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MARINE WILDLIFE CONSERVATION. AN ASSESSMENT OF EVIDENCE OF A TH--ETC(U)
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Marine Wildlife Conservation

An assessment of evidence
of a threat to marine wildlife
and the need for conservation measures

THE NATURAL ENVIRONMENT RESEARCH COUNCIL
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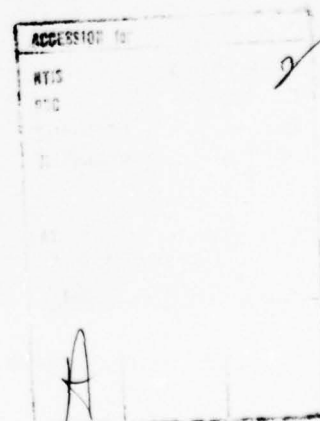
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Durdle Dor, near Lulworth Cove, Dorset.

PREFACE

1. The Natural Environment Research Council, through the Nature Conservancy, has since 1965 been responsible for establishing and maintaining National Nature Reserves and giving advice on conservation issues. National Nature Reserves have hitherto been established only on land, although some conserve a part of the intertidal zone—primarily because of its importance as a feeding ground for migratory birds. Increasing pressure on the sub-tidal and littoral marine environment from industrial development, mineral resource exploitation, and recreational activities, superimposed on the traditional uses of the seas around the UK for commercial fishing and navigation, has led to growing concern about the protection of this part of our natural environment.

2. Council therefore set up, in December 1971, a working Party on Marine Wildlife Conservation, chaired by Professor R. B. Clark, to assess the existing evidence of the threat to marine species and habitats and to advise Council of the need for conservation measures. The report of the Working Party follows.

3. Shortly before the Working Party reported (in October 1972) to Council, the Government White Paper ("A Framework for Government Research and Development," Cmnd 5046) was published. This decreed that a Nature Conservancy Council, grant-aided by the Department of the Environment, would in future be responsible for the conservation functions of the former Nature Conservancy, whose research activities would, however, stay with NERC. This changed situation has been largely, but not wholly, taken into account by the Working Party in framing its final recommendations. For the most part its conclusions are unaffected, but implementation of some of its recommendations will need to take cognizance of the constitutional separation of conservation and research activities.

4. The Working Party, whose members were drawn from Fisheries Departments, and recreational groups, as well as scientists and conservationists, was aware of the wide range of views that are expressed about marine conservation; this was reinforced by written and oral submissions put to the Working Party. Often the interests of different parties are potentially in conflict and any consideration of marine reserves will need to ensure that all these divergent and contradictory views are taken fully into account.

5. So far as the intertidal zone is concerned there is a good deal more conservation in hand than is generally realised, even though some of it is incidental to other objectives. Some intertidal areas enjoy the full status of National Nature Reserves, albeit not selected to conserve the marine fauna and flora. Others are afforded various degrees of protection from human interference by being designated as Sites of Special

Scientific Interest, by being managed as reserves by local authorities or voluntary bodies such as the Royal Society for the Protection of Birds and the National Trust, or because access to them is restricted by the Ministry of Defence. Intertidal muddy and sandy shores are well represented in existing NNRs but almost nothing is known about their fauna and flora other than resident and migratory birds. The Working Party has rightly recommended that existing sites should be surveyed to establish just what is, in effect, being protected already. There is little attempt at present to protect rocky shores and no sites extend below low water mark. The report stresses the need to gather information in a systematic way so that the need for marine conservation may be assessed more accurately in the future.

6. Conservation of intertidal and sub-tidal areas presents different problems and requires different measures to protect them. The former can be and in some cases are, protected by NNR status; access to them can be controlled and no new legal principles need be invoked if further sites are proposed. Sub-tidal habitats, on the other hand, cannot be protected in the same way; even if access, or the right of passage across or through the overlying water body could be restricted, it still may not afford the desired protection, since destructive influences (e.g. pollution) could still operate. More effective would seem to be to foster the understanding of the objectives of conservation by those who use coastal environments for commercial, recreational or amenity use. Here the voluntary organisations and sports bodies can play an important role in promoting educational programmes and codes of practice and the "look, don't take" approach.

7. Council has warmly welcomed the report of Professor Clark's Working Party, and in its future planning and support of marine research, will be taking steps to implement those recommendations that fall within its remit. The need for long-term studies into natural population fluctuations and understanding of the relative effects of man-made and natural influences upon them, clearly identified by this Working Party, is obviously of considerable relevance to other aspects of Council's research programmes and policy, notably in connection with pollution. It was, for example, in recognition of the importance of such studies that Council, in 1970 established the Institute for Marine Environmental Research. Steps will also be taken by Council to ensure that the data resulting from these and other investigations are collected and stored, along with any existing data, in a readily available and usable form, as recommended by this Working Party. Although other recommendations will have implications for the Nature Conservancy Council both Councils will need to work closely together and jointly review the available scientific evidence and general developments periodically as recommended by the Working Party.



Male corkwing wrasse guarding its nest.

NATURAL ENVIRONMENT RESEARCH COUNCIL WORKING PARTY ON MARINE WILDLIFE CONSERVATION

MEMBERSHIP:

Professor R B Clark	Member of Council (Chairman)
Sir Edmund Irving	Member of Council
Dr B Forman	Nature Conservancy
Dr H A Cole	Ministry of Agriculture Fisheries and Food
Mr B B Parrish	Department of Agriculture and Fisheries for Scotland
Mr F L Briscoe	Sports Council
Dr G W Potts	Marine Biological Association, Plymouth
Dr J R Lewis	Wellcome Marine Laboratory, University of Leeds
Mr R I Currie	Scottish Marine Biological Association, Oban
Professor N Millott	University Marine Biological Station, Millport
Dr I C White	NERC Headquarters (Secretary)

INTRODUCTION

CHAPTER 1.

THE WORKING PARTY

1.1 The question of NERC policy on the conservation of marine life has been raised several times during the last few years in a number of ways.

1.2 In April 1969, the Nature Conservancy submitted a paper on conservation policy in the shallow seas for consideration by Council's Oceanography and Fisheries Committee. This paper indicated that although the Nature Conservancy had established a number of coastal National Nature Reserves (NNR), *intertidal areas were included in them only as a matter of convenience or because of wader and wildfowl populations on them.* Under existing law, the Nature Conservancy had no power to acquire or declare as NNRs, areas below low water mark. The paper raised the question of areas which had key importance as representative samples of major shore types or as research or educational areas, and which might be safeguarded as NNRs. It also raised, in a preliminary way, the question of conservation below tidemarks. The O & F Committee advised Council that in the absence of strong evidence that a marine conservation problem existed and was due to controllable factors, the proposals should not be pursued at that time.

1.3 Parliamentary questions in July 1969 and May 1971 called for information on the consideration being given to the establishment of *marine parks and aquatic reserves below low water mark.*

1.4 The Department of Education and Science asked for a statement of the present position and a reply was sent on 11 June, 1971 indicating the legal, scientific and practical problems associated with the establishment of sublittoral reserves, as pointed out by the O & F Committee in 1969.

1.5 In August 1971, the Council for Nature raised with the Chairman of Council (Professor V C Wynne-Edwards) the general question of the conservation of marine life.

1.6 In view of renewed pressure from interested organizations and individuals on NERC, and independently on the Nature Conservancy, to consider the need to protect marine life around the United Kingdom, the subject was examined by Preparatory Group C (Marine Sciences) of Council on 14 December, 1971. The Nature Conservancy Scientific Policy Committee submitted a paper as a basis for discussion, which recommended the setting up of a Working Party to investigate the question. Preparatory Group C agreed that there was a need to establish whether there was an overall threat to marine life in British coastal waters before any consideration could be given to protective measures that *might be effective.*

1.7 The Preparatory Group invited Professor R B Clark to chair a Working Party to make a preliminary assessment of evidence and advise if there was a case for additional conservation measures in the marine environment. The membership of the Working Party is listed above and the terms of reference were as follows:

- i To advise Council, on the basis of existing knowledge of marine ecosystems, on the case for establishing underwater marine nature reserves or other conservation measures, giving consideration to:
 - a) the definition and identification of areas or species of 'special' interest;
 - b) the problem of measuring changes, distinguishing between natural and artificial factors, the extent of the pressure on marine habitats;
 - c) the investigation necessary to quantify measures;
 - d) the need, if any, for protective measures.
- ii To report to Preparatory Group C by October 1972.

1.8 The Working Party met on three occasions and considered written and oral evidence.

1.9 Written evidence was received in response to a request sent to selected local authorities, Sea Fisheries Com-

mittees (circulated by the Association of Sea Fisheries Committees), marine laboratories, conservation societies, sports associations and other interested organizations and individuals. The complete list of organizations and individuals circulated, together with an indication of the information requested, forms Appendix I and the submissions received are listed and summarized in Appendices II-VII.

1.10 Visitors who attended the second meeting of the Working Party are listed in Appendix II.

CHAPTER 2.

OBJECTIVES OF MARINE CONSERVATION IN RELATION TO NERC

2.1 By analogy with the situation on land, reserves (in a general sense), or parks, in the marine environment could be established for a variety of reasons: to preserve an area for educational or general amenity use, to protect it because of its outstanding natural beauty, to allow specific sports activities, or to protect a habitat or species for commercial or scientific purposes. In the last case these measures may be supplemented by specific protection of particular rare and threatened species by means of Protection Orders.

2.2 Experience in the terrestrial environment shows that there is not a clear separation of function or interest in the establishment of reserves, and a site can often fulfil more than one purpose.

2.3 Pending legislation to transfer the responsibility to a new Nature Conservancy Council under the aegis of the Department of the Environment, NERC has, through the Nature Conservancy, a responsibility to establish nature reserves on the basis of scientific considerations, with conservation and education (including research) as the primary justification. Specifically, National Nature Reserves (NNR) have been established by the Nature Conservancy for the following reasons:

- a) to preserve representative examples of ecosystems and of geological or physiographical features in Great Britain;
- b) to provide reservoirs of populations of flora and fauna;
- c) to provide bases for comparison against which to measure changes produced by natural or man-made factors;
- d) to provide research areas and areas for management trials where security of tenure and freedom from disturbance can be assured;
- e) to provide demonstration areas for teaching and display.

NNRs are judged to be of national or even international importance to nature conservation and in most instances they are the best example of particular ecosystems now left in Britain, though a few have been chosen for their typical features or research value.

2.4 However, in as much as sectors of the public are given access to NNRs when and where this is compatible with conservation and research, amenity, though not a primary consideration from Council's viewpoint, must

often be taken into account. Conversely, where amenity or recreational considerations are paramount, reserves (in the broad sense) may be established by such bodies as Local Authorities or voluntary organizations, but such reserves may also, in part, serve the interests of conservation. Thus there is a continuous spectrum from the purely scientific, closed reserve to the recreational park.

2.5 NERC, through the Nature Conservancy, also has a responsibility to give advice on conservation matters and so is necessarily involved, at least peripherally and sometimes to a considerable extent, with the establishment of reserves for other than scientific reasons.

2.6 For historical and other reasons the Nature Conservancy has hitherto directed its attention almost entirely to conservation in the terrestrial environment and this is reflected in the existing selection of NNRs. The selection of sites considered by the Nature Conservancy to be of special scientific significance and thus worthy of conservation preserves this approach and, indeed, the classification of habitats used by the Nature Conservancy in this connexion is based largely on phytosociological criteria which, while well suited to the terrestrial environment, are less so to others.

2.7 The chief departure of the Nature Conservancy from its otherwise terrestrial orientation in the establishment of NNRs relates to birds. This has resulted in the conservation of intertidal areas which are important feeding grounds for wildfowl and waders.

Oystercatchers on a National Nature Reserve.





Ainsdale NNR, Lancashire, looking towards Southport.

2.8 Although the primary reasons for establishing coastal NNRs which extend to low water mark have been ornithological or physiographical, the entire marine flora and fauna of these areas are often conserved, so far as human interference is concerned by regulating or prohibiting access as well as the collection of specimens for scientific purposes, bait digging, etc. Commercial fishing and commercial harvesting of shellfish in these areas are specifically excluded from regulation by Nature Conservancy, however, and are the responsibility of the Fisheries Departments.

2.9 The Nature Conservancy, on behalf of NERC, has established 133 NNRs in Great Britain, totalling 278,193 acres. Of these, 33 contain coastal habitats (see Appendix VIII) totalling 64,448 acres, including about 37,000 acres of foreshore. Approximately a further 276,000 acres of foreshore have been identified by the Nature Conservancy as having special scientific significance.

2.10 Appendix VIII gives a necessarily approximate analysis of the types of marine and estuarine habitats that are considered by the Nature Conservancy to be of special scientific significance. While a selection of muddy and sandy intertidal habitats are at present protected by NNR status or identified as worthy of conservation, almost nothing has been done, or is proposed, specifically to conserve rocky shores.

2.11 While an extension of the Nature Conservancy's activities to include conservation in the entire range of intertidal habitats would involve nothing new in principle,

the establishment of NNRs, or other conservation measures below low water mark would. The Royal Charter (1965) limits Council, so far as its power to 'establish, maintain and manage nature reserves' is concerned, to Great Britain which, by definition in this context, extends only to low water mark of mean ordinary tides. This definition has, of course, no biological significance, but there are serious legal problems to extending conservation measures to coastal waters beyond low water mark which we discuss later.

2.12 The Nature Conservancy's policy in selecting NNRs has been to conserve samples of 'all major natural and semi-natural examples of important habitats' in Great Britain. Although, as we have previously noted, attention has been concentrated on terrestrial habitats, there is no logical reason for excluding intertidal marine habitats and no biological reason for excluding shallow sublittoral habitats.

2.13 The Working Party, however, was conscious of the fact that, whatever the long-term objectives, financial limitations dictate that priorities must be established. It has therefore taken the view that for the intertidal environment and still more for the sublittoral, the need for the establishment of NNRs or the introduction of other conservation measures by the Nature Conservancy should be demonstrated, and that the primary justification, as on land, must be based on scientific considerations.

Other bodies concerned with marine conservation have different interests and responsibilities, and these are discussed in Chapters 12-15.

CHAPTER 3.

PROBLEMS OF MARINE CONSERVATION

3.1 The coastal marine environment suffers stresses different from those on land and presents peculiar problems for conservation. These differ slightly between the intertidal and sublittoral areas. We have regarded the former as extending from the effective high water of spring tides, where it becomes the maritime zone, to low water of mean ordinary tides, which is a legally defined boundary. The sublittoral or subtidal area extends from there to an indefinite depth which, for the purposes of this enquiry, we have taken to be in the region of 100-150 ft.

3.2 Different marine habitats, though localized, are not isolated to anything like the same degree as habitats on land (4.3-4.5). Damaging influences such as those resulting from the persistent discharge of toxic wastes into estuaries and coastal waters will generally have an impact over a relatively wide area. It is therefore impracticable to screen a sample of marine habitat from outside influences to the same extent that a nature reserve on land can be protected.

3.3 The coast and coastal waters have many different users whose interests are to varying degrees potentially in conflict. For purposes such as navigation, port and harbour installations, and the discharge of wastes, water quality may not be a significant consideration. For commercial and sport fishing, and for many other recreational activities on the other hand, high water quality and an abundance of at least some categories of marine life, is vital. The most stringent requirements are for areas with a fauna or flora of particular richness or scientific interest, which are used for educational or research purposes.

3.4 Even where different users have common interests, their activities may put them potentially in conflict with one another. Commercial and sport fishermen often seek the same fish; collecting for educational purposes, whether commercially or by parties of students, or souvenir hunting by skin divers, may deplete the fauna of an area selectively and conflict with research or conservation activities; conservation of the feeding grounds of wildfowl may conflict with commercial harvesting of the fauna; and conservation of a particular habitat may result in a reservoir of pests of commercial species being harboured.

3.5 In particular, since virtually all coastal areas of Great Britain, except for a few heavily polluted estuaries, support some commercially valuable fish or shellfish, any proposal to designate areas as reserves for other purposes would conflict with fisheries unless established patterns of exploitation could be maintained.

3.6 The comments received by the Working Party from the Sea Fisheries Committees make clear their concern about possible restriction of fishing areas. For example, the Clerk and Chief Fishery Officer to the South Wales SFC, after commenting on the lack of evidence of the need to close areas to fishing in order to conserve non-commercial

marine species, added "any attempt to interfere with commercial fisheries in the interests of conservation of non-commercial species would most likely result in the strongest objections from various sources including Sea Fisheries Committees. A very strong case would have to be made out if there was to be interference with the right of public fishery". The Clerk to the Cornwall SFC, after describing the pattern of fishing off the Cornish coastline and the importance of the nearshore waters to men working vessels with limited range, concluded "In view of the foregoing features, you will appreciate that my Committee would not welcome any extreme conservation proposal involving a total prohibition of commercial fishing in any particular area."

3.7 The great variety of uses of the coast and coastal waters are all legitimate and, particularly in the more populous parts of the country, they are increasing. All inevitably interact with one another, and while some activities are confined to specific locations or habitats, many are more widespread. Furthermore, because of the reduced isolation of marine habitats from neighbouring areas, the influence of one form of activity may be felt outside as well as within the place where it occurs.

3.8 These conflicts make conservation along conventional lines difficult, but if because of this the problem is ignored, there is a danger that by the time damage from human activities is detected, it may be on such a scale that remedial measures will be slow to take effect or even impossible.

3.9 It is partly in recognition of this danger that marine reserves and parks have been established in many countries including USA, Canada, Mexico, Bahamas, Tobago, Costa Rica, Falkland Islands, Australia, New Zealand, Fiji, Philippines, Kenya, South Africa, Israel, France and others. These range from purely recreational underwater parks to totally conserved areas for research and monitoring.

Below: Cockle fishers on the Burry Inlet, South Wales. Right: Spring plankton with echinoderm larvae.



EVIDENCE OF CHANGE

CHAPTER 4.

PROBLEMS OF EVALUATING EVIDENCE OF CHANGE IN THE MARINE ENVIRONMENT

4.1 The submissions made to the Working Party related to supposed pressures on the coastal marine flora and fauna resulting from a variety of activities, including: skin diving; educational collecting and the biological supply trade; sport fishing and bait digging; commercial fishing; and pollution. It is worth noting that the evidence we received was largely circumstantial, related to comparatively few areas, and came from relatively few sources.

4.2 There are problems in detecting biological change and then in trying to decide if it is the result of natural influences or human activities. These problems are identical with those experienced in the current, wider concern about the ecological effects of pollution. Severe difficulties arise from the lack of long-term quantitative data about particular species, habitats or localities, and about both local and general natural factors in the marine environment that induce change.

4.3 It is perhaps not sufficiently appreciated that marine species do not usually exist in a steady numerical state. Rather, they are likely to fluctuate irregularly or cyclically over time spans of a few to possibly 20-30 years. This may be as a result of direct effects of natural variables (climatic or hydrographic) in the environment on, for example, their fecundity, or as a result of similar fluctuations in other species with which they have feeding or competitive interactions. A well documented example of this is the heavy mortality that occurred on the shore during the severe winter of 1962-63 and it is significant that much of the evidence submitted to us from south and west coast areas concerned the recovery of affected species since then. Intermittent scarcity and even extreme abundance of particular species are part of the general experience of most field biologists, but in the absence of data on the subtle fluctuations of the physical environment, these fluctuations mostly remain unexplained.

4.4 A high proportion of British coastal species have planktonic (drifting) eggs and/or larvae, and this has important consequences and implications. These distributive stages are very susceptible to environmental influences which are often imperfectly understood, and there is growing evidence that while most species reproduce and recruit new members annually, in some (including molluscs and echinoderms) significant recruitment to adult stocks may only occur once or twice in a decade. This is probably a major cause of natural fluctuations and also entails the risk of a severe and prolonged decline if destruction of adult stocks coincides with recruitment failure.

4.5 On the other hand, the existence of planktonic eggs and larvae also means that recruitment is not necessarily dependent upon the presence of breeding stocks in a specific area. Although the various types of physical habitats with their distinctive populations appear discretely distributed around the coast they are in fact brought into practical continuity by the tidal and other movements of the overlying water. The recolonization by littoral barnacles and limpets that followed their destruction during the Torrey Canyon operations demonstrates the effectiveness of larval transport. But for the other, less ubiquitous species, whether or not destruction at specific sites is made good, may depend upon the distance to the nearest breeding stocks, the duration and survival of the larval phase, strength of local water movements, and the rate of recolonization, data which are often largely unknown.

4.6 With this as the general background, short-term data or general impressions can be misconstrued; and even when species or habitats have been followed over many years there is often insufficient environmental data to implicate a specific causal factor. In the present case with few continuous long-term data available and even less background knowledge of the environmental influences operating upon the abundance of most of the species mentioned, it is premature to speak of a persistent decline or danger of extinction around the coast generally, and often impossible to ascribe apparent declines to natural or man-made influences.



CHAPTER 5.

SKIN DIVING

5.1 Much of the evidence submitted to the Working Party related to the activities of skin divers.

5.2 Skin diving is an increasingly popular sport: the current (1972) membership of the British Sub-Aqua Club, to which at least two-thirds of all divers belong, is nearly 16,000, with an annual growth rate of about 20 per cent.

5.3 The majority of diving clubs, of which there are now 520, are situated inland. Training is completed in swimming pools and, particularly during the summer, clubs travel to the coast to dive. Favourite areas are where the water is not unduly polluted and affords good visibility, and in most cases where there is a rock substratum with a varied fauna and flora.

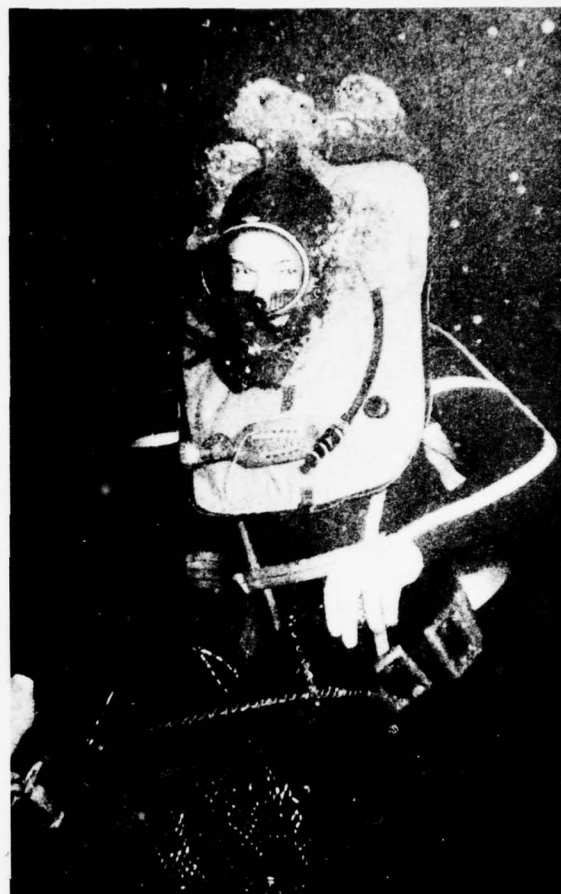
5.4 Some divers are fully professional and trade in scallops (*Pecten maximus*), ormers (*Haliotis tuberculata*) in the Channel Islands, lobsters (*Homarus gammarus*), crawfish (*Palinurus elephas*) and crabs (*Cancer pagurus*). They have also become involved in the souvenir trade and collect sea urchins (*Echinus esculentus*) and gorgonid coral (*Eumicella verrucosa*) which are dried and sold. Other echinoderms collected and dried for the souvenir trade are *Solaster papposus*, *Marthasterias glacialis*, *Luidia ciliaris* and *Henricia sanguinolenta*. The activities of divers who are in commerce in this way would presumably come under the control of the Ministry of Agriculture, Fisheries and Food, the Department of Agriculture and Fisheries for Scotland or the Ministry of Agriculture for Northern Ireland.

5.5 Amateur divers are generally not interested in commercial gain from diving, which, for them, is purely recreational. They collect similar items to the professional for home consumption and personal souvenirs but may be expected to have an interest in a wider range of species but to take fewer specimens of those they do collect. Their cumulative impact, however, may still be considerable.

5.6 There is no sharp distinction, however, between professionals and amateurs because a number of divers are 'weekend professionals' and sell their catch in order to pay for their diving. Although amateurs are thought to be in the great majority, we do not know how extensive the practice of diving and collecting animals for profit is in this country.

5.7 Collecting by skin divers is highly selective and has at least the capability of being extremely thorough in areas where they are active, to a depth of 100-150 ft. In most places where it was claimed that there was 'pressure' from divers, this referred only to the fact that divers made frequent use of a particular site and evidently collected a substantial quantity of material from it. Only little evidence (which we describe below, 5.15) showed whether or not this intensity of collecting depleted the fauna.

5.8 Conditions most suitable for diving are met, and hence pressure is greatest, in south-west England, Wales,



and to an increasing extent Scotland. A few regions bordering the North Sea also afford good water conditions and are heavily used.

5.9 Within these regions, diving has been concentrated chiefly at areas where there is easy land access for the heavy diving gear, but with the increasing number and sophistication of motor boats and inflatables, areas once protected through lack of access are now used.

5.10 Localities in south-west England which were mentioned in submissions as being subject to heavy pressure from skin divers included Portland, Weymouth, Chesil Beach, Lyme Regis, Torbay, Isles of Scilly, Polperro and Lundy. There may be others.

5.11 A good deal of evidence received related to the extreme pressure from divers on the Milford Haven area of the Pembrokeshire coast in the vicinity of Dale Fort and Martin's Haven. The latter was mentioned in three submissions as being severely depleted of some species and having been altered drastically by the activities of amateur and professional skin divers. Evidence also pointed to the recent extension of this pressure to the island of Skomer and neighbouring areas which had formerly been inaccessible. Evidence was also received that shores in North Wales were subject to similar pressure.



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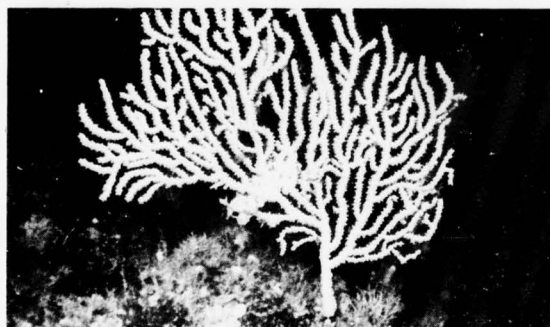
5.12 Scotland does not yet seem to be under such severe pressure from skin divers although it was suggested to us that there are already signs that this activity is increasing.

5.13 North-east, east and south-east England are, generally speaking, not suitable for skin diving because of poor visibility and, in many places, pollution. However, this causes a concentration of activity at the relatively few good sites as at St Abbs.

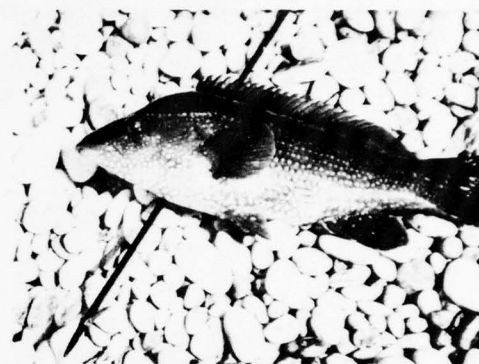
5.14 No evidence was received of severe pressure from skin divers on the south coast (Sussex, Hampshire) although diving is a popular activity there.

5.15 Professional divers are reported to be responsible for the local depletion of inshore *Pecten* on the Welsh coast, *Haliotis* in the Channel Islands, and *Homarus*, *Palinurus* and *Cancer* from the Welsh and Dorset coasts. The collection of large numbers of *Echinus* and *Eunicella* for the souvenir trade in the Isles of Scilly and on the Dorset and Welsh coasts is claimed to have caused local depletion of these species. Most of these claims were inevitably based on subjective judgement and unsupported by quantitative data, but evidence was provided for Martin's Haven in Pembrokeshire which lends credence to them. Here, from observations made during the last 10 years, it has been found that not only are the total numbers of *Echinus* reduced, but their mean size has been decreased. Furthermore, there has been observed an increase in the growth of algae which is indirect evidence of reduced grazing intensity by *Echinus*.

Below: The sea fan (*Eunicella verrucosa*) and the edible or common sea urchin (*Echinus esculentus*).



5.16 Spear fishing is not usually carried out with aqualungs, although some diving clubs may do this sport. This activity can cause shyness and depletion of some fish stocks, particularly of the animals such as Wrasse (*Labridae*). Although spear fishing appears not to be a very popular sport in British waters at present, it has been suggested that labrids have been depleted and those that remain are of small size. Spear fishing is common in South Devon, while bass are less abundant on the Dorset coast from Weymouth to Portland as a result of spear-fishing activities. With respect to the latter, however, it must be observed that the scarcity of bass has been widespread since about 1962.



5.17 The Working Party is prepared to believe that intensive collecting by skin divers has depleted *Echinus* and other elements of the fauna in the most popular areas. Indeed, it was explained to us that one reason for divers extending their activities from Martin's Haven towards Skomer was because the fauna of the former was no longer as abundant or interesting as formerly.

5.18 Whether this local depletion is significant in a wider context is almost impossible to assess. Skin divers do not normally descend below 100-150 ft. only the shallow water populations are exploited and those species with a wide bathymetric range, in part escape collection by divers. Furthermore, divers at present confine their activities to particular localities and neighbouring inaccessible areas are unexploited. It is therefore likely that unexploited reservoirs of most species exist near the heavily exploited sites.



CHAPTER 6.

EDUCATIONAL COLLECTING AND THE BIOLOGICAL SUPPLY TRADE

6.1 Evidence that biological supply and educational activities have depleted the marine fauna and flora is at most tentative. As in other sections of this enquiry, the Working Party has been hampered by the lack of data about the distribution and population dynamics of the species widely used in training and research. Against such a background it is not possible to assess adequately the extent of changes or damage to populations, much less to diagnose the causes of these changes.

6.2 For many years the Marine Biological Association, Plymouth, the Scottish Marine Biological Association (more recently the University Marine Biological Station) at Millport, and the Dove Marine Laboratory, Cullercoats, have supplied marine specimens for research and educational purposes. Despite this activity, they have no evidence that it has caused a depletion of the local fauna and flora. Some species are less abundant than formerly, but it is not known if this is a result of natural population fluctuations in response to climate or other natural factors, or to man-made causes.

6.3 In the collecting grounds fished by the University Marine Biological Station, Millport, numbers of *Nephrops*, *Pecten*, gadids such as cod and whiting, and *Raja* are reported to have shown significant decline as revealed by catches in recent years. All these species are of prime commercial importance, but more a widespread decline of all of them in the Clyde has not been observed by DAES.

6.4 Evidence was received from two biological supply houses of the species and numbers of organisms that are supplied to customers which include universities, colleges of education and schools. The firms act as distributors and rely on professional collectors for their specimens, so that they would not be aware of local depletion of particular species. However, they have not been conscious of any difficulty in obtaining supplies through shortage of specimens.

6.5 Rumours of 'entrepreneur agencies' supplying specimens by the thousand to overseas educational customers and biological supply houses could neither be confirmed nor denied.

6.6 Appendices IV and V give details of material supplied by the two major commercial biological supply houses in Britain and by the MBA, a major institutional supplier. The former operate on a comparable scale to the marine laboratories but are concerned with a more limited variety of organisms.

6.7 Some of the species that are widely used for educational and research purposes are also fished commercially. *Echinus* is taken in large numbers by skin divers (see 5.4) and the polychaetes *Nereis* and *Arenicola* are collected in large numbers by bait diggers (see 7.4). The impact of



The Norway lobster (*Nephrops*) at its burrow.

educational specimen supplies on the marine environment is negligible beside these activities. As examples of this, the largest single item in the biological supply trade is dogfish, of which Messrs. Gerrard and Harris sold a total of 27,663 in 1971-72, but annual landings by the fishing industry at one small fishing port (Campbeltown) alone and of only one species of dogfish are 2,500-3,300 cwt, representing some 70,000 fish. We are also informed that a single fishing vessel may bring in as many as 3,000 *Nephrops* in a single trip, which is much more than the total annual educational requirement for this species.

6.8 Field courses are claimed to be a source of depredation and despoilation in some areas, chiefly intertidal, notably on the south Devon coast, Anglesey, Dale Fort, Slapton Ley, Port Erin and parts of the Yorkshire coast. The evidence for this is slight. However, with the increased interest in the environment, greater numbers of junior school parties are taken to the shore and there is evidence that these less experienced groups are not aware of the damage caused by careless collecting, especially to under-stone and rock pool faunas.

6.9 It is possible that some scientists, particularly those such as biochemists and physiologists who require large numbers of a particular species, are unwittingly responsible for some overcollecting, but we have no firm information about this.

CHAPTER 7.

SPORT FISHING

7.1 Sea angling from the shore or from boats is a popular recreational activity for many people on most parts of the British coast and their gross expenditure on gear, boat hire, transport and accommodation is very substantial (estimated at £70 million for 1971). To some extent their interests parallel those of commercial fishermen but they also fish for such species as common dab, sea bream, bass, pollock, tope and blue shark which are not very significant commercially. Sea anglers are very sensitive to encroachment on the public right of fishery.

7.2 The Working Party received no evidence that sea anglers caused undue pressure on fish populations in particular localities or habitats because of their fishing activities.

7.3 However, there was strong evidence that damage to sandy and muddy beaches was being caused by the rising demand for bait. The quantity of bait dug is unknown, but a measure of the demand can be gained from a report that a single shop could sell 100 lb. of worms a day at the week-end, if they could be collected. Commerce in bait accounts for only a fraction of the total, however, because it is estimated by the National Anglers' Council that 75 per cent of sea anglers dig their own bait.

7.4 Excessive bait digging was suggested as a cause of a scarcity of the following bait species, *Nereis virens*, *Nereis diversicolor*, *Arenicola marina*, *Arenicola ccaudata*, *Nephtys caeca* and *Nephtys hombergi*, mainly in the Fleet and Poole areas of Dorset, but other areas of the coast may be similarly affected.

7.5 In addition to depletion of certain polychaete worms, over-digging alters shore profiles and unwanted invertebrates are killed by being exposed at the surface or through being damaged. Young stages may be particularly vulnerable. *Zostera* beds are also reported to be adversely affected by bait diggers. Many muddy and sandy shores

around the British coast are so affected and evidence was forthcoming of pressure from this activity at Chesil Beach, Poole Harbour, the Menai Straits and in the vicinity of Southend in the Thames estuary.



CHAPTER 8.

OTHER WATER SPORTS

8.1 Although water sports generally are increasing in popularity, we received no evidence that water sports other than skin diving and, indirectly, sea angling were affecting particular localities or habitats although it was recognized that the great increase in water sports could rapidly change the situation.

8.2 In particular, the growth in the number of small boats and yacht marinas may cause increased disturbance, the risk of chronic oil pollution from the numerous engines and local sewage pollution from the inboard toilets. These problems are most marked where marinas are situated in sheltered conditions with little tidal exchange.

Below: Port Hamble Marina, Hampshire. Above: Digging lug worms for bait.



CHAPTER 9.

COMMERCIAL FISHING

9.1 Government control of the activities of commercial fisheries is the responsibility of the Fisheries Departments. At present, legislation is limited to fish and shellfish (molluscs and crustaceans) but the interests of the Ministry of Agriculture, Fisheries and Food (MAFF), the Department of Agriculture and Fisheries for Scotland (DAFS) and the Ministry of Agriculture for Northern Ireland (MANI) also extend to all potentially exploitable living resources in the sea and the environment on which they depend.

9.2 Regulation of the exploitation of fish and shellfish within the exclusive fishing limits of the UK results from domestic legislation which implements agreements reached at the North-East Atlantic Fisheries Commission. This is supplemented by such additional national regulations and bye-laws as may be required. The bye-laws are enforced in England and Wales by the Sea Fisheries Committees, in Scotland by the Secretary of State for Scotland and in Northern Ireland by the Secretary of State for Northern Ireland. The legislation and bye-laws prescribe, among other things, closed seasons and closed areas, restrictions upon the type or size of fishing gear that may be used, minimum mesh sizes of nets and minimum sizes of fish or shellfish that may be landed. Enforcement is the responsibility of the Departmental Fisheries Inspectorates (and in Scotland, of the Departmental Fisheries Protection Service) and, on the high seas, of the Fishery Protection Service of the Navy.

9.3 The successful exploitation of any fishery depends essentially upon management of the resource and of its exploitation. Inevitably this involves a departure from the natural balance of the unexploited ecosystem. The cultivation of shellfish, for example, often entails the wholesale removal of predators and competitors. Many reports of a local depletion of commercially valuable species reflect the exploitation pattern over a wider area covered by the stocks as a whole, including the high seas where international fleets operate. These changes do not necessarily indicate that conservation regulations are defective; intensive exploitation may produce changes in the abundance and size of the exploited stocks (for example, a decrease in numbers of larger, older members) but the sustained total fishery yields may well be greater. Local stocks of relatively sedentary species such as lobsters may be temporarily depleted without materially affecting the status of the stock as a whole.

9.4 The fishing industry, including shellfish harvesting, has by far the greatest impact on at least a part of the marine environment and for the commercially exploited species, the activities of amateur collectors are totally insignificant besides the catches of the industry, although there may be local effects of some importance.

9.5 While benthic trawling, dredging for scallops and suction dredging for cockles may produce marked effects in those localities where they are practised, we received no evidence that particular inshore localities or habitats were under pressure from the activities of professional fishermen. Since the areas most likely to be suggested as under-water reserves are off rocky coasts, potting for lobsters, crawfish, crabs and prawns is the most probable method of fishing which needs to be considered. These activities usually have a long history in the area and are unlikely to be detrimental to the habitat.





CHAPTER 10.

POLLUTION

10.1 The Working Party did not consider in any detail the effects of pollution although the discharge of wastes into estuaries and coastal waters has certainly caused ecological changes and, especially near centres of industrial activity and dense population, impoverishment of the marine flora and fauna.

10.2 Several submissions made to us attributed local decline in intertidal plants and animals, and in certain sport fish, to chronic pollution. Not surprisingly these were in regions where industrial wastes are discharged in quantity, such as the north-east coast of England, the Mersey area, south-east England, and the Bristol Channel.

10.3 The reduced success of sea anglers in recent years (which is authenticated by club records) in the Bristol Channel, Solent and the region of Weymouth, was attributed to pollution. Similarly, a decline in nudibranchs, littorinids and other molluscs was reported from the Cheshire coast, and an otherwise unexplained decline of a number of species in Plymouth Sound is claimed to be the result of pollution (see Appendix III). On the Durham coast, industrial and municipal wastes and mining wastes add to a natural load of suspended matter in the water and cause a reduction in species diversity, favouring filter-feeders in the coastal marine fauna. Algal growth is also affected there.

10.4 Knowledge of the biological effects of waste discharges on the coast is still very limited and so it is impossible to evaluate most claims of pollution damage except where the pollution is gross and damage obvious.

10.5 At present, even accepting claims at their face value, pollution damage is confined to certain reasonably well-defined and predictable parts of the coast, except for isolated incidents like the damage resulting from the wreck of the 'Torrey Canyon'.

10.6 The impact of oil pollution on seabirds, almost entirely the consequence of ship and oil tanker operations at sea, has been omitted from our discussion. It is in many respects a distinct and separate problem which has been under investigation by various organizations for some time; the Nature Conservancy already has a considerable commitment with regard to seabird conservation.

10.7 Whatever the effects of pollution, it is significant that the best authenticated depletion in numbers of some animals (e.g. *Echinus* and *Eunicella*) is in regions where there is negligible local pollution.

CHAPTER 11.

TOURISM

11.1 Many intertidal habitats around the British coast are under pressure from holiday makers who, through sheer weight of numbers as much as anything else, can cause serious local damage. The effect of this pressure is particularly well illustrated on the Dorset coast where comparison is possible between exploited beaches and adjacent beaches under the control of the Ministry of Defence, which are generally closed to the public. On the latter beaches there is a reported abundance of species that are either rare or absent on the adjacent accessible beaches. Other coastal areas protected because of their use by MOD might afford similar comparisons.

CURRENT MARINE CONSERVATION MEASURES IN THE UNITED KINGDOM

CHAPTER 12.

BACKGROUND

12.1 A need to regulate human activities on certain shores and in some inshore waters has been expressed for some time, and a number of measures have been introduced or are contemplated to mitigate the effect of human pressures on the marine environment at specific locations.

12.2 Different bodies and organizations are responsible for these measures and their motives for introducing them are equally varied. Nevertheless, even if 'science and education' (in terms of the objectives of NERC) have not been the primary reason for regulating human activities, the effect of these measures is usually to conserve marine wildlife at least in some degree.

CHAPTER 13.

INTERTIDAL NATURE RESERVES

13.1 We have already observed (2.9), that National Nature Reserves at present include about 37,000 acres of foreshore in the 33 coastal NNRs, and that about a further 276,000 acres of foreshore are considered by the Nature Conservancy to be of special scientific significance and thus worthy of conservation.

13.2 In addition to NNRs, Local Authorities, acting in consultation with the Nature Conservancy, have established 13 Local Nature Reserves on the coast totalling 7,190 acres. Local Nature Reserves often play an important role in outdoor education and may suffer from the pressure of over-collecting and over-use (see chapter 6).

13.3 Sites of Special Scientific Interest also afford some protection of the fauna, flora, and geographical or physiological features, at least to the extent that a Local Planning Authority is required to consult the Nature Conservancy and take its views into account when considering a planning proposal that would affect the site. Of approximately 3,000 SSSIs that have been scheduled in Great Britain, 460 are on the coast.

13.4 The National Trust now owns 305 miles of coastline in England and Wales including many areas of great scientific importance, several of which are already being managed primarily as nature reserves. A few of them (e.g. Scolt Head Island, Norfolk) have been included in the series of NNRs.

13.5 The Royal Society for the Protection of Birds manages a total of 41 reserves, of which 18, covering 9,885 acres, are on the coast.

13.6 Voluntary Trusts for Nature Conservation which now exist in most parts of the country care for 38 coastal reserves totalling 5,040 acres.

13.7 We have not discovered the extent to which these coastal reserves, other than the NNRs, extend to low water mark, although we understand that many of them include the foreshore or afford a measure of protection to it from human interference.

13.8 Since many of these areas have been established primarily to conserve seabirds and wildfowl, conservation of the intertidal marine flora and fauna is only incidental and its composition is generally not known.

13.9 Conservation of a considerable selection of intertidal habitats, though predominantly of a 'soft' character, is thus already in progress at least so far as the acquisition of reserves is concerned. While management to conserve the marine flora and fauna may not be fully effective in all cases, excessive collecting and activities damaging to the environment are prevented or discouraged on most of them.

13.10 In many parts of the country bye-laws exist which prohibit bait digging on certain areas of beaches. The reason for this is usually safety or to prevent coastal erosion. This may make a modest contribution to conservation of the fauna in that a reservoir of species exists in the undisturbed areas from which adjacent areas can be repopulated.

Angel Marshes, Walberswick NNR, Suffolk.



CHAPTER 14.

SUBTIDAL NATURE RESERVES

14.1 The need for conservation measures below water mark has only recently been suggested and there are legal complications to establishing underwater reserves (see 17.1-17.8). For these reasons none of the existing coastal nature reserves extend below low water. Proposals for underwater reserves are, however, under active consideration at Lundy, Skomer, Torbay and, less advanced, in the Isles of Scilly, the Farne Islands and at Deal.

Lundy

14.2 The island of Lundy at the entrance to the Bristol Channel was purchased by the National Trust in 1969 and is administered by the Landmark Trust under whom an extensive programme of restoration and improvement is in progress.

14.3 The National Trust and Landmark Trust accepted provisionally in 1971 a proposal to establish a marine nature reserve in the waters around Lundy and, in this, received the support of the Lundy Field Society and Devon Trust for Nature Conservation.

14.4 Following this proposal an investigation of the subtidal marine life around Lundy was made by a group of biologists in 1971 and a meeting was held in October 1971 of representatives of the island authorities, the Lundy Field Society, sports divers, commercial divers, and marine biologists, with an observer from the Nature Conservancy, and a report was produced in December 1971.

14.5 At present, conservation measures are directed towards encouraging skin divers not to collect specimens of the subtidal fauna, and to restrict collecting by island visitors. Since most divers stay on the island, pressure can be brought to bear on them to conform to a code of conduct that has been produced. Casual visitors to the island are given a leaflet requesting their co-operation in preserving the fauna and flora.

14.6 An Advisory Committee, set up to consider the practical problems of establishing the reserve and its associated facilities, has approached the Crown Estate Commissioners regarding the possibility of leasing the seabed around Lundy.

14.7 For the present, pending further investigation of the problems of obtaining and enforcing adequate legislation for the purpose of establishing and maintaining a marine nature reserve a system of voluntary co-operation, based on the code of practice that has been published, is being encouraged on the island.

Skomer

14.8 The island of Skomer, off the Pembrokeshire coast, is a National Nature Reserve owned by NERC but leased to the West Wales Naturalists' Trust who are responsible for its management.



The west coast of Lundy, looking south.

14.9 The Trust has proposed that the NNR should be extended to sublittoral areas up to 0.5 km from low water mark, and that the surrounding water and adjacent coastline, including Martin's Haven and Gateholm, should be declared a marine park.

14.10 This proposal was discussed on March 4, 1972 at a meeting of representatives of the Trust, the Nature Conservancy, the South Wales Sea Fisheries Committee, Dale Fort Field Centre and the Wales Association of Sub-Aqua Clubs.

14.11 The area in question is under severe pressure for divers (see 5.11 and 5.15) and it is proposed that a code of conduct should govern their behaviour and that of other visitors to the marine park.

14.12 Within the area designated as a marine reserve, it is proposed that collection of living material, geological specimens, etc., should be restricted to scientists in possession of a permit.

14.13 It is also proposed that for the purposes of effecting proper control, navigation and anchoring of vessels within the area, should be restricted, except in an emergency.

14.14 In association with these developments, the Trust has proposed the establishment of an information centre at Martin's Haven and an underwater research and data centre at Dale Fort Field Centre.

14.15 Action on these proposals has been deferred pending the publication of this Working Party's findings.

Tor Bay

14.16 The Saltern Cove SSSI was notified for the geological interest of the cliff exposures, but there is a good deal of educational value on the adjacent grassland and foreshore, all belonging to the Local Authority, and a proposal to declare the whole area as a Local Nature Reserve is well advanced.

14.17 The wildlife and educational interests of this area extend below low water into Tor Bay, in which the Local Authority has jurisdiction for navigation purposes under the Tor Bay Harbour Act, 1970. By local arrangement some control of an offshore strip, extending 400 yards from the low water mark boundary of the Nature Reserve, is exercised.

14.18 The subtidal area is marked out with buoys as a surface speed limit area and mooring and water-skiing are prohibited within it. The Technical Department of the Local Authority has laid out markers for a biological survey to be carried out by the local branch of the British Sub-Aqua Club.

14.19 There is no control over public access to the subtidal area but the present restrictions in it, together with its proximity to the Local Nature Reserve, are expected to afford some degree of protection until its status becomes clearer.

Isles of Scilly

14.20 The Isles of Scilly experience pressure from tourists and skin divers; the latter engage in collecting underwater specimens and in the pursuit of 'submarine archaeology' use explosives on wreck sites. The Local Authority has shown an interest in the possibility of establishing a marine reserve in the area.

Farne Islands

14.21 The Farne Islands are National Trust property and are managed in the interest of seals and nesting seabirds on the islands. Collecting in the intertidal zone while not prohibited, is discouraged, and scientists require the consent of the local Management Committee to do so. Skin diving, principally for the exploration of wrecks, is a recent phenomenon. Unlike the situation on Lundy and the Isles of Scilly, none of the divers is based on the islands and voluntary regulation of their activities is difficult. The local Committee has a management plan in hand, which may well include a fringing marine zone.

Deal

14.22 The Deal Council is hoping to establish a national playing field of approximately two square miles in area off the coast of Kent to provide for sports and amenity activities. Once consultation with local bodies and amenity associations is completed, proposals will be put to Parliament in the form of a private Members' bill.

Winter scene at Saltern Cove in Tor Bay, South Devon.



CHAPTER 15.

EDUCATION

15.1 Several of the activities which result in the destruction of habitats and the depletion of marine organisms are due to ignorance and are against the interest of those who cause the damage.

15.2 The National Anglers' Council and the National Federation of Sea Anglers are conscious of the problem created by the excessive demand for bait and the damage caused on some beaches by over-digging. These associations are conducting a campaign to encourage their members to back-fill holes they make on beaches when bait digging and not to take more bait than they actually need.

15.3 The British Sub-Aqua Club has a concern for the preservation of marine life which provides much of the interest attached to diving. In an effort to give its members a positive role when they dive, the Club has embarked on a programme to provide educational courses in marine biology for divers and will shortly include marine biology in the syllabus for the BSAC Diving Certificate. For some years the Club has also encouraged the participation of members of local diving clubs in marine research and benthic surveys, in which the collecting can be controlled and directed to a useful end.

15.4 The British Sub-Aqua Club favours the establishment of marine reserves or parks where its members would be free to observe underwater scenery but subject to control in collecting specimens. Such parks, if established, might act as a magnet for divers but, in the view of the BSAC, would help further training in marine biology and inculcate the idea of conservation of marine animals among its members.

CHAPTER 16.

MONITORING AND RECORDING

16.1 Conservation, in both its planning and management stages, demands a steady input of information about the status and distribution of habitats and species, and of changes taking place. This exists in only a few localized areas of the marine environment and the Working Party has been conscious of how much the lack of quantitative data of this kind has hampered its own deliberations.

16.2 This situation may well improve in future years as monitoring and recording activities, notably in conjunction with pollution and fisheries are initiated, continued or intensified. These are likely to yield data that will be valuable in assessing the damage done to marine species or habitats by human activities.

16.3 Considerable marine expertise exists within NERC institutes and component bodies. With the establishment of the Institute for Marine Environmental Research at Plymouth, experience gained from the long-established monitoring and recording of North Atlantic plankton by the Oceanographic Laboratory, Edinburgh, will be applied to the coastal environment. This will involve research programmes in several coastal areas designed to model the

effects of natural and man-made changes on the biota in the inshore and estuarine environment.

16.4 The Marine Biological Association, Plymouth, the Scottish Marine Biological Association, Oban (formerly Millport), and other marine stations have extensive records extending back for many decades. In these laboratories research workers have over the years carried out detailed quantitative ecological studies of local inshore areas as well as research on the basic biology of selected species. The monitoring of areas to assess the effects of pollution or possible industrial development may also provide a base line of natural population fluctuations. In addition to research in progress at a variety of locations, the opportunity exists to repeat surveys in areas for which detailed past records are available.

16.5 The Fisheries Departments maintain detailed records extending back for many years of the state of fish and shellfish stocks around the UK coast. In addition, statistics of landings from exploited stocks of a range of species (Fish Stock Records, HMSO) give, in conjunction with laboratory population analyses, a useful record of variations in abundance of year classes which, in certain cases, can be attributed to known factors such as the severe winter of 1962-63.

16.6 In addition to the research undertaken by universities on the ecology and basic biology of marine organisms, their teaching activities, along with those of university marine laboratories, Field Studies Centres and the activities of amateur naturalists, generate a good deal of casual information about the distribution of marine (mainly intertidal) organisms. This is rarely quantitative and even less often gathered consistently over a long period. Above all it is not usually in an accessible and usable form.

16.7 A start is already being made to centralize and systematize information about the distribution of certain groups of marine organisms at the Biological Records Centre, Monks Wood. In addition, the Coastal Ecology Research Station, the Department of Trade and Industry and Department of the Environment have prepared lists of coastal environments (almost exclusively intertidal) of scientific interest, in consultation with the appropriate specialist groups.

Distribution of marine organisms

16.8 The Biological Records Centre (BRC) is now co-ordinating data collection and mapping the distribution of some marine organisms. The basis for this is the presence or absence of species within unit areas to allow a comparison of past and present distributions, following the pattern now well established for terrestrial organisms in Britain.

16.9 Amateur societies are relied upon to recruit observers and to screen data submitted. However, it is hoped that marine stations will be the principal source of detail and that interest will grow among sub-aqua divers.

16.10 For schemes covering littoral species, for example

marine algae and molluscs, 10 km squares of the national grid are being used, but for the wider ranging schemes covering the North Sea and Western Approaches the unit will be a square of 15' longitude.

16.11 Progress has now been made with four schemes (on the distribution of algae, echinoderms, isopods and molluscs) and discussions are in progress to institute similar recording schemes for fish and dinoflagellates.

16.12 The most advanced of these schemes is for marine molluscs. Non-quantitative data (chiefly on littoral species) exist in the form of records collected by the Conchological Society on a marine census area basis. These, together with all published and museum records, which have been collected together by species, could form the basis for a valuable series of distribution maps. In addition, the Society is about to launch a more comprehensive scheme to study the present distribution of molluscs at the 10 km level and, in time, maps showing the past and present distribution will be available.

16.13. These are all baseline activities and it will be a long time before any quantitative evidence of change is available.

Distribution of important marine habitats

16.14 Early in 1969, the Coastal Ecology Research Station compiled a list of littoral sites considered important for research, education, or for the diversity of littoral plant and animal life. Emphasis was placed on rocky shores and the information was gathered by circularizing 33 institutions (selected universities and marine laboratories). The sites were those proposed by the respondents, and the list has not been evaluated further.

16.15 The Department of Trade and Industry and the Department of the Environment have prepared, in consultation with NERC institutes, the Nature Conservancy, and the Fisheries Departments, a list of coastal sites which have scientific, educational or other interest and on which Local Authorities are recommended not to initiate remedial or protective measures against oil pollution without first consulting the appropriate Regional Officer of the Nature Conservancy and the District Inspector of Fisheries. These provisions for consultation have recently been extended to include other suspected toxic materials stranded on beaches.

16.16. The Biological Records Centre is associated with a habitat recording scheme that has been prepared for use by sub-aqua divers. A pilot scheme using a record card suitable for use by amateurs is being conducted in south-west England by an Assistant Regional Officer of the Nature Conservancy at Taunton.



CHAPTER 17.

LEGAL CONSIDERATIONS

17.1 Control of the shore and seabed presents legal problems which the Working Party is not competent to evaluate.

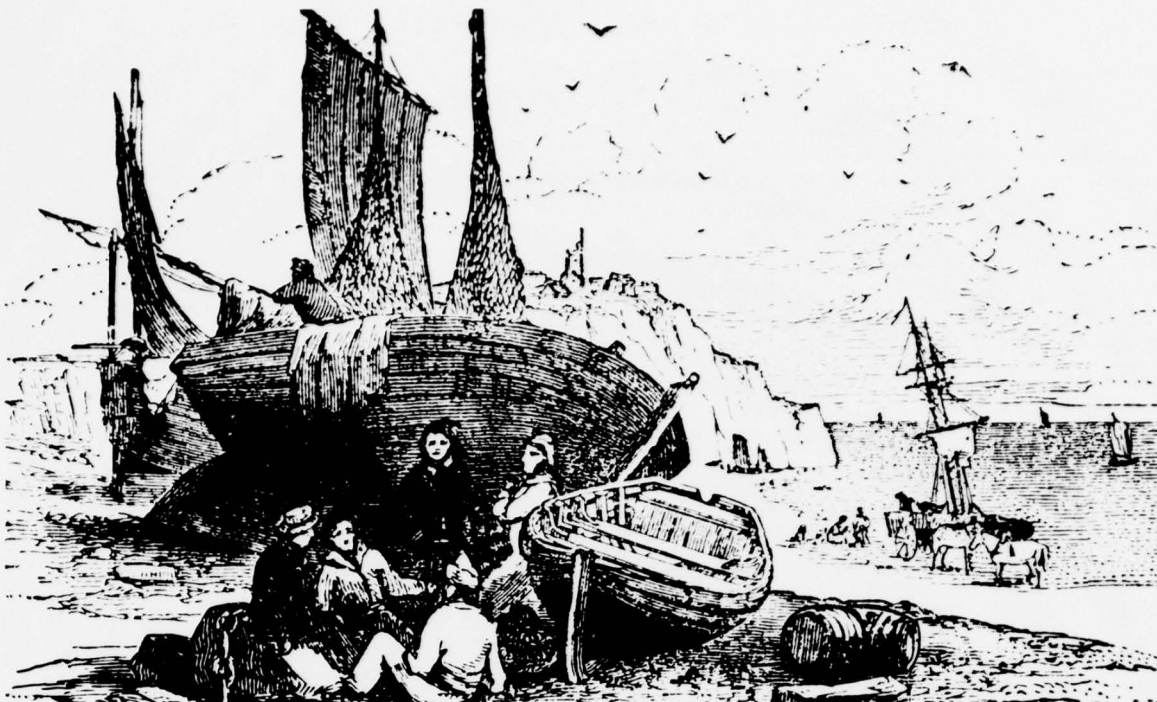
17.2 "At common law the public has a right to fish in the tidal reaches of all rivers and estuaries and in the sea and arms of the sea within the limits of the territorial waters of the kingdom except where the Crown or some subject has acquired a propriety exclusive of the public right or where Parliament has restricted the common law rights of the public. Before Magna Carta the Crown could exclude the right of the public in any particular place by granting a Several Fishery to a subject, and frequently did so; the Crown also had power by means of the writ *de defensione ripariae* to bar fishing and fowling in any river, whether fresh or salt, till the King had taken his pleasure there. Since that date, however, these powers have ceased to exist and the public right can now be excluded or modified only by act of the legislature.

"The public right must be exercised reasonably and in accordance with the statute law. The public has no right to fish by kiddles, weirs or other engines fixed in the soil, for such methods involve a use of the soil which cannot be vested in the public but must belong either to the Crown or to some private owner. The public may, however, lay lines, draw nets and adopt any other ordinary mode of fishing. The public may take shellfish, even though they were laid down by some other fisherman. No member of the public as such may assert a right to the exclusive possession of part of the foreshore for storing shellfish as an incident of his right to fish".

These extracts from Halsbury's Laws of England (vol. 17, paras. 512-517) establish the background against which any proposals to restrict fishing in the interests of conservation of non-commercial species or for the purpose of creating reserves for research or recreation, need to be considered. As we have already observed, the Working Party received evidence from both Sea Fisheries Committees (see 3.6) and the National Anglers' Council (see 7.1) that there would be strong resistance to further encroachment on the public right of fishery.

17.3 We understand that, generally speaking, the shore and seabed are vested in the Crown Estate unless claims for other ownership have been established and admitted. Such claims must relate to the period before Magna Carta unless they result from special Acts, such as those providing for the development of the shore by a local or a harbour authority, the Central Electricity Generating Board, etc. The Duchy of Cornwall also has extensive rights.

17.4 Claims to ownership of the shore relating back to the period before Magna Carta have been admitted in respect of substantial areas of shore and shallow water used for shellfish cultivation, especially for oysters. In effect these areas of shore or shallow water are in private ownership and may be bought and sold. The extent of ownership of the shore in any particular area is difficult to



establish and new claims frequently come to light only when competing interests begin to develop. The records of the Crown Estate are therefore incomplete but provide the best starting point for any investigation. The Crown Estate may also lease areas for special purposes such as gravel extraction or the construction of shore works, but such rights do not extinguish the rights of public fishery, although they may make it virtually impossible to exercise them.

17.5 Substantial areas of shore and shallow water within territorial waters have been the subject of Several or Regulating Orders made under the provisions of the Sea Fisheries Act 1868 and, latterly, the Sea Fisheries (Shellfish) Act 1967. Several Orders have the effect of granting exclusive rights to individuals, companies, fishermen's co-operatives or Sea Fisheries Committees (in England and Wales) in respect of defined areas for the purpose of cultivating molluscan shellfish while Regulating Orders give powers to regulate shell fisheries, e.g. by the operation of a licensing system. In such areas any active interference with the seabed or shellfish laid upon it renders the offender liable not only to prosecution but also to payment of damages. Substantial areas in England and Wales (e.g. in the Wash and in the estuaries of the outer Thames and along the south coast) have been the subject of such Orders and there are a few in Scotland. The provisions of the Acts are still in force; additional Orders have been made in recent years and some new applications are in the pipeline. There is a standard procedure which requires each application to be advertised and if objections are received there is provision for a public enquiry. Orders may be made for a term of up to 60 years and may be renewed.

17.6 The Ministry of Defence may restrict access to areas of coastal waters which are used as firing or bombing ranges or for experimental purposes or for security in areas which border on defence establishments. Limited access may be allowed to commercial fishermen. In areas where cables and submarine pipelines for gas and oil are laid trawl fishing is discouraged.

17.7 Under the provisions of the Sea Fisheries Regulation Act 1966 (which consolidated and extended earlier powers) the Minister of Agriculture, Fisheries and Food may, on the application of a County Council or Borough Council, create a sea fisheries district within territorial waters in England and Wales for the purpose of regulating fisheries. The Sea Fisheries Committee so established may with the consent of the Minister, make bye-laws—

- a) to restrict or prohibit fishing for or taking all or any specified kinds of fish during any specified period;
- b) to restrict or prohibit any method of fishing;
- c) to regulate, protect and develop fisheries for all or any specified kinds of shellfish.

However, it is clear that the intentions of the Act relate to commercial fisheries and although areas may be closed to all kinds of fishing (or particular methods), we are advised that it would not be proper to use these powers to prohibit fishing for purposes not directly connected with fisheries.

17.8 It seems inevitable that to establish marine reserves below low water mark of ordinary tides and within territorial waters, or to place restrictions on access for the purpose of conservation of marine life, scientific research (outside fisheries), or special recreational use, new legislation would be required.

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 18.

GENERAL

18.1 While the Working Party has been deliberating, the White Paper *Framework for Government Research and Development* (Cmd 5046) was published. This foresees a change in the status and terms of reference of the Nature Conservancy. While much of our report deals with the Nature Conservancy as it is at present organized, our conclusions and recommendations will not be affected by this change although the way in which they are implemented may be.

18.2 As requested by Preparatory Group C on 14 December 1971, the Working Party has made a preliminary assessment of the existing evidence of the need for conservation in the marine environment. Although we are aware that in the time available we could not explore fully all the scientific information, we consider that by seeking evidence and views from a wide range of sources we have obtained a fair sample of evidence and opinion to add to our own experience. It is on this basis that we recommend a number of courses of action.

18.3 Because of the number and variety of interests involved in the marine environment it is not surprising that any discussion about possible conservation measures provokes a multitude of viewpoints as to the necessity for such measures. The Working Party gave some consideration to this (3.3-3.7, 9.2) and sought the views of various organizations that might be affected by any proposals (see Appendix I). From the replies received (3.6, 7.1, 15.4) it is obvious that if further consideration is given to this topic the detailed views of all organizations potentially affected (Sea Fisheries Committees, Harbour Authorities, River Boards, Sports Associations, etc) will need to be taken into account.

CHAPTER 19.

INFORMATION

19.1 The Working Party is conscious of the inadequacy of scientific information about the present status of non-commercial plants and animals in British coastal waters, and about recent changes in their status or distribution. The conclusions we have reached are therefore to a considerable extent based on judgment rather than scientific facts derived from long-term investigations.

19.2 Whatever aspect of man's activities in the marine environment is being investigated, an understanding in depth is required about the structure and functioning of biological communities under fluctuating natural conditions. Lacking such understanding, man-made change can be distinguished only by direct association with a specific human activity. Even when such causes can be detected, the significance of the change must be judged in relation to natural fluctuations; when no such causes are known, it can only be concluded that observed changes are temporary and isolated points in a complex, imperfectly-known, chain of natural events.

19.3 For several reasons it appears to us that the need for detailed information about, and a better understanding of, natural fluctuations in the abundance of marine plants and animals will grow in future years. International bodies have already instituted a number of schemes for monitoring the marine environment in connexion with pollution and with conservation. Furthermore, growing public interest in matters affecting the environment, increased public awareness of changes in coastal waters as a result of the growth of recreational activities on the coast and shallow sea, as well as increased pressure on this environment from its various users, will result in a demand for more detailed management than at present.

19.4 For this, long-term ecological studies are needed, with the objective of monitoring and analysing natural population fluctuations and, at selected sites, the effect of various types of man-made influence upon the flora and fauna. Since many human activities are essentially predatory upon established organisms, it is particularly important to increase our knowledge of their reproductive biology and recruitment. We have noted (16.3-16.6) that relevant research is already underway within NERC, the Fisheries Departments and the universities but until it is intensified or, in some cases initiated, enquiries of the sort that have occupied this Working Party will be handicapped by shortage of factual information.

19.5 **Recommendation 1.** In view of the paucity of factual information we have at our disposal, we recommend that long-term studies be intensified or instituted into natural population fluctuations, the reproductive biology and recruitment of intertidal and shallow sublittoral marine organisms, and into the impact of man-made influences upon them. Priority should be given to habitats and species which are already thought to be threatened by human activities.

19.6 We note the start that the Biological Records Centre has made in compiling distribution records of some groups of marine organisms (16.8-16.13) and the compilation by various organizations, including the Coastal Ecology Research Station, of inventories of important intertidal and subtidal habitats (16.14-16.16). We have some reservations about the value of plotting on the basis of 10 km squares or square of 15' of longitude as BRC has proposed (16.10), and about the reliability of information gained in the subtidal habitat recording scheme using largely inexperienced observers (16.16). It may be that this is the best that can be done at present but the quality and usefulness of information gathered should be improved at the earliest opportunity.

19.7 We have reason to believe that in addition to the extensive records of the Fisheries Departments and NERC marine laboratories a good deal of information about the distribution of marine organisms may exist within universities, their marine laboratories, Field Studies Centres and the like (16.6). We welcome the start made by Preparatory

Group F of Council to collect such information relating to biological monitoring and would like to see this information readily available for future enquiries.

Recommendation 2. We therefore recommend that the content and format of the information collected at the Biological Records Centre and other organizations be discussed with the marine biological organizations (e.g. MBA, SMBA) and the Fisheries Laboratories, with a view to ensuring that the various data collecting schemes are nearly as possible consonant with one another and that the data are in a form that will allow maximum benefit to be derived from them.

CHAPTER 20. THE INTERTIDAL ENVIRONMENT

20.1 The area between tidemarks is the most accessible part of the marine environment and is probably most at risk from human interference. A number of coastal National Nature Reserves and some other reserves controlled by voluntary bodies or Local Authorities extend to low water mark of mean ordinary tides (see 13.1-13.10). Thus no new principle is involved in the conservation of the marine environment so far as it relates to the intertidal zone; NERC through the Nature Conservancy already practises it.

20.2 Hitherto the establishment of NNRs in the intertidal zone has been directed very largely to the conservation of physiographic features and the feeding grounds of wildfowl and seabirds. On this account, most of the conserved areas have a soft substratum. Conservation of other elements of the marine fauna and, generally, of the flora has been incidental to this.

20.3 The Nature Conservancy has as an objective the conservation of examples of *all* major natural and semi-natural habitats in Great Britain (2.12). If this objective is taken literally there is no logical reason for excluding from it the conservation of a representative selection of marine intertidal habitats.

20.4 It should be noted that in the intertidal environment the most useful classification of habitats has been found to be one based largely on substrate, floristic and faunistic characteristics. A phytosociological classification which is eminently suitable on land is of very limited applicability to marine environments (2.6).

20.5 It is likely that there are many equivalent examples of most, if not all, types of British intertidal habitat around the coast and while some have been damaged as a result of human activities, it might be argued that many alternative examples remain untouched. We do not know if this is invariably true but, with the growth of population and industry near the coast and increased recreational use of coastal waters, it is likely to become less true in future years. In these circumstances, although there seems to be no pressing need to increase the number of intertidal NNRs, measures to conserve at least some representative intertidal habitats and their marine flora and fauna may become urgently necessary at some time in the future.

20.6 In the short term, studies of the population dynamics of marine organisms that we have recommended (see 19.4 recommendation 1) would benefit from freedom from interference by human agencies, so far as this can be achieved. The small number of sites at which these studies are conducted should therefore have protection similar to that afforded by being included in NNRs. Some suitable sites already have this status, others might be made available in areas of restricted access (for example, in areas controlled by MOD) but it may be necessary to consider establishing new NNRs specifically for this purpose.

Recommendation 3. We recommend that where the best habitats for in-depth studies of the population dynamics of intertidal marine organisms do not exist in present coastal NNRs, the use of other protected areas should be explored and consideration given to establishing new NNRs specifically for this purpose.

20.7 Beyond this, we cannot assess the priority that should be given to conserving intertidal habitats. Information that would show which, if any, type of habitat is particularly threatened, is lacking. In addition to having regard to other national interests, allocation of priorities must take into account competing claims on a finite budget for the establishment of NNRs in the terrestrial environment.

20.8 In furtherance of this assessment of priorities, it would be advantageous to determine the flora and fauna that is already conserved in existing intertidal NNRs and in NNRs likely to be added in the next few years. This should be done in conjunction with a review and analysis of the coastal sites, claimed to be of scientific and educational importance, that has been compiled by the Coastal Ecology Research Station (see chapter 16).

Intertidal flora and fauna.



Recommendation 4. We recommend that a review be undertaken by experienced marine biologists of the marine flora and fauna of existing coastal NNRs and other intertidal areas that have been suggested as having special scientific and educational value.

20.9 It should be noted that if this is done, the number of sites that need to be considered and kept under review in order to gauge the increasing human impact on the coastal environment, and decide the time at which conservation of a particularly threatened habitat becomes necessary, would have been reduced markedly.

Recommendation 5. We recommend that a small Working Party of experts review, in detail, the available scientific information and general developments at intervals of two or three years in order to advise on the urgency of conserving threatened marine environments in the light of information then available.

20.10 The destructive activities of bait-diggers on 'soft' beaches (see 7.3) is not of overwhelming significance to conservation of habitats of this kind because many examples of such beaches are already included in coastal NNRs. The Working Party, however, welcomes the efforts of the National Anglers' Council and National Federation of Sea Anglers to publicize among its members the need to minimize damage to beaches and to make sparing use of bait species.

CHAPTER 21.

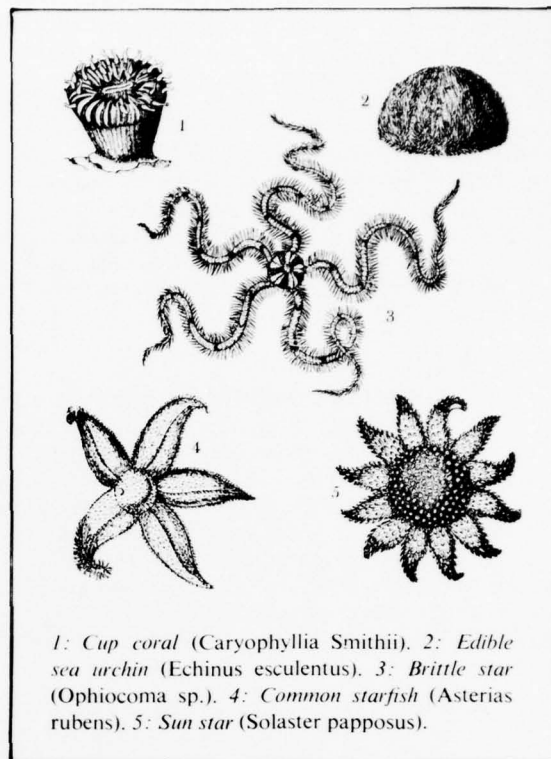
THE sublittoral ENVIRONMENT

21.1 Most of the concern expressed to the Working Party about human depredation of sublittoral flora and fauna referred to the activities of skin divers. This may be because diving is a relatively new and rapidly expanding activity with the unusual feature that the removal of organisms is highly selective and can be very thorough.

21.2 In part, though we cannot estimate how much, the collection of large crustaceans (lobsters, crawfish, crabs) and molluscs (*Pecten*, *Haliotis*) for human consumption, and other organisms (*Echinus*, *Eunicella*) for the souvenir trade, is a commercial undertaking which provides full- or part-time employment for some divers. It is a commercial fishery, the regulation of which—if it is to be regulated—probably rests with the Fisheries Departments.

21.3 Evidence and opinions submitted to us suggest that there may well have been deleterious change in the flora and fauna below tidemarks, particularly as a result of intensive collecting by skin divers, but these changes appear to be purely local in character.

21.4 Such is the extent and variety of the British coastline that even if certain areas suffer biological damage or change as a result of human activities, there are likely to be alternative comparable habitats and ample reserves of most species elsewhere or at depths below 100-150 ft (the maximum at which skin divers usually operate) which are not under such pressure. Shores with difficult access from land have hitherto been protected, though this may change



1: Cup coral (*Caryophyllia Smithii*). 2: Edible sea urchin (*Echinus esculentus*). 3: Brittle star (*Ophiocoma* sp.). 4: Common starfish (*Asterias rubens*). 5: Sun star (*Solaster papposus*).

with the increase in use of motor boats, but coastal military installations, firing ranges, and the like to which the general public does not normally have access, continue to serve as reservoirs of shore and shallow water species.

21.5 Areas in which skin diving is particularly common because diving conditions are most favourable are in south-west England, south-west and north Wales and, to an increasing extent, in Scotland. Evidence of serious local impoverishment of the underwater fauna and ecological change resulting from this pressure was available only from one place in south-west Wales, but since pressures are similar elsewhere we assume comparable changes have taken place even though detailed evidence is lacking.

21.6 Most of the ecological change (growth of algae with concomitant faunistic changes) appears to be due to the reduction in number of herbivorous *Echinus* through excessive collecting at particular localities. We have not the information to assess the significance and extent of these changes, but we doubt if *Echinus* is in danger of serious depletion around the British coast although the ecological changes associated with overcollecting it, though localized, might be of more consequence. The logical way, if it is necessary, to prevent these changes and to conserve *Echinus*, would be to restrict the collection of this animal. Since it must be regarded as a commercial species, this is a matter for negotiation with the Fisheries Departments, the bodies most likely to be given responsibility for regulating its exploitation.

21.7 Because of its slow growth, the intensive collection of *Eumicella* may give cause for some concern, but since we have no knowledge of its distribution and abundance, the reality of the threat to this species cannot be assessed. The most appropriate conservation measure for this species, if it proved necessary, would be to regulate collection of it, but since, like *Echinus*, it must be regarded as a commercially exploited species, responsibility for it rests with the Fisheries Departments.

21.8 Legal problems of control of the seabed are unresolved but cannot be overlooked. They would require further examination and clarification before the establishment of NNRs extending into the sublittoral zone could be contemplated.

21.9 Although at present the Nature Conservancy's interests do not extend below low water mark, there is no biological justification for excluding sublittoral marine habitats.

21.10 In the light of all these considerations:—

Recommendation 6. We recommend that, although there is little evidence that sublittoral habitats are at present endangered to the extent that would provide scientific justification for the establishment of NNRs in this environment, the legal barriers to doing so should be explored in case the need for them is demonstrated at a later date.

Recommendation 7. It may be the case, though it is not established, that *Echinus* and *Eumicella*, and possibly other species, are collected in too great a quantity in some areas. We recommend that, since these must now be regarded as commercially exploited species, discussions should be held with the Fisheries Departments to determine whether or not regulation of their collection is desirable.

We draw attention here to **Recommendation 5** which applies to the subtidal environment as much as to the intertidal.

21.11 Over-collecting by skin divers is detrimental to their own interests, whether they are engaged in commercial exploitation of marine resources or, like the majority of divers, dive for recreation. We therefore welcome efforts of the British Sub-Aqua Club to educate its members in marine biology, and the advantage of non-destructive observation of the marine fauna.

21.12 Evidence available to us suggests that the supply trade in biological material for teaching and research has a negligible impact on the marine flora and fauna. Educational field courses, particularly elementary ones, inflict damage only on particular beaches close to Field Study Centres, marine laboratories, and in local nature reserves used by school parties. We welcome efforts to educate the leaders of such parties on the needs of marine conservation, but believe that more could be done in this direction.

Recommendation 8. We recommend that the attention of the Nature Conservancy Council and the Department of Education and Science be drawn to the need for increased

efforts to educate the leaders of educational field courses to treat the coastal marine environment with care and to limit collecting of specimens to what is necessary.

21.13 Discharge of municipal and industrial wastes into coastal waters causes environmental change and, in some places deterioration. At present, this appears to be limited to fairly well defined, if extensive, areas such as the north-east coast of England, the region of the Mersey, and the Bristol Channel. We have not assessed this in relation to conservation.

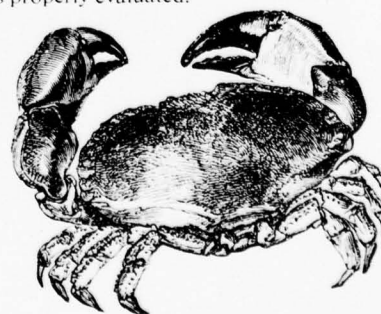
CHAPTER 22. ADVISORY SERVICE

22.1 Voluntary bodies and Local Authorities have schemes to establish 'underwater parks' at various localities including Lundy, Tor Bay, and Skomer, in which the activities of skin divers will be regulated to conserve an interesting and varied fauna and flora. It is anticipated that such parks would act as a magnet for divers and provide a valuable opportunity for propaganda about the virtues of non-destructive behaviour in the marine environment. We believe that underwater parks will serve a similar enlightened recreational function to parks of various kinds on land.

22.2 While it is clearly not the function of a Research Council to engage in this activity, the establishment of underwater parks will have implications for the Nature Conservancy Council through its responsibility to advise on conservation matters.

22.3 It can be foreseen that the management of underwater parks will generate unfamiliar conservation problems, as will assessment of priorities for other forms of marine conservation embodied in the foregoing recommendations. Considerable expertise in marine biology exists within NERC, the Fisheries Departments and the universities; advantage should be taken of this.

Recommendation 9. We recommend that in matters relating to marine conservation advantage be taken of the marine biological knowledge and experience within NERC, the Fisheries Departments and the universities. The sources of information and advice should be identified and liaison established with them. A senior marine ecologist should be involved at a high level in future policy decisions about conservation in the marine environment to ensure that this advice is properly evaluated.



CHAPTER 23.

SUMMARY OF RECOMMENDATIONS

Recommendation 1. In view of the paucity of factual information we have at our disposal, we recommend that long-term studies be intensified or instituted into natural population fluctuations, the reproductive biology and recruitment of intertidal and shallow sublittoral marine organisms, and into the impact of man-made influences upon them. Priority should be given to habitats and species which are already thought to be threatened by human activities.

Recommendation 2. We recommend that the content and format of the information collected at the Biological Records Centre and other organizations be discussed with the marine biological organizations (e.g. MBA, SMBA) and the Fisheries Laboratories, with a view to ensuring that the various data collecting schemes are as nearly as possible consonant with one another and that the data are in a form that will allow maximum benefit to be derived from them.

Recommendation 3. We recommend that where the best habitats for in-depth studies of the population dynamics of intertidal marine organisms do not exist in present coastal NNRs the use of other protected areas should be explored and consideration given to establishing new NNRs specifically for this purpose.

Recommendation 4. We recommend that a review be undertaken by experienced marine biologists of the marine flora and fauna of existing coastal NNRs and other intertidal areas that have been suggested as having special scientific and educational value.

Recommendation 5. We recommend that a small Working Party of experts review, in detail, the available scientific information and general developments, at intervals of two

or three years in order to advise on the urgency of conserving threatened marine environments in the light of information then available.

Recommendation 6. We recommend that, although there is little evidence that sublittoral habitats are at present endangered to the extent that would provide scientific justification for the establishment of NNRs in this environment, the legal barriers to doing so should be explored in case the need for them is demonstrated at a later date.

Recommendation 7. It may be the case, though it is not established, that *Echinus* and *Lamella*, and possibly other species, are collected in too great a quantity in some areas. We recommend that, since these must now be regarded as commercially exploited species, discussions should be held with the Fisheries Departments to determine whether or not regulation of their collection is desirable.

Recommendation 8. We recommend that the attention of the Nature Conservancy Council and the Department of Education and Science be drawn to the need for increased efforts to educate the leaders of educational field courses to treat the coastal marine environment with care and to limit collecting of specimens to what is necessary.

Recommendation 9. We recommend that in matters relating to marine conservation advantage be taken of the marine biological knowledge and experience within NERC, the Fisheries Departments and the universities. The sources of information and advice should be identified and liaison established with them. A senior marine ecologist should be involved at a high level in future policy decisions about conservation in the marine environment to ensure that this advice is properly evaluated.

Illustrations: The Council wishes to express its gratitude to the following organizations and individuals who have supplied photographs to illustrate this report:— Institute of Geological Sciences; Ministry of Agriculture, Fisheries and Food, Lowestoft; Marine Biological Association, Plymouth (D. Nicholson, G. Potts and R. Swinfen); Marine Science Laboratories, Menai Bridge (K. Hiscock); Nature Conservancy (G. Farrar, B. Forman and P. Wakely) and R. Jackman and E. Ramsay.

Organizations and individuals asked to submit their detailed views or evidence (in form laid out below):—

County Councils, County Borough Councils, etc.:

Cornwall
Devon
Pembrokeshire
Dorset
Exeter
Torquay
Isles of Scilly
Plymouth
Shetland Isles

Sports Associations:

British Sub-Aqua Club
National Anglers' Council

Sea Fisheries Committees and similar organizations:

Association of Sea Fisheries Committees (who circulated all members)
Scottish Inshore White Fish Producers' Association Ltd
Salmon Net Fishing Association of Scotland
Fisheries Organisation Society Ltd

Conservation Organizations:

Committee for Environmental Conservation
Council for Nature
Countryside Commission
Society for the Promotion of Nature Reserves
Conservation Society

Marine Stations:

Dale Fort Field Studies Centre
Oriental Field Studies Centre
Marine Biological Station, Port Erin
Gatty Marine Laboratory, St Andrews
Marine Biology Station, Belfast
Marine Science Laboratories, Menai Bridge

Marine Recorders and others:

Mr A Wheeler	Dr R Lincoln
Mrs S Turk	Dr J H Price
Mrs N F McMillan	Dr T Norton
Mr A Norris	Mr I G Grainger
Dr D J Bellamy	

Form of Circular Letter

We are aware that general impressions of scarcity or decline in numbers of an organism are very difficult to confirm except by detailed studies conducted over a substantial period of time. It is also extremely difficult to distinguish natural fluctuations from man-induced changes.

It is quite likely that you will only be able to give a general impression but this will be helpful, especially if the information could be given under the following headings:

1. Species or common name to which data relates.
2. Name and status of observer (i.e. scientist, fisherman, diver, etc.)
3. Area to which observations apply.
4. Period covered by observations.
5. Frequency of observations.
6. Changes observed and time of onset of change.
7. Qualitative Quantitative nature of data and method of observation, i.e.
 - a. changes in counts or frequencies of contacts per unit area over period covered;
 - and or b. changes in counts or frequencies of contact per unit line of searching;
 - and or c. progressive decline in number of species over period covered;
 - and or d. progressive increase in time taken to collect a standard number of specimens;
 - and or e. evidence of local souvenir trade increase or decrease due to decline of supply;
 - and or f. other changes observed.
8. Suggested cause(s) of change.
9. Any other remarks.

APPENDIX II

Papers considered by the Working Party

GENERAL PAPERS

Management of wildlife as a natural resource—views of the Nature Conservancy
Memorandum on species and habitats at risk—Dr G W Potts
Work of the Biological Records Centre, Monks Wood and marine recording
Report of meeting held at Dale Fort on 4 March
Habitat recording scheme—J Lamerton (Nature Conservancy)
Letter from—Dr D J Bellamy (University of Durham)
Nature Conservation at the Coast. Special Study Report, Countryside Commission. HMSO London, 1970.

FISHERIES REGULATIONS AND LEGAL ASPECTS

Note by MAFF on fisheries conservation and regulation
Examination of existing framework of laws relating to proposals for the establishment and management of marine nature reserves in England and Wales—D H Wood (Nature Conservancy)

CONSERVATION SOCIETIES, NATURALISTS' TRUSTS, MARINE RECORDERS & OTHER ORGANIZATIONS

Submissions from:

Council for Nature—
including evidence from Field Studies Council, National Trust, Scottish National Trust, Royal Society for the Protection of Birds, Seabird Group, Committee for Environmental Conservation
Society for the Promotion of Nature Reserves—
including evidence from County Naturalists' Trusts (Cornwall, Devon, Dorset, N. Wales)
Dorset Naturalists' Trust
Dorset Natural History and Archaeological Society
Mrs S Turk, Conchological Society
Professor L A Harvey

Other submissions:

Change in abundance of fish and polychaete species in Dorset—J Churchouse
Population changes in Poole Harbour—L Ogilvy-Morris
The Fleet Waters—W C Cook
Marine birds—M R Shepherd
Diving off the East Coast—Sqn. Ldr. D A J Taylor
Change in abundance of molluscs—N C McMillan

MARINE LABORATORIES

Submissions from:

Orielton Field Centre—Dr R G Crump
Dale Fort Field Centre—Mr D C Emerson
Marine Biological Association—Dr G W Potts
Marine Station, Port Erin—Professor E Naylor
Marine Sciences Laboratory, Menai Bridge—Professor G E Fogg
Gatty Marine Laboratory: St Andrews—Professor M S Laverack

BIOLOGICAL SUPPLY

Numbers of marine species sold 1971-72 by T Gerrard & Co Ltd
Numbers of marine species sold 1971-72 by Harris Biological Supplies Ltd
Number of marine species sold 1939-71 by Marine Biological Association, Plymouth

SEA FISHERIES COMMITTEES AND SIMILAR ORGANIZATIONS

Submissions from:

South Wales
Southern
North Eastern
Eastern
Cornwall
Scottish Herring Producers' Association Ltd.
Fisheries Organisation Society, Ltd

COUNTY COUNCILS AND OTHER AUTHORITIES

Submissions from:

Dorset
Pembroke
Cornwall
Plymouth
Scilly Isles
Swanage
Weymouth

SPORTS ASSOCIATIONS

Submissions from:

British Sub-Aqua Club
National Anglers' Council
National Federation of Sea Anglers

PROPOSED OR EXISTING UNDERWATER RESERVES:

Projected underwater reserves—Office note
Lundy Reserve—K Hiscock
Lundy Reserve—I G Grainger
Skomer Reserve—D Miles (West Wales Naturalists' Trust)
Establishing Underwater Parks—O L Wallis
(Paper presented at the 36th North American Wildlife and Natural Resources Conference, Portland, Oregon.
March 8, 1971.)

VISITORS WHO ATTENDED SECOND MEETING AND DISCUSSED ASPECTS OF THE SUBJECT WITH THE WORKING PARTY:

Mr B J F Haller	Harris Biological Supplies, Ltd
Dr F Perring	Biological Records Centre, Monks Wood
Mr R Vallintine	Director, British Sub-Aqua Club
Mr P Tombleson	Secretary, National Anglers' Council
Mr M J North	Secretary, National Federation of Sea Anglers
Mr J Lamerton	Nature Conservancy, SW England
Mr D Miles	West Wales Naturalists' Trust
Dr D J Bellamy	Representing Council for Nature and Society for the Promotion of Nature Reserves

APPENDIX III

Summary of evidence of change in abundance of marine organisms submitted to this Working Party by Marine Laboratories, Conservation Societies and other organizations

(Note: Generally speaking the evidence is listed as received. However, for the non-specialist some attempt has been made to identify specific names with common ones.)

SPECIES OR COMMON NAME TO WHICH DATA APPLY	NAME AND STATUS OF OBSERVER	AREA TO WHICH OBSERVATIONS APPLY	PERIOD COVERED BY OBSERVATIONS	FREQUENCY OF OBSERVATIONS	CHANGES OBSERVED AND TIME OF ONSET OF CHANGE	NATURE OF DATA	SUGGESTED CAUSE AND REMARKS
ALGAE							
<i>Laminaria</i> sp. (kelp)	G Dineson, Diver	East Coast, England			Disappearing	Observation	Pollution Decline of associated molluscs
<i>Alaria</i> sp. (kelp)	MBA, Staff	Plymouth inshore areas	since 1945	Irregular	Decline in abundance	Observation	Climatic variation
Rare red algae and some delicate brown algae	MBA, Staff	Plymouth Sound	1850 to present	Every 2 or 3 years	since 1941 decline in abundance	Observation	Sewage and other pollution
Some red algae	MBA, Staff	Wembury and Looe	Recent years	Irregular	decline in abundance	Observation	Unknown
<i>Ulva lactuca</i> (sea lettuce)	L Ogilvy-Morris	Poole Harbour	1948-1972		Bloom over last 2 years	Observation	
<i>Fucus</i> sp. (wrack)	L Ogilvy-Morris	Poole Harbour	1948-1972		Bloom over last 2 years	Observation	
ANGIOSPERMAE							
<i>Zostera</i> sp. (eel grass)	L Ogilvy-Morris	Poole Harbour	1948-1972		Beds being damaged	Observation	Bait digging
COELENTERATA							
<i>Eunicella verrucosa</i> (sea fan)	Cornwall Nat. Trust	Cornish coast			Progressive decline in numbers	Observation	Commercial collecting
<i>Eunicella verrucosa</i> (sea fan)	North Wales Trust	N Wales			Progressive decline in numbers	Observation	Collecting by skin divers
Gorgonians (sea fan)	Devon Nat. Trust	Devon & Lundy			Decline in numbers	Observation	Collecting by skin divers
Gorgonians (sea fan)	RG Crump, Field Studies Centre	Martins Haven, Pembrokeshire	1962-1972, continuing	Irregular	Decline in numbers	Observation	Collecting by skin divers
Cup Coral	RG Crump	Martins Haven, Pembrokeshire	1962-1972, continuing	Irregular	Decline in numbers	Observation	Collecting by skin divers
<i>Anemonia sulcata</i> (sea anemone)	J B Hawthorne, Zoologist (Dorset Nat. Trust)	Dorset Coast	1960-1972	Several times per year at some sites, irregular for rest	Reduced in numbers after 1962 3 winter but now recovered	Observation	Severe winter 1962 3
<i>Bunodactis verrucosa</i> (sea anemone)	J B Hawthorne	Dorset Coast	1960-1972	Several times per year at some sites, irregular for rest	Extirminated after 1962 3 now recovered	Observation	Severe winter 1962 3
<i>Adamsia palliata</i> (sea anemone)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
<i>Aiptasia couchi</i> (sea anemone)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
<i>Aurelia aurita</i> (jellyfish)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
Hydroids	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown

SPECIES OR COMMON NAME TO WHICH DATA APPLY	NAME AND STATUS OF OBSERVER	AREA TO WHICH OBSERVATIONS APPLY	PERIOD COVERED BY OBSERVATIONS	FREQUENCY OF OBSERVATIONS	CHANGES OBSERVED AND TIME OF ONSET OF CHANGE	NATURE OF DATA	SUGGESTED CAUSE AND REMARKS
MOLLUSCA							
<i>Pecten maximus</i> (scallop)	RG Crump, Field Studies Centre	Martins Haven	1962/1972 continuing	Irregular	Decline in numbers	Observation	Collecting by amateur and commercial divers
<i>Pecten maximus</i> (scallop)	N. Wales Nat. Trust	N. Wales			Decline in numbers	Observation	Overfishing by skin divers
<i>Cyprina islandica</i> (black clam)	DC Emerson, Field Studies Centre	Millford Haven, Skomer, Martins Haven			Decline in numbers		Commercial collecting
<i>Zirfaea crispata</i> (oval piddock)	N F McMillan (Professional malacologist)	Hilbre Island	1940-1969		Decline in numbers		Extinction of local habitat
<i>Littorina littorea</i> (edible periwinkle)	N F McMillan	Cheshire Side of River Mersey	1935-1971	Pre 1950, once a week Post 1950, occasional	Disappearance of littorinids c. 1946	Approx. 15 minutes search each visit	Increased pollution of Mersey
<i>L. saxatilis</i> (rough periwinkle)	N F McMillan	Cheshire Side of River Mersey	1935-1971				
<i>L. littoralis</i> (flat periwinkle)	N F McMillan	Cheshire Side of River Mersey	1935-1971				
Nudibranchs (sea slugs)	N F McMillan	Hilbre Island	1940-1972				
<i>Haliotis tuberculata</i> (ormer)	N. Wales Nat. Trust	Channel Isles			Decline in numbers	Observation	Increased pollution of water
<i>Dentalium</i> sp. (elephant's tusk shell)	E J Rees, Menai Bridge	N. Wales			Spectacular decline since 1890's	Observation	Collecting by skin divers
<i>Anomia ephippium</i> (saddle oyster)	J B Hawthorne, Zoologist (Dorset Nat. Trust)	Dorset Coast	1960-1972	Several times a year at some sites, irregular at others	Extirminated 1962, 3, now recovered	Now only found as dead shells	Severe winter of 1962/63
<i>Gibbula umbilicalis</i> (top shell)	J B Hawthorne	Dorset Coast	1960-1972		Reduced in numbers, 1962, 3 now recovered		
<i>Monodonta lineata</i> (top shell)	J B Hawthorne	Dorset Coast	1960-1972		Extirminated 1962, 3, now recovered		
<i>Pholas dactylus</i> (piddock)	J B Hawthorne	Dorset Coast	1960-1972		Reduced in numbers, 1962, 3 now recovered		
<i>Patella intermedia</i> (limpet)	MBA Staff	Trevone	Recent years	Irregular	Decline in numbers	Observation	Unknown
<i>Cardium edule</i> (cockle)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
<i>Ensis</i> sp. (razor shell)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown

SPECIES OR COMMON NAME TO WHICH DATA APPLY	NAME AND STATUS OF OBSERVER	AREA TO WHICH OBSERVATIONS APPLY	PERIOD COVERED BY OBSERVATIONS	FREQUENCY OF OBSERVATIONS	CHANGES OBSERVED AND TIME OF ONSET OF CHANGE	NATURE OF DATA	SUGGESTED CAUSE AND REMARKS
POLYCHAETA							
<i>Nereis virens</i> (rag worm)	N. Wales Nat. Trust	Menai Straits			Progressive decline in numbers	Observation	Commercial bait digging. Educational collecting
<i>Nereis virens</i> (rag worm)	J Churchouse, Weymouth Angling Soc. & Marine Biol. Group	The Fleet (eastern end) Dorset	For last 5 years	4 times per month	Decline in population	Observation	
<i>Arenicola marina</i> (lug worm)	J Churchouse	The Fleet (eastern end) Dorset	For last 5 years	4 times per month	Decline in population	Observation	
<i>Arenicola caudata</i> (lug worm)	J Churchouse	The Fleet (eastern end) Dorset	For last 5 years	4 times per month	Decline in population	Observation	Excessive all year round bait digging. Effect on flatfish and bivalve populations
<i>Nereis diversicolor</i> (rag worm)	J Churchouse	The Fleet (eastern end) Dorset	For last 5 years	4 times per month	Decline in population	Observation	
<i>Nephtys hombergi</i> (cat worm)	J Churchouse	The Fleet (eastern end) Dorset	For last 5 years	4 times per month	Complete disappearance	Observation	
<i>N. caeca</i> (cat worm)	J Churchouse	The Fleet (eastern end) Dorset	For last 5 years	4 times per month	Complete disappearance	Observation	
<i>Arenicola marina</i> (lug worm)	L Ogilvy-Morris	Poole Harbour	1948-1972		Decline in numbers	Observation	Excessive bait digging. Affecting populations of gapers and clams
<i>Nereis</i> sp. (rag worm) <i>Audouinia cirriformia</i>	L Ogilvy-Morris J B Hawthorne (Dorset Nat. Trust)	Poole Harbour Dorset Coast	1948-1972 1960-1972	Several times a year at some sites, irregular at others	Decline in numbers Reduced numbers after 1962.3	Observation Observation	Severe winter of 1962.3
CRUSTACEA							
<i>Homarus gammarus</i> (lobster)	RG Crump, Field Studies Centre	Martins Haven	1962-1972 continuing	Irregular	Progressive decline, now rare	Observation	Collecting by divers
<i>Homarus gammarus</i> (lobster)	DC Emerson, Field Studies Centre	Martins Haven, Skomer, Milford Haven N. Wales			Decline in numbers	Observation	Collecting by divers
<i>Homarus gammarus</i> (lobster)	N. Wales Trust				Decline in numbers	Observation	Overfishing by divers
<i>Homarus gammarus</i> (lobster)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown

SPECIES OR COMMON NAME TO WHICH DATA APPLY	NAME AND STATUS OF OBSERVER	AREA TO WHICH OBSERVATIONS APPLY	PERIOD COVERED BY OBSERVATIONS	FREQUENCY OF OBSERVATIONS	CHANGES OBSERVED AND TIME OF ONSET OF CHANGE	NATURE OF DATA	SUGGESTED CAUSE AND REMARKS
CRUSTACEA (contd.)							
<i>Palinurus elephas</i> (crawfish)	RG Crump, Field Studies	Martins Haven	1962-1972 continuing	Irregular	Progressive decline, now rare	Observation	Unknown
<i>Palinurus elephas</i> (crawfish)	DC Emerson, Field Studies Centre	Martins Haven, Skomer, Milford Haven			Decline in numbers	Observation	Unknown
<i>Palinurus elephas</i> (crawfish)	N. Wales Nat. Trust	N. Wales			Decline in numbers	Observation	Unknown
<i>Cancer pagurus</i> (edible crab)	RG Crump, Field Studies Centre	Martins Haven	1962-1972 continuing	Irregular	Decline in numbers, now rare	Observation	Overfishing by divers
<i>Cancer pagurus</i> (edible crab)	DC Emerson, Field Studies Centre	Martins Haven, Skomer, Milford Haven			Decline in numbers	Observation	Overfishing by divers
<i>Cancer pagurus</i> (edible crab)	N. Wales Trust	N. Wales			Decline in numbers	Observation	Overfishing by divers
<i>Portunus puber</i> (tidler crab)	J B Hawthorne, (Dorset Nat. Trust)	Dorset Coast	1960-1972	Several times a year at some sites, irregular at others	Extirminated 1962 3, now recovered	Observation	Severe winter 1962 3
<i>Maia squinado</i> (spider crab)	J B Hawthorne	Dorset Coast	1960-1972		Reduced in numbers 1962 3, now recovered	Observation	
<i>Balanus perforatus</i> (barnacle)	J B Hawthorne	Dorset Coast	1960-1972		Reduced in numbers 1962 3, now recovered	Observation	
<i>Leander</i> sp. (prawn)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
<i>Montula</i> sp.	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
<i>Pandalus montagui</i> (prawn)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
<i>Maia squinado</i> (spider crab)	Sundry fishermen	Hayling Island to Lyme Regis	14 years	Seasonal while fishing	Disappearance after 1962 63 winter, now some recovery	Numbers found in pots	Severe winter of 1962 63
Small lobster	Sundry fishermen	Swanage area	Since 1947	Seasonal	Decline since 1966	Observation	Unknown
Small green shore crab	Fisherman	Swanage	Since 1947	All year round	Decline since 1966	Observation	Unknown
Crabs	Dorset Nat. Trust	Dorset Coast			Decline in numbers		Heavy fishing by divers
Lobsters	Dorset Nat. Trust	Dorset Coast			Decline in numbers		Heavy fishing by divers
Crawfish	Dorset Nat. Trust	Dorset Coast			Decline in numbers		Heavy fishing by divers
Prawns	Sundry fishermen	Fleet, Dorset	Since 1947	Irregular	Extirminated 1962 3, some species recovered	Observation	Severe winter of 1962 3

SPECIES OR COMMON NAME TO WHICH DATA APPLY	NAME AND STATUS OF OBSERVER	AREA TO WHICH OBSERVATIONS APPLY	PERIOD COVERED BY OBSERVATIONS	FREQUENCY OF OBSERVATIONS	CHANGES OBSERVED AND TIME OF ONSET OF CHANGE	NATURE OF DATA	SUGGESTED CAUSE AND REMARKS
ECHINODERMATA							
<i>Echinus exculentus</i> (edible sea urchin)	DC Emerson, Field Studies Centre	Martins Haven	1969-1972 continuing	Regular March-September	Complete disappearance by Easter 1971	Some quantitative data and comparison with nearby bays	Collecting by skin divers
<i>Echinus exculentus</i> (edible sea urchin)	RG Crump, Field Studies Centre	Martins Haven	1963-1971 continuing	Irregular	Decrease in total numbers, smaller av. test diameter	Longer time to observe given number. Reduction in average size from 5"-3"	Collecting by skin divers. Marked increase in extent of <i>Laminaria</i> beds
<i>Echinus exculentus</i> (edible sea urchin)	Cornwall Trust	Cornish Coast			Decline in numbers	Observation	Commercial & educational collecting
<i>Echinus exculentus</i> (edible sea urchin)	N. Wales Nat. Trust	N. Wales			Decline in numbers	Observation	Overfishing by divers
<i>Solaster papposus</i> (sun star)	DC Emerson, Field Studies Centre	Martins Haven, Skomer, Milford Haven			Decline in numbers	Observation	Overfishing by divers
<i>Marthasterias glacialis</i> (starfish)	DC Emerson	Martins Haven, Skomer, Milford Haven	1970-1972 continuing		Small numbers 1970, absent 1971	Observation	Overfishing by divers
<i>Luidia</i> sp. (starfish)	DC Emerson	Martins Haven, Skomer, Milford Haven	1970-1972 continuing		Small numbers 1970, absent 1971	Observation	Overfishing by divers
<i>Hemicia sanguinolenta</i> (starfish)	DC Emerson	Martins Haven, Skomer, Milford Haven	1970-1972 continuing		Decline in numbers	Numbers found per 40 minute search	Overfishing by divers
<i>Asterina gibbosa</i> (starfish)	J B Hawthorne, (Dorset Nat. Trust)	Dorset Coast	1960-1972	Several a year at some sites, others irregular	Extirminated after 1962, 3 in some localities	Observation	Severe winter 1962-63
<i>Antedon</i> sp. (feather star)	E I Rees, Menai Bridge	N. Wales			Absent from Menai Straits, still common on rocky ground of N. coast of Anglesey	Observation	
ECHIUROIDEA							
<i>Thalassoma neptuni</i>	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown

SPECIES OR COMMON NAME TO WHICH DATA APPLY	NAME AND STATUS OF OBSERVER	AREA TO WHICH OBSERVATIONS APPLY	PERIOD COVERED BY OBSERVATIONS	FREQUENCY OF OBSERVATIONS	CHANGES OBSERVED AND TIME OF ONSET OF CHANGE	NATURE OF DATA	SUGGESTED CAUSE AND REMARKS
CHORDATA							
Tunicata							
<i>Ciona</i> sp. (sea squirt)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
<i>Styela</i> sp. (sea squirt)	MBA Staff	Plymouth area	Recent years	Irregular	Decline in abundance	Observation	Unknown
Vertebrata							
Skate	Sundry fishermen	Isle of Wight to Weymouth N. Wales	14 years	Seasonal whilst fishing	Progressive decline since 1968	Reduction in catches	Not known
<i>Raja batris</i> (ray)	E I Rees, Menai Bridge				Common in 1930's and 40's, now rare	Reduction in catches	
<i>Dicentrarchus labrax</i> (bass)	J Churchouse—Sec. Weymouth Ang. Soc. & Marine Biol. Group	Weymouth Portland	1952-1972 continuing		i.) In Fleet area: decline in numbers caught since 1962. ii.) In Weymouth Portland area: decline in numbers caught	Collation of reports and observations of 300 members	Local cyanide pollution in 1952, further decrease due to human activity and bad breeding years. Fishing by divers and effects of salvaging with explosives
<i>Labrus bergyllia</i> (bullwrasse)	J Churchouse—Sec. Weymouth Ang. Soc. & Marine Biol. Group	Stone Pier, Weymouth	1966-72 continuing	3-5 times per month from April-October	Decline of all after 1962 3 winter and then some recovery. Decline from 1966 of goldsinny and bullwrasse	Numbers caught	Sewage pollution
<i>Crenilabrus melops</i> (corkwing wrasse)	J Churchouse	Stone Pier, Weymouth	1966-1972 continuing				
<i>Centrolabrus exoletus</i> (rock cook)	J Churchouse	Stone Pier, Weymouth	1966-1972 continuing				
<i>Ctenolabrus rupestris</i> (goldsinny wrasse)	J Churchouse	Stone Pier, Weymouth	1966-1972 continuing				
GENERAL: Inshore plankton	MBA Staff	Plymouth inshore stations	Recent years	Annually	Decline in abundance	Quantitative	Urbanization and increased freshwater run off.

APPENDIX IV

Sales of living and preserved specimens by MBA, Plymouth and two biological supply companies 1971/72

	HARRIS BIOLOGICAL SUPPLIES LTD	T GERRARD & CO LTD	M.B.A SPECIMENS DEPT
PORIFERA			
<i>Grantia compressa</i> (sponge)	114 tubes of 10		268
<i>Sycon ciliatum</i> (sponge)	27 tubes of 10		
<i>Spongilla</i> sp. (sponge)	34 tubes of 10		
COELENTERATA			
<i>Obelia geniculata</i> hydroids, selected with gonothecae	65 tubes of 10		18 tubes
<i>Obelia</i> medusae (supply spasmodic)	63 tubes of 5		1096
<i>Tubularia</i> sp.	5 tubes of 5		25 tubes
<i>Alcyonium digitatum</i> (dead-men's fingers)	23		12
<i>Actinia equina</i> (anemone)	223	738	442
CTENOPHORA			
<i>Pleurobrachia pileus</i> (sea-gooseberry)	26 tubes of 3		
NEMERTINEA			
<i>Lineus</i> sp. (bootlace worm)	10 tubes of 5		216
ANNELIDA			
<i>Nereis</i> (ragworm) (total)		383	3190
<i>Sabella pavonina</i> (fan worm)	79		228
<i>Aphrodite aculeata</i> (sea mouse)	94		167
<i>Pomatoceros</i> sp. (keel worm)		1075 units	6630
<i>Arenicola marina</i> (lug worm)		1114	213
CRUSTACEA			
<i>Lepas anatifera</i> (goose barnacle)	48 tubes of 5		503
<i>Carcinus maenas</i> (shore crab)	448	1003	7216
<i>Nephrops</i> sp. (Norway lobster)		1396	
MOLLUSCA			
<i>Chitons</i> (coat-of-mail shell)	29 tubes of 5		179
<i>Patella vulgata</i> (limpet)	30 × 10	120	1463
<i>Buccinum undatum</i> (whelk)	41 tubes of 5	75	331
<i>Aplysia punctata</i> (sea hare)	40		141
<i>Acanthodoris pilosa</i> (sea slug)	16		
<i>Pecten</i> sp. (scallop)	195		386
<i>Haliotis</i> (ormer)	1		
<i>Sepia officinalis</i> (cuttle fish)	170	53	413
<i>Loligo</i> sp. (squid)		83	23
<i>Mytilus edulis</i> (mussel)		367	4000
Piddocks		200	
ECHINODERMATA			
<i>Echinus esculentus</i> (sea urchin)	223		300
<i>Holothuria nigra</i> (cotton spinner)	48 since 12 10 71		187
<i>Asterias rubens</i> (common starfish)		738	969
CHORDATA			
<i>Ciona intestinalis</i> (sea squirt)	68	100	297
<i>Gadus callarias</i> (cod)		65	182
<i>G. merlangus</i> (whiting)		500	
Dogfish	14020	13643	2875

APPENDIX V

Specimens supplied by the MBA (1939-1971)

	1939	1946	1947	1948	1949	1950	1951	1952	1953	1957	1958	1971
PORIFERA												
<i>Sycon</i> (sponge)	156	156	334	387	103	245	406	240	468	450	276	268
<i>Grantia</i> (sponge)	102	216	222	223	360	222	328	148	270	250	133	
COELENTERATA												
<i>Obelia</i> medusae	385	1995	956	754	1364	3661	2146	4032	3275	4000	799	216
<i>Acyonium</i> (dead men's fingers)	8	22	65	25	19	25	37	22	23	20	8	12
<i>Actinia</i> (sea anemone)	—	—	—	—	—	—	—	—	—	—	—	442
<i>Calliactis</i> (sea anemone)	—	—	—	—	—	—	—	—	—	—	—	830
Anemones (others)	490	451	541	603	708	755	942	504	900	900	588	326
TURBELLARIA												
<i>Procerodes</i> (<i>Gunda</i>) (flat worm)	799	692	1336	932	908	796	934	743	662	700	564	1154
NEMERTINI												
<i>Amphiporus</i> (ribbon worm)	12	180	281	384	69	246	228	328	324	500	24	80
POLYCHAETA												
<i>Aphrodite</i> (sea mouse)	196	54	269	311	308	467	208	284	309	300	217	272
<i>Nereis</i> (ragworm) (Total)	1351	1170	1220	1158	1357	1025	1132	1881	1747	1800	1039	3190
<i>Histiobdella</i>	—	3	109	42	60	28	31	54	65	—	—	1
<i>Arenicola</i> (lug worm)	848	593	1256	1295	1179	1191	1266	1533	1010	1200	803	213
<i>Sabella</i> (fan worm)	—	—	—	—	—	—	—	—	—	—	—	228
<i>Pomatoceros</i> (keel worm)	—	—	—	—	—	—	—	—	—	—	—	6630
CRUSTACEA												
<i>Lepas</i> (goose barnacle)	74	280	703	536	447	446	326	481	—	1000	398	503
<i>Ligia</i> (sea slater)	213	276	364	345	845	1256	680	911	928	900	368	1867
<i>Gammarus</i> (sand hopper)	154	204	345	322	96	502	326	384	488	450	31	1692
<i>Hemimysis</i>	12	36	240	258	77	408	114	228	120	—	—	574
<i>Macromysis</i>	96	216	484	132	87	168	36	198	60	60	—	—
<i>Leander</i> (prawn)	—	—	—	—	—	—	—	—	—	—	—	1532
<i>Eupagurus</i> (hermit crab)	9	35	120	36	55	141	40	167	32	100	121	421
<i>Carcinus</i> (shore crab)	265	1320	1525	1555	1340	1563	1043	2117	1759	1800	1057	7216
<i>Maia</i> (spider crab)	—	—	—	—	—	—	—	—	—	—	—	187
MOLLUSCA												
<i>Pateila</i> (limpet)	319	1459	1752	3759	1494	810	576	678	1483	1400	183	1463
<i>Littorina</i> (periwinkle)	—	—	—	—	—	—	—	—	—	—	—	726
<i>Buccinum</i> (whelk)	131	369	226	535	164	566	373	727	286	500	455	331
<i>Aplysia</i> (sea hare)	120	944	552	101	1397	251	1232	911	837	800	759	141
<i>Mytilus</i> (mussel)	264	844	836	1049	1786	874	908	2963	1404	3000	2194	4000
<i>Pecten</i> (scallop)	—	—	—	—	—	—	—	—	—	—	—	386
<i>Sepia</i> (cuttlefish)	406	429	246	962	1173	700	1058	953	1057	1000	700	446
<i>Loligo</i> (squid)	28	153	146	76	105	224	97	261	66	100	32	23
ECHINODERMATA												
<i>Antedon</i> (feather star)	53	65	200	279	67	285	139	171	104	200	231	7
<i>Asterina</i> (starfish)	66	30	133	70	59	56	90	154	93	100	24	51
<i>Asterias</i> (starfish)	338	322	653	1098	789	1266	676	1582	1032	1200	545	969
<i>Ophiothrix</i> (brittle star)	37	170	200	232	76	317	100	154	—	200	4	213
<i>Echinus</i> (sea urchin)	122	50	123	257	115	634	354	483	268	150	128	300
<i>Echinocardium</i> (sea urchin)	4	58	140	24	23	35	23	35	17	150	132	12
CHORDATA												
<i>Ciona</i> (sea squirt)	159	540	545	769	987	1438	726	1475	1357	1400	827	297
<i>Oikopleura</i>	168	144	290	154	168	354	516	422	277	250	27	12
<i>Amphioxus</i> (lancelet)	387	661	655	860	1974	1038	1193	1137	1830	2000	1333	635
<i>Scyliorhinus</i> (dogfish)	2679	3544	5599	4453	3858	3725	3888	4046	4306	6000	6090	2875
<i>Raja</i> (ray)	46	271	353	543	516	802	892	1077	995	1000	686	391
<i>Gadus</i> (cod family)	219	386	497	312	494	599	548	739	502	500	316	182

APPENDIX VI

Summary of replies from Sea Fisheries Committees (circulated by Association of Sea Fisheries Committees) of England and Wales

South Wales Sea Fisheries Committee

Comments

An outline of the fishery in the South Wales area and a summary of those species fished for was supplied. A statement of the damage done to cockle beds by oyster-catchers in the Burry inlet was also given. The most pertinent part of the reply was, "It is very obvious to me that any attempt to interfere with commercial fisheries in the interests of conservation of non-commercial species would most likely result in the strongest objections from various sources including Sea Fisheries Committees. A very strong case would have to be made out if there was to be interference with the public right of fishery."

Southern Sea Fisheries Committee

No views expressed but information on reduction of populations supplied (summarised in Appendix IV).

Cornwall Sea Fisheries Committee

Comments

"Availability of fish stocks varies from year to year and from season to season. Such changes usually arise from what are described as 'natural causes' for want of a better term, simply because there is no evidence of specific reasons for short-term fluctuations.

Patterns of fishing change because of changing availability of stocks, but are also affected by market demands, introduction of new types of fishing gear and different methods of working existing gear.

My committee are keenly interested in the conservation of marine resources with the aim of preserving fish stocks in commercial quantities. Long before the stock of any species is in danger of extinction, or is even overfished in the scientific sense, a position is reached where the fishermen catching that species can no longer get an economic return for their fishing effort. The men turn their attention to other species in order to remain in business.

The whole of the Cornish coastline is very exposed and cannot be fished continuously. The majority of fishing boats are small because they work from beaches where they have to be hauled clear of the sea in bad weather or from harbours that dry out at low tide. These boats cannot, generally, work very far from their operational bases; either because of the need for the larger ones to catch the tides when returning to harbour or because the smaller ones are physically unsuited to larger trips. These factors are themselves, to some extent, conservational in terms of fish stocks.

In view of the foregoing features, you will appreciate that my Committee would not welcome any extreme conservation proposal involving a total prohibition of commercial fishing in any particular area."

Eastern Sea Fisheries Committee

Comments

"Our records are only of commercial species, and although it is difficult to see what action could now be taken it may be worth noting that the Wash and areas off North Norfolk did have oyster stocks of sufficient quantities to support commercial fisheries. Quantities of shell can be found in many areas but no known stocks exist at present. For cockles in the Wash it is a matter of general knowledge that since 1963, although initial spatfall has been well up to average quantities survival, to adult size and entry into commercial catches has been negligible. Fishermen have blamed pollution for these failures, but this has not been confirmed. Fishermen still suggest that there could be some subtle environmental change not recorded by infrequent checks of limited parameters.

At present there exists the possibility of an improvement in the situation set out above, in that areas of young cockles resulting from last year's spatfall are still alive, and if they survive for a few months they could be of commercial value.

Nevertheless, it may be that your other work might point towards a reason for survival failures over so many years, and if as a result you wished to carry out any investigations which, could be assisted by co-operation with our vessels I am sure the Committee would favourably consider any suggestions."

Fisheries Organisation Society Ltd.

Comments

"A summary of the work of the Society was given with a request that sociological factors had to be taken into account when considering measures. Although professional fishermen practise conservation measures to ensure continuance of their livelihood the introduction of regulations, often on inadequate evidence, to conserve non-commercial species could affect traditional fishing."

Summary of replies from County Councils, County Boroughs, Town Councils and Urban District Councils

Dorset County Council

Comments

"It would appear generally that the marine wildlife of the Dorset coast is particularly rich in species and that with a few exceptions it has been largely undisturbed by man. Natural phenomena, such as the exceptional winter of 1962/3 appear to have had a considerable short term effect, but, being natural, these influences on the marine wildlife cannot be blamed on man. From the information obtained there appear to be a few locations in the Poole and Weymouth areas where the marine ecosystem is being influenced by man. The Fleet supports a rich and varied marine flora and fauna, and although informed discussions about its status are taking place, further consideration should be given to the conservation of this unique feature of the British coast."

Extensive information and names and addresses of persons prepared to submit further detailed information was also supplied. The detailed information is summarized in Appendix IV.

Borough of Weymouth & Melborne Regis

Comments

"The subject of the Research Council's enquiry is indeed a comprehensive one. Marine species in this context includes not only fish and birds, but the whole of the very extensive invertebrate fauna as well as seaweeds and other vegetative life. The ecological information which they request about each species is extremely detailed, and as this order of information invariably takes some time to collect, I would have thought that twelve months was a reasonable time rather than the ten days which we have been given. It is therefore impossible to reply to their letter except in the most general terms.

Undoubtedly, there is a great amount of relevant knowledge among local inhabitants here. Even though the enquiry is not primarily about commercial or edible creatures,

the local fishermen know a great deal about other things as well. Anglers and natural historians would be good sources also of information.

I am not aware of any specific conservation measures here, apart from the usual statutory ones, such as prohibition on the taking of birds' eggs and fish of less than minimum size."

Swanage Urban District Council

Comments

"With the very hard winter of 1962/3 many species were practically wiped out, especially small shellfish and starfish. Recently these varieties are returning in increasing numbers each year. There has been a number of cod caught with a kind of ulcer on them, and in very poor condition. I am waiting to get one to send to the Ministry of Agriculture and Fisheries Laboratory at Weymouth. Apart from these facts there is only the problem of the over-fishing of lobsters."

Plymouth City Council

Comments

"Without knowing what form of conservation measures might be contemplated it is not really possible to indicate what the reaction of the City Council might be to any necessary restriction on activities in or passage over such an area."

Council of the Isles of Scilly

Comments

"The islands are most concerned with the preservation of the natural environment in and around the Islands, and will be most interested in the outcome of the Working Party's deliberations."



Acreage of coastal habitats in Great Britain considered by the Nature Conservancy to be of special scientific significance

(Areas conserved within existing National Nature Reserves—see para 2.9 of report—and some maritime habitats are included).

An approximate breakdown is as follows:—

MUD FLATS (mainly estuarine)	281,000 acres (61%)
MARSH (largely saltmarsh but including some reclaimed grazing marsh)	95,000 acres (21%)
CLIFFS AND ROCKY SHORES (including related habitats such as grassland and woodland)	35,000 acres (7.5%)
DUNES	36,000 acres (7.5%)
SHINGLE (including a little shell beach)	10,000 acres (2%)
COASTAL LAGOON	4,000 acres (1%)
TOTAL acreage	461,000 acres (100%)

Types of habitat in coastal National Nature Reserves

AINSDALE SAND DUNES—Flats and dunes	MONACH ISLANDS—Saltmarsh and dunes
AXMOUTH LYME REGIS UNDERCLIFFS—Cliffs	NOSS—Cliffs
BRAUNTON BURROWS—Flats, dunes and shingle	RHUM—Flats, dunes, shingle, cliffs and boulder-shore
BRIDGWATER BAY—Flats, saltmarsh, shingle and cliff	RONA & SULA SGEIR—Cliffs
HOLKHAM—Flats, saltmarsh and dunes	ST. CYRUS—Flats, saltmarsh, dunes and cliffs
LINDISFARNE—Flats, saltmarsh and dunes	ST. KILDA—Cliffs
ORFORDNESS-HAVERGATE—Flats, saltmarsh, dunes and shingle	SANDS OF FORVIE—Flats, saltmarsh, dunes and cliffs
SALTLEETBY THEDDLETHORPE DUNES—Flats, saltmarsh and dunes	TENTSMUIR POINT—Flats and dunes
SCOLT HEAD—Flats, saltmarsh, dunes and shingle	DYFI—Flats, saltmarsh and dunes
STUDLAND HEATH—Dunes	GOWER COAST—Cliffs
WALBERSWICK—Flats	MORFA DYFFRYN—Flats, saltmarsh and dunes
WINTERTON DUNES—Dunes	MORFA HARLECH—Flats, saltmarsh and dunes
CAERLAVEROCK—Flats and saltmarsh	NEWBOROUGH WARREN—YNYS LLANDWYN— Flats, saltmarsh, dunes, shingle and cliff
HAAF GRUNEY—Boulder-shore	OXWICH—Flats, saltmarsh and dunes
HERMANESS—Saltmarsh, cliff and boulder-shore	SKOMER ISLAND—Cliffs
INVERAVER—Flats, saltmarsh, dunes, shingle and cliff	WHITEFORD—Flats, saltmarsh and dunes
ISLE OF MAY—Cliffs	

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