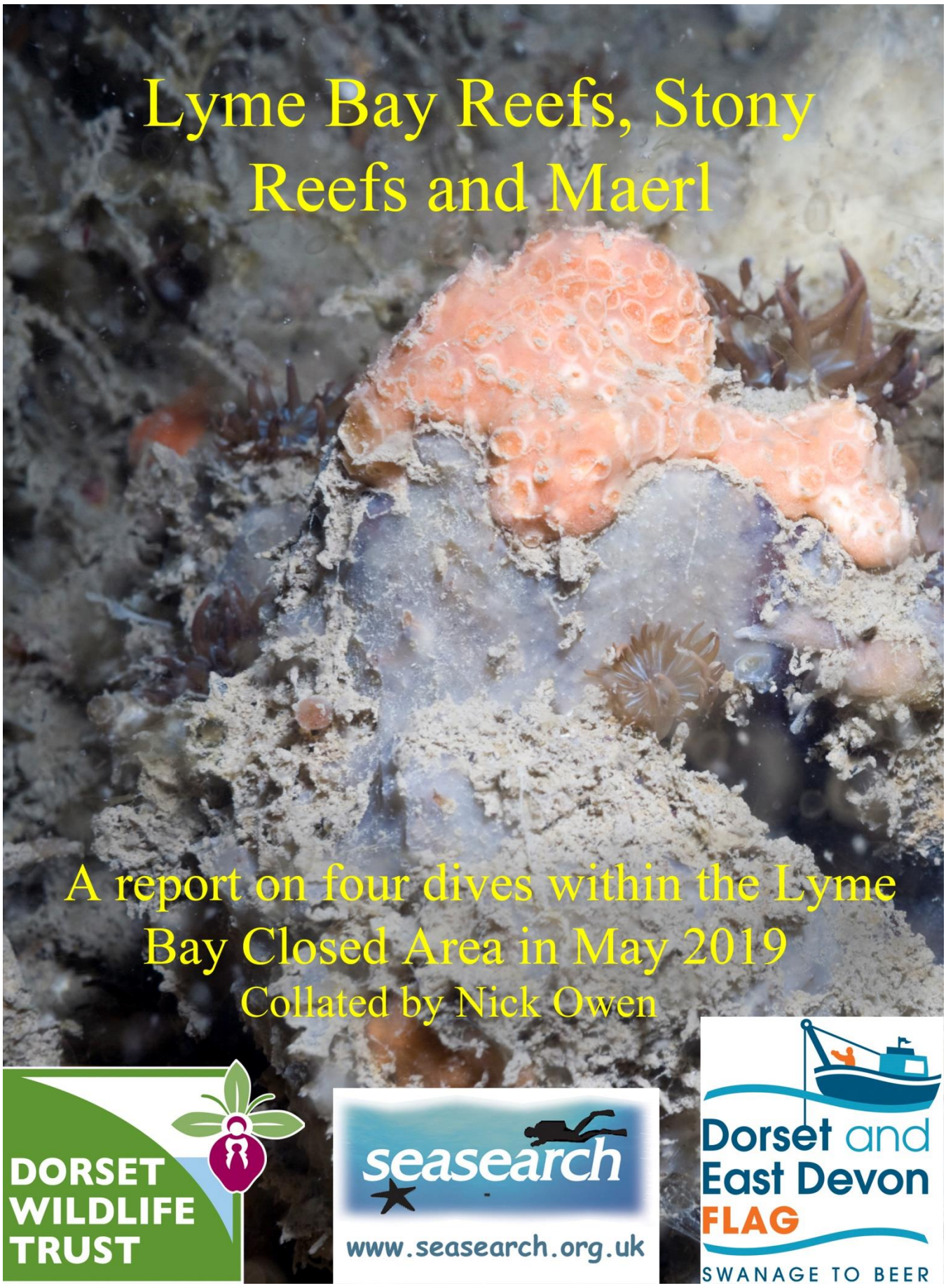

Lyme Bay Reefs, Stony Reefs and Maerl

A report on four dives within the Lyme Bay Closed Area in May 2019

Collated by Nick Owen

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Contents

Introduction

This survey was carried out by eight volunteer divers on the chartered hard boat Blue Turtle based in Lyme Regis. The main aim of the survey was to look at un-dived features from the DORIS multibeam sonar survey in the Closed Area with a primary emphasis on increasing the spread of Seasearch records. In two instances the selected sites were in the vicinity of previous Seasearch records with the aim of collecting data to contribute towards monitoring any gross changes in communities. The DORIS map can be seen at http://www.dorsetwildlifetrust.org.uk/doris.html and a map and details of the Closed Area can be seen in the Appendix.

Diving practice

All divers on the survey were volunteers, had been Seasearch trained and were familiar with Lyme Bay diving in circa 25 metre depths. Four dives were carried out over the two days. Underwater visibility varied from two to four metres in blooming plankton, with better visibility in deeper water. On each site the centre of the site was shotted and buddy pairs volunteered for a direction in which to head whilst recording. A Seasearch Surveyor form was completed by each buddy team for each site using descriptions and species records from each diver. Where photographs, or video were taken, these were used to help complete forms. Seasearch Surveyor forms (thirteen in total) have been lodged with Dorset Wildlife Trust and will be entered on the Marine Recorder data base. The data on the forms and in this report are presented in good faith with the aim of contributing to an accurate picture of seabed topography and biota.

Diving conditions

Surface conditions were excellent, sunny with slight seas and neap tides. Breeze, up to force 3 on Saturday was from the North, changing to southeast during Sunday but blowing less strongly. In-water conditions were 'do-able' with a *Phaeocystis* plankton bloom reducing visibility, the effect of this being greater the closer in to the shore. Water temperature was 11 to 12 degrees Celsius and swell negligible.

Observations

Observations from the dives are presented in two sections, the second of which (page 10) offers an analysis of what was seen. This is intended to take the reader beyond a bare report of what was seen. It is hoped that this and the questions highlighted in blue on page 15 will stimulate discussion.

Target selection

The following considerations played a part in selection of targets:

- No previous Seasearch data. Or:
- The possibility of monitoring communities in areas thought possible to harbour maerl or to develop stony reef community.
- The possible existence of sediment veneers over bedrock.

Bedrock reef habitats in Lyme Bay have been extensively recorded in the past with Seasearch records clustering around areas of rugged bedrock habitat. In more recent years, aided by the DORIS bathymetry, emphasis has begun to change towards filling in 'blanks' in the coverage of Seasearch records, prompting visits to less-rugged habitat and reports have been made of sites where reef biota have been recorded growing through sediment "veneers" over bedrock , boulders or cobbles. As veneer habitats are under-recorded and can harbour unusual species, one of the objectives of these dives was to see if this habitat could be found and recorded. Stony reefs are also seldom-recorded, being vulnerable to disturbance, especially where the average size of individual 'stones' is fairly small. One of the criteria an area of seabed must fulfil to qualify as stony reef (Irving 2009) is that the substratum must be stable-enough to develop a fauna and/or flora of long-lived species growing upon hard surface.

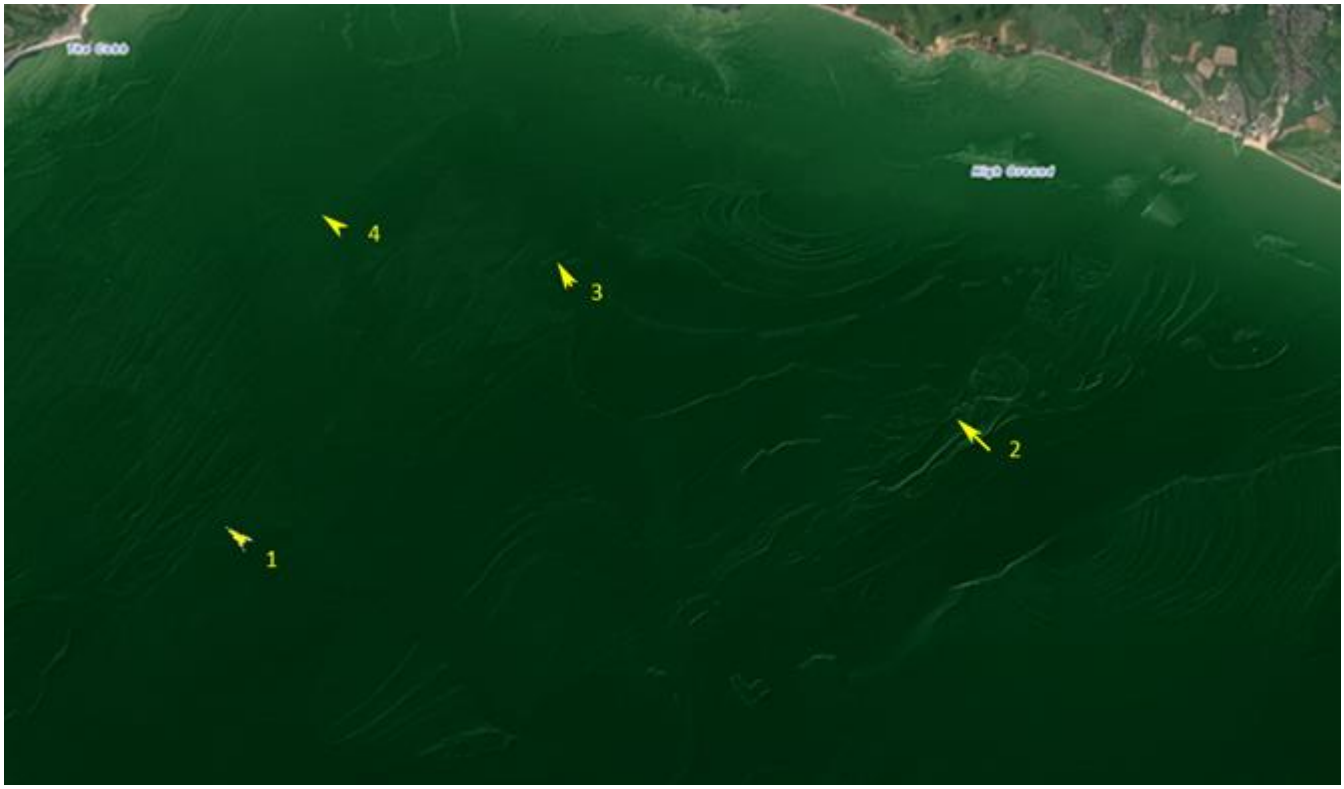

Figure 1: Snapshot of the DORIS bathymetry for Lyme Bay with 2019 dive sites marked.

Divers

Lin Baldock (BMB), Ruth Beaver (RB), Alison Bessell (AMB, Sunday only), Alistair Cott (AC), (Nick Owen (NJO), Cathryn Quick (CEQ), Ben Robinson (BR) Ruth Sharratt (RS). All divers were volunteers.

Summary descriptions of dived sites.

All dive pairs were asked to produce Seasearch forms for each site and these are lodged with Dorset Seasearch and will be uploaded to the National Biodiversity Network via Marine Recorder in due course. The completed forms were used to produce the seabed and habitat descriptions in this report. Site names are arbitrary and serve only to distinguish between sites. Bracketed letters after species names are SACFOR abundances. Depths on site diagrams are given as metres Below Sea Level (BSL) and positions are of the shot, taken from the dive boat GPS and use the WGS84 datum. All dates are of the format yyyymmdd with "a" and "p" added for dive 1 and dive 2 for ease of sorting of records.

Site 1 Lanes Ground Cluster Centre.

Date 20190511a

Position 50 40.477'N 02 54.952'W

Lanes Ground is an area of relatively flat seabed clear of obstructions that could impede the use of bottom-towed fishing gear (BTG). In this area there is a cluster of Seasearch records dating back to 2004 (BTG use was stopped in 2008). This location was chosen so as to collect data on seabed community/ies encountered so as to contribute diver records towards monitoring any long-term changes in community in the absence of disturbance by BTG.

Seabed description.

CEQ, BMB and BR went northwest over a "fairly flat seabed" at 26m BSL of "Mixed ground with cobbles, silty sand and gravel" with "bryozoan/hydroid turf and sponges." Large sessile species, including *Pentapora foliacea* (R), *Eunicella verrucosa* (O) *Phallusia mammillata* (O) and several hydroids were recorded. Infauna included *Pawsonia saxicola* (R) and *Myxicola infundibulum* (R).

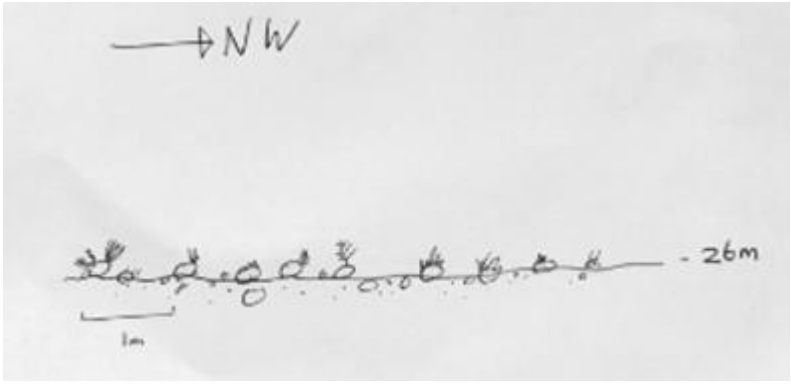

Figure 2. Seabed sketch copyright CEQ. note sessile species shown on clasts.

RS and NJO recorded a slightly silty stony reef on flat seabed composed of small boulders, cobbles and pebbles with patches of gravel and shell fragments/muddy sand between. Small areas of underlying stiff, piddock-bored blue-grey clay were seen and photographed. Clasts* supported a diverse turf of sponges, hydroids, bryozoan crusts, squirts (*Phallusia* prominent) and frequent small to medium *Eunicella*. Small foliose red algae were present but rare. Frequent Free-swimming, palm-sized *Pecten maximus* (F), and dead *P. maximus* shells (C) in all states of colonisation from fresh to eroded/encrusted were noted.

***Clast:** A fragment of rock broken off larger rock. A separate piece of mineral geological detritus broken or eroded out of a geological deposit and of a size ranging from that able to be picked up individually in the fingers to boulder size. Source: Various, geology, informal.

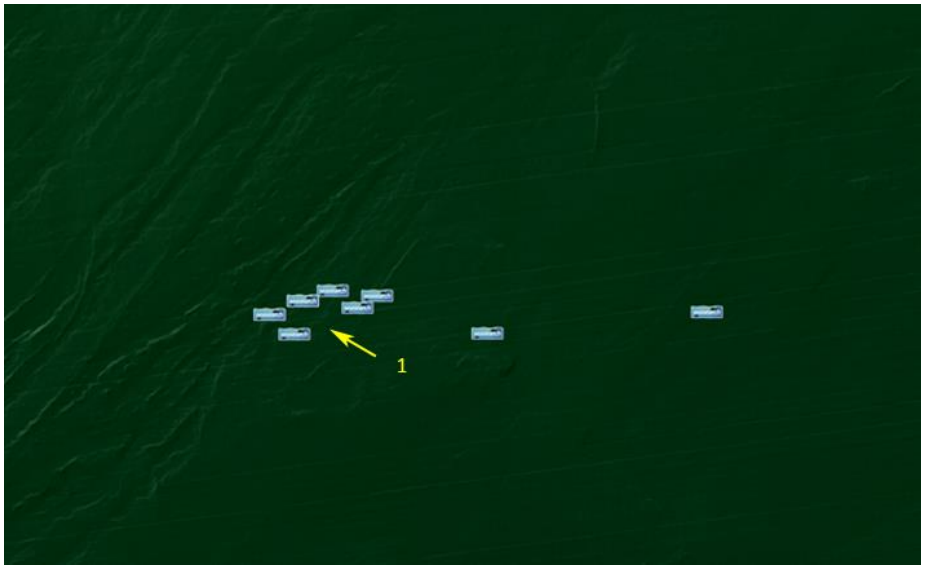

Figure 3: Dive 1 Lanes Ground Cluster Centre

Image 4. Bioconsolidation of clasts: left hand image shows several pebbles in the right-hand part of the image linked by the sponge *Iophon sp*. (also overgrowing foliose red algae) and a small gravel flake with a coralline crust (black arrow) linked by *Iophon*. The right hand image shows the same flake lifted and rotated about its long axis to expose the lower face – the *Iophon* 'bridge' was torn away to do so. Diver's fingers for scale.

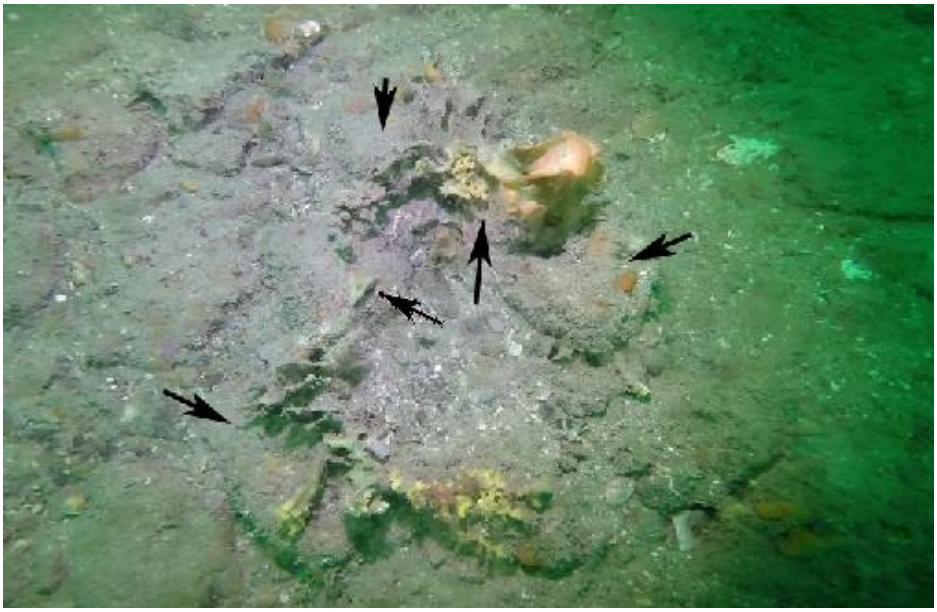

Image 5. Gopro snapshot showing a degenerate *Pentapora* colony growing over at least five clasts (arrowed).

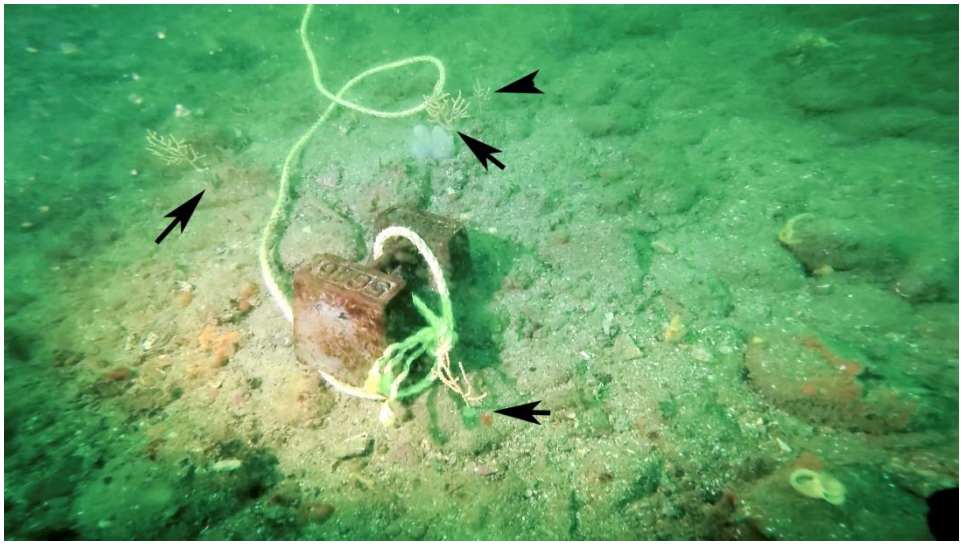

Image 6. Gopro snapshot showing typical substratum encountered with four *Eunicella verrucosa* (black arrows). Note size of colonies, small size of clasts and presence of pebbles and gravel/shell fragments.

Site 2 Inner Sawtooth Ledges, Long Ledge.

Date 20190511p

Position 50 41.025'N 02 48.409'W

Clusters of Seasearch dives have been recorded to the northeast (Inner Sawtooth Ledges) and southwest (Outer Sawtooth Ledges) of this site and more dives on the bigger parallel reef feature to the South. The feature chosen is a long, narrow and low but relatively sharply-defined feature running NE to SW on the NW side of a long oval of flat sea bed. This site was chosen so as to investigate the raised feature and to find out whether the flat seabed is sediment (thought to be the case) or veneer over flat bedrock.

In the slight sea conditions, this relatively small feature was clearly visible on the sounder and the shot was skilfully placed on the pre-selected numbers right at the base of the raised feature on the transition between reef and flat seabed in 24.9m BSL. BMB and RS on nitrox 32% volunteered to survey the flat area. RB and AC headed to the reef and turned southwest whilst CEQ, BR and NJO took a brief look at the sediment immediately around the shot and then headed directly up the slope from the shot before going northeast along the ridge.

Figure 7: Site 2, Inner Sawtooth, Long Ledge

Seabed description.

As indicated on the DORIS bathymetry, this site is a long, low , narrow ridge to the north and west of a trough filled with sediment. Five habitats were observed but note that 'Habitat 3' is itself a mosaic of habitats:

Habitat 5 (deepest). BMB and RS found: "Soft sediment composed of mud, silt (largely faecal pellets) and fine fragments (equivalent to medium sand) of shell with burrows and holes. Solitary tunicates, *Corymorpha nutans* and burrowing brittlestars prominent. Polychaete tubes abundant. There may be pebbles and cobbles buried beneath the sediment since seafans, *Aiptasia* and *Nemertesia ramosa* were recorded" along with the nationally scarce sponge *Adreus fascicularis*.

Habitat 4: A narrow band of soft silt/mud and biogenic fragments forming a veneer over bedrock along the base of:

Habitat 2: Southeast-facing silty bedrock slope with some boulders and cobbles supporting a forest of *Eunicella* and erect sponges with many juvenile *Eunicella* and large, densely-branched specimens, extending across the whole of the slope to the SW of the shot.

Image 8: 1488_02_00 View southeast down the main slope towards the shot showing *Eunicella* forest with sponges on silty (veneered) rock. *Chartella* can be seen on the slope lip (foreground) only. Contrast with image 9.

Habitat 1: Sponge and bryozoan habitat. Northwest of the shot the habitat began to include increasing amounts of *Chartella papyracea* with diverse sponge crusts and cushions, common *Aiptasia mutabilis* plus *Alcyonium digitatum* and *Pachmatisma johnstonia* increasingly seen along the lip. The bedrock appeared to become much more 'knobbly' and *Eunicella* disappeared from the habitat as 'knobbles' and *Chartella* became more prevalent.

Image 9: 1493_02_14. Break in main slope looking SW along the line of the ledge from a position some 25m to the NE of the shot. Note presence of *Alcyonium digitatum* and massive *Pachymatisma johnstonia* on the slope crest. They are also on the vertical. The band at the slope crest just to the left of the break is dominated by branched bryozoans (*Chartella* predominating) with very diverse sponges and lots of other biota. The cross section X-Y on the site diagram runs through this point.

Habitat 3: Beyond the break in the slope to the north, the reef fell gradually away in a series of silty small ridges and silt-filled gullies supporting a mosaic of habitats not surveyed in detail due to lack of time.

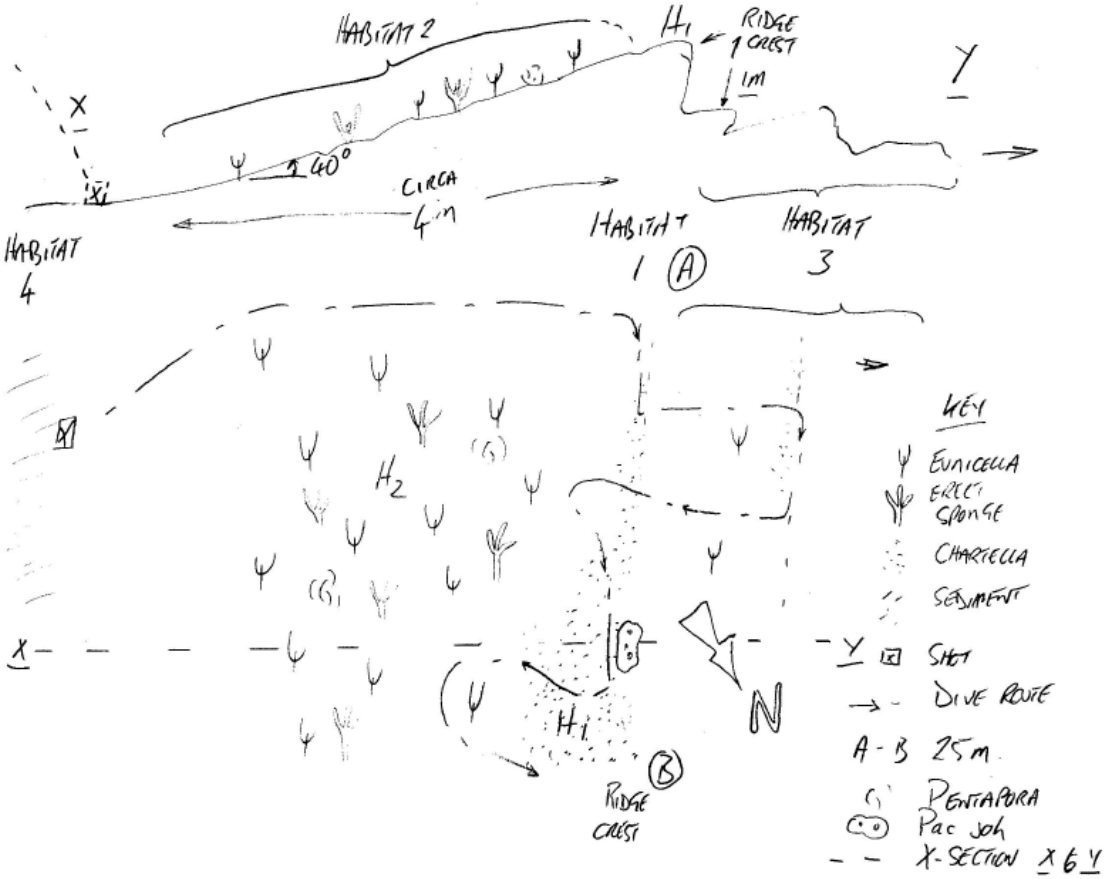

Figure 10: Diagram of habitats as surveyed by NJO/BR/CEQ

Site 3 Nick's No.8.
Date 20190512a
Position 50 41.939N 02 52.051W

This site was well down on the list of 'possibles' for the trip, originally in the queue behind some sites in shallower water, closer to the Cobb, but the blooming plankton meant that slightly better visibility was to be found in deeper water, so this site was 'promoted'. This general area is in a gap in Seasearch data – the icons in figure 11 show dive sites on the two reef ridges to the south and southeast, but this site was thought to be a possibility for sediment veneer on flat bedrock or in-situ-eroded slabs. The shot was dropped on the 'numbers' as the sounder showed no particular features. Each dive pair was asked to head away from the shot in a different compass cardinal direction. Underwater visibility was 2m for large objects but the dense *Phaeocystis* bloom reduced usable visibility for recording smaller species/features to around 1metre and settled/trapped bacterial material tended to obscure smaller sessile species.

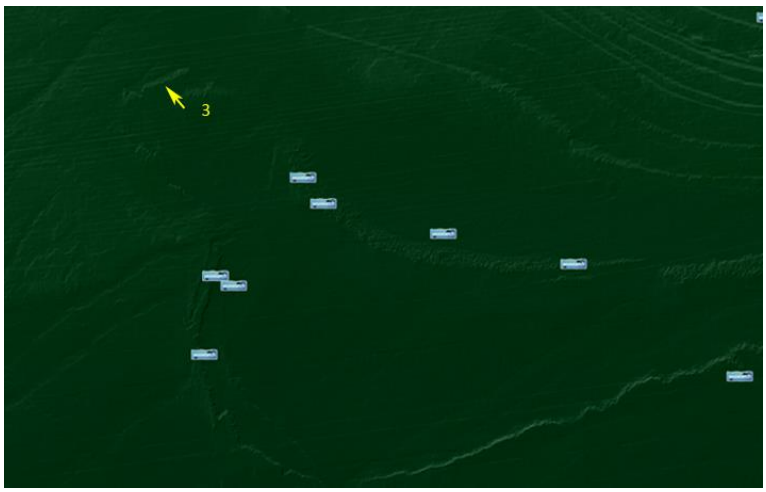

Figure 11: Dive 3 'Nick's No. 8'

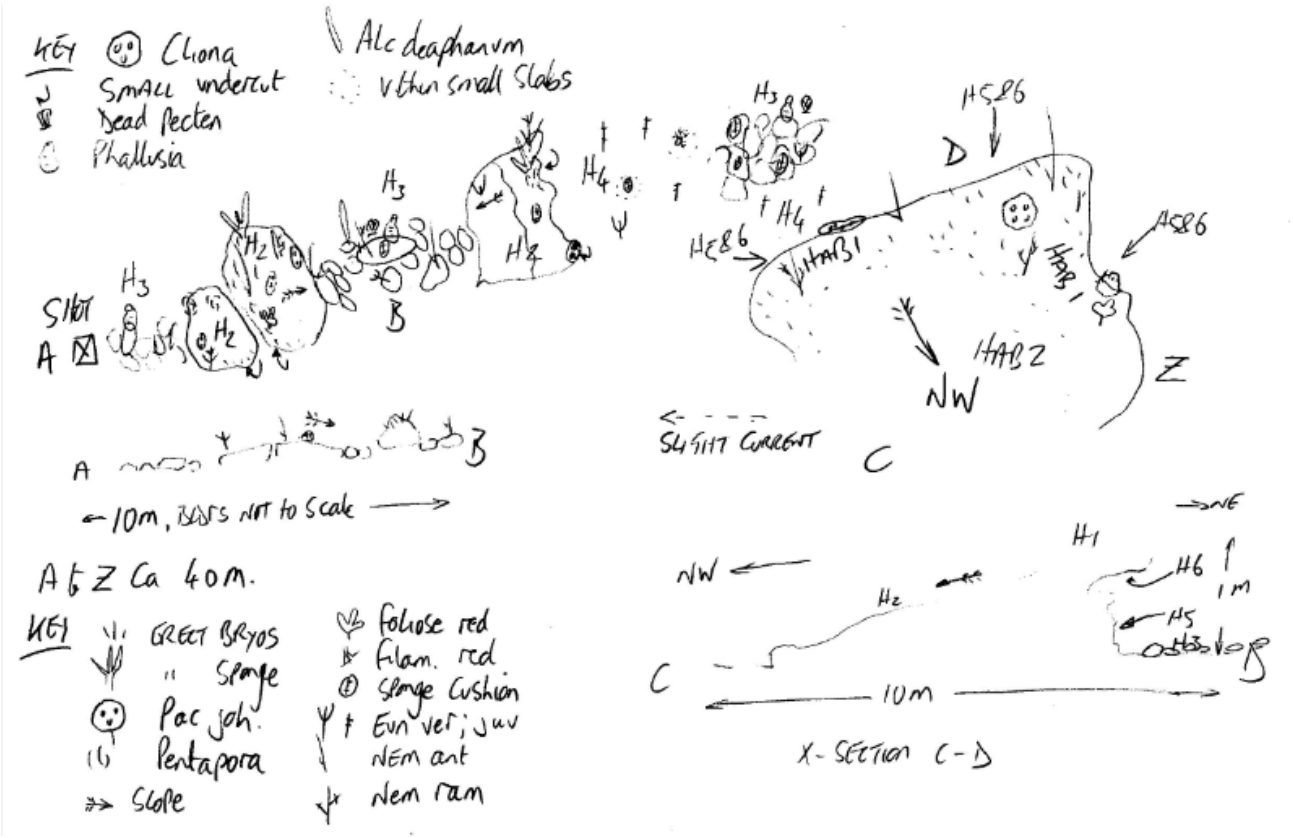

Figure 12, Site diagram, Nick's No.8

Seabed description.

CEQ and BR went north and recorded: Mixed sediment with pebbles, cobbles and occasional small boulders at 22m (BSL) dominated by bryozoan/hydroid turf and sponges. Occasional patches of rippled gravel/sand.

BMB and RS went south and recorded: Level seabed of small boulders and (towards the end of the dive) bedrock with a fauna of hydroids, bryozoan turf and sponges. Patches of pebbles and muddy shell gravel forming a mosaic between the rock. Occasional *Eunicella* noted, some of which were dead and heavily fouled.

AMB and NJO were assigned 'west' and covered around 40m across a gentle current over a habitat mosaic on silty mixed ground of in-situ-eroded slabby boulders, (Habitat 2) cobbles, pebbles and stony reef (Habitat 3) all on a flat sea bed and supporting a diverse fauna dominated by sponges, bryozoans and tunicates modified by patches of deeper silt/shell fragment veneer on lower rock surfaces (Habitat 4). Towards the end of the dive they encountered an area of slightly tilted elevated bedrock to their northwest and turned to investigate. The rock was sheared at 1to 1.5m above the surrounding seabed and faced south through west and gently sloped towards the northwest with verticals (Habitat 5) overhangs (Habitat 6) and a band of taller, bryozoan and sponge dominated turf lacking *Eunicella* on the lip (Habitat 1).

Three of the 6 biotopes were recorded in detail:

Habitat 2: Boulder slab tops and top of reef section with a rich silt veneer-influenced turf of sponges (branching and cushions), bryozoans, tunicates and hydroids with rare large *Eunicella* (mostly odd shapes and encrusted) and occasional smaller *Eunicella*, clumps of solitary tunicates and some large *Cliona celata*. Red algae present.

Habitat 1 was Bryozoan (*Chartella*) dominated turf in a band around the edge of the 1m-high raised ledge at the end of the dive with hydroids and sponges, many *Aiptasia* and no *Eunicella*.

Habitat 3 was Stony reef of slabby boulders, cobbles and pebbles with patches of gravel, more silty than above with fewer branching sponges, *Nemertesias* and more *Phallusias*. *Eunicella* occasional. Red algae present. Difficult to record owing to dense plankton bloom settling onto biota and substratum.

Habitats 4, 5 & 6 were not surveyed in detail due to time constraints but were:

4 Low-lying rock with veneer of silt and shell fragments with sparse animal turf

5 Verticals on raised bedrock reef at dive end with bare rock, piddock holes and sponge crusts.

6 Overhangs on raised bedrock reef.

Site 4, **Lyme Roughs Southwest**
Date 20190512p
Position 50 42.112N 02 54.086W

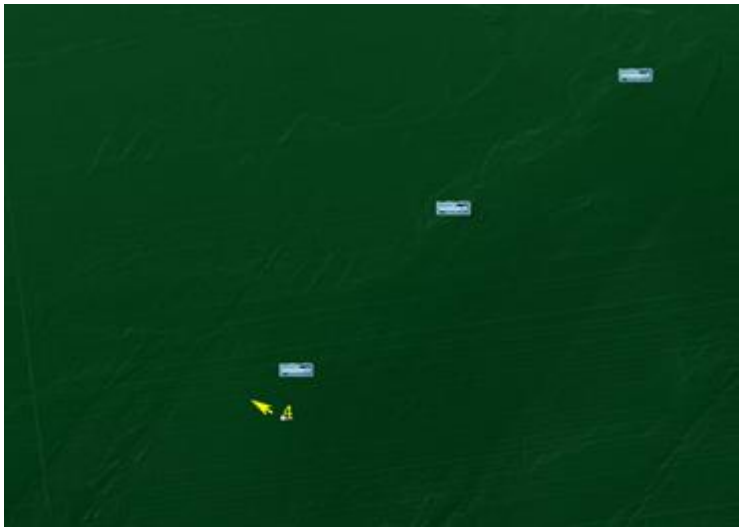

Figure 13: DORIS snapshot of Lanes Ground Southwest.

Like Lanes Ground, Lyme Roughs has a history of use by bottom-towed gear and has been Seasearched previously, The presence of live maerl has been mentioned on a couple of these survey events. This site was selected to investigate whether live maerl could be found a little further south and west than on previous dives. If so, was it a 'maerl bed'?

Seabed description.
CEQ and BR encountered "Flat seabed at 20m (BSL) with mixed ground, cobbles and pebbles". They recorded "some live maerl. Coverage of live maerl increased as we swam north" and covered over 20m.

RB and AC went west and recorded: "Maerl bed 6% live and pink 24% dead, all damaged and very broken up. Angular pebbles. Occasional boulders many encrusted with *P. mammillata* and serpulid worms. *Phallusia mammillata* often covered partially with *Ophiothrix fragilis.* Many broken shells - empty queenie shells, slipper limpet shells , shore urchin shells - and sand. Dominant species were *Aequipecten*, *P. mammillata* and brittlestars." SS.SMP.MRL

BMB and RS recorded: "Level seabed of pebbles, cobbles and scattered small boulders with dead maerl gravel, stone gravel and silt between at 20m BSL. Small proportion of live maerl (up to 5% in places). Fauna of serpulid worms, sparse hydroids and *Aequipecten opercularis*. Divers went south and covered about 40m". Low outcrops of bedrock were seen towards the end of the dive and a butterfly blenny (*Blennius ocellaris*) was seen inside a whelk shell.

Image 14: Serpula vermicularis with operculum, copyright Ruth Sharratt.

NJO and AMB went east approximately 100m over a flat seabed of 'mixed ground' of cobbles and pebbles with abundant coralline crusts on clasts and shell pieces and rare small boulders with live and dead maerl at about 15% coverage (30% live 70% dead). Clumps of solitary squirts were seen on clasts. Maerl pieces were ball-shaped to 'twiglets' with visible white dots on many pieces. Digging indicated that sediment clasts were supported by muddy fine sand.

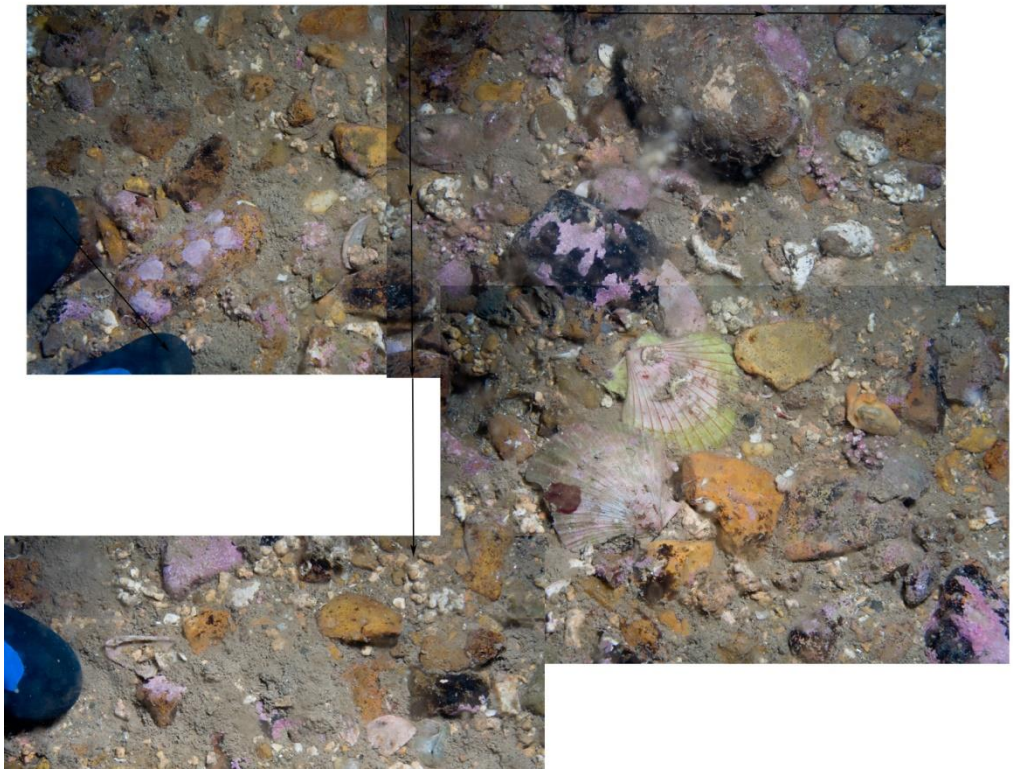

Image 15: Part of a composite made up of four DSLR shots of a patch of seabed chosen at random. In an area of 15X15cm (225 square cm) there were 6 live and 7 dead (white) maerl pieces plus some buff (fossil) pieces. Measuring off the image gave an estimate of total area of live maerl of 62.4 square mm or 2.8%. This percentage, based on a single small random sample should of course be treated with caution, but video runs taken on the dive indicate that the incidence of maerl recorded in the image above is typical of that recorded throughout the dive.

Dive No./Date	Site name	Position (WGS84)	Notes
1 20190511a	Lanes Ground Cluster Centre	50 40.477N 02 54.952W	stony reef with sediment
2 20190511p	Inner Sawtooth, Long Ledge	50 41.025N 02 48.409W	sloping reef over sediment to south and small ledges to North
3 20190512a	Nick's No 8	50 41.939N 02 52.051W	sediment, stony reef and low-relief bedrock outcrops with sediment veneer
4 20190512p	Lyme Rough Southwest	50 42.112N 02 54.086W	maerl bed on mixed ground

Table 2. Dived sites and positions.

Analysis of observations.

Individual sites.

The four dive sites surveyed proved to be four extremely interesting and varied sites:

Site 1, Lanes Ground Cluster Centre, Stony reef.

The substratum throughout the dive was composed of mixed-size, mostly rounded pebbles and cobbles with the the largest clasts recorded being small boulders. Gravel and shell fragments were also recorded. Apart from a couple of small patches of blue clay, no evidence of underlying geology was seen. NJO went digging to hand-depth in several locations and found only mud (accumulated silt), shell fragments and more clasts. Despite the diversity in size of the clasts and relatively small maximum size, the substratum throughout the dive supported a highly diverse turf. This indicates that the substrate is stable, an observation which is backed up by observations

such as well-grown *Eunicella* colonies on clasts fist-sized and smaller, coralline crusts on upper surfaces only of pebbles, degenerate large *Pentapora* colonies bridging several cobbles and pebbles and sponge cushions (especially *Iophon sp*.) linking several clasts.

Apart from one very badly damaged and encrusted specimen all the many *Eunicella* seen were smaller than hand-sized - perhaps an indication that they all originate post 2008 (<10 growing seasons old).
Many free-swimming juvenile Pecten maximus were seen, but no large, old specimens were recorded, although dead shells of a variety of sizes apparent ages since death were present.

Site 2, Inner Sawtooth Ledges, Long Ledge, mud, silt veneer and bedrock reef.

Species diversity on Long Ledge as a whole was very high. One observer recorded 19 species of sponge plus others not identified in situ. Habitat diversity was especially high in Habitat 1 (Sponge and bryozoan community) and quite a bit of time was spent here by all three divers of the recording group. In the low visibility, this strip stood out in the video (see Image 9) due to its supporting a dense turf with a noticeable component of *Chartella papyracea,* rare in the rest of the site. *Chartella* was present in the turf further back in the dive route, but did not appear to spread away from the immediate crest. The more silty *Eunicella* with branching sponges community (habitat 2) appeared to be present closer to the crest in this section of reef See image 8.

The turf of the sponge and bryozoan community (**habitat 1**) appeared on first impression to be growing on very knobbly rock. The 'knobbles' were golf-ball-sized, fist-sized or bigger and were covered in bryozoans, sponges, worm tubes and other species. When poked, the knobbles were not hard but firm and resilient, incompressible and no contraction was seen. Although concentrated in the area on which the dive ended, the 'knobbles' were also scattered in the transition to Habitat 2 (the reef slope) and may have been present elsewhere on the ridge.

Image 16: Gopro snapshot 1494_00_09 showing 'knobbles' underlying Habitat 1. The sponge masses here are 2 finger joints to 1 finger high. **Front cover**: Macro shot of single 'knobble' showing epizoa.

One knobble had a very small sample removed and spicules later analysed (NJO). Results were inconclusive with a wide range of spicules observed. One possibility is that the sponge sampled was *Stryphnus ponderosus* as characteristic spicules were present in large numbers) but that the sample was contaminated by epizoic sponges. *S. ponderosus* is known to be cryptic "Almost invariably coated with other sponges"..."or bryozoans, and consequently not obvious to the eye when seen in situ." (Ackers et al 2007
Observations on site indicated that Habitat 1 (the sponge/bryozoan community) was founded on sponges (*Stryphnus ponderosus*). It is possible that at this location, *S. ponderosus* is acting as a keystone species, changing niche dimensions to suit a wide range of epibiotic species by flowing enough water to keep its surface free of fine silt. This possibility would bear further investigation and if true, this is an observation of particular interest.
Habitat 2 was silty *Eunicella* and erect sponges quite often seen in Lyme Bay but noteworthy here for the numbers and age range of *Eunicella* colonies including some apparently aged colonies in excellent condition.
Habitat 3, on small-scale broken ends of strata to the N and E of the main ridge, was not surveyed in detail. The varied substratum supported a small-scale mosaic of habitats determined by aspect/elevation/current shelter and amount of silt which might re-pay further investigation.

Habitat 4 was a band of silty sediment veneer on the transition between Habitat 2 and habitat 4 (the shot was in this habitat).
Habitat 5 was soft sediment in 25m or more of water with abundant mounds and burrows of very varied morphology, likely indicating that this habitat has not been disturbed for a considerable time. The geography of the site with a long, narrow trough of sediment running diagonally across the prevailing tidal streams and bounded by rocky ridges on all sides would make the deployment of bottom-towed gear difficult. This might be an area of soft sediment in Lyme Bay which has never seen bottom-towed gear and would be worthy of further investigation to test this supposition.

Site 3, Nick's No.8

In the low visibility, habitat variations were difficult to discern and it was easy to record this site as 'mixed ground'. However, this classification does not adequately sum up what is actually present: A veneer-influenced habitat mosaic on gently dipping low-relief hard sedimentary bedrock eroded in-situ into slabs and low, raised areas overlain (**habitat 2**) with cobbles, pebbles and patches of gravel (**habitat 3**) and muddy biogenic fragments. The following images illustrate this.

Image 17: gopro snapshot at 00:47 showing silt-veneered low-relief bedrock slabs with a deeper veneer in the centre and left. 10 seconds later in the same clip (00:56), same location after wafting we have:

Image 18: hard, flat bedrock revealed under a thin covering of fine silt. Note *Alcyonidium diaphanum*, small erect sponges and the odd *Polymastia* with short, 'closed' papillae in front of the diver's thumb.

Is this habitat 2 (boulder/slab tops) or habitat 3 (pebbles and stony reef) or neither? A short distance away we found:

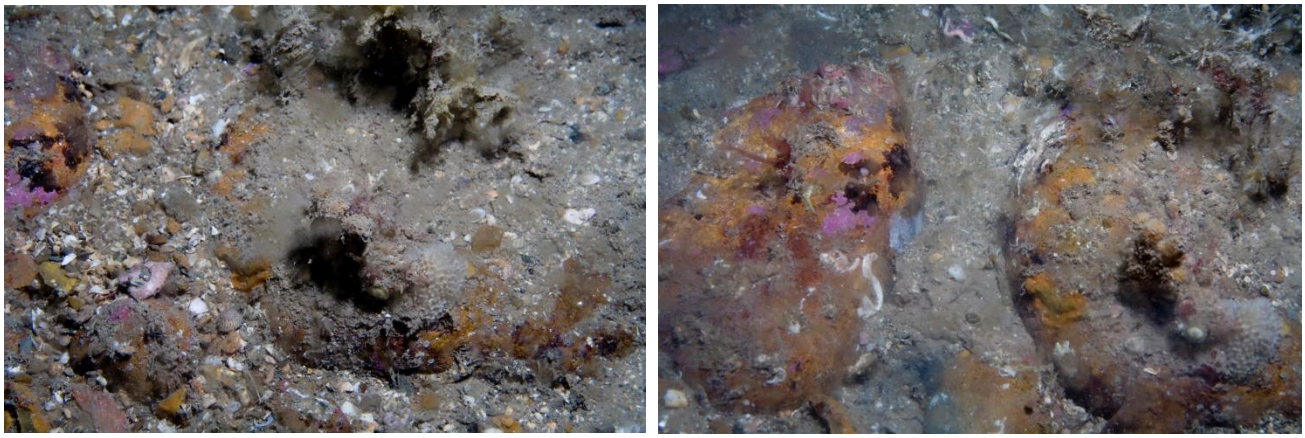

Image 19: Left image (3896NJO) pebbles with silty sand/biogenic fragment overlay. Right image (3897NJO) shows the same location after wafting, revealing more detail of biota. Habitat 3 (veneer influenced stony reef).

Habitat 3 (pebbles and stony reef) is also shown in the following gopro snapshot. Cobbles and pebbles can be seen plus a few of the sponges (*Iophon sp.* and *Haliclona oculata*) that combine with other smaller species to indicate that this substratum is stable enough to qualify as 'stony reef' rather than being 'large-clast sediment'. The poor quality of the image illustrates how difficult it is to record and differentiate between these two habitat classifications in poor visibility.

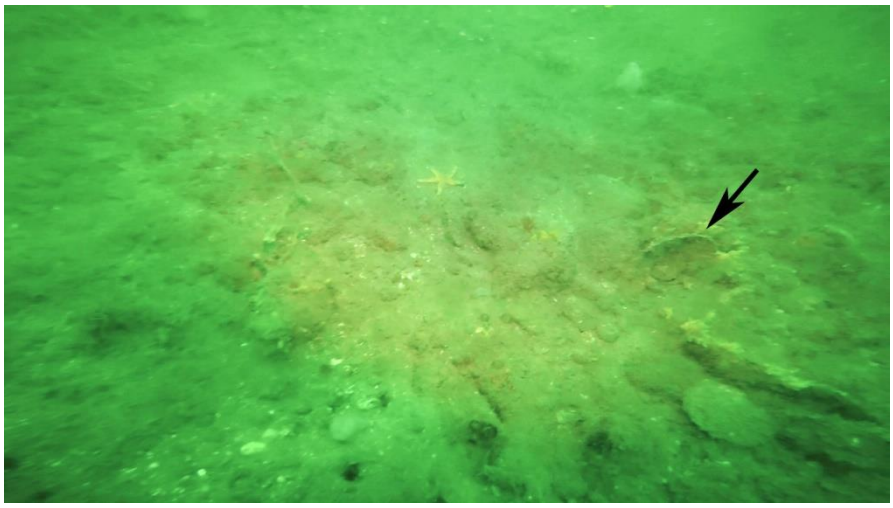

Image 20 (1503_00_13) veneer-influenced stony reef with sponges, *Aiptasia, Phallusia* and dead *Pecten maximus* shells. The large, old *P. maximus* shell arrowed is wedged deeply into sediment next to a cobble and indicates previous disturbance of the substratum.

Previous page: Image 21 Gopro snapshot (1497_01_18) from close to the shot showing Habitat 3 stony reef (left) and bedrock slabs (Habitat 2) with more-diverse turf including hydroids, bryozoans, erect sponges and *Pentapora*. The dark patch at upper far left is a diver (there really is one) who is about 2m away.

Site 4, Lyme Rough Southwest

The whole area dived was a maerl bed with live maerl at 1% to 5% coverage evenly spread over the entire area dived - approximately 150m total distance divided between north, east and south from the shot. The pair who travelled west from the shot reported signs of past seabed disturbance in the form of many broken shells and the maerl bed being broken up.

The pair who went east (100m covered) reported that clasts present appeared to be matrix-supported: fingers could quite easily be worked into the silty sediment between clasts. No bedrock was found when probing and infauna was notably rare. Pebbles with coralline crusts examined had live crusts on upward faces only - sediment-embedded faces examined were clear of live material. Pink and white maerl pieces were almost uniformly 3 dimensional and rounded - few maerl 'twiglets' were found whilst buff (fossil) pieces of maerl were fragmentary. Some slight 'drifting' of silt on the substratum surface was noted. Larger sessile species (hydrozoa, solitary tunicata) were almost restricted to tops of larger, taller cobbles and small boulders and the *Alcyonium* seen were all young/small.

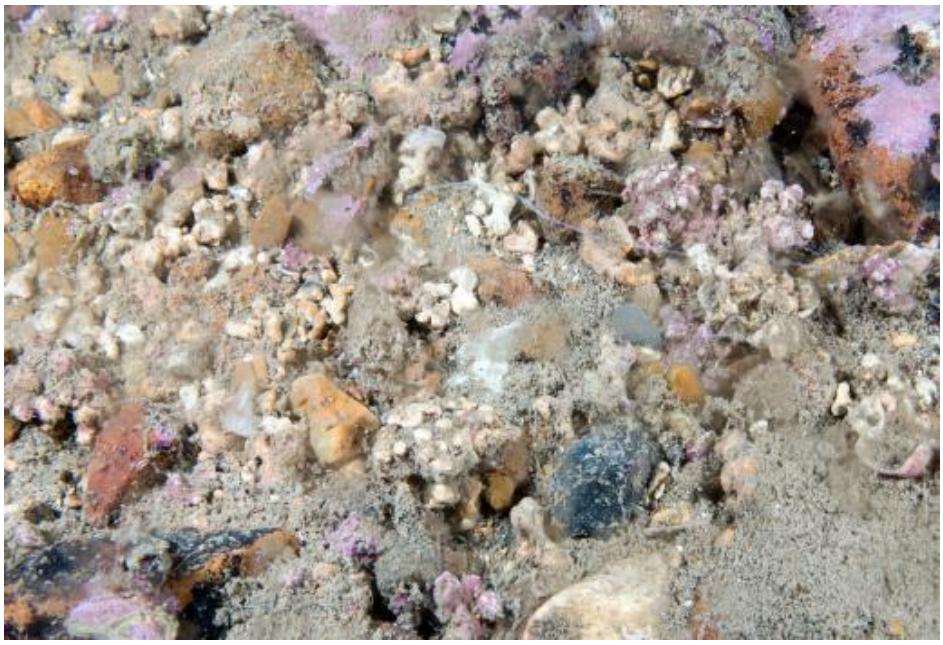

Image 22 DSLR macro shot of seabed showing silty live and dead maerl amongst geogenic gravel with coralline crusts. Copyright BMB.

Summary of observations.

Site condition/biodiversity.

All sites were in apparently good condition with little sign of recent disturbance save the note of damage of the maerl bed to the west of the shot at Lyme Roughs. Recorded diversity of species varied from site to site, partly dependant upon diversity of the available substratum. Taken together, the sites provide an interesting snapshot of the biodiversity of Lyme Bay, including areas which are not the bedrock reefs which have long attracted divers to the area.

Individual sites.

Questions arising from observations and suggestions for future work are set down here in blue text.

1 Lanes Ground, supported a varied and diverse species list despite the substratum being ‘mixed ground’ composed of stones and rocks of small boulder size down to gravel and muddy biogenic fragments. This site qualifies as ‘stony reef’ (Irving 2009).

1. Some evidence of bioconsolidation of the substratum was seen with sponges and *Pentapora* linking clasts together.
1.1 Will bioconsolidation of stony reef continue on this site and become more visible in the future?
2. Bioconsolidation and the presence of larger, long-lived species on smaller clasts argues that this site has been stable for some years.
2.1 Has the substratum at this site been stable since 2008 or was there some disturbance in the stormy winter of 2013/14?
3. The frequent *Eunicella* recorded were almost universally hand-sized or smaller, perhaps indicating that they had begun growing since the cessation of the use of bottom-towed gear in 2008.
1.3 Is this assertion valid? Could an average age of *Eunicella* on this site be established through sampling or measurement in situ to test this?
4. Many *Eunicella* were seen growing on clasts fist-sized and smaller.
1.4 What will be the eventual fate of these colonies? Will they eventually topple their stones as they increase in size and the fallen *Eunicellas* then die?
5. Many free-swimming young *Pecten maximus* were seen, but notably few large individuals.
1.5 Is this a constant feature of this site or part of a re-colonisation by this species?

2 Inner Sawtooth, Long Ledge showed considerable topographic variation in a small area.
1. Habitat 5 (soft sediment with abundant life apparent) may never have been subject to disturbance by bottom-towed gear. If this is so, this is a rare circumstance in inshore waters.
1.1 Further investigation of the habitat in this location is desirable. (The site was re-visited in August 2019).
2. Habitat 2 is an excellent example of the *Eunicella* and erect sponge 'forest' that is a feature of Lyme Bay reefs.
2.2 How much of this habitat is present here?
3. The sponge and erect bryozoan community (habitat 1) appears to be founded on a dense aggregation of cushions of the sponge *Stryphnus ponderosus*.
3.1 Is habitat with the particular set of features noted to be found elsewhere along this ridge?
3.2 Is it a discrete biotope and is *Stryphnus* acting as a keystone species? Careful observation of depth differentials (if any) between this habitat and neighbouring areas of *Eunicella* 'forest' would be useful.
3.3 Sampling of sponges on the site as a whole might be instructive.
4. Silt veneer is present on this site in a band between deep sediment (habitat 5) and the sloping habitat 2. Very similar silty bedrock was seen in the 'gully bottoms' in Habitat 3.
4.1 How much silt veneer habitat is present here and does it support species not found elsewhere in this vicinity?
4.2 Further investigation of habitat 4 (silt veneer) would be useful. (A re-visit took place in August 2018).

3 Nick's No.8
Habitat mosaics are increasingly being recorded in Lyme Bay. The habitat on this site was difficult to record in low visibility, but stony reef and rocky reef were both recorded, both influenced by silt veneers.
3.1 To what extent does the presence of a silt veneer retard or eliminate possible long-term development of 'reef' community features on positionally stable clasts?
3.2 Does a silt veneer hinder the recognition of stony reef (as opposed to large-clast sediment) by simply hiding small-scale structure from a video camera or diver's eye?

4 Lyme Roughs Southwest.
1. A maerl bed, similar to that studied for many years by Ken Collins of Southampton University off Ballard Down/Swanage Bay further east in Dorset. Maerl beds with live maerl present in the 1-5% coverage range may not be counted as active beds by some workers. Note that the small size and wide spacing of the maerl thalli and usual poor visibility on Lyme Roughs would make survey by drop-down video extremely difficult.
2. It is also possible that if surveyors are familiar only with luxuriant beds such as those in the Fal/Helford, 'sparse' beds like this might be interpreted as 'damaged' or just disregarded.
3. It is possible that in this location tide or tide/wave action-driven bedload movement of silt and small/biogenic particles occurs, moving maerl. Water movement (e.g. during storms) may topple small clasts with larger sessile species acting as sails, therefore preventing or slowing the build-up of biodiversity on a small-clast stony reef and helping maintain conditions suitable for maerl.
3.1 How far does this Lyme Bay maerl bed extend?
3.2 How much carbon is sequestered in this maerl bed?
3.3 How far down in the substratum can dead/fossil maerl be found?

Acknowledgements

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Funding from the FLAG (Fisheries Local Action Group) in Dorset through a grant awarded to Dorset Wildlife Trust is gratefully acknowledged.
All DORIS snapshots are taken from the Dorset Wildlife Trust website . Seabed Imagery © Dorset Wildlife Trust Contains Maritime and Coastguard Agency data, Crown copyright
The support of the Dorset Seasearch Coordinator Lin Baldock in the organisation of the 'Lyme Bay early-season trip' over many years should be acknowledged.
All Seasearch Surveyor forms from these dives have been lodged with Dorset Wildlife Trust.

References

1 Ackers, R. Graham, Moss, David, Picton, Bernard E., Stone, Shirley M.K. and Morrow, Christine C., "Sponge V" Sponges of the British Isles, Marine Conservation Society, 2007
2 Irving, R. 2009. The identification of the main characteristics of stony reef habitats under the Habitats Directive. Summary report of an inter-agency workshop 26-27 March 2008. JNCC Report No. 432

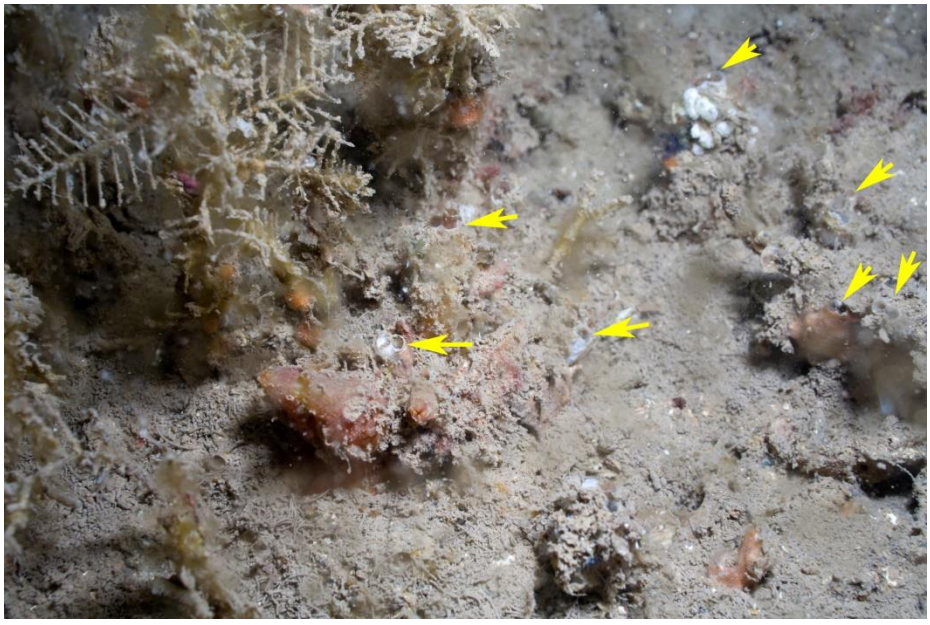
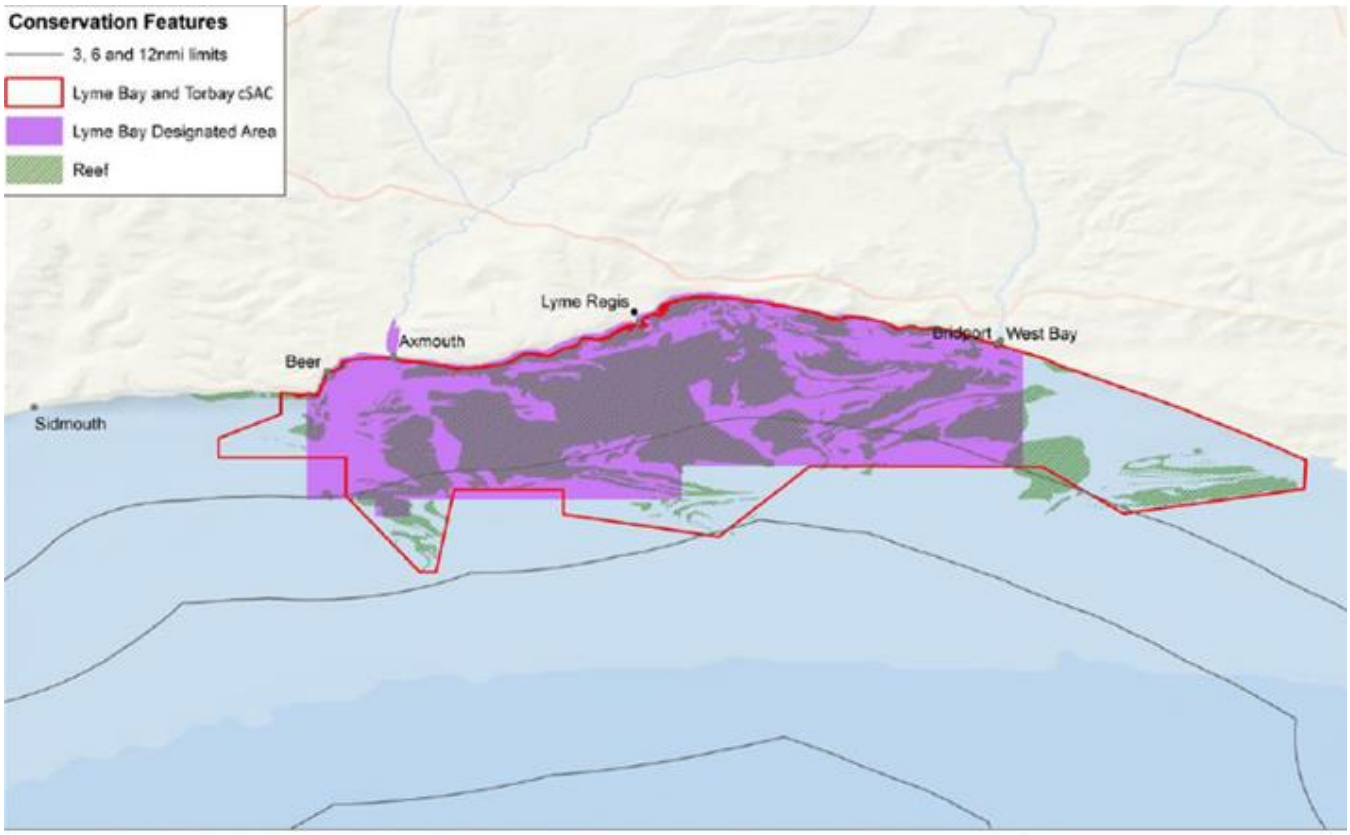


Image 23 (3926NJO) Site 3 (Nick's No. 8) Habitat 2. Twinned calcareous siphonal tubes (yellow arrows) of the rock boring flask shell *Rocellaria dubia* protruding above silt veneered bedrock and supporting diverse epifauna including bryozoan crusts, sponge crusts, tunicates and *Spirobranchus* worms..

Image 24, Kirchenpaueria pinnata (3897 NJO, Site 4, Lyme Rough) on a cobble and covered in plankton 'caught' out of the water column

Appendix:
The Lyme Bay Closed Area



Data sourced from English Heritage and Natural England ("contains, or is based on, information supplied by Natural England").
Base map sources: GEBCO, NOAA,CHS, CSUMB, National Geographic, DeLorme, NAVTEQ, Esri, and U.S. National Park Service.

The Lyme Bay Closed Area referred to in this report is the area closed to fishing with bottom towed gears (scallops and demersal fish) in July 2008 by the adoption of Lyme bay Designated Area (Fishing Restrictions) Order 2008 (2008 No.1584) and is the area above shown in purple and is also known as the Lyme Bay Designated Area.
http://www.legislation.gov.uk/uksi/2008/1584/pdfs/uksi_20081584_en.pdf

The other area mapped above is the Lyme Bay and Torbay cSAC (candidate Special Area of Conservation) which was presented to the European Commission in August 2010 and is outlined in red. It was later adopted as a Site of Community Importance (SCI). A separate area within this designation is centred on Torbay and is not shown here.

This SCI is proposed for designation in relation to the protection of bedrock reef, biogenic reef and sea cave features and the related flora and fauna those features support, including sea squirts, sponges, anemones, corals, sea fans and bryozoans, some of which include erect species.

http://webarchive.nationalarchives.gov.uk/20140305094342/http://www.marinemanagement.org.uk/protecting/conservation/lyme_bay.htm