

# PEBL Seaweed Monitoring Handbook

Link to [Seaweed Monitoring Data Spreadsheet](#)

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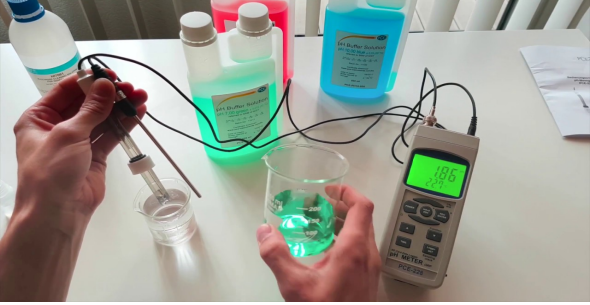



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Total time of all monitoring activities: 4-5hrs at sea, 1-2hrs on land

Training time for new team of 3 people: 6hrs

## Overview of monitoring activities

Ref, Category, Parameter	Equipment	Image	Active Quantity
1. Biodiversity - Acoustic	Chilonia F-POD		1
2. Biodiversity - Benthic video	BRUV (GoPro + Crab)		3
3. Enviro. - Light sensors	HOBO Pendant 64K Light Sensors		2

4. Enviro. - Turbidity, Current speed, Temperature	PEBL GrowProbe3		2
5. Enviro. - Salinity / pH	PCE instruments data logger		1
6. Enviro. - Nitrates & Phosphates	Hanna Marine LR Nitrate & ULN Phosphate Pocket Checker		1
7. Stock - Top line and cultivation line monitoring	White zip-tie, net bag, bongo, precision weighing scale, foldable 2m ruler		1
8. Enviro. - Heavy Metal	Net bag, luggage weighing scale, styrofoam box, icepack		1

**Please note: device locations can be found on the “Map” sheet on the [Seaweed Monitoring Data Spreadsheet](#)**

## 1. Passive Acoustics | Chilonia F-POD

Checking rigging: 30 min

**Equipment required**

Item	Quantity
F-POD	1
D-Cell Battery	10
SD Card 32GB	1
4m Floating rope (10mm min diameter)	1
1m Chain	3
14m Floating rope (10mm min diameter)	2
1 off 21m (14m +5m) Leaded rope (10mm min diameter)	2
Small Dive buoy (ideally yellow)	1
20KG (min) Iron/Steel Weight	1
12KG (min) Iron/Steel Weight	1

**Pre-deployment checks and setup**

Refer to [Chilonias user guide](#) how to change batteries and program ready for deployment.

**Rigging**

The PAM should be rigged up as in Figure 1.0. It is very important that none of the ropes can rub on anything, as they will fail.

1. Attach PAM to 4m floating rope like Figure 1.1 ->



2. Use a Shackle to couple the Floating rope to the fixing point on the 12Kg weight.
3. Use a shackle to couple the 1m chain to the 12Kg weight.
4. Tie the 14m floating rope to the chain, then attach another 1m chain to the other side of the rope.
5. Attach the second chain to the 20Kg weight using a shackle.

6. Attach another 1 m of chain to the 20Kg weight followed by tying 14m of floating rope to the chain end.
7. Tie and splice the 21m leded rope into to floating rope.
8. Attach a dive buoy 5m from the end of the leded rope
9. Attach an A0 buoy at the end of the leded rope.

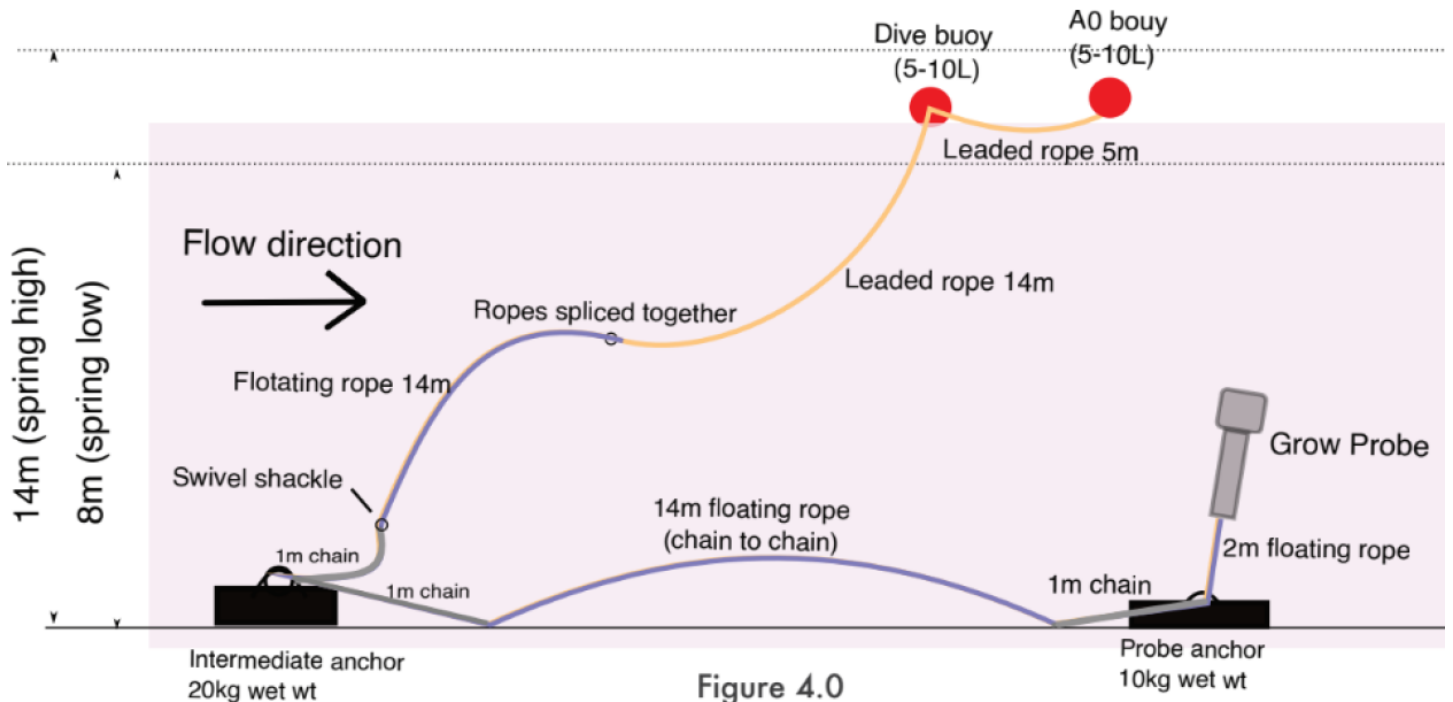


Figure 1.0

### Deployment

1. Deploy in an area at least 200m from the coast and 100m from any object in the sea.
2. With all ropes neatly organised, lower the first weight and PAM off the boat while the boat is moving slowly away from the position you are placing the weight.
3. While the boat is still moving in the same direction, lower the remaining weight and rope until you feel the first weight hit the seabed.
4. Keep the boat moving in the same direction while you lower the remaining rope until you feel the second weight hit the ground.
5. If the boat has not set a straight course, you can drag the whole setup along the seabed to ensure there is adequate distance between the two weights on the seabed.
6. Make note of position

### Retrieval

1. Simply lift PAM out of the water using the buoy and winching up the rope.
2. Retrieve data:
  - a. Untie the rope that goes through the end of the PAM
  - b. Use a strong screwdriver to leverage open the top cap by placing it through one of the three holes and twisting. You may need a second person to hold the unit to prevent it from spinning.
  - c. Press and hold button, Remove SD Card, convert to .che using chelonia software and email data to [craig@pebl-cic.co.uk](mailto:craig@pebl-cic.co.uk)



## 2. Benthic Video | BRUV (GoPro + Crab shells or Mackerel Recording 3 sites: 1hr x 3 = 180 min (to be carried out whilst stock monitoring and checking probes)

### Equipment required

Item	Quantity
Drift Ghost camera with waterproof housing	3
SD Card 32GB	3
Computer with micro-USB lead	1
14m Floating Rope	1
14m Sinking Rope	1
A0 Buoy	1
Scaffold pole	1
Net bag filled with crab waste of mackerel	1

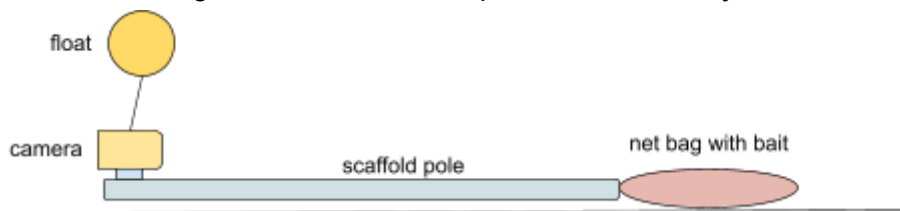


### Pre-deployment checks and setup

1. Charge camera batteries
2. Plug camera into computer using micro-USB lead and clear the memory

### Rigging (example sketch below)

1. Attach camera in waterproof housing to pole facing away from the rope, toward the crab bait
2. Attach a net bag of crab bait to the clip at the end of the joust



### Deployment

1. Deploy as close to sea farm as possible without the possibility of ropes tangling. Floating rope is tied to BRUV and sinking rope is near the surface as in acoustic probe.
2. Deploy for 60 minutes (this is how long battery will last) and make note of position

### Retrieval

1. Lift out of water using buoy and discard the crab bait
2. Repeat at all sites using fresh bait and a fresh GoPro
3. Once back on land, plug Camera into the computer using a micro-USB cable and transfer the video file to PC and rename files to match site and date. Sometimes a single deployment can appear as multiple videos, so rename these as part 1 and part 2. E.g. CW-221002-pt1
4. Upload to Youtube using [hello@PEBL-CIC.co.uk](mailto:hello@PEBL-CIC.co.uk) and publish as unlisted video.

### 3. Light intensity | Hobo MX2202 Logger

Checking rigging: 15 min

#### Equipment required

Item	Quantity
Hobo MX2202 Sensor attached to PVC float	2
Phone with Hobo App installed	1
Battery CR2032	2
1m rope	2



#### Pre-deployment checks and setup

1. Press the top of the Hobo MX2202 whilst your Hobo app is running and bluetooth is enabled
2. Check battery status and change battery if required
3. Wipe memory
4. "Launch" logger (full Hobo User guide can be found [here](#))
  - a. Logging interval: 5 minutes
  - b. Start Logging: Now
  - c. Stop Logging: When memory fills
5. Screw cap with logger back onto tube and tighten (*if tube is not already deployed*)

#### Rigging & deployment

1. Lift cultivation line and clear a 2m section if heavy with seaweed
2. Attach to cultivation line and at least 2m from any nets or other equipment. Ideally use the same location as the previous deployment.
3. Use an [Anchor Hitch](#) with a stopper (or any other sturdy knot you know how to tie)
4. Make note of position on farm

#### Retrieval

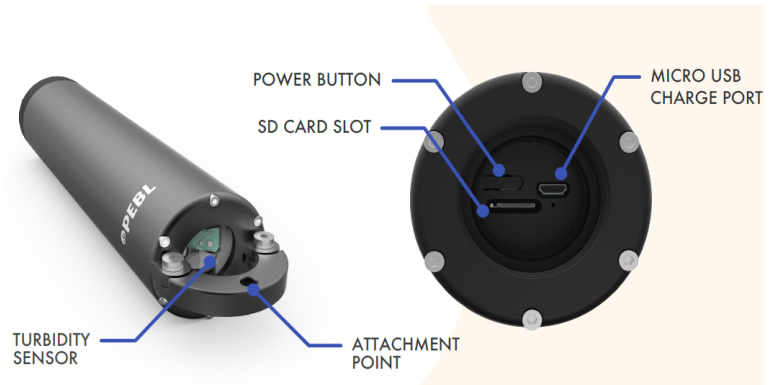
1. Unscrew sensor cap from tube and replace with a new logger and screwcap
2. Connect with smartphone as in pre-deployment check
3. Select "readout" and stop recording, name the file and save to computer e.g. 220419-220604-CYM-CW-FarmFlow
  - a. (STARTDATE-ENDDATE-COMPANY-FARMREF-FARMFLOW/BEDFLOW)
4. Upload data to the relevant Google Drive folder

## 4. Turbidity, Current speed, Temperature | PEBL GrowProbe3

Checking rigging: 15 min

**Equipment required**

Item	Quantity
PEBL GrowProbe3 including buoyancy attachment and calibration tube	2
Computer with windows operating system	1
Farm-depth deployment: 1m rope	1
Seabed-depth deployment: Same rigging as acoustic probe (see 1.)	1

**Pre-deployment checks and setup**

1. Unscrew the bung and remove the SD card
2. Check the probe configuration is correct for the sampling period and the local wifi details are entered (see GrowProbe3 manual for more detail)
3. Re-insert the SD card into the probe and connect the microUSB cable near to the wifi router.
4. If configured correctly you will receive an email. Leave probe plugged in until light goes white (indicating full charge)
5. Unplug microUSB cable and screw cap back onto logger

**Farm-depth rigging & deployment**

1. Lift cultivation line and clear a 2m section if heavy with seaweed
2. Attach to the cultivation line and at least 2m from any nets or other equipment. Ideally use the same location as the previous deployment.
3. Use an [Anchor Hitch](#) with a stopper (or any other sturdy knot you know how to tie) one end to the cultivation line and another approx 0.5m away to the eyelet in the horseshoe of the GrowProbe.
4. Make note of position on farm

**Seabed-depth rigging & deployment**

1. Same mooring set up as used for acoustic probe in section 1.

**Retrieval**

1. Unscrew sensor cap from tube and replace with a new Pendant
2. Once back at HQ, plug sensor into Hobo Pendant Coupler
3. Boot the Hoboware and click "readout". Stop recording, name the file and save to computer e.g. 220419-220604-CYM-CW-FarmFlow
  - a. (STARTDATE-ENDDATE-COMPANY-FARMREF-FARMFLOW/BEDFLOW)
4. Upload data to the relevant Google Drive folder

## 5. Salinity &amp; pH | PCE Data Logger

Total sample time: 15 min

## Equipment required

Item	Quantity
PCE Data logger with salinity probe attached	1
Water sample container	1
Marker pen	1



## Water Sample Method

1. Label sample container with date and farm site
2. Take water sample at the desired location (e.g. seaweed farm)
  - a. Lower bucket with rope attached (found on boat) into surface water
  - b. Transfer water from bucket into sample container and close lid

## Measurement Method

1. Use collected water sample (one sample can be used for multiple measurements)
2. Press mode to cycle through the different modes until you get to Salinity
3. Connect the salinity probe to the 'Cd' port, and lower the probe tip into the water sample and wait for 2 minutes for measurement to settle.
4. Repeat for pH probe (remove the probe soaker bottle and re-attach it after sampling)
5. Log results in spreadsheet

## 6. Nitrates &amp; Phosphates | Hanna Marine LR Nitrate Pocket Checker

Total sample time: 1hr

## Equipment required

Item	Quantity
Hanna Marine LR Nitrate Pocket Checker (blue)	1
Hanna Marine ULR Phosphate Pocket Checker	
Water sample container	1
Marker pen	1



## Water Sample Method

1. Label sample container with date and farm site
2. Take water sample at the desired location (e.g. seaweed farm)
  - a. Lower bucket with rope into seawater and transfer water from bucket into sample bottle

## Measurement Method

1. Use collected water sample (one sample can be used for multiple measurements)
2. Refer to [Hanna Nitrate and Phosphate user guide](#)

## 7. Seaweed Stock sampling

Total sample time: 2hrs

## Packing checklist (before going out on boat)

Item	Location	Purpose
Bongo	In large shed next to trailer	Carrying seaweed sample bags
Large plastic waterproof case labelled Stock monitoring	On the raised platform immediate top left (access by ladder)	To carry all items below
6x red net bags with grey tags, 6x yellow net bags with clear tags	Inside stock monitoring case	For putting seaweed samples in
Black permanent marker pen	Inside stock monitoring case	Marking shellfish sample bottles
Folding ruler	Inside stock monitoring case	Measuring 50cm seaweed samples
Large white zip ties	Inside stock monitoring case	Marking sampling locations
Digital camera/Smartphone	Inside stock monitoring case	Taking images of sampling point
Knife	Keep your own	Cutting seaweed samples
Waders and Lifejacket	Hanging from right hand raised platform	Safety

## Sampling locations (reference)

Farm	Species	Line	Buoy	Depth	Notes
St. Justin	Seaweed	1st from West	Betw. 1&2 from North	Cultivation	From closest to W1
St. Justin	Seaweed	3rd from West	Betw. 1&2 from South	Cultivation	From closest to W3
Porthlysgi	Seaweed	West	W1-W2 (West of line)	Top line	From closest to W1
Porthlysgi	Seaweed	West	W1-W2 (West of line)	Top line	From closest to W1
Carnawig	Seaweed	East	E1-E2 (East of line)	Top line	From closest to E1
Carnawig	Seaweed	East	E1-E2 (East of line)	Top line	From closest to E1

## A: Collecting Samples

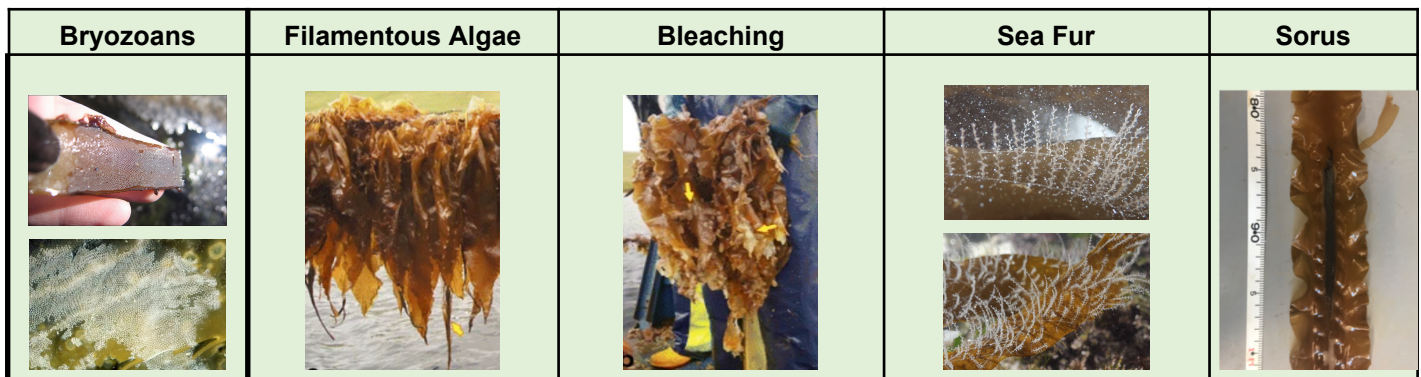
1. Locate the white zip tie marking the sampling area
2. Take a photo of the zip tie with approx 1m either side in shot
3. Use the folding ruler to mark a 50cm section next to the white zip tie that has not already been harvested.



4. Using a knife cut a 50cm section of seaweed from the line as close to the rope as possible without damaging it
5. Fill the sample into the associated net bag. E.g. The sample gathered at St. Justinians at the North of the Farm will be filled into the bag labelled SJN. The red bags are for samples from the cultivation line and yellow bags are for samples from the top line.
6. Once the bag is filled, drop it into the large bongo.

### B: Taking measurements

1. Load the [Stock Monitoring Data Spreadsheet](#)
2. Natural Settlement measurement (1st & 2nd tab in spreadsheet):
  - a) Take 20 individuals out of each net bag and record the number of individuals of each species.
  - b) The first tab in the spreadsheet is for the cultivation line (this will have little settlement)
  - c) The second tab is for the top line. This will be mostly Furbelows and Oarweed.
  - d) Enter the % of naturally settles species for each sample set (of 20)
3. Epiphytes on Cultivation Line (3rd Tab):
  - a) Take 10 Sugar Kelp individuals out of each cultivation line net bag at random
  - b) Record the % of coverage on each blade of epiphytes into the 3rd tab in the spreadsheet.



4. Productivity and Loss on Cultivation Line (4th tab):
  - a) Fold out the 2.6m long ply board onto a raised surface (e.g. trailer)
  - b) Place the 10 samples onto the ply board. Do this in two batches if the space is limited.
  - c) Measure the total length (holdfast to tip), max width, the width at the tip to the nearest 0.5cm using a measuring tape.
  - d) Replace all samples into the net bags and measure the weight using the digital hanging scale

## 8. Heavy Metal Sampling

Total sample time: 30 mins

### Sending off samples for heavy metal testing (every 2 month)

1. Take approx. 100g of Sugar Kelp sample from each farm (e.g. either N or S) and pack them all into a single resealable plastic pouch (totalling 300g) and label with permanent marker PEBL-S1
2. Place the samples into a styrofoam box along with some paper towels and a frozen ice block
5. Print off '[Analysis Request Form](#)' and date, name and sign in the box on the bottom of the page
6. Insert the form into another waterproof resealable pouch and tape it to the front of the box.
7. Arrange a next-day courier (with Celtic couriers) addressed to:  
SOCOTEC Marine – Sample Receipt, Etwall House, Bretby Business Park, Ashby Road, Burton on Trent, DE15 0YZ