Rep. Lundy Field Soc. 52

CHANGES IN THE MARINE LIFE OF LUNDY

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ABSTRACT

The seabed marine life around Lundy has changed significantly in the past 30 years since the early 1970's and many of those changes are declines in abundance of cherished species such as nationally rare or scarce organisms. Some changes are gains and increases in species. The changes observed are within the time-scales of long-term fluctuations and recovery of some of the declining species is expected in the future. Most importantly, Lundy retains its very high diversity of habitats and species including nationally rare and scarce species.

This note reflects some informal observations by the author and some recent more systematic observations of others. The re-commencement of monitoring and surveys associated with effects of climate change on rocky shore species planned for 2003 are welcome.

Keywords: *Lundy, Biodiversity, Climate Change, Marine Species, Monitoring.*

INTRODUCTION

Although Lundy was visited by the pre-eminent Victorian naturalist Philip Henry Gosse (Gosse, 1865), he left very little in the way of observations of marine life on the island that could be used in a comparative way. Tregelles collected seaweeds from Lundy (Tregelles, 1937) and his herbarium is now maintained at the Natural History Museum in London. The rocky shores of Lundy were sampled and described by Professor and Mrs Leslie Harvey in the late 1940's and early 1950's (Anonymous, 1949; Harvey, 1951; Harvey, 1952). In the late 1960's, the marine algae were thoroughly sampled both on the shore and underwater (Irvine *et al.*, 1972). In the 1970's and 1980's extensive descriptive surveys were undertaken of shore and seabed habitats and species creating the marine fauna lists published in this journal (listed in Hiscock, 1997). Observations of seabed marine life have been continued since the 1980's by the author and significant changes in the abundance of some conspicuous species have been observed. It now seems that, when Lundy was being promoted as a marine nature reserve in the 1970's

and 1980's (see Irving and Gilliland, 1997), the island marine life was on a 'high' and several declines are described in this paper together with suggestions of why such declines might have occurred.

a BASIS FOR ASSESSING CHANGE

In the late 1960's and early 1970's, the marine life on Lundy proved to be of exceptional richness in the surveys undertaken as well as delight to underwater photographers because of the colourful nature of many of the species. Monitoring of any change in some of those species started in 1983, as part of an Underwater Conservation Society expedition to Lundy. In 1984, the Nature Conservancy Council established a formal monitoring programme. Analysis of monitoring site data for the years 1983 to 1987 (Hiscock, 1994) concluded that "Overall trends in the abundance of southern species at Lundy are downwards". Later analysis of viewpoint photographs of the Knoll Pins monitoring site taken in 1996 and a general difficulty in finding certain species to photograph which were widespread in the early 1970's led to the conclusion that the marine life was not as rich as it had been in the period to the mid 1980's. Re-surveys of monitoring sites have not been undertaken by statutory authorities in recent years although Marine Conservation Society working parties (see Irving, 2003 for a list of studies) have carried out a range of important observations.

Case studies for 28 species, gleaned from various sources, are given below.

b SPECIES ACCOUNTS

1 Algae

Asparagopsis armata (harpoon weed) (the gametophyte stage of *Falkenbergia rufulanosa*). First described in Britain at Lundy (Harvey and Drew, 1949) but as the '*Falkenbergia rufulanosa*' tetrasporic phase. Recorded in the Landing Bay at Lundy in late September 1972 (Haisworth (*sic*), 1976) but not subsequently until 2001 (Reach, 2003). '*Falkenbergia rufulanosa*' is abundant at Lundy.

Sargassum muticum (japweed) is an unwelcome recent arrival at Lundy. It is a non-native species that can dominate rock pools and shallow areas. It most likely first appeared at Lundy during 2000 (Reach, 2003).

Zanardinia prototypus. This conspicuous brown algae looks like an old penny fringed with hairs. It was widely distributed and common in south-west England (including Lundy) during the 1970's but was not recorded at Lundy during intensive studies of seaweeds in the late 1960's to 1971 (Irvine *et al.*, 1972) or seen at Lundy after about 1980 (Hiscock and Maggs, 1984). *Zanardinia* is an ideal 'returning' species to look out for as it has such a characteristic appearance.

2 Porifera

Thymosia guerneii. This nationally rare sponge was widespread but uncommon around Lundy in the 1970's. It is one of the species that I have found difficult to re-find to photograph during recent excursions to the island. The colony at the monitoring site at the Knoll Pins had disappeared in 1996. I believe that it has suffered significant decline in recent years.

Axinella dissimilis. This branching yellow sponge with characteristic star-shaped marks around the exhalent osculae, is widely distributed in south-west Britain. It is known from monitoring studies to be extremely slow-growing and no new individuals have been recorded from monitoring sites in Lundy and the Isles of Scilly. Some individuals have been lost from one of the monitoring sites at Lundy – most likely as a result of prolonged easterly gales in 1985. However, the greatest loss at Lundy might have been due to collecting during scientific studies in the 1970's. Our guilty consciences hope for recruitment of new individuals but there is no indication of whether renewal might be from local or distant populations.

3 Cnidaria

Aiptasia mutabilis. The trumpet anemone is a nationally scarce species that may have increased in abundance at Lundy with particularly extensive 'new' populations observed just to the east of the new jetty in 2001.

Calliactis parasitica. The 'parasitic anemone' lives on whelk shells inhabited by hermit crabs. Hiscock (1974) notes that David George recorded the anemone in Quarry Bay as "frequent on mud on every large *Pagurus bernhardus* shell observed" in 1971 but is now rarely seen.

Parazoanthus anguicomus. The white cluster anemone is a northern species that nevertheless occurs in south-west Britain. It has been difficult to find in recent years at Lundy although previously (noted as the white form of *Parazoanthus dixoni* – now *axinellae* – in Hiscock, 1974) was frequently observed especially off the east coast.

Parazoanthus axinellae. This bright yellow cluster anemone is delightful to photograph but I was struggling in 1996 and 1997 to find populations at Lundy. Also, it had declined greatly in extent in 1996 at the monitoring site at the Knoll Pins. Colonies expand along stolons but seem to have retracted – is it something in (or not in) the water that is causing its decline?

Balanophyllia regia. The scarlet and gold star coral is a nationally scarce species and one that has remained remarkably constant in its presence intertidally at Lundy. Harvey (1951) notes its presence, and a location where individuals were mapped and measured in 1971 retains about the same population, most recently measured in 2002 (Ben Sampson, personal communication).

Leptopsammia pruvoti. The populations of *Leptopsammia pruvoti* at Lundy and the Isles of Scilly have, at most, recruited less than 1% to the population in the years of monitoring, at Lundy, for 13 years. One part of the Lundy population photographed in 1996 had declined by 22% since 1984. In another pair of photographs, fortuitously taken at exactly the same location, the number of corals in 1981 was 34 and, in 2001, 14. This lack of recruitment is puzzling as, on three occasions that I know of, animals brought into aquaria have produced viable larvae within a few days or at most two weeks, suggesting that an increase in sea temperature might be required to renew populations. Perhaps larvae are being produced but settlement is being blocked by dense growths of erect bryozoans.

Hoplangia durotrix. This small carpet coral is small and inconspicuous but can clearly be seen in early monitoring photographs at the Knoll Pins. It was seen again at the Knoll Pins monitoring site in 2001 but could not be found there in 2002. The species was seen at Gannets' Rock in 2000. The ease with which the species can be found has declined.

Alcyonium glomeratum. Red sea fingers are especially abundant at wave sheltered sites with moderate tidal flow. At Lundy, they seem to be less abundant and have declined within the area photographed as a part of the monitoring programme at the Knoll Pins. Since they do colonise wrecks near to rock (for instance the 'Elk' off Plymouth Sound, the Cita – seen three years after it sank – in Scilly), it seems that recruitment does occur from time-to-time and perhaps favourable water quality or a surge in temperature or the presence of suitable bare substratum enables successful reproduction and recruitment.

Parerythropodium hibernicum. The pink sea fingers is small and inconspicuous but can clearly be seen in early monitoring photographs at the Knoll Pins. It appears to have disappeared from the monitoring site although could be found elsewhere on the Knoll Pins in 2002. Nevertheless, ease of finding the species has declined.

Eunicella verrucosa. The pink sea fan is one of the most charismatic of marine species found around Lundy. Both pink and white varieties are present. In 2001, I noticed that many of the sea fans off the north coast of Lundy were dead or mostly dead. The situation was similar on the east coast although apparently (reports from Ilfracombe Sub-Aqua Club) not so severe on the west coast. Fans appear to have been infected by a fungal growth and dead areas become 'fouled' with attached barnacles and erect bryozoans.

Lucernaria campanulata and *Haliclystus auricula.* These stalked jellyfish were recorded in Harvey (1951) and Harvey (1952). In Hiscock (1975), Charles Boyden is reported as having recorded *Haliclystus auricula* as 'common' at The Gates (Boyden undertook work on Lundy in the early 1970's). Stalked jellyfish have not been recorded during monitoring studies of rockpools at The Gates which commenced in 1984.

4 Polychaeta

Sabellaria alveolata. Colonies of the honeycomb worm were recorded in Seals Hole by Gosse (1865) and the species is noted by Harvey (1951) as present on granite shores. George (1975) did not record the species in 1971 or 1974 surveys. Because *Sabellaria alveolata* reefs are a UK Biodiversity Action Plan habitat, it would be appropriate to check-out Seals Hole, where the mixture of sand and boulders is an appropriate habitat, for the species.

5 Crustacea

Palinurus elephas. As a crude measure of abundance, I have seen six crawfish collected by one person in one dive off the south coast of Lundy in the early 1970's. It is likely that a diver searching for crawfish would be lucky to see one in six dives today. Of course, the explanation is 'obvious' – the crawfish being fished-out at Lundy (by potting and diving) and fishing with trammel nets downstream of Lundy. Or, could it be that the high abundance of (and survival of) the larvae of decapods seen in the late 60's and 70's was connected with water quality at the time. If so, perhaps we can expect the return of crawfish in 'droves' after the water quality has been 'right' for a few years.

Xantho incisus and *Xantho pilipes*. These small crabs live under boulders in the lower intertidal and shallow subtidal. Both species were recorded by Harvey (1950) although I have not found them and they are not recorded in Atkinson and Schembri (1982).

Solidobalanus fallax. This distinctive southern species of barnacle was first recorded in British waters in 1994 (Southward, 1995) on the shells of scallops. It has subsequently been found off the Gower coast of south Wales. It was found at Lundy attached to dead portions of seafans, a habitat in which it also occurs off Plymouth.

6 Mollusca: Opisthobranchia

Tritonia nilsodhneri. Hiscock (1994) recorded that populations at Lundy had declined from an occurrence of the species or its spawn on 30% of its prey, *Eunicella verrucosa*, in 1975 to 22% in 1986 and 11% in 1987. However, the suggestion that decline had occurred was misleading as, in 1990, 35% of sea-fans were colonised, in 1995, none were found and in 1996 19% of seafans inspected were colonised (Irving, 1997). This species was first described in 1963 and has a very restricted recorded distribution. Is this short-lived sea slug really declining (or coming-and-going)? Or, is observation of such a well-camouflaged that looking for it needs skill and care? Care is certainly needed with sampling strategies if real changes are to be detected.

Greilada elegans. This spectacularly gaudy blue spot sea slug was once present in large numbers around Lundy and elsewhere in the south-west. The last one that I saw was being carried around in a jam jar from filming location to location during a BBC excursion to Lundy in the early 1980's. It was the only one that could be found at the time.

Osilinus (=*Monodonta*) *linearis*. Harvey (1951) records the toothed top shell as "not uncommon" at Ladies Beach. However, in the 1970's, it might have taken five minutes or more to find one specimen of this southern species of topshell at Devils Kitchen. In 2002, there were several locations on the upper shore where there were several per square metre, most likely reflecting good recruitment of this southern species during warmer climatic conditions.

7 Fish

Zeus faber (John Dory). This conspicuous fish species, which is observed inshore over rock was once regularly seen at Lundy but has been seen very rarely in recent years. Catches of John Dory are correlated with occurrence of warmer water (Southward, et al., 1975). Fish seem to respond very rapidly to warming events and the fish was regularly seen on the wreck of the MV Robert off the east coast in 2002 (Ben Sampson, personal communication).

Cepola rubescens (red band fish). The red band fish is not rare but the very large (estimated as 16,000 individuals) population present off the east coast of Lundy in the mid to late 1970's (Pullin and Atkinson, 1978) was unusual for the shallow depth at which it occurred and because only a very few have occasionally been seen since. Perhaps the conditions which favoured a high abundance of post-larval fish in plankton samples in the western Channel during the late 1960's and 1970's also occurred near Lundy and led to massive settlement in proportion to the few that now occur.

Balistes carolinensis. The trigger fish is not recorded in Pullin (1977) but was seen at Lundy for the first time by the author in 2001. One fish was seen at the surface off Battery Point on the west coast. The year 2001 was an exceptional year for trigger fish, with large numbers occurring in many locations.

DISCUSSION

When observing declines in abundance or even apparent losses of species, the immediate response by the public especially is that impoverishment must be due human activities. Contamination of water quality has certainly had an effect in enclosed areas where, until tributyl-tin antifouling paints were banned on small boats, species diversity had almost certainly fallen enormously, with bivalve molluscs particularly affected. However, Lundy could reasonably be expected to be immune from the elevated levels of contaminants that occur in enclosed areas. Jones and Matharu (1974) took samples from various organisms to analyse for heavy metals and concluded that concentrations were in the range to be expected in coastal areas. There is now the observation that nutrient levels in the Bristol Channel are elevated (Environment Agency, 1999) and may have some effect if sources of suspended food are enhanced, species such as the erect bryozoans thrive and may block larval settlement. Such a possible explanation for loss of some species is conjecture and should not be cited as fact! The widely

reported demise of seafans and corals in the north-eastern part of the western Mediterranean in 1999 (see, for instance, Perez *et al.,* 2000) was ascribed to a local warming event. Whilst photographs of the fungal infection that caused mortality in seafans there look very similar to that which has affected seafans at Lundy, it would seem strange that a species (*Eunicella verrucosa*) at the northern limits of its distribution should be adversely affected by a warming event. However, in combination with enhanced nutrient levels it might be that warm seawater conditions may have triggered the disease of seafans. Or perhaps such mortality 'just happens' from time-to-time. The Plymouth Marine Fauna (Marine Biological Association, 1957) includes the following note: "latter half of Aug. and first half Sept. 1924; Capt. Lord reported that a great amount of *Eunicella* brought up was dead: many colonies brought in were partially dead, none in such good condition as the previous July".

The idea that the abundance of species can differ enormously in different years or between blocks of years, and can do so at intervals of several decades, is well-established for the pelagic ecosystem. Russell (1973) observed that the post-larval stages of teleostean fishes (and larvae of other species especially decapods) were very abundant in the plankton off Plymouth in the 1920's, declined in the 1930's, and stayed low until somewhere around 1965 when a marked increase in the macroplankton, including fish larvae occurred. The numbers stayed high to the early 1970's. (Alan Southward, in the Cooper Memorial Lecture on 31 March 1998, suggested that what is now known as the 'Russell cycle' returned to its 1920's peak between 1965 and 1979). Russell accounts for these differences as due most likely to different hydrographical characteristics in the north resulting in an alteration in the movements of water around the British Isles rather than to increases in temperature. Some species may therefore require a particular water 'quality' in terms or nutrient status for propagules to survive or thrive and therefore colonise an area. The 'fertility' of such water was also demonstrated by Wilson (1951) in experimental studies rearing larvae. Wilson (1951) concluded "This is the first observation that has been made to show that the difference in bottom faunas from one region to another may be related to the ability, or otherwise, of larval stages to develop in the overlying water mass". It is easy to suggest that changes in the benthos, especially of species that might benefit from a higher food supply during their pelagic stage, may mirror the changes in the plankton. If such a mirroring is indeed the case, in the next few years, we might expect a 'boom' in the abundance of some of the seabed species which I suggest have declined since the 70's.

More short-term climatic variation is also important. For instance, populations of the warm water *Chthamalus* species 'collapsed' in the mid-60's (but are now rising again, presumably as a result of warmer conditions) (Alan Southward in the Cooper Memorial lecture given on 31 March 1998). However, significantly increased water temperature in 1989 and 1990 (Fowler and Pilley, 1992) did not seem to result in higher abundances for declining or lost species although temperature must have some effect in triggering reproduction especially for warmer water species. Changes in water masses creating better conditions for the survival of spores or larvae might be especially important for species such as seaweeds, and animals with planktotrophic larvae including decapod

crustacea, opisthobranchs, and fish. It might also be that changes in water currents are important and that southern species which have produced larvae to the south of Britain recruit to our coastal waters only if currents bring the larvae. However, for species with lecithotropic (and most likely short-lived) larvae, especially benthic larvae, such as *Leptopsammia pruvoti*, some other mechanism must exist and it might be that temperature is more important in encouraging production of gametes in the first place.

Many southern species have persisted. There are still many seven-armed starfish *Luidea ciliaris* (a species that Holme, 1983 suggested might have declined off Plymouth because of changes in water masses). The southern hydroid *Gymnangium montagui* thrives. Populations of the scarlet and gold star coral *Balanophyllia regia*, which has its northern limits in Pembrokeshire, are stable at monitoring sites (Ben Sampson, personal communication).

CONCLUSION

My observations are informal and my visits to Lundy becoming less frequent. I will have missed many changes that will be revealed only by systematic and careful survey. The renewal of monitoring studies by English Nature at Lundy is welcome as are the studies that will be undertaken of rocky shore species as a part of the Marine Biodiversity and Climate Change (MarClim) programme. There is also a significant role to be played by observant visitors to the island including both divers and rockpoolers. There is re-survey work that could be undertaken from reference data collected by Professor Harvey in the early 1950's and unpublished (fauna associated with kelp holdfasts and *Corallina* turfs) for which I currently have the original data. Observations of rare and unusual species, often supported by recording schemes, should be reported. Photographs of unusual species or events are particularly welcome.

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* The title of this paper was misprinted and should have been: Hainsworth, S. Some interesting additions to the marine flora of Lundy.

** The correct name is *Asparagopsis armata*.