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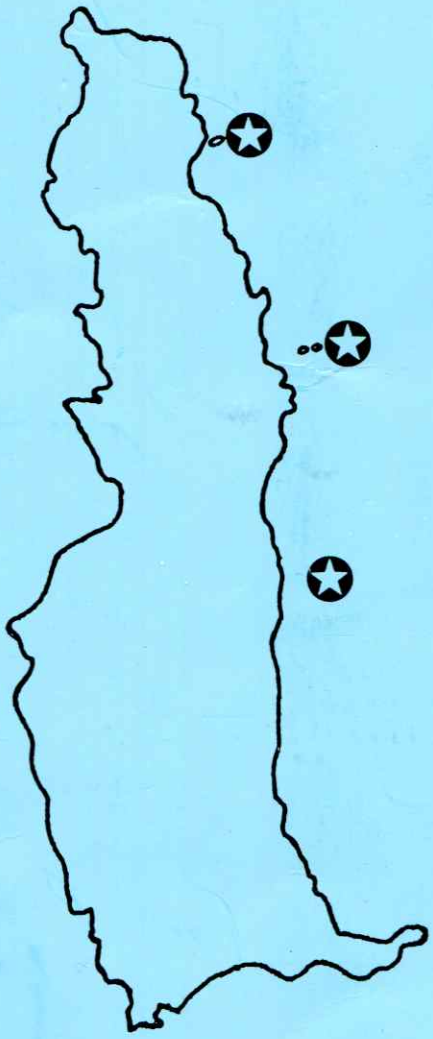
# LUNDY MNR

## SUBLITTORAL MONITORING AND MAINTENANCE

## 1988



MARINE MATTERS ENVIRONMENTAL AGENCY

A Report to the Nature Conservancy Council

from

Marine Matters Environmental Agency

# MONITORING AND MAINTENANCE OF LUNDY MNR SUBLITTORAL SITES 17TH-25TH SEPTEMBER, 1988

by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# MONITORING AND MAINTENANCE OF LUNDY MNR SUBLITTORAL SITES 17TH-25TH SEPTEMBER, 1988

## 1. Introduction and Objectives

In recent years, sublittoral monitoring at Lundy has involved one week's diving to obtain a photographic record of four fixed transect sites on the east coast of the Island, followed by laboratory comparison and interpretation of slide sets between years. (A full historical account of monitoring at Lundy is provided in Appendix 1.) For 1988, based on the recommendations of the 1987 Lundy Report (Howard, 1987), the programme of work was different from previous years.

In particular, it had been decided that detailed comparison of photographic slides was not required annually for stable components of the biological community, but was more applicable on a two to three year basis. However, the transects were to be photographed to provide a complete annual record, should they be required at a future date.

Incorporating other recommendations of the 1987 report the objectives for 1988 were prioritised as follows:

1. To further investigate a population of the Red Band Fish, Cepola rubescens, located in 1987.
2. To carry out essential maintenance at established east coast sites by replacing worn or loose pitons and ring bolts.
3. To individually identify sea fans and axinellid sponges at the Quarry Bay site.
4. To undertake photographic surveys of established monitoring sites at the Knoll Pins, Gannets' Rock and Quarry Bay for record purposes only.
5. To photograph and make records of algae on Algal Limits Transect 4.
6. If time permitted, to determine suitable fixed monitoring sites on the wreck MV 'Robert'.

The timing of the survey was two months later in the year than in previous years, having normally been performed during July and the implications of this are discussed in the text.

All of the objectives were successfully completed with the exception of Item 6 above, for which no time was available.

## 2. Survey of Areas Previously Colonised by *Cepola rubescens*

### 2.1. Re-survey of the site located in 1987

At the completion of work in 1987, a pig-iron, used as an anchor for a surface marker buoy, was left on the seabed to aid relocation of the site. Using transits for positioning over the site, the pig-iron was found within forty minutes in low visibility water. A search of the area in the immediate vicinity of the pig-iron failed to find any *Cepola* and all that was evident were the remnants of burrows filled in with sediment.

As the *Cepola* had been within a 10 m radius of the pig-iron in 1987, a series of circular searches was made around the pig-iron. Three complete sweeps were carried out at 6 m, 14 m and 22 m radii using a diver pair working at the limit of visibility. No *Cepola* were seen but three 'remnant burrows' were found in the area previously colonised by *Cepola*.

The only other burrows found in 1987 were approximately 60 m south of the pig-iron, so this area was also covered by circular searches. Three complete sweeps were made covering a total radius of 25 m. Again, no *Cepola* were seen and on this occasion no 'remnant burrows' were apparent.

## 2.2. Searches off Halfway Wall Bay and Gannets' Bay

As in previous years, divers were towed behind the inflatable on the end of a 50 m length of rope which was trailed astern. The diver was attached to a surface marker buoy. The inflatable was put into gear and made way at minimum engine revs, giving a towing speed of approximately 1 knot.

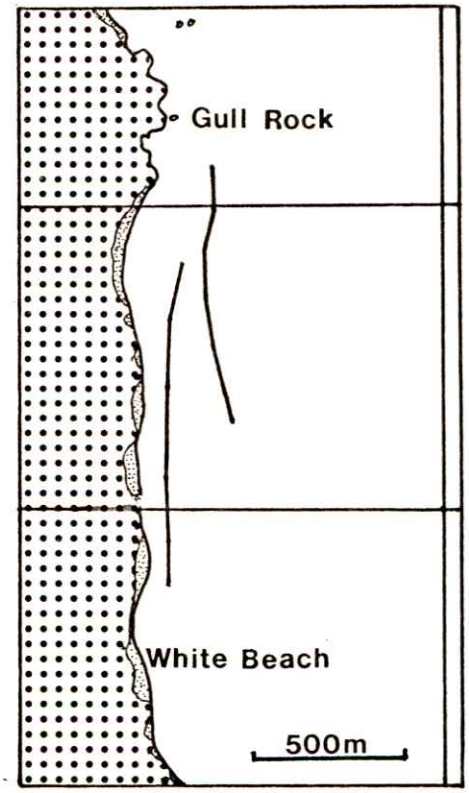
Two tows were conducted for a predetermined 25 minutes each. The first tow started off Halfway Wall and headed south towards the area between Castle Keep and the South Light. The second tow started due east of Gull Rock and headed towards Rat Island. At regular, timed intervals compass bearings were taken on Gull Rock, Halfway Wall, Quarter Wall Cottages, VC Quarry, Time Keepers Hut and the Flag Pole according to position. Lines of tows were then plotted and are shown in Figure 1.

Underwater visibility was low, approximately 4 m, thus only a narrow band of sediment to the left and right of the tow could be searched. No Cepola were seen on either tow.

A diver swim search was also carried out in Gannets' Bay from north to south. No Cepola or burrows were seen (Figure 1.).

## 2.3. Discussion

The absence of Cepola from the 1987 location site raises many questions, mainly concerning the presence or absence of migratory habits of these fish. Little is known of the general biology of Cepola (Atkinson, pers. comm.) but the small group of fish seen in 1987, one male and five females, probably constituted a breeding group. The presence of these fish, normally found in waters deeper than 60 m, in the shallow waters off Quarry Bay (15-25 m) and being exclusively adults, suggests that migrations into shallower water

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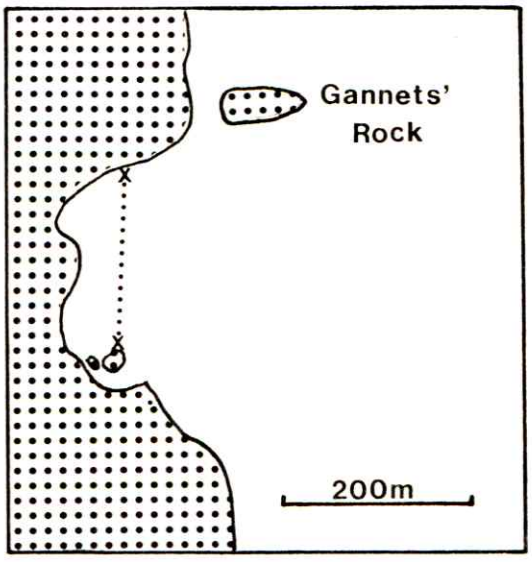


B

Figure 1 Location of diver tows (A) and swim (B) searches. September 1988.

for spawning may occur. Indeed, the sporadic reports of Cepola from Portland and Brixham Harbours, also shallow, may support this inference. Adults may move inshore during the summer, excavate their burrows, spawn and then return to deeper waters. Vacated burrows would then fill in with sediment due to natural processes.

In a study of Cepola at Lundy in 1977, Atkinson et al., stated that the fish spawned in July. In this context, the timing of the 1988 survey being two months' later in the year than in previous years, could have precluded the possiblity of relocating any Cepola. Thus it must be strongly recommended that future searches for Cepola be conducted during the month of July. Also, if only small numbers of Cepola have been spawning in recent years, then it is unlikely that exactly the same sediment patch would be re-excavated between years. It would appear therefore, that it will be necessary in future years to conduct towed searches to locate the discrete groups of Cepola.

## 3. Maintenance at East Coast Monitoring Sites

### 3.1. Introduction and Methods

While fixing transect lines during the 1987 survey, a number of pitons and ring bolts were found to be loose. The Knoll Pins site was particularly poor where all pitons were in danger of falling out. Ring bolts were heavily encrusted with fouling growth at all sites, as were the subsurface marker buoys. Even with the aid of submersible photographs of piton and ring bolt positions, encrustation made relocation difficult. Plastic rawl plugs had been used for the original ring bolts, but some were found to rotate when attempting to clean off fouling growth and eventually became loose. It was evident therefore, that a better method of fixing the ring bolts was required and bolts with expandable seats were chosen. The seat fits into a hole drilled into the rock and the act of screwing in the bolt expands the seat outwards against the rock giving a solid foundation.

For fixing the ring bolts, an air drill was used with tungsten carbide bits (marketed under the name of "Mason Master Blue Flash"). A 6 mm hole was drilled into the granite first and then drilled out with a 12 mm bit to take the expandable ring bolt seat. Ring bolts and seats were of zinc-coated anodised steel (very resistant to corrosion) as stainless steel seats were not readily available. However, the ring bolts and seats can easily be replaced if stainless steel components are obtained.

### 3.2. Quarry Bay

Using transits, the site was located at the first attempt. All ring bolts at Quarry Bay were quickly found due to their prominent positions on boulders although covered with fouling growth. The bolts were cleaned and found to be firm and in good condition. The subsurface marker buoy was replaced with a new rope and buoy.

### 3.3. The Knoll Pins

The first attempt at site location took place at high water and coupled with low underwater visibility led to the diver failing to find the site. (It transpired that the diver had dropped onto the north side of the Submerged Pin which is adjacent to the Outer Pin, where the site is located.) The successful search was made at low water when the Outer Pin was visible and the site was found very quickly.

All transect pitons and ring bolts required replacing at the Knoll Pins. The piton to the east of the transect, used for attaching a marker buoy, was in good condition.

A long air line between the air drill and supply cylinder permitted the cylinder to be rested on a convenient ledge well below the transect line, thus avoiding possible damage to the delicate organisms under study.

The two pitons marking the east and west limits of the transect were replaced first. New ring bolts were located immediately adjacent to the existing pitons to ensure that the position of the transect was not altered.

For the east ring bolt, drilling the 6 mm hole to a depth suitable for the ring bolt seat (approximately 5 cm) took 10 minutes and used 100 bar of air from the supply cylinder. After drilling this hole, the tip of the tungsten carbide drill bit was completely worn away. At the west end of the transect, advantage was taken of a natural crevice into which the ring bolt was fixed. Thus no drilling was required.

On a second dive, a ring bolt was fixed 5-7 cm to the right of the piton above 'the Cave' (i.e. the 2nd piton from the east). Drilling this hole used 120 bar of air and was an enlargement of a natural crevice. A second drill bit was ruined drilling out the 6 mm diameter hole.

During the same dive, a further hole was attempted to the left hand side of the existing 3rd piton from the east (to the right of 'the Cave') but the supply air cylinder ran out before much progress was made.

For a third dive a suitable crevice for drilling out was located 1.5 m to the right of the 3rd piton from the east (the old piton was left in place). Drilling took fifteen minutes and was just completed when the air line separated from the supply tank. This resulted in the tank venting free and cartwheeling to the seabed from where it was retrieved. Again, a new 6 mm drill bit was ruined drilling this one hole.

The larger 12 mm drill bit was harder wearing and was intact after drilling out all the holes for the ring bolt seats.

The new ring bolt locations have been incorporated into Site Location Sheet 17.

3.4. Gannets' Rock

The site was found at the second attempt in difficult tidal conditions and poor underwater visibility.

The top and bottom pitons were easily located, but the central pitons had to be located by fixing the transect line at the top and bottom and then working up the line to find the pitons. The second piton from the top was particularly difficult to locate as it was almost completely covered by a Pentapora colony.

All other pitons were heavily encrusted and after cleaning were considered in a satisfactory condition, although the top piton may require replacing next year. This piton could have been replaced this year except for the destruction of all drill bits during drilling on the Knoll Pins site.

The subsurface marker buoy was replaced with a new rope and a cleaned buoy.

3.5. Discussion

Future maintenance work at existing monitoring sites, or the establishment of new sites can benefit from the knowledge gained during the current fieldwork.

1) When considering the fixing of ring bolts to a selected sited, maximum use must be made of natural crevices which are either suitable for directly fitting a ring bolt or for drilling out.

2) The drilling of virgin rock is very time consuming, requiring approximately one dive per hole drilled, a large quantity of air for the smallest of holes and a new drill bit will probably need to be used for each hole drilled if the rock is hard.
3) It is easier to drill a small diameter hole first and then to drill out to a larger size.
4) A single diver can operate the equipment providing a safe resting place for the supply cylinder is available.
5) A 'hammer' action is more efficient than a steadily applied pressure to the drill.
6) Very secure fittings are required for the attachment of the air line to supply cylinder and drill.
7) Ring bolts and seats can be unscrewed and removed if replacement is required. This therefore excludes the need for additional drilling.
8) Higher quality drill bits may be harder wearing.

## 4. Experimental Tagging of Sea Fans and Axinellid Sponges

### 4.1. Introduction and Methods

Consistent problems have been experienced each year when divers attempted to identify individual sea fans and axinellids used for monitoring purposes. It had been recommended in the 1987 Lundy report that the sea fans and sponges be tagged for ease of identification. However, there was concern that the tagging may cause damage to these delicate organisms.

In order to assess the effect of individual tags on Eunicella verrucosa and axinellid sponges, a trial has been established using 5 sea fans and 5 sponges adjacent to the Quarry Bay monitoring site. If these tags appear not to be detrimental to the growth and general well-being of the individuals, then it is proposed that those individuals which have had viewpoint monitoring photographs taken of them over the past few years be tagged in the same way.

Individual sea fans and sponges were chosen with the following factors in mind:

1) Ease of relocation and identification.
2) Range of sizes.
3) Varying proximity to seabed and orientation on boulder.

Small white plastic garden labels were marked with the numbers 1 to 10, cut to a small size, and were then threaded with plastic ties. The ties were positioned around the bases of the sea fans and sponges and tightened to an extent whereby they were not likely to be moved a great deal by water movements, but at the same time they were not strangling the individual sea fans or sponges. A similar method was used for tagging sea fans on Skomer (Bunker, 1985) but tags were fixed to side branches. Once in place, the ends of the ties were snipped off with scissors and photographs were taken of the tagged specimens.

## 4.2. Results

The 5 sponges tagged were all on an encrusted facing side of a boulder some 3 m south of the southern end of the transect line (buoyed end) and were numbered 1 to 5. A new Site Location Sheet has been prepared to assist in their relocation (Sheet 36).

The sponges tagged were:

No. 1. Axinella polypoides approximately 20 cm tall.
No. 2. Unidentified branching species approximately 8 cm tall.
No. 3. Raspailia ramosa approximately 6 cm tall.
No. 4. Small ?Axinella polypoides approximately 4 cm tall.
No. 5. Small ?Axinella polypoides (unbranched) approximately 4 cm tall.

The sea fans (numbered 6 to 10) were grouped in an area to the north west of the marker buoy and their positions are included on the new Site Location Sheets 37 and 38. Individual sea fans were as follows:

No. 6. Relatively free of drift weed, approximately 20 cm tall.

No. 7. Badly affected by drift weed and an old mermaid's purse, so that only the tips of the sea fan appeared healthy. This 'debris' was removed, revealing the horny skeleton of the sea fan underneath, approximately 25 cm tall.

No. 8.) These two sea fans were 15 cm apart and approximately
No. 9.) the same size, i.e. 20 cm tall.

No. 10. This was a well established, large (35 cm tall) sea fan growing out from the side of the boulder. Approximately 25% of the fan's area was covered by drift weed.

## 4.3. Discussion

The use of tags for identifying ring bolts, pitons and individual organisms has had considerable discussion over recent years. It has been argued that attaching tags to ring bolts to facilitate relocation may attract the attention of sports divers, who, on closer inspection of the tags may damage the organisms under study. This is certainly valid at the Knoll Pins and Gannets' Rock sites, which are popular dive sites. Quarry Bay, on the other hand, is not so popular and covers a much larger area, so that the chances of divers encountering the study site are much lower. Thus, it is considered that attaching tags to sea fans and axinellids in Quarry Bay, carries an acceptably low risk from sports divers and the benefits for monitoring purposes will be significant.

## 5. Photographic Monitoring at Established East Coast Sites

### 5.1. Methods

Photographs of fixed transects were taken with a Nikonos V camera, Nikkor 15 mm lens and SB102 flash gun fitted with a diffuser, all attached to the hollow section aluminium frame described in the 1985 Lundy report. Film stock was Fuji 50 ASA colour transparency film used at an aperture of f9 at a fixed lens distance of 45 cm. The system was used on Auto with TTL flash.

For wide angle photographs of the Knoll Pins 'Cave' the same camera system was used without the aluminium frame and with a Nikon 15 mm view finder. Small areas in 'the Cave' were photographed in close-up using the Nikonos V camera, Nikkor 28 mm lens, Nikonos close-up supplementary lens and SB103 flash gun. Film stock was Fujichrome 50 ASA colour transparency film exposed at f9 on Auto and TTL flash.

Two sets of photographs have been produced for all sites except the Knoll Pins 'Cave' close-ups of which there is only one set.

### 5.2. Quarry Bay

This transect lies along the seabed at a boulder-sediment interface. Large amounts of silt made photography at Quarry Bay very difficult. On the transect line, exposures were taken from south to north on the east side of the line, then from north to south on the west side of the line.

Visual identification of individual Eunicella and axinellid sponges proved difficult. There was considerable difficulty in matching up diagrams and photographs for viewpoint photography of the boulders bearing the Eunicella and axinellids under study. The very poor underwater visibility compounded the problems of identification by precluding distant viewing and prevented viewpoint photographs of Boulder 2 being obtained. Confirmation of identification can only be made by reference to the previous year's photographs.

## 5.3. The Knoll Pins

The fixed transect lies horizontally across a vertical rock face and was photographed from left to right (i.e. east to west) taking frames sequentially above and below the transect line.

Close-up photographs of 'the Cave' were started on the left hand side (east) working sequentially top to bottom. One film covered just over half 'the Cave' and a second film was required for the right hand side. To use up the second film, the series was continued across the base of 'the Cave' from right to left and then finished off in the recess in the left of 'the Cave'.

Wide angle photographs of 'the Cave' were taken from top left to right, middle left to right and bottom left to right. These photographs are for use as reference in constructing a mosaic of prints made from the close-up photographs, should they be required at some future date.

## 5.4. Gannets' Rock

This transect runs perpendicularly down a cliff face and was photographed from bottom to top, working sequentially to the left and right of the line. On this transect, an aperture of f11 was used. All other camera settings were unchanged.

## 5.5. Algal Limits Transect 4

### 5.5.1. Introduction and Methods

A transect was established at the Knoll Pins in 1985 to provide a basis for assessing changes in algal cover and therefore of differences in light penetration from year to year. The full transect was made up of four sub-transects from shallow (ALT1)

to deep water (ALT4). In the shallower transects the profuse cover of kelp overlying other algae made comparisons between years difficult. Also, it had been the experience of previous years that it was not possible to identify many of the foliose red algae with certainty from the photographs.

Thus, for 1988, it was decided to photograph only ALT4 which contained the deepest occurring algae and to make records of the algae present. This site had not been previously marked with ring bolts or pitons due to difficulties in drilling the very hard granite. Therefore, one of the objectives of the 1988 programme was to fix a permanent marker to the deepest part of the transect.

Setting a ring bolt in rapid-setting cement underwater was considered, but not attempted, because of the setting characteristics of the components. As an alternative a ring bolt was cast in a large block of concrete on land, transported to the site and lowered to the seabed. The concrete block was then positioned at the bottom of ALT4 by a diver. A surface marker buoy was attached to the block as a site marker and removed on completion of fieldwork.

### 5.5.2. Results

Two sets of photographs of ALT4 were obtained from bottom to top and working sequentially to the left and right of the line. From the slides, a Site Location Sheet 32A has been prepared to facilitate accurate relocation of the transect line in future years. Algal species present within 2 m either side of the transect and their greatest recorded depths were:

| | |
|---|---|
| ?Rhodophyllis sp. | 22.8 m bcd: Occasional |
| ?Desmarestia ligulata | 21.3 m bcd: Rare |
| Unidentified foliose red | 21.3 m bcd: Occasional |
| ?Polyneura sp. | 20.8 m bcd: Rare |

The greatest recorded depth of red algae at 22.8 m bcd is very similar to that of 22.0 m bcd recorded in 1986 and 1987.

During the dive, annotated sketches were made of each algal species to aid identification. However, this method proved unsatisfactory even when used in conjunction with slide inspection. It is therefore recommended that in future years, species of algae which are present on the transect should be collected from the surrounding area (not from the transect). The specimens should then be pressed to provide a permanent record and allow accurate identification.

## 5.6. Discussion

Detailed comparison of slide sets between years was not required and has not been attempted. If future comparisons with the 1988 slide set are made, then the following should be borne in mind:

1) Sequential orders of photographs have been specified in the relevant sections of this report.
2) One of the transect lines was lost during a dive and a new line had to be fabricated for the Gannets' Rock site. As the line had to be made up at sea, the 0.5 m interval markers may be slightly variable in distance. However, the top and bottom of the transect were accurately positioned. (A new line should be prepared for 1989).
3) Confirmation of the labelling of slides of individual sea fans and axinellids should be made by reference to the 1987 slide set.

## 6. General Discussion

The fieldwork objectives were all achieved with the exception of establishing fixed monitoring sites on the MV 'Robert'. Successful completion of the very full work programme was partly due to the absence of malfunctions in photographic equipment, thus giving efficient use of man dives.

Poor underwater visibility created practical problems for viewpoint photography, tow searches for Cepola rubescens and diver efficiency. There were also heavy deposits of silt at all sites. There had been few easterly winds of moderate or greater force at Lundy throughout the summer (N. Wilcox, Warden), but the extended period of relatively calm weather had not improved underwater visibility. Gale force winds on the last day of fieldwork reduced visibility to almost zero at the Knoll Pins and Gannets' Rock.

There were also strong water currents at times of expected slack water predicted by the Lundy tidal stream chart. This chart had proved accurate during previous surveys and there is no ready explanation for the anomalies which were experienced throughout the week.

The timing of the fieldwork, two months later in the year than in previous years, had two major effects. Firstly, the possible migratory habits of Cepola rubescens may have meant that there were no Red Band Fish at Lundy at the time of the survey. Thus, there was no justification in spending more time than necessary in searching for them. Secondly, monitoring seasonal algae and annual species on the fixed transects introduced an important variable in comparison with previous years. This should be borne in mind if comparisons are made retrospectively.

It is strongly recommended therefore that future sublittoral monitoring at Lundy be conducted during the month of July and that the slides from 1988 be used mainly for comparisons of the stable components of the biological community.

## 7. Recommendations for Future Work

The following recommendations are considered to be important aspects of the ongoing sublittoral monitoring programme at Lundy. The work outlined constitutes more than one week of fieldwork, therefore, guidance has been given as to the time requirements of each recommendation. Estimates are based on 6 man dives per day (the norm for Lundy) and include time required for locating the sites and laying transect lines. Some dives require diver pairs and for these, the cook/support diver usually assists.

The recommendations are:

1. Whenever possible, sublittoral surveys should be conducted during the month of July in each year.
2. Tow searches be continued for Cepola rubescens off Halfway Wall Bay and swim searches in Gannets' Bay. The location of the 1987 Cepola site should be resurveyed.
   Time required: 1 day.
3. Fixed monitoring sites should be established on the wreck MV 'Robert', photographed and a comprehensive species list compiled.
   Time required: ½ day.
4. Comprehensive records and collections should be made of algal species on ALT4 in addition to photography.
   Time required: 1 day.
5. To record the presence and abundance of Tritonia odhneri on Eunicella verrucosa at Brazen Ward in addition to Quarry Bay.
   Time required: ½ day.
6. Establish a new monitoring site off the west coast of Lundy in the area of the Battery, at a depth of approximately 20 m.
   Time required: 1 day.
7. Assess the trial of labelling sea fans and sponges in Quarry Bay. If successful, label target specimens on the Quarry Bay transect and prepare new location sheets.
   Time required: ½ day.
8. Undertake photographic surveys of established monitoring sites at Quarry Bay, the Knoll Pins and Gannets' Rock using the methodology of previous surveys.
   Time required: 4 days.

The above time estimates have been made by reference to dive records from 1987 and 1988 and are considered to be good approximations. A time saving could be made by enlarging the survey team from three to four divers which would increase the number of dives from six to eight per day. However, this would necessitate the provision of additional photographic equipment to make the most efficient use of diver time.

## 8. Site Location Sheets

New and replacement site location sheets have been prepared in waterproof plastic, giving transit marks, site sketches and photographs where appropriate. Two sets have been produced and are held at NCC Peterborough. The following modifications were made to the existing sheets.

| | |
|---|---|
| Sheet 17 | Corrections made for the new ring bolts at the Knoll Pins. |
| Sheet 17A | New: Knoll Pins, photographs of ring bolt locations. |
| Sheet 17B | New: Knoll Pins, photographs of ring bolt locations. |
| Sheet 28A | Transit marks for the Cepola site - replacement. |
| Sheet 32A | New: Algal Limits Transect 4. Position of transect line used in 1988. |
| Sheet 36 | New: Quarry Bay, tagged sponges. Site location and photograph. |
| Sheet 37 | New: Quarry Bay, tagged Eunicella. Site location and photograph. |
| Sheet 38 | New: Quarry Bay, tagged Eunicella. Photographs. |

## 9. Acknowledgements

We are grateful to the Landmark Trust and the Lundy islanders for their help and cooperation; Captain Denver Scoins and crew of the MV 'Oldenburg' for assistance with our inflatable and associated diving equipment: the Lundy Warden, Neil Wilcox, for every assistance with fieldwork.

We also extend our thanks to Margaret-Anne Howard, who gave up her holiday to feed us and act as a much-needed support diver, all on a voluntary basis.

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# Appendix 1

## Historical Account of Monitoring at Lundy

| DESCRIPTION OF SURVEY | TECHNIQUES USED | WORK CARRIED OUT |
|---|---|---|
| Photographic Monitoring at the Knoll Pins | Initially by viewpoint photography of a conspicuous cave. Pitons and ring bolts were used in 1984 to mark a transect relaid on each survey. Sequential photographs 50 x 50 cm taken along the top and bottom of the transect. Mosaic of 22 x 16 cm taken in a cave below the transect line. Photographs taken by view finder with 28 mm lens in 1984 and with framer and 15 mm lens 1985 to 1988. | Views of 'the cave' in 1981 and 1983 to 1988 inclusive. Photographs at about transect line position in 1983. 50 x 50 cm and 22 x 16 cm photographs taken 1984 to 1988 inclusive. |
| Photographic Monitoring at Quarry Bay | Ring bolts were used in 1984 at the edge of the boulder slope to mark a transect, relaid on each survey. Photographs of 50 x 50 cm along the transect and of 22 x 16 cm on the side of one boulder. Viewpoint photographs of individual sponges and sea fans. Transect photographs taken by 28 mm lens and parallax-corrected view finder in 1984 and with 15 mm lens and framer in 1985 to 1988. Photographs of individual animals taken with standard lens using parallax-corrected view finder. | Photographs taken 1984 to 1988 inclusive. |
| Photographic Monitoring at Gannets' Rock | Pitons and ring bolts were used in 1984 down the cliff north of Gannets' Rock Pinnacle to mark a transect relaid on each survey. Sequential 50 x 50 cm photographs along the transect taken by view finder with 28 mm lens in 1984 and with framer and 15 mm lens in 1985 to 1988. | Photographs taken 1984 to 1988 inclusive. |
| Surveys of the red band fish Cepola rubescens | Tow dives using telephone communication along set position and direction in Halfway Wall Bay using transit marks. Swim across Gannets' Bay. Present transit marks and methods were determined by Hiscock in 1983. Cepola located in 1987. 4 x 50 m transects N, E, S and W of Cepola site worked in 1987. Circular searches around Cepola site in 1988. | The area was surveyed systematically in 1977 by Pullin and Atkinson (1978). Tow dive surveys in 1983 to 1988 inclusive. Circular searches around 1987 Cepola site in 1988. |
| Algal Limits Monitoring | A location with steeply sloping rocks extending below the lowest limit of foliose algae at the Knoll Pins. 50 x 66.6 cm photographs taken using framer and 15 mm lens along four transects. Depth profiles were drawn but monitoring is in relation to topographical features and the transect. | Established and photographed in 1985. Photographed in 1986 and 1987. Only Transect 4 photographed in 1988 with recording of species present. |
| Abundance of Tritonia odhneri on Eunicella verrucosa | First undertaken at the Quarry Bay site in 1986. Each sea fan was inspected and the presence and numbers of Tritonia and spawn recorded. | Survey in 1986 and 1987. |
| Observations on the wreck MV 'Robert' | Observations and photographs of the communities living on the wreck. | First surveyed in 1979 having remained undiscovered for four years after sinking. Resurveyed in 1980, 1984, 1986 and 1987. |

## Appendix 3

### Equipment Check List

For the benefit of future surveys, a checklist for the minimum essential equipment is provided below:

Photographic:

2 battery chargers
24 C cell batteries - rechargeable ) Can only be charged
12 AA cell batteries - rechargeable) during the day
E6 developing kit
Wetting agent
Jobo and accessories e.g. measuring cylinders, thermometer
String and bulldog clips
Dark bag
Slide mounts
Slide labels
Adaptors and trailing sockets
Slide wallets
50 ASA film
Large Pelecase for travel
Medium Pelecases for boat
2 Nikonos V* cameras) of alternative with appropriate
2 SB102 flash units ) flash units. *Include 6 s/s washers
1 SB103 flash unit ) for adapting to aluminium frame
1 close-up kit
1 28 mm lens
1 15 mm lens with view finder
1 cool box
2 guard boxes - for batteries/film in boat
Blackboard and chalk
Nikonos service kit
Black "chequer" board
Aluminimum camera frame

Stationery:

Rotring pens and ink
Pens/pencils/rubber
Tippex
Paper clips
Scissors
Adhesive labels
Drawing pins
Ruler
Packaging tape
Cellotape
Clear Fablon
Insulating tape
Waterproof pens and markers

Boat and Diving Equipment:

Sighting compass
Oxygen adminstration equipment
Diving cylinders additional to personal equipment
Spare back packs
Inflatable - preferably Avon work boat
2 outboard engines
Fuel tanks and spare leads
2 Jerry cans
Outboard oil
Tool box
Boat boxes
Pump
Oars
Anchor
Trailer with spare wheel, bearings, trailer board and strops
Shot line (50 m)
Dry suit repair kit and seals
Spare 'O' rings and weights
Slates
VHF radio and charger
Dive computer batteries (for 'Edge')
SMB's and reels

Miscellaneous:

Laminated site location sheets
3 transect lines
Spare line (approx. 30 m)
Small buoys
Ring bolts - 6 mm diameter, plus seats
Drill bits (6 mm and 12 mm)
Air drill and chuck
Plastic ties
Plastic labels
Soldering iron and solder (fine electrical)
Tidal prediction sheets