

LUNDY MARINE NATURE RESERVE

MANAGEMENT PLAN

DRAFT

DECEMBER 1983

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This management plan is structured according to the Nature Conservancy Council 'Handbook for the Preparation of Management Plans' (1st edition, February, 1983)

Reference:

Hiscock, K. (1983). Lundy marine nature reserve management plan. Nature Conservancy Council, Huntingdon. iv and 87 pp.

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List of abbreviations used in the text

| | |
|----------------|--|
| BCD Marine Ltd | Bristol Channel Divers Marine Limited |
| DIF | District Inspector of Fisheries (Ministry of Agriculture, Fisheries and Food) |
| DSFC | Devon Sea Fisheries Committee |
| HWMOST | High Water Mark of Ordinary Spring Tides |
| LWMOST | Low Water Mark of Ordinary Spring Tides |
| LWST | Low Water Spring Tides |
| LFS | Lundy Field Society |
| LT | Landmark Trust |
| MHW | Mean High Water |
| MHWN | Mean High Water Neaps |
| MHWS | Mean High Water Springs |
| MLW | Mean Low Water |
| MLWN | Mean Low Water Neaps |
| MLWS | Mean Low Water Springs |
| MNR | Marine Nature Reserve |
| NCC | Nature Conservancy Council |
| NERC | Natural Environment Research Council |
| NSMF | National Site Management Framework |
| RNLI | Royal National Lifeboat Institution |
| SSSI | Site of Special Scientific Interest |
| TDC | Torrige District Council |

Where low case letters are used in 'marine nature reserve', this refers to the voluntary reserve.

Upper case (capital) letters are used to denote the proposed statutory Marine Nature Reserve.

LUNDY MARINE NATURE RESERVE MANAGEMENT PLAN

PLAN

1. DESCRIPTION

1.1. GENERAL INFORMATION



Plate 1. Oblique aerial view of Lundy from the south.

1.1.1. Location

Lundy is an island at the entrance to the Bristol Channel 18 km north of the nearest mainland at Hartland Point and at a position $51^{\circ} 11' N$, $4^{\circ} 40' W$ (Ordnance Survey grid reference SS 135460). The island is in the County of Devon, the District Council of Torridge and the South-West Region of the Nature Conservancy Council. Local fisheries are within the jurisdiction of the Devon Sea Fisheries Committee. Fig. 1 (which folds out of the back of the plan) shows the location of Lundy in south-west Britain.

1.1.2. Summary description

Fig. 1 shows the general features of Lundy and Plate 1 an aerial view. The island is 4.9 km long and 1.5 km at its widest, with a coastline of 15 km in length and an area of 4.3 km². The present voluntary marine nature reserve extends from High Water Mark of Ordinary Spring Tides (HWMOST) seawards for a distance of 1 km from Low Water Mark of Ordinary Spring Tides (LWMOST). This boundary lies within an area formed by the following lines of latitude and longitude: 51°9'N to 51°13'N, 4°38'W to 4°42'W. It is intended that the boundary to the proposed statutory Marine Nature Reserve should approximate to the voluntary reserve boundary, though it will follow lines of latitude and longitude as shown in Fig. 2. The Marine Nature Reserve includes approximately 0.6 km² of shore between HWMOST and LWMOST and 16.3 km² of seabed from LWMOST to the boundary approx 1 km seawards. Lundy is bordered to the south and west by high steep or vertical cliffs and to the north and east by steeply-sloping sidelands above much shorter cliffs. There is a plateau at about 102 m to 122 m and the highest point is 138 m above MLW. Shores are either steep bedrock or boulder around almost all of the island. Coarse sand is present in the Landing Bay. Underwater, steep rock slopes and cliffs extending to 30-40 m below chart datum are present on the north-east coast whilst extensive areas of gradually sloping and very broken bedrock are present off the west and south coasts, generally terminating in a plain of sediments or stones at 30-40 m below chart datum. Off the south part of the east coast, a boulder slope is generally present and extends to a sediment plain in depths ranging from about 15 m just south of the Knoll Pins to near chart datum level in the Landing Bay.

The marine communities present around Lundy are greatly influenced by the position of the island offshore in south-west Britain, leading to the presence of many oceanic or Mediterranean-Atlantic species, and by the wide range of exposure to wave action and tidal streams present around Lundy.

Intertidal communities present on rocky shores range from those characteristic of sites 'very sheltered' from wave action to those which are 'very exposed' to wave action (according to the definitions of Ballantine, 1961). The biologically richest areas are the broken slate shores of the south-east corner of the island where a wide range of species of algae and animals are found on rocks, in pools, under stones and in small caves.

All of the main shallow rocky sublittoral zones are well-represented around the island with variation in their component species due mainly to the strength of wave action and tidal streams. The range of communities found is from the wave- and tide-exposed parts of the south-west and north-west coasts where the kelp forest is

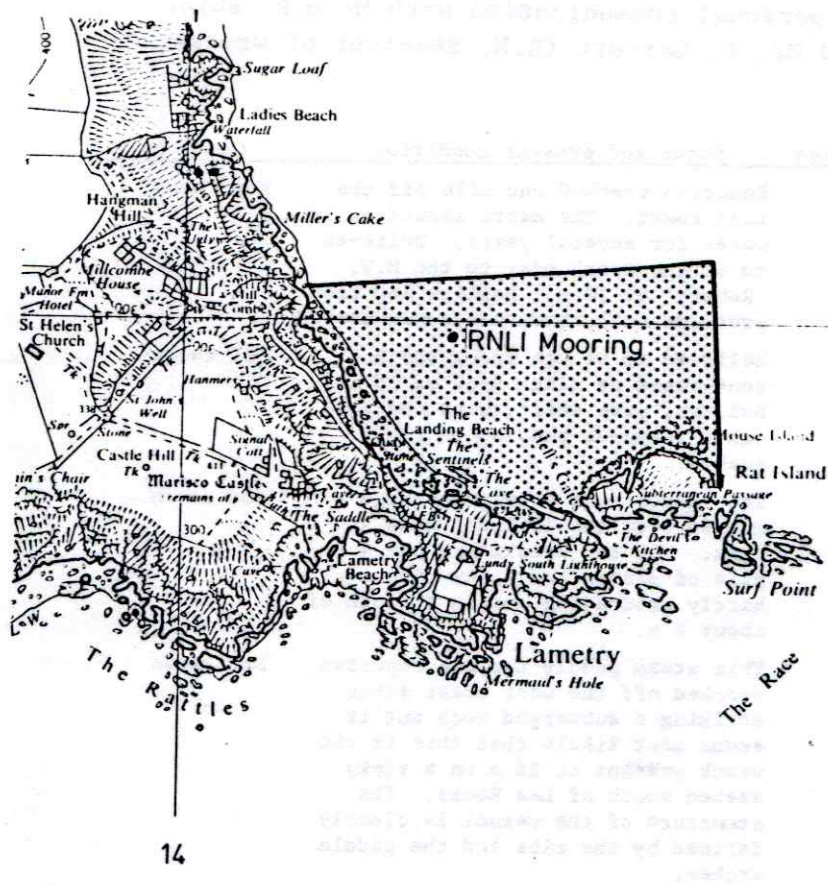


Fig. 3. Area of foreshore and seabed in the vicinity of the Landing Bay which is leased by The Landmark Trust from the Crown Estate Commissioners.

1.1.3. Tenure

Lundy is owned by the National Trust and leased to The Landmark Trust. The shore and seabed around Lundy are the property of The Crown. The area shown in Fig. 3 is leased by the island from The Crown Estate Commissioners for the purpose of controlling moorings and anchoring. The only exception within that area is that the RNLI are permitted to lay one mooring at the position indicated. The ownership of wrecks around Lundy, where known, is listed in Table 1.

TABLE 1

Known visible wrecks around Lundy. Approximate position is shown in Fig. 14. Compiled from information in Bouquet (1967) and Larn (1974) and from personal communication with Mr D.R. Shiers (BCD Marine Ltd.) and Mr. D. Garrett (H.M. Receiver of Wrecks, Appledore).

| Name of wreck | Year wrecked | Notes and present condition | Owned by |
|---------------------------------|----------------|---|-----------------|
| ?S.S. 'Iona' | 1864 | Reported wrecked one mile off the east coast. The masts showed at low water for several years. Believed to be the wreck near to the M.V. 'Robert' at 20 m. Boilers and ribs protrude well above muddy sand seabed. | Not known |
| ?S.S. 'Ethel' | 1877 | Believed to be the wreck south - south-east of Black Rock at 15 m. Boilers, prop shaft, ribs and some other features showing on rocky seabed. | Not known |
| S.S. 'Salado', Barge 'Rover' | 1897) 1898) | The 'Rover' was a salvage barge moored over the 'Salado' when it sank. The two wrecks are now a pile of plates and a few ribs hardly protruding and in a depth of about 8 m. | Not known |
| ?P.S. 'Earl of Jersey' | 1898 | This steam paddle tug was reported wrecked off the west coast after striking a submerged rock but it seems most likely that this is the wreck present at 26 m on a rocky seabed south of Lee Rocks. The structure of the vessel is clearly defined by the ribs and the paddle arches. | Not known |
| H.M.S. 'Montagu' | 1906 | Duncan-class battleship stranded at Shutter Rock and now largely a pile of thick plates at 5 m. The gun turrets still protrude slightly. Some salvage has been carried out up until about 1976. | BCD Marine Ltd. |
| S.S. 'Carmine Filomena' | 1937 | Present on the rocky seabed at about 8 m. as a pile of plates with some plates and ribs protruding to form prominent features with overhangs and small 'caves'. | BCD Marine Ltd. |
| M.V. 'Atlas' | 1942 | | Not known |
| M.V. 'Amstelstroom' | 1948 | | BCD Marine Ltd. |
| M.V. 'Robert' | 1975 | Intact and lying on its starboard side on the muddy sand seabed at 20 m. | BCD Marine Ltd. |
| M.V. 'Kaaksburg' | 1981 | Partly broken-up and entirely in the intertidal zone. | Not known |
| Unidentified | | Plates and ribs of a vessel present on the north side of Seals Rock at about 18 m. | Not known |

1.1.4. Map coverage

Table 2 gives a list of currently available large-scale maps and charts which include Lundy.

TABLE 2

Currently available charts and maps which include Lundy.

| <u>Chart or map</u> | <u>Description</u> | <u>Scale</u> | <u>Edition</u> |
|--|---|--------------|----------------|
| <u>Admiralty charts</u> | | | |
| 1164 | Hartland Point to Ilfracombe including Lundy. | 1:75,000 | 1979 |
| 1179 | Bristol Channel | 1:150,000 | 1979 |
| <u>Ordnance Survey maps</u> | | | |
| SS 44/54 | Ilfracombe and Lundy | 1:25,000 | 1968 |
| SS 14 NW/ SS 14 SW | Lundy | 1:10,560 | 1967 |
| 180 | Barnstaple and Ilfracombe | 1:50,000 | Second Series |
| <u>National Grid plans</u> | | | |
| 1248-1348 | Lundy (part) | 1:2,500 | - |
| 1247-1347 | Lundy (part) | | |
| 1246-1346 | Lundy (part) | | |
| 1245-1345 | Lundy (part) | | |
| 1244-1344 | Lundy (part) | | |
| 1343-1443 | Lundy (part) | | |
| <u>Published by the Landmark Trust</u> | | | |
| Lundy | Lundy | 1:12,672 | - |

1.1.5. Photographic coverage

Table 3 lists the aerial photographs of Lundy available from the Department of the Environment and Ordnance Survey. Without purchase and inspection of Department of the Environment photographs it is not possible to indicate the state of the tide at the time the photographs were taken or their suitability for survey of intertidal areas. The only cover held by the Ordnance Survey was flown when calculated tidal height was 1.4 m above chart datum level at Lundy (approximately Mean Low Water level).

There is a large amount of photographic material illustrating features of littoral and sublittoral habitats, communities and species. Some sublittoral material is held by NCC as one of the products of the South-West Britain Sublittoral Survey and is listed in two catalogues. Most material is held by K. Hiscock.

TABLE 3
Aerial photographs

Department of the Environment

| Sortie | Print numbers | Date | Scale |
|--------------|-----------------|---------|----------|
| HECATE/72/79 | 002-010 approx. | 13.6.79 | 1: 2,400 |
| 13/RAF/5728 | 079-080 approx. | 2.1.80 | 1:43,600 |

Ordnance Survey

| Film number | Height | Date | Time (GMT) | Scale |
|-------------|--------|---------|------------|----------|
| 73-163 | 14,000 | 15.5.73 | 11:14 | 1:28,000 |

Cambridge University/NCC

| Sortie | Print Numbers | Type | Date | Scale |
|--------|-------------------------|-----------------------|---------|----------|
| RC8 AR | 253-259 | Vertical | 9.10.74 | 1:10,000 |
| RC8 ER | 119-123 | Vertical | 29.7.82 | 1:15,000 |
| CPV | 27-39 41-55 57-62 | Coastline Obliques | 20.6.83 | |

1.2. ENVIRONMENTAL INFORMATION

1.2.1. Physical1.2.1.1. Climate

Lundy has a mild oceanic climate typical of south-west Britain. Regular meteorological observations have been made since 1979 at the South Light but are not included here. Fig. 4 illustrates the strength and direction of winds in the region of Lundy.

1.2.1.2. Hydrography

The main physical factors important to marine species are summarised in Table 4.

TABLE 4

A summary of the environmental factors important to marine species and prevailing around Lundy.

| Environmental factor | Description | Sources of information |
|--|---|---|
| Tidal range | MHWS 8.0 m; MHWN 5.9 m; MLWN 2.7 m; MLWS 0.8 m relative to chart datum. (Max. range in 1981, +0.4 - 8.4 m) | Admiralty (1980) |
| Time of LWST | Midday / Midnight | " |
| Wind | Prevailing winds from the west. Fig. 4. | Hiscock (1976) |
| Wave exposure on shore | Fig. 5. | " |
| Wave exposure on seabed | Fig. 6. | " |
| Tidal stream velocity | Weak and irregular off parts of the west and east coasts, to 5 knots off parts of the north and south coasts. Fig. 7. | Admiralty (1980), Admiralty Survey A6582, chart 1164, limited unpublished measurements. |
| Salinity | 34.5 ‰ to 35.0 ‰ | Conseil Permanent International pour l'Exploration de la Mer (1962) |
| Seawater temperatures | 8°C (February) to 16°C (August) 8.4°C (March) to 17.5°C (August) off Rat Island 1972-73. Fig. 8. | " Hiscock and Dymond (1973) |
| Suspended sediment (turbidity) and light penetration | No measurements. Intermediate between coastal and oceanic conditions. Underwater horizontal visibility is variable but, during summer, is usually between 4 and 15 m. | K. Hiscock (unpublished observations) |
| Residual currents | Predominantly from the south-west (Fig. 9). Locally, residual currents form gyres around the banks (Fig. 10). | Cooper (1961); Pingree (1978); Lee and Ramster (1981). |
| Nature of water masses and proximity of frontal boundaries | Predominantly of coastal origin with some input of oceanic water. The frontal boundary between well-mixed and well-stratified waters is to the west of Lundy but is sometimes close during spring and summer (Plate 2). | K. Hiscock (unpublished observations from satellite photographs 1978 to August 1982) |
| Bathymetry | A gradual but broken slope is present off the south and west coasts and the south part of the east coast. Steep slopes and cliffs extending to 40 m depth are present on the north-east and north coasts (Fig. 11). | Admiralty Survey A6582. Admiralty Chart 1164. |

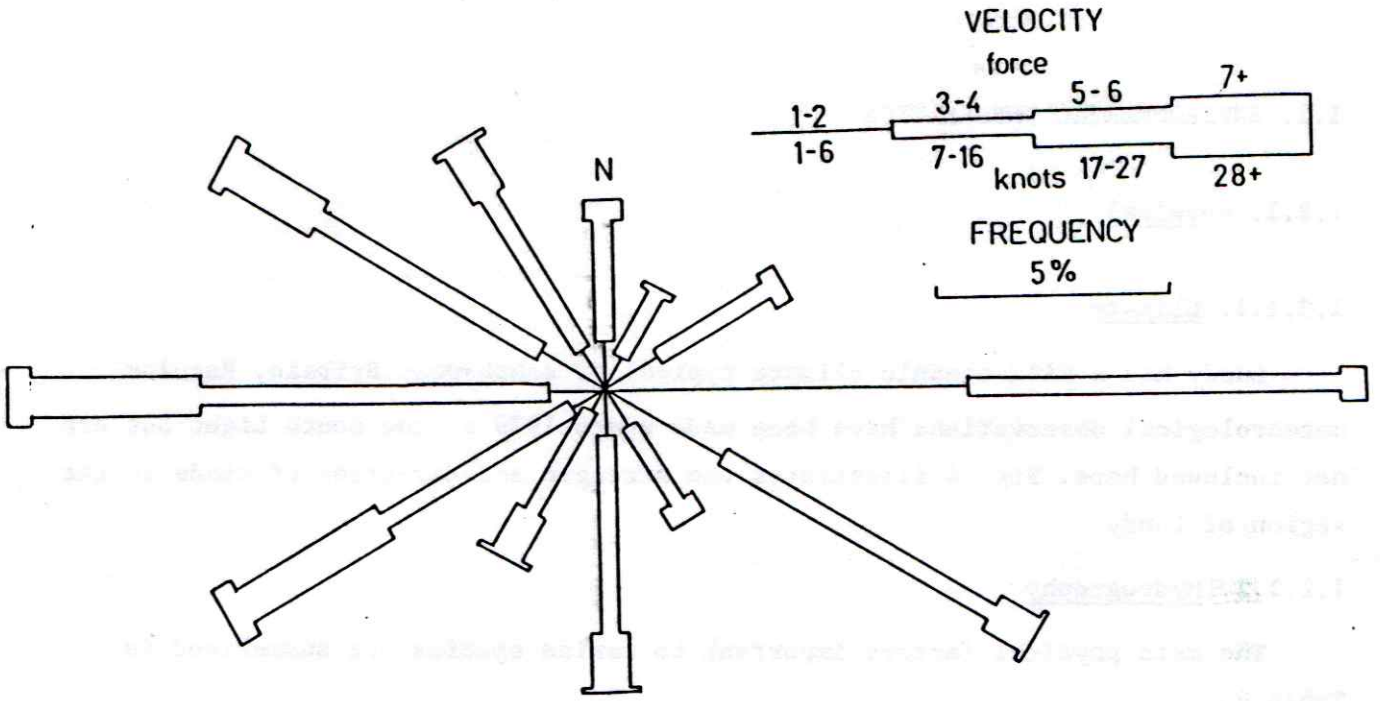


Fig. 4. Wind frequency and direction in the region of Lundy from 1960 to 1969. Records from RAF Chivenor, 20 km south-east of Lundy. (From Hiscock, 1976).

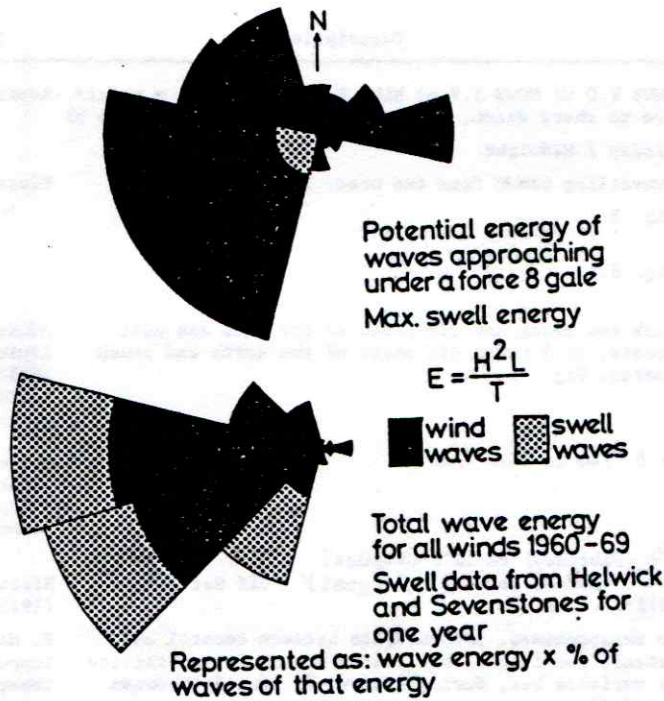


Fig. 5. Wave exposure represented as potential energy of waves and as total wave energy. Derived from Hiscock (1976) with data for winds from RAF Chivenor and swell waves from Sevenstones and Helwick light vessels.

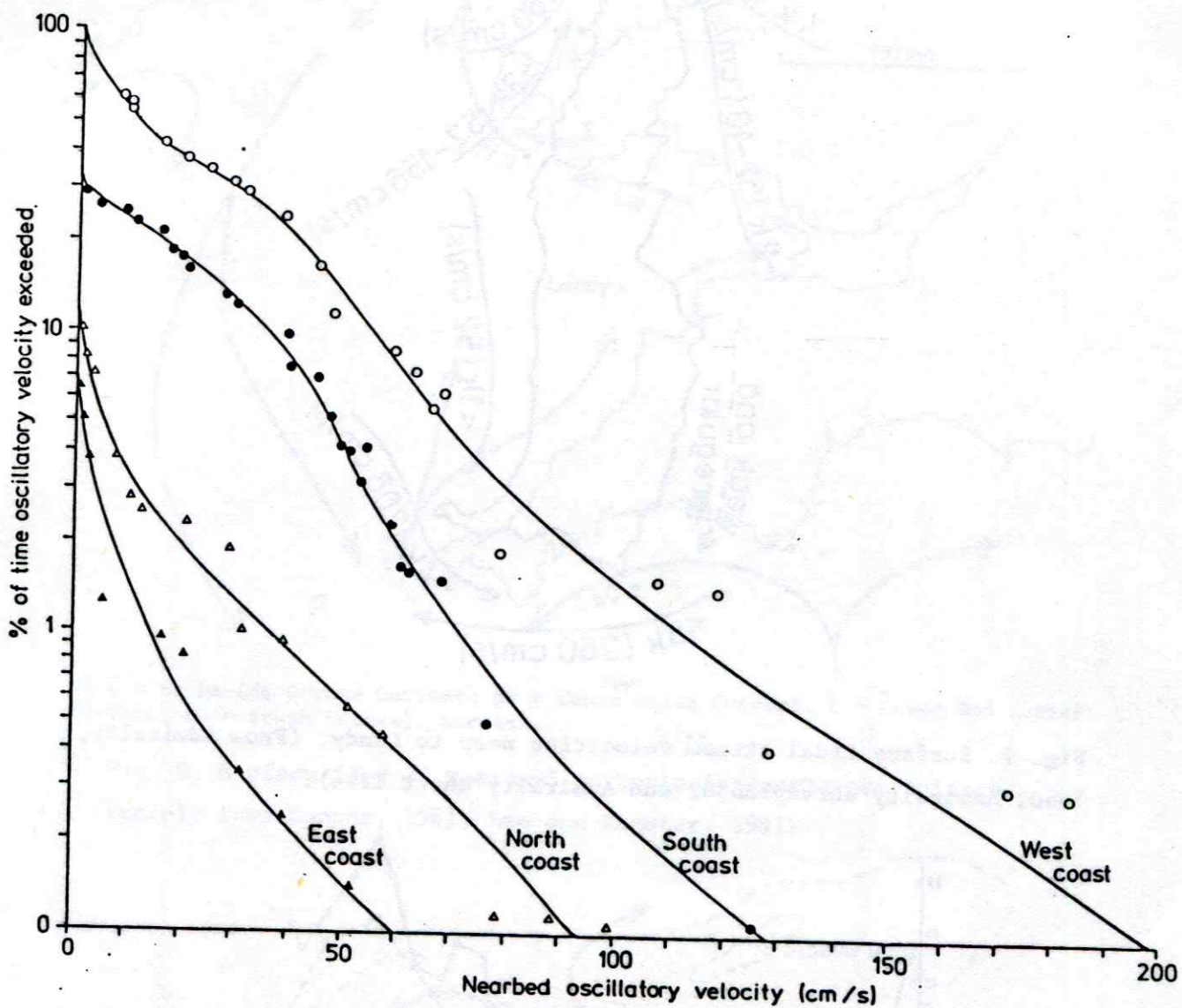


Fig. 6. The strength and frequency of nearbed peak oscillatory velocity of wave-induced water movement at 20 m depth off the four coasts of Lundy. The figure is based on wind records from RAF Chivenor and swell records from Sevenstones and Helwick light vessels. (From Hiscock, 1976).

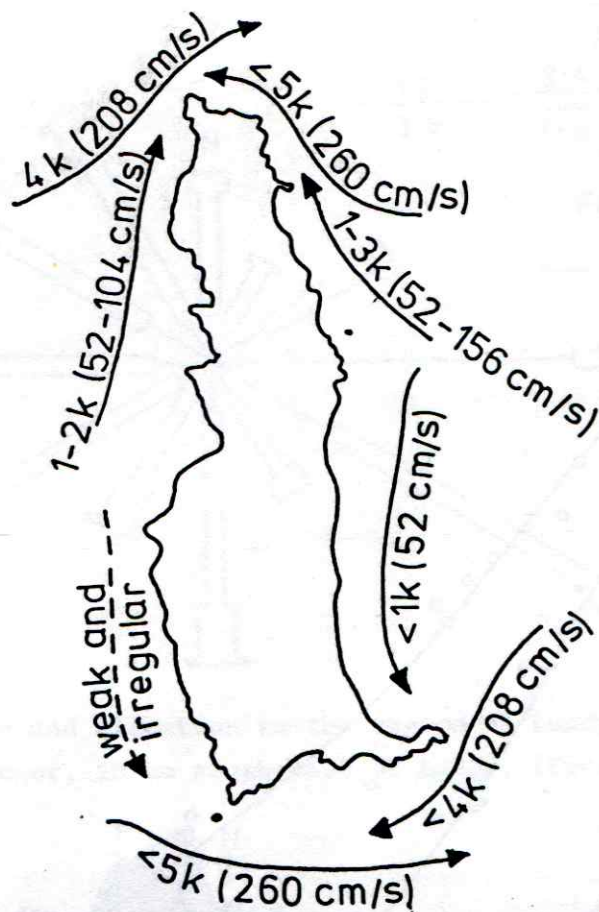


Fig. 7. Surface tidal stream velocities near to Lundy. (From Admiralty, 1960; Admiralty survey A6582 and Admiralty chart 1164).

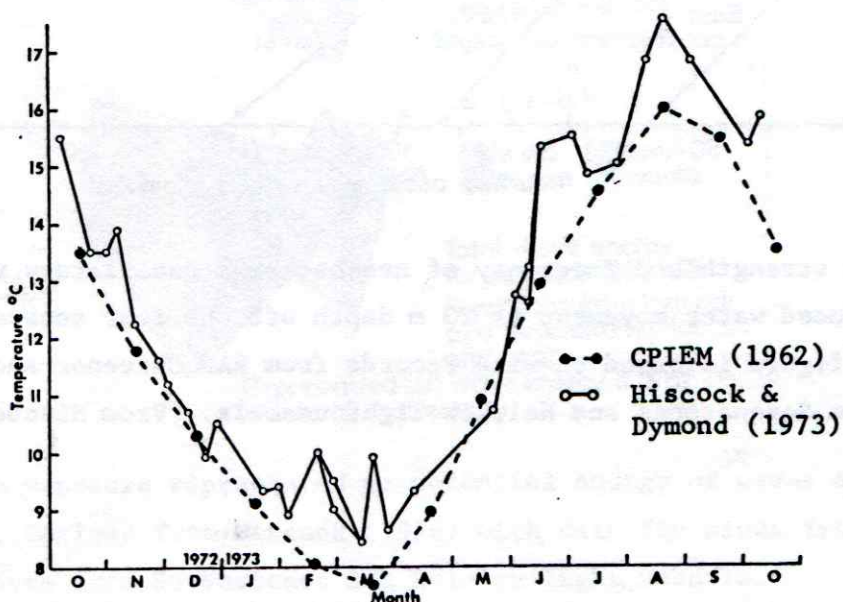
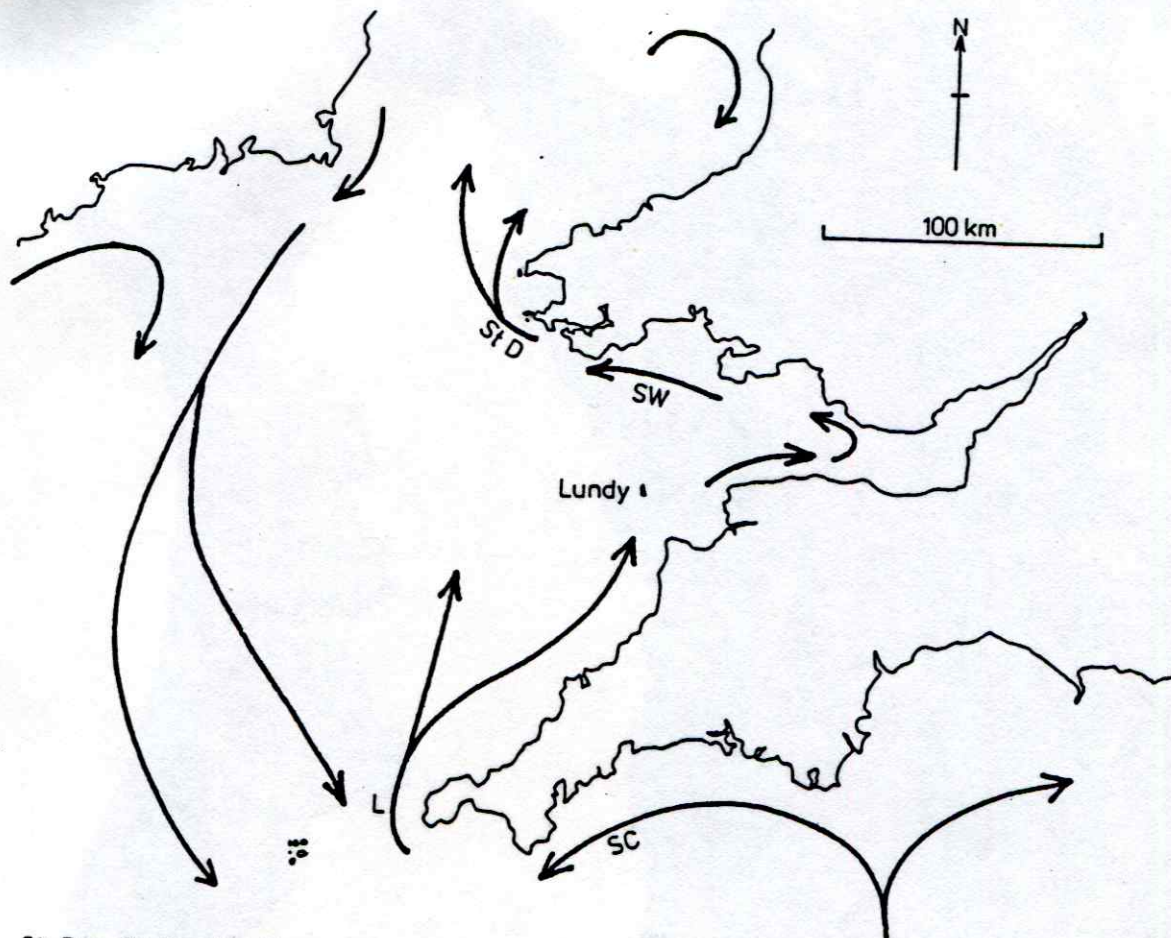


Fig. 8. Surface sea water temperatures in the vicinity of Lundy (CPIEM, 1962) and in the Landing Bay during 1972-73 (Hiscock and Dymond, 1973).



St D = St Davids Corner Current; SW = South Wales Current. L = Lands End Corner Current; SC = South Cornwall Current.

Fig. 9. Surface flow of residual currents in south-west Britain (mainly from Cooper, 1961; Lee and Ramster, 1981).

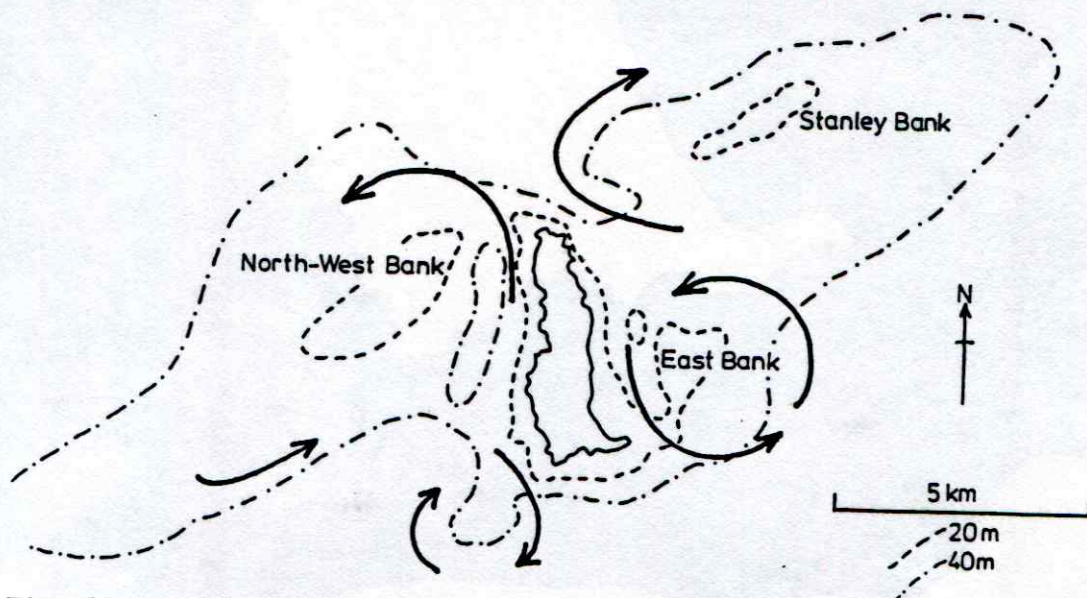


Fig. 10. Residual circulation of water masses around Lundy (from Pingree, 1978).

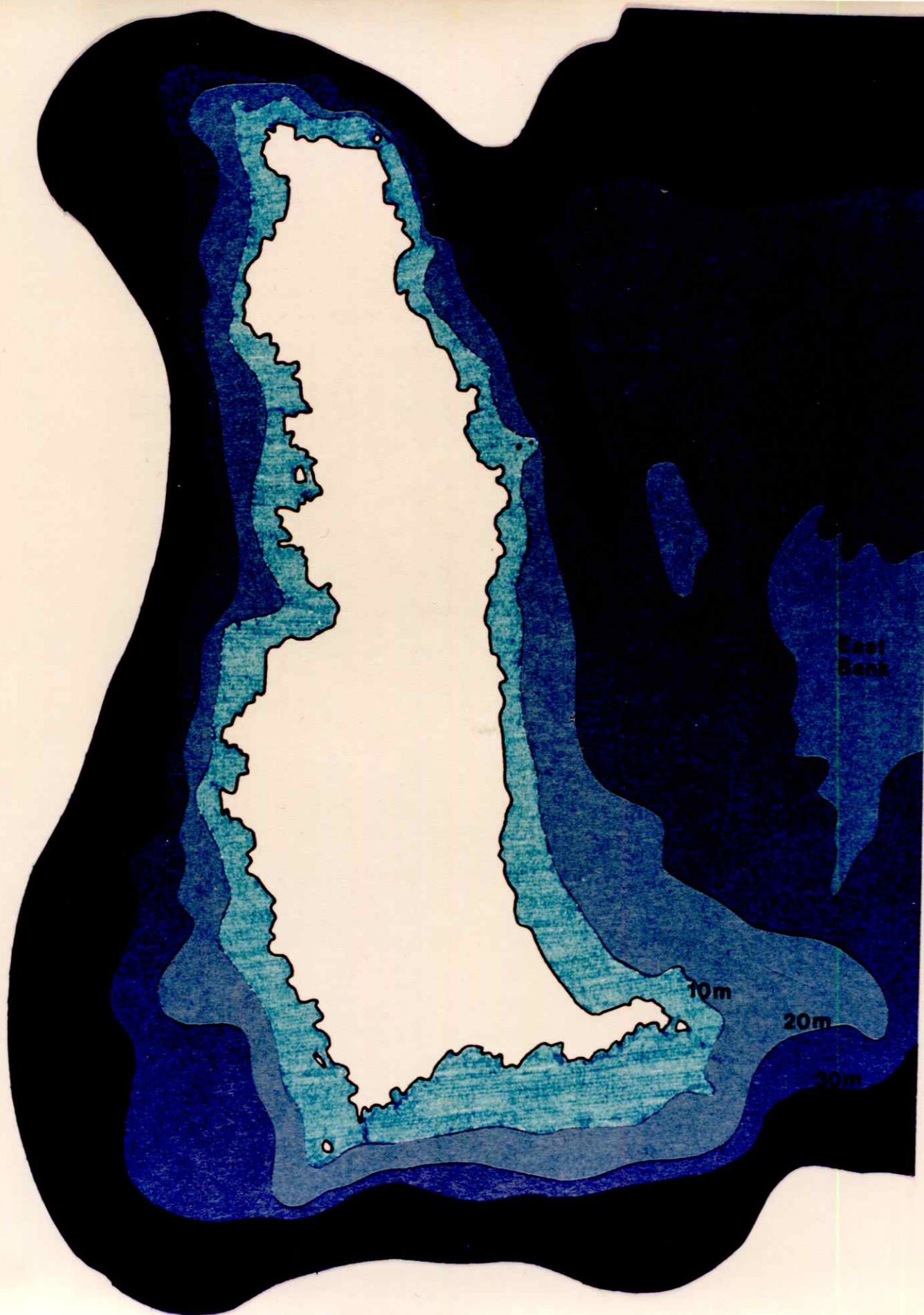


Fig. 11. Depth contours relative to chart datum level. Based on portions of British Admiralty Chart No. 1164 and British Admiralty Survey A6582 with the sanction of the Controller, H.M. Stationery Office and of the Hydrographer of the Navy.

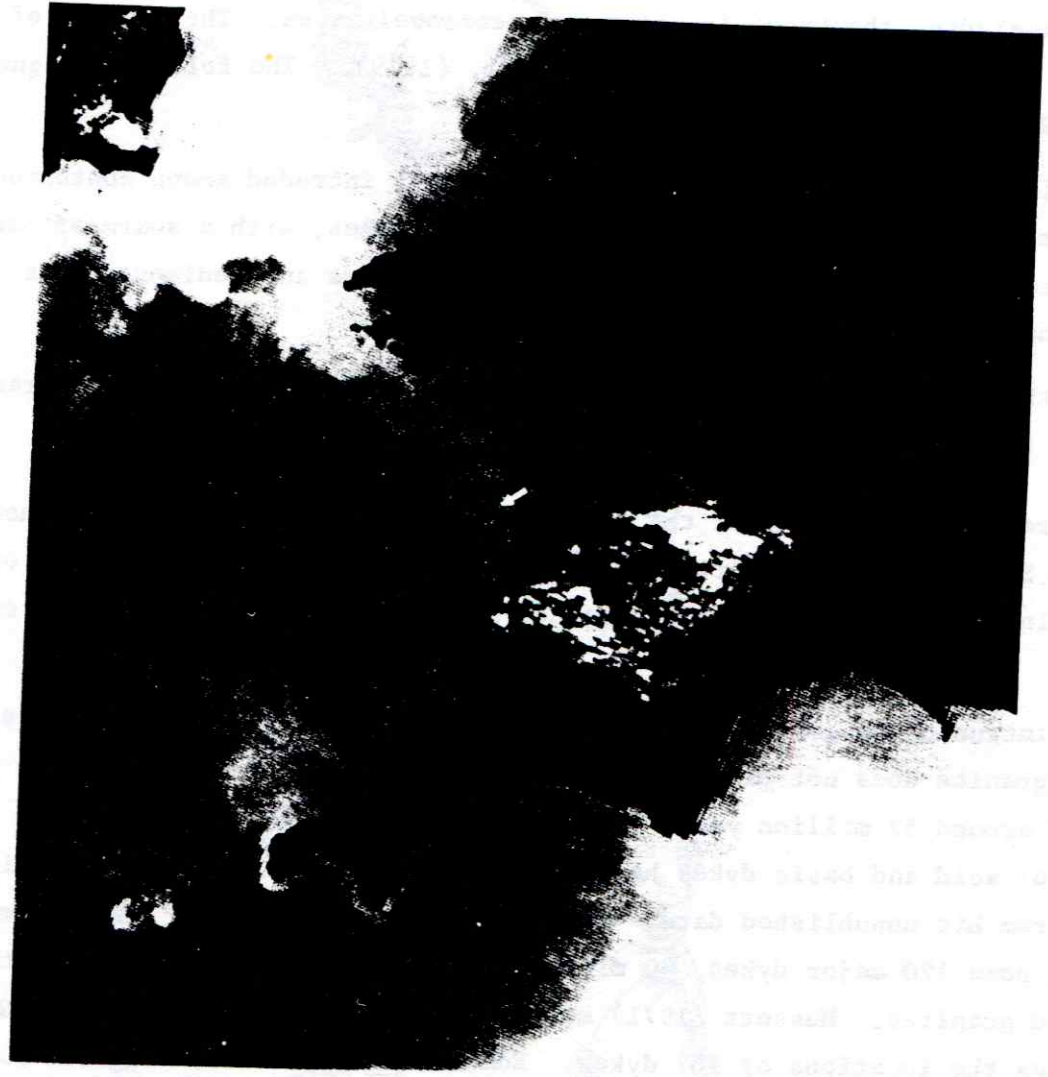


Plate 2. Infra-red satellite photograph showing the boundary of well-stratified oceanic water (dark areas) with well-mixed coastal water (lighter areas). The stratified oceanic water was closer to Lundy than usually indicated on this occasion.

1.2.1.3. Geology and geomorphology

Fig. 12 illustrates the main features of the coastal geology and geomorphology of Lundy including the known locations of sea-level caves. The geology of Lundy is described by Dollar (1942) and Edmunds et al. (1979). The following is quoted from Dollar (1942):

'It is a composite block of alkaline granites intruded among contoured slates, altered calcareous grits and thin marbles, with a swarm of basic, intermediate and acid dykes cutting both granites and sediments in a dominantly north-westerly direction....'

'Of the subaerial volume, approximately 91.4% is granite and microgranite, 6.4% is altered sediment and 2.2% is dyke-rock.'

The 'altered sediments' are of the Lundy slate series (very similar to those of the Morte Slates of nearby North Devon) and occupy the south-east corner of the island. In the subtidal, the rocky seabed along almost all of the south coast is of slate.

The intrusion of granite rock is a small one and Edmunds et al. (1979) suggest that the granite does not extend far beyond the island. The age of Lundy granite is put at around 52 million years (Middle Eocene) (Edmunds et al., 1979). The location of acid and basic dykes has been mapped by Mr. C.G. Taylor and Fig. 11 is derived from his unpublished data. Dollar (1942) describes the dyke-swarm as including some 120 major dykes, 30 minor dykes and six sills which cut both the slates and granites. Mussett (1971) mentions '250 or so dykes' whilst C.G. Taylor illustrates the locations of 167 dykes. Edmunds et al. (1979) suggests about 200 basic dykes and 32 acid or intermediate dykes. About 91% of the swarm are vertical or nearly vertical basic igneous intrusions about 1.2 m thick whilst the remainder are of different composition and may share a fissure with a previously-formed dyke, leading to a total thickness of up to about 3 m.

The rock type and the presence of dykes are extremely important in determining the different rock formations and types of mobile substrata present around Lundy. The granite rock forms a block-like structure with vertical and nearly horizontal surfaces predominating and with some canyons and extensive vertical surfaces present. Slate areas are generally much more broken but, again, extensive vertical surfaces can be present. Granite rock falling to the shore and seabed generally remains as large rounded boulders whilst slates break up, and, off the south-east coast,

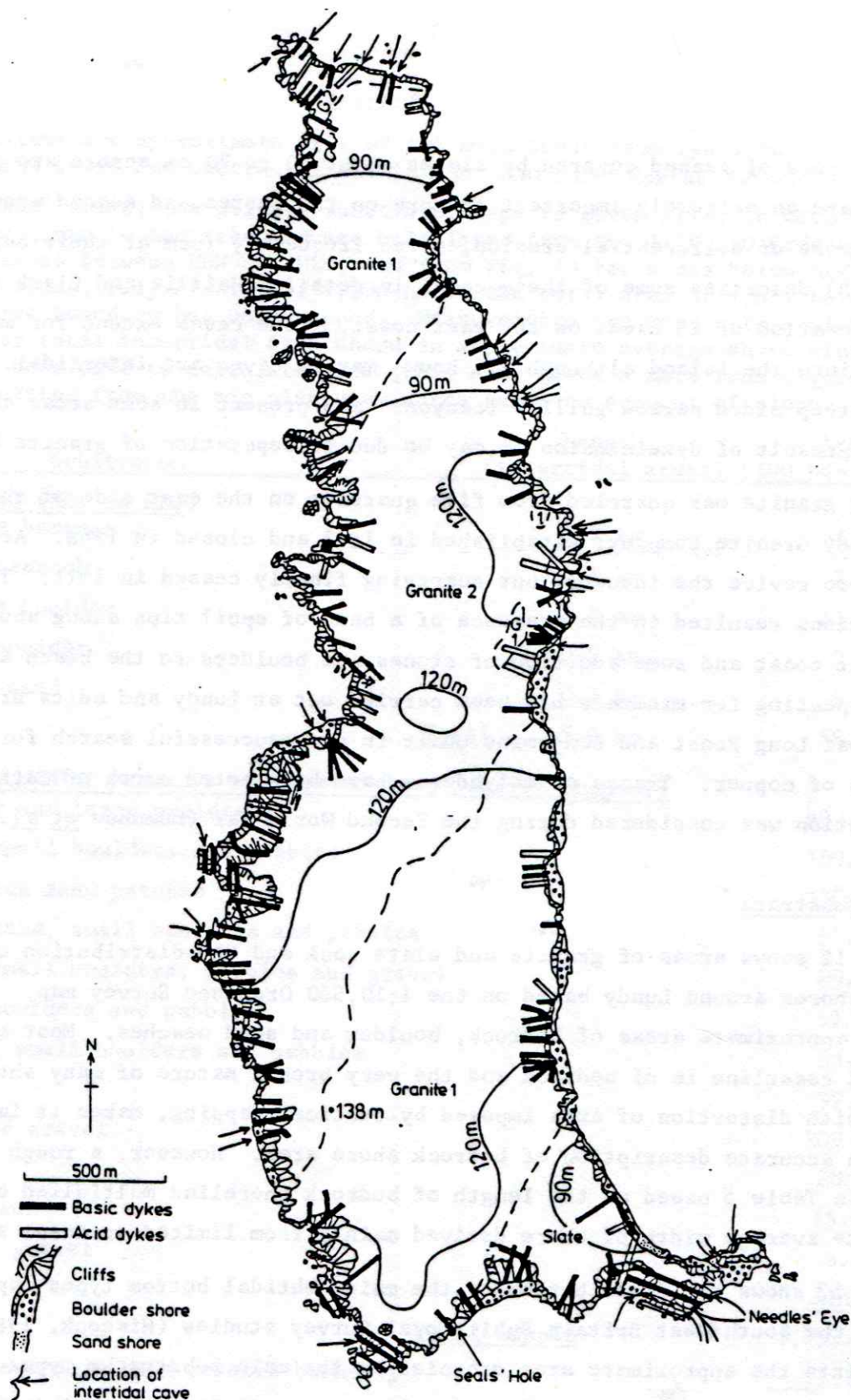


Fig. 12. Coastal geology and geomorphology. Heights in metres are approximate. Different rock types are separated by a broken line. Upper Granite (G1) and Lower Granite (G2) are shown. Geological features are copied from an unpublished map by C.G. Taylor. The location of intertidal caves is from Mills (1968), Clark and Baillie (1974) and unpublished information but is considered incomplete.

extensive areas of seabed covered by slates about 10 to 20 cm across are present. The dykes are an extremely important feature on the shores and seabed around Lundy since, because of differential erosion, caves frequently form at their base. Mills (1968) describes some of these caves in detail. Baillie and Clark (1974) show the location of 18 caves on the east coast. Some caves extend for many tens of metres into the island although all known marine caves are intertidal. Subtidally, steep-sided narrow gullies (canyons) are present in some areas and these may be the result of dyke erosion or may be due to separation of granite blocks.

Lundy granite was quarried from five quarries on the east side of the island by the Lundy Granite Company, established in 1863 and closed in 1868. Attempts were made to revive the industry but quarrying finally ceased in 1911. The quarrying operations resulted in the presence of a band of spoil tips along about 500 m of the east coast and some addition of stones and boulders to the beach at Quarry Bay. Prospecting for minerals has been carried out at Lundy and adits driven into the cliff at Long Roost and Benjamins Chair in an unsuccessful search for economic quantities of copper. Traces of molybdenum have been noted north of Battery Point and extraction was considered during the Second World War (Edmunds *et al.*, 1979).

1.2.1.4. Substrata

Fig. 12 shows areas of granite and slate rock and the distribution of boulder and sand shores around Lundy based on the 1:10,560 Ordnance Survey map. Table 5 lists the approximate areas of bedrock, boulder and sand beaches. Most of the intertidal coastline is of bedrock and the very broken nature of many shores, together with distortion of area imposed by vertical mapping, makes it impossible to give an accurate description of bedrock shore area. However, a rough estimate is given in Table 5 based on the length of bedrock shoreline multiplied by an approximate average width of shore derived mainly from limited transect studies.

Fig. 13 shows the distribution of the main subtidal bottom types mapped following the South-West Britain Sublittoral Survey studies (Hiscock, 1981). Table 5 lists the approximate area occupied by the main substratum types currently mapped within the 1 km boundary of the marine nature reserve. Large areas of the seabed are of bedrock, particularly off the west and south coasts. Off the sheltered east coast, several sediment types are present. These are generally of a mixed nature as reflected in the categories of Table 5. Also, sediments occur amongst areas of bedrock and large boulders.

TABLE 5

Extent and approximate area of the main substratum types on the shore and underwater within the statutory Marine Nature Reserve.

For subtidal areas, the primary substratum type is given first in each category. Areas are given in hectares and are calculated from the 1:10,560 Ordnance Survey map for areas between MHW and MLW, and from Fig. 13 for areas below MLW. For subtidal areas, only a total of 1,500 ha of the total area of 1,631 ha within the reserve boundary has been mapped. Measurements are made with a planimeter except for total intertidal area where an approximate average shore width of 40 m has been used to calculate area (this also gives a more true figure than that resulting from the map plan view which takes no account of slope).

| <u>Substratum</u> | <u>Length</u> (intertidal areas) | <u>Area</u> (100 ha = 1 km ²) |
|---|---|--|
| <u>Intertidal (MHW to MLW)</u> | | |
| Granite bedrock | 9.2 km | 36.8 ha |
| Slate bedrock | 1.9 km | 7.7 ha |
| Granite boulder | 2.9 km | 11.0 ha |
| Slate boulder | 0.9 km | 3.5 ha |
| Coarse sand | <u>0.1 km</u> | <u>0.8 ha</u> |
| <u>Total</u> | 15.0 km | 59.8 ha |
| <u>Subtidal (LWMOST seawards to the statutory Reserve boundary)</u> | | |
| Bedrock and large boulders | | 492.7 ha |
| Rock, small boulders and pebbles | | 159.3 ha |
| Rock with sand patches | | 136.1 ha |
| Rock, sand, small boulders and pebbles | | 54.6 ha |
| Rock, small boulders, pebbles and gravel | | 29.8 ha |
| Small boulders and pebbles | | 69.7 ha |
| Gravel, small boulders and pebbles | | 51.7 ha |
| Gravel | | 197.9 ha |
| Sand and gravel | | 209.1 ha |
| Sand | | 28.9 ha |
| Coarse sand | | 15.0 ha |
| Mud and gravel | | 6.7 ha |
| Mud | | <u>48.4 ha</u> |
| | <u>Total mapped</u> | 1,499.9 ha |
| Unmapped area within reserve boundary | | <u>131.2 ha</u> |
| | <u>Total area of subtidal part of reserve</u> | <u>1,631.1 ha</u> |

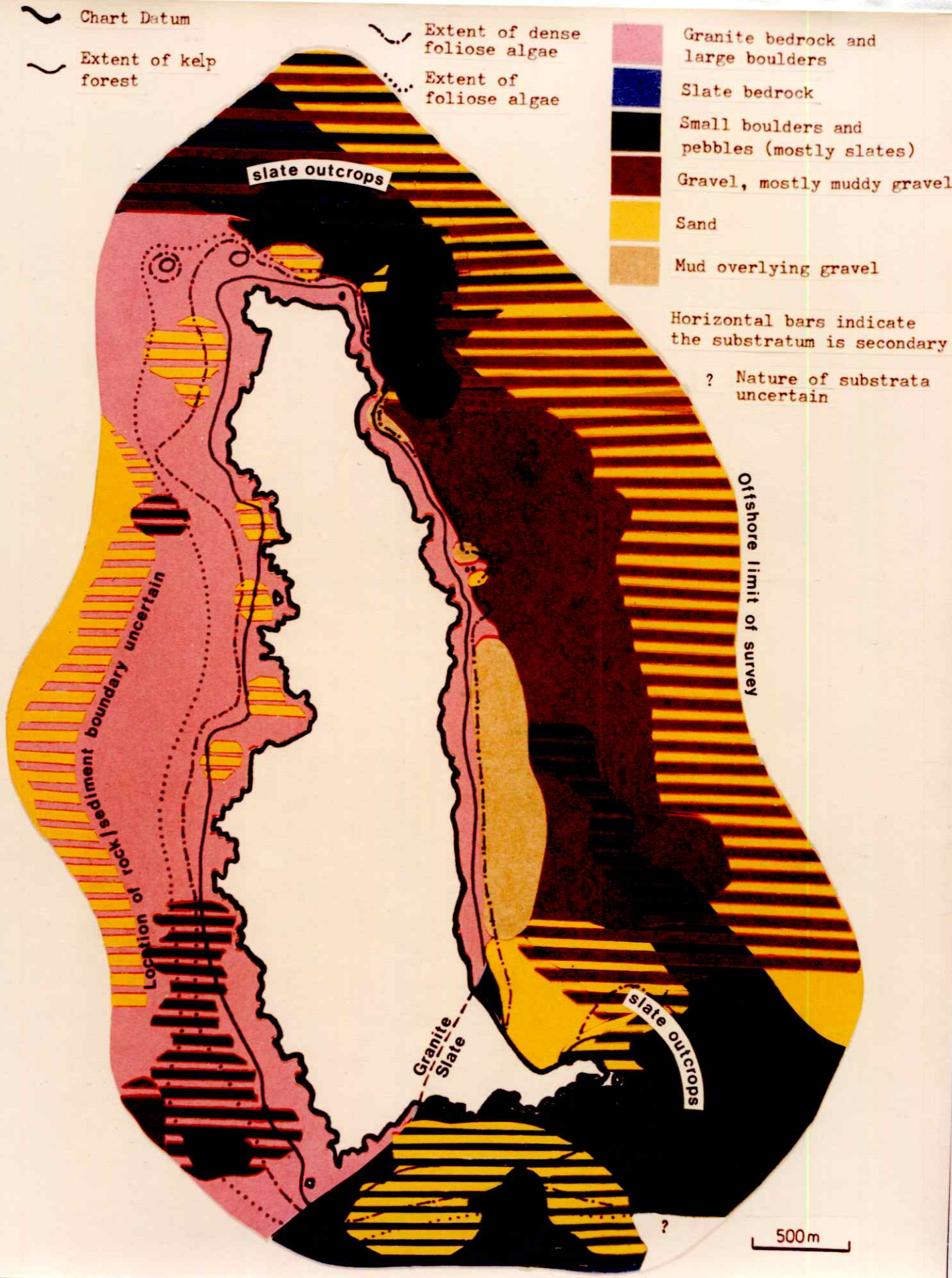


Fig. 13 Distribution of sublittoral bottom types and the extent of algal cover.

1.2.2. Biological

1.2.2.1. Flora

Algae. The marine algae of Lundy are described most recently by Irvine *et al.* (1972). Their lists include almost all of the algae currently recorded around Lundy although recent work has added a further ten species making a total of 316 species; a very rich flora. Studies subsequent to 1978 provided a great deal of information on the biology of sublittoral species in particular. Some species very rarely encountered in the British Isles and two species new to science have been recorded (see Table 8). The algal flora is distinctively south-western with some Mediterranean-Atlantic species such as Laminaria ochroleuca and Carpomitra costata present in large amounts.

Lichens. The lichen flora of Lundy, including littoral species, is listed by Noon and Hawksworth (1972). They surveyed a wide range of sites on the land but the only intertidal or splash zone site studied appears to be below the South Light.

1.2.2.2. Fauna

Invertebrates. Lists of the marine fauna are given by Harvey (1950) and in a series of publications in the Report of the Lundy Field Society from 1974. Currently, all of the main groups have been listed with the exception of sponges (in preparation). References are given in Section 1.3.1. The marine fauna is very rich particularly in sublittoral species and is distinctively Mediterranean-Atlantic with many species rarely found in the British Isles present in abundance at some locations: Axinella polypoides, Leptopsammia pruvoti, Alcyonium glomeratum, Eunicella verrucosa, Parazoanthus axinellae, Aiptasia mutabilis, Mesacmaea mitchellii. Many rare species are present and are listed in Table 8. The sponge, Anthozoan and Opisthobranch faunas are particularly rich. Sea urchins, which are important grazing species, are frequent around Lundy but numbers are not sufficiently high to result in impoverishment of the sublittoral communities.

Fish. Fish species recorded from the area of Lundy are most recently listed in Pullin (1977). Territorial fish which thrive in rocky areas and areas with kelp forest are present in large numbers around Lundy. Species of wrasse are particularly abundant on the east coast including ballan, cuckoo, goldsinny and corkwing wrasse. Here, the extensive boulder slopes and broken rock surfaces provide suitable habitats.

In 1982, an unconfirmed observation of the rare Baillo_u's wrasse was made off the south coast. Other fish living on the rocky seabed include monk fish, leopard-spotted goby and blennies. Bib are found in caves during daytime. Occasional visitors to Lundy in this habitat include John Dory and, in the mid-1970's, several separate observations were made of seahorse. Dogfish are frequently found on rock and sediments, whilst sediments alone support a sparse fish fauna including dragonets, plaice and ray. The red band fish is an unusual inhabitant of the sediments and its biology has been thoroughly investigated by Pullin, Atkinson and others (various papers and reports). Pollack are common swimming over the kelp forest and wrecks. Basking sharks and, more rarely, sunfish are seen in Lundy waters during summer.

Seals. The population of Atlantic grey seals on Lundy has been studied by Clark and Baillie (1974) and most recently reviewed by Clark (1977). In counts of hauled-out seals observed along the coast northwards from Quarter Wall on the east side all around the island to Shutter Rock, up to about 60 seals were observed with an average count of 37. The average is most likely an underestimate of the total population since many seals haul out along the south coast and particularly in the region of Rat Island. The count of 80 seals made all around the island and described by Britton (1969) is probably more accurate. Twelve pups were found during 1975, all at the ends of caves, and it seems likely that more were born, suggesting about a total of 25. The mean birthdate in that year was estimated as September 15th. Pups may also be found on some of the more inaccessible boulder beaches (eg Halfway Wall beach).

Seabirds. The cliffs and grassy slopes of Lundy provide nesting sites for a wide range of seabirds particularly auks. Species nesting in large numbers include guillimot, razorbill, shag, kittiwake, fulmar, herring gull, greater black-back gull and lesser black-back gull. Puffins are present in small numbers. The breeding population of Manx shearwaters is uncertain but possibly high.

1.2.2.3. Communities

The first draft of this management plan included detailed descriptions of the littoral and sublittoral communities present at Lundy. However, the large amount of information available made the descriptions too long for inclusion in the final management plan. The descriptions are therefore summarised here but included in full in Supplement 1 (Information file on the littoral ecology of Lundy) and Supplement 2 (Information file on the sublittoral ecology of Lundy).

Littoral communities. Littoral communities are present on bedrock and boulders all around Lundy with only very small areas of sand present in the region of the Landing Bay. The communities include species generally typical of rocky shores in south-west Britain which range in wave exposure from 'very sheltered' to 'very exposed' (approximately according to the definition of Ballantine, 1961). Some prosobranch molluscs are less abundant on Lundy than would have been expected on similar shores on the nearby mainland. The communities show a clear zonation in relation to height on the shore and the large tidal range at Lundy leads to the presence of extensive areas of the different communities. Local differences in community type on open shores are related mainly to slope, aspect and the mobility of the substratum.

In addition to the communities present on open rock surfaces, rich or unusual communities are present under boulders, under overhangs, in gullies, in rockpools and in some caves. The large number of intertidal caves on Lundy provide a particularly unusual feature to the littoral ecology of the island.

The distinctly different communities in littoral habitats present on Lundy have been separated, for purposes of description into the following categories:

- Communities on bedrock and boulders on the west coast.
- Communities on bedrock and boulders on the south coast west of The Gates.
- Communities on broken bedrock and boulders at The Gates.
- Communities from the north side of Rat Island to the Landing Beach.
- Communities on bedrock and boulders on the east coast.
- Communities on bedrock and boulders on the north coast.
- Communities present under boulders on the above shores.
- Communities present in rockpools on the above shores.
- Communities in caves on the above shores.

The general features of these communities are described later in Table 7.

Sublittoral communities. The distribution of different sublittoral communities around Lundy is determined by three main factors: substratum type, light intensity and water movement regime. The distribution of substratum types and of the extent of the algal-characterised zones (determined by light penetration) is shown in Fig. 13. Further differences are brought about by topographical features and by such factors as siltation and sand scour. The particularly wide range of environmental

conditions prevailing around Lundy and the considerable depth to which rock extends leads to the presence of a wide range of communities. All of the main nearshore sublittoral sub-zones related to light penetration are very well-represented on the different coasts although on the south part of the east coast, there is no lower circalittoral sub-zone due to the nearshore shallow extent of sediments. Depth limits of these various sub-zones relative to chart datum level are:

| | |
|--|--------------------|
| Sublittoral Fringe (characterised mainly by <u>Laminaria digitata</u> , <u>Alaria esculenta</u> and encrusting calcareous algae)..... | +1 to 0 m |
| Upper Infralittoral (characterised by a forest of <u>Laminaria</u> <u>hyperborea</u> and other kelps)..... | 0 to 8 m |
| Lower Infralittoral (characterised by a sparse kelp park and/or dense foliose algae)..... | 8 to 14 m |
| Upper Circalittoral (characterised by domination by animal species with sparse foliose algae)..... | 13 to 22 m |
| Lower Circalittoral (characterised solely by animal species)..... | 22 m and deeper |

The main distinctly different communities in sublittoral habitats are listed below:

Communities on bedrock and large boulders on wave-exposed coasts (west and south coasts).

Communities on bedrock and large boulders on wave-sheltered coasts (north and east coasts).

Communities on vertical and overhanging rock.

Communities in caves.

Communities on wrecks.

Communities in canyons.

Communities on sandy rocks and rocks adjacent to sand in shallow water.

Communities on small boulders, stones and large shells.

Communities on clean mobile gravel.

Communities on and in sediments including mud overlying gravel, muddy gravel, fine sand with mud and shells, shallow muddy sand, mixed substrata and coarse clean sand.

The general features of these communities are described in Table 7, although classification is slightly different in that table. Biogeographically distinctive features of the sublittoral communities at Lundy include the domination of circalittoral rock by erect Bryozoa with a wide variety of sponges, hydroids and other

groups present together with the high abundance of some large conspicuous Mediterranean-Atlantic species at some locations. Ecologically important features include the fairly shallow downward extent of algal domination, the considerable downward extent of rock surfaces, the fairly low density of sea urchins (Echinus esculentus) and the very wide range of habitats present.



Fig. 1. Approximate positions of some station groups around land.

1.2.3. Cultural

1.2.3.1. Archaeology

Many vessels have been wrecked on or near Lundy although few remain intact. There are no wrecks listed as of historic importance at Lundy. Probably the oldest known remains on the seabed are two cannon and, previously, a number of stone cannon balls at a site near to the Knoll Pins. The known visible wrecks together with a note on their condition has been given in Table 1. Fig. 14 shows their approximate position. The wreck of the small coaster M.V. 'Robert' which sank in 1975 is of high intrinsic appeal and the communities present on the wreck of high scientific interest.

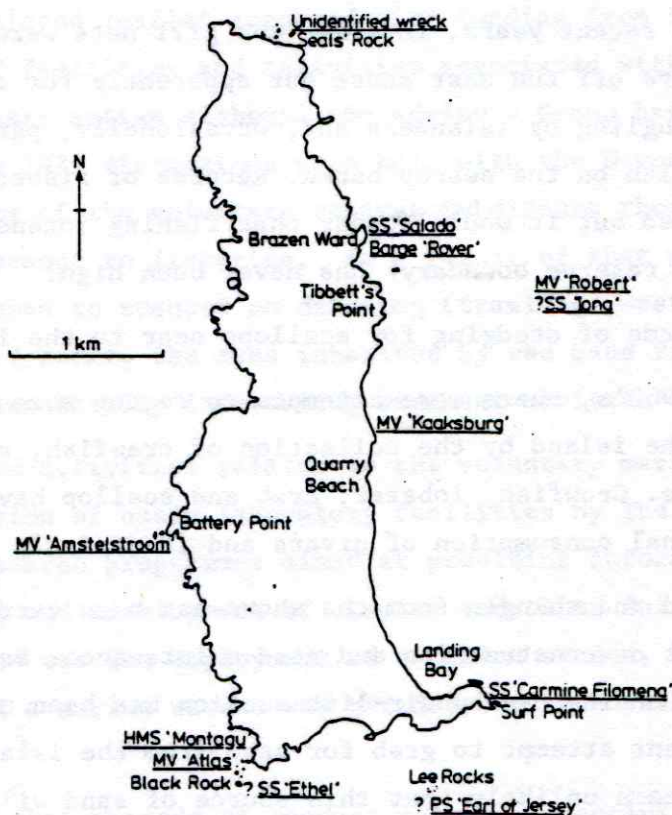


Fig. 14. Approximate positions of known visible wrecks around Lundy.

1.2.3.2. Resource-use history

It would appear that fairly intensive pot fishing for lobster and crawfish has been carried out around the island for over a hundred years. Over the past 20 years much of this fishing has been from large boats shooting strings of pots for crawfish around the north and west coasts. However, this fishing has been carried out very irregularly and at low intensity in the past two years, up to 1982. Some nearshore fishery for lobsters exists and in 1982 one islander had about 65 pots deployed in nearshore areas. One boat, potting for lobsters in areas distant from the reserve boundary, was based at Lundy for two years up to 1982 and had keep pots north of the Landing Bay. In 1983, however, this boat was not present, nor were there any pots deployed by islanders. The one regularly-visiting boat from Padstow in 1983 had 180 pots within the reserve boundary and 520 outside it, up to 4 miles away from the island.

Very little commercial fishing for bottom-living or demersal fish is known to have taken place in recent years. In 1982, two gill nets were set on the seabed near to the shore off the east coast but apparently for only a few days. There is some sports angling by islanders and, occasionally, parties from the mainland who usually fish on the nearby banks. Records of fisheries near to Lundy are not maintained but it would appear that fishing intensity near to the coast (within the 1 km reserve boundary) has never been high.

There are no records of dredging for scallops near to the island.

During the late 1960's, there were attempts to recoup some of the costs of diving operations on the island by the collection of crawfish, sea urchins and sea fans for later sale. Crawfish, lobster, crab and scallop have continued to be taken for the personal consumption of divers and in strictly limited numbers.

Collection of sand and shingle from the shore has been carried out for many years for purposes of construction and road maintenance. Sand collected from subtidal areas of the Landing Bay by air-lift suction has been used for construction but a recent attempt to grab for sand from the island supply vessel failed and it seems unlikely that this source of sand will be exploited again in the near future.

One particularly valuable 'resource' which Lundy offers is shelter from gales within the lee of the island, particularly Lundy Roads. Many vessels anchor here during storms and the smaller coasters and fishing boats come close inshore.

In the past 15 years, Lundy has become popular with both sports divers and research biologists studying sublittoral areas. Limited accommodation and beach facilities generally restricts numbers to about 12 in one week. Some divers visit the island on day or weekend trips using their own or charter vessels.

1.2.3.3. Past management for nature conservation

Lundy has been notified as a Site of Special Scientific Interest and this designation includes intertidal areas. There is no formal implemented management plan for Lundy although a management plan has been produced by the Lundy Field Society. This plan includes reference to intertidal and subtidal areas based on the management policy published for the voluntary marine nature reserve (Hiscock et al., 1973). Marine areas around Lundy have been designated a voluntary marine nature reserve since 1973. The proposal to establish a marine reserve was first made in 1971 (Hiscock, 1971) at which time some informal agreements on collecting had already been reached with BCD Marine Ltd. who held the diving concession on Lundy. In 1972, an Advisory Committee was formed including representatives of The Landmark Trust, Nature Conservancy, Lundy Field Society, BCD Marine Ltd. and marine biologists. A management policy was published in 1974 (Hiscock et al., 1973) and an associated leaflet prepared with funding from the Nature Conservancy. The development of facilities and activities associated with the voluntary marine reserve has been very active although the Advisory Group has not met formally for several years. In 1979 discussions were held with the Devon Sea Fisheries Committee to outline the aims of the voluntary reserve and discuss those aspects of management of particular relevance to fisheries. As a result of that meeting, a voluntary agreement was reached to request no dredging (trawling) west of a line between the Knoll Pins and Surf Point, the area inhabited by red band fish and where one of the richest, most scientifically interesting sediment habitats was present.

Facilities and activities related to the voluntary marine nature reserve have included construction of basic laboratory facilities by The Landmark Trust, development of research programmes aimed at providing information for management, running of courses and development of display and other interpretative facilities. Of great importance was the employment of a marine warden, Nigel Thomas, in 1978. The appointment of a marine warden was carried out as a pilot project with the aims outlined below:

1. To ensure that the code of conduct related to activities within the marine reserve was abided by.
2. To provide guidance and information to amateur divers on holiday at Lundy.
3. To advise and assist field workers carrying out studies around Lundy.
4. To assist in organising and running field courses in sublittoral ecology.
5. To prepare illustrated guides for the reserve.
6. To report on the project.

All of these aims were fulfilled and much information was obtained on the distribution of marine-oriented activities around Lundy. The project was reported in Thomas and Hiscock (1978).

1.2.3.4. Public interest

Research. Lundy has sporadically drawn the attentions of marine biologists and naturalists for over 100 years. George Tugwell, writing in 1856, describes a party of naturalists who visited Lundy in 1851 and 'exported a man and a crowbar, and by dint of diligent stone-turning for the space of two hours, they were able to return laden with all imaginable and unimaginable spoils and there were divers animals of higher organisation which I will only name in the hope that some other naturalist will be tempted to explore the same prolific hunting ground.' The island was visited by the Victorian naturalist Philip Henry Gosse although he appears to have recorded few marine species. Charles Kingsley mentions species collected at Lundy in his 'Glaucus' (1873). Edward Forbes dredged off the east coast of Lundy and his findings are described in the Report of the British Association for the Advancement of Science (1851). More recently, G.F. Tregelles collected and listed marine algae in 1934; his records are included in the 'Ilfracombe Fauna and Flora' (Palmer, 1946). Records of marine animal species in the same volume are few. A considerable amount of intertidal work was carried out by Professor L.A. Harvey in the late 1940's and early 1950's and mostly reported in the Report of the Lundy Field Society. There was then a gap in marine studies before a period of intensive investigation by a large number of workers, particularly in sublittoral areas, from 1969 to 1980. These studies are described in Section 1.3.2.

A considerable amount of research by professional and amateur biologists has been carried out on Lundy and most aspects of the island's natural history have been studied. Most of these studies are described in the Report of the Lundy Field Society.

Education. Professor Harvey used Lundy as a base for studies of marine ecology by students attending courses at Exeter University. However, few of the shores at Lundy are accessible from the land and, although a wide range of rocky intertidal habitats are present, the island is not generally a suitable base for teaching general aspects of littoral ecology. During the 1970's two courses in sublittoral ecology and methods for studying underwater areas using diving were

run from the island. The wide variety of habitats and communities, together with the convenience of the Landing Bay for learning techniques, made the island a good location for such a course. In 1982, a one week 'guided tour', which included talks on marine biology and was advertised to divers interested in natural history, attracted 37 applicants for ten places. Lundy is clearly becoming more attractive to divers interested in natural history because of the richness of the sublittoral communities and the knowledge that has been accumulated about the biology of the area.

Leaflets and displays have been prepared illustrating aspects of marine ecology and species. These have been of considerable interest to the people who have been able to view them, mostly the visiting divers. In the early 1970's, an island museum was planned and a major marine display was to have been an important part of that facility. However, plans for a museum have been, for the moment, shelved. There are, though, plans to change the present shop premises into a visitor information centre, as the shop is moving into new premises. This, hopefully, will provide room for a marine display. Certainly there is a great deal of interest amongst visitors in the marine natural history of Lundy and further interpretative facilities would be appropriate.

Recreation. Visitors to Lundy use the Landing Beach for recreation and swimming but there are no developments associated with these activities. Diving is based at the jetty and there is a concrete hut at the top of the jetty to provide storage and changing facilities. Fig. 15 shows the extent of diving activities in 1978. There is a small amount of angling from rocks and dinghies in the Landing Bay. Parties of anglers visiting from the mainland for one day in charter boats generally go to the fishing banks. Yachting to Lundy is popular and vessels anchor in the Landing Bay mainly, and occasionally in such locations as Frenchmans Landing, Gannets Bay, Jennys Cove and Rattles Anchorage.

For many years, Lundy has been a popular diving site for those divers able to reach the island from the mainland or to spend a week on the island. However, reaching the island from Ilfracombe or Swansea is a major undertaking requiring a substantial vessel and few parties visit Lundy by this means. In 1981 and 1982, one charter vessel is known to have visited Lundy with a party of divers. Staying on Lundy is expensive by many standards, and only about 12 divers can be accommodated on the island and at the diving facility in the Landing Bay at any one time. Divers visit Lundy for general sports diving, wreck diving and, more and more, for the natural history interest of the area.

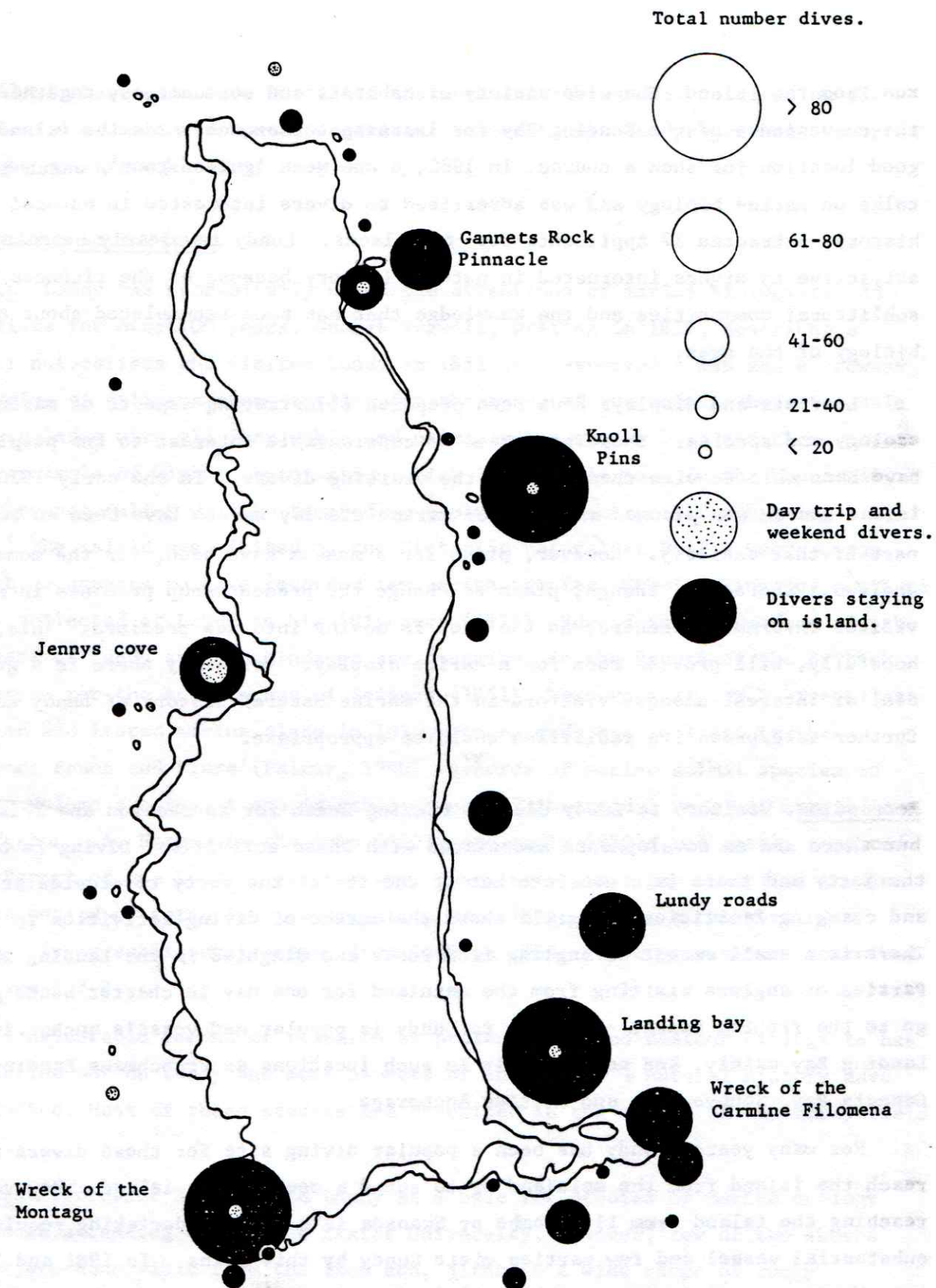


Fig. 15. The extent and distribution of diving activities in 1978.
From Thomas and Hiscock (1978).

Local activities and interests. These are included in the preceding notes on recreation and Sub-section 1.2.3.2 on Resource-use history.

Landscape and amenity. Many visitors to Lundy, including those who dive, are attracted by the spectacular coastal scenery. Access to Lundy for those wishing to view the scenery, and provision of the small amount of footpath maintenance and associated management required to maintain the scenic beauty of the area, is assured through the ownership of Lundy by the National Trust and management by The Landmark Trust. Visitors are also attracted to the island by the wildlife present and their interests are not greatly catered for except by the Lundy Field Society.

1.2.4. Ecological relationships: implications for management

The distribution of marine habitats around Lundy, which in turn affects the communities present, is determined by the rock type, the supply of mobile substrata, and the redistribution of mobile substrata by water movement. Much of the coast is of bedrock and wave action, together with tidal streams in the sublittoral, prevents the accumulation of sediments in most areas of the littoral and exposed areas of the sublittoral. Boulders falling from the cliffs accumulate in bays and on the east coast form the main hard substratum adjacent to the coast along much of the island particularly in the sublittoral. In other places, rock surfaces are too steep for boulders to accumulate on the shore or shallow subtidal. Where wave action is lowest, in the Landing Bay, sediments accumulate on the shore. Where tidal streams and wave action are weakest, in the lee of headlands on the north and south coasts, and off the east coast south of Gannets Rock, sediments accumulate; the type of sediment determined by the type and strength of water movements. These complex relationships are unaffected by aspects of management excepting any major changes brought about by changed water movement regimes resulting from, for instance, tidal barrage construction.

Local distribution of species on the shore around the island is mainly the result of varying degrees of exposure to wave action and the wide range of exposure grades results in a wide variety of communities. The wide vertical extent of species and communities on Lundy shores is brought about by the large tidal range and the classic intertidal patterns of zonation resulting from degree of immersion and emersion can clearly be seen. The shore is a very dynamic ecosystem with a high recovery potential following damage. However, aspects of shores are liable to long-term damage following disturbance particularly on some of the rich lower-shore communities or in some caves.

Local distribution of species underwater around the island is largely the result of exposure to wave action and tidal streams, factors which both vary widely around Lundy. The development of different communities at different depths is the result of attenuation of light with increasing depth, which affects populations of algae, and the attenuation of wave energy with depth, which affects many species of algae and animals directly and indirectly by such factors as siltation and food supply. Large changes in the tidal stream velocity or wave energy would result in changes in community type. Dredging for aggregates or sand may produce plumes of fine sediment and alter the sedimentation regime.

Local topographical features of rock which form vertical surfaces, overhanging surfaces, gullies, canyons, caves, rock pools and other features, result in the presence of different communities to those of surrounding open rock surfaces. The fissured and friable nature of the slate rock leads to the presence of many crevice-living species. The large number of sea level caves which extend deep into the rock and above high water level at their ends are clearly of great importance for the breeding of seals. Such features should be mapped and described so that any threats of disturbance in certain areas may be assessed.

The richest communities in terms of numbers of species present and, in the subtidal, large numbers of rare or unusual species, are those of sheltered coasts. Here, species are subject to much less physical variability and therefore stress than on the more exposed coasts and a large number of species can survive. Also, strong wave action and strong tidal streams can be highly destructive and the number of species able to survive in such rigorous conditions low. At the other extreme, physical control of communities due to heavy siltation in very still conditions only occurs substantially on parts of the east coast south of Gull Rock. Physical control of communities also occurs due to mobility of substrata in wave action and results in scouring and abrasion with the development of communities of fast-growing, initial colonising species through various types of communities at different stages of development. Some of these communities are quite rich and include species very rarely encountered elsewhere. However, the most frequently disturbed substrata, including sand on the Landing Beach and sand in the subtidal off the south and north coasts, are highly impoverished and are clearly not sufficiently stable to allow the development of a macrofaunal community. The richest communities are often those considered 'spectacular' or 'colourful' by divers and certain sites may be subject to excessive diving. Similarly, rich shore sites may be subject to excessive disturbance by the interested public.

The location of Lundy in south-west Britain is important both for the survival of Mediterranean-Atlantic species because of high winter temperatures, and because of the presence of nearby stocks of these species. Also, residual currents are from the south-west and thus larval dispersal towards Lundy from the south occurs. The nature of the water masses present around Lundy also appears to be important. Some species (for instance Alcyonium glomeratum and Holothuria forskali) appear to occur on coasts near to oceanic water. The proximity of an oceanic front just to the west of Lundy might also be important. The very large number of suspension-feeding species, which are present in abundance around Lundy, doubtless thrive partly because of the input of highly productive coastal water. The fairly high suspended sediment load is also of importance in determining the penetration of light and therefore the downward extent of the kelp forest and of foliose algae.

The restricted downward extent of algae when compared with some other coasts of the British Isles is an important factor in the scientific value of Lundy because animal-dominated communities are within practical diving depths and the full sequence of shallow sublittoral zonation on rocks can be observed before reaching the sediment plain. The offshore location of Lundy leads to the reduction in range of variability of some environmental factors such as salinity and suspended sediment concentration and such stability might be advantageous to many species. Also, the island is relatively isolated from mainland sources of pollution. These environmental factors seem unlikely to change. However, any increase in the levels of sedimentation may lead to smothering of sessile species, and the possibility of such change, resulting from practices carried out some distance from the MNR, should not be ruled out (see 2.3.3.).

Several species will be important in determining the presence or abundance of other species. Inter-relationships between species include such factors as the provision of shelter (for instance in kelp holdfasts), predation (for instance by dogwhelks on mussels and barnacles) and grazing (for instance by limpets on algal sporelings). Of particular importance to the communities present in the sublittoral is the grazing of the sea urchin Echinus esculentus. Urchins are fairly sparse around Lundy but nevertheless their grazing activities free space for settlement of new species and probably exert a considerable influence on the variety of species and communities present. On the other hand, a high density of urchins would maintain rocks largely clear of organisms and lead to impoverishment. Any unnatural disturbance of this balance should be prevented.

Many other environmental factors are of importance to the community which develops at a particular location and these are described separately for littoral and sublittoral areas. Altogether, the range of environmental conditions forms a complex mosaic in which it is difficult to assess the importance of any one factor to account for such features as the large number of Mediterranean-Atlantic species present or the richness of particular communities. Very little management is required to ensure that the present communities continue to be present. Inevitably, there will be natural fluctuations but no sorts of stocking, culling or similar activities are appropriate. Only large-scale disturbance of habitats and species by man should be guarded against.

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1.3.2. Register of unpublished information and scientific research

The following sections describe research activities carried out from 1948 to 1980 inclusive. Most of this work has been reported; some continues. No programmes of work were carried out in 1981. Affiliations of each worker are given at the time the work was carried out. References are included in the Bibliography (Section 1.3.1.). References in the Bibliography also include minor studies or studies where Lundy was part of a larger programme and these are not described here.

Studies of rocky shore ecology and listing of the marine fauna and flora 1948-1951. (L. A. Harvey, University of Exeter).

Professor L. A. Harvey and Mrs. C. L. Harvey together with parties of students from the University of Exeter carried out studies of shore ecology on granite and slate shores at accessible sites around the island. Much of this information was published in Anon. (1948), Harvey (1950, 1951) and included both descriptions of shore communities and species lists. Unpublished field notes in typed format are held by K. Hiscock.

Survey of the marine algae of Lundy. (D. E. G. Irvine, Polytechnic of North London, and others).

The main aim of this work was to investigate the sublittoral flora for comparison with other regions and to study intertidal vegetation where time permitted. Fifteen sites at locations all around the island were studied. The published work (Irvine *et al.*, 1972) includes all valid records of Lundy algae up to that date and an assessment of previous studies, particularly those of G. F. Tregelles which are not specifically described here.

Studies of rocky shore communities, 1971. (C. R. Boyden, Bristol University).

This work was carried out to provide further descriptions of shore communities. Five shores were visited and the communities described. Animal species were listed and their abundance on each shore recorded (Boyden, 1971).

The marine fauna of Lundy. (Co-ordinated by K. Hiscock, Field Studies Council Oil Pollution Research Unit).

A great deal of the work carried out in recent years has been aimed at assembling lists of the marine animals present around Lundy from the littoral splash zone to deep water including the seabed within the influence of the island mass (an area 23 km east to west and 15.5 km north to south). For most groups, experienced taxonomists have visited Lundy to record and collect species within

their fields of interest. Some collecting and observation has also been done during ecological studies and samples have been collected on behalf of some workers. Each list is published as it is considered reasonably complete in the Report of the Lundy Field Society. Details of the results of the work cannot be given here but it is noted that the studies have provided a great deal of new information about animals living, in particular, on sublittoral rocks, and have also recorded many species previously unknown in the British Isles, extended known distributional limits and described extremely rare species.

The list below gives the main groups, notes the progress of publication and lists the persons responsible for each part of the work.

- Porifera. In preparation (S. M. Stone, British Museum of Natural History).
Coelenterata. Published (K. Hiscock, Field Studies Council).
Polychaeta. Published (J. D. George, British Museum of Natural History).
Isopoda. No responsibility at present.
Amphipoda. Published (P. G. Moore, University Marine Station, Millport).
Decapoda. Published (R. J. A. Atkinson, University Marine Station, Millport).
Prosobranchia. Published (B. Picton, Ulster Museum).
Opisthobranchia. Published (G. Brown, University of Bristol, and P. J. Hunnam, Field Studies Council).
Bivalvia. Published (J. Wilson, Trinity College, Dublin).
Bryozoa. Published (P. J. Hayward, University College, Swansea).
Echinodermata. Published (P. Tyler, University College, Swansea).
Ascidiacea. Published (D. J. W. Lane, University College of North Wales).
Pycnogonida. Published (P. E. King, University College, Swansea).
Pisces. Published (R. Pullin, Marine Biological Station, University of Liverpool. Records are also made by Hudson, 1971).

Further studies of the marine flora of Lundy. (S. Hiscock and C. Maggs, Field Studies Council Oil Pollution Research Unit).

Following the thorough studies of Irvine *et al.* (1972), further observations have been made on the distribution and ecology of algae. Several species not located by Irvine *et al.* have been recorded and it is planned to describe these records together with others made in south-west Britain in a paper now being prepared.

The distribution of rocky sublittoral animal communities. (K. Hiscock, University College of North Wales).

Studies of the distribution and abundance of conspicuous animal species were carried out at sites all around the island in 1969 and 1970 and as part of a Ph.D. project aimed at describing the effects of wave action and tidal streams on

rocky sublittoral animal communities. The work for this study was completed in 1974 but further sites continue to be visited and records maintained of the distribution of species which can be recognised in situ (Hiscock, 1971, 1976, in press).

Quantitative sampling of undergrowth communities from sublittoral rocks. (K. Hiscock, University College of North Wales).

Quantitative collections have been made using an underwater suction sampler from 14 locations all around Lundy at 10 m and 20 m depths. The work has been carried out to: a) describe the distribution of small sublittoral species present in different habitats around Lundy, and b) to provide specimens of the smaller species for the preparation of the fauna lists. The samples have been partly sorted and identified.

Surveys of the zonation of rocky shore species. (K. Hiscock and S. Hiscock, Field Studies Council Oil Pollution Research Unit).

A systematic survey of the abundance of rocky shore algae and animals has been carried out at four sites around Lundy. At each site the density and percentage cover of organisms were recorded for stations placed at vertical intervals 60 cm apart and extending from the kelp zone on the lower shore to the first flowering plant in the splash zone on the upper shore (Hiscock and Hiscock, 1979).

The zonation of rocky sublittoral species. (K. Hiscock, D. Rostron and S. Hiscock, Field Studies Council Oil Pollution Research Unit; N. A. Jephson, Portsmouth Polytechnic; and T. Hruby, Glasgow University).

During 1976 a systematic survey of zonation of plants and animals was carried out at Brazen Ward on the east coast. During 1977, the work was repeated on the west coast at Dead Cow Point. Stations at 2 m depth intervals from 0 m to 16 m and 18 m on horizontal rock were marked and the abundance of all observed plants and animals recorded. Quantitative samples were also collected at each depth with an underwater suction sampler. Measurements were made of tidal flow and the amount of light reaching each station at Brazen Ward. Sorting and identification of materials is complete and the data are being prepared for publication.

The fauna of sediments off the east coast. (J. Wilson, Trinity College, Dublin, and R. Hoare, University College of North Wales).

The epifauna and infauna of soft sediments off the east coast were observed and sampled during 1975. Transect lines at right angles to the shore were used to carry out a programme of sampling with coring tubes and the recording of density of epifauna species by direct measurement. Further core samples were collected from all along the east coast and a few sites on the other coasts (Hoare and Wilson, 1976). During 1978, further observations were made of epifauna species on all of the main sediment types off the east coast. Also, a suction sampler was used to collect sediments for the recording of infauna species from the main sediment types.

Studies on octocorals of the genus Alcyonium. (Dr. M. W. Robins, Kings College, University of London).

This study was aimed at obtaining information on the population characteristics of Alcyonium digitatum and A. couchii (= A. glomeratum) at sites on Lundy. Work was carried out mainly on the east coast (Robins, 1971).

Studies of the red band fish Cepola rubescens. (R. S. V. Pullin, University of Liverpool Marine Biological Station, and R. J. A. Atkinson, University Marine Biology Station, Millport).

The first in situ description of the burrows and burrowing habit of Cepola rubescens was obtained at Lundy in 1974. Further, more detailed studies in 1975, 1976, 1977 and 1978 have provided a great deal of new information about the species. Polyester resin casts have been taken to describe burrow structure and measurements have been made of distribution, age and size structure, feeding behaviour, reproduction, and associated species. During 1977, mapping was carried out to determine the size and extent of the Cepola population on Lundy and to provide information to assist in the conservation of the species (Atkinson, 1976; Atkinson and Pullin, 1976; Atkinson et al., 1977; Pullin and Atkinson, 1978).

Studies of the sea urchin Echinus esculentus. (P. Rodhouse and others, University of Southampton).

Density, size, structure and depth distribution of E. esculentus were measured at six sites around Lundy during July 1976. In situ measurements of respiration were made and growth rates calculated from annual rings on the gonad plates (Rodhouse and Tyler, 1978).

Studies of *Goneplax rhomboides*. (R. J. A. Atkinson, University Marine Biology Station, Millport).

During 1974 studies were made of a population of the crab *Goneplax rhomboides* off the east coast. The density and aggregation of burrows was investigated and resin casts taken to describe the structure of burrows (Atkinson, 1975).

The concentration of heavy metals in sediments and organisms. (G. B. Jones, University of Southampton).

Specimens of organisms from littoral and sublittoral areas around Lundy together with samples of sediments from the east coast have been analysed for arsenic, mercury, cadmium and copper (Jones et al., 1973; Jones, 1974, 1975).

Mapping of sublittoral marine habitats. (Co-ordinated by R. Nash, University Marine Biology Station, Millport).

During three weeks in 1977, a team of six divers carried out a survey all around Lundy aimed at mapping sublittoral substrata, topographical features and the main rock cover organisms. Supplementary observations have been made in 1978 and 1979. The work was intended to provide the basis by which the range of habitats present and their extent could be assessed as a contribution to the management plan (Nash and Hiscock, 1978, 1979).

Description, characterisation and mapping of sublittoral communities.

(Co-ordinated by K. Hiscock, Field Studies Council Oil Pollution Research Unit).

Following the habitat survey, a team of biologists able to identify a wide range of species carried out a study aimed at describing the sublittoral plant and animal communities present in the different habitats. Work was restricted mainly to the east coast by weather conditions in 1978 and a thorough series of observations of epifauna was made together with samples of infauna species from the main types of sediment. In 1979 the survey was continued on the west coast with further east coast sites surveyed during bad weather. Further observations were made in 1980. The results of the work will be reported to the Nature Conservancy Council.

Studies of minimum sampling area for sublittoral hard substrata. (D. Rostron and K. Hiscock, Field Studies Council Oil Pollution Research Unit.)

The wreck of the M.V. 'Robert', a small coastal vessel, provided unbroken extensive surfaces for the testing of sampling efficiency in a simple situation. Twenty 0.1 m² samples were collected at randomly located positions on a grid established along the upward-facing side of the hull. Fourteen of the samples have been sorted and the species identified and enumerated to provide a basis for analysis. A paper is in preparation.

Studies of rocky shore communities 1980. (K. Hiscock and S. Hiscock, Field Studies Council Oil Pollution Research Unit, and S.J. Hawkins, Marine Biological Association of the U.K.).

These studies were carried out to record the communities present on shores not adequately described by previous investigations and to look specifically at cave and rock pool communities. Shores were surveyed north of the Landing Beach, at Gannets Bay, the north coast, the west coast below Quarter Wall, and at Lametry Bay (Hiscock, 1982).

Studies by Atlantic College. (J. Mendelssohn and students of the United World College of the Atlantic, St. Donats).

Students of Atlantic College have used Lundy as a dive-training base from 1973 to 1980. During this time several projects have been carried out including a topographical survey with associated species distribution data at the Knoll Pins (Mendelssohn, 1973), surveys of substratum types off the east coast and surveys of Echinocardium cordatum density in the Landing Bay (unpublished reports held by K. Hiscock).

Studies by the Institute for Marine Environmental Research

Studies of environmental conditions and a wide range of aspects of marine ecology in the Severn Estuary and Bristol Channel have been carried out by staff at the Natural Environment Research Council Institute for Marine Environmental Research at Plymouth. These studies generally extended almost as far as Lundy towards the open Atlantic and provide useful information, particularly on water quality, plankton distributions and the extent of substratum and sediment community types near to Lundy. Information for these programmes of research has been published in a wide range of journals, in reports on the proposed Severn Barrage and in IMER Annual Reports.

1.3.3. Other references in Management Plan

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2. EVALUATION AND OBJECTIVES

2.1. CONSERVATION STATUS OF THE SITE

2.1.1. Historic

Although the work of Professor Harvey in the late 1940's and early 1950's pointed to many aspects of the intertidal ecology of Lundy which were of high scientific interest, the suggestion that the island be given any special status for its marine biological attributes was not made until the early 1970's. In 1971 Machin and Machin published an article in the Journal of the Devon Trust for nature conservation, suggesting that Lundy would make an ideal site for the establishment of a marine nature reserve mainly because of its isolation from disturbance. At the same time, biologists had carried out some diving around Lundy and discovered several conspicuous but rarely recorded Mediterranean-Atlantic species present in large amounts, which pointed to the probability that marine biological interest was high. In 1971 an expedition of marine biologists studied aspects of littoral and sublittoral ecology around Lundy with the aim of assessing the scientific interest of the area. Their report (Hiscock, 1971) indicated that there was a valid case to be made for Lundy as an area of high scientific interest and recommended that moves to establish a voluntary marine nature reserve (in the absence of appropriate legislation to establish a statutory reserve) be pursued. The Nature Conservancy was involved at this early stage in an advisory capacity since they had no remit to manage underwater areas. In 1973 an Advisory Committee was formed, including representatives of the island authorities, the Lundy Field Society, the Nature Conservancy, divers and marine biologists. A management policy which included a code of conduct was drafted and published in 1974 (Hiscock *et al.*, 1973). The code of conduct was also printed in a leaflet funded by the Nature Conservancy and made available to visiting divers. The 1970's saw a great deal of research carried out underwater and on the shore at Lundy, aimed at obtaining the information to provide a description of the littoral and sublittoral ecology of the island and surrounding seabed, to describe the biology of some important species in detail, and to list the marine flora and fauna. During this period further displays and leaflets were prepared, courses in marine ecology were organised, and the activities of the voluntary marine reserve developed. In 1978 a marine warden was appointed for the summer season as a pilot project aimed mainly at obtaining a better understanding of the work of a warden in the context of Lundy. The work has been funded from several sources including the Nature Conservancy Council, the World Wildlife Fund, the Lundy Field Society, the Browne Fund of the Royal Society, the Natural

Environment Research Council, and by individual workers. By 1980 it was considered that the aim of obtaining a broad description of the habitats, communities and species present around Lundy has been achieved and it was appropriate to spend time consolidating that information before starting any new phase of work.

Following the publication of the management policy in 1974, the voluntary reserve was considered successful in obtaining the co-operation of visiting divers and, fortunately, no major incidents damaging to the wildlife interests of the island were reported. However, there was concern about two matters: commercial collection of the sea urchin Echinus esculentus and dredging (trawling) over the area of seabed occupied by the red band fish Cepola rubescens which was also an area of high scientific interest for other reasons. At the invitation of the Devon Sea Fisheries Committee, representatives of The Landmark Trust (Col. R. Gilliat), the Nature Conservancy Council (Mr. J.F. Lamerton) and marine biologists (Dr. K. Hiscock) discussed the matter with the Sea Fisheries Committee in March 1979. Although it was felt that the collection of sea urchins could not be considered by the Sea Fisheries Committee, a high degree of agreement was reached over the desirability of restricting disturbance of the seabed off the east coast of the island. Initially, the Sea Fisheries Committee agreed to investigate the possibility of incorporating a ban on dredging (trawling) west of a line between Surf Point and the Knoll Pins through new bye-laws at that time being drafted. However, in the event, a gentlemen's agreement was made.

With the passing of the marine nature reserve clauses of the Wildlife and Countryside Act in November 1981, it was clear that Lundy would be one of the prime locations for designation and management as a marine nature reserve. Provisions in that Act enable the NCC to apply to the Secretary of State for the Environment in England for an order to establish a Marine Nature Reserve. At a special meeting in December 1981, a sub-group of the NCC's Advisory Committee on Science (ACOS) considered the development of NCC's policy and proposed site selection for Marine Nature Reserves based on a paper by Dr. Roger Mitchell (NCC Chief Scientist Team). A staff working group was set up to give urgent consideration to the problems and procedures likely to arise in the course of implementation and reported to Council in January 1982, having accepted the selection of an initial group of twenty-six sites, of known outstanding interest and the selection from that list of six (later seven) sites including Lundy for immediate attention. At their meeting on February 1st 1982, Council endorsed the proposals in respect of the scientific

2.1.2. SSSI status under the 1981 Act

Lundy is notified to MLW of spring tides as a grade 3 site, with the exception of the central southern area of the island.

2.1.3. Site definition and boundaries

Fig. 16 is a copy of Admiralty Chart 1164 with the seaward boundary of 1 km from LWMOST (of the voluntary MNR) drawn on and illustrating some of the general features mentioned here. A map which shows the boundary of the statutory MNR, based on latitude and longitude, is shown in Fig. 2. Figs 17, 18 and 19 show the areas in the Landing Bay, at the Knoll Pins and on the east coast where agreements have been made or Codes of Conduct instituted in addition to the general provisions of the Marine Nature Reserve regulations.

The limits of the Marine Nature Reserve as a whole have been determined by the following criteria:

1. Inclusion of habitats, communities and species of high scientific interest. These are predominantly on rock substrata which extends to about 1 km offshore on the west and south coasts and on/in sediments which are rarely encountered on the open coast and which extend to about 1 km off the east coast.
2. Inclusion of an area which is reasonably small from the point-of-view of control.
3. Exclusion of fishing banks and areas of substrata which occur commonly in the Bristol Channel and its approaches.

The locations of areas requiring particular agreement or regulation regarding activities have been specified on the following basis:

1. It is accepted that there will be disturbance of the Landing Bay by moorings, anchoring and possibly extraction of sand and shingle. However, because of the presence of an unusual habitat/community which occupies only a small area within the reserve to the north-east of the Landing Bay, disturbance is to be restricted as far as possible to the south-west of a line between Mouse Island and the measured mile posts (which are between Millers Cake and Ladies Beach), (Fig.17).
2. Because of the exceptionally high scientific interest and intrinsic appeal of communities and species at the Knoll Pins and the large amount of diving there, boats are requested not to anchor there and agreement is sought not to deploy lobster pots within 100 m of the Pins, (Fig. 18).
3. Because of the high scientific interest of the area of mud and muddy gravel adjacent to the south part of the east coast, it is hoped that there should be no dredging or trawling west of a line between Surf Point and the Knoll Pins. (This code of practice is aimed mainly at scallop dredging). (Fig 19).

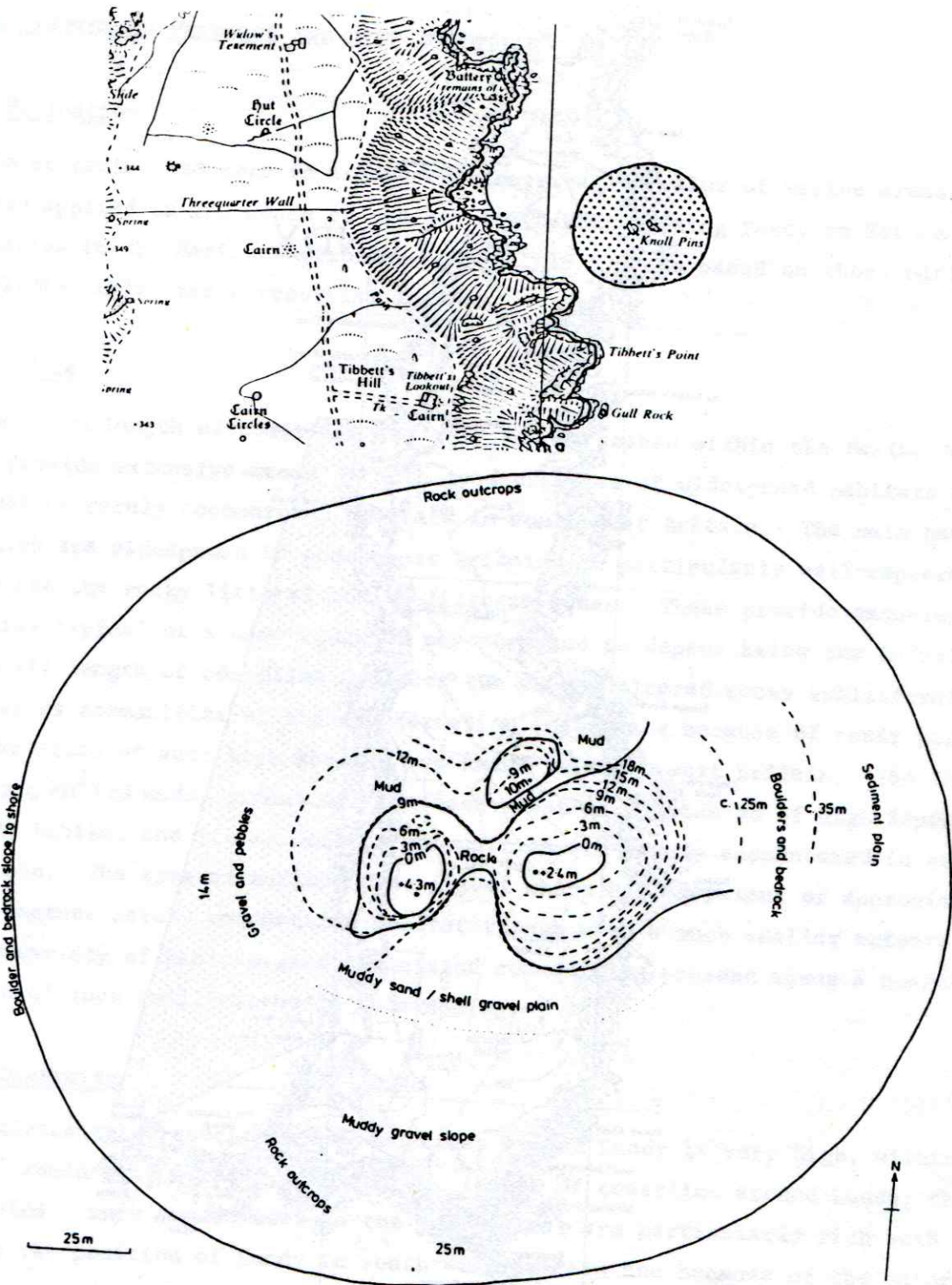


Fig. 18. No anchoring/potting boundary around the Knoll Pins. The upper part of the figure shows the position of the area (shaded) on the Ordnance Survey 1:10560 map. The lower part shows topography (from Mendelsshon, 1973) and substratum types.

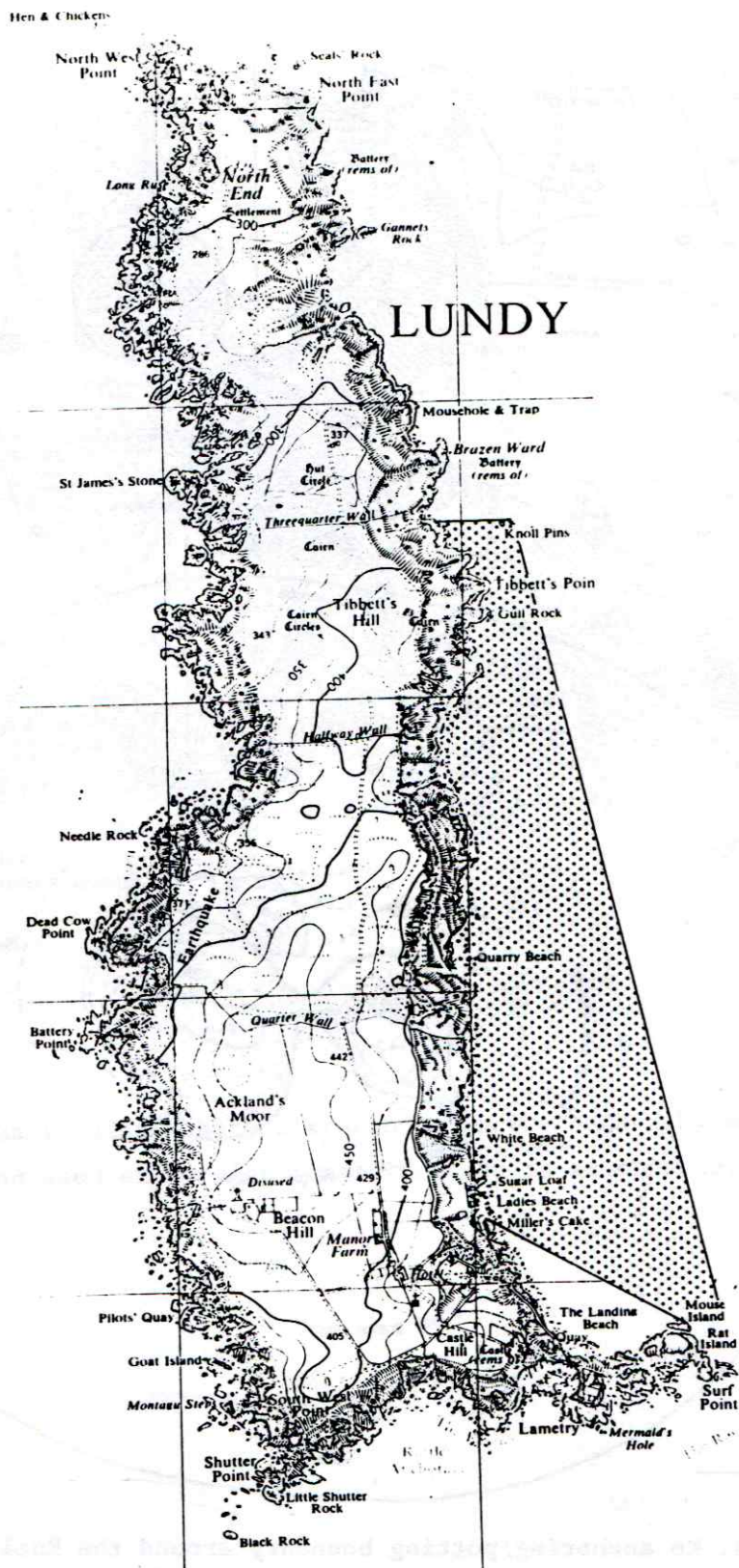


Fig. 19. Area off the east coast (shaded) where trawling and dredging should not take place. Ordnance Survey map SS 44/54. (1:25, 000).

2.2. EVALUATION OF FEATURES AND SITE POTENTIAL

2.2.1. Evaluation

The criteria used here to assess the conservation value of marine areas around Lundy are applied in the sense of the joint NCC/NERC Working Party on Nature Conservation in the Marine Environment (Anon., 1979). and based on those outlined by Ratcliffe (1971) for terrestrial areas.

2.2.1.1. Size

The 15 km length of coastline and 16.3 km² of seabed within the Marine Nature Reserve provide extensive areas of both good examples of widespread habitats and of unusual or rarely encountered habitats in south-west Britain. The main habitat types which are widespread in south-west Britain but particularly well-represented at Lundy are the rocky littoral and sublittoral areas. These provide examples of communities typical of a wide range of exposure and to depths below the infralittoral. Only a small length of coastline includes the wave-sheltered rocky sublittoral areas which possess communities of high conservation importance because of their rarity. No similar areas of such high quality are known in south-west Britain. The large extent (2.0 km²) of muddy gravel off the east coast is considered of high importance since this habitat and its associated communities are rarely encountered in south-west Britain. The area of mud/mud over gravel which has an extent of approximately 55 ha is another rarely encountered habitat though with a much smaller extent. The very wide variety of habitats and associated communities present along a coastline and seabed of such small extent is outstanding.

2.2.1.2. Diversity

The diversity of species and communities around Lundy is very high, within the context of south-west Britain and, for the length of coastline around Lundy, the British Isles. Rock communities in the sublittoral are particularly rich both because of the position of Lundy in south-west Britain and because of the nature of the main rock cover organisms which provide shelter for a wide variety of other species. The small numbers of the sea urchin Echinus esculentus, is also important since grazing pressure is low. Intertidal rock communities in sheltered areas are somewhat impoverished compared to those on the mainland because of the absence or very low abundance of some key gastropod species with short-lived

planktonic larvae. Community diversity is high because of the wide range of environmental conditions and substratum types resulting from variable wave and tidal stream exposure around the island.

2.2.1.3. Naturalness

All of the communities within the marine nature reserve are natural communities influenced very little by activities of man with the exception of communities on wrecks. The only wreck off Lundy which has distinctive communities is the M.V. 'Robert' which lies just inside the Reserve boundary. The 'Robert' provides communities of high scientific interest and an opportunity to study colonisation and succession. Since the activities of divers would be controlled by the Marine Nature Reserve code of conduct, the wreck is a useful addition to marine wildlife interests around Lundy.

2.2.1.4. Rarity

Tables 7 and 8 make it clear that there are a large number of both rarely encountered communities and rare species present around Lundy. It is this large number of rare or unusual communities and species which makes the major contribution to the scientific interest of the island, rather than the presence of any one community or species.

2.2.1.5. Fragility (vulnerability)

Most communities present around Lundy are most likely resilient to minor environmental change. However, within the context of present or future possible activities around Lundy, five potential problems are mentioned here:-

1. Some communities and species would be vulnerable to any high increase in suspended sediment load resulting from dredging for sand and gravel on the nearby banks.
2. Sediment communities would be highly disturbed by dredging for scallops in nearshore areas.
3. Populations of slow-growing species including sea fans and cup corals would be severely reduced by collecting.
4. The ecology of sublittoral rocky areas would be affected by large-scale collection of sea urchins.
5. The use of tangle nets for fishing might entangle wildlife as well as commercial shellfish species.

All of these problems should be avoided by suitable agreements, supported by byelaws where appropriate.

2.2.1.6. Typicalness

Lundy provides representatives of a wide range of commonly occurring habitats, communities and species.

2.2.1.7. Recorded history

The large amount of scientific study, particularly descriptive surveys, carried out around Lundy provides a very good base for assessment and management. The amount of information is higher than for any other marine site with sublittoral rocky areas as a key component in the British Isles.

2.2.1.8. Position in an ecological/geographical unit

The scientific importance of terrestrial habitats and species together with their long history of study has been long-accepted and the site therefore notified as a SSSI. The island is particularly important for the presence of extensive seabird populations, as a landing place for migrating birds (both traditionally included in terrestrial conservation plans), and also for its colony of grey seals. The value of terrestrial and marine areas thus enhance each other to increase the importance of the whole area.

2.2.1.9. Potential value

The potential value of Lundy for recreation underwater particularly as associated with studies of natural history and photography has not been fully realised and the wide range of habitats, communities and species makes Lundy an excellent location for the amateur naturalist as well as professional biologist. Although the number of divers able to stay on the island will always be small, there is scope for expansion from the past size of diving operations. The numerous wrecks, if left undamaged by salvage operations, have the potential to act as artificial reefs and produce an interesting time series of fouling organisms of use to researchers and educators.

2.2.1.10. Intrinsic worth/appeal

This feature is rated very highly on Lundy. The colourful nature of many of the species and communities around the island is outstanding and unmatched in south-west Britain. Also, the scenic appeal both above and below water are highly attractive features.

2.2.1.11. Research and educational value

These values have been proven over the past ten years by the very large amount of research carried out around the island, the running of several courses in marine ecology, and the visits to Lundy by amateur divers specifically because of the underwater wildlife appeal. Facilities for research, education and guidance have been developed. However, the value of the island for these activities must be seen against the difficulty of access (visits are generally limited to those able to stay for a week), the limited number of persons able to stay on the island and dive at any one time, and the inaccessibility of the majority of shores for intertidal work.

Descriptive studies of nearshore sublittoral areas around Lundy have been completed in greater detail than for any other similar size area in Britain. This provides a basis for identifying sites which could provide important information on the dynamic aspects of sublittoral communities. In the context of marine nature reserve management, we need information on the longevity, growth rates and reproductive success of several species of nature conservation importance. Many of these species are present on Lundy and there is the opportunity to use the island for long-term studies of these species and of sublittoral communities in general.

There are several problems in the field of fisheries conservation where the degree of control which should be possible in a marine nature reserve, in co-operation with sea fisheries authorities, could provide valuable information on fisheries management. On Lundy, the collection of returns of shellfish catches (by both fishermen and divers) could provide statistics to assess the optimum level of fishing along such a coast. Cessation of any trawling for or collection of scallops within the reserve boundary would make Lundy a good location to monitor populations of scallops and study aspects of recruitment and natural fluctuations which might help in the management of the fishery.

2.2.2. Identification/confirmation of important features

2.2.2.1. Introduction

The outstanding scientific interest of the area has been demonstrated over the past 12 years in a wide range of scientific publications and reports. Also, a large number of acknowledged experts in various fields of marine ecology and systematics have worked at Lundy and consider the area to be outstanding. The area has been assessed in relation to other areas along the coast of south-west Britain from North Pembrokeshire to Cape Cornwall with additional information from South Cornwall and has been found to be of exceptional interest. The large amount of scientific study has enabled the accompanying assessment to be reasonably comprehensive and there could be no claim that the area had not been thoroughly assessed.

Biotic and abiotic features of the marine nature reserve area around Lundy are evaluated here in terms of their International, National, Regional or Local importance. Evaluation is based on the results of the South-West Britain Sublittoral Survey (Hiscock, 1981) and other surveys in the British Isles, mainly carried out or commissioned by the Nature Conservancy Council and the Underwater Conservation Society, and on wide discussion with biologists familiar with marine habitats, communities and species around Britain.

Table 6 lists general features, Table 7 lists all of the main habitat types, and Table 8 lists particular species.

2.2.2.2. Communities

This section includes all of the main community types encountered during the surveys carried out since 1971. Some categories in this list include several separate communities which occur along a continuum (for instance in relation to height on the shore/depth below the sea surface, or in relation to wave exposure and tidal stream velocity). The rating of importance is made broadly according to the following definitions:

International. Communities which are outstandingly good examples of their type in the north-east Atlantic. Communities recorded at only a very few locations in the north-east Atlantic.

National. Communities which are outstandingly good examples of their type in Britain. Communities recorded at only a very few locations in Britain. Both of these definitions refer to communities which are or are likely to be widely occurring in other parts of north-west Europe.

Regional. Communities which are present elsewhere in Britain but which are outstandingly good examples of their type in south-west Britain or are as good examples as similar communities present elsewhere in Britain. Communities recorded at only a few locations in south-west Britain.

Local. Communities which are widespread in south-west Britain with as good or better examples as several other locations.

All of the above definitions are made with regard to the small amount of descriptive survey work carried out in nearshore sublittoral areas and it is considered that the evaluation is at least as high as indicated.

2.2.2.3. Species

Selected species are listed and evaluated as of International, National or Regional importance in their presence on Lundy. ('Local' importance is not relevant to this section since only rare species or species of high scientific interest are being considered.) Full species lists are included in supplements. The rating of importance is made broadly according to the following definitions:

International. Species which are recorded at only a few locations in the north-east Atlantic. Species recorded in higher abundance at Lundy than anywhere else in the north-east Atlantic or where Lundy is one of only a very few locations where large quantities are recorded.

National. Species which are recorded at only a few locations in Britain but are more widespread in other parts of the north-east Atlantic. Species recorded in higher abundance at Lundy than anywhere else in Britain or where Lundy is one of only a very few locations where large quantities are recorded in Britain. This rating is also used for species which are or are probably widely distributed in south-west Britain but where Lundy populations provide particularly good and well-documented examples of the species.

Regional. Species which are unrecorded or recorded at only a few locations in south-west Britain but are widespread in other parts of Britain. Species recorded in higher abundance at Lundy than anywhere else in south-west Britain or where Lundy is one of only a very few locations where large quantities are recorded in south-west Britain.

Table 8 provides a useful guide to the components which make Lundy of high conservation value because of the large number of rare species, species of high scientific interest and species with a high intrinsic appeal. It is this large number of such species present around the island which is considered important rather than the presence of any one species.

2.2.2.4. Physical features

The isolation of Lundy both from the point-of-view of access and also far from mainland sources of pollution, is important. The geology of Lundy is of some interest but is not given any assessment here.

TABLE 6
Evaluation of general features

| Feature | Notes | Importance |
|---|--|----------------|
| Wide variety of habitats within a small area. | The 15 km of coastline around Lundy and the 13.3 km ² of subtidal seabed within the 1 km marine nature reserve boundary includes a very wide variety of habitats (Table 2). These range from coasts extremely exposed to wave action to those very sheltered from wave action and from areas exposed to tidal streams of up to 5 knots to areas where tidal flow is negligible. Rock pool, cave, understone, crevice and other intertidal habitats are also present. The wide range of habitat types in the subtidal and, in particular, the presence of many circalittoral sheltered rock and sediment habitats in shallow water, is outstanding. Many of these habitats have been rarely recorded in south-west Britain and the Lundy examples are well-documented. | National. |
| Presence of communities and species of Mediterranean-Atlantic or oceanic character. | Many of the communities present around Lundy are of a Mediterranean-Atlantic appearance and are characterised by species whose centre of distribution lies well to the south of the British Isles. Such communities have not been observed elsewhere in south-west Britain. Information from Brittany suggests that the high abundance of some of these species is unusual for the north-east Atlantic. Several of the species which occur on Lundy, including some of the Mediterranean-Atlantic species, appear to be restricted to coasts where oceanic water is present close inshore (Cornwall, western Ireland, western Scotland). | International. |
| Large number of rare or unusual species. | Lundy has been thoroughly studied over the past twelve years and many rare species including some new to science and some new records for Britain have been recorded (Table 8). Many of these species are conspicuous and of high intrinsic as well as scientific appeal. Experienced biologists who are specialists in their field consider that Lundy is truly rich in species and that many rare or unusual species which do not occur elsewhere or are very rarely observed elsewhere are present on Lundy. The suggestion that the number of rare or unusual species present around Lundy is not merely a reflection of intensity of study, is also evidenced by the conspicuous nature of many of the species which would have made them readily observed in other surveys. The large number of such species recorded around Lundy is seen of highest importance rather than the presence of any one particular species. | National. |

TABLE 7
Communities present.

| Community(-ies) | Notes | Importance of Lundy community (-ies) |
|---|---|--------------------------------------|
| Littoral | | |
| Communities on mostly unbroken bedrock on the open shore. | These communities range from those characteristic of very exposed habitats to those of very sheltered habitats and provide examples of a wide range of communities in all of the littoral zones and sub-zones within a small area of coast. It is this wide range of communities which is considered important. Sheltered shore communities have low abundance of some littoral prosobranchs most likely because of the distance from mainland populations and subsequent poor recruitment. | Regional. |
| Communities on broken bedrock (slate shores). | These sheltered and semi-exposed communities include a very wide range of species and are much richer than unbroken bedrock communities. Similar communities are present on the adjacent North Devon coast but the communities at the Gates are very rich. | Regional |
| Communities in rock pools. | Quite a wide variety of communities are present in usually small rock pools on west, south and east coasts. Well-developed communities in deep rock pools are present near to Lametry Beach. There has been no detailed study of these communities. | Local. |
| Communities on boulder beaches. | The communities present vary widely depending on the stability of the boulders and exposure of the shore to wave action. The boulders offer many different habitats and rich communities are often present. | Local. |
| Communities in caves. | The large number of intertidal caves present around Lundy vary in size and type from small caves and arches which are scarcely large enough to enter at Rat Island to the high caves several tens of metres in length in the granite of the south, west, north and east coasts. The caves have distinctive communities which vary from cave to cave and are determined mainly by the degree of abrasion from boulder scour. | Regional. |
| Communities under stones and boulders. | Many of the shores around Lundy are of boulders with some stones, but the communities present vary widely. The richest communities are present under boulders on the wave-sheltered coasts, particularly slate shores where silt accumulates and movement of boulders by storms does not occur or is infrequent. The mobile or abraded boulders of exposed shores are less rich. | Regional. |
| Communities in sand. | Highly impoverished communities are present in the area of coarse sand present in the Landing Bay area. The Landing Beach near to the slipway is greatly disturbed by traffic. | Local. |
| Sublittoral | | |
| Communities on mostly unbroken bedrock. | These include the main community divisions with depth from the sublittoral fringe to the lower circalittoral on all coasts except the sheltered part of the east coast where lower circalittoral communities are not present because sediment extends into shallow water. Within each separate division, widely different communities are present at different locations around the island. The community type is related to the degree of exposure to wave action and tidal streams and to other environmental factors such as siltation which are influenced by exposure. Many of the animal communities, particularly on the east coast, include colourful Mediterranean-Atlantic species in abundance, and are of high scenic appeal. The range of communities, their richness and the presence of many Mediterranean-Atlantic species is outstanding in the context of north-east Atlantic sublittoral ecosystems. | International. |
| Communities on cliffs. | The extensive sublittoral cliffs present at Gannets Rock Pinnacle and Seals Rock provide good examples of semi-exposed and exposed cliff faunas respectively. Smaller areas of sublittoral cliffs are present on other parts of the coasts and include communities distinctly different from those of surrounding upward-facing or broken rock. | ?Regional/National. |

| Community (-ies) | Notes | Importance of Lundy community (-ies) |
|--|---|--------------------------------------|
| Communities in canyons. | Canyons are a very distinctive feature of some sublittoral areas around Lundy and are of high scenic appeal apart from their biological interest. The communities present are similar to those of deep (dark) parts of sublittoral cliffs but are also oases of shelter on exposed coasts and include muddy bottoms in areas where mud would normally be swept away. Similar canyons have not been observed elsewhere. | Regional. |
| Communities in sublittoral caves. | Distinctive communities with several rare species are present in small caves at the Knoll Pins and, formed by very large boulders, Gannets Bay. Although these caves are small, sublittoral caves are rarely found and so the distinctive communities within them are rated as of Regional importance. | Regional. |
| Communities on wrecks. | The community present on the wreck of the M.V. 'Robert' is extremely well-developed as a distinctly different community to those of rocks in similar conditions and can be considered a 'classic' wreck community. The 'Robert' is one of very few intact wrecks present around the coast and should remain intact for several years although must be considered a transitory feature. Other wrecks around Lundy are mostly broken-up and the communities present display little difference to adjacent rock communities. | National (at present). |
| Communities on stable boulders. | Algal communities on sublittoral boulders are often distinctly different to those of nearby rock, although it is not clear whether this results from the habitat or natural variability. Animal communities on boulders are distinctly different from those of nearby rock and are comparatively impoverished. The areas of boulder substratum around Lundy are very extensive and include wave-sheltered areas where distinctive communities not observed or rarely observed elsewhere in south-west Britain are present. | National. |
| Communities on mobile boulders. | These distinctive communities include some species not found in abundance elsewhere. They also provide examples of communities under stress and successional communities although the boulders may be moved by storms several times a year to once in several years. These communities are particularly well-developed off the south part of the west coast. | Regional. |
| Communities on sandy rocks and rocks adjacent to sand in shallow depths. | Distinctive communities of algae are recorded from sandy rocks and include some very rich communities in terms of the number of different species present. Some species only present in this habitat are rarely recorded elsewhere around the island. Examples of this type of community are present at north of Surf Point, on the south, north-west and north coasts. | Regional |
| Communities on stones subject to strong tidal streams. | Algal communities in shallow water include a wide range of species many of which are specifically found in this type of habitat. In deeper water, distinctive animal communities are found which are rich in species often rarely encountered elsewhere. This habitat is particularly well-developed in the region of Rat Island and the eastern part of the south coast as well as at Gannets Rock. South and east of Rat Island, extensive beds of brittle stars are present. | Regional or National |
| Communities on clean stable or semi-stable gravel. | The small area of clean granite gravel north of Gannets Rock appears to have a distinctive and interesting community. Granite gravel has not been observed elsewhere although similar communities on clean shell gravel have been observed in other parts of south-west Britain. | ?Regional. |
| Communities on clean mobile gravel. | The distinctive ephemeral communities of algae which develop on gravel during summer are interesting and have not been observed elsewhere in south-west Britain. | Regional. |
| Communities on muddy gravel. | The extensive areas present off the east coast are colonised by a distinctive fauna rarely encountered elsewhere during studies nearshore in south-west Britain. The communities correspond to the 'Boreal offshore muddy-gravel association' described by Holme (1966) for areas off Plymouth. Their assessment as of National importance here is made because this type of community was not described by Jones (1950) and therefore appears to be unusual, and because of the convenience for study in shallow water at Lundy. | National. |

| Community (-ies) | Notes | Importance of Lundy community (-ies) |
|--|---|--------------------------------------|
| Communities in medium well-sorted sand in the Landing Bay. | The community here is significantly different to other areas of sand and is considered to correspond most closely with the <u>Tellina tenuis-T. fabula</u> community of Thorson (1957) and is also similar to the <u>Tellina</u> sub-community of the <u>Venus</u> community described by Warwick and Davis (1977) for sandy bays in the outer Bristol Channel. | Local. |
| Communities in coarse sand off the north and south coasts. | These sand areas are highly mobile, clean, coarse sand with very little macrofauna present although abundant microfauna was found on the north coast. In view of their impoverishment, they are regarded as of local interest. Similar highly mobile clean, coarse sands are present on the North Cornwall coast. | Local. |
| Communities in mud and muddy sand. | These extensive areas nearshore off the east coast support a rich community characterised by several conspicuous species including <u>Amphiura filiformis</u> , <u>Goneplax rhomboides</u> and <u>Cepola rubescens</u> . The community has been assigned to the <u>Amphiura filiformis</u> community of Thorson (1957) and is probably similar to the 'Boreal offshore muddy-sand association' described by Holme (1966) for the English Channel. This appears to be an unusual habitat for the Bristol Channel and is particularly interesting because of the presence of <u>Cepola rubescens</u> which upgrades the rating to one of National importance. | National. |
| Communities in sandy mud or mixed sediments. | This distinctive community which is characterised by the hydroid <u>Corymorpha nutans</u> and by burrowing anemones <u>Edwardsia claparedi</u> and <u>Cerianthus lloydi</u> occurs in small patches at localities adjacent to the Knoll Pins and Gannets Rock. The community is unusual in the context of nearshore areas in south-west Britain. | Regional. |
| Communities in muddy sand. | This refers to communities offshore of the east coast which have not been sampled and which are most likely similar to other areas in the Bristol Channel. | Local. |
| Communities on mixed sediments. | These are predominantly sand with larger substrata of shells, stones and clinker present. They represent a highly heterogeneous habitat with a fairly wide variety of epifaunal species, some of which are rarely observed elsewhere. | ?Regional. |
| Communities on sand-covered and scoured rocks. | These communities occur particularly on the south and north coasts and in the region off Long Roost. Several species are present only or mainly in these habitats. This type of community is well-represented along the north coast or Cornwall. | Regional. |

TABLE 8
Species of high scientific interest.

| Species | Notes | Importance of Lundy populations |
|--------------------------------------|--|---------------------------------|
| ALGAE | | |
| Rhodophyta | | |
| <u>Scinaia turgida</u> | Present in areas of tide-swept pebbles on the east and south-east coasts of Lundy. Sparsely distributed in Britain but recorded at several locations in the south-west (Hiscock, 1981). | Regional. |
| <u>Asparogopsis armata</u> | Lundy is the furthest north record of the gametophyte stage found in 1973 (Hainsworth, 1975). The nearest record of <u>A. armata</u> gametophyte stage is from West Cornwall (Hiscock, 1981). The tetrasporic phase (' <u>Falkenbergia rufulanosa</u> ') is present in many parts of south-west Britain. | Regional. |
| <u>Schmitzia neopolitana</u> | Recorded from pebbles off the west coast (recorded by Hiscock, 1981 as <u>Calosiphonia vermicularis</u>), This is the first recorded location in the British Isles, the species also being known from the Mediterranean and Brittany. (C. Maggs, personal communication). | National/ International |
| <u>Schmitzia sp.nov.</u> | This species new to science was first found on Lundy in 1980 and has since been found at a few other locations in the British Isles. The species is currently being fully described (C. Maggs, personal communication). | International |
| <u>Drachiella spectabilis</u> | Recorded at one site on the north-west and one site on the south-east coast of Lundy (Hiscock, 1981). Unrecorded in Britain since the 19th century but widely recorded in south-west Britain since 1978. | Regional. |
| <u>Grateloupia dichotoma</u> | Recorded from the lower littoral in pools and from sublittoral stones on Lundy (Irvine et al., 1972). This is the most northerly record of the species. | Regional/National. |
| <u>Myriogramme minuta</u> | Found amongst specimens collected on Lundy in 1976 from the lower shore. This is the first record for Britain. Also recorded from North Devon, the Aran Islands (Ireland) and from France (C. Maggs, personal communication). | National. |
| Phaeophyta | | |
| <u>Laminaria ochroleuca</u> | Present at sites on the east coast of Lundy usually mixed with <u>Laminaria hyperborea</u> . Lundy is the furthest north this species has been recorded. More abundant in West and South Cornwall and South Devon (Hiscock, 1981). | Regional. |
| <u>Carpomitra costata</u> | Present as isolated stands at locations all along the south part of the east coast of Lundy in as high abundance as anywhere else observed in south-west Britain. This is a rarely recorded species in Britain with the furthest north occurrence in West Wales (Hainsworth, 1975; Hiscock, 1981). | National. |
| <u>'Microsporangium gelatinosum'</u> | Recorded at two locations on Lundy by Irvine et al. (1972). This is the first record of this phase of <u>Scytosiphon lomentaria</u> in Britain. | National. |
| ANIMALS | | |
| Porifera (sponges) | | |
| <u>Thymosia guernei</u> | Present in the circalittoral of wave-exposed coasts on Lundy. Not recorded with certainty in Britain since 1895 although now known to be widely distributed in small amounts in south-west Britain. Lundy populations are particularly high. | National. |
| <u>Axinella polypoides</u> | Present off all coasts of Lundy but particularly abundant off the south part of the east coast. Although recorded at many locations in south-west Britain, Lundy was the only area where this southern species was found in large amounts (Hiscock, 1981). | National. |
| <u>Rhaphidostyla incisa</u> | Recorded from several locations on wave-exposed coasts in the circalittoral at Lundy. Until recently, only recorded from the Mediterranean and the Atlantic coasts of France although now known from several sites in south-west Britain (Hiscock, 1981). | Regional. |
| Coelenterata: | | |
| Anthozoa | | |
| <u>Parerythropodium coralloides</u> | A few small colonies are present in a cave on the east coast of Lundy. This species has a very localised distribution in Britain where it is recorded at a few widely separated locations. The importance of the Lundy population is difficult to assess since the species is more abundant in other parts of Britain (Hiscock, 1974, as <u>Parerythropodium hibernicum</u>). | Regional. |

Now (WORMS, 2022)
Dermocorynus
dichotomus

| Species | Notes | Importance of Lundy populations |
|--|---|---------------------------------|
| <u>Alcyonium glomeratum</u> (red sea fingers) | This species occurs in large amounts and is a dominant feature of some communities on parts of the east coast. The intrinsic appeal of this species is high. <u>A. glomeratum</u> is widely distributed in South Cornwall, South Devon and the Scilly Isles and is present at a few locations in West Wales and Western Scotland. However, other populations, including those of Brittany and Eire, are of lower density and more widely separated than at Lundy (Hiscock, 1974, 1981). | National/ International. |
| <u>Eunicella verrucosa</u> (sea fan) | Large amounts are present around Lundy though dense colonies are very patchy in distribution. The white colour variety is present. Large numbers of this slow-growing species were collected from Lundy in the late 1960's. <u>E. verrucosa</u> is widely distributed in south-west Britain although dense colonies are rarely observed. Lundy is the furthest north at which dense colonies occur although in Britain, the species extends to North Pembrokeshire (Hiscock, 1974, 1981). | National. |
| <u>Mesacmaea mitchellii</u> | High densities are present in the extensive areas of shallow muddy gravel off the east coast. Manuel (1981) records this species as locally frequent on south and east coasts of the British Isles. Within the area included in the South-West Britain Sublittoral Survey this species has only been found at Lundy and, as a single record, Skomer. This lack of records is probably a reflection of the usually deep nature of the habitat in which the species is found (Hiscock, 1981). | National. |
| <u>Halcampoides purpurea</u> | This large sea anemone typically lives in clean gravel and maerl but is visible above the sediment only at night. Two individuals were observed during a brief excursion onto the coarse sand/gravel area south of the Knoll Pins in 1982. Manuel (1981) records the species only for south-west and west Ireland in the British Isles. | National |
| <u>Aiptasia mutabilis</u> | Present often in large numbers on the south part of the east coast in the infralittoral zone. Manuel (1981) records this as an uncommon species in Britain. It appears to have a rather patchy distribution in south-west Britain and is restricted to wave-sheltered areas and the lower infralittoral zone. | Regional. |
| <u>Aureliana heterocera</u> | A small population is present on the gravel and pebble area north-east of Rat Island. Manuel (1981) records this as an uncommon species. Its habitat (clean coarse gravel and small stones) is very specialised and small numbers have been recorded from the south coast of England, Skomer and the Isle of Man. | Regional. |
| <u>Parazoanthus axinellae</u> | Colonies of this species were commonly present at sheltered locations in the circalittoral around Lundy. Particularly large populations were present on the east coast. <u>P. axinellae</u> is recorded from several locations in south-west Britain and with a northern recorded limit at Bardsey but nowhere are the populations as large as those recorded at Lundy (Hiscock, 1981). | National. |
| <u>Parazoanthus anguicomus</u> | Several colonies have been recorded from the Knoll Pins and Gannets Rock. Recorded from Britain by Manuel (1981) as western and northern Scotland only (Hiscock, 1981). | National. |
| <u>Hoplantzia durotrix</u> | A few colonies have been recorded from a small cave on the east coast of Lundy. The species is known only from a few locations in South and North Devon in Britain but is a common Mediterranean species (Manuel, 1981). Larger numbers are known to occur at two sites in North Devon but, in view of the rarity of this species, the Lundy occurrence is rated highly (Hiscock, 1981). | Regional/National. |
| <u>Caryophyllia inornatus</u> | Recorded from a small cave on the east coast and possibly widely distributed on parts of the east coast of Lundy. This species was unrecorded in Britain until Lundy specimens were identified in 1982 (R. Manuel, personal communication). <u>C. inornatus</u> also occurs on the north coast of France and is common in the Mediterranean. | National/ International. |
| <u>Balanophyllia regia</u> | Present in the infralittoral zone at several locations around Lundy with large populations at some sites off the south coast. This is a widely distributed species but with very localised occurrence in south-west Britain with the furthest north record at Ramsey. Lundy populations provide good representatives for this species (Hiscock, 1981). | Regional/National. |
| <u>Leptopsammia pruvoti</u> | Large populations are present on vertical and overhanging surfaces on parts of the east coast of Lundy. Lundy was the first known location of this Mediterranean-Atlantic species in Britain which is also known from the Scilly Isles and Portland. The species is common in parts of south-west Europe. The species is of high intrinsic appeal (Hiscock, 1974, 1981). | National. |

| Species | Notes | Importance of Lundy populations |
|---|--|---------------------------------|
| Mollusca: | | |
| Opisthobranchia | | |
| <u>Colpodaspis pusilla</u> | A single specimen was found at the Knoll Pins (Brown and Hunnam, 1976). This the the second British record following collection near Plymouth in 1893 (Thompson and Brown, 1976). | National. |
| <u>Tritonia odhneri</u> | This species occurs on <u>Eunicella verrucosa</u> and was first discovered in Britain at Lundy. Records have also been made from North Cornwall and the Channel Isles (Thompson and Brown, 1976). | National. |
| <u>Greilada elegans</u> | Present in large numbers at some locations at Lundy particularly off the west coast. Although recorded at several locations in south-west Britain, the abundance of this species is much higher at Lundy than observed elsewhere (Brown and Hunnam, 1976; Hiscock, 1981). | National. |
| <u>Trapania pallida</u> | Recorded at several sites on the east coast of Lundy (Brown and Hunnam, 1976). First described in 1968, this species is recorded at very few locations in Britain. | National. |
| <u>Trinchesia</u> sp. | Recorded from Halfide Rock and Gannets Rock on Lundy (Brown and Hunnam, 1976). An undescribed species known from several locations in south-west Britain. | National. |
| Bryozoa | | |
| <u>Callopora discreta</u> | Recorded from shell fragments south - south-west of Black Rock at 32 m. Recorded only very rarely since first described by Hincks (1862) (Hayward, 1976). | National. |
| <u>Ammatophora nodulosa</u> | Recorded from shell fragments collected south - south-west of Black Rock at 32 m. Very rarely recorded (Hayward, 1976) | National. |
| <u>Smittina affinis</u> | Two colonies were found on <u>Cellaria</u> collected from Lundy Roads at 20 m. This is the first record since its original description by Hincks (1862) for a single specimen in Start Bay, South Devon (Hayward, 1976). | National. |
| <u>Mimosella verticillata</u> | Present at the edge of the boulder slope along the south part of the east coast of Lundy. The Lundy record is the first noted occurrence of this species from British waters, the nearest records being from Roscoff in France (Hayward, 1976). | National. |
| Ascidacea (sea squirts) | | |
| <u>Pycnoclavella aurilucens</u> | Present at several wave-exposed sites on Lundy and particularly abundant off the north coast. This species has been recorded from several widely separated locations in south-west Britain although only recorded from near Plymouth by Miller (1970). The Lundy populations are particularly good examples (Hiscock, 1981). | Regional. |
| <u>Archidistoma aggregatum</u> | Recorded at two locations off the west coast of Lundy. Previously recorded only from Plymouth (Miller, 1970) and not found at any other sites during the South-West Britain Sublittoral Survey. | National. |
| Pisces | | |
| <u>Cetorhinus maximus</u> (basking shark) | This species is a frequent visitor to Lundy during July and August. The species occurs close to the shore wherever oceanic water comes near to the coast along the west of Britain (Pullin, 1977; Hiscock, 1981). | Regional. |
| <u>Mola mola</u> (sunfish) | A small number of individuals are seen around Lundy in most years. An oceanic fish near the northern recorded limit of distribution (Pullin, 1977; Hiscock, 1981). | Regional. |
| <u>Cepola rubesens</u> (red band fish) | Lundy is the first known shallow-water location for this fish. Records from shallow water have also been made from Brixham and The Solent and the fish is frequent offshore. The population at Lundy was well-developed in the mid-1970's but appears to have declined up to 1981. <u>Cepola</u> is present off the east coast. The fish has high intrinsic appeal and has been thoroughly studied on Lundy (Atkinson, 1976; Atkinson and Pullin, 1976; Atkinson et al., 1977; Pullin, 1977; Hiscock, 1981). | National. |
| Mammalia | | |
| <u>Halichoerus grypus</u> (grey seal) | The population of grey seals around Lundy is estimated at about 50 individuals of which 30 to 40 are adult females. In 1975, 12 pups were found in caves and it has been suggested that up to 25 might have been born on the island (Clark, 1975). | Regional. |

2.2.3. Management implications of the National Site Management Framework (NSMF)

The NSMF is being prepared for terrestrial habitats to indicate the minimum degree of sophistication necessary for each site plan within each well-defined habitat. Thus, the Framework relies heavily on the description and assessment of sites in the Nature Conservation Review (NCR) (Ratcliffe, 1977). The NSMF cannot include marine habitats until a marine NCR is prepared. However, it is clear that marine areas around Lundy are of outstanding scientific interest and require full management for the conservation of species and habitats as well as the provision of facilities for appropriate research, education and recreation.

2.2.4. Specified limits

This section is included in management plans to provide an indication of how far changes in ecosystems should be allowed to proceed before action is taken to prevent further change. In the case of the wholly natural fluctuations at Lundy, an area considered to be almost entirely unaffected by man's activities, action to prevent or reduce natural change seems inappropriate. However, several of man's activities around the island or likely activities may create unacceptable change and the limits of such activities will be outlined in Section 2.3.10 (Impact assessment).

2.2.5. Ideal management objectives

The overall objectives for marine nature reserves are outlined in Clause 36 of the Wildlife and Countryside Act 1981:

- a. "Conserving marine flora or fauna or geological or physiographical features of special interest in the area; or
- b. "Providing, under suitable conditions and control, special opportunities for the study of, or research into, matters relating to marine flora and fauna and the physical conditions in which they live, or for the study of geological and physiographic features of special interest in the area ..."

Specific objectives relevant to Lundy are:

A. Protection

1. To regulate the general collection of specimens including prohibition where necessary.
2. To protect communities of high scientific interest from damage due to (i) collection of samples by visitors or scientists; (ii) unintentional "trampling" by divers; (iii) fishing activities.
3. To protect populations of nearshore territorial fish species, particularly wrasse.
4. To prohibit spearfishing.
5. To protect populations of seals from disturbance, particularly during pupping.
6. To protect seabird populations where they occur on or adjacent to the sea.
7. To protect marine communities from oil or other forms of localised but unpredictable pollution by ensuring appropriate combative measures can be swiftly put into operation.
8. To prevent the discharge of pollutants or refuse into the waters within the marine nature reserve boundary.
9. To minimise damage to communities caused by activities in the Landing Bay.
10. To prevent damage or disturbance due to activities such as dredging and dumping outside of the reserve boundary.
11. To prevent damage or disturbance to marine communities due to the use of explosives (on wrecks).

B. Research/Education/Recreation

12. To maintain and improve facilities for research.
13. To maintain and improve facilities for the information and education of visitors.
14. To operate a system of guidance to visiting divers and others wishing to visit certain areas of the reserve or see particular species, etc.
15. To ensure the continued maintenance and improvement of general facilities for diving from the island so as to provide access to underwater areas.
16. To continue studies of the distribution, extent and composition of the marine communities, species and habitats present at Lundy.
17. To maintain records of marine biological observations made around the island.
18. To encourage and assist studies associated with monitoring of environmental conditions and of fluctuations in marine species.
19. To co-operate with fisheries authorities in the collection and maintenance of statistics of fishing activities.
20. To monitor the effects of fishing gear deployed on the seabed within the marine nature reserve boundary.

2.3. FACTORS INFLUENCING MANAGEMENT

2.3.1. Natural trends

Natural fluctuations doubtless occur for many species. However, communities of conspicuous species, particularly the large colourful Mediterranean-Atlantic anthozoans, appear to have been very similar over the past 12 years of scientific study so far carried out. Some species show large fluctuations in numbers from year to year and this appears to be the case for many opisthobranchs and some algae. The population of red band fish Cepola rubescens appears to have declined since 1977 when a population of predominantly old individuals was present and it seems likely that recruitment has been poor in recent years. Little further comment can be made on the scale or causes of population fluctuations without proper data, and the monitoring of species and communities of conservation importance has already been recommended, (see Table 9B Section 3.1.2).



2.3.2. Man-induced trends

1. These are probably substantial on the Landing Beach where tractor and other vehicle movements cause considerable disturbance. However, this is not a rich shore and access to service shipping is essential. The removal of sand and shingle from this beach may result in changes in beach level, (see Table 9B Section 3.1.2).
2. Populations of lobster, crawfish and scallops are doubtless lower than in an unexploited situation but absence of any records of catch prevent a proper assessment, (see Project RP12 Section 3.1.2).
3. Sea fans, Eunicella verrucosa, were collected in very large numbers off the south and west coasts before 1970 and, in view of the slow growth and short larval life, populations are probably still reduced, (see Table 9B Section 3.1.2).
4. There may be some 'trampling' effect at popular diving sites and anchoring in rocky areas may cause damage but both are difficult to assess and probably generally minor. (See Project RH10, Section 3.1.2.).

2.3.3. Externalities

The Severn Estuary and Bristol Channel receive large quantities of domestic and industrial wastes. These wastes are dispersed by currents mainly to the north and west along the South Wales coast and mostly degraded to harmless substances. Some are persistent and accumulate in sediments and organisms and may influence the biology of species. Work carried out by Jones (1974a and b) on heavy metal concentrations in organisms indicates that Lundy is similar to coastal areas in other parts of Britain and that there are no signs of elevated levels of heavy metals due to local sources.

The dumping of sewage sludge and industrial wastes in the Bristol Channel (Fig. 20) has caused concern to fishermen who suggest that increased siltation and heavy metal accumulation in organisms may be occurring around Lundy as a result (Devon Sea Fisheries Committee meeting reported in the Western Morning News, October 18th, 1982). This has also been commented on by local divers who have witnessed increased levels of sedimentation and turbidity around the island over a number of years. The effects of this dumping have been assessed by Murray *et al.* (1980). In 1978, 393,600 tonnes of sewage sludge (including 9,513 tonnes of suspended solids) and 5,020 tonnes of industrial waste (including 306 tonnes of suspended solids) were dumped. The amount of sludge had increased every year from 1976 to 1978. Dredge spoil is also dumped in Swansea Bay. The studies carried out by Murray *et al.* (1980) using seabed drifters shown that dispersal of the dumped material is to the north-east (to Swansea Bay) and east (to Bridgwater Bay). However, several drifters were returned from Barnstaple Bay following one release. The dumping of wastes in the present position must be

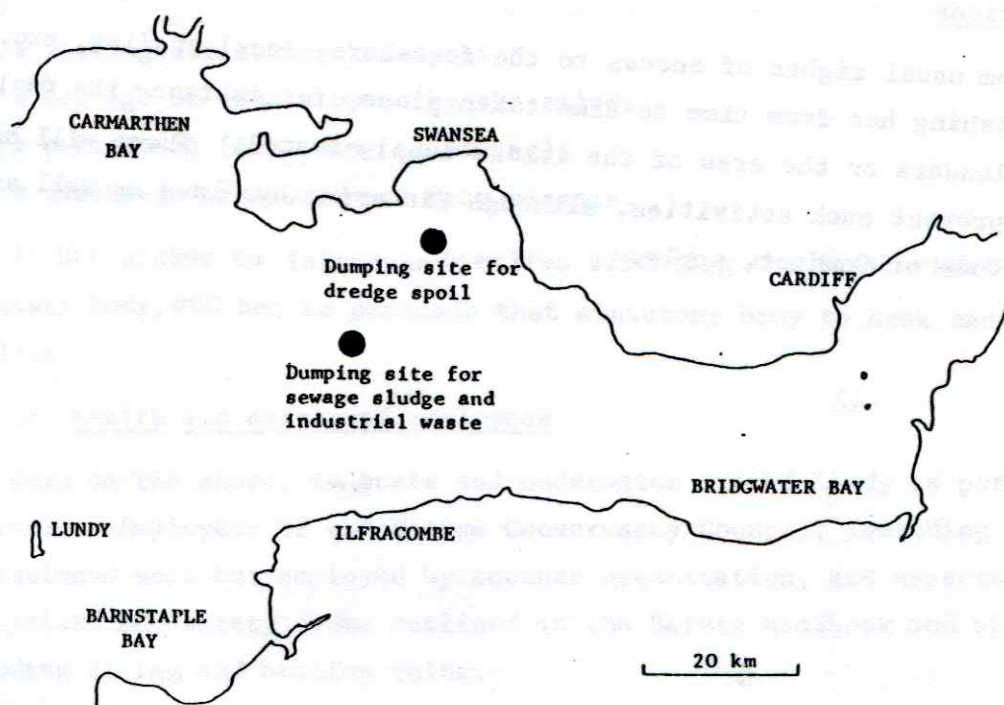


Fig. 20. Location of dumping sites in the Bristol Channel (from Murray *et al.*, 1980).

seen as highly unlikely to have any effect on Lundy beyond the general effects of sewage and industrial waste disposal from all sources in the Bristol Channel. In order to assess possible correlation between such dumping practices and levels of sedimentation around the island, collection of data from certain monitoring studies should be undertaken (see Project RP11, 3.1.2/2).

Fisheries and other forms of resource exploitation distant from Lundy doubtless have some effect on the area in determining the abundance of migratory fish or the quantities of larvae of exploited species.

Lundy lies across a main shipping route to ports in the Bristol Channel and Severn Estuary. Vessels are occasionally wrecked on or near Lundy and pollution as a result of discharge from a damaged vessel by oil or other substances is always a possibility. Oil is a particular threat for which contingency plans compatible with those already prepared by Devon County Council should be made. (See Project APO8, Section 3.1.2 and also Section 2.3.7.19).

2.3.4. Obligations

Apart from usual rights of access to the foreshore, local angling, etc., some small-scale fishing has from time to time taken place, for instance the deployment of pots by islanders or the crew of the island supply vessel. There will be no intention to prevent such activities, although fisheries bye-laws as well as the proposed Code of Conduct, apply.

2.3.5. Legal constraints

2.3.5.1. Constraints of tenure

The ownership of Lundy by the National Trust and its leasing to The Landmark Trust is beneficial to the running of a Marine Nature Reserve and no constraints are envisaged although close liaison will always be required.

The leasing of the foreshore and seabed in the Landing Bay by The Landmark Trust from The Crown Estate Commissioners (Fig. 3) is of no problem to the Marine Reserve status of the area, except that the Landing Beach and nearby areas of the Landing Bay must be seen as an area subject to disturbance. Restriction of this disturbance to the south-west of a line between the north of Mouse Island and the measured mile markers on the south side of Ladies Beach is desirable (Fig. 17).

2.3.5.2. Constraints of access

The public have privilege of access to the foreshore and the right of navigation and fishing. However, access to the island is controlled by The Landmark Trust and this has been important in the past and will be important in the future for enforcement of codes of conduct.

2.3.5.3. Constraints of other legal users

Other legal users of the shore, seabed, water column and sea surface include a wide range of statutory and non-statutory bodies and individuals who either have a legal right to certain activities or a general right not covered by law.

Examples include:

- fishing for commercial species;
- salvage of wrecks owned by the salvor;
- navigation (including anchoring);
- discharge of substances from vessels.

If NCC wishes to introduce bye-laws affecting the legal rights of any other statutory body, NCC has to persuade that statutory body to seek and implement those bye-laws.

2.3.5.4. Health and safety of employees

Work on the shore, in boats and underwater around Lundy is potentially hazardous. Employees of the Nature Conservancy Council, including those undertaking commissioned work but employed by another organisation, are expected to abide by appropriate NCC safety codes outlined in the Safety Handbook and which at present including diving and boating rules.

Sports diving undertaken under the auspices of NCC employees should be carried out according to the rules of and to the standards set by, the British Sub-Aqua Club.

2.3.6. Managerial constraints

The main constraint to management will be the provision of adequate finance and, inevitably, not all desired projects can be undertaken at once. This clearly points to the necessity of establishing the most important requirement of management and assigning priorities to the various projects in the prescriptive part of this Plan.

2.3.7. Impact assessment

2.3.7.1. Introduction

Although many potential conflicting interests are outlined here, most have not yet caused problems in the management of the voluntary reserve. Those that have resulted in a conflict of interests have been mainly tempered by discussions in relation to the voluntary marine reserve, the application of a Code of Conduct since 1973, and the widespread acceptance of the outstanding scientific, wildlife and scenic values of Lundy. However, many present and potential impacts need to be guarded against.

2.3.7.2. Dredging (the use of fishing gear which is towed over the seabed)

The scientific and conservation value of areas of sediment off the east coast is very high. Dredging has not recently been used, to our knowledge, within the reserve boundary. Dredging causes considerable disturbance to the sediment and the species present there. This is unacceptable in a site being managed to maintain the natural communities present. The population of scallops (the species most likely to be sought by dredging) is low but lack of disturbance would provide the opportunity to monitor population dynamics as well as protecting sediment communities.

2.3.7.3. Potting

The use of pots to catch lobsters, crabs and crawfish has been in existence around Lundy for many years. The present communities are in balance with this level of disturbance and, in view of this, the traditional rights of fishing by this method should be respected. However, in order to assess the numbers of such species found within the Reserve boundary, a system of monitoring should be introduced whereby catches can be recorded and assessed. To minimise disturbance around the scientifically important area of the Knoll Pins, agreement should be sought not to deploy pots within 100m of the Pins.

2.3.7.4. Tangle netting

Tangle nets laid to catch shellfish have not been widely employed around Lundy. There are fears that wildlife species other than shellfish will be entangled in such nets and their use could therefore alter the ecology of the seabed. Any such disturbance would be unacceptable. However, there is no evidence to indicate what impact tangle nets might have but, should they be deployed at Lundy, it would be essential to monitor their effect immediately. Tangle nets are also a danger to divers.

2.3.7.5. Gill Netting

Gill nets are laid over rock or sediment to catch fish. Two such nets were deployed adjacent to the east coast in 1982. There is considerable concern in some circles about the use of monofilament gill nets in particular, both because of their efficiency and 'ghost fishing' or entanglement when lost. These nets are also potentially dangerous to divers. However, negligible disturbance appears to be caused to areas of sediment where they are deployed. Their use on Lundy should be carefully monitored.

2.3.7.6. Collection of shellfish by divers

Up to 1970, small numbers of crawfish were collected by divers for sale on the mainland. It is also believed that some scallops have been taken for sale in recent years. Crawfish, lobsters, crabs and scallops in small numbers have been taken by divers in recent years for their own consumption as allowed in the voluntary code of conduct. However, this allowance has sometimes been abused and collecting of scallops in particular is undesirable. It is proposed that divers should be strongly discouraged from taking anything in the reserve and that any collection of shellfish should be reported to the Warden as part of a programme of population monitoring.

2.3.7.7. Souvenir-collecting by divers

Up until 1970, both sea fans and sea urchins were collected for sale as souvenirs. This was stopped by the marine reserve discussions and infringement of this part of the Code of Conduct, whether for sale as curios or for personal specimens, is believed to have stopped. Other specimens might be collected as souvenirs or, for instance, to stock marine aquaria. Many of these species are very slow-growing (for instance, the sea fan) and others ecologically important (sea urchins) and a total ban on collecting is appropriate.

2.3.7.8. Scientific collecting

Scientific collecting has been high over the past ten years although the numbers of any one species collected generally small. Some destructive sampling of communities has occurred involving no more than about 10 m² of seabed in total at a wide range of locations. Population sampling of the red band fish has been carried out although no large-scale destructive sampling has occurred. All of this work has been carefully considered in relation to the effects of the scientific interest of the area and sampling has been considered a minimal disturbance. However, full consultation and agreement with NCC or their Warden on Lundy should precede any destructive sampling of communities, and broad guidelines should be issued for general collecting such as that undertaken during descriptive survey or taxonomic work.

2.3.7.9. Disturbance of breeding seals

From the available evidence, it appears that seal pups are born only at the ends of sea-level caves and also on inaccessible boulder beaches. The fact that up to 25 pups may be born on the island has only been revealed recently, and the remote nature of the caves and exceptionally difficult access makes disturbance unlikely. However, visitors should be prohibited from entering caves during September and October when pups are born (except by agreement with NCC or their Warden on Lundy).

2.3.7.10. Disturbance of cliff nesting birds

Lundy provides nest sites for large and important seabird colonies. Some of the seabirds, especially the cliff nesting species, are very vulnerable to human disturbance. The birds particularly at risk are guillemots and razorbills. Other species that may be affected include puffins, shags and kittiwakes. Fulmars and the larger gulls appear to be reasonably tolerant of human activity.

All the cliff-nesting seabirds, even guillemots and razorbills, will tolerate low levels of disturbance, especially when approached slowly and quietly and when the approaching vessel can be seen for a reasonable distance, and provided of course that it does not get too close. Problems arise when fast, often overpowered inflatables or other speedboats approach or operate near the cliffs at speed. There is a particular problem when these craft suddenly appear around headlands. Yachts become a problem when they allow their sails to flap uncontrolled near the cliffs. Canoeists are also a threat. Their manoeuvrability permits easy access to sites close to the shore, and voices raised to communicate between canoes are very disturbing to the seabirds.

It is recommended that in order to minimise disturbance to cliff nesting birds between 1st April and 1st August, boat operators should proceed slowly (maximum speed 8 knots) and quietly when within 100m of such areas.

2.3.7.11. Spearfishing

This has always been prohibited by the island authorities and enforced by BCD Marine Ltd and subsequently by Aquaserve Diving Ltd. Spearfishing causes a high degree of damage to fish populations both in terms of mortality and in frightening fish. This damage is particularly important since the fish usually sought by spearfishermen are long-lived territorial species. Thus there should continue to be a complete ban on the use of spears and spearguns.

2.3.7.12 Angling

Angling is carried out by islanders and visitors as well as the occasional angling party on a day trip from the mainland. No objection is envisaged to the taking of short-stay 'migratory' fish. However, the nearshore populations of wrasse are of high scientific interest and a rule should be agreed that wrasse caught on rod and line are returned to the sea alive.

2.3.7.13 Mooring and anchoring

Long-established moorings are present in the Landing Bay and include weights, heavy chains and anchors. Where an anchorage is needed, moorings are clearly more desirable than anchors which drag and cause disturbance on each application. The Landing Bay inside of a line between the north tip of Mouse Island and the measured mile markers should be considered a disturbed area for anchoring and mooring. Anchoring will also be necessary for safe navigation all around the island and must therefore be an acceptable disturbance. However, some nearshore rock communities are highly susceptible to damage by anchoring and divers should be encouraged not to anchor (this is in any case safe practice when divers are in the water and might require rapid recovery) and should, except for emergency, be prohibited from anchoring within 100 m of the Knoll Pins.

2.3.7.14 Extraction of sand and shingle from the Landing Bay and Landing Beach

Collection of sand and shingle from the shore has been carried out for many years for purposes of construction and road maintenance. An attempt to use a ship-mounted grab to collect sand from the Landing Bay was unsuccessful. In 1982, large amounts of sand and shingle were removed from the Landing Beach and this led, at least temporarily, to exposure of more rock and boulders near to the collection point. It is not clear from where sand and shingle are recruited to the Beach, but monitoring would seem appropriate to attempt to ensure that no lasting damage is done, (see Table 9B Section 3.1.2).

2.3.7.15. Extraction of sand and gravel offshore

In 1971, permits were sought by a company wishing to carry out exploratory dredging on the Stanley Bank. Objections were lodged on behalf of the voluntary marine reserve. Extraction of sediments results in considerable disturbance of communities and of silt. The silt is likely to form a plume of suspended sediment downstream and considerably alter the sedimentation regime on distant communities. Excessive sedimentation could cause smothering. For this reason consultation with NCC should precede the use also of underwater archaeological suction equipment in wreck

investigations etc, especially if to be used close to areas of high scientific interest (eg the Knoll Pins).

2.3.7.16. Disposal of rubbish

This has only been seen as a conflict in relation to visiting vessels. Instances have occurred where strandlines have been littered with rubbish disposed of by crew of pleasure steamers whilst in the Landing Bay. This is clearly an undesirable practice and attempts by the island authorities to prevent disposal at Lundy have had mixed success. Dumping of substances into coastal waters is prohibited by the Dumping at Sea Act (1974) and by the Devon Sea Fisheries Committee (1982) byelaw concerning detrimental substances.

All island rubbish is incinerated (if possible) and the produce is dumped over the cliff at Benjamins Chair. Problems here are aesthetic and are not seen as an aspect of marine conservation.

2.3.7.17. Sewage and waste water disposal from the island

Sewage is treated by septic tank and the effluent joins the stream at Millcombe to be discharged just north of the Landing Bay. No obvious effects have been observed and no conflict is seen at current levels of island habitation.

2.3.7.18. Sewage sludge and industrial waste disposal in the Bristol Channel

Dumping activities in the Bristol Channel are described in Section 2.3.3. The dumping of wastes in the present positions must be seen as highly unlikely to have any effect at Lundy. However, any application to dump elsewhere in the Bristol Channel or approaches to the Bristol Channel would have to be seriously studied in relation to possible effects at Lundy.

2.3.7.19. Pollution from oil and other substances

The possibility of oil and other pollution from various sources remains a threat to Lundy's marine environment, and although such circumstances which cause the pollution are unpredictable, contingency plans to deal with them should be prepared. Recommended treatment for Lundy in the event of oil pollution, as stated in Devon County Council's "Scheme for Coastal Pollution Counter Measures, 1981", is that "... Oil at sea should be dispersed with low toxicity approved products consulting DIF, but not within one mile of the island. Local cleansing of landing place acceptable in view of deep water and tides. Elsewhere oil should be left to degrade naturally. Consult the Landmark Trust Agent."

2.3.7.20. Use of explosives

Explosives have been used mainly to dislodge plates of H.M.S. 'Montagu' near Shutter Rock in the early 1970's. No ecological damage was observed following one monitored explosion except to the communities on the wreck. However, there is a potential for damage to communities and species, particularly fish and seals. A system of consultation should therefore be introduced.

2.4. OPERATIONAL OBJECTIVES AND MANAGEMENT OPTIONS

Chapter 2.4 is a statement of the intended management of the site based on the ideal objectives for the Marine Nature Reserve listed in Section 2.2.5 and considered against the constraints outlined in Sections 2.3.5 and 2.3.6 and potential impacts described in Section 2.3.7.

The operational objectives for Lundy differ little from the ideal objectives and, to avoid repetition of both Section 2.2.5 and the action suggested in Part 3 (Prescription), this chapter has not been divided into the sections and sub-sections outlined in the NSMF.

The main constraints to the ideal management objectives are:

1. the level of co-operation and agreement from fisheries authorities for wildlife conservation measures which might affect fishing practices;
2. the acceptability of any restriction on collecting of wildlife or commercial species by divers and scientists;
3. the cost of improving or developing any facilities for research, education, information or recreation;
4. practical difficulties of enforcing any bye-laws or codes of conduct; and
5. the need for extraction of sand and shingle from the Landing Beach/Bay for building on the island.

There is no active estate management necessary on the shore or underwater at Lundy and so no conflict of possible nature conservation or resource management options necessitating the selection or ranking of different options. However, options have to be selected in the conflict which potentially exists between fishing activities, wildlife conservation, scientific study and recreation. The operational objectives must encompass a balance of on the one hand, the use of marine resources (including those for fisheries, research, education and recreation), with, on the other, the minimisation of damage to species and communities, and the prevention of any damage in specified areas of high scientific interest.

The objectives as related to the provision of facilities, are modified according to constraints in Part 3 (Prescription). The objectives as related to the protection of species and habitats, are modified here as a Code of Conduct which takes account of the constraints imposed on the ideal management objectives. The Code of Conduct is intended to be an integral part of, or supplement to, the bye-laws proposed for the Marine Nature Reserve by the Nature Conservancy Council.

(21.3.84)

LUNDY MARINE NATURE RESERVE

PROPOSED CODE OF CONDUCT

The variety of marine habitats, communities and species present around Lundy is of outstanding conservation importance. Respect of this code of conduct will help to ensure that these special features remain as undisturbed as possible, thereby helping to maintain the present interest for all to enjoy. Several of the points below have the statutory backing of Nature Conservancy Council, Devon Sea Fisheries Committee, or National Trust byelaws (as indicated), which overall are designed to conserve fish stocks and to protect the Reserve against over-collecting of species and other unwitting or wilful damage to the marine environment.

Research

A. Species other than fish or shellfish

1. Many vulnerable species and communities occur within the Reserve and to ensure their protection no destructive sampling of marine wildlife should be undertaken unless a permit allowing such sampling has been issued following consultation and agreement with the Nature Conservancy Council. (NCC proposed byelaw).
 2. To minimise the impact of collecting, only single specimens of marine wildlife should be collected for the purposes of identification. Any other collection may only take place after issue of a permit following consultation and agreement with the Nature Conservancy Council. Permission may be withheld for some species of coral, soft coral and sea fans in particular. (NCC proposed byelaw).
 3. When looking for examples of marine wildlife, you are requested to replace boulders in their original positions if they have been overturned for examination. Please limit this activity as every time a boulder is disturbed the associated communities are damaged.
 4. There are large numbers of rare and unusual species growing on the Knoll Pins many of which are delicate and particularly vulnerable to damage from certain activities. To minimise the risk of such damage to the communities found here, there should be no anchoring * within 100m of these rock pinnacles (NCC proposed byelaw), nor should fishing gear be deployed within this area. (Requested DSFC byelaw).
- (* Except in an emergency or rescue operations).

B. Fish and Shellfish

5. The towing of trawls and dredges over the seabed can cause considerable damage to soft sediment habitats and communities, many of which are of high scientific interest. For this reason, trawling and dredging within the Reserve boundary is prohibited. (requested DSFC byelaw).
6. Tangle and gill nets can break free from their set positions and may ensnare divers, seals, diving seabirds and other marine wildlife. To minimise the risk of this happening, such nets should only be deployed within the Reserve after agreement with the Devon Sea Fisheries Committee.
7. There should be no collection of shellfish by any means within 100m of the Knoll Pin. (requested DSFC byelaw).
8. To protect populations of nearshore territorial fish (many of which are long-lived and remain or return to the same area over many years) anglers are asked to return to the sea any wrasse caught.
9. The use of spearguns within the Reserve is prohibited. (?MAFF/DSFC byelaw, + NT byelaw (intertidal)),

Seals

10. Intertidal caves and inaccessible boulder beaches are used by grey seals for pupping during September and October. To minimise disturbance to seals at this time, do not approach nearer than 100m by sea or land to these areas between 1 September and 1 November except by agreement with the Nature Conservancy Council. (NT byelaw + NCC proposed byelaw)

Seabirds

11. Boats operated close to sea bird colonies, especially at speed, may disturb breeding birds. Please therefore proceed slowly (max. 8 knots) and quietly when within 100m of such areas, between 1 April and 1 August.

Rubbish

12. To avoid littering the beach or seabed with unsightly rubbish, boat operators and others visiting Lundy should not deposit rubbish within the Reserve. (NT byelaw + NCC proposed byelaw + DSFC byelaw 3(i)).

Wrecks and Archaeology

13. Owners of wrecks or anyone else planning salvage operations using explosives within the Reserve should consult the Nature Conservancy Council, so that adverse effects on wildlife can be minimised.
14. Persons intending to use underwater excavation equipment for archaeological or other purposes should likewise consult the Nature Conservancy Council before such equipment is used.

Divers

15. When underwater, divers are asked to disturb as little as possible. Thoughtless finning close to delicate species, such as sea fans and Ross coral, can easily cause damage. It can also stir up sediment, adversely affecting sediment communities in very sheltered areas and hindering other divers (especially photographers) from seeing what you have just seen.

Also, remember your bubbles can lodge in caves and overhangs and can kill marine life there.

When diving on the wreck of the "M V Robert" off the east coast (which is of considerable scientific interest), divers are requested not to disturb the marine life growing on the wreck.

3. PRESCRIPTION

3.1. PROJECTS

3.1.1. Project identification

3.1.2. Project register

The project register is the total identification of all those tasks required to manage the Marine Nature Reserve. It is presented here as Table 9 which also includes Section 3.1.3 (Project descriptions). Section 3.1.4 (Project groups) has not yet been prepared.

Note: Certain projects listed here have had project numbers allocated to them which do not appear in the Handbook for the Preparation of Management Plans (NCC, June 1983) eg 'RP11: collect data, marine environmental conditions'. In such an instance, the number allocated was the next available, further to those listed in the Handbook's Checklist of Site Management Projects (Appendix 1). In one case, a completely new number has been used, 'MWO1: Appoint Warden'. Those projects which are not listed in the Handbook have been allocated numbers for convenience so they can be easily identified. These numbers, however, should not be regarded as definitive.

TABLE 9

Project Register (Section 3.1.2) including Project Description (Section 3.1.3)

| <u>Project Code</u> | <u>Project Title</u> | <u>Project Description</u> |
|---------------------|---|---|
| RECORDS | | |
| RL01 | Collect information, bibliography, published and unpublished works | <p>Reference sources to include:-</p> <p>Previous reports on establishment of MNR, including those by Warden (1978) and Liaison Officer (1983).</p> <p>A complete set of Annual Reports of LFS, plus photocopies of articles relevant to MNR.</p> <p>Copies of other published material concerning MNR, and reports from visiting research workers on work undertaken within MNR.</p> <p>A complete set of most recent marine algae, invertebrate and fish identification keys and guides.</p> <p>Reference books to encompass marine ecology, seashore/sublittoral guides, fish and seabird identification, British sea mammals etc.</p> |
| RL02 | Collect information, maps | A complete set (+ copies) of National Grid/ Ordnance Survey maps (1:2500) to be available, as reference source. |
| RL03 | Collect data, photographs aerial, every 10 years | A set of oblique views of coastline were taken summer 1983 (20.6.83). This project would monitor gross changes in cliff structure/erosion; beach levels etc; and be used for reference. |
| RL04 | Collect data, photographs, ground/sea | Records of visiting boats (especially those fishing), and ships anchoring/sheltering in Lundy Roads. Also of recreational activities (canoeing, windsurfing etc). To be used for reference. |
| RL05 | Collect data, photographs, fixed point | <p>Viewpoint photography of selected intertidal areas for gross monitoring of algae cover and of other easily-visible features. On the Land's Beach, this to include recording of sediment levels.</p> <p>Also of key underwater species and communities at easily-relocatable sites (see project RH10).</p> |
| RL09 | Collect data, photographs, intertidal and subtidal habitats, communities, species | This project provides illustrative material for displays, lectures etc, and is undertaken directly by the Warden and by commissioned or grant-aided research workers. |
| RL10 | Maintain data, photographs, reference material | MNR set of photographs taken both above and below water to be added to continuously and catalogued. For illustrated talks, lectures, display material etc. |

| <u>Project Code</u> | <u>Project Title</u> | <u>Project Description</u> |
|---------------------|--|--|
| RL11 | Collect data, littoral habitats and communities | This project is required to assess the range of habitats and communities present around Lundy and identify any not adequately studied in past work. Initially, it is a very broad survey carried out largely by boat with inspection where appropriate. Also investigation of littoral cave communities and those of deep intertidal rock pools, eg Mermaid's Hole. |
| RL12 | Collect data, sublittoral habitats and communities | This project is intended to complete the broad survey and mapping of sublittoral habitats and communities by recording at accurately-located sites not previously surveyed and use of standard recording cards developed for past surveys. Also investigations of sublittoral cave/wreck communities. |
| RL13 | Collect data, sublittoral habitats, from divers | To encourage visiting divers to report on substrate type, unusual species distribution etc, if diving in areas where this information is uncertain. |

Physical

| | | |
|------|---|--|
| RP11 | Collect data, marine environmental conditions | To collect data on a regular basis to record seawater temperature and turbidity at least. The data to be used to assist interpretation of ecological changes, and the occurrence of particular species (for instance visiting oceanic fish) |
| RP12 | Collect data, fisheries, and monitor effects | In co-operation with DSFC, to collect and record data on numbers of shellfish species taken within the Reserve area in relation to fishing effort. To seek co-operation of fishermen and DSFC in studying the ecological effects of deploying fishing gear on the seabed, particularly nets and pots. |

Flora and Fauna

| | | |
|-------|--|--|
| RF/RA | Collect data, species, general | A great many observations of marine species are made by visiting scientists and others, and such observations are to be recorded and stored (see also project RLO1). |
| RF/RA | Collect data, species and communities, by monitoring | Little is known about the longevity, growth rates or annual variability of many species or communities of high conservation interest. |

Specific projects to include:-

- i. Counts of particular species (eg sea fans, sea urchins) in certain areas to estimate density, age etc.
- ii. Swim-line surveys over the area occupied by the red band fish along lines readily re-located by transit marks. Burrows will be counted over a set distance.

| <u>Project Code</u> | <u>Project Title</u> | <u>Project Description</u> |
|-------------------------------|---|---|
| | | <p>iii. Estimation of numbers of grey seals and location of popular basking sites, through counts from sea and cliffs all round the Island. Possible identification of individual seals.</p> <p>iv. Investigation of caves/pupping sites during September/October.</p> <p>v. See project RP12.</p> |
| <u>Human Impact</u> | | |
| RH10 | Survey features, public, effects of pressure | Little is known about the effects of divers in "trampling" of underwater areas. This project is intended to provide information on effects at the Knoll Pins by direct observation and viewpoint photographic recording of the same areas at intervals. |
| <u>MANAGEMENT</u> | | |
| (MWO1) | Appoint Warden | This is essential to many of the projects here. It is envisaged the Warden would be resident on Lundy for a summer period (April-October), and would transfer to a mainland base for the winter. |
| <u>Wardening: Information</u> | | |
| MI01 | Inform public, general, by answering enquiries | This project refers to both postal enquiries and those made directly to the Warden by visitors. |
| MI02 | Inform, public, visiting divers, by advice | This project refers to the initial introduction of visiting divers to the Code of Conduct for the MNR aspects of Reserve activities, and of opportunities offered by facilities provided. This introduction is given before diving commences. |
| MI03 | Inform divers, by guidance | One of the major duties of a Warden will be to provide direct guidance to visiting divers, to take them to particular sites to view features or species, and to give background information as required. |
| MI04 | Inform visitors, by guidance | Taking small groups of visitors on beach explorations at low tide, pointing out prominent features and species, zonation of shore, answering questions, etc. Probably 1-2 times per week in mid-summer, for 1-2 hours. Notice informing of such to be displayed in advance in the Information Centre. |
| MI05 | Information divers/visitors, by illustrated talks | Using MNR slide set, etc. Regular (once weekly) talks by the Warden or visiting guest speakers on marine biology/ecology or related topics. Held either in Laboratory or Information Centre, by arrangement with Island authority. |

| <u>Project Code</u> | <u>Project Title</u> | <u>Project Description</u> |
|---------------------------|--|--|
| <u>Wardening: Liaison</u> | | |
| ML08 | Liaise, owners/occupiers | All Island residents (except one or two) are employees of the Landmark Trust. Close liaison must be maintained with all (especially Island Agent), as well as with representatives of LT who visit the Island regularly. The Island Agent should be kept informed of all MNR projects affecting LT interests, eg use of buildings (Laboratory, Information Centre etc). |
| ML09 | Liaise, diving authority | Aquaserve Diving Ltd, run by Mr John Shaw. The Warden will have to work in close co-operation with the diving authority, and maintain a close liaison on a day-to-day basis, regarding matters concerning the MNR. |
| ML10 | Liaise, visiting research workers | To be informed of research intentions. Permission to grant such may be required from higher NCC authority. Also may be withheld for work in certain areas (eg Knoll Pins) and certain species, or if destructive sampling is to be included. Report of findings to be submitted to Warden. |
| ML11 | Liaise, visiting school/university parties | To be available for shore field work, talks etc. To ensure no gross collecting of samples. |
| ML12 | Liaise, Lundy Field Society members | To help co-ordinate research carried out within MNR by LFS representatives. To write a report for inclusion in LFS Annual Report. To discuss points of mutual interest with their representative on the Island, to help implement climbing restrictions etc. |
| ML13 | Liaise, DSFC Officers | To maintain communication as necessary relevant to fisheries and MNR interests. Also the DSFC vessel "Spirit of Devon" visits Lundy during the summer, as routine patrol of North Devon coastline. To seek agreement concerning recording of data on shellfish catches etc (see project RP12). |
| ML14 | Liaise, local authority representatives | Occasionally, members of Torridge District Council visit the Island. Also MNR displays may be housed at mainland sites (eg North Devon Maritime Museum, Appledore) within DTC authority. |
| ML15 | Liaise, visiting fishermen | To promote understanding and co-operation. To identify boats and areas where pots are being set. Ensure they are aware of special areas within MNR. Most useful for Warden to go out on board visiting fishing vessels to get to know fishermen and to observe methods etc. Also to request that catches taken within the MNR are recorded and reported, by appropriate agreement. |
| ML16 | Liaise, anglers | Inform visitors who intend to fish from the Island of MNR code of conduct, and offer advice as necessary. |

| <u>Project Code</u> | <u>Project Title</u> | <u>Project Description</u> |
|--------------------------|--|--|
| ML17 | Liaise, recreational users of shore/Landing Bay | Request those using beach not to leave litter. Explain aims of MNR and code of conduct to boat users (yachts, canoes, windsurfers, other craft) |
| ML18 | Liaise, visiting climbers | Together with LFS Island representative, inform of climbing restrictions on certain cliffs between 1st April-1st August. Ask them to report any observations of seals, basking sharks, sunfish, porpoises etc. |
| ML19 | Liaise, residents/visitors concerning terrestrial SSSI | Assuming MNR Warden to be only NCC rep on Lundy, it is probable that involvement concerning terrestrial wildlife, certain farming practices etc will occur. Where necessary, recommend contact with higher NCC authority. |
| ML20 | Liaise, RNLI (Clovelly) | The lifeboat 'City of Bristol' regularly comes over to Lundy throughout the summer, mooring in the Landing Bay. Co-operation concerning the MNR should be sort as soon as possible and maintained |
| ML21 | Liaise, press/media local and national | Lundy is bound to receive a fair amount of publicity if declared as one of Britain's first Marine Nature Reserves. The Warden is likely to have to deal with this, in agreement with NCC Press Officer. |
| <u>Wardening: Patrol</u> | | |
| MPO2 | Protect site, Reserve, by wardening | This project overlaps with those of information but also the approach to visiting vessels to offer advice, help, and to inform them of the Reserve. The exact nature of the wardening procedure is difficult to specify. It will have to rely greatly on goodwill and co-operation of all users of the MNR, particularly divers and boat operators. It is hoped 'policing' will be carried out discreetly, though byelaw powers must be invoked where necessary (see also projects MPO4/05, AS02) |
| MPO4 | Protect site, general, by law enforcement |) Both of these aspects refer to the byelaws as applied to the statutory designation of the MNR.) The Warden will be expected to notify appropriate authorities if any contravention of byelaws has occurred. |
| MPO5 | Protect species, general by law enforcement | |
| <u>Estate Display</u> | | |
| MDO1 | Inform public, visitors, by leaflet | Leaflets provide an important source of information for visitors and something in return for what some see as the restrictions placed on them. Several leaflets have already been produced for Lundy, and these should be upgraded in quality and appropriate new leaflets produced. |
| MDO2 | Inform public, visitors, by signs (displays) | Preparation and maintenance of displays. New displays illustrating aspects of marine ecology and the main sublittoral species should be prepared, both for display on the Island (in conjunction with LFS) and also at mainland sites. |

| <u>Project Code</u> | <u>Project Title</u> | <u>Project Description</u> |
|---------------------|----------------------|---|
| | | (eg Bideford and/or Ilfracombe). Maintenance of the Island displays will be the responsibility of the Warden. |
| | | Also the Warden should be prepared to give talks to mainland Diving Clubs, Nat Hist Societies, conservation bodies etc. |
| | | Display of tide tables in Information Centre for use by visitors to plan beach excursions. |
| | | Also display of MNR code of conduct in Diving Hut and Information Centre. |

Estate Fabric

| | | |
|------|--|--|
| ME07 | Protect site, general, by placing marker buoys | It is possible this may be necessary to indicate intertidal caves where seals are known to pup, between 1st September-1st November, as well as close to known pupping beaches (eg Halfway Wall beach). |
| ME13 | Protect site, general, by removing litter | Litter is washed up on all beaches, though it is most noticeable in the Landing Bay, where it creates an eyesore. Regular removal of such litter should take place, to be burnt in the incinerator on top of the Island. |
| ME14 | Maintain Laboratory facilities | A large room behind the Barn has been set aside for use as a laboratory, and equipped with electricity supply, noticeboards, benches and stools. Improvement and maintenance is required. The corrugated iron roof needs replacing as this leaks, allowing rainwater to collect on benches. The internal walls require repainting. |
| ME15 | Maintain facilities for diving | To ensure that there is a properly-supervised facility for diving from the Island. |
| ME16 | Improve facilities for diving | To improve the buildings and their surrounds which are used for diving, in agreement with the diving concessionaire (Aquaserve Diving Ltd). To repair and improve access to diving hut via cliff path from the South Light. |

ADMINISTRATION

Correspondence and Reports

| | | |
|--------|---------------------------------|--|
| AC02-6 | Prepare reports, correspondence | These projects include the preparation of a Warden's report at the end of each summer, correspondence with visitors, members of the Advisory Committee, etc. |
|--------|---------------------------------|--|

Notification/Declaration

| | | |
|------|---------------------------|--|
| AN05 | Declare Reserve, National | |
|------|---------------------------|--|

| <u>Project Code</u> | <u>Project Title</u> | <u>Project Description</u> |
|-----------------------------------|--|--|
| (AN06) | Establish Advisory Committee | Many statutory and non-statutory organisations have an interest in marine areas around Lundy. The main organisations including the Landmark Trust, Lundy Field Society, DSFC, Aquaserve Diving Ltd, and other organisations should be represented on this committee to provide advice to NCC. |
| <u>Inspection</u> | | |
| AI03 | Implement inspection, Reserve, boats | The craft used by the Warden (inflatable boat(s) and outboard engine(s)) will require routine maintenance and repairs, as well as a thorough service at the end of the season. |
| AI04 | Implement inspection, Reserve, equipment | This includes diving equipment (especially air bottles), lifejackets, first aid kit etc, which will need to be checked before the start of each season. |
| AI05 | Implement inspection, Reserve, inventory | A check list of all NCC equipment used by Warden and others within the MNR. |
| AI09 | Implement inspection, Reserve, general | This project refers to visits to be made by NCC staff and members of the Advisory Committee to inspect facilities, displays, etc, and undertake discussions regarding the day-to-day running of the Reserve. |
| <u>Site and Species Safeguard</u> | | |
| AS02 | Protect site, general, by prosecution, Wildlife and Countryside Act (S. 36/37) | In extreme cases it may be necessary to prosecute persons contravening byelaws. |
| <u>Plans and Revisions</u> | | |
| APO4 | Prepare plan, annual work, Reserve | The annual work plan to be prepared in discussion with the Advisory Committee during the winter preceding each summer season. |
| APO7 | Revise Plans/Statement/Schedules, site | Alterations, additions, deletions to be made to work projects/programme register, as appropriate. |
| APO8 | Prepare, plan, oil spill response | The Devon County Council procedures for dealing with oil pollution etc should be adapted for Lundy. The Plan should identify those habitats and communities most at risk from oil and which would therefore be given priority for protection in the case of a large spill. Also to provide general advice, contact numbers etc with appropriate authorities. |

3.2.1 Work Programme: RECORDS

| <u>Project Code</u> | <u>Project Title</u> | <u>Year</u> | | | | | | |
|---------------------|---|-------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | <u>84</u> | <u>85</u> | <u>86</u> | <u>87</u> | <u>88</u> | <u>89</u> | <u>90</u> |
| RL01 | Collect information, bibliography, published and unpublished works | / | / | / | / | / | | |
| RL02 | Collect information, maps | / | /? | | | | | |
| RL03 | Collect data, photographs aerial, every 10 years | | | | | | | |
| RL04 | Collect data, photographs, ground/sea | / | / | / | / | / | | 1993 |
| RL09 | Collect data, photographs, intertidal and subtidal habitats, communities, species | / | / | / | / | / | | |
| RL10 | Maintain data, photographs, reference material | / | / | / | / | / | | |
| RL11 | Collect data, libbtoral habitats and communities | / | / | /? | | | | |
| RL12 | Collect data, sublittoral habitats and communities | / | / | /? | | | | |
| RL13 | Collect data, sublittoral habitats, from divers | / | / | | | | | |
| RP11 | Collect data, marine environmental conditions | / | / | / | / | / | | |
| RP12 | Collect data, fisheries, and monitor effects | / | / | / | / | / | | |
| RF/RA | Collect data, species, general | / | / | / | / | / | | |
| RF/RA | Collect data, species and communities by monitoring | | / | / | / | / | | |
| RH10 | Survey features, public, effects of pressure | / | / | / | | | | |

KEY: / : Year in which project is to be undertaken
 ✓ : Project completed for that year
 /? : Possible undertaking of project

Work Programme: MANAGEMENT

| <u>Project Code</u> | <u>Project Title</u> | <u>Year</u> | | | | | |
|---------------------|---|-------------|-----------|-----------|-----------|-----------|-----------|
| | | <u>84</u> | <u>85</u> | <u>86</u> | <u>87</u> | <u>88</u> | <u>89</u> |
| (MW01) | Appoint Warden | /? | | | | | |
| MI01- MI05 |) Wardening: information (see project register) | / | / | / | / | / | |
| MI08- MI21 |) Wardening: liaison (see project register) | / | / | / | / | / | |
| MPO2- MPO5 |) Wardening: patrol (see project register) | / | / | / | / | / | |
| MD01 | Inform public, visitors, by leaflet | / | / | | | | |
| MD02 | Inform public, visitors, by signs (displays) | / | / | | | | |
| ME07 | Protect site, general, by placing marker buoys | /? | /? | | | | |
| ME13 | Protect sign, general by removing litter | / | / | / | / | / | |
| ME14 | Maintain Laboratory facilities | / | / | | | | |
| ME15 | Maintain facilities for diving | / | / | / | / | / | |
| ME16 | Improve facilities for diving | | /? | /? | | | |

Work Programme: ADMINISTRATION

| <u>Project Code</u> | <u>Project Title</u> | <u>Year</u> | | | | | |
|---------------------|---------------------------------------|-------------|-----------|-----------|-----------|-----------|-----------|
| | | <u>84</u> | <u>85</u> | <u>86</u> | <u>87</u> | <u>88</u> | <u>89</u> |
| AC02-6 | Prepare reports, correspondence | / | / | / | / | / | |
| AN05 | Declare Reserve, National | | /? | | | | |
| (AN06) | Establish Advisory Committee | / | | | | | |
| AI03-9 | Inspections | / | / | / | / | / | |
| AS02 | Protect site, general, by prosecution | | /? | /? | /? | /? | |
| AP04 | Prepare plan, annual work, Reserve | / | / | / | / | / | |
| AP08 | Prepare plan, oil spill response | / | | | | | |

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3.2.2 Annual Work Plan

It is not appropriate to construct a full-comprehensive Annual Work Plan at this stage, for availability of man-power/funding etc for the coming season (1984) is not known. However, a list of projects which should take place (if possible) is given below.

| <u>Project Code</u> | <u>Project Title</u> | <u>Remarks</u> |
|---|---|---|
| ON THE MAINLAND (prior to summer season on Lundy) | | |
| (AN06) | Established Advisory Committee | It is hoped this will be achieved early 1984. |
| (MW01) | Appoint Warden | The presence on the Island of a Warden is strongly recommended, even prior to designation of Lundy as a statutory MNR. Ideally, this appointment should be taken up in late March/April, so that some time may be spent preparing items on the mainland before the summer season (late April-early November) on Lundy. |
| MD02 | Inform public, visitors by signs (displays) | <p>There are various possibilities for displays, both on the Island and on the mainland.</p> <p>The display prepared June 1983, primarily for use by divers, should be returned to the Island and wall-mounted in the Diving Hut, in time for the summer season.</p> <p>LFS are currently considering a large scale display for exhibition in the Information Centre, on all aspects of the Island's wildlife and archaeology. It would include a section on marine life. It is hoped this may be ready by Summer 1984.</p> <p>Both Ilfracombe Museum and the North Devon Maritime Museum (Appledore) have been approached about the possibility of incorporating a small photographic display on the MNR within their exhibits. Both are in favour of this, but funding for the preparation of such displays has yet to be decided upon.</p> <p>A display about Lundy (featuring the work of artist John Dyke) is currently being prepared for a touring exhibition of libraries and museums in the South West. It is hoped this will include a small section on the MNR.</p> <p>Preparation/co-ordination of these displays is necessary early in 1984, once funding etc has been arranged.</p> |
| MD01 | Inform public, visitors, by leaflet | Present diving leaflets in use need to be updated/modified and reprinted where necessary. New ones should be considered for sublittoral exploration/species identity, and also for littoral habitats (for use by non-divers) eg a map of Devil's Kitchen with indication and description of special sites of interest, etc. |

| <u>Project Code</u> | <u>Project Title</u> | <u>Remarks</u> |
|--------------------------|--|--|
| | | A new leaflet should be prepared for display in the Information Centre, explaining about the MNR generally. |
| | | Most of the preparation of these leaflets should take place on the mainland. |
| APO8 | Prepare plan, oil spill response | This should be done as soon as possible. |
| RL01 | Collect information, bibliography, published and unpublished works | Much of this material is already available. However, identification keys and field guides are required. |
| AI03 | Implement inspection, Reserve, boats | NCC inflatable boat(s) and engine(s) should be thoroughly checked before going to the Island (materials for maintenance are less easy to obtain once there). |
| AI04 | Implement inspection, Reserve, equipment | |
| AI05 | Implement inspection, Reserve, inventory | A list of equipment should be made at the start of the season, added to when appropriate, and checked at the end. |
| AI09 | Implement inspection, Reserve, general | Arrangements for visits of NCC staff/Advisory Committee members etc to be made as and when appropriate. |
| ON LUNDY (summer season) | | |
| MLO8 - ML21 | Wardening: liaison | To be carried out on a day-to-day basis. Higher NCC authority to be kept informed where appropriate. |
| MI01- MI05 | Wardening: information | To be carried out on a day-to-day basis, where appropriate. |
| MPO2- MPO5 | Wardening: patrol | To be carried out on a day-to-day basis, where appropriate. |
| RL04- RL13 | Collect data | These projects to be undertaken throughout the season. |
| RP11/12 RF/RA | | Full use should be made of low spring tides to check littoral habitats around the island, especially for photographing. |
| | | Details of shellfish taken (both by divers and fishermen, if possible) to be recorded. |
| | | Sea conditions: regular checks of temperature and turbidity (using Secchi disc) to be undertaken when conditions allow. |
| | | Specific scientific projects to be undertaken have yet to be decided upon for summer 1984. |

| <u>Project Code</u> | <u>Project Title</u> | <u>Remarks</u> |
|---------------------|--|---|
| RH10 | Survey features, public, effects of pressure | Descriptions of attended dives to be made, with special note of hazards/damage done by fishing, etc |
| ME13 | Protect site, general, by removing litter | This should be done regularly, especially after 'steamer' days, when many visitors are on the Island for a short time. |
| ME14 | Maintain Laboratory facilities | General maintenance required to ensure room is usable by visiting groups for work associated with MNR, and also others (eg model gliding club). |
| AC02-6 | Prepare reports, correspondence | Correspondence to be undertaken as necessary throughout the summer. Report to be prepared at the end of the season (November). |
| APO4 | Prepare plan, annual work, Reserve | Once returned to the mainland, in conjunction with the Advisory Committee. |

This draft Management Plan has been prepared by Keith Hiscock with grant aid from the Nature Conservancy Council and provision of facilities by the Field Studies Council Oil Pollution Research Unit. Typing has been carried out by Mrs. Lucille Evans.

This Plan has relied heavily on work carried out over the past 12 years specifically aimed at providing information for management and the following organisations who have grant-aided or commissioned this work are acknowledged.

Nature Conservancy Council

World Wildlife Fund

Browne Fund of the Royal Society

Lundy Field Society

Natural Environment Research Council

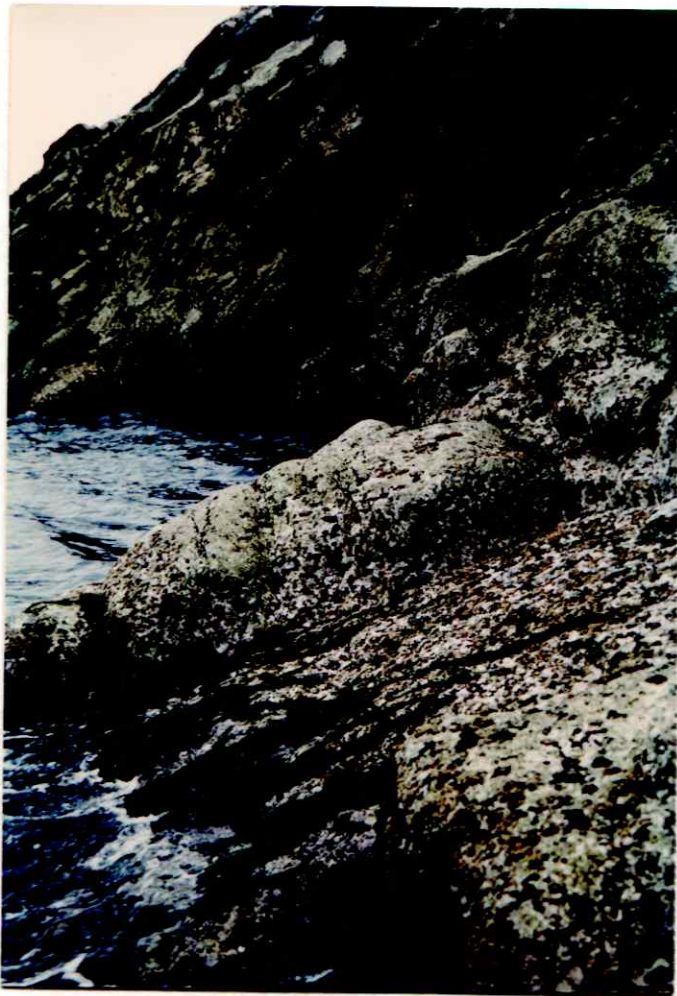


Plate 2. Littoral bedrock communities on the north coast near Kittiwake gully dominated by limpets and barnacles with few algae, except on the lower shore where Himantalia elongata and Corallina officinalis are present.



Plate 3. Littoral bedrock communities on the west coast at Dead Cow Point. Dominated by limpets and barnacles with a few patches of Fucus vesiculosus linearis and dense Corallina officinalis on the lower shore. The most wave-exposed littoral communities on Lundy.



Plate 4. Littoral cave and boulder shore on the west coast below the Old Light. Boulders dominated by limpets and barnacles and, where abrasion occurs, green filamentous algae.



Plate 5. Littoral slate rock platform and upper-shore rockpools at Lametry Beach on the south coast. Rock platform with sparse colonisation except in the region of pools.



Plate 6. Shallow mid-shore rockpool at Lametry Beach. Pool dominated by encrusting calcareous alga with scattered foliose algae.

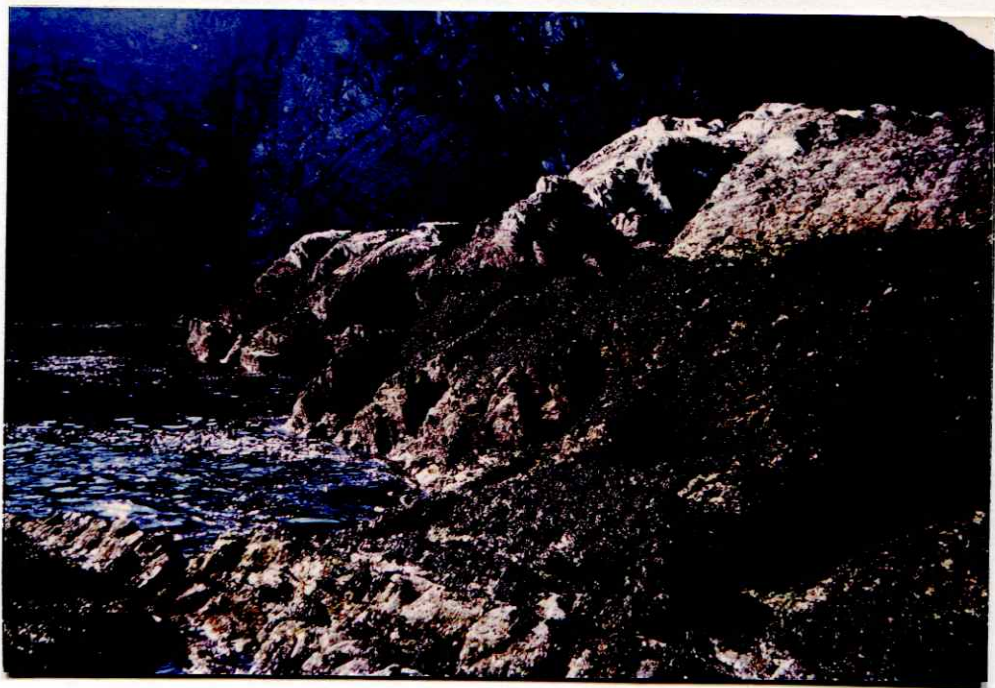


Plate 7. Littoral bedrock communities on the south coast, east of Lametry. Dominated by species of Fucus and showing clear zonation.



Plate 8. Littoral communities on broken slate bedrock and boulders at Hells Gates, dominated by a dense growth of various species of large seaweeds and with rich communities under algae, in pools and under rocks.



Plate 9. Littoral communities north of Rat Island, dominated by large brown algae including Ascophyllum nodosum. The most wave-sheltered littoral communities on Lundy.

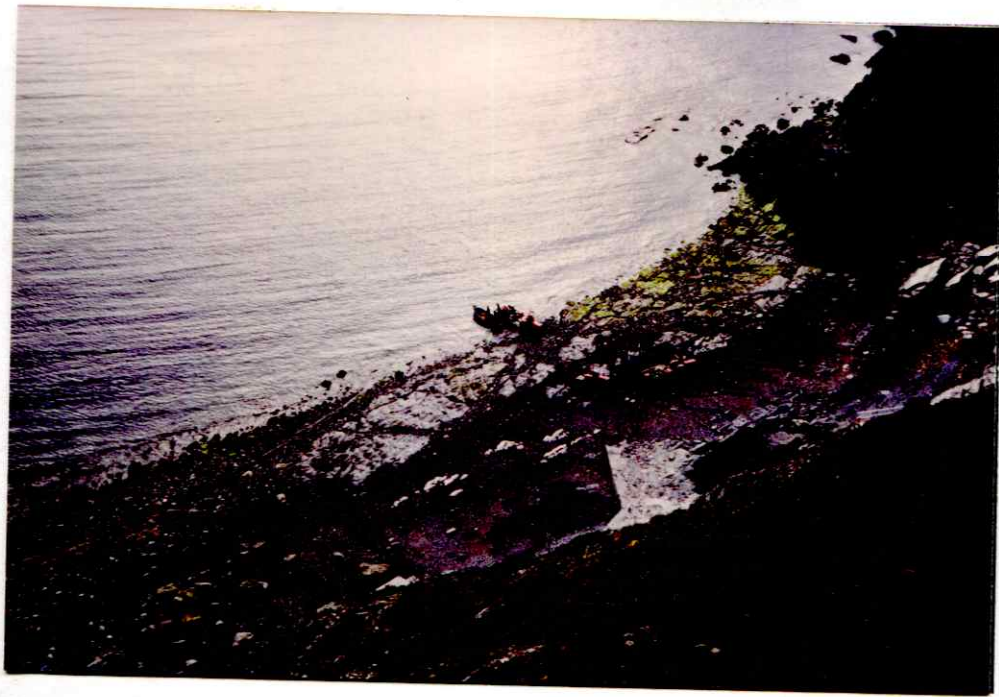


Plate 10. Sandy beach in the Landing Bay.

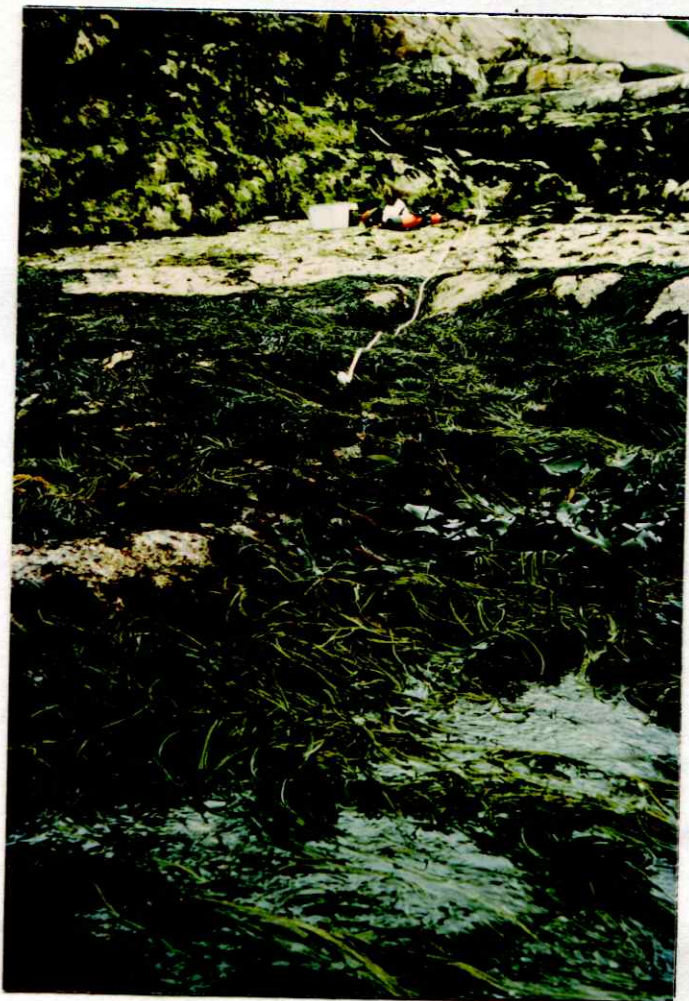


Plate 11. Littoral bedrock communities on the east coast at Brazen Ward with a patchy cover of seaweeds.



Plate 12. Littoral communities on boulders at the east coast at Gannets Bay, dominated by large brown algae including Ascophyllum nodosum and with filamentous green algae where abrasion occurs.



Plate 13. Zonation on sublittoral rocks. The sublittoral fringe at +1 to 0 m characterised by encrusting calcareous algae and Laminaria digitata. (L/H/145A). Picture width ca. 40 cm.



Plate 14. Zonation on sublittoral rocks. The upper infralittoral kelp forest at 0-8 m characterised by a forest of Laminaria hyperborea and sparse foliose algae. Picture width ca. 1.5 m.



Plate 15. Zonation on sublittoral rocks. The lower infralittoral kelp park at ca. 8-10 m. (A/23). Picture width ca. 3 m.

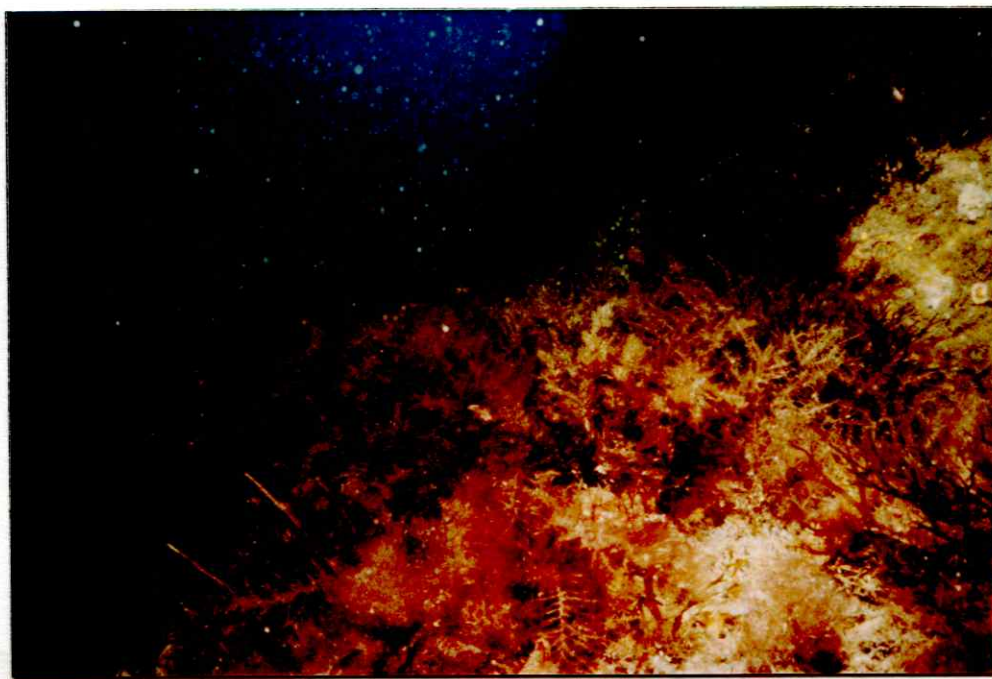


Plate 16. Zonation on sublittoral rocks. The lower infralittoral dominated by foliose alga at ca. 10-13 m. (SEL/52). Picture width ca. 1.5 m.



Plate 17. Zonation on sublittoral rocks. The upper circalittoral dominated by animals with sparse foliose algae present at ca. 13-22 m. (L/H/136A). Picture width ca. 1 m.



Plate 18. Zonation on sublittoral rocks. The lower circalittoral dominated by animals with foliose algae absent. Ca. 25 m. (SEL/58). Picture width ca. 1 m.

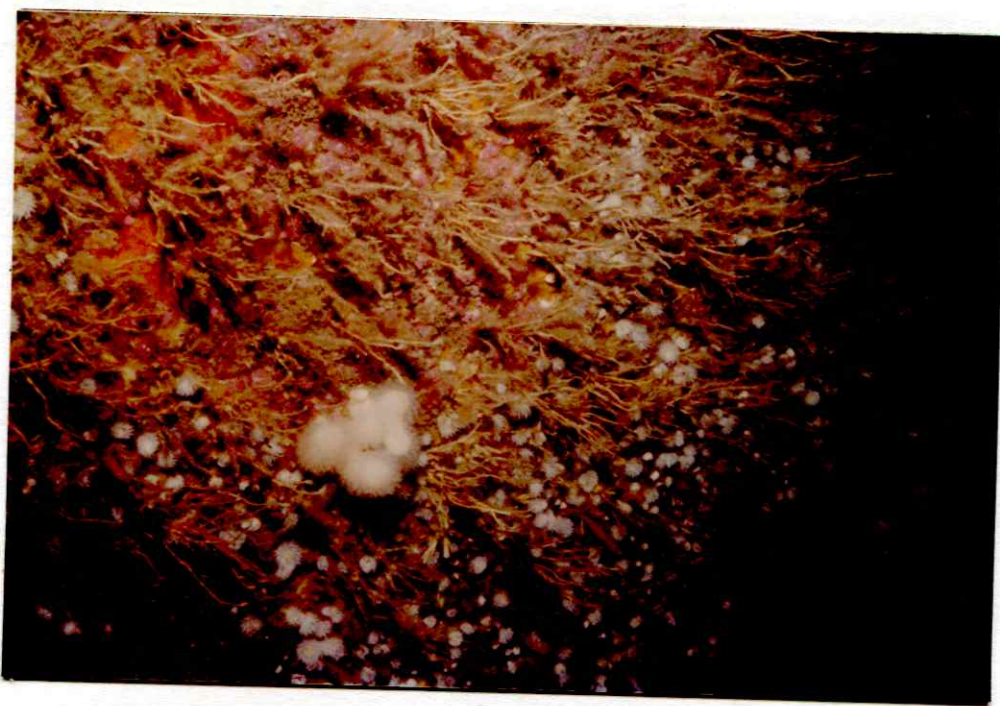


Plate 19. Circalittoral communities on vertical rock at sites very exposed to wave action and tidal streams, characterised by Tubularia indivisa, Corynactis viridis, Alcyonium digitatum and Actinothoe sphyrodeta at the Hen and Chickens. Ca. 10 m. (SEL/130). Picture width ca. 1 m.



Plate 20. Circalittoral communities on upward-facing rock on the wave-exposed west coast, characterised by a low turf of Bryozoa with few large erect species present. Jennys Cove at ca. 17 m. (L/H/111A). Picture width ca. 80 cm.



Plate 21. Sand-scoured communities dominated by encrusting calcareous algae in shallow water on the wave-exposed west coast. Jennys Cove at ca. 2 m. (SEL/43). Picture width ca. 1.5 m.

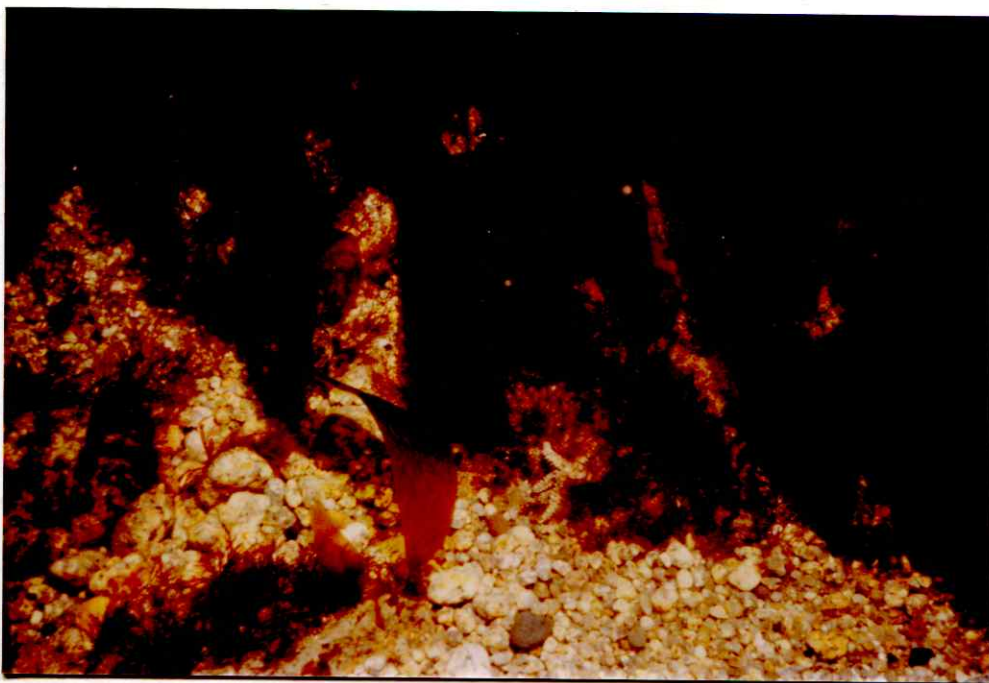


Plate 22. Communities of algae growing on gravel and small stones during summer calm weather on the west coast. Between Half Tide Rock and The Battery at ca. 10 m. (SEL/96). Picture width ca. 20 cm.



Plate 23. Circalittoral communities on boulders occasionally disturbed by wave action at a site exposed to strong wave action and tidal streams. Offshore of Montagu Steps at ca. 26 m. (SEL/100). Picture width ca. 1 m.



Plate 24. Circalittoral communities on bedrock in areas swept by strong tidal streams off the south coast, characterised by a turf of Hydrozoa and Bryozoa and by Alcyonium digitatum. Lee Rocks at ca. 25 m. (SEL/20). Picture width ca. 1 m.



Plate 25. Circalittoral rock partly covered by sand, characterised by the sponge Ciocalypa penicillus and the dahlia anemone Urticina felina. Rattles anchorage at ca. 18 m. (L/H/64A). Picture width ca. 1 m.



Plate 26. Offshore areas of slate pebbles, characterised by encrusting Bryozoa with Ophiocomina nigra and areas of dense Ophiothrix fragilis. South of Rat Island at ca. 32 m. (L/H/35A). Picture width ca. 1 m.



Plate 27. Nearshore area of slate pebbles, characterised by foliose algae with some rarely-encountered species present. North-east of Mouse Island at ca. 9 m. (L/H/65A). Picture width ca. 1 m.



Plate 28. Very shallow rocks and shingle bordering the south-west part of the Landing Bay, characterised by Corallina officinalis, Laminaria spp., Cystoseira baccata and Chorda filum. Ca. 0 m. (SEL/304). Picture width ca. 1.5 m.

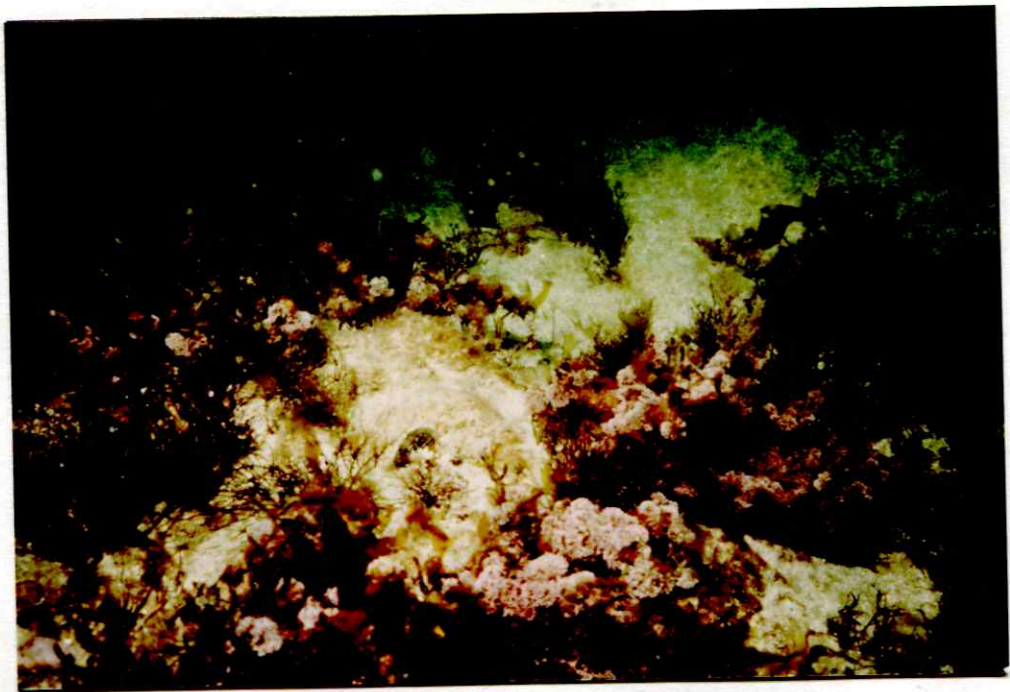


Plate 29. Sandy rocks to the north of Surf Point, characterised by, amongst other species, Jania rubens and Furcellaria fastigiata with Nassarius reticulatus present. (SEL/300).

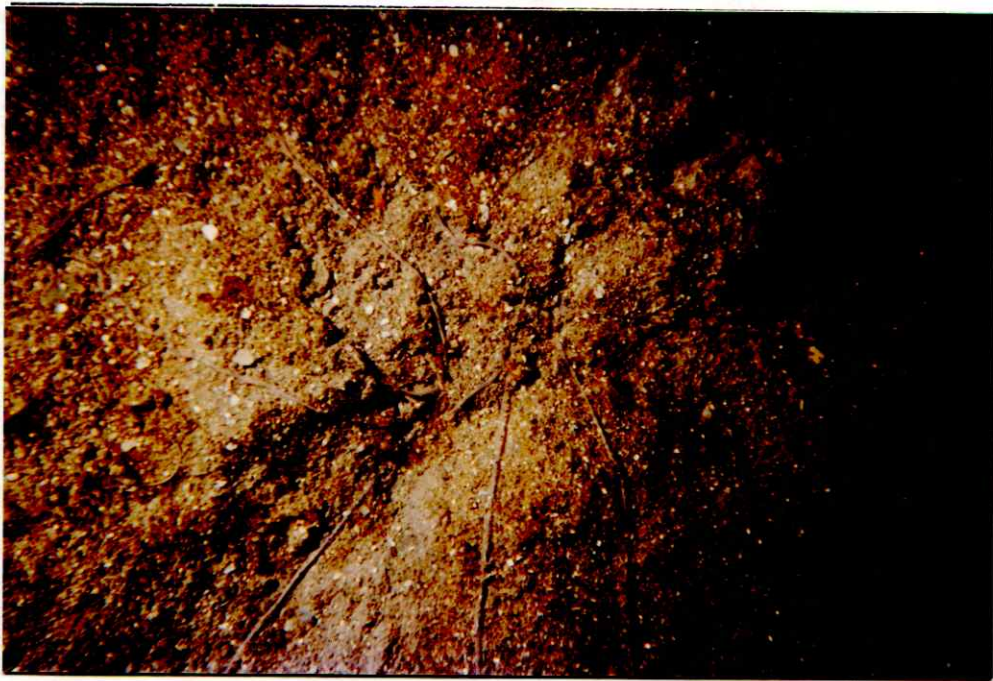


Plate 30. Areas of muddy sand in the Landing Bay, characterised by a Tellina tenuis-T. fabula community. Tentacles of a terebellid worm showing. Ca. 4 m. (W/10). Picture width ca. 20 cm.



Plate 31. Mud overlying gravel and stones nearshore on the south part of the east coast, characterised here by Cereus pedunculatus. Off White Beach at ca. 9 m. (SEL/59). Picture width ca. 1.5 m.



Plate 32. Muddy sand off the east coast, colonised by an Amphiura filiformis community, characterised by the arms of the burrowing brittle star Amphiura filiformis and by the hydroid Corymorpha nutans. South Point of Halfway Wall Bay at ca. 14 m. (H/26). Picture width ca. 20 cm.



Plate 33. Muddy shell gravel off the east coast, colonised by a Syndosmya (= Abra) alba community and characterised by the burrowing anemone Mesacmaea mitchellii and burrows of the crab Goneplax rhomboides. Offshore of The Quarries, ca. 16 m. (L/H/23A). Picture width ca. 60 cm.

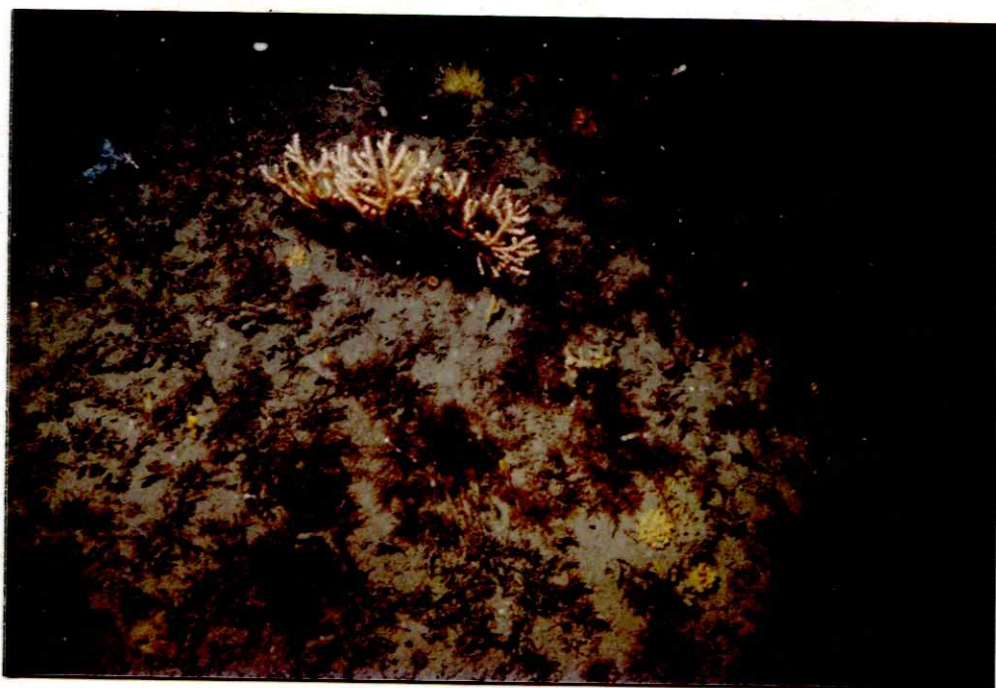


Plate 34. Mud-covered bedrock and boulders adjacent to the east coast, colonised by a sparse flora and fauna with a low variety of species. The Quarries at ca. 13 m. (SEL/193). Picture width ca. 1 m.

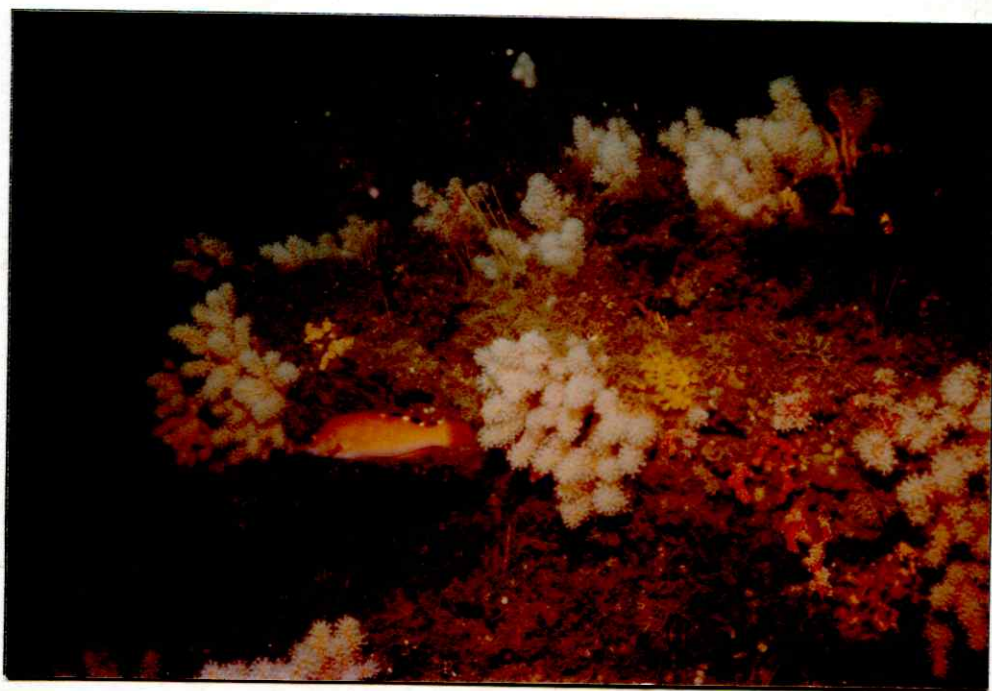


Plate 35. Rich circalittoral communities of Mediterranean-Atlantic species on the north part of the east coast with red sea fingers *Alcyonium glomeratum* most conspicuous here. Knoll Pins at ca. 25 m. (SEL/56). Picture width ca. 1.5 m.



Plate 36. Circalittoral communities in a small cave on the east coast where four of the five species of stony corals found in British waters are present. The yellow cup coral Leptopsammia pruvoti is most conspicuous. Location not specified here. Depth ca. 18 m. (SEL/229). Picture width ca. 80 cm.

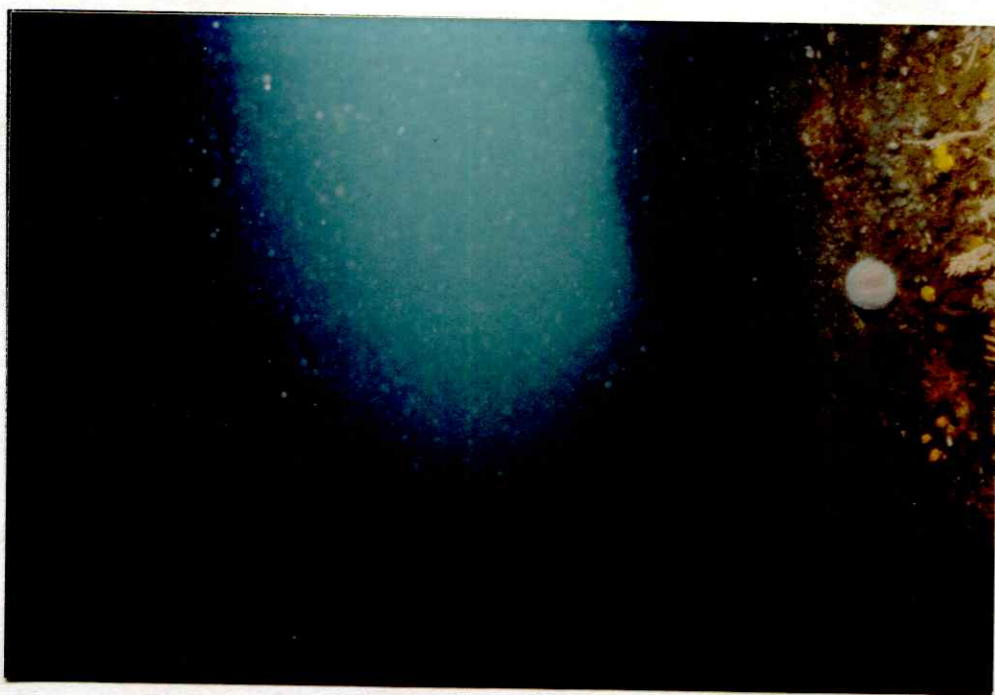


Plate 37. An underwater 'canyon' providing a habitat for many rare or unusual species. Knoll Pins at ca. 18 m. (SEL/49). Width of canyon ca. 1.5 m.

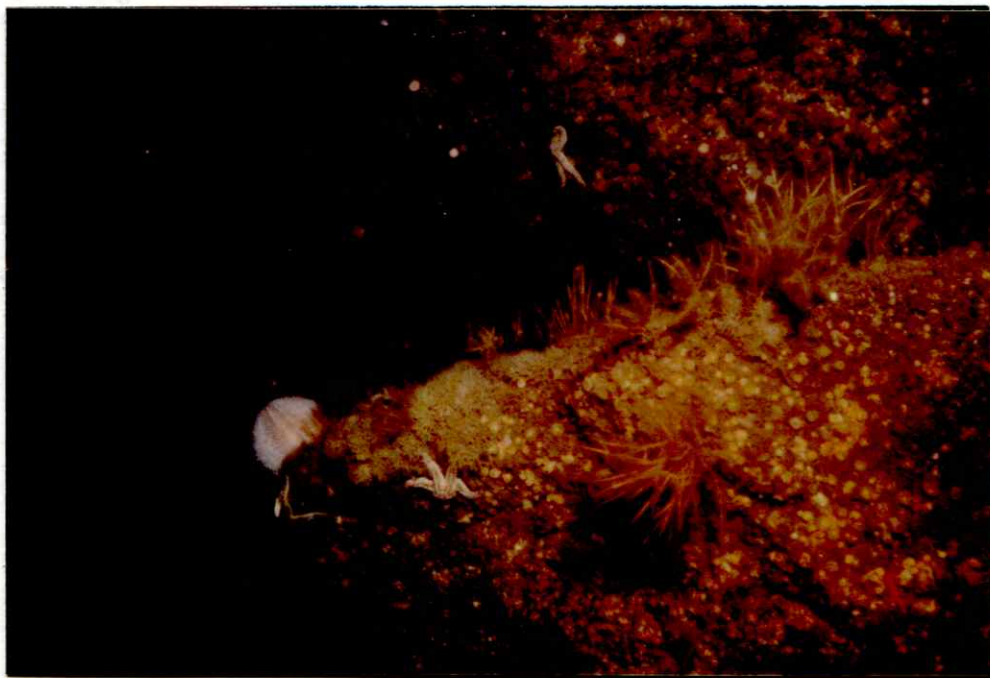


Plate 38. Vertical and overhanging rock on an extensive cliff face, characterised by dense jewel anemones Corynactis viridis. North of Gannets Rock at ca. 20 m. (SEL/84). Picture width ca. 2 m.



Plate 39. Slope of clean gravel partly colonised by rock-living species. North of Gannets Rock at ca. 18 m. (SEL/81). Picture width ca. 18 m.

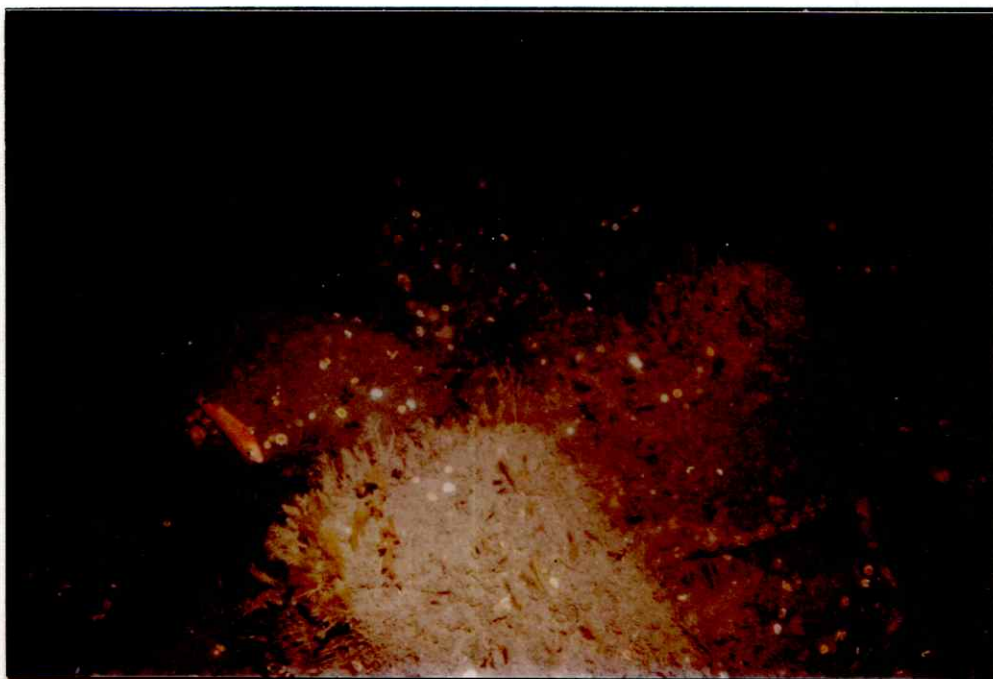


Plate 40. Circalittoral boulder slope with sparse epifauna on the east coast, north of Gannets Rock at ca. 30 m. (SEL/71). Picture width ca. 2 m.



Plate 41. Circalittoral rock off the north coast swept by strong tidal streams and with sand deposited. Characterised by the tunicate Pycnoclavella aurilucens. Virgins Spring at ca. 15 m. (L/H/47A). Picture width ca. 80 cm.

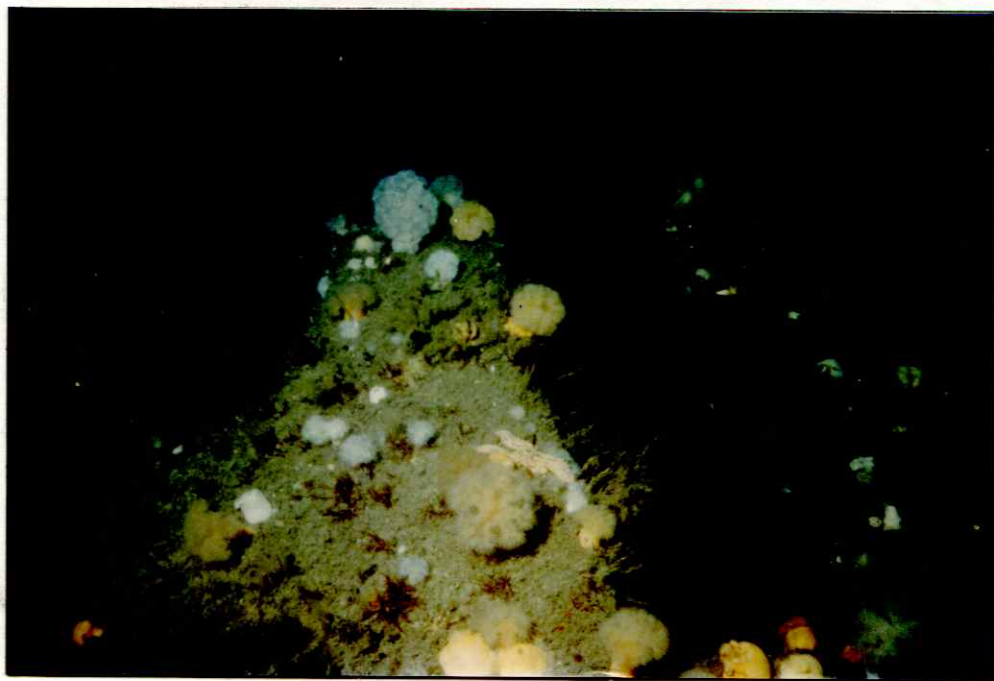


Plate 42. Communities on the wreck of the M.V. 'Robert' with large numbers of the plumose anemone Metridium senile present. Ca. 16 m. (SEL/205). Picture width ca. 3 m.

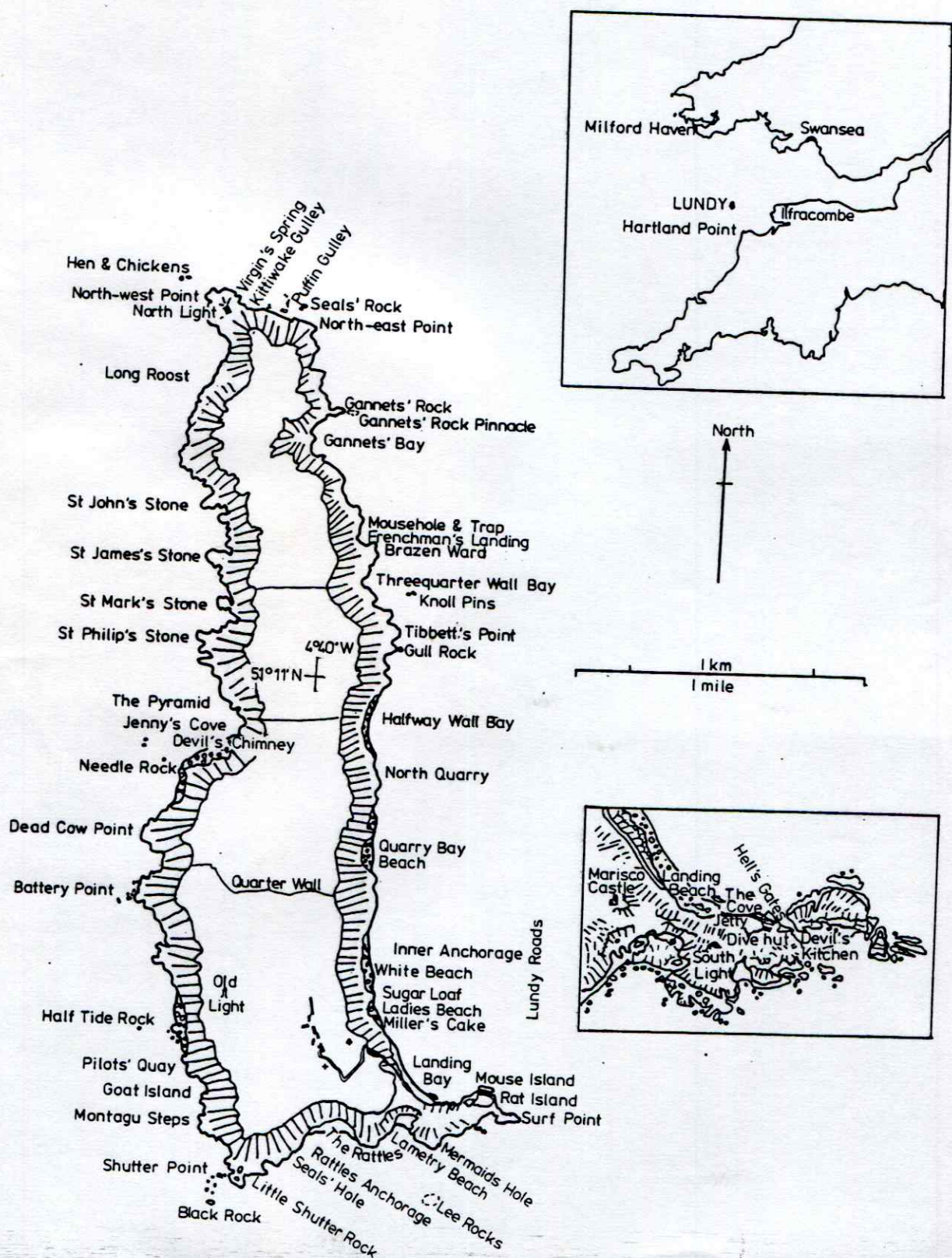


Fig. 1. Location of Lundy and names of coastal features.