from site.
3. Wash equipment in freshwater, allow to dry, and store properly.
4. Organise data and follow the data lifecycle – see data management section, page 1. Use the naming convention guidance in the appendix (page 12) for data and photo storage.

Species Checklists

Species checklists should be created before the survey listing the species that are common to the area or what you may expect to see. Any species not on the checklist identified when surveying can be added to the bottom of the checklist.

This will reduce the time taken to record all the species you see and will give you more time to focus on exploring! A species checklist template can be found on page 8.

3.2 Underwater video transect

DIFFICULTY LEVEL
ADVANCED

Introduction

The underwater video transect survey will allow you to collect data on a larger area of the seabed rather than a single point. This survey is usually undertaken by drifting on the sea surface in a kayak or boat. The camera on the seabed will likewise drift along the seabed and you can record a drift line transect.

In this survey you will record video transects (i.e. a straight line recording of an area) that can be used to determine what marine species are present on different areas of the seabed. This survey should be carefully planned and target specific areas you want to gain detailed information about such as the distribution of seabed habitats and associated species. Similarly to previous surveys, there should be an emphasis on collecting accurate and reliable metadata (GPS position, time, depth).

With additional considerations it may also be useful to estimate the extent of seabed habitats by detecting what marine species or features are present at carefully planned survey station locations.

Using an ROV to complete this survey is not recommended because it is challenging to manoeuvre an ROV to travel in a straight line. An ROVs direction of travel is affected by water currents, requiring a skilled pilot to control. We recommend you follow the underwater marine life observation survey for completing surveys with an ROV.

▼ **Maerl bed in Caol Scotnish rapids with common and black brittlestars.**
© Graham Saunders/Marine Scotland

Survey briefing

Background

Before beginning this survey, a comprehensive survey plan should be created using the survey plan template in consultation with any seabed biodiversity data available. You should have a clear survey area planned and survey stations with known GPS positions and assigned survey stations numbers/names. See the getting started chapter for survey planning considerations.

This survey should be completed using a polecam or DDV camera system deployed from a kayak (polecam) or boat (DDV), see operational guidance for the camera system you are using.

The two most important aspects of this survey are attention to recording accurate metadata and good image quality of the footage. Please consult the image quality operational guidance for more details. In particular, ensuring that the camera is moving over the seabed at a slow pace (<0.6 knots).

Purpose

- Find out the distribution of species and habitats in inshore waters
- Record seabed habitats along a transect

Overview

1) Prepare a clapperboard with station details and film at the beginning of each survey station.
2) Deploy the camera system at your planned survey station. On deployment, record the time, GPS position and depth, taking a waypoint on your hand-held GPS device.
3) Film the station for a maximum of five minutes with the camera slowly drifting along the seabed.
4) Observe and record the main seabed substrate and main marine life cover at the survey station. Describe any changes in habitat or species composition in the survey station description.
5) Take notes of what marine species you see, indicating how abundant they are (rare, occasional or common).
6) Occasionally land the camera or hold still over the seabed to get a good quality image of the seabed without movement. Post survey you may be able to extract a video still image at these intervals.
7) At the end of the survey station, record the GPS position, time and depth and take a waypoint on your hand-held GPS device before removing the camera system from the seabed.
8) Organise data and follow the data lifecycle – see data management section. Use the naming convention guidance in the appendix for data and video/photo storage.

Have you read the getting started chapter?

Ensure you follow:

- Quality control guidelines, page 16
- Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

Equipment

- Clapperboard template, page 13 – ensure it is waterproof
- Survey plan template, page 5 – *complete before the survey*
- Underwater video transect recording form, page 17
- Polecam or DDV system
- Hand-held GPS device
- Identification guides
- Clipboards, pencils and waterproof protector or waterproof slate (for use in wet conditions)
- Tide tables
- First aid kit
- Kayak, small boat, or other suitable vessels

How to setup the survey

1. Plan survey location.
2. Select a survey date – plan to undertake surveys around slack tide. *This will remove or reduce tidal impact.*
3. Check weather and tides for the survey location and time.
4. **Prepare survey plan – use the survey plan template, page 5.**
5. Prepare survey equipment.
6. Prepare GPS device (WGS84) – use the GPS device in track mode and ensure this is turned on for the duration of surveying. Ensure GPS is set to record in decimal degrees (e.g. 57.493723, -4.201847).
7. Fill out the survey and site information in the survey recording form.
8. Prepare a clapperboard with the survey information for the transect / survey station.
   - Print and laminate clapperboard template.
   - This should be filled in and updated for every survey station or recorded transect.

Filming setup:

- Please refer to the image quality operational guidance, page 9.
- The camera angle should face a ~45 degree angle to the seabed.
- The camera should be approximately 30cm – 1m from the seabed during filming.
- Recording of the transect will begin when the camera is close to the seabed.
- In most cases, underwater lighting will be required to improve clarity of footage.

Notes for filming:

- A GPS position captured on a screen overlay function is recommended.
- GPS waypoints should be created for the transect start and end.
- The GPS device should be in track mode for the whole period of survey (time at sea). *See GPS device operational guidance,* page 10.
- Ensure, where possible, that the direction of travel is in a constant compass bearing.
- Video footage should be recorded at a smooth slow pace to allow a clear image of the seabed (<0.6 knots).
- A video length of maximum 5 minutes is recommended.

Survey method

Polecam and DDV

The ideal setup is to have the GPS position of the polecam or DDV camera system displayed as a screen overlay on the video footage. If you do not have a GPS position screen overlay installed, your location can be recorded from the position of the deployment vessel. The camera will always be attached to the deployment vessel so the camera will be more or less below the vessel (the GPS position of the camera may be slightly different if the camera is at an angle in the water, however for the purposes of this survey this is within an acceptable margin).

ROV

Using an ROV to complete this survey is not recommended. This is because it is challenging to manoeuvre an ROV to travel in a straight line. An ROVs direction of travel is affected by water currents, requiring a skilled pilot to control. We recommend you follow the underwater marine life observation survey for completing surveys with an ROV.

Only complete this survey using an ROV in optimum conditions (including no underwater current) and if you are confident the ROV is travelling in a straight line.

Method – protocol

1. Follow the specific operational guidance for your survey approach – such as polecam or DDV.
2. Ensure your GPS device (WGS84) is recording your location in track mode.
3. Fill in the clapperboard and film it for around five seconds with the camera system (polecam, DDV, ROV), ensuring it can be clearly read before deploying the equipment to survey. If possible keep the film of the clapperboard in the same video segment as the survey station you are going to film (i.e. don't start and stop the video).
4. Deploy the camera system. Start recording the video transect data when the seabed is in view using the survey recording form. **Travel in a straight line and at a consistent depth where possible.**
5. Record all metadata at the start of the transect– when you first see the seabed. **Accurate metadata recording is the most important element of the survey.**
   - Take a waypoint on your GPS device
   - Record the **time**
   - Record the **GPS position**
   - Record the **seabed depth**
6. Record the **main seabed substrate** and **main seabed marine life cover** found together in the transect video.

Substrate options:

- Rocky reef
- Boulders
- Cobbles and pebbles
- Sand and gravel
- Mud
- Mixed ground
- Wreckage
- Other…

Marine life cover options:

- Kelp forest
- Kelp park
- Mixed seaweeds
- Encrusting pink algae
- Seagrass bed
- Maerl bed
- Tall animal turf
- Short animal turf
- Animal beds (please state what type .....)
  e.g. flame shells, horse mussels
- Sediment with life apparent
- Barren sediment.
- Other…(please state .....)

This should be the main substrate and marine life cover you see at the same time in the full video transect. If they change, record the most common in the video and describe any changes observed in the description for that station.

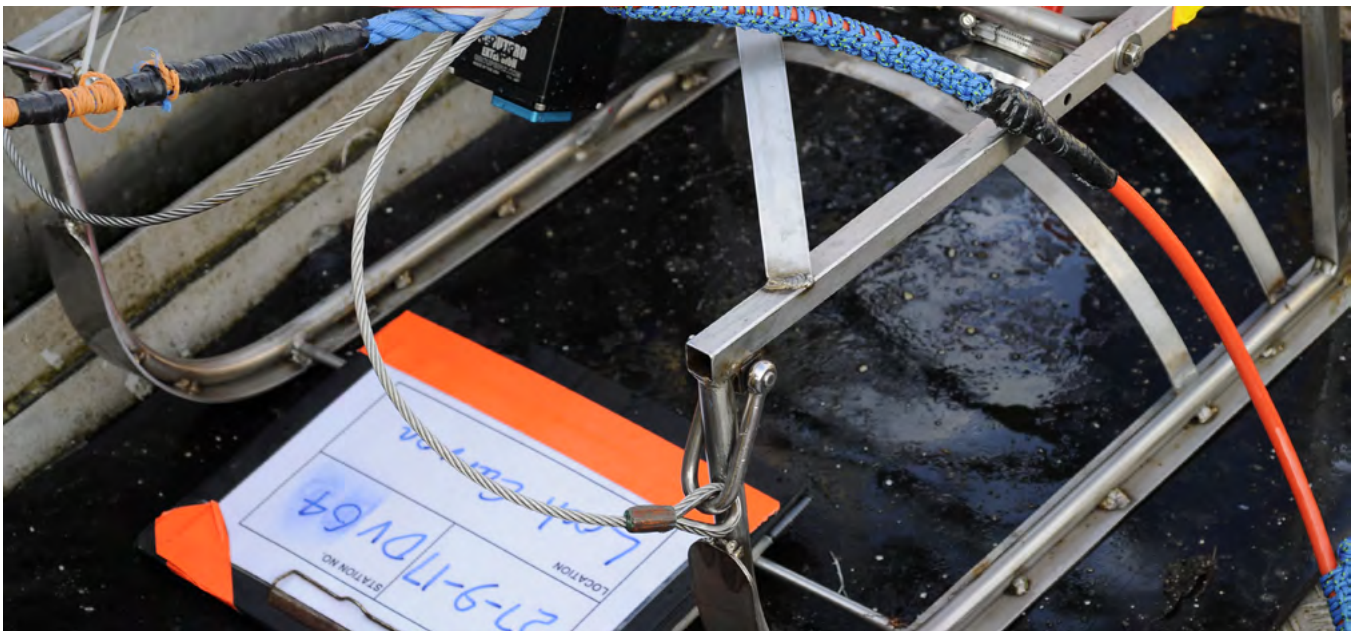
7. **Take a video still -** Land the camera system on the seabed to capture a 2 to 3 second recording the seabed without movement. Additionally, take a still photograph if possible with your camera system.
8. Describe the **marine life species** present.
   Try to identify all visible species indicating the most dominant species. Please provide an estimate of the number of each species over the survey area in terms of a known area (e.g. Queen scallop: 1 per 1m²). If unable to determine, indicate P for present.
   This could include - seaweeds, sponges, starfish, brittlestars, feather stars, sea urchins, anemones, hydroids, sea slugs, bivalves, crabs, bryozoans, sea cucumbers, sea squirts, fishes.
9. After 5 minutes end the video transect. Record all metadata at the end of the transect – before retrieving the camera system from the seabed.
   - Take a waypoint on your GPS device
   - Record the **time**
   - Record the **GPS position**
   - Record the **seabed depth**
10. Retrieve the camera system. End video recording.
11. Complete this survey method for each survey station planned using the same survey recording form.

Before you finish

1. Check all survey recording forms are completed fully.
2. Remove equipment from site.
3. Wash equipment in freshwater, allow to dry, and store properly.
4. GPS device coordinate file showing polecam or DDV track and waypoints should be downloading from the device and stored. You should refer to this after the survey to verify the correct GPS positions were recorded on your recording forms.
5. Ensure all data (video files, recording forms, GPS tracks etc.) are labelled appropriately using the correct naming convention are stored appropriately so the data can be accessed and used in the future. Use the naming convention guidance in the appendix (page 12) for data and photo storage.
6. Organise data and follow the data lifecycle – see data management section, page 1.

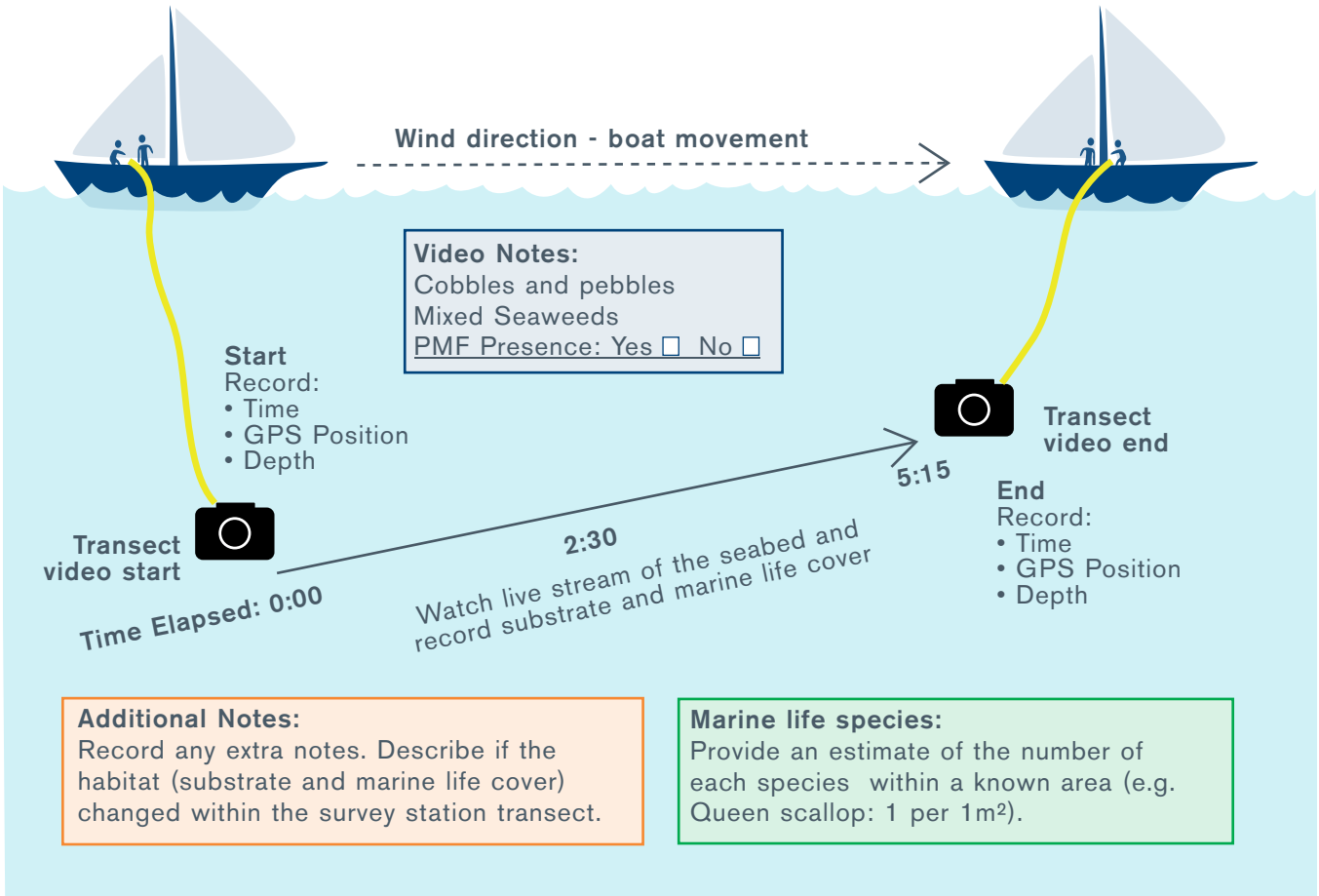
▼ Close-up of a drop down video system. A clapperboard was used at the start of each remote video clip.

© Ben James/NatureScot



Video stills

We recommend that you land the camera occasionally to get a close up of the seabed while the video camera is not moving – i.e. a “video still”. On reviewing the footage, you can take a screen grab. Use the naming convention guidance in the appendix for data and photo storage.



▲ **Diagram of the underwater video transect method.**

3.3 Feature focus: habitat mapping

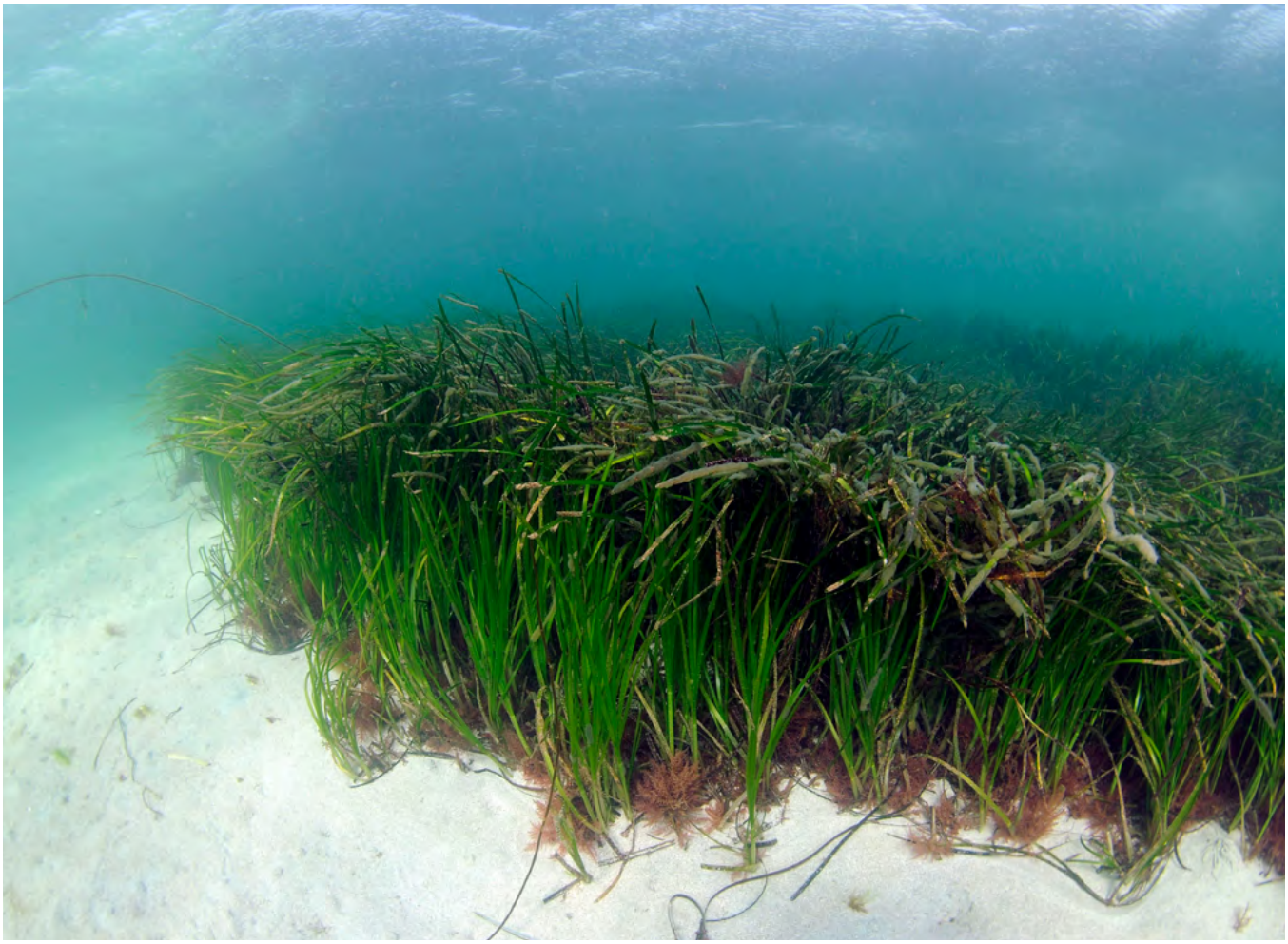
DIFFICULTY LEVEL
ADVANCED

Introduction

The purpose of the habitat mapping survey is to find out the size of a habitat by mapping the habitat boundary. This will enable you to keep a visual record of a feature of interest and monitor any changes over time. The feature must be intertidal or in shallow water that can be clearly seen using your eyes when exposed at low tide or snorkelling (generally 3m depth or shallower).

In this survey you will track the boundary of a feature, gaining data on the extent of the habitat. You don't need to map every inch of your local seabed and intertidal area. This method is designed to enable communities to develop an overview map of particular habitats and marine life of interest within your area.

▼ A shallow *Zostera marina* seagrass bed in the Sound of Barra.
© Ben James/NatureScot



Survey briefing

Purpose

– Get an estimation of the habitat size

Overview

1) You must be able to clearly see the seabed and identify the substrate using your own eyes. This survey can be carried out in the intertidal zone or shallow water, typically less than 3m depth.
2) Plan a habitat you would like to map (e.g. a seagrass bed or kelp forest).
3) Choose a date and time with suitable tidal conditions, such as a low tide to access as much of the bed as possible (spring low tides are preferred).
4) Determine the feature boundary, using a GPS device on track mode, moving around the boundary of the habitat.
5) At regular intervals, take additional waypoints on your GPS device of the boundary, taking photographs as evidence. Ensure you match the image with the waypoint and GPS position, recording on the survey recording form. Use the naming convention guidance (page 12) in the appendix for data and photo storage.
6) If completing the survey by snorkelling, use a safety marker buoy (SMB) and attach the GPS device in track mode to the SMB in a waterproof bag.
7) Once you have moved around the full circumference of the feature, stop the track mode on your GPS device.
8) For the mapped habitat, describe the main substrate, marine life cover and marine species present, recording on the habitat mapping recording form.
9) Make some notes to aid relocation of the habitat for future surveys.
10) Organise data and follow the data lifecycle – see data management section, page 1.

Have you read the getting started chapter?

Ensure you follow:

– Quality control guidelines, page 16
– Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

This survey can be undertaken at a spring low tide if the extent of the bed is exposed, allowing the survey to be undertaken by foot. If submerged, you can complete the survey snorkelling or in a kayak or small boat using a bathyscope.

Equipment

- Survey plan template, page 5 - *complete before the survey*
- Feature focus: habitat mapping recording form, page 20
- Hand-held GPS
- Suitable waterproof camera or video camera
- Identification guides
- Clipboards, pencils and waterproof protector or waterproof slate (for use in wet conditions or snorkelling)
- Tide tables
- First aid kit

In shallow water you may also require:

- Bathyscope: In shallow water, you may be able to survey wading or in a small kayak or boat with a bathyscope.
- Snorkelling equipment
  - Safety marker buoy (SMB) for surveyor
  - Waterproof bag or container for the GPS device (attach to the SMB for snorkelling)
  - **Follow snorkelling and wading safety tips within getting started,** page 1**.**

How to setup the survey

1. Plan survey location – *make use of satellite imagery.*
2. This survey can only be conducted with previous knowledge of a suitable habitat (such as a plant or animal bed or seaweed and kelp habitat).
3. Select a survey date
   - Choose a date with a low spring tide. This will expose the habitat out of the water and enable it to be surveyed by foot or allow it to be surveyed in shallow water snorkelling or in a kayak using a bathyscope.
4. Check weather and tides times for the planned survey location and time.
5. Prepare survey equipment.
6. Prepare GPS device (WGS84) – use the GPS device in track mode and ensure this is turned on for the duration of the survey. Ensure GPS is set to record in decimal degrees (e.g. 57.493723, -4.201847).
7. Arrive at the survey site at least 1.5 hours before low tide.
8. Fill out the survey and site information in feature focus: habitat mapping recording form.
9. Prepare survey plan using the survey plan template, page 5.

Tip: look at satellite imagery to help make your plan!

Survey method

1. Locate the feature you intend to map using a GPS device and maps from your survey plan. Spend some time looking at the feature to familiarise yourself with it.
2. Ensure your GPS device is recording your location in track mode.
3. Record the feature boundary. Locate the feature boundary and move around the boundary:
   - Take waypoints at intervals as you move around the feature boundary.
   - Take photographs or video footage at each waypoint of the boundary. *For intertidal, ensure the GPS screen is in the image/video where possible showing the correct time, date and GPS coordinate of the habitat you are mapping.*
   - At each waypoint, record the boundary description – *defined, patchy or gradual. You may need to explore past where you think the habitat boundary is to ensure is in not just the end of a patch.*
4. When you are confident you have surveyed the entire habitat in your survey area and reach the starting point again, stop mapping with the GPS device, switching off track mode on the GPS device.
5. Once mapping the boundary is complete, record the **time** and the **GPS position** (WGS84 in decimal degrees) of the habitat. Take a waypoint on your GPS device.
6. For the mapped habitat:

Ensure your image, waypoint and boundary all match up on the survey recording form.

Describe the main seabed substrate.
Choose from:

- Rocky reef
- Boulders
- Cobbles and pebbles
- Sand and gravel
- Mud
- Mixed ground
- Other…

Describe the main seabed marine life cover.
Chose from:

- Kelp forest
- Kelp park
- Mixed seaweeds
- Encrusting pink algae
- Seagrass bed
- Maerl bed
- Tall animal turf
- Short animal turf
- Animal beds (please state what type .....)
  e.g. flame shells, blue mussels
- Sediment with life apparent
- Barren sediment
- Other… (please state .....)

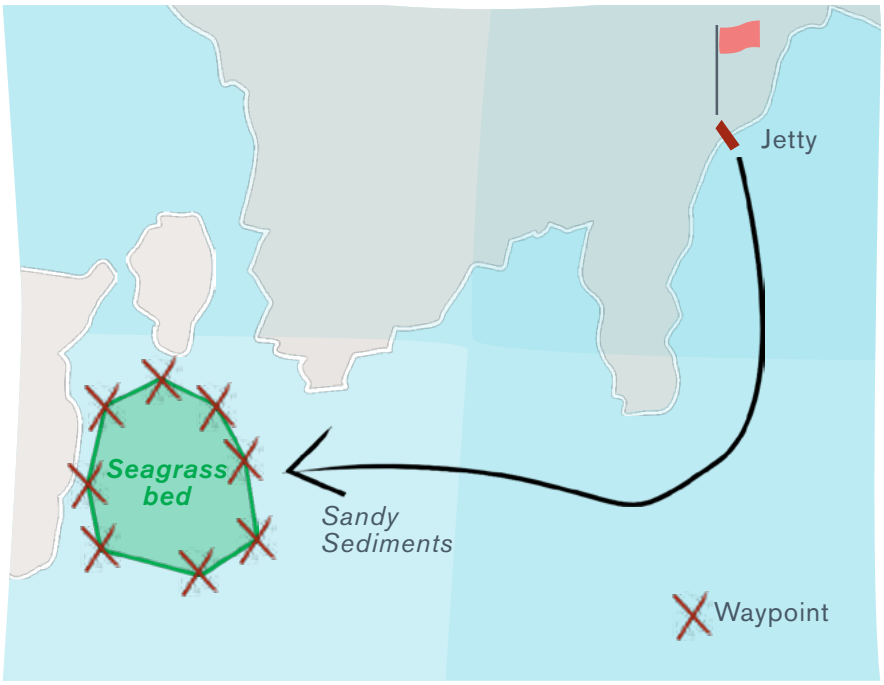
7. Describe the marine life species present.
    - *Try to identify all visible species indicating the most dominant species. Please provide an estimate of the number of each species over the survey area in terms of a known area (e.g. Queen scallop: 1 per 1m²). If unable to determine, indicate P for present.*
      This could include - seaweeds, sponges, starfish, brittlestars, feather stars, sea urchins, anemones, hydroids, sea slugs, bivalves, crabs, bryozoans, sea cucumbers, sea squirts, fishes.
8. Take some images or video footage that best shows the area and your observations. In particular, ensure the seabed marine life cover is visible in images.
9. Make some notes to help relocate the site – such as notable features, angles to headlines and viewpoints to help navigation.

Before you finish

1. Check all survey recording forms are completed fully.
2. Remove equipment from the site.
3. Wash equipment in freshwater, allow to dry, and store properly.
4. GPS device coordinate track file and waypoints should be downloading from the device and stored. You should refer to this after the survey to verify the correct GPS positions were recorded on your recording form.
5. Ensure all data (video files, recording sheets, GPS tracks etc.) are labelled appropriately using the correct naming convention and stored appropriately so the data can be accessed and used in the future. Use the naming convention guidance in the appendix (page 1) for data and photo storage.
6. Organise data and follow the data lifecycle – see data management section, page 1.

Create a map

After collecting survey data, it's possible to create a sketch map of the habitat area using the GPS track and waypoints.



▲ **Example sketch map where the boundary of a seagrass bed was mapped.**

3.4 Feature focus: habitat quality

DIFFICULTY LEVEL
ADVANCED

Introduction

In this survey you will focus on recording detailed information about the health of plant and animal beds. By surveying the density of a habitat-forming species we can gain important insight into the health of the feature.

This survey can be used to survey plant and animal beds that inhabit the intertidal zone when the features are exposed at low tide. This survey method follows Seagrass-Watch protocols but we have adapted it to include alternative steps for other types of plant and animal beds. We suggest using this method for seagrass beds and blue mussel beds.

▼ View of an extensive area of intertidal sediment flats with eelgrass (*Zostera noltei*) and casts of the lugworm.
© NatureScot

Survey briefing

Purpose

- Survey the health of plant and animal beds
- Determine percentage cover of the plant and animal bed
- Determine algae percentage cover

Additionally:

Seagrass beds -

- Identify percentage of epiphyte cover
- Determine the height of the canopy

Blue mussel beds -

- Determine the proportion of living mussels to shell debris

Overview

This should be undertaken on plant and animal beds that are found intertidally and cover an area larger than 50m by 50m.

1) Lay out three 50m transect line parallel to each other, 25m apart and perpendicular to the shore.
2) Record the GPS position at the start and end of each transect, recording the compass degrees looking down the transect towards the sea.
3) Place a quadrat every 5m moving down the transect.
4) Record data on the condition of the plant and animal beds. This will include recording data on % coverage, % algal coverage, identifying other marine life etc. within the 50cm x 50cm area.
5) Continue working in pairs until all quadrat stations are completed.
6) For seagrass you will need to measure the length of some shoots (minimum of three per quadrat).
7) Once completed, ensure all forms are completed fully.
8) Pack-up kit and rinse equipment.
9) Organise data and follow the data lifecycle – see data management section.

Have you read the getting started chapter?

Ensure you follow:

- Quality control guidelines, page 16
- Survey planning - common sense checklist, page 15

These can be printed and taken with you.

Setting up

Equipment

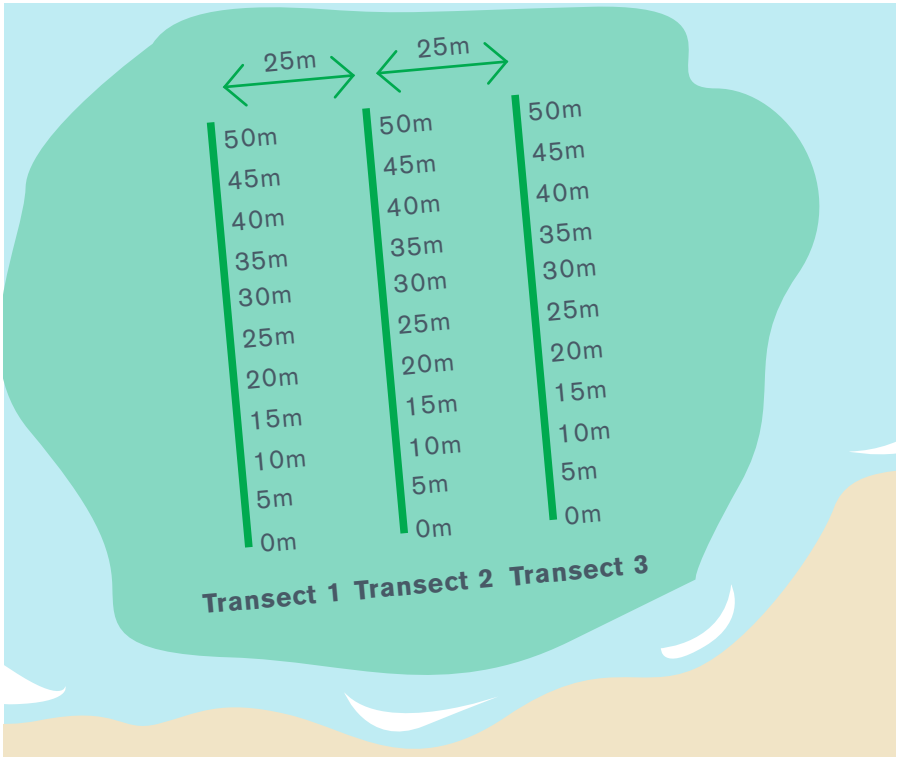
- Photo quadrat label template, page 11
- Feature focus: habitat quality recording form, page 22
- 50m transect line (x3 if three transects undertaken simultaneously)
- Hand-held GPS/ Smartphone (if GPS is inbuilt)
- Compass
- 50cm x 50cm quadrat (x3 if three transects undertaken simultaneously)
- Magnifying glass
- Clipboards, pencils, waterproof protector and 30cm ruler
- Camera/ smartphone
- Identification guides
- First aid kit
- Tide tables

How to setup the survey

1. Select a survey date –a low tide of 0.4m or less is recommended.
2. Check weather and tides for the survey location and time.
3. Arrive at the survey site at least 1.5 hours before low tide.
4. Fill out the survey and site information in the plant and animal bed recording form.
5. Lay out three 50m transect lines parallel to each other, 25m apart and perpendicular to the shore.

Record survey set-up

1. Record the latitude and longitude (WGS84 in decimal degrees) at the start and end of each transect, recording the compass bearing looking down the transect towards the sea.



◀ **Survey site setup. The green area represents a seagrass bed, detailing the positioning of the 50m transect lines and every 5m positioning of the quadrats.**

Survey method

Repeat these steps approximately every 5m distance gained in the plant or animal bed, you should complete 10 quadrats per transect line (within a site larger than 50m by 50m).

All habitats

Place a quadrat every 5m along the transect. Start at 5m on each transect. Complete one quadrat at a time working in pairs. For each quadrat:

1. Take a photograph of the quadrat – place a photo quadrat label beside the quadrat and the transect line (tape should be easily read with the correct distance in the photograph). Use the photo quadrat label template, page 11. Take the photo from directly above the quadrat, looking straight down, ensuring the image includes the entire quadrat frame, quadrat label and tape measure.
2. Describe the substrate composition – *e.g. cobbles and pebbles, sand and gravel, mud, mixed ground etc.*
3. Describe other features, identify and count any macrofauna – *such as bivalve, crabs, anemones.*
4. Identify the type of animal or plant bed (if present)- *e.g. seagrass, blue mussels.*
5. Estimate percentage cover of the bed.
6. Estimate algae percentage cover – *Make a note if the algae is overlying the habitat or rooted within the sediment. Note: this does not include any seagrass epiphyte cover.*

Additionally for seagrass

7. Estimate canopy height of the dominant seagrass species - *Measure from the sediment to the leaf tip of at least three shoots.*
8. *Estimate epiphyte percentage cover – epiphytes are algae or animals attached to seagrass blades and often give the blade a furry appearance. First estimate how much of the blade surface is covered, and then how many of the blades in the 50cm x 50cm quadrat area are covered (e.g., if 20% of the blades are each 50% covered by epiphytes, then quadrat epiphyte cover is 10%).*

Additionally for blue mussels

7. Record the percentage cover of live mussels.
8. Record the percentage cover of dead mussel shells.

Before you finish

1. Check all survey recording forms are completed fully.
2. Remove equipment from the site.
3. Wash equipment in freshwater, allow to dry, and store properly.
4. Ensure all data (images, recording forms etc.) are labelled appropriately using the correct naming convention and stored appropriately so the data can be accessed and used in the future. Use the naming convention guidance in the appendix (page 12) for data and photo storage.
5. Organise data and follow the data lifecycle – see data management section, page 1.