



# PINK SEA FAN SURVEY 2001-2002

A report by Chris Wood for the Marine Conservation Society

## CONTENTS

<b>1. Executive Summary and Acknowledgements</b>	<b>2</b>
<b>2. Introduction and Methods</b>	<b>5</b>
<b>3. General Findings</b>	<b>7</b>
a. Distribution	
b. Depth range	
c. Habitat	
d. Abundance	
e. Size	
f. Condition	
g. Colour	
h. Associated species	
<b>4. Human Impacts and current protection for sea fans</b>	<b>17</b>
<b>5. Findings by Area</b>	<b>21</b>
a. Anglesey and Pembrokeshire	
b. Lundy	
c. North Cornwall	
d. Lands End	
e. The Manacles	
f. Plymouth	
g. Lyme Bay	
h. Purbeck	
i. Channel Islands	
<b>6. Conclusions and recommendations</b>	<b>35</b>
Bibliography	<b>39</b>
Appendices	<b>41</b>

All photographs are by the author except where stated.



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## Please Note

This report has been reduced in content to make it suitable to download from the internet.

The following elements contained in the full report have been omitted

- Front and back covers
- 3 pages of colour photographs
- Appendix 1 – table of raw data
- Appendix 2 – sea fan survey forms and guidance notes

These can be provided on request. Contact the author at [chris@seasearch.org.uk](mailto:chris@seasearch.org.uk) or telephone 07776 142096

## Reference:

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Copies of this report can be obtained from the Marine Conservation Society.

## 1.0 Executive Summary and Acknowledgements

### Executive Summary

- 1.01 This report presents the findings of a two-year study of the Pink sea fan, *Eunicella verrucosa*, and associated species, based on records of sea fans made by volunteer divers. The report shows that sea fans extend both further to the north in South Wales and to the east in Dorset than had been recorded in recent surveys. It also identifies the areas with the densest populations as at The Manacles and south of Plymouth. Sea fan populations in most areas appear to be in good condition, with the exception of Lundy, where those in the Marine Nature Reserve are in serious decline. There also appears to be a lack of small colonies in South Wales, including the Skomer Marine Nature Reserve, which does not suggest a sustainable population in the long term.
- 1.02 The sea fan anemone, *Amphianthus dohrnii*, is shown to be extremely rare with most specimens being found at The Manacles in Cornwall. The sea fan nudibranch, *Tritonia nilsodneri*, is much more common, occurring on up to 20% of the sea fans in Devon and Cornwall.
- 1.03 Recommendations are made of the areas where the existing site designation and protection measures could be enhanced, and further monitoring and scientific studies are called for, especially in the Lundy Marine Nature Reserve.

### Acknowledgements

This survey was greatly assisted by the financial support and support in kind from the Countryside Council for Wales and the British Sub Aqua Jubilee Trust.

The great majority of the data was collected by volunteer divers, without whom the objectives of the survey would not have been achieved. Those who completed forms or helped in other ways in each area are:

**North Wales** – Chris & Paul Turkentine, Chris Wood, Ian Saunders, Kirsten Ramsay, Paul Brazier, Rohan Holt, Tom Stringell.

**Pembrokeshire** – Andy Colls, Ben Wells, Bruce & Jennifer Jones, Catherine Hall, Chris Wood, Dale Rostron, James Perrins, John & Sara Wilson, Jon Hudson, Kate Lock, Katie Jones, Matthew Copp, Neil Gibb, Peter Hewitt, Sue Burton, Vicki Billings.

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**Manacles** – Andy Colls, Andrew Mainwaring, Brod Mason, Chris Wood, Darren & Sam Murray, Jessica McGarty, Tim Theobalds

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**Lyme Bay** – Colin Munro, Chris Wood, Melanie Gomes, Val Shepherd

**Purbeck** – Bill & Peter Hewitt, Chris Wood, Mike Markey, Tom Cowan  
**Channel Islands** – Alan Irving, Brod Mason, Chris Wood, Quintin Wicton, Sue Daly, Terry Ozanne

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The author would like to thank Keith Hiscock of the Marine Biological Association and Colin Munro of Reef Research for their advice on form design and methodology, Sam Fanshawe, Lucy Kay and Kirsten Ramsay for their support with the funding proposals and Jean-Luc Solandt, Sam Fanshawe and Kirsten Ramsay for reading the report in draft.

## 2.0 Introduction and methods

- 2.01 The Pink sea fan, *Eunicella verrucosa*, largely as a result of the former practice of collection as souvenirs, is one of relatively few marine species which receives protection from disturbance under the Wildlife and Countryside Act. It is an offence to kill, injure, take possession of or sell Pink sea fans. As a result of this protection the intentional taking of sea fans from the seabed has largely ceased. The major threats today are from fishing activities, whether intensive potting, netting, line fishing or rock hopper trawling.
- 2.02 Not surprisingly the Pink sea fan is also a UK Biodiversity Action Plan species for which the Joint Nature Conservation Committee (JNCC) has produced a Species Action Plan<sup>(1)</sup>.
- 2.03 This Seasearch survey has been designed chiefly to contribute to the following Action identified in the action plan.
- 5.5.2 Undertake a programme of spot surveys in three years between 1999 and 2004. The surveys are to be conducted at locations where pink sea-fan are known to occur, from forest areas to areas where abundance is sparse. Sites at the present limit of distribution should also be included. This can be linked to long-term monitoring of climate change. The data to be recorded should include density, size structure, colour, fouling, percentage infestation by predators (seaslug *Tritonia nilsodhneri* and the prosobranch *Simnia patula*). Data is also required on the occurrence and density of the sea-fan anemone *Amphianthus dohrnii* (often found attached to the pink sea-fan). (Action: CCW, EN, NERC)
- 2.04 The Marine Conservation Society (MCS), through its representation at a Pink sea fan workshop arranged by Devon Wildlife Trust in 2001, became aware that no work had commenced under this action, except for programmes in specific areas – Skomer and Lyme Bay, and considered it was an action where volunteer participation could lead to useful results. The survey was agreed by the National Seasearch Steering Group as the first Seasearch Stage 3 project<sup>(2)</sup>.
- 2.05 In addition to the action above the survey was designed to assist in addressing other actions in the Action Plan<sup>(1)</sup>. These include:
- 5.3.1 Investigate causes of decline and take the appropriate management response where human activities are implicated. (Action: CCW, EN)
- 5.4.1 Increase awareness among coastal zone management groups, divers and inshore fishermen of the sensitivity of the pink sea-fan in locations where it is known to exist. (Action CCW, EN)
- 5.6.1 Provide information on the pink sea-fan and *Amphianthus dohrnii*. Distribute as appropriate to recreational divers and lobster potters through leaflet, posters, displays and talks. (Action CCW, EN)
- 5.7.1 Successful conservation of the sea-fan anemone *Amphianthus dohrnii*, which has a separate action plan, depends on the continued presence of the pink sea-fan. Studies of the two species should be carried out simultaneously.

- 2.06 The Countryside Council for Wales has supported the project by funding the production of survey guidance notes and recording forms. It has also contributed towards targeted surveys in both North and South Wales. The British Sub-Aqua Jubilee Trust has also contributed to the project costs, representing the involvement of the amateur diving public.
- 2.07 During the survey period the proposed Marine Wildlife Conservation Bill was promoted as a Private Member's Bill. Whilst the Bill did not pass into law the debates in the House included direct reference to the Pink sea fan as a species which might have been a beneficiary of legislation to extend the concept of Sites of Special Scientific Interest (SSSIs) into the sub-littoral zone.
- 2.08 The survey material comprised a two sided sheet of guidance notes and a recording form. These are reproduced as Appendix 1. The survey was designed so that it could be undertaken with a minimum of training and required no additional equipment apart from a slate and measuring device (often combined). The survey was designed to be undertaken by divers on an individual basis as well as on specifically targeted survey dives.
- 2.09 The project was publicised to a number of different potential audiences. Divers were reached by short articles in the diving press as well as a longer article in Marine Conservation<sup>(3)</sup> and on the MCS website<sup>(4)</sup>. Local recorders in Cornwall were reached by an article in the newsletter of the Environmental Records Centre for Cornwall and the Isles of Scilly<sup>(5)</sup>. The academic community was addressed through a presentation to the Coelenterate Group annual meeting in Bangor in March 2002.
- 2.10 In practice the great majority of records came from specifically targeted dives, especially during 2002. On a number of these the methodology was amended so that some divers concentrated on recording a limited number of sea fans in detail whilst others searched a much larger number of fans for the presence of *Amphianthus dohrnii*.

## Plate One – facing page

Top left	A white sea fan colony (Guilleaumesse, Sark).
Top right	A small sea fan amongst a dense mixed population (The Manacles).
Mid left	A group of sea fans with a number in poor condition and fouled by hydroid turf (Elk Reef, Plymouth).
Mid right	A densely branched sea fan colony (Gammon Head, Salcombe)
Bottom left	A single <i>Amphianthus dohrnii</i> in close up (Woodford's Wall, The Manacles).
Bottom right	A group of <i>Amphianthus dohrnii</i> on a single fan (Hilsea Point Rock. South Devon).

### 3.0 General Findings

3.01 During the survey a total of 1,007 sea fans were fully recorded with all of the information required on the record card. A further 2,867 were checked for the presence of *Amphianthus dohrnii*. The records came from 8 main areas – Pembrokeshire, Lundy, Lands End, The Manacles, Plymouth, Lyme Bay, Purbeck and The Channel Islands but there were a small number of records from intervening areas such as North Cornwall, Isles of Scilly and Salcombe. In addition to the sites at which sea fans were found and recorded, a number of other sites were visited where they might have been present but proved not to be.

3.02 The findings in this chapter relate to all of the records whilst Chapter 5 deals with records from individual areas.

#### a. Distribution

3.03 The Pink sea fan is distributed around south and west coasts of the British Isles. Manuel<sup>(6)</sup> states that its present eastward limits are unknown though older records suggest that it occurred in the English Channel almost as far as the Thames Estuary. More recent information on distribution comes from the Marine Nature Conservation Review<sup>(8)</sup> and the BioMar/Ulster Museum study of Ireland<sup>(9)</sup>. The distribution obtained from these sources is shown in Figure 1.

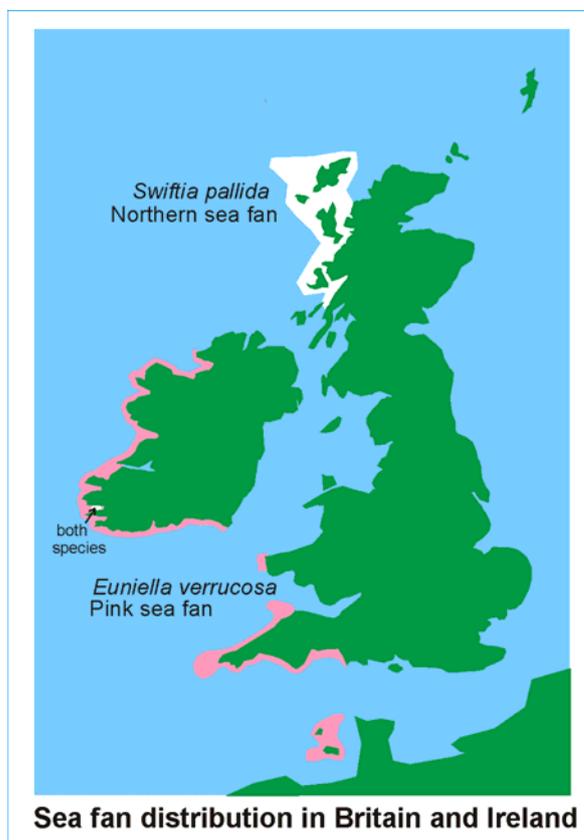


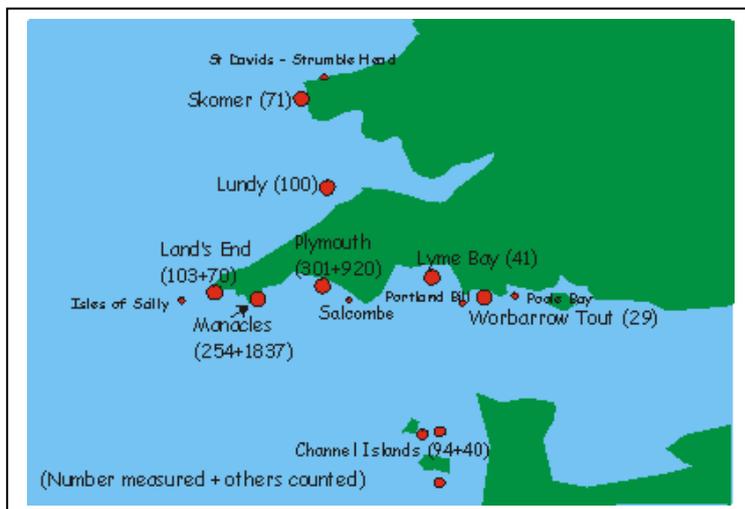
Figure 1.

3.04 No surveys were carried out in Ireland or of the Northern sea fan, *Swiftia pallida*. However pink sea fans were recorded at three sites on the St David's Peninsular just south of Strumble Head which are to the north of the most northerly MNCR record by some 15km. It seems unlikely that there would be suitable habitats north of Fishguard due to the relatively shallow and sandy nature of Cardigan Bay.

3.05 There was one unconfirmed sighting of a single pink sea fan in Anglesey in 2001. Despite a dedicated search in the same location in 2002 we were unable to confirm this record. Whilst the habitat appeared suitable this would have been a long way from

the nearest previous records.

- 3.06 At the easterly extent of the range in the English Channel our records confirm that sea fans extend considerably east of the generally accepted limit of Portland Bill. A significant population has been recorded near Worbarrow Tout on the Isle of Purbeck and 20km to the east of Portland Bill, whilst a single specimen was seen as far east as Poole Bay, a further 30km to the east, or 50km east of Portland Bill.
- 3.07 In the case of the Pembrokeshire and Poole Bay specimens these were individual large colonies which must have been established for some years. There was no evidence of new recruitment of small colonies. On the other hand the range of sizes of the Worbarrow colonies suggest that this is a well distributed population with both older and younger colonies present.



3.08 Figure 2 shows the location of the records made. Large circles denote significant numbers of sea fan records and the number measured is shown in brackets, together with the number of additional fans searched for *Amphianthus dohrnii* where appropriate.

Figure 2. Location of survey records

## b. Depth range

- 3.09 The expected depth range of *Eunicella verrucosa*, is given by Manuel (1981) as from 10m to 200m. It is beyond the scope of a volunteer diving survey to obtain records from depths of more than 35m and thus we cannot shed any light on the occurrence of populations in deeper water.
- 3.10 The great majority of the records are from depths greater than 10m as expected. However sea fans were recorded from depths less than 10m below chart datum for a number of areas. In Pembrokeshire, at Skomer North Wall, fans were found as shallow as 7.8m and at Penlee Point near Plymouth a single specimen was found at 8.2m. However, the two main areas for shallow sea fans were at Plymouth and in the Channel Islands.
- 3.11 At Plymouth there is a significant population of over 80 sea fans attached to the stone walls of a fort inside the Plymouth Breakwater, and surrounding debris and rocks. These fans are between 3.7m and 7.9m below chart datum. The reason for their presence is unclear but they are

clearly well established and appear to be a thriving population. The site is extremely sheltered and thus sea fans would be unlikely to be damaged by rough weather. However it is not in a significant tidal stream though the fans lie between the fort and the breakwater itself where any small water current is accentuated.

- 3.12 In the Channel Islands, at the Sauvage Reef south of Jersey, sea fans were found as shallow as 3.5m below chart datum. 14 fans were measured in depths less than 10m but the actual depth at the time of survey was in excess of 10m in every case. There is a tidal range of up to 14m in this area and thus actual depth will be greatly in excess of chart datum depth for most of the time.

**c. Habitat**

- 3.13 Sea fans are always found attached to stable structures, normally bedrock, but also metal wreckage or, in the case of Plymouth Breakwater Fort, stonework.

- 3.14 As filter feeders, sea fans are commonly found in areas with some water currents. The fan is usually oriented across any current in order to ensure a good supply of nutrients to each polyp, but in areas where water movement varies in direction they may have a more bushy growth form. Sea fans are reasonably flexible and can stand gentle currents. They would not survive in areas of violent surges or wave action. It is significant, for instance, that they are both less common and generally smaller in size on the Lands End peninsular, which is a relatively exposed location with deep wave surges; than they are at The Manacles on The Lizard peninsular which lies on an easterly facing coast and thus suffers relatively little storm movement. We have not recorded sea fans on the much more exposed westerly coast of The Lizard.

- 3.15 In many cases it is clear from the location of individual colonies that they are in areas where current may be enhanced by rock formations. However the densest colonies are found in areas of flat open bedrock where the prevailing current will not be affected by micro-habitats. In terms of recorded currents The Manacles reaches 1.7knots on springs and Worbarrow is similar (1.6kt). The rich sites south of Plymouth at The Drop Off and in Bigbury Bay (wreck of The Persier) both have currents which do not exceed 1knot.

- 3.16 Sea fans were recorded on vertical walls, steep slopes, in gullies, and on flat open bedrock. The denser beds of sea fans normally occur on deeper open bedrock on wreckage, often below 25m.

**d. Abundance**

- 3.17 Abundance at any one site appears to be dictated by habitat, depth and geographical location. The densest beds of sea fans, with densities as high as 25 colonies per square metre were all recorded from deeper habitats

and on largely horizontal bedrock or metal wreckage. Dense sites included the flat open seabed below The Voices on The Manacles and on Pencra Reef nearby (Plate 3), the Drop Off south of Plymouth and the wreck of The Persier in Bigbury Bay. All of these sites were at least 20m below chart datum.

- 3.18 At other sites in the same areas where sea fans were found on vertical or sloping surfaces at the same depth, the densities were much lower.
- 3.19 There were other sites with similar depths and habitat where densities were lower. These include the wreck of The Lincoln near Lands End where up to 8 colonies per square metre were recorded. Whilst this is lower than at other similar sites it was the highest density of sea fans in the Lands End Area. A similar density at similar depths occurred on two of the sites in Lyme Bay, whereas the open bedrock in sites of Worbarrow Tout only reached 2 colonies per square metre. This suggests that higher densities do not occur at the extremes of the distribution.
- 3.20 Densities at the northern extent of distribution, in Pembrokeshire, were uniformly low.
- 3.21 In the Channel Islands we did not discover any deep open bedrock sites. The densities recorded were quite low, but not unusually so for the depths and habitats concerned.

e. **Size**

- 3.22 There are significant differences in the maximum size attained by pink sea fans in different areas. These are shown in Figure 3. The maximum sizes fall into three groups. Fans in the Purbeck and Lands End areas are the smallest, not exceeding 30cm in either width or height. Most of the areas are in the middle group, with a maximum size of up to about 50cm wide and high. The Channel Islands have the largest sea fans with a maximum size of 100cm wide and 75cm high.

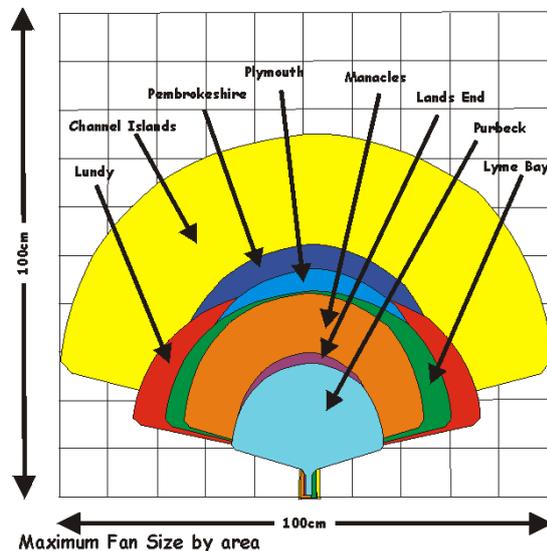


Figure 3

- 3.23 The average size of fans in a population takes into account the whole size range. For the purposes of this study we did not measure fans that were less than 10cm in both height and width. Thus a high average size may well reflect a lack of younger colonies in the population. The best example of this can be seen by comparing the Pembrokeshire and Channel Islands populations. In terms of maximum size Channel Island fans easily exceed

those in Pembrokeshire, however, the average size of the Pembrokeshire population is a little higher than that in the Channel Islands. This is because there appear to be very few small sea fan colonies in Pembrokeshire.

3.24 The other conclusion that can be drawn from a comparison of the two diagrams (Figures 3 & 4) is that the largest sea fans in a population tend to be broader than they are high, whereas the average fan is higher than it is broad. Young sea fans tend to grow as a single stalk until they are about 10-12cm tall and then begin to branch. Small colonies are therefore significantly taller than they are wide. As the colony gets larger and more profusely branched the proportions gradually change so that the largest fans in a population are broader than they are high.

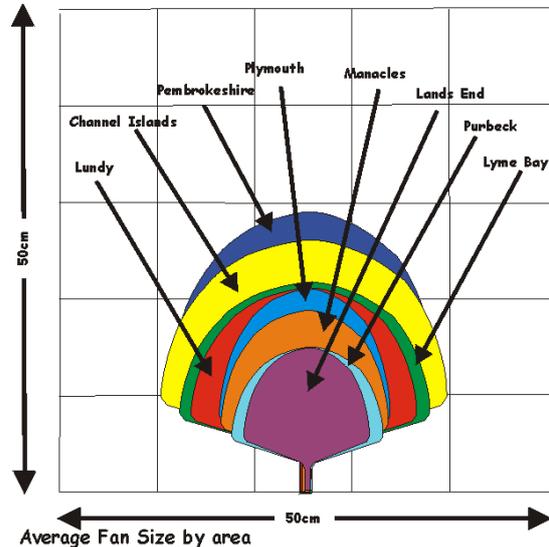


Figure 4

**f. Condition**

3.25 Each fan was assessed on a 1-5 scale in which 5 was a complete fan without dead or damaged branches and without obvious gaps in its overall form, whereas 1 represented a virtually completely broken or dead fan with the intervening scores representing partially damaged colonies. In the rare circumstances where there was a standing dead fan this was recorded as D (or 0 in terms of mathematical calculations). There is an element of subjectivity in this methodology but this should be minimised by the relatively large numbers of fans recorded in each area and the fact that many of the observers carried out recording in a number of different areas.

3.26 The results of this part of the survey are very clear cut. In all areas except Lundy the fans are in good condition with an average score in excess of 4. It should be noted that this survey only records fans which are in situ.

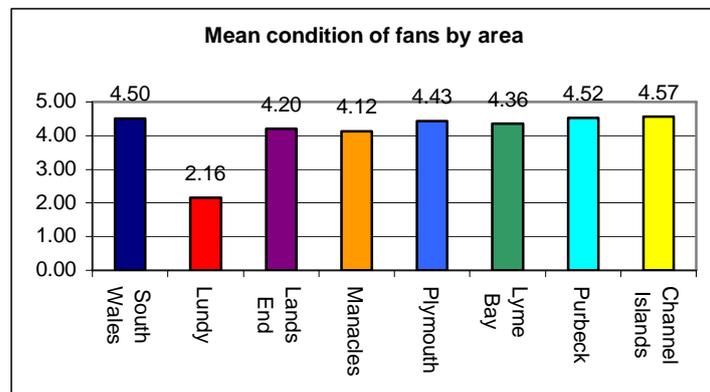


Figure 5

It cannot record fans which have been broken off and dispersed whether as a result of storm damage or physical damage from fishing gear or diver's fins. It should not therefore be assumed that the high average condition of the living fans means that the population is not under pressure, though it does suggest that in all of the areas with a high score for condition that the prevailing conditions in terms of water quality, nutrients and lack of siltation are suitable for sea fans to thrive.

- 3.27 In the case of Lundy a very different picture emerges. With an average score for condition of a little over 2 out of 5 the Lundy population is clearly under significant threat. This is clearly not a physical threat as such as the colonies remain attached and partially living. It seems rather to be a loss of living tissue, which is most likely to have resulted from changes in water quality. This is considered in more detail in Chapter 5.

#### **g. Colour**

- 3.28 Whilst *Eunicella verrucosa* has the common name of Pink sea fan it has been known for many years that not all colonies are pink in colour. Manuel<sup>(6)</sup> states that specimens from the English Channel are almost invariably pink whereas in many west coast localities both pink and white forms occur. Mediterranean examples are always white. Our records confirm that English Channel specimens are almost invariably pink. Of the 3,692 fans recorded on both sides of the English Channel only 8 (0.02%) were white in colour (Plate 1). Our west coast records from Lundy and Pembrokeshire included no white specimens at all though a white specimen was reported from Lundy during a Seasearch survey in 2002.

- 3.29 White specimens appear to be completely healthy and, since they are mixed with much larger numbers of pink specimens the colour is clearly not environmentally determined. It is not surprising that the whole as opposed to part of colonies should be white since growth of individual colonies is by asexual reproduction. We assume that the colour is genetically determined though we have not carried out any long term studies of white fans to confirm that their colour is a permanent feature.

- 3.30 Whilst the pure white colonies are easy to distinguish, the more subtle colour differences between pink and buff (yellow-brown) ones are more open to individual interpretation. What does seem to be clear is that degenerating colonies lose their pink colouration and become buff in colour. This is due largely to the loss of living tissue. The records from Lundy show that only 17% of colonies there were pink, the remainder being either buff or dead. Elsewhere about 90% of colonies were pink in colour.

#### **h. Associated species**

- 3.31 Species associated with Pink sea fans fall into four headings
- Drift organisms which become attached to sea fans (algae),

- Opportunistic organisms which grow on dead branches (hydroids, bryozoans, sponges, soft corals, barnacles, sea squirts),
- Species which feed or live on sea fans (nudibranchs, sea fan anemones, false cowrie, featherstars),
- Egg cases which are deliberately attached to sea fans (dogfishes).

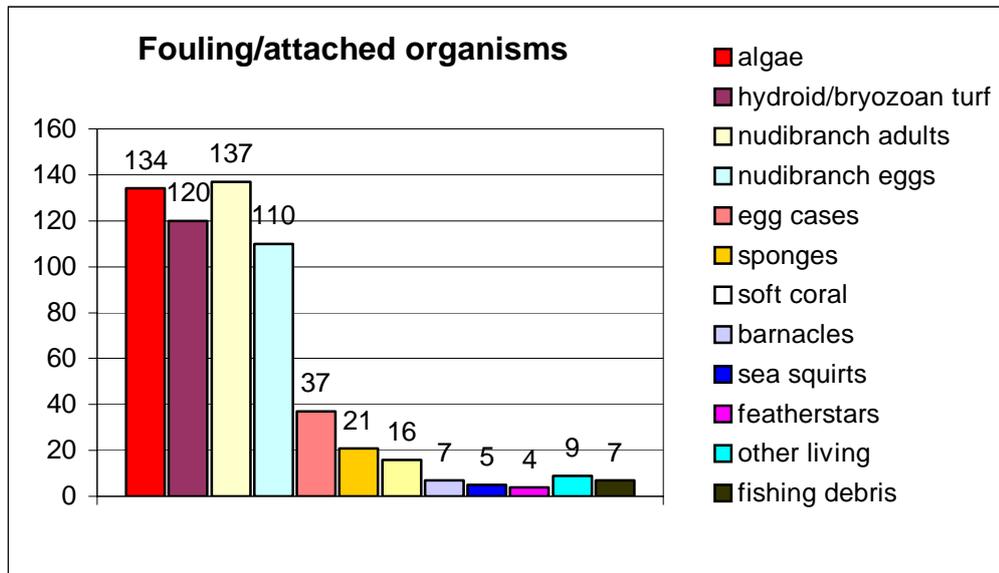


Figure 6

### i. Fouling by drift algae

3.32 Figure 6 above shows attached and fouling organisms found on the 1,007 sea fans which were recorded and measured and does not include the additional fans searched for *Amphianthus dohrnii*. The second largest category, with 134 fans affected, was drift algae – 13%. The percentage of sea fans with drift algae varied from 0% in Lyme Bay to 29% in Lundy. In Lundy there was a distinct difference between the western and eastern sides of the island. On the east side, where the sea fans grow amongst a rich algal turf, the percentage was as high as 53%.

3.33 It is to be expected that algal fouling will vary during the year and in relation to weather conditions and not too much should be drawn from these findings. However, in Lundy there is a strong correlation between drift algal fouling and poor sea fan condition which may be related.

### ii. Opportunistic growths

3.34 When parts of a colony die the bare branches become rapidly colonised by other animals, primarily because of the higher nutrient levels which can be obtained from an elevated position above the surrounding rock faces. The most common growth is a mixed small bryozoan and hydroid turf which becomes rapidly clogged with detritus creating an unidentifiable silty mass which commonly spreads between branches. It is unlikely that this leads to

further mortality of polyps within the colony, but it will certainly prevent the re-growth which might otherwise have occurred (Plate 2).

- 3.35 This 'turf' was recorded on 120 of the 1,007 fans – 12%. However this figure masks some striking differences from area to area. By far the highest incidence of hydroid/bryozoan turf was on Lundy where 45% of fans were covered in it to a greater or lesser extent. There is a strong correlation between this high figure and the poor condition of the Lundy fans in general. Elsewhere the incidence ranged from 3% (Purbeck) to 15% (Pembrokeshire).
- 3.36 Other growths on dead branches were sponges (37 – 4%), soft coral – usually *Alcyonium digitatum* (16 – 2%), barnacles and sea squirts. Sponges and soft corals are relatively slow growing animals which must have been established on the branches for a considerable time. Barnacles and sea squirts may have been much more recently established. The presence of long lived animals suggests that dead sea fan branches maintain their integrity and provide a stable surface for attachment for a considerable period.

### iii Sea fan anemone (Plate 1)

- 3.37 The sea fan anemone, *Amphianthus dohrnii*, is believed to have an obligatory relationship with sea fans, both Pink and Northern varieties, and occasionally with other erect animal structures such as the larger and firmer hydroids. The anemone is believed by Manuel<sup>(6)</sup> to reproduce largely by basal laceration leading to large aggregations of closely packed individuals. The species is believed to have become rare in recent years with very few records made. It is the subject of its own Species Action Plan<sup>(1)</sup> and specific attempts were made to record its presence by looking at many more fans for it without making full records of each one. Thus a total of 3,874 sea fans were checked for the presence of the anemone.
- 3.38 Our records confirm the rarity of this species. A total of 29 sea fans were found on which they were present, representing only 0.07% of the fans counted. Sea fan anemones were found only in three areas; Lands End, The Manacles and Plymouth, but were extremely rare at Lands End (1 anemone out of 173 – 0.6% ) and Plymouth (2 anemones out of 1,222 – 0.2%). At The Manacles they were recorded on 26 fans at three different sites – Woodfords Wall (1), Pen-Win (16) and Pencra Reef (9). However this only represents 1.2% of the 2,091 fans searched for them. No sea fan anemones were recorded at all from Pembrokeshire, Lundy, Lyme Bay, Purbeck or the Channel Islands.
- 3.39 In the majority of cases where sea fan anemones were present there was only one anemone per fan (16 of 29 – 55%). However up to 11 anemones per fan were recorded which confirms the ability of these anemones to aggregate as a result of basal laceration (Plate 1). The fact that a significant number of anemones were single also suggests that basal laceration is not the only method of reproduction and that sexual

reproduction must also occur. The fact that there appeared to be no clustering of fans with anemones present suggests that there is a larval dispersion of some sort and that the larvae are not very short lived.

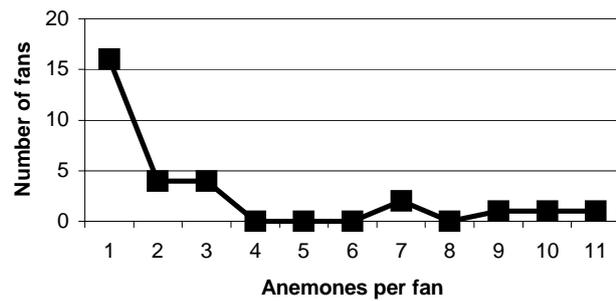


Figure 7. Number of *Amphianthus* on sea fans

- 3.40 The longevity of the anemones cannot be ascertained from our results as the records were generally one off and have not been repeated. However one of the stimuli for this study came from observations and photographs of sea fan anemones made by the author from Hilsea Point Rock in 1999 (Plate 1). Although the individual fans where anemones were present were not recorded the general location is very specific, at the end of a long rock gully, and none of the sea fans in that area had any anemones present either in 2000 or 2001. It may therefore be that individual anemones have a short life cycle.

#### iv. Sea fan nudibranch (Plate 2)

- 3.41 The sea fan nudibranch, *Tritonia nilsodhneri*, is a well-known associate of sea fans and is likely to have an obligatory association with them. The nudibranch is a remarkable mimic of the Pink sea fan both in colour and in body form, and has pairs of gills along the back which mimic the feeding polyps of the sea fan. They can be most easily identified by the distinctive egg spiral, which is laid around a branch of the fan (Plate 2). The nudibranch feeds on sea fan polyps and thus does have some impact on the health of its host fan. However polyps are regenerated by the fan and no long term damage appears to be done to the colony as a whole from the presence of this parasitic creature.
- 3.42 During the survey the presence of adult nudibranchs and their egg spirals were recorded separately. Figure 6 shows that both were commonly recorded with adults on 137 of the 1,007 fans searched for them (14%) and egg spirals on 110 fans (11%). 175 fans (17%) had one or other present.
- 3.43 The geographic distribution of the sea fan nudibranchs is uneven. They were most common in Devon and Cornwall, with The Manacles having the highest density of 26%. Lundy and Plymouth had 20% and Lands End 11%. The Channel Islands has a similar density of 15%. However no nudibranchs at all were observed in Pembrokeshire and they were rare in Lyme Bay (5%) and Purbeck (6%).
- 3.44 The nudibranch has been assumed to remain on a single sea fan and not to move between colonies. However we observed two individuals on The

Manacles, in an area of dense sea fan cover, moving across the sea bed between fans. It is not clear what would have stimulated them to do so but it does mean that nudibranchs can move between hosts if required to do so.

v. ***Simnia patula*** (Plate 2)

- 3.45 *Simnia patula* is a gastropod mollusc in the family Ovulidae, which is closely related to the cowries. The group are known either as egg shells or false cowries. Most species occur in the Indo-Pacific and many are known to live in close association with colonial animals such as soft corals, sea fans and sponges. *Simnia patula* is the only representative of the family in British waters and is commonly associated with Dead men's fingers, *Alyconium digitatum* (a soft coral), in south-west England. The shells are predominantly white in colour with yellow lines on the mantle, and are very well disguised on the white bodies of Dead men's finger colonies. Like the sea fan nudibranch, the egg masses of *Simnia* are much more obvious than the adults, forming dark disks.
- 3.46 Only two sea fans were found with *Simnia* present, in each case the adult, and no egg masses were observed. The two fans were at Lundy and Logans Rock, near Lands End (Plate 2). In both cases the molluscs were on healthy fans and it can be assumed that the small numbers of *Simnia* which predate sea fans, like the nudibranchs, do not cause any significant damage to colonies.

vi. **Featherstars**

- 3.47 Four sea fans in the Lands End areas were seen with featherstars attached. It is presumed that they were taking advantage of the greater access to passing nutrients rather than feeding on the sea fan itself. As mobile animals they are unlikely to do any damage to the colonies.

vii. **Egg cases**

- 3.48 The egg cases of dogfish, commonly known as mermaids purses, were found attached to 37 sea fans (4%). The egg cases are attached by tendrils at the corners, which are wrapped around suitable objects by the mother after laying. Sea fan colonies with egg cases attached are frequently distorted by the tightness of the tendrils and individual branches may be closely bunched together (Plate 2). Since the dogfish eggs take from 5-11 months to hatch their presence is at least likely to inhibit growth during the period they are attached, and there may well be damage to individual polyps as a result of the lack of room to expand and feed. Of all of the animals which live on or become attached to live sea fans these are likely to have the greatest effect. However, once the discarded egg case has decomposed and dropped off it is likely that the colony will recover, unless it is quickly colonised by hydroids and bryozoans, or clogged by drift algae.

## 4.0 Human Impacts and current protection for sea fans

### Human Impacts

- 4.01 Very little evidence of direct human impacts on sea fans was observed during the survey. A small number of living but broken off fans were seen, but the reason could not be deduced. Only 7 fans were seen with human debris attached – fishing line (4), fishing net (1), rope (1) and a piece of hessian sacking (1).
- 4.02 Despite this small number of records it should not be assumed that direct human impacts are not occurring. In the majority of cases where fishing gear or careless divers impact on sea fans the whole colony would become quickly detached and would rapidly die and decompose. Our survey would not pick up such damage unless it had occurred very recently before the observations were made.
- 4.03 One dive undertaken by the author in Lyme Bay in August 2000, prior to this survey, recorded significant numbers of broken fans, many with fishing line tangled around them. There was also a part of the site with no sea fans and relatively little attached life, which was assumed to be the result of scallop dredging.
- 4.04 Lyme Bay has been the subject of an initiative by the Devon Wildlife Trust<sup>(9)</sup>, which has led to the identification of the most at-risk populations and the protection of 2 areas, covering around 5 square miles, by voluntary agreement. A survey was undertaken by the Trust into the effects of scallop dredging on boulder reef habitats. The results showed that habitat cover, structure, species abundance and diversity decrease on boulder reef habitat with increasing scallop dredging effort<sup>(9)</sup>. Little regeneration of any species was seen during a re-survey 12 months later. A detailed monitoring programme has been established inside the closed areas, based on measuring key indicator species in random quadrats in control and closed areas. The results will be annually reviewed by the Lyme Bay Partnership. The Pink sea fan is one of the indicator species.
- 4.05 The continuing problems of the sea fan population in the Lyme Bay area were highlighted by a report and photographs received in March 2002 from Chesil Beach, Dorset (which faces Lyme Bay). Here Steve Trewhella found 81 sea fans washed up on a half-mile stretch of beach, many of which were entangled in monofilament nets. Some of these are shown in Plate 3 (facing page 34).
- 4.06 We are not aware of any other areas where the fishing pressure around known sea fan sites is as significant as in Lyme Bay. Populations around Skomer and Lundy are protected from most fishing impacts by their Marine Nature Reserve status. Other areas such as The Manacles and sites off Plymouth do not receive such protection but are not in areas traditionally dredged for scallops to the same extent.

- 4.07 Diver damage has been considered significant in the past but our survey provides no evidence of this. Divers should continue to be educated to avoid damage to marine life and, as sea fans are potentially easily damaged, they should be a focus for such training.

## Protection for sea fans

### Marine Nature Reserves

- 4.08 Sea fans are present in two of the three Marine Nature Reserves in the UK, Lundy and Skomer. This should ensure that the populations are at little risk from physical damage by fishing gear and that their health is regularly monitored
- 4.09 The Skomer population has been identified for a considerable length of time and there is a regular monitoring programme carried out by Countryside Council for Wales staff based in the reserve. The population appears to be in good condition though it is surprising, and of concern, that there are very few small colonies. This suggests that effective reproduction in South Wales is taking place largely asexually, and thus that new colonies are not being formed. In the long term this would be an unsustainable situation.
- 4.10 Paradoxically, in view of its Marine Nature Reserve status, Lundy is the area where sea fans appear to be most in decline. There are healthy populations both to the north in Pembrokeshire and to the south around Lands End and thus the cause of decline must be relatively local in nature. Other species, such as the Sunset coral, *Leptopsammia pruvoti* may also be in decline in the same area. Identifying the cause of decline and determining the action to be taken should be a priority for the monitoring undertaken by English Nature in the Marine Nature Reserve. We understand that the amount of monitoring in recent years has been limited. The Marine Conservation Survey has carried out some work using volunteer divers, and our records come largely from that source. They suggest that urgent research and action is required and that a regular monitoring programme should be initiated

### Special Areas of Conservation (SACs)

- 4.11 Habitats and species of conservation importance listed in the Habitats Directive have been identified by the Nature Conservation Agencies. Reefs are one of the marine habitats listed in the Directive, though the Pink sea fan is not amongst the listed species. Information on the current state and areas included within SAC designations is taken from the Joint Nature Conservation Committee website<sup>(10)</sup>.
- 4.12 The Pembrokeshire Marine SAC includes Skomer Island and a significant area of the Pembrokeshire coastline. The northerly limit is at Abereiddi on the St Davids Peninsular and thus includes the sea fan sites previously

identified in the MNCR. However the new sites we have identified in this survey are not within the SAC and thus do not receive protection in this way. Since these are probably the most northerly occurrences in England and Wales, this omission, though understandable in the light of knowledge at the time, is regrettable. Reefs are listed as a primary reason for the designation of the SAC and, whilst there is no specific reference to sea fans, the text refers to “the wide range and abundance of invertebrate animal communities, with ..... soft corals and anemone species.”

- 4.13 The Lundy SAC includes all of the sea fan sites around the island and the Pink sea fan is listed as one of the species that are the primary reason for its designation. Regular monitoring is one of the requirements of SAC designation and, as stated above the need for this is nowhere more apparent than at Lundy.
- 4.14 The Scilly Isles SAC lists sea fans as a primary reason for selection. We do not have sufficient records from the Scilly Isles in this survey to draw any conclusions about the populations there.
- 4.15 The sea fan populations we have observed around Lands End and the Lizard are outside SAC areas with one exception. The Fal and Helford SAC lists reefs as a qualifying feature for selection of the area as a SAC but not as a primary reason for it. Sea fans are not listed as one of the defining species. However the SAC boundary extends to Porthoustock and thus the Pencra Reef populations are just within the boundary though the sea fans on The Manacles are not.
- 4.16 The Pencra reef populations are a good example of a dense sea fan ‘forest’ and match the highest densities of sea fans found anywhere in our studies. Whilst they are just within the Fal and Helford SAC their importance ought to be recognised and they should be included in monitoring programmes. However they do not sit well within the primary reasons for the designation of this area and would be better recognised and protected in a SAC that included Pencra Reef and The Manacles and had the biodiversity of its reefs as a primary reason for designation. This is also the area with the highest level of occurrence of *Amphianthus dohrnii*, which appears to be a very rare species indeed. We hope that Seasearch results from The Manacles will provide broader information about the high biodiversity of this area which, deservedly, is highly regarded for its marine life by British divers.
- 4.17 The Plymouth Sound and Estuaries SAC specifies sea fans in the approaches to Plymouth amongst the primary reasons for selection of the area. However the southern boundary of the SAC does not extend sufficiently far south to include the rich populations on The Drop Off, as it is formed by a straight line between Rame Head and Yealm Head and this site is south of that line. In view of the fact that it was clearly the intention to include these populations we suggest this boundary be reviewed and extended.

- 4.18 The offshore sea fan sites at Hand Deepes, The Eddystone and the dense sea fan 'forest' on The Persier are all outside SAC designated areas. There is at present no appropriate legislation to protect isolated sites such as these. The Persier populations are particularly at risk from fishing gear damage though thankfully there is no evidence of this having occurred.
- 4.19 The Lyme Bay sea fan populations are not protected by SAC designation.
- 4.20 The Worbarrow sea fan populations are adjacent to, but not within an SAC, the Isle of Portland to Studland Cliffs SAC. This SAC includes coastal cliffs but does not have any marine habitats within it. It is unfortunate that the most easterly significant populations of sea fans are not protected by inclusion in a SAC and we recommend that English Nature consider extension of the existing coastal SAC to include at least these sites. In view of the work carried out within the Kimmeridge VMCR further evidence of the desirability of the inclusion of reef habitats in this SAC may well exist.

### **Voluntary Marine Nature Reserves.**

- 4.21 The Worbarrow sea fan populations are within the Kimmeridge VMCR and we understand that detailed survey and monitoring work is to be carried out during 2003. Whilst VMCR status does not confer legal protection it is an important focus for education and information provision. In the case of the Kimmeridge VMCR it has been proactively managed by the Dorset Wildlife Trust for some years.
- 4.22 The sea fans at Bawden Rocks in North Cornwall are within the St Agnes VMCR.

#### **Plate 2 – facing page**

- |              |  |
|--------------|--|
| Top left     | A standing dead sea fan colony covered with silty animal 'turf' (Wreck of Bay Gitano, Lyme Bay).   |
| Top right    | A healthy sea fan colony with one dead branch covered in silty animal 'turf' (The Nubb, Lyme Bay). |
| Mid left     | A 'mermaids purse' dogfish egg case wrapped around a sea fan colony (Gammon Head, Salcombe).       |
| Mid right    | Purse sponges and silt on sea fan (near wreck of Poulmic, Plymouth).                               |
| Bottom left  | <i>Simnia patula</i> on sea fan (Logan's Rock, Lands End).   |
| Bottom mid   | <i>Tritonia nilsodhneri</i> on sea fan branch (Wreck of the Carmarthen, The Lizard).               |
| Bottom right | Egg spiral of <i>Tritonia nilsodhneri</i> (The Voices, Manacles).                                  |

## 4.0 Findings by Area

5.01 This chapter provides a summary of the records for each area and draws out their significance. The raw data from which the summary comes is in Appendix 1.

### i. North Wales and Pembrokeshire

5.02 Pink sea fans have previously been recorded from a small number of sites in Pembrokeshire<sup>(7)</sup>. Most of these are within the Skomer Marine Nature Reserve and are regularly monitored. Whilst it was important to provide information on these fans to compare them with fans in other locations, one of the main aims of the survey in Wales was to investigate sites at the limit of the known range.



Figure 8. Sea fan sites in Wales

5.03 No sea fans have been reported from North Wales in the past, the nearest records being in Pembrokeshire<sup>(7)</sup> and south east Eire<sup>(8)</sup>.

Seasearch studies in Anglesey in 2001 recorded a single fan from the Skerries at the north western tip of Anglesey however it was not photographed or confirmed by an experienced observer. A dedicated survey was carried out in the area in 2002 involving dives at four different sites within the area of the Seasearch record. Whilst the habitat appeared suitable for sea fans, none were recorded. Both sloping and horizontal rock faces were found. Predominant living cover was sponges, anemones and featherstars. Unfortunately further observations were curtailed by bad weather.

5.04 Sea fans were also searched for in Seasearch surveys in southern Llyn and Bardsey Island in 2002. Again suitable habitats are available, particularly on Bardsey, but no sea fans were recorded.

5.05 At present it appears that sea fans are absent from North Wales. However since they are well established on both sides of the Irish Sea to the south

and suitable habitats are available it would not be surprising if they became established in the future.

- 5.06 The most northerly MNCR record for pink sea fans is at Lech ganol near Abereidddy Bay north of St Davids<sup>(7)</sup>. There are no other records from the St David's Peninsular and we concentrated our studies on the northerly facing stretch of coast between St Davids Head and Strumble Head. Sea fans were found at 5 locations along this stretch of coast, 4 of which are to the north of the Lech ganol record. The locations of these and of the other sites searched along this stretch of coast, are shown in Figure 9 below.

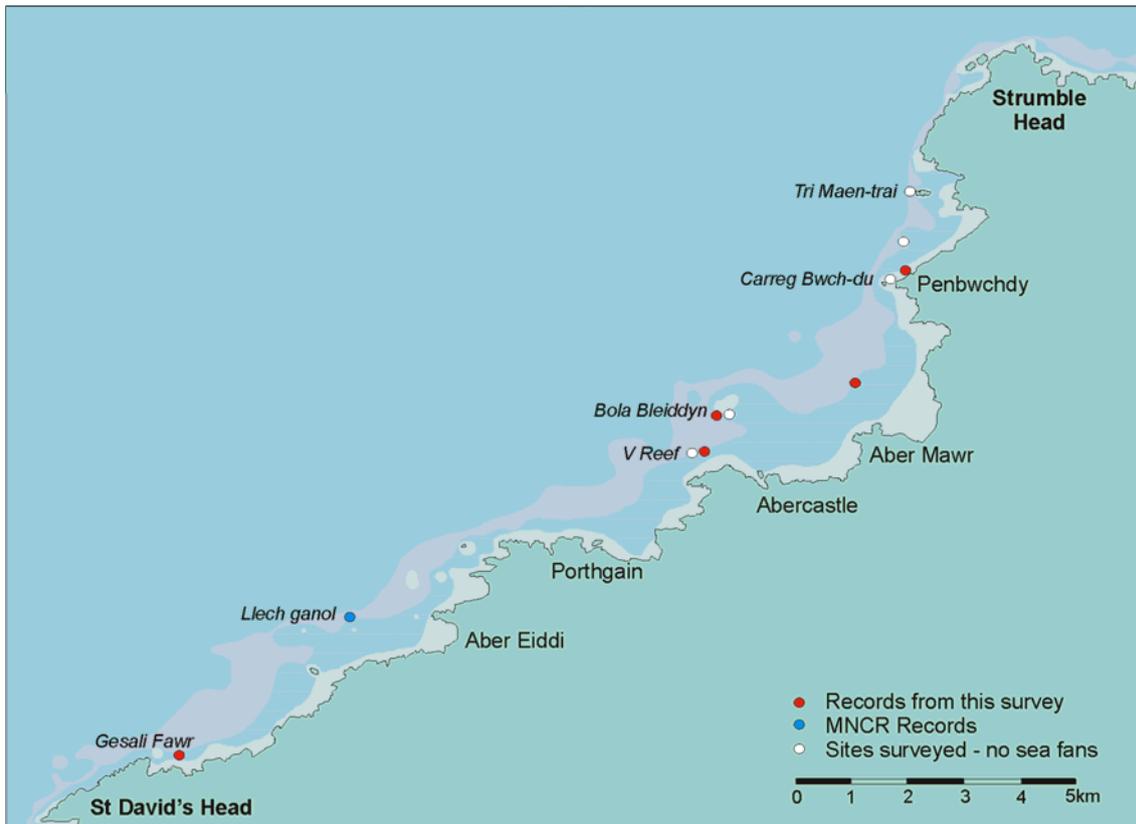


Figure 9. Sea fan sites in North Pembrokeshire

- 5.07 It is possible that sea fans extend beyond Strumble Head as far as Fishguard Bay but unlikely that they are found any further to the north-east as the seabed in Cardigan Bay is much more gently sloping and there are less likely to be any suitable rocky habitats. Any records in this area would be most likely to be found on wrecks, which provide a hard substratum for attachment in an area of largely soft seabeds.
- 5.08 In Southern Pembrokeshire there is a well recorded population on Skomer and MNCR<sup>(7)</sup> records from The Smalls, East of Martins Haven and SW of Long Point on the Dale Peninsular. Our records of the Skomer population come from the Marine Nature Reserve database, and from MCS Divers. In 2002 we investigated sites at Stack Rocks in St Brides Bay and sites around Skokholm Island. The only recorded sea fan was a single specimen from the south-east side of Skokholm island.

5.09 The density of sea fans in Pembrokeshire is generally low, with significant numbers found only around Skomer. Only two records, both from Skomer, recorded a density of 2 colonies per square metre. Elsewhere the density did not exceed 1 colony per square metre.

5.10 The most significant feature of the size distribution of sea fans in Pembrokeshire is the low number of small fans. No fans with either a height or width of less than 10cm were seen, which suggests that the population is not recruiting new colonies at a significant rate. The majority of colonies that occur are well established and thriving but the lack of small colonies may suggest a lower rate of larval distribution in Pembrokeshire than elsewhere. This would inhibit population growth and expansion and could affect the long-term stability of the populations.

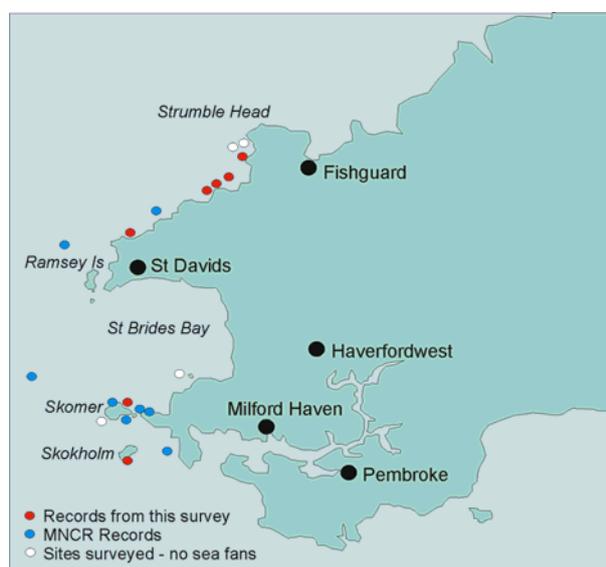


Figure 10. Sea fan sites in Pembrokeshire

5.11 Since the completion of the study we understand that Skomer MNR staff have identified two small colonies (5cm tall) there (K.Ramsay pers. comm.). Research has also been carried out by Reef Research<sup>(11)</sup> on the reproductive cycle of *Eunicella verrucosa* at Skomer for the Countryside Council for Wales. This shows that mature reproductive bodies are present in polyps in the summer and is consistent with their work in Lyme Bay.

5.12 The Pembrokeshire sea fans are generally in good condition with a mean rating of 4.5 out of 5.0. The incidence of attached organisms varied. Hydroid/bryozoan turf was 3% above the mean at 15% whilst drift algae was 2% below mean at 11%. The incidence of dogfish egg cases was 7% almost twice the mean figure of 4%. Sea fan anemones and sea fan nudibranchs appear to be absent from the area.

5.13 Only 2 of the fans had any obvious signs of human impact. Both were fouled by fishing line and were at Bola Reef off Abercastle.

#### j. Lundy

5.14 Lundy was the first Marine Nature Reserve to be declared and is well known for its mixture of southerly and more northerly species. It has quite different conditions on the westerly and easterly sides of the island. The

West Coast is exposed to Atlantic swells and weather whilst the East Coast is relatively sheltered.

5.15 Sea fans were recorded from 5 different sites, though these are not the only ones where they are present. 3 sites were on the exposed north and west coasts and 2 were on the relatively sheltered east coast. The locations are shown in Figure 11. A total of 100 fans were recorded.

5.16 The most significant feature of the Lundy sea fan population is its poor condition. The average condition of the fans was 2.16 which means that more than 50% of each fan, on average, was damaged. This was significantly the lowest condition rating of any area in the survey, the others all being between 4.1 and 4.6.

5.17 There is some differentiation between sites, but all are relatively poor compared to other areas as Figure 12 below shows:

5.18 It can be seen that Gull Rock on the east coast and Battery Point on the west coast have the populations in best condition, whilst the population of fans in the worst condition is at Brazen Ward, on the east coast.



Figure 11. Sea fan sites around Lundy

	% Dead or 1	Mean	% 5 (complete)
North Coast	36	2.39	0
Brazen Ward	54	1.50	0
Gull Rock	25	2.83	17
Dead Cow Point	38	2.16	6
Battery Point	22	2.89	6
Mean	37	2.16	5

Figure 12. Sea fan condition at sites around Lundy

5.19 Many of the fans in poor condition were fouled by a 'turf' of small hydroids and bushy bryozoans, often with silt amongst it. There were also a range of other animals such as Serpulid worms, barnacles, sponges, *Bugula* and *Pentapora* bryozoans and soft coral. Dogfish egg cases were relatively common and one fan had the false cowrie, *Simnia patula*, on it. A number of the fans were also fouled by drift algae, mostly *Dictyota*. The majority of these will have grown after the death or die back of the host fans, with the exception of the dogfish eggs and *Simnia*. The incidence of *Tritonia nilsodhneri* at 20% was average and it is notable that these occurred on the fans that were in better condition. The sea fan anemone was absent.

5.20 The cause of the decline in the population of sea fans in Lundy is not clear. Since it is equally poor on both sides of the island it is not likely to be related to storm conditions, and this is accentuated by the fact that many of the poor fans were still standing. For this reason, and because fishing activities are limited by the Marine Nature Reserve status, it can also be assumed that physical damage from fishing practices is not the cause. Since what appears to happen is a loss of living tissues on the branches of the fan, as well as polyp mortality, the most likely cause is a change in water quality or the availability of nutrients. This suggests that monitoring of the water quality around the island and further studies on the sea fans and other rare animals is a high priority. There is a wide range in size of fans, including some small colonies, which suggests that the mortality is recent and that a balanced population existed until relatively recently. It is a rather sad demonstration of the inadequacy of the Marine Nature Reserve concept as the change in water quality is almost certainly the results of actions much further away and could not be controlled by the limitations on damaging activities around the island itself.

5.21 A much higher proportion of sea fan colonies were recorded as having a buff colouration in Lundy compared to other sites. This is related to the poor condition of the fans since the loss of living tissue leaves the skeleton exposed, which is buff rather than pink in colour. No white fans were recorded during the survey but a photograph of a single healthy white fan was received in 2002.

**k. North Cornwall**

5.22 No records were made during the survey period from North Cornwall. There are records in the MNCR database from 6 sites between Trevoze Head and Boscastle. The opportunity has subsequently been taken by the author, whilst undertaking Seasearch surveys, to record the presence of sea fans at sites to the south of the MNCR records around Newquay and St Agnes. In this case the fans were not

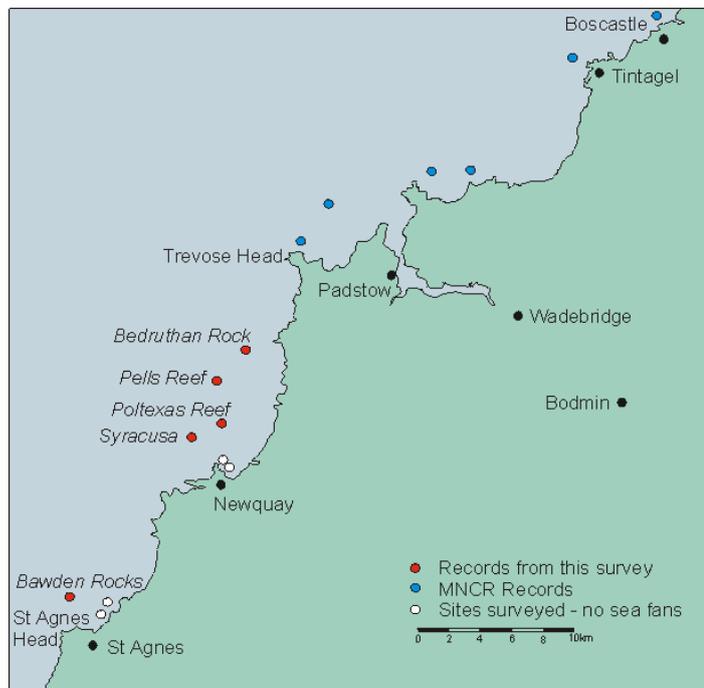


Figure 13. Sea fan sites in North Cornwall

measured or assessed for condition, but they were checked for the presence of *Tritonia nilsodhneri* and *Amphianthus dohrnii*.

- 5.23 Dives were undertaken at 9 sites, 3 at St Agnes and 6 at Newquay and sea fans were recorded from 5 sites, all of those with suitable habitat – the other 4 sites being somewhat shallow. The sea fans were not dense at any site but recorded as common at Bawden Rocks. *Tritonia nilsodhneri* were present, two adults on one fan. *Amphianthus dohrnii* was not seen.
- 5.24 The sea fans were generally in good condition with the exception of those at the deep Pells Reef, north of Newquay where they were notably in poor condition and heavily fouled with silty hydroid/bryozoan turf.

## I. Lands End

- 5.25 Sea fans were recorded from 3 sites on the south facing coastline between Lamorna Cove and Lands End. There are no MNCR<sup>(7)</sup> records from this stretch of coastline but there are likely to be many other locations

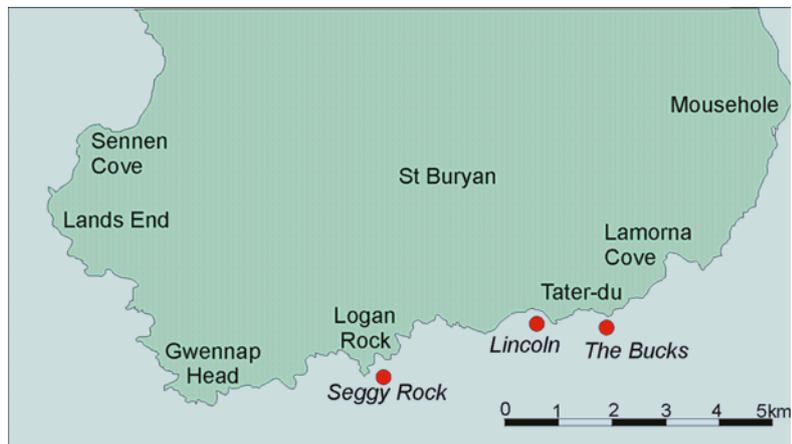


Figure 14. Sea fan sites around Lands End

in the area where sea fans can be found. Seggy Rock is just below Logan Rock and is exposed at most states of the tide. It is partially sheltered by the promontory of Logan Rock. The Lincoln is a broken up wreck on an open bedrock bottom, where the sea fans were observed, and The Bucks are two rocks off the point of Tater-du, which are exposed at low water. The records were from the seaward side of the Outer Buck Rock. Full details were taken of 103 fans, whilst a further 70 were checked for the presence of the sea fan anemone.

- 5.26 The two main features of the sea fans at these sites are their small size and the depth at which they are found. The tallest fans were 30cm high and the widest 27cm, whilst the mean height and width were 15.6cm and 12.2cm respectively. The only other area with such small fans is Lyme Bay. No fans were recorded shallower than 17m below chart datum, again a similar situation to Lyme Bay. In both cases the small size, and in the case of Lands End the depth of the shallowest sea fans is likely to be the result of the exposed conditions in these areas. Storm surge is likely to be experienced as deep as 20m in the Lands End area and this may inhibit the growth of larger and more delicate colonies. Suitable habitats were

available in shallower water both at Seggy Rock and The Bucks as both rocks reach the surface.

- 5.27 Notwithstanding the small mean size of the sea fans there is a wide range of sizes, including a number of small fans, which suggests a healthy population, capable of regenerating after storm damage.
- 5.28 The mean condition of the fans, 4.2, was slightly below average, but is not a cause for concern. Fouling by hydroid/bryozoan turf (10%) was below average and only small numbers of attached animals were observed. However these did include one anemone with a group of seven *Amphianthus dohrnii* on it at The Bucks, though other nearby fans did not show any sign of the anemones. The egg cowrie *Simnia patula* was also present on one fan at Logan Rock. The sea fan nudibranch was relatively uncommon being found on 11% of sea fans compared to a mean of 17% over the survey as a whole.

#### e. The Manacles

5.29 The Manacles is a well known site for sea fans. The site is unusual in that the seabed is relatively deep close inshore and rises steeply to a number of pinnacles, some of which just reach the surface. The site faces east and thus is sheltered from the prevailing south-westerly winds and does not experience the deep swells which many sites in the south-west peninsular do. The only other area with sea fan populations on an easterly facing coast is the east side of Lundy. However the sea bed close to the island is less deep and there are few horizontal bedrock surfaces.

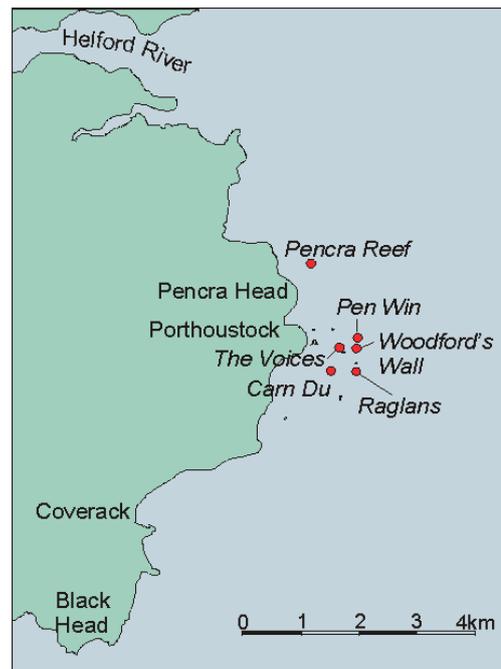


Figure 15. Sea fan sites at The Manacles

- 5.30 Five sites were surveyed on the main Manacles reef, four of which were on the sides and bases of rocky pinnacles. The fifth side, Carn Du, was shallower and away from the steep outer slopes of the reef. Pencra Reef is a different habitat consisting of a deep flattish reef with no steep sides or shallow rocks.
- 5.31 Sea fans were found both on horizontal bedrock surfaces and on the sloping sides of the pinnacles, however the highest densities were on deeper horizontal surfaces at Pencra Reef and below the Pen Win and Voices pinnacles. In these areas densities of between 10 and 25 colonies per square metre were recorded. The latter was the greatest density recorded during the survey.

- 5.32 The condition of the Manacles population is exactly average for the survey as a whole though it is slightly poorer than all of the other areas except Lundy. The incidence of hydroid/bryozoan turf is a little higher (13% compared with 12% overall). There were also significant numbers of fans which were fouled with algae (16.5% compared to 13% overall).
- 5.33 There is a good range of sizes in the population including a number of small specimens. This suggests a healthy population.
- 5.34 The Manacles are notable for the presence and number of sea fan nudibranchs, *Tritonia nilsodhneri*, and sea fan anemones, *Amphianthus dohrnii*. 26% of all the anemones had either *Tritonia* adults, eggs or both present and this was significantly the highest density of any area. A maximum of 6 egg masses and 3 adults was found on one fan.
- 5.35 A total of 2,091 fans were checked for the presence of *Amphianthus*, with 26 found with the anemones present. This represents 1.2% of the population which is the highest density recorded. The only other areas with these anemones present were Lands End (0.6%), and Plymouth (0.2%). Up to 11 individual anemones were found per fan, though 15 of the 26 fans only had a single anemone present. Whilst these anemones are known to reproduce by basal laceration the presence of significant numbers of single anemones suggests that sexual reproduction must also occur. There is no sign of clustering of anemones on adjacent fans which also suggests that the planktonic stage is not especially short.
- 5.36 The Manacles is the only site we have seen where the number of anemones would make a study of the population dynamics of this rare anemone a viable proposition.

#### **f. Plymouth**

- 5.37 The records in the Plymouth area come from 13 sites between Hand Deeps (south of Rame Head) in the west, to Gammon Head (east of Salcombe) in the east. The sites fall into 5 distinct categories and represent the widest range of habitats with sea fan populations anywhere in the study. The sites include
- offshore reefs (Hand Deeps, The Eddystone),
  - offshore wrecks (The Persier, Bigbury Bay),
  - deep flat rocky outcrops (The Drop Off, The Cattrans),
  - inshore rocky reefs (Penlee Point, Elk Reef, The Mewstone, Fairyland, Hilsea Point, Gammon Head) and
  - shallow artificial substratum (Breakwater Fort)

In some cases these are examples of sites in the areas where sea fans occur and there are known populations outside these sites e.g. wreck of the James Egan Layne in Whitsand Bay and East Rutts. 302 fans were fully recorded and measured and a further 920 checked for sea fan anemones.

5.38 The offshore reef sites, Hand Deeps and The Eddystone, are both sites where the reefs almost break surface and there are steep rocky walls on all sides to in excess of 30m. Sea fans are not found on the shallow slopes, the shallowest record being 15.5 bcd. The deepest record was from 32.5m bcd but this almost certainly reflects diving limitations rather than a true limit. The sea fans were found largely on deeper horizontal faces and at the base of vertical rock faces.

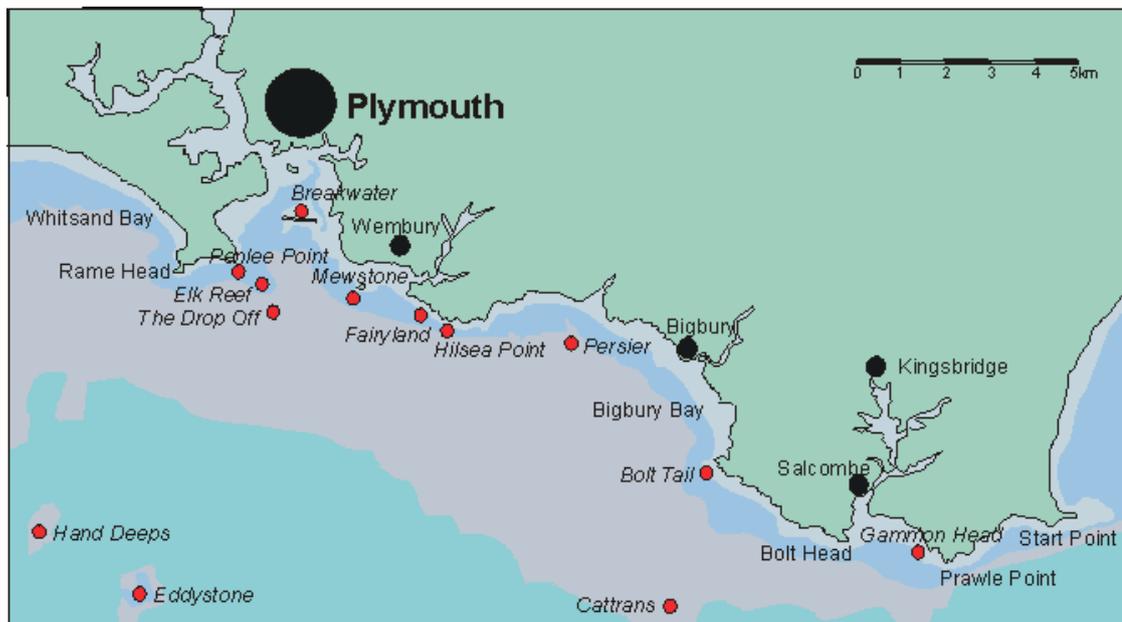


Figure 16. Sea fan sites in South Devon

5.39 All of the offshore deep flat rocky sites and the one offshore wreck, had high densities of sea fans, up to 25 colonies per square metre. Depths of these sites varied from 18m – 31m bcd. In all cases the habitat was a hard horizontal surface, either rock or wreckage. All three sites are exposed to south-westerly wind and swell but it must be assumed that they are below the depth of significant deep swells.

5.40 The colonies in these areas show a wide variety of sizes, including substantial numbers of small colonies and show every evidence of being in good condition. Because of the openness of the habitat they are clearly extremely vulnerable to damage by mobile fishing gear but the large size of some of the colonies and the density of the populations suggest that this is not a current problem.

5.41 The Wreck of The Persier is the wreck with the highest density of sea fans, matching the dense 'forests' of Pencra Reef and The Drop Off. Many wrecks have smaller numbers of sea fans, often in amongst metal structure where they gain some protection from deep swells. The Persier was sunk in 1945 and thus the sea fan population there is not more than 57 years old. The maximum size of the fans measured was 25cm wide by 30cm high and the variety of sizes is typical for the dense populations. The

author dived the wreck in 1974 and 1975 (30 years after its sinking) and found that “on the flatter plates were large numbers of gorgonians all in lines – the most I have seen anywhere” (personal logbook). Sea fans also occur on the reef immediately to the west and thus colonisation might have been relatively quick. However this shows that a dense sea fan population can be established in appropriate circumstances within a 30 year period. An artist’s impression of the wreck today is shown in Figure 17. Observations of other wrecks in deeper water in the Plymouth area have recorded similar densities of sea fans (B. Mason pers. Comm.). Examples are the Austral Bush (62m) and the Medoc (56m).



Figure 17. An artist’s impression of the wreck of The Persier showing the sea fans along the plates to one side

- 5.42 Subsequent studies in 2003 as a part of the Seasearch project have identified a site to about a mile to the east of the Persier where the sea fans are in a much poorer condition. MNCR records in 1996 <sup>(7)</sup> identified this site as being “important for the exceptional abundance of *Eunicella verrucosa*”. At this site the current condition of the sea fans is similar to that recorded from Lundy and, in view of the good condition of the fans on the Persier (confirmed by the author at the same time as the Seasearch observations above) it may be that very local influences can affect sea fan populations.
- 5.43 The sea fans on the reefs closer inshore are generally in shallower water (minimum 8.2m bcd, Penlee Point – maximum 22m bcd, Hilsea Point Rock). In some cases the populations were in relatively poor condition (The Mewstone and Elk Reef) and there was significant fouling by hydroid/bryozoan turf. However there was a good range of size of the colonies which suggests a healthy and recruiting population.

- 5.44 The sea fan colonies on and adjacent to the fort inside the Plymouth Breakwater are perhaps the most surprising. They are by far the shallowest sea fans seen, living in depths from 3.7m bcd to 7.9m bcd. There are no hard surfaces deeper than these depths within this part of Plymouth Sound. The colonies are in three different habitats. Most are on the vertical granite walls of the fort itself and a total of 48 colonies were recorded and measured here out of a total of about 70. A further 15, mostly small, colonies were found on adjacent metal debris which appeared to be boilers or water tanks originating from the fort. Finally a further 18 colonies were measured on the boulders and rocky outcrops that form the base of the inside of the Breakwater at this point. All of the colonies were in an area about 50m square and generally between the breakwater and the fort. Many of the fans in this population are quite small but the largest have heights and widths of 40cm, which suggests a fairly long lived and stable population. The site is extremely sheltered, which has presumably allowed the fans to survive in such shallow water. There is very little tidal current within this part of the Sound but it is likely to be at its most significant in the narrow gap between the breakwater and the fort where the sea fans are found.
- 5.45 This is a completely artificial environment comprising granite walls, metal wreckage and introduced boulders. It is however a well established and stable habitat and, as the fort appears to be unused, is not one where much disturbance takes place. The origin of the sea fans is more difficult. In view of the distance from other suitable habitats it seems likely that the sea fans were originally introduced by human means, either by being brought on rocks from elsewhere when the breakwater and fort were built or released into the sea following collection for the Plymouth Laboratory or Aquarium. Whatever their history this is the shallowest and most accessible sea fan habitat we found and the population appears to be thriving. It is likely to be isolated from other populations, however, and would not be likely to re-recruit if the existing population were to die back.
- 5.46 20% of the sea fans in the Plymouth area had the sea fan nudibranch, *Tritonia nilsodhneri*, living on the colonies. South Devon and Cornwall appear to be the centre of occurrence of the nudibranch which is more rare both to the north and east.
- 5.47 Only two sea fans were found with sea fan anemones, *Amphianthus dohrnii* present, both in the dense sea fan 'forest' at The Drop Off. The author has previously observed and photographed sea fan anemones at Hilsea Point Rock but these were not seen during the survey. This suggests that populations are not static, since the colonies on which they were found were in a prominent location and the anemones were searched for on two occasions during the survey. The author has also recorded a single anemone on the wreck of the Persier in July 2003, whereas none were seen during the survey period.

**g. Lyme Bay**

- 5.48 Detailed studies of the sea fans in Lyme Bay have been carried out by Munro & Munro <sup>(12)</sup> of Reef Research. Our records in this area are limited but do include an area adjacent to the site at East Tennant's Reef where Munro & Munro are carrying out their work. East Tennant's Reef is the deepest of the three sites visited and is a low lying reef 23-25m below chart datum with soft sediments around it. This and the other similar reefs in Lyme Bay are known to have been significantly impacted by bottom fishing for scallops and this has led to a voluntary ban on scallop dredging in certain areas, negotiated by the Devon Wildlife Trust <sup>(9)</sup>.
- 5.49 The populations observed at East Tennant's Reef and Sawtooth Ledges were in good condition and with a good range of sizes.

#### **h. Dorset**

- 5.50 Dorset lies at the easterly extent of the known current distribution of the Pink sea fan though Manuel <sup>(6)</sup> states that older records suggest that this species occurred in the English Channel almost to the Thames Estuary (Margate) but that its present eastward limits are unknown. The Marine Nature Conservation Review records in the Mermaid database <sup>(7)</sup> have Chesil Beach, on the west side of Portland Bill, as the most easterly site with sea fans recorded, but our surveys have shown that there is a healthy population of sea fans at Worbarrow, about 20km east of Portland Bill and that individual fans occur as far east as Poole Bay.

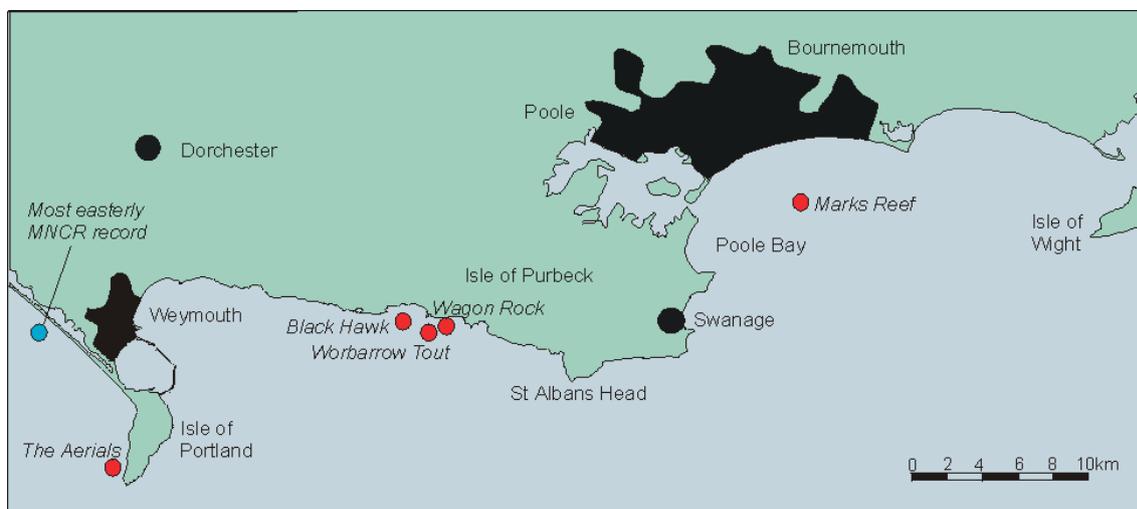


Figure 18. Sea fan sites in Purbeck, Dorset.

- 5.51 The sea fan populations in the Worbarrow area are reported from three sites, the broken up wreck of the Black Hawk, in the middle of Worbarrow Bay and two low lying reefs off Worbarrow Tout and Wagon Rock a little to the east. A total of 28 individual sea fans were measured at these three locations, though this was not the entire population. The fans were growing generally on flattish upwards facing surfaces and the depths below chart

datum ranged from 15.6-17.6m on the Black Hawk to 17.5-20-5m off Worbarrow Tout.

- 5.52 The sea fans at these three sites were good condition, with a mean rating of 4.8. They were however noticeably smaller than the average elsewhere, with no individuals exceeding 25cm high or 30cm wide. There were a number of small individuals.
- 5.53 This population can be compared with that at Skomer, as these are the two sites where significant numbers of sea fans occur at the limits of distribution for the species. Both populations appear to be in good condition but the habitat is quite different. The Skomer population also consists of larger individuals, with no small colonies present, whereas the Worbarrow population is smaller overall, but seems to have a good number of smaller, and presumably younger, colonies.
- 5.54 It is understood that a study of the Worbarrow population is to be made in 2003 as a part of the activities within the Purbeck Voluntary Marine Reserve (P. Tinsley pers.comm.).
- 5.55 The single record of a sea fan from Poole Bay was of a relatively large single colony, in relatively good condition on a low rocky reef at a depth of 13.4m. This is similar to the occasional records of well distributed fans off North Pembrokeshire and, like them, is a long way from the known areas of significant populations.

#### i. Channel Islands

- 5.56 There are no MNCR records from the Channel Islands as they were outside the scope of the surveys. However Pink sea fans are known to occur in the Channel Islands<sup>(13)</sup> and during this survey we received records from Guernsey, Sark and the Sauvage Reef, to the south of Jersey. The majority of the records are from Sark.

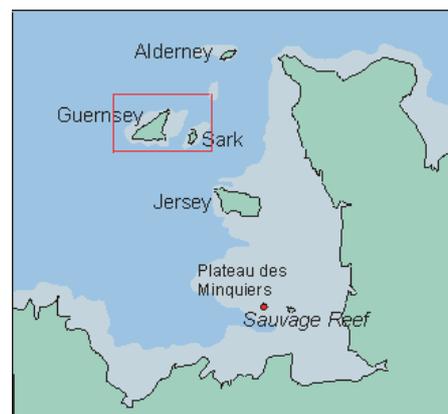


Figure 19. Sea fan sites in the Channel Islands

- 5.57 There were no records of extensive 'forests' of sea fans from the Channel Islands and the average density was nowhere more than 1 colony per square metre. However the sea fans here had the widest range of sizes of any of the study areas, ranging from young colonies only 2cm wide or 7cm high, to the largest record by a long way, a colony 100cm wide and 75cm high at Sauvage Reef. This is very much larger than the maximum sizes stated for the species by Manuel<sup>(6)</sup>, which are up to 30cm high and 40cm

wide. There were a number of other records of large fans from this site, which suggests a very stable situation and lack of storm damage over a long period in view of the long growth periods that must be involved for these specimens. The average size of the colonies in the Channel Islands was only a little larger than the overall average for the survey which demonstrates a wide, and thus healthy, range of colony size and age.



Figure 20. Sea fan sites in Guernsey and Sark

5.58 The incidence of eggs or adult *Tritonia nilsodhneri* was a little below average, at 15%, and no *Amphianthus dohrnii* were recorded.

**Plate 3 (facing page)**

- |              |   |
|--------------|---|
| Top left     | A sea fan colony dying back from the base with living branches (The Raglans, Manacles).                   |
| Top right    | A dense bed of sea fans at The Manacles.  |
| Mid left     | broken seas fans entangled with nets and washed up on Chesil Beach in March 2002 (Photo Steve Trehwella). |
| Mid right    | Diver recording sea fans at Hand Deeps, off Plymouth (Photo: William Hewitt).                             |
| Bottom left  | A young sea fan colony approx 10cm high (East Tennant's Reef, Lyme Bay)                                   |
| Bottom right | A large sea fan in the Channel Islands (Guilleaumesse, Sark).   |

## 6.0 Conclusion and Recommendations

### Conclusions

- 6.01 The study has extended the range of the Pink sea fan beyond recently recorded limits both in South Wales at the northerly extent and Dorset at the easterly extent. The most significant population outside previously known areas is near Worbarrow Tout on the Isle of Purbeck (Dorset). A report of a single sea fan in North Wales cannot be confirmed but further dives should be undertaken in that area as its presence there would be significantly outside the previously recorded distribution.
- 6.02 The great majority of the sea fan records are from depths greater than 10m as expected. However sea fans were recorded from depths less than 10m below chart datum for a number of areas. In Pembrokeshire, at Skomer North Wall, fans were found as shallow as 7.8m and at Penlee Point near Plymouth a single specimen was found at 8.2m. In the Channel Islands the shallow depth of some sea fan colonies in relation to chart datum may be explained by the wide tidal range in this area.
- 6.03 The sea fan colonies on and adjacent to the fort inside the Plymouth Breakwater are by far the shallowest sea fans seen, living in depths from 3.7m bcd to 7.9m bcd. This is a completely artificial environment comprising granite walls, metal wreckage and introduced boulders. It is however a well established and stable habitat and, as the fort appears to be unused, is not one where much disturbance takes place. It is likely to be isolated from other populations, however, and would not be likely to re-recruit if the existing population were to die back.
- 6.04 The densest beds of sea fans, with densities as high as 25 colonies per square metre were all recorded from deeper habitats and on largely horizontal bedrock or metal wreckage. Dense sites included the flat open seabed below The Voices on The Manacles and on Pencra Reef nearby, the Drop Off south of Plymouth and the wreck of The Persier in Bigbury Bay. All of these sites were at least 20m below chart datum.
- 6.05 There are significant differences in the maximum size attained by sea fans in different areas. Fans in the Purbeck and Lands End areas are the smallest, not exceeding 30cm in either width or height. Most of the areas are in the middle group, with a maximum size of up to about 50cm wide and high. The Channel Islands have the largest sea fans with a maximum size of 100cm wide and 75cm high.
- 6.06 In all areas except Lundy the fans are in good condition with an average score in excess of 4 on a 1-5 scale. It should be noted that this survey only records fans which are in situ. It cannot record fans which have been broken off and dispersed whether as a result of storm damage or physical damage from fishing gear or diver's fins. It should not therefore be assumed that the high average condition of the living fans means that the population is not under pressure, though it does suggest that in all of the

areas with a high score for condition that the prevailing conditions in terms of water quality, nutrients and lack of siltation are suitable for sea fans to thrive.

- 6.07 In the case of Lundy a very different picture emerges. With an average score for condition of a little over 2 out of 5 the Lundy population is clearly under significant threat. This is clearly not a physical threat as such as the colonies remain attached and partially living. It seems rather to be a loss of living tissue, which is most likely to have resulted from changes in water quality.
- 6.08 Species associated with Pink sea fans fall into four categories:
- Drift organisms which become attached to sea fans (algae),
  - Opportunistic organisms which grow on dead branches (hydroids, bryozoans, sponges, soft corals, barnacles, sea squirts),
  - Species which feed or live on sea fans (nudibranchs, sea fan anemones, false cowrie, featherstars),
  - Egg cases which are deliberately attached to sea fans (dogfishes).
- 6.09 Our records confirm the rarity of the sea fan anemone, *Amphianthus dohrnii*. 29 sea fans were found on which they were present, representing only 0.07% of the fans counted. Sea fan anemones were found only in three areas; Lands End, The Manacles and Plymouth, but were extremely rare at Lands End (1 anemone out of 173 – 0.6% ) and Plymouth (2 anemones out of 1222 – 0.2%). At The Manacles they were recorded on 26 fans at three different sites – Woodfords Wall (1), Pen-Win (16) and Pencra Reef (9). However this only represents 1.2% of the 2,091 fans searched for them in this area. No sea fan anemones were recorded at all from Pembrokeshire, Lundy, Lyme Bay, Purbeck or the Channel Islands. There is some evidence that individual anemones have a short life cycle.
- 6.10 Sea fan nudibranchs, *Tritonia nilsodhneri*, were present, either as adults or egg masses on 17% of the sea fans recorded. Their geographic distribution is uneven. They were most common in Devon and Cornwall, with The Manacles having the highest density of 26%. Lundy and Plymouth had 20% and Lands End 11%. The Channel Islands has a similar density of 15%. However no nudibranchs at all were observed in Pembrokeshire and they were rare in Lyme Bay (5%) and Purbeck (6%).
- 6.11 Very little evidence of direct human impacts on sea fans was observed during the survey. A small number of living but broken off fans were seen, but the reason could not be deduced. Only 7 fans were seen with human debris attached – fishing line (4), fishing net (1), rope (1) and a piece of hessian sacking (1). However, it should not be assumed that direct human impacts are not occurring. In the majority of cases where fishing gear or careless divers impact on sea fans the whole colony would become quickly detached and would rapidly die and decompose. Our survey would not pick up such damage unless it had occurred very recently before the observations were made.

- 6.12 The population most at risk from human activities appears to be that in Lyme Bay. In March 2002 a large number of broken sea fans were washed up on Chesil Beach, many of which were entangled in monofilament nets.

## Recommendations

- 6.13 Further dives should be undertaken at The Skerries, Anglesey in order to confirm whether or not sea fans are present in that area.
- 6.14 The Countryside Council for Wales should reconsider the northern boundary of the Pembrokeshire Marine SAC as at present it excludes the new sea fan sites we have identified in this survey. Since these are probably the most northerly occurrences in England and Wales this omission, though understandable in the light of knowledge at the time, is regrettable.
- 6.15 The regular monitoring programme carried out by Countryside Council for Wales at Skomer should be continued. In the light of the very limited number of new colonies, further research should take place both here and elsewhere on the reproduction strategy of the Pink sea fan in order to ascertain why there appears to be a lack of larval distribution in South Wales. In the long term the current population may be unsustainable.
- 6.16 In view of the fact that Lundy is the area where sea fans appear to be most in decline, identifying the cause of decline and determining the action to be taken should be a priority for the monitoring undertaken by English Nature in the Marine Nature Reserve. A regular monitoring programme should be initiated and maintained, similar to that already undertaken at Skomer.
- 6.17 The Manacles and Pencra Reef on the East side of the Lizard Peninsular are good examples of dense sea fan 'forests' and match the highest densities of sea fans found anywhere in our studies. Whilst the Pencra Reef population is just within the Fal and Helford SAC the similar populations at The Voices on the Manacles are excluded. This area also has the highest level of occurrence of *Amphianthus dohrnii*, which appears to be a very rare species indeed.
- 6.18 The importance of these sites ought to be recognised, at least by SAC designation and they should be included in monitoring programmes. However they do not sit well within the primary reasons for the designation of the Fal and Helford SAC and would be better recognised and protected in a new SAC that included Pencra Reef and The Manacles and had the biodiversity of its reefs as a primary reason for designation.
- 6.19 The Plymouth Sound and Estuaries SAC specifies sea fans in the approaches to Plymouth amongst the primary reasons for selection of the area. However the southern boundary of the SAC does not extend sufficiently far south to include the rich populations on The Drop Off, as it is

formed by a straight line between Rame Head and Yealm Head and this site is south of that line. In view of the fact that it was clearly the intention to include these populations we believe this boundary should be reviewed and extended.

- 6.20 The offshore sea fan sites at Hand Deepes, The Eddystone and the dense sea fan 'forest' on The Persier are all outside SAC designated areas. There is at present no appropriate legislation to protect isolated sites such as these but they should be considered should legislation like that envisaged by the 2002 Marine Wildlife Conservation Bill become established in the future.
- 6.21 The populations on open sites such as The Drop Off and The Persier are vulnerable to damage by mobile fishing gear, particularly rock hopper dredges. We believe they are sufficiently important populations to justify a restriction on fishing activity around them. This would have to be done by a fisheries byelaw which could be an outcome of SAC designation.
- 6.22 The Lyme Bay populations are probably those at greatest risk from fishing damage. The initiative undertaken by Devon Wildlife Trust is applauded but it does not apply to all of the known sites and, in view of the relatively slow growth rates for sea fans, regeneration is likely to be slow. Again preventing further damage by fisheries byelaws to exclude rock hopper dredging from the rocky areas is likely to be the only effective solution.
- 6.23 The Worbarrow sea fan populations are adjacent to, but not within an SAC, the Isle of Portland to Studland Cliffs SAC. It is unfortunate that the most easterly significant populations of sea fans are not protected by inclusion in a SAC and we recommend that English Nature extend the existing coastal SAC to include at least these sites. In view of the work carried out within the Kimmeridge VMCR further evidence of the desirability of the inclusion of reef habitats in this SAC may well exist.

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