

THE MACROFAUNA OF SOFT SUBSTRATES OFF THE COAST OF LUNDY

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Introduction

The original aim of the survey, which took place in July 1975, was to map the distribution of soft bottom fauna all around the Lundy coast. However, prolonged gales prevented any investigation of the west coast and allowed only one visit to the south. A total of eleven sites were sampled, nine on the east coast, one on the south coast and one on the north coast. Sediment samples were collected and an estimate of the exposure to water movements was made at each site. Circumstances did not allow a detailed benthic survey on quantitative lines but emphasis was placed more on a qualitative study to determine which species were present at as many different sites as possible.

Materials and Methods

At each site two cores of sediment were taken by a diver with a plastic corer 25 cm long and 8 cm in diameter, giving a sample volume of approximately 1 litre. The corers were stoppered with rubber bungs and returned to the surface for sieving through a 0.5 mm mesh. A smaller corer was used to collect about 200 ml of sediment for estimates of the particle size distribution.

At two sites, one off Quarry Bay and the other off Halfway Wall Bay, a transect line was laid for a distance of 50 m from the edge of the boulder slope extending from the beach in an easterly direction. Two large core samples were collected at intervals of 10 m along each transect line in order to obtain a more detailed picture of the faunal distribution in these areas. The cores were treated as described above. Observations, and, where necessary, collections of the surface epifauna were made at all sites but especially along the transect lines. Observations were dictated into an underwater tape recorder.

In addition to the above, a naturalists dredge was towed from an inflatable dinghy along the position of the dotted lines shown in Fig. 1. The use of a small hand-held Van Veen grab proved largely ineffective where there were coarse deposits in the sediment. A portable underwater suction sampler (Hiscock & Hoare, 1973) was used on one occasion in the landing bay. However, its use on a larger scale would have required much more time than was available.

Upon returning to the laboratory the sediment samples were transferred to large measuring cylinders which were then filled with sea water and shaken by hand for two minutes. Distinct layers were produced by the differential settling rates of different sized particles. The volume of each layer was read-off and converted to a percentage of the total volume of sediment. While this method is somewhat crude it does distinguish gross differences between different deposits.

Results

1. Sediment Distribution

The rough distribution of particle size graded as mud, fine sand, medium sand and coarse sand including shells and stones is shown in Fig. 1. As would be expected the percentage of coarse material was greater at sites such as Seals Hole on the south coast and Seals Rock in the north, where water movements are strongest. The large proportion of coarse material at site 3 in the Landing Bay appears to be contributed to largely by clinker and small stones possibly originating in the past from ships at anchor. The amount of mud was greater at the more sheltered sites such as Quarry Bay, Three-quarter Wall Bay and in the deeper water to the south of the Knoll Pins and Gannets Rock.

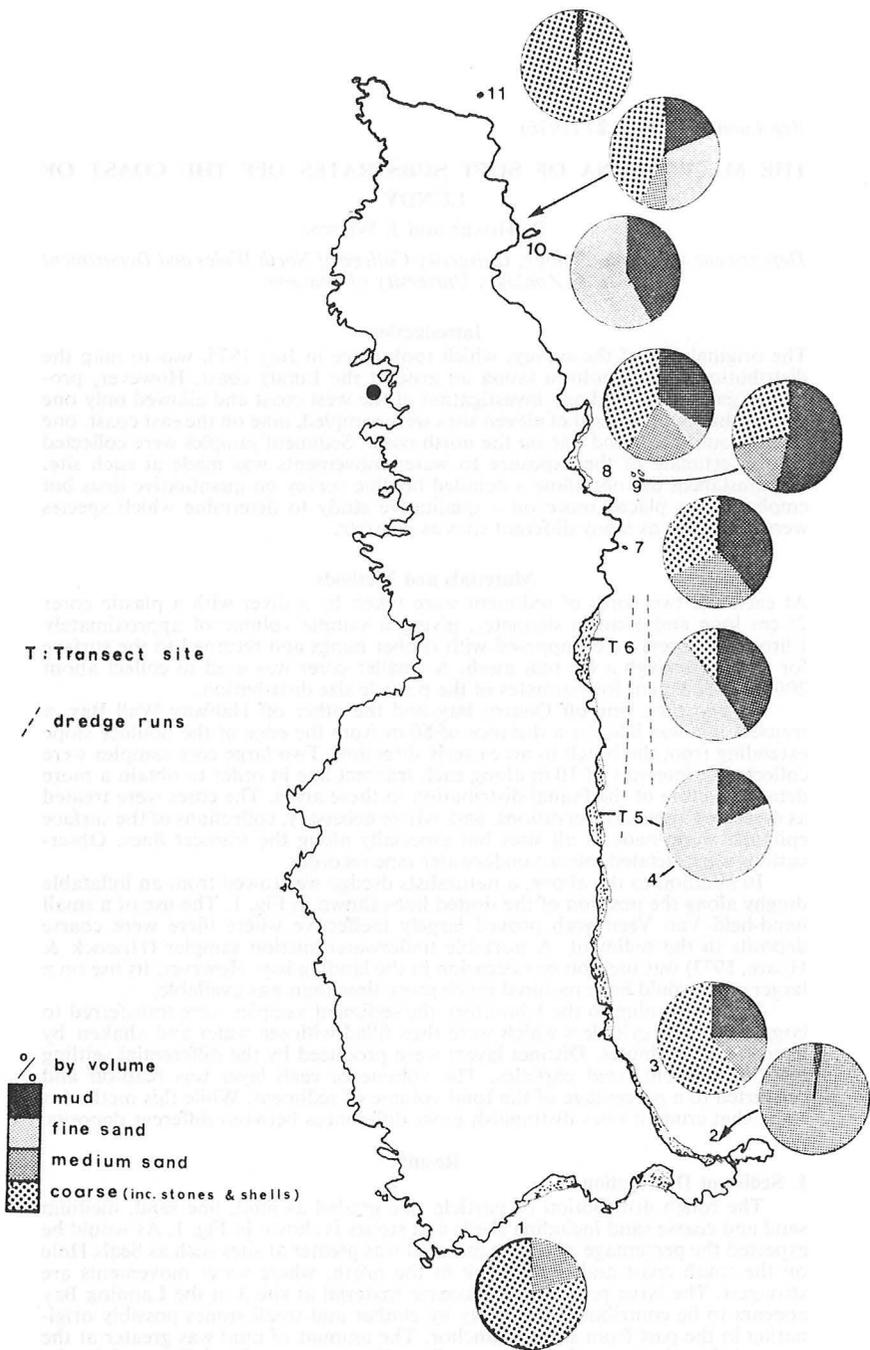


Fig. 1. Sediment characteristics and the location and depth (below Chart Datum) of the sampling sites. 1. Seals Hole, 15 m. 2. Landing Bay, 5 m. 3. Millers Cake, 14 m. 4. Quarter Wall Bay, 15 m. 5. Quarry Bay, 16 m. 6. Halfway Wall Bay, 16 m. 7. Gull Rock, 14 m. 8. Threequarter Wall Bay, 12 m. 9. Knoll Pins, 16 m. 10. Gannets Rock, 15 m. 11. Seals Rock, 28 m.

2. The Fauna

The accompanying fauna list shows the distribution of all species, however sampled, at all sites and includes the transect line data. Where the samples were not quantitative (i.e. taken by methods other than coring) the species are recorded merely as present or absent. In all a total of 81 species were found in samples from all sites, the highest numbers being found in samples from Quarry Bay and Halfway Wall Bay. However, this apparent difference is to some degree a function of the much larger number of samples taken at the transect sites, as well as more detailed observations along the transect lines. Nevertheless, there seems little doubt that the sites around the middle of the east coast supported a richer fauna than elsewhere.

Site 1. Seal's Hole

The sediment at this site consisted largely of coarse, shelly sand formed into large sand waves and dispersed in patches between rock outcrops. The nature of the bottom suggested that it was extremely mobile, under the influence of waves and the strong currents which run parallel to the south coast. Such mobility explains the dearth of animals—only one species of bivalve mollusc, *Venus ovata* being found in the core samples. This animal has a strong shell to resist abrasion and can easily re-bury itself when disturbed.

Site 2. The Landing Bay

The area sampled, near the moorings, consisted almost entirely of sand with a small amount of mud and harboured a total of 17 species. It was the only site where the burrowing polychaete *Magelona papillicornis* was common, the other species—*M. rosea*—being found at other sites. In addition, the burrowing heart urchin, *Echinocardium cordatum* appeared to be fairly abundant in the area, an observation which substantiates that made by Atlantic College students in 1974.

Site 3. Millers Cake (off The Ugly)

It is clear from Fig. 1 that there was a high percentage of coarse material in the sediment at this site, which appears to be reflected in the fauna—only 8 species being found. Disturbance of the bottom by ships' anchors may also be a consideration here. Apart from a specimen of the bivalve *Abra alba* all the species recorded were polychaete worms, the Eunicid—*Marphysa bellii*—being more abundant here than elsewhere.

Site 4. Quarter Wall Bay

Further north, at Quarter Wall Bay only 4 species were found although the sediment was similar to that at the next site—Quarry Bay—where 31 species were collected. This discrepancy is only partially explained by the much greater number of samples taken at the latter site. There does appear to be a real difference between the two sites, the reasons for which are not clear but merit further investigation. *Abra alba* was especially abundant at this location and perhaps it competitively excludes other species.

Site 5. Quarry Bay

A total of 31 species were found at the Quarry Bay site with large forms such as the hydroid, *Corymorpha nutans* (attached to small stones in the mud), the anemones, *Peachia* and *Cerianthus* and the brittle star, *Amphiura filiformis* being commonly seen at the surface of the mud. The carnivorous starfish, *Astropecten irregularis* was found only at this site although one specimen had been seen near the Knoll Pins in 1974 (personal observation).

Site 6. Halfway Wall Bay

The greatest number of species (37) were found at this site. The polychaete worm, *Pectinaria koreni* and the echinoderms *Leptosynapta decaria* and *Asterias rubens* were not seen elsewhere. The presence of the 'sand-hopper', *Talitrus*

saltator—a shore organism—in one of the samples must be anomalous. The most likely explanation is that the specimen was carried to Lundy by the easterly gales after being displaced from one of the Devon beaches, or possibly from elsewhere on Lundy if it occurs there.

Site 7. Gull Rock

Fourteen species were found in the cores taken from Gull Rock, the most abundant being the Maldanid worm, *Clymene santanderensis*. It was, in addition, the only site where the bivalve *Abra nitida* was found, albeit only rare. Again, the presence of the species, *Eurydice pulchra* normally found only on sandy shores must be attributed to displacement from some other location, probably the mainland, by the gales.

Site 8. Threequarter Wall Bay

The sediment was fairly similar to Gull Rock but there were more species found here than at the latter site. *Atelecyclus rotundatus*, *Nucula turgida* and *Turritella communis* were found solely at this location together with the polychaetes *Sabellaria spinulosa* and *Nephtys incisa*.

Site 9. The Knoll Pins

The cores were taken on the south side of the base of the inner Knoll Pin where the high percentage of mud indicates shelter from the direct effects of water movements. Nine species occurred in the samples, of which only one, the polychaete *Orbinia cuvieri* was not found elsewhere.

Site 10. Gannets' Rock

Two sites were sampled in the vicinity of Gannets Rock. The southern site was in the mouth of Gannets Bay where the sediment consisted of muddy sand. Much coarser sediment was found at the second site just to the north of Gannets' Rock where currents were stronger. Although not evident from the fauna list, there was a large difference in species composition between the two sites. The numbers in the fauna list came from the northern samples only, no animals being found in the cores from Gannets Bay. However, species such as *Pecten*, *Echino-cardium*, *Goneplax*, and *Eupagurus* were observed there on other occasions together with the burrowing teleost, *Cepola rubescens*.

Site 11. Seals' Rock

A patch of shell gravel occurred in deep water at the seaward base of Seals Rock. Only three species, all polychaetes, were found in the samples. The presence of *Scalibregma inflatum* was surprising as it is generally considered to prefer muddier situations.

Transect Sites

More species were found on the transect line at Halfway Wall Bay than at Quarry Bay but at neither site did there appear to be much difference between the species distribution at stations along the transect. There are probably two main reasons for this fairly homogenous distribution. Firstly, both transects were on a virtually level bottom, there being no more than about 0.5 m difference between the beginning and the end of the transect line. Secondly, the sediment seemed to be fairly uniform over the whole length of each transect. Consequently, it was not considered that a separate description of the transect data was merited in this report.

Discussion and Conclusions

The chief disadvantage of the corers used was the size of the sample taken. Two cores sampled an area of only 100 sq cm. In general, the bigger the sample, the better it is as an estimate of the population. However, the coring technique is quicker than other methods, enabling the diver to cover more sites in a given time. Consequently, as the aim of the survey was to cover as much of the coast of Lundy as possible and with the facilities and time available, it was decided to use

the corers at the expense of a larger sampling unit. Furthermore, many benthic species exhibit a patchy or uneven distribution which the present sampling techniques were not designed to detect.

A further point worth considering is the possible differences between observations made during the day and those made at night. No night dives were carried out on this occasion but some animals evince rhythms of activity by which they are more active at night. For example, Mori & Matutani (1952) found the starfish, *Astropecten polyacanthus* to be most active at dawn, burying itself during the day. The species *A. irregularis* found around Lundy may have a similar rhythm which might explain how rarely it is seen during the day.

From the limited data collected it would appear that the distribution of the fauna inhabiting the soft substrates around the coast of Lundy is primarily controlled by the nature of the sediment. This, in its turn, is influenced by the degree of water movement. Such a relationship appears to be ubiquitous and is well founded in the literature on benthic ecology. See, for example, Gray (1974).

REFERENCES

- Gray, J. S. (1974). Animal-Sediment Relationships. *Oceanogr. Mar. Biol. Ann. Rev.*, **12**, 223-262.
- Hiscock, K. & Hoare, R. (1973). A portable suction sampler for rock epibiota. *Helgolander wiss. Meeresunters.*, **25**, 35-38.
- Marine Biological Association (1957). *Plymouth Marine Fauna 3rd edition*, 453 pp. Plymouth.
- Mori, S. & Mutatani, K. (1952). Studies on the daily rhythmic activity of the starfish, *Astropecten polyacanthus*, etc. *Publ. Seto. Mar. Biol. Lab.* **2**, 213.

List of the Soft Substrate Fauna at all Sites

After the species name is first given the station number(s) where it was found, followed in parentheses by the numbers of individuals per sq. m. or by 'pr.' to denote present but not counted. The nomenclature is taken from the Plymouth Marine Fauna (Marine Biological Association, 1957).

POLYCHAETA: *Lepidonotus squamatus*: 5(25); *Lepidonotus* sp.: 5(25), 6(pr.), 7(100); *Harmothoe spinifera*: 4(100), 8(100); *Harmothoe longesetis*: 5(20); *Sthenelais* sp.: 3(67); *Pholoe minuta*: 5(25), 6(20); *Syllis cornuta*: 10(100); *Nephtys hombergi*: 5(75), 6(40), 9(100); *Nephtys cirrosa*: 2(pr.), 3(67), 5(25); *Nephtys incisa*: 8(199); *Glycera convoluta*: 6(40), 7(100); *Marphysa bellii*: 3(268), 5(250), 6(40), 7(100); *Lumbriconereis fragilis*: 2(pr.); *Lumbriconereis gracilis*: 3(201), 4(100), 8(100); *Lumbriconereis latreilli*: 5(75), 6(40); *Lumbriconereis coccinea*: 7(199); *Lumbriconereis impatiens*: 9(100); *Scolecoplepis girardi*: 2(100), 11(100); *Aonides oxycephala*: 5(225), 6(60), 7(100), 9(100); *Pygospio elegans*: 2(100); *Polydora ciliata*: 5(25); *Polydora* sp.: 6(20); *Magelona papillicornis*: 2(1194), 8(100); *Magelona rosea*: 4(100), 5(225), 6(100), 7(199); *Cirratulus filiformis*: 6(199); *Scalibregma inflatum*: 3(67), 5(75), 6(60), 8(100), 11(100); *Notomastus latericeus*: 3(67), 5(525), 6(40), 7(199), 8(498), 9(498); *Capitella capitata*: 3(134), 5(50), 6(40), 8(100); *Proclymene Mulleri*: 6(60); *Clymene santanderensis*: 2(100), 6(740), 7(597); *Clymene Oerstedii*: 5(225), 6(120), 8(100); *Clymene gracilis*: 6(80); *Owenia fusiformis*: 2(100), 8(100), 9(100); *Sabellaria spinulosa*: 8(100); *Pectinaria koreni*: 6(80); *Pectinaria auricoma*: 5(25), 6(100), 8(100), 11(100); *Lanice conchilega*: 2(pr.), 6(pr.); *Polycirrus* sp.: 5(25), 6(20), 8(398), 9(100); *Trichobranchus glacialis*: 8(100); *Orbinia foetida*: 8(100); *Orbinia cuvieri*: 9(100).

MOLLUSCA: *Cylichna cylindracea*: 5(25); *Turritella communis*: 8(pr.); *Nucula turgida*: 8(100); *Montacuta ferruginosa*: 2(pr.); *Dosinia exoleta*: 2(pr.), 8(100), 10(100); *Gari fervensis*: 2(pr.); *Venus ovata*: 1(100), 5(25), 7(100), 8(199), 9(100), 10(199); *Venus striatula*: 2(pr.); *Abra alba*: 3(67), 4(1900), 6(140), 8(498), 10(pr.); *Abra nitida*: 7(100); *Tellina tenuis*: 2(pr.); *Tellina fabula*: 2(pr.); *Cultellus pelucidus*: 5(25), 6(20); *Corbula gibba*: 6(100); *Pecten maximus*: 8(pr.), 10(pr.).

CRUSTACEA: *Eurydice pulchra*?: 7(100); *Ampelisca brevicornis*: 7(199); *Bathyporeia pelagica*: 2(199); *Urothoe grimaldi*: 2(pr.); *Talitrus saltator*(?): 6(20); *Callinassa laticauda*: 6(20); *Upogebia stellata*: 7(100), 8(100), 10(100); *Macropodia longirostris*: 5(pr.); *Eupagurus prideauxi*: 5(pr.), 6(pr.), 7(100); *Eupagurus bernhardus*: 6(pr.), 8(100), 10(pr.); *Atelecyclus rotundatus*: 8(100); *Goneplax angulata*: 10(pr.).

ECHINODERMATA: *Marthasterias glacialis*: 5(pr.), 6(pr.); *Astropecten irregularis*: 5(pr.); *Amphiura filiformis*: 5(125), 6(300); *Ophiura texturata*: 5(pr.); *Echinocardium cordatum*: 2(pr.), 6(pr.), 10(pr.); *Leptosynapta decaria*: 6(20); *Asterias rubens*: 6(pr.).

COELENTERATA: *Corymorpha nutans*: 5(pr.), 6(pr.); *Cerianthus lloydii*: 5(25), 6(20); *Cerianthus membranaceus*: 5(pr.); *Peachia hastata*: 5(25), 6(pr.); *Adamsia palliata*: 5(pr.), 6(pr.).

SIPUNCULOIDEA: *Golfingia elongata*: 7(100).

NUMBER OF SPECIES AT EACH SITE: 1(1), 2(17), 3(8), 4(4), 5(31), 6(37), 7(14), 8(23), 9(9), 10(9), 11(3). **TOTAL NUMBER OF SPECIES:** 81.

THE RED BAND-FISH, *CEPOLA RUBESCENS* L. AT LUNDY

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INTRODUCTION

The red band fish, *Cepola rubescens* L. is a long eel-like fish (see Fig. 2) with very striking orange-red colouration. According to Wheeler (1969), it is trawled most commonly on mud grounds at depths of 70 to 200 m off South and South-West Britain. There is very little published information on this species other than an analysis of length and weight relationships for Mediterranean specimens (Vives, Suau, and Planas, 1959) and some brief observations on captive fish (Wilson, 1953, 1963). The latter suggests that this fish makes burrows. *Cepola* was first found in Lundy waters by Atkinson in 1974 when diving in Quarry Bay and has been intensively studied since then at other sites in Halfway Wall Bay and Gannets Bay. These studies have been reported by Atkinson (1976) and Atkinson, Pullin, and Dipper (in press).

1974 STUDIES

These studies, reported by Atkinson (1976) were restricted to preliminary observations on burrow and fish size and distribution. They confirmed that large *Cepola*, 60–70 cm, standard length were present in Quarry Bay. The area studied was 17 m below Chart Datum. The burrowing habit of *Cepola* was confirmed, the burrows being massive structures 60–70 cm deep and having the appearance of a vertical shaft with a slightly enlarged basal chamber in the shell gravel layer underlying the mud. The burrowing crab *Goneplax rhomboides* was also present in large numbers. Along a 48 × 2 m belt transect, *Goneplax* burrows occurred at about 1 per sq. m, and 6–7 *Cepola* burrows were present.