A review of the effects of recreational interactions within UK European marine sites

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Prepared for the UK Marine SACs Project, Task Manager Sarah Soffe, Countryside Council for Wales

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Preface

The 1990s have witnessed a "call to action" for marine biodiversity conservation. The global Convention on Biodiversity, the European Union's Habitats Directive and recent developments to the Oslo and Paris Convention have each provided a significant step forward. In each case marine protected areas are identified as having a key role in sustaining marine biodiversity.

The Habitats Directive requires the maintenance or restoration of natural habitats and species of European interest at favourable conservation status, with the management of a network of Special Areas of Conservation (SACs) being one of the main vehicles to achieving this. Among the habitats and species specified in the Annexes I and II of the Directive, several are marine features and SACs have already been selected for many of these in the UK. But to manage specific habitats and species effectively there needs to be clear understanding of their distribution, biology and ecology and their sensitivity to change. From such a foundation, realistic guidance on management and monitoring can be derived and applied.

One initiative now underway to help implement the Habitats Directive is the UK Marine SACs LIFE Project, involving a four year partnership (1996-2001) between:

English Nature
Scottish Natural Heritage
Countryside Council for Wales
Environment and Heritage Service, Department of the Environment for Northern Ireland
Joint Nature Conservation Committee, and
Scottish Association of Marine Science.

The overall goal of the Project is to establish management schemes on 12 of the candidate marine SAC sites. A key component of the Project is to assess the interactions that can take place between human activities and the Annex I and II interest features on these sites. This understanding will provide for better management of these features by defining those activities that may have a beneficial, neutral or harmful impact and by giving examples of management measures that will prevent or minimise adverse effects.

Seven areas where human activity may impact on marine features were identified for study, ranging from specific categories of activity to broad potential impacts. They are:

port and harbour operations
recreational user interactions
collecting bait and shoreline animals
water quality in lagoons
water quality in coastal areas
aggregate extraction
fisheries.

These seven were selected on the grounds that each includes issues that need to be considered by relevant authorities in managing many of the marine SACs. In each case, the existing knowledge is often extensive but widely dispersed and needs collating as guidance for the specific purpose of managing marine SACs.

The reports from these studies are the result of specialist input and wide consultation with representatives of both the nature conservation, user and interest bodies. They are aimed at staff from the relevant authorities who jointly have the responsibility for assessing activities on

marine SACs and ensuring appropriate management. But they will also provide a valuable resource for industry, user and interest groups who have an important role in advising relevant authorities and for practitioners elsewhere in Europe.

The reports provide a sound basis on which to make management decisions on marine SACs and also on other related initiatives such as the Biodiversity Action Plans and Oslo and Paris Convention. As a result, they will make a substantial contribution to the conservation of our important marine wildlife. We commend them to all concerned with the sustainable use and conservation of our marine and coastal heritage.

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Director, English Nature

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Contents

Appendices

Executive Summary

Scope and purpose of the review

This document reviews the potential effects of land and water-based recreation and recreational infrastructure on European marine sites, with a particular focus on the habitats and species within marine Special Areas of Conservation (mSAC) designated under the Habitats Directive. It examines these effects within the context of natural and other human influences and highlights examples of good practice in recreational management. It is based upon a comprehensive literature review, wide-ranging consultation and site visits.

These guidelines have been developed for relevant authorities, site managers and other users to assist the management of recreational activities on European marine sites through the management scheme. Their scope focuses primarily on the management of activities affecting marine SACs. However, where these activities also have the potential to affect bird features on sites designated as Special Protection Areas (SPAs), the guidance extends to these. This report does not attempt to provide guidance on new developments which are subject to a separate and specific assessment process.

Recreation covers a wide breadth of activities. To address this range, the report provides guidance both generically and on specific activities through the following structure:

Generic guidance - see Chapters 2- 6

Feature sensitivity
Recreational trends
Water-based recreation
Recreational infrastructure
Land-based recreation.

Activities - see Chapter 7

Activity guides for each recreational activity translate this generic knowledge into a specific profile addressing the characteristics and potential impacts of each activity.

The guidelines consider the broad options available for managing activities and their relative value. The application of these options are illustrated through case studies.

The Effects of Recreation on the Marine Environment

Marine environments have been shaped over thousands of years by powerful natural forces. Throughout history, human activities have also had a profound influence on marine areas. It is relatively recently, however, that participation in recreational activities has grown to the extent that it has been linked to declining environmental quality in certain areas.

The recreational issues most frequently linked with environmental impacts range from physical actions such as infrastructure development, dredging and trampling to biological effects caused by sewage discharge, antifouling paint leaching and engine exhaust emissions. The potential impacts of the activity on a marine feature depend largely on the following variables:

- the feature's existing environmental condition
- its capacity to resist change
- the characteristics, intensity and location of the activity.

Many human activities occur within the coastal zone and each of these has different implications for the environment. It is therefore important to consider the effects of recreation in the context of environmental changes caused both by natural occurrences and also by human activities other than recreation.

Benefits of Recreation for Nature Conservation

Recreational activities may benefit nature conservation. Most recreational participants actively seek pleasant environments in which to undertake their activities and therefore are likely to have an awareness of, and appreciation for, the natural environment. Many regular participants are also likely to have an intimate knowledge of the environment in which they undertake their activities and may even be aware of changes taking place over time. Such knowledge can make an important contribution to understanding environmental change and the enthusiasm of many participants can contribute to the success of environmental initiatives.

Tourism and recreation are becoming increasingly important economic sectors in many coastal areas. It is often the increased income generated by these sectors that enable improvements to be made in areas such as wastewater treatment. Recreational participants may also be successful in campaigning collectively for improvements in the environments in which they undertake their activities (e.g. Surfers Against Sewage, the Blue Flag Scheme etc.)

For many recreational participants, their activities provide their only contact with the natural environment. This may act as a major catalyst for their wider understanding of environmental issues and support for conservation objectives.

Potential Effects of Water-based Recreation

The potential impacts on European marine sites from water-based recreation arise from the following sources:

- engine emissions
- sound emissions
- antifouling paint leaching
- sewage and other waste discharges
- disturbance to species
- erosion and turbidity
- direct physical impact

Engine Emissions

Boats use a wide variety of different engines and transmission systems. This makes an assessment of the generic impact of emissions from such craft particularly difficult. The emissions themselves also vary in their importance. Little research has been carried out specifically into the impacts of marine engine emissions on the environment. The research done suggests that marine engine exhaust emissions have limited observable impact on the designated features in marine SACs, although impacts on fish and other marine wildlife have been observed in some studies.

Accidental discharge of oil and fuel can have a potentially more significant effect on the marine environment than emissions from engine combustion, due to the concentrated nature of the pollutants that may reach the water. Similarly the overboard discharge of oil-contaminated bilge water can have an adverse localised effect on the environment.

Legislation concerning marine engine emissions is to be taken forward in the forthcoming European Directive on marine engines which will specify common European emissions standards. The standards will extend to emissions, such as benzene, about which very little is known in the context of impacts on designated species and habitats in mSAC areas.

Antifouling Paints

Boat hulls are prone to colonisation by the many microorganisms which inhabit the aquatic environment. Antifouling paints are designed to inhibit such colonisation through slow leaching of a biocide, usually copper. Biocides can have harmful effects, not only on the fouling organism they are designed to deter, but also on other marine life unconnected with fouling activity. There remains a large degree of uncertainty regarding the impact of such biocides in general, and copper-based antifouling paints in particular, on the marine environment.

Elevated concentrations of copper can occur in the vicinity of marina basins and in those areas where land side boat maintenance activities take place. Experimentally it has been demonstrated that copper ingestion above natural background levels can prove toxic to marine organisms. However, there is currently no evidence to suggest that this has a significant impact on the designated features in marine SACs. In many areas, the concentration of copper directly attributable to leisure boats is negligible compared to that originating from land side industrial activities and commercial shipping.

Compounds may be added to copper-based antifouling paints to boost their effectiveness. Studies on some of these have suggested that they may reduce photosynthesis and plant growth. As a result some European countries, notably Denmark, to seek a ban on the use of certain biocides in antifouling paints. The evidence is disputed by industry and other EU countries have opposed the unilateral actions.

Sewage Discharge

Toilet systems from craft discharging directly to the water may lead to localised pollution. The effect of raw and treated sewage discharge from boats in fast flushing coastal areas and open seas is negligible, particularly in the context of the huge quantities of sewage discharged by water companies.

Boat sewage discharge in poor flushing estuarine areas and inlets and bays may have an impact on human health and the aquatic environment. The potential impact is likely to be most significant in areas which already suffer from environmental stresses, often caused by sewage discharge from water company plants or agricultural run-off. In such areas, where there are already low levels of dissolved oxygen and high levels of nutrients in the water, an increase in biochemical oxygen demand and nutrient levels resulting from boat sewage discharge can damage marine fauna and flora. The irresponsible disposal of chemical toilet waste can also have a localised impact on marine fauna and flora.

Larger boats also discharge grey water from onboard sinks, showers and washing machines. Such discharges tend to be in a very dilute form and the impact is therefore likely to be negligible from all but the largest of craft.

Disturbance to Species

It is extremely difficult to assess the impact of boating-related disturbance on species in isolation from other sources of disturbance, both natural and human influenced. It is very much at the local site level that the causes and effects of disturbance can be observed. Furthermore, it is the long-term impacts on population which are of most significance for management rather than the short-term disturbance effects.

It is also important to bear in mind that all types of craft have the potential to cause disturbance, whether wind, human or engine powered. Species may be disturbed not only by the boats themselves but also by the participants, particularly where the boats allow the users access to sensitive habitats.

The disturbance to bird species may vary from a short-term effect to long-term population impacts arising from impaired breeding or feeding success. This will depend upon a range of factors including the magnitude and predictability of the noise, the bird species, the availability of alternative sites and the season.

Engine sound and erratic manoeuvres can distract feeding dolphins and may drive them away from an area. Where boating takes place in shallow coastal waters frequented by seals or in the vicinity of haul-out sites it can also cause disturbance.

There is little evidence, however, to link short-term disturbance effects to long term population impacts.

Erosion and Turbidity

The natural process of bank erosion can be accelerated and accentuated by various human activities. Boating may have an impact on vegetation through the contact of boats with banks, scouring and uprooting of submerged vegetation by hulls, chains, oars and anchors and cutting of vegetation by propellers.

Indirectly, boats may impact on vegetation by the generation of wash and wake and the consequent effect of erosion and turbidity. The specific characteristics of a site play an important role in determining the level of boating induced turbidity. In exposed coastal areas, however, the increase in suspended sediments caused directly by boating activity is likely to be small in comparison to that caused by natural processes. Conversely, in sheltered areas where features may be sensitive to increases in turbidity, small amounts of boat traffic may have an impact.

Potential Effects of Boating-related Infrastructure

The physical infrastructure needed to facilitate water-based recreation ranges from an informal parking area and launch site, through swinging mooring provision to fully serviced marina operations. Boatyards and yacht clubs are also essential to many of the water-based activities. The potential impacts of such facilities arise both from new construction and also from the management and maintenance of existing facilities.

Development Impacts

The magnitude of potential environmental impacts caused by the development of new boating facilities depends on factors such as the location of the development, the scale of the scheme, construction methods and project design and implementation. Those developments which

irreversibly modify existing natural habitats are likely to cause the most significant impacts. In particular, where land claim is part of the development, the potential to modify the habitat is greater.

Depending upon its scale, capital or maintenance dredging induces turbidity and may affect tidal regimes. Dredging may disturb large benthic communities on the water bed, although evidence of long term impact is limited. There is a trade-off between maintaining adequate flushing characteristics of marina basins by dredging and causing increases in turbidity by the dredging operation.

The disposal of dredge spoil may have the beneficial result of removing contaminants from marine sediment, many of which are from industrial and agricultural sources, although the location of disposal is an important issue. Conversely, it may also lead to the resuspension of such contaminants in the water column.

Water quality in a low flushing marina basin can undergo a number of changes. In particular, water temperature may increase, dissolved oxygen levels may decrease, and there may be increases in certain pollutants such as copper from antifouling paints.

Operational Impacts

The impact of the operation of boating facilities is dependent to a large degree on the nature of the management procedures on site. A large variety of toxic chemicals and oils and fuels are handled at boatyards and marinas and poor management of such substances has the potential to cause significant localised impacts. Conversely, the provision of adequate facilities for the reception of various wastes, the adoption of run-off minimisation strategies and effective general site management can all improve the environmental performance of a facility.

Potential Effects of Land-based Recreation

Intertidal areas can come under considerable pressure from recreational activities. Not only do they support a variety of land based activities, such as walking and horse riding, but they also provide access channels to the water for water-based recreation.

Trampling

Impacts associated with trampling vary according to the nature of the site, the substrate, and the levels and types of recreational activities. Impacts are particularly severe in and around sand dune areas. This is because these areas form major access points to beaches and also possibly because participants are unaware of their significance and sensitivity.

Littering

Recreational participants may be a localised source of litter, although much of the litter found on beaches and intertidal areas tends to originate from other landside sources or from ships.

Disturbance to Species

Landside recreation can disturb species both through presence of participants and also through direct interference. The causes of disturbance can range from the mere presence of participants in close proximity to wildlife, through noise, to the physical impacts of trampling. Levels of disturbance are difficult to assess as the sensitivity of different species to disturbance varies considerably, as does the potential disturbance caused by each activity. Although landside

recreational participants can cause disturbance to seals, the long-term effects of such disturbance remain uncertain.

Guidelines for managing recreational activities

In many areas, there is little consensus on whether a recreational problem actually exists which needs to be managed. Where a problem is generally recognised, it is difficult to reach agreements on the best way to solve it. Participants can often see management as an excuse for bringing in controls on all activities, irrespective of whether they have an impact. Conversely, managers may view recreational participants as an impediment to achieving effective conservation practices.

The Habitats Directive initially compounded these problems through lack of promotion of its purpose and objectives and, in particular, the benefits of designation to the user.
However the designation of mSAC areas has taken place within the context of existing patterns of use. It should not be assumed therefore that the requirement to meet the conservation objectives and thereby maintain or restore the conservation features is necessarily incompatible with existing activities within these sites.

Generic good practice

- aim for early consultation on management techniques, including their funding and policing, between relevant authorities, site managers and recreational participants and seek representatives widely from organisations and individuals that encompasses a range of positions and attitudes

- consider the formation of sub-groups to achieve more manageable consultation

- the involvement of local communities in the development and implementation of management measures provides a means of raising awareness of the site and scheme and potentially facilitates onward enforcement of actions

- involve local groups as they are excellent sources of information on the distribution and nature of activities and to assess the effectiveness of potential management measures

- view information gaps, not as a threat, but as an opportunity to facilitate discussion over management, to build contacts through collaborative research and to use the valuable knowledge of recreational participants

- prepare strategies for communication on a site that include raising awareness of the roles of the different organisations and groups involved in the management of the sites and reaching the recreational activities and participants that are poorly represented by associations

- accompany all management measures with an appropriate programme of education and interpretation, addressing the reasons for the measures as well as the intended outcomes and the benefits for the environment and users

- leisure activities are a major opportunity to engage with the public on environmental issues, and education and interpretation can be highly effective ways of delivering long term commitment to management schemes

- make decisions through transparent consensus processes such that the scientific and value judgements are clear to all concerned by them and thereby minimising future disagreements arising

- develop standard and consistent approaches to collating information on recreation in order to facilitate comparisons between activity levels across sites

- adopt management techniques that are no more restrictive or binding than necessary; these techniques will depend upon the vulnerability of the features and the enforceability of the measure

- develop the SAC management framework on existing management structures where possible, such as estuary management partnerships, to avoid duplication and conflict

Voluntary approaches

- establish volunteer groups and liaison groups as a means of securing wider participation in site management and set aside funds and resources for initial training and driving

- codes of practice may be effective means of communicating management information especially if linked to other safety or amenity guidance, kept succinct and are supported by funds for implementation

- zoning of activities is being increasingly applied for conservation management reasons and is a simple and flexible tool though care is needed to dilute the role of zoning as a means of addressing safety issues

Regulatory approaches

- review the range and effectiveness of existing powers before setting up new regulatory controls

- consider bylaws when voluntary measures are impractical - the role of bylaws has been subject to a recent review by an inter-departmental working group. Implementation tends to be expensive in terms of resources for enforcement and the impact on local relationships with relevant user groups

- prepare measures for informing and encouraging the participation of user and interest groups and raising their commitment and support as a means of limiting the potentially high costs associated with enforcement.

Crynodeb Gweithredol

Rhychwant a phwrpas yr arolwg

Mae'r ddogfen hon yn adolygu effeithiau posibl hamddena ar dir a dwr ynghyd ag is-adeiledd hamddena ar safleoedd morol Ewopeaidd gan ganolbwyntio'n arbennig ar y cynefinoedd a'r rhywogaethau o fewn Ardaloedd Cadwraeth Arbennig Morol (ACAm) a ddynodwyd o dan y Gyfarwyddeb Cynefinoedd. Mae'n archwilio'r effeithiau hyn o fewn cyd-destun dylanwadau naturiol a dylanwadau dynol eraill ac yn tynnu sylw at enghreifftiau o arfer da mewn rheolaeth hamddena. Fe'i seilir ar arolwg cynhwysfawr o gyhoeddiadau, ymgynghori eang ac ymweliadau â safleoedd.

Darparwyd y canllawiau hyn ar gyfer awdurdodau perthnasol, rheolwyr safleoedd a defnyddwyr eraill i gynorthwyo i reoli gweithgareddau adloniadol ar safleoedd morol Ewropeaidd drwy'r cynllun rheoli. Mae eu rhychwant yn canolbwyntio yn bennaf ar reoli gweithgareddau sy'n effeithio ar ACA morol. Ond, ble mae gan weithgareddau botensial hefyd i effeithio ar nodweddion adar ar safleoedd a ddynodwyd fel Ardaloedd Gwarchodaeth Arbennig (AGA), mae'r arweiniad yn ymestyn i'r rhain. Nid yw'r adroddiad hwn yn ceisio darparu arweiniad ar ddatblygiadau newydd sy'n ddarostyngedig i broses asesu ar wahân a phenodol.

Mae hamdden yn cynnwys amrywiaeth eang o weithgareddau. I ymdrin â'r rhychwant hwn, mae'r adroddiad yn rhoi arweiniad mewn dull generig ac ar weithgareddau penodol drwy'r strwythur canlynol:

Arweiniad generig - gweler Penodau 2-6

Sensitifrwydd nodweddion

Tueddiadau adloniadol

Adloniant yn seiliedig ar ddwr

Is-adeiledd adloniadol

Hamdden yn seiliedig ar dir.

Gweithgareddau - gweler Pennod 7

Mae canllawiau gweithgaredd ar gyfer pob gweithgaredd adloniadol yn trosi'r wybodaeth generig hon yn broffil penodol yn ymdrin â nodweddion ac effeithiau potensial pob gweithgaredd.

Ystyria'r canllawiau'r dewisiadau eang sydd ar gael ar gyfer rheoli gweithgareddau a'u gwerth cymharol. Dangosir sut y cymhwysir y dewisiadau hyn drwy astudiaethau achos.

Effeithiau hamddena ar yr amgylchedd morolhamddena ar yr amgylchedd morolhamddena ar yr amgylchedd morol

Ffurfiwyd y cynefinoedd morol dros filoedd o flynyddoedd gan rymoedd naturiol pwerus. Dros y canrifoedd, mae gweithgareddau dynol hefyd wedi cael dylanwad enfawr ar ardaloedd morol. Ond yn gymharol ddiweddar serch hynny y mae cyfranogiad mewn gweithgareddau hamdden wedi cynyddu i'r fath raddfa nes y'u cysylltir â dirywiad yn ansawdd yr amgylchedd

mewn rhai ardaloedd.

Mae'r agweddau o hamddena a gysylltir amlaf ag effeithiau amgylcheddol yn amrywio o weithgareddau ffisegol fel datblygiad yr is-adeiledd, carthu a sathru i effeithiau biolegol a achosir gan arllwys carthion, paent i atal tyfiant ar waelod cychod yn gollwng cemogolion i'r dwr a nwyon o bibellau egsost. Mae effeithiau posibl y gweithgaredd ar nodweddion morol yn dibynnu i raddau helaeth ar y canlynol:

· cyflwr amgylcheddol presennol y nodweddion
· eu gallu i wrthsefyll newid
· nodweddion, dwysedd a lleoliad y gweithgaredd niweidiol.

Mae llawer o weithgareddau dynol yn digwydd o fewn y gylchfa arfordirol ac mae gan bob un o'r rhain oblygiadau gwahanol ar gyfer yr amgylchedd. Mae'n bwysig felly ystyried effeithiau hamddena yng nghyd-destun newidiadau amgylcheddol a achosir gan ddigwyddiadau naturiol a hefyd gan weithgareddau dynol heblaw hamddena.

Manteision hamddena ar gyfer gwarchod naturhamddena ar gyfer gwarchod naturhamddena ar gyfer gwarchod natur

Mae'n bwysig cydnabod yr effeithiau manteisiol y gall gweithgareddau hamddena eu cael ar warchod natur. Mae'r rhan fwyaf o'r rhai sy'n hamddena yn chwilio am amgylcheddau dymunol i wneud hynny ac felly maent yn debygol o fod ag ymwybyddiaeth o, a gwerthfawrogiad o'r amgylchedd naturiol. Mae llawer o'r rhain sy'n hamddena yn rheolaidd hefyd yn debygol o fod â gwybodaeth fanwl am yr amgylchedd lle maent yn gwneud eu gweithgareddau a gallant hyd yn oed fod yn ymwybodol o newidiadau sy'n digwydd gydag amser. Gall gwybodaeth o'r fath wneud cyfraniad pwysig tuag at ddeall newid amgylcheddol a gall brwdfrydedd llawer o'r rhai sy'n hamddena gyfrannu at lwyddiant cynlluniau amgylcheddol.

Mae twristiaeth a hamddena yn dod yn sectorau economaidd mwy a mwy pwysig mewn llawer o ardaloedd arfordirol. Yn aml yr incwm cynyddol a gynhyrchir gan y sectorau hyn sy'n caniatau gwelliannau mewn meysydd fel trin dwr gwastraff. Gall y rhai sy'n hamddena hefyd, trwy ymgyrchu gyda'i gilydd, hybu'n llwyddiannus welliannau i'r amgylcheddau lle maent yn ymgymryd â'u gweithgareddau (e.e. Brigdonnwyr yn erbyn Carthffosiaeth, Cynllun y Faner Las ac ati).

I lawer o'r rhai sy'n hamddena, eu gweithgareddau awyr agored hwy eu hunain yw eu hunig gyswllt gyda'r amgylchedd naturiol. Gall hyn weithredu fel catalydd enfawr i'w dealltwriaeth ehangach o faterion amgylcheddol a'u cefnogaeth i amcanion cadwraeth.

Effeithiau posibl adloniant ar ddwrposibl adloniant ar ddwrposibl adloniant ar ddwr

Mae drwg-effeithiau posibl hamddena ar y dwr ar Safleoedd Morol Ewropeaidd yn deillio o'r ffynonellau canlynol:

· allyriadau o beiriannau
· allyriadau swn
· paent o waelod cychod yn gollwng cemegolion i'r dwr
· carthion ac arllwysiadau gwastraff eraill

- aflonyddu ar rywogaethau
- erydiad a chymylogrwydd
- effaith ffisegol uniongyrchol

Allyriadau o beiriannau

Mae cychod yn defnyddio amrywiaeth eang o wahanol beiriannau a systemau traws-yrru. Mae hyn yn gwneud asesiad o effaith generig allyriadau o gychod o'r fath yn arbennig o anodd. Mae'r allyriadau eu hunain hefyd yn amrywio o ran pwysigrwydd. Ychydig iawn o ymchwil a wnaed yn benodol i effeithiau allyriadau o beiriannau morol ar yr amgylchedd. Mae'r ymchwil a wnaed yn awgrymu bod gan allyriadau o bibellau egsost y peiriannau hyn effaith gyfyngedig ar y nodweddion a ddynodwyd mewn ardaloedd ACA morol, er y sylwyd ar effeithiau ar bysgod a bywyd gwyllt morol arall mewn rhai astudiaethau.

Gall arllwysiad damweiniol o olew a thanwydd gael effaith mwy sylweddol o bosibl, ar yr amgylchedd morol na mwg egsost o beiriannau oherwydd natur gryfach y llygrwyr a all gyrraedd y dwr. Yn yr un modd, gall arllwys dwr gwaelodion llong wedi ei ddifwyno gan olew i'r môr gael effaith leoledig niweidiol ar yr amgylchedd.

Mae deddfwriaeth yn ymwneud ag allyriadau o beiriannau cychod i gael ei gyflwyno yn y Gyfarwyddeb Ewropeaidd sydd ar fin ymddangos ynghylch peiriannau cychod a fydd yn nodi safonau cyffredin ar gyfer allyriadau Ewropeaidd. Ymestynnir y safonau at allyriadau, fel benzene, y gwyddys ychydig iawn amdanynt yng nghyd-destun effeithiau ar rywogaethau a chynefinoedd dynodedig mewn ardaloedd ACAm.

Paent i atal tyfiant ar waelod cwch

Mae gwaelod cychod yn fannau lle gall llu o ficro-organebau sy'n byw yn yr amgylchedd morol ymsefydlu. Mae paent i atal twf o'r fath yn gweithio trwy ollwng bywleiddiad copr fel arfer, yn araf. Gall bywleiddiaid gael effeithiau niweidiol, nid yn unig ar yr organeb sy'n peri'r difrod y maent i fod i'w atal, ond hefyd ar fywyd morol arall nad oes cysylltiad rhyngddo a'r gweithgaredd hwnnw. Ond ceir llawer o ansicrwydd o hyd ynglyn ag effaith bywleiddiaid o'r fath yn gyffredinol, a phaent atal twf micro-organebau yn seiliedig ar gopr yn arbennig, ar yr amgylchedd morol.

Mae'n wybyddys y gall crynodiadau uwch o gopr hel yng nghyffiniau basnau marinas ac yn yr ardaloedd hynny lle mae gweithgareddau i gynnal cychod yn digwydd ar lan. Yn arbrofol dangoswyd y gall llyncu neu amsugno copr sy'n uwch na'r lefelau naturiol yn y cefndir fod yn wenwynllyd i organebau morol. Ond nid oes tystiolaeth ar hyn o bryd i awgrymu fod hyn yn cael effaith sylweddol ar gynefinoedd mewn ardaloedd ACA morol. Mewn llawer ardal, mae'n wir hefyd fod y crynodiad o gopr y gellir ei briodoli yn uniongyrchol i gychod pleser yn fach iawn o'i gymharu â'r hyn sy'n deillio o weithgareddau diwydiannol ar y lan ac o longau masnach.

Gall cyfansoddion gael eu hychwanegu at baent sy'n seiliedig ar gopr i atal twf ar waelod cychod i'w gwneud yn fwy effeithiol. Awgrymodd astudiaethau ar rai o'r rhain y gallant gwtogi ar ffotosynthesis a thwf planhigion. O ganlyniad mae rhai gwledydd Ewropeaidd, Denmarc yn arbennig, wedi gofyn am waharddiad ar ddefnyddio rhai bywleiddiaid mewn paent sy'n atal twf micro-organebau. Ond mae diwydiant yn amau'r dystiolaeth ac mae gwledydd eraill yn yr UE wedi gwrthwynebu'r camau unochrog hyn.

Arllwys carthion

Gall system toiled yn arllwys yn uniongyrchol i'r dwr lygru'r amgylchedd. Ond mae effaith carthion heb eu trin a charthion wedi eu trin o gychod mewn ardaloedd arfordirol lle mae'r dwr yn llifo'n gyflym ac mewn moroedd agored yn fychan, yn arbennig yng nghyd-destun y cyfansymiau enfawr o garthion a arllwysir gan gwmnïau dwr.

Ar y llaw arall, gall arllwys carthion o gychod mewn ardaloedd aberol lle nad yw'r dwr yn llifo'n gyflym a morydau a baeau gael effaith ar iechyd pobl ac ar yr amgylchedd dyfrol. Mae'r effaith posibl yn debygol o fod ar ei fwyaf mewn ardaloedd sydd eisoes yn dioddef o bwysau amgylcheddol, a achosir yn aml gan arllwysiad o garthion o waith y cwmnïau dwr neu ddwr ffo amaethyddol. Mewn ardaloedd o'r fath, lle ceir eisoes lefelau isel o ocsigen, a lefelau uchel o faethynnau yn y dwr, gall cynnydd yn y galw am ocsigen a lefelau uwch o faethynnau yn deillio o arllwysiadau carthion o gychod wneud difrod i'r ffawna a'r fflora morol. Gall gwaredu gwastraff o doiledau cemegol yn anghyfrifol hefyd gael effaith leol ar ffawna a fflora morol.

Mae cychod mwy hefyd yn arllwys dwr llwyd o fasnau molchi, cawodydd a pheiriannau golchi i'r môr. Tuedda arllwysiadau o'r fath i fod yn wan iawn ac mae'r effaith felly yn debygol o fod yn fach o bob un ond y mwyaf o'r cychod hyn.

Aflonyddu ar rywogaethau

Mae'n hynod o anodd asesu effaith cychod ar rywogaethau heb ystyried ffynonellau eraill o aflonyddwch, rhai naturiol a dynol. Ar lefel leol y gellir gweld effeithiau ac achosion aflonyddwch orau. Ymhellach, yr effeithiau tymor hir ar boblogaeth sydd fwyaf pwysig ar gyfer rheolaeth yn hytrach nag effeithiau aflonyddwch tymor byr.

Mae'n bwysig cofio hefyd ei bod yn bosib i bob math o gwch neu long achosi aflonyddwch, boed y gyriant gan wynt, gan ddyn, neu gan beiriant. Aflonyddir ar rywogaethau nid yn unig gan y cychod eu hunain ond hefyd gan y rhai sydd ynddynt, yn arbennig lle mae'r cychod yn cario'r defnyddwyr i gynefinoedd sensitif.

Gall yr aflonyddwch i rywogaethau o adar amrywio o effaith tymor byr i effeithiau tymor hir sy'n amharu ar y nythu neu fwydo. Bydd hyn yn dibynnu ar amrediad o ffactorau gan gynnwys natur sy'n aflonyddu arnynt, y rhywogaeth o adar, argaeledd safleoedd eraill a'r tymor.

Gall swn peiriant a symudiadau afreolaidd aflonyddu ar ddolffinod sy'n bwydo a'u gyrru i ffwrdd. Gall pobl sy'n defnyddio cychod mewn dyfroedd arfordirol bas lle mae morloi yn byw neu ger y lleoedd y deuant i'r lan hefyd achosi aflonyddwch.

Ychydig iawn o dystiolaeth a geir serch hynny i gysylltu effeithiau aflonyddwch tymor byr ag effeithiau tymor hir ar y boblogaeth.

Erydiad a chymylogrwydd

Gellir cyflymu a dwysau'r broses naturiol o erydu glannau gan nifer o weithgareddau dynol. Gall cychod gael effaith ar lystyfiant drwy gyswllt rhwng cwch a'r lan, wrth i lystyfiant o dan y dwr gael ei niweidio a'i ddadwreiddio gan waelodion cychod, cadwyni, rhwyfau, angorau a phropelorau yn torri llystyfiant.

Yn anuniongyrchol, gall cychod gael effaith ar lystyfiant drwy greu adlif a'r erydu a'r cymylogrwydd a ddaw yn sgîl hyn. Mae nodweddion penodol safle yn chwarae rôl bwysig wrth

benderfynu ar lefel y cymylogrwydd a achosir gan gychod. Mewn ardaloedd arfordirol agored, serch hynny, mae'r cynnydd mewn gwaddodion yn y dwr a achosir yn uniongyrchol gan gychod yn debyg o fod yn fach o'i gymharu â'r hyn a achosir gan brosesau naturiol. I'r gwrthwyneb, mewn ardaloedd cysgodol lle gall nodweddion fod yn sensitif i gymylogrwydd, gall nifer fechan o gychod gael effaith.

Effeithiau posibl isadeiledd sy'n gysylltiedig â chychod

Mae'r isadeiledd ffisegol sy'n angenrheidiol i hwyluso adloniant ar ddwr yn amrywio o ardal barcio anffurfiol a safle lansio, hyd at ddarpariaeth glanio a marinau gyda gwasanaethau cyflawn. Mae iardiau cychod a chlybiau cychod hwylio yn hanfodol hefyd i lawer o'r gweithgareddau sy'n seiliedig ar ddwr. Deillia effeithiau posibl cyfleusterau o'r fath o waith adeiladu newydd ac hefyd o reoli a chynnal cyfleusterau sy'n bodoli'n barod.

Effeithiau datblygiad

Mae maint effeithiau amgylcheddol posibl a achosir gan ddatblygiad cyfleusterau newydd ar gyfer cychod yn dibynnu ar ffactorau fel lleoliad y datblygiad, graddfa'r cynllun, dulliau adeiladu a dylunio a gweithredu prosiectau. Mae'r datblygiadau hynny sy'n newid cynefinoedd naturiol presennol am byth yn debyg o achosi'r effeithiau mwyaf sylweddol. Yn arbennig, lle bo hawl ar dir yn rhan o'r datblygiad, mae'r posibilrwydd i newid y cynefin yn fwy.

Gan ddibynnu ar ei raddfa, cyfalaf neu waith cynnal, mae carthu yn creu cymylogrwydd a all effeithio ar drefn y llanw. Yn ychwanegol, gall carthu aflonyddu ar gymunedau benthig mawr ar wely'r môr, er bod tystiolaeth o effaith tymor hir yn gyfyngedig. Rhaid sicrhau cydbwysedd rhwng cynnal nodweddion fflysio digonol ar fasnau marinas drwy gyfrwng carthu ac achosi cynnydd mewn cymylogrwydd gan y gwaith carthu ei hun.

Gall gwaredu gwastraff y carthu fod yn fanteisiol os bydd llygredd yn y gwaddod a symudir, llawer ohono yn dod o ffynonellau diwydiannol ac amaethyddol, er bod lleoliad y gwaredu yn fater pwysig. I'r gwrthwyneb, gall hefyd arwain at ail godi llygredd i'r golofn ddwr.

Awgryma tystiolaeth y gall ansawdd dwr mewn basn marina lle bo ond ychydig o fflysio yn digwydd fynd drwy nifer o newidiadau. Yn arbennig, gall tymheredd y dwr gynyddu, gall lefelau ocsigen yn y dwr ostwng, a gellid gweld cynnydd mewn rhai llygrwyr fel copr o baent i atal twf micro-organebau.

Effeithiau gweithrediadol

Mae effaith gwneud defnydd o gyfleusterau cychod yn dibynnu i raddau helaeth ar natur y gweithdrefnau rheoli ar y safle. Ymdrinnir ag amrywiaeth mawr o gemegolion gwenwynllyd ac olewau a thanwydd mewn iardiau cychod a marinas a gall rheolaeth wael ar sylweddau o'r fath achosi effeithiau lleol sylweddol. I'r gwrthwyneb, gall darparu cyfleusterau digonol ar gyfer derbyn amrywiol wastraffau, mabwysiadu strategaethau i leihau dwr ffo a rheolaeth effeithiol ar y safle yn gyffredinol i gyd leihau effaith y lle ar yr amgylchedd yn sylweddol.

Effeithiau posibl hamddena yn seiliedig ar dir cyfagos

Gall ardaloedd rhyng-lanw ddod o dan gryn bwysau oddi wrth weithgareddau hamddena. Maent nid yn unig yn cynnal amrywiaeth o weithgareddau tirol, fel cerdded a merlota, ond maent hefyd yn darparu sianeli mynediad at y dwr ar gyfer hamddena ar y dwr.

Sathru

Mae effeithiau yn gysylltiedig â sathru yn amrywio yn ôl natur y safle, yr is-strata, a'r lefelau a'r mathau o weithgareddau hamddena. Mae effeithiau yn arbennig o ddifrifol yn ac o amgylch ardaloedd o dwyni tywod. Mae hyn oherwydd bod yr ardaloedd hyn yn ffurfio pwyntiau mynediad pwysig at y traethau ac hefyd o bosibl oherwydd nad yw pobl yn ymwybodol o'u pwysigrwydd a'u sensitifrwydd.

Sbwriel

Gall pobl yn mwynhau hamddena fod yn un ffynhonnell o sbwriel, ond mae llawer o'r sbwriel a ganfyddir ar draethau ac ardaloedd rhynglanw yn tueddu i ddeillio o ffynonellau eraill ar y tir neu o longau.

Aflonyddu ar rywogaethau

Gall hamddena ar y tir aflonyddu ar rywogaethau drwy bresenoldeb pobl a hefyd drwy aflonyddwch uniongyrchol. Gall achosion aflonyddwch amrywio o bresenoldeb pobl yn agos at fywyd gwyllt, hyd at swn, ac effeithiau ffisegol megis sathru. Mae'n anodd mesur lefelau aflonyddwch oherwydd bod sensitifrwydd gwahanol rywogaethau i aflonyddwch yn amrywio'n sylweddol, fel ag y mae lefel yr aflonyddwch a achosir gan bob gweithgaredd.. Er y gall pobl sy'n hamddena ar y tir aflonyddu ar forloi, mae effeithiau tymor hir aflonyddwch o'r fath yn dal yn ansicr.

Canllawiau ar gyfer rheoli gweithgareddau hamdden

Mewn llawer o ardaloedd, ychydig o gonsensws a geir ynghylch a yw problem adloniadol yn bodoli ac angen ei rheoli. Ble bo problem yn cael ei chydnabod yn gyffredinol, mae'n anodd cyrraedd cytundebau ynghylch y ffordd orau i'w datrys. Gall cyfranogwyr yn aml weld rheolaeth fel esgus dros gyflwyno rheoliadau ar bob gweithgaredd, p'run ai a ydynt yn cael effaith ai peidio. Gall rheolwyr, i'r gwrthwyneb, ystyried cyfranogwyr adloniadol fel rhwystr i sicrhau arferion cadwraeth effeithiol.

Ychwanegodd y Gyfarwyddeb Cynefinoedd at y problemau hyn ar y dechrau drwy beidio â hyrwyddo ei phwrpas a'i hamcanion ac, yn arbennig, fanteision y dynodiad i'r defnyddiwr. Ond mae dynodi ardaloedd ACAm wedi digwydd o fewn cyd-destun patrymau defnydd sy'n bodoli ar hyn o bryd. Ni ddylid tybio felly bod y gofyniad i gwrdd â'r amcanion cadwraeth a thrwy hynny gynnal neu adfer y nodweddion cadwraeth o anghenraid yn anghydnaws â gweithgareddau sy'n digwydd yn barod o fewn y safleoedd hyn.

Arfer generig da

- anelu at ymgynghoriad buan ynghylch technegau rheoli, gan gynnwys eu hariannu a'u plismona, rhwng awdurdodau perthnasol, rheolwyr safleoedd a chyfranogwyr adloniadol a gofyn am sylwadau yn eang gan gyrff ac unigolion sy'n cynnwys amrediad o safbwyntiau ac agweddau

- ystyried ffurfio is-grwpiau i sicrhau ymgynghoriad mwy hydrin

- mae cyfranogiad cymunedau lleol yn natblygiad a gweithredu mesurau rheoli yn darparu dull o godi ymwybyddiaeth o'r safle a'r cynllun a gallai hwyluso symud ymlaen gyda gorfodi camau gweithredu

- sicrhau cyfranogiad grwpiau lleol oherwydd eu bod yn ffynonellau gwybodaeth ardderchog ynghylch dosbarthiad a natur gweithgareddau ac i asesu effeithiolrwydd mesurau rheoli potensial

- ystyried bylchau mewn gwybodaeth, nid fel bygythiad, ond fel cyfle i hwyluso trafodaeth dros reolaeth, i greu cysylltiadau drwy ymchwil ar y cyd ac i ddefnyddio gwybodaeth werthfawr cyfranogwyr adloniadol

- paratoi strategaethau ar gyfer cyfathrebu ar safle sy'n cynnwys codi ymwybyddiaeth am rolau'r gwahanol fudiadau a grwpiau sy'n ymwneud â rheoli'r safleoedd a chyrraedd y gweithgareddau hamdden a'r cyfranogwyr sy'n cael eu cynrychioli'n wael gan gymdeithasau

- sicrhau bod rhaglen briodol o addysg a dehongli yn cyd-fynd â'r holl fesurau rheoli, yn ymdrin â'r rhesymau am y mesurau yn ogystal â'r canlyniadau a fwriedir a'r manteision i'r amgylchedd a defnyddwyr.

- mae gweithgareddau hamdden yn gyfle mawr i gysylltu â'r cyhoedd ynghylch materion amgylcheddol, a gall addysg a dehongli fod yn ffyrdd hynod effeithiol o gyflwyno ymrwymiad tymor hir i gynlluniau rheoli.

- gwneud penderfyniadau drwy brosesau consensws tryloyw fel bod y penderfynaidau gwyddonol a'r penderfyniadau ynghylch gwerth yn glir i bawb a thrwy hynny yn cadw unrhyw anghytundebau yn y dyfodol i isafswm

- datblygu agweddau safonol a chyson at goladu gwybodaeth am adloniant er mwyn hwyluso cymariaethau rhwng lefelau gweithgaredd ar draws safleoedd

- mabwysiadu technegau rheoli nad ydynt yn fwy cyfyngol na rhwymol na'r angen, bydd y technegau hyn yn dibynnu ar natur fregus y nodweddion a pha mor rwydd fydd gorfodi'r mesur

Dulliau gwirfoddol

- sefydlu grwpiau gwirfoddol a grwpiau cyswllt fel dull o sicrhau cyfranogiad ehangach mewn rheoli safleoedd a neilltuo arian ac adnoddau ar gyfer hyfforddiant a gyrru

- gall codau ymarfer fod yn ddull effeithiol o gyfathrebu gwybodaeth rheoli yn arbennig os cysylltir y rhain â chanllawiau diogelwch neu fwynderau eraill, os ydynt yn cael eu cadw yn gryno ac yn cael eu cefnogi gan arian ar gyfer eu gweithredu

- defnyddir cylchfeuo gweithgareddau yn gynyddol am resymau yn ymwneud â rheoli cadwraeth ac mae'n declyn syml a hyblyg er bod angen gofal i wanhau rôl cylchfeuo fel dull o ymdrin â materion diogelwch

Dulliau rheoleiddio

- adolygu amrediad ac effeithiolrwydd pwerau sy'n bodoli cyn sefydlu mesurau rheoleiddio newydd

- ystyried is-ddeddfau pan fo mesurau gwirfoddol yn anymarferol - mae rôl is-ddeddfau wedi bod yn ddarostyngedig i arolwg diweddar gan weithgor rhyng-adrannol. Mae gweithredu yn tueddu i fod yn ddrud yn nhermau adnoddau ar gyfer gorfodaeth a'r effaith ar berthynas leol gyda grwpiau defnyddwyr lleol

- paratoi mesurau ar gyfer rhoi gwybodaeth i ac annog cyfranogiad grwpiau diddordeb a defnyddwyr a chynyddu eu hymrwymiad a'u cefnogaeth fel dull o gyfyngu ar y costau uchel potensial sy'n gysylltiedig â gorfodaeth.

1. Introduction

1.1 The Aim of the Guidelines

These guidelines have been prepared as part of the UK Marine SACs Project. The overall aim of this Project is to promote the implementation of the Habitats Directive in marine areas through trialing the establishment of management schemes on twelve sites in the UK (figure 1.1, p.29) and by providing proven good practice and guidance to practitioners in the UK and Europe.

To support the establishment of these management schemes, the Project is undertaking a series of tasks to collate and develop the understanding and knowledge needed. One of the areas for providing guidance to those developing the schemes concerns the interaction between human activities and marine features. Human activities have an important role in the management of marine features and may have both beneficial and damaging impacts. This report is one of seven studies bringing together guidance on these impacts and promoting the means of avoiding significant damage to features, the others being:

- port and harbour operations
- collecting bait and other shoreline animals
- water quality in lagoons
- water quality in coastal areas
- aggregate extraction
- fisheries

The objectives of these guidelines are to:

- identify and agree the activity and circumstances where the impact on conservation features is minimal or beneficial
- identify and agree the operations and circumstances where potential for adverse effect does exist
- identify existing guidance and procedures which can be used to exercise appropriate controls for avoiding, minimising or addressing these impacts.

The target audience for these guidelines includes: relevant authorities, country conservation agencies, users, industry and interest groups and European practitioners.

1.2 Background to European Marine Sites

1.2.1 The Habitats and Birds Directive

In May 1992, EC Directive 92/43/EEC Conservation of Natural Habitats and of Wild Fauna and Flora was adopted by the council of ministers. This Directive, commonly known as the 'Habitats Directive' requires member states to maintain or restore wild species and natural habitats to a 'favourable conservation status' within the European Union. The main aim of the Habitats Directive is:

- to maintain biodiversity through the conservation of rare, threatened or important habitats and the habitats of certain species, namely, Annex I and Annex II features

The definitions of Annex I and II features are:

Annex I habitats : a natural habitat listed in Annex I of the Habitats Directive for which Special Areas of Conservation (SAC) can be selected (Council Directive 92/43/EEC).

Annex II species : a species listed in Annex II of the Habitats Directive for which SAC can be selected (Council Directive 92/43/EEC).

One of the ways in which member states are expected to achieve this aim is through the designation and protection of a series of sites, known as Special Areas of Conservation (SACs).

The Birds Directive ('Council Directive 79/409/EEC on the Conservation of Wild Birds') complements the Habitats Directive by requiring member states to protect rare or vulnerable bird species through designating Special Protection Areas (SPAs). Together, the terrestrial and marine SPAs and SACs are intended to form a coherent ecological network of sites of European importance, referred to as Natura 2000.

1.2.2 Special Areas of Conservation

SACs are designated sites which support rare, endangered, or vulnerable species of plants or animals (other than birds) or areas which support outstanding examples of habitats which are characteristic of the region. Where the designated site includes areas of sea or seashore, it is described as a marine Special Area of Conservation (mSAC). The Regulations of the Habitats Directive describe *marine areas* as any land covered (continuously or intermittently) by tidal water, or any part of the sea, in or adjacent to Great Britain up to the seaward limit of territorial waters.

The protection of these sites is extremely important as not only do they provide valuable natural habitats in their own right, but they also combine to form an essential network of areas within the European community. Natura 2000 provides a corridor of protected areas throughout Europe designed to make a major contribution to the conservation of rare and vulnerable plants, animals, birds and habitats.

1.2.3 Habitats Regulations

The requirements of the Habitats Directive have been transposed into UK legislation through the Conservation (Natural Habitats &c.) Regulations 1994 and the Conservation (Natural Habitats &c.) (Northern Ireland) 1995, known as the Habitats Regulations.

Unlike on land, where SACs and SPAs are underpinned by Sites of Special Scientific Interest (SSSI), there is no existing legislative framework for implementing the Habitats Directive in marine areas. Therefore the Regulations have a number of provisions specifically for new responsibilities and measures in relation to marine areas.

The Regulations place a general duty on all statutory authorities exercising legislative powers to perform these in accordance with the Habitats Directive. The term European marine site is defined to mean any SPA and SAC or part of a site that consists of a marine area, and "marine" includes intertidal areas[1]. The new duties in connection with the management of marine sites are summarised below.

[1] In the regulations of the Habitats Directive, a European marine site is described as a European site in so far as it consists of marine areas.

1.2.4 UK marine SACs

In the UK, candidate SACs have been selected for the ten marine features listed in Annex I and II of the Directive and shown in table 1.1. There are 42 sites (as at October 1999) that have been forwarded to European Commission as candidate SACs. These are shown in figure 1.1.

Table 1.1 Annex I and II Features

Annex I habitat	**Annex II species**
Estuaries	Bottlenose dolphin
Large shallow inlets and bays	Common seal
Sandbanks which are slightly covered by seawater at all times	Grey seal
Mud and sandflats not covered by sea water at low tide	
Reefs	
Lagoons	
Submerged or partially submerged sea caves	

Sites have been selected for other coastal habitats or species such as saltmarsh, sand dunes or the shore dock plant. Whilst these are intertidal areas and therefore strictly European marine sites, they are generally part of ecological systems that extend above high water and come under the provisions of the Habitats Regulations relating to terrestrial SACs. For this reason, these coastal SACs lie outside the remit of this report, although reference may be made to them where considered relevant to the management of human activities on marine SACs.

1.2.5 Management Schemes

In the UK, management schemes may be established on European marine sites as a key measure in meeting the requirements of the Habitats Directive. Each scheme is to be prepared by a group of authorities having statutory powers over the marine area - the 'relevant authorities'. The Regulations set out which authorities have responsibilities for managing these sites and how they are to be managed, as described below.

Relevant authorities are those who are already involved in some form of relevant marine regulatory function and would therefore be directly involved in the management of a marine site, and may include the following:

- country conservation agency
- local authorities
- environment agencies
- sea fishery committees
- port and harbour authorities

A European site is any one of the following:
- a Special Area of Conservation
- a Site of Community Importance which has been placed on the list referred to in the third sub-paragraph of Article 4(2) of the Habitats Directive;
- a site hosting a priority natural habitat type or priority species in respect of which consultation has been initiated under Article 5(1) of the Habitats Directive, during the consultation period or pending a decision of the Council under Article 5(3), or;
- an area classified pursuant to Article 4(1) or (2) of the Wild Birds Directive.

- navigation authorities
- lighthouse authorities

A scheme may be established by one, or more, of the relevant authorities. It is expected that one will normally take the lead. Once established, all the relevant authorities have an equal responsibility to exercise their functions in accordance with the scheme. Each site can have only one management scheme.

Whilst only relevant authorities have the responsibility for establishing a management scheme, government guidelines (Department of the Environment, Transport and the Regions, 1998. European Marine Sites in England and Wales) strongly recommends that other groups including owners and occupiers, users, industry and interest groups be involved in developing the scheme. To achieve this, it suggests the formation of advisory groups and a process for regular consultation during the development and operation of the scheme.

Within the Regulations, the nature conservation bodies have a special duty to advise the other relevant authorities as to the conservation objectives for a site and the operations that may cause deterioration or disturbance to the habitats or species for which it has been designated. This advice forms the basis for developing the management scheme.

The scheme encourages the wise use of an area without detriment to the environment, based on the principle of sustainability. European marine sites have been selected with many activities already taking place and it is recognised that these are normally compatible with the conservation interest at their current levels. Only those activities that would cause deterioration or disturbance to the features for which a site has been designated need to be subject to restrictions under a management scheme.

The primary focus of a management scheme is to manage operations and activities taking place within a European marine site, promoting its sustainable use. However, it may also provide guidance for the assessment of plans and projects, particularly those of minor or repetitive nature. A plan or project is any operation which requires an application to be made for a specific statutory consent, authorisation, licence or other permission. Not all types of plan or project fall within the statutory functions of relevant authorities, but are consented or authorised by other statutory bodies, termed ‘competent authorities’ (e.g. government departments).

1.3 The Scope of the Guidelines

The purpose of the UK Marine SACs Project is to establish management schemes in twelve demonstration sites around the UK. These demonstration sites have been selected to represent a wide diversity of wildlife and habitat interests, and a range of management issues.

This report seeks to identify the potential impacts of recreation on the 10 marine features for which the 12 demonstration mSAC sites have been designated. There are a number of other features that may require consideration as part of the mSAC management process, for example birds, saltmarshes and sea cliffs. However, the focus for this report has been on marine features.

The features for which the demonstration sites have been designated are shown in figure 1.1. Sites have also been designated for other species or habitats, which are not within the remit of this project. For example, glasswort and other annuals colonising mud and sandflats have been designated in the Wash and North Norfolk Coasts.

Figure 1.1. Demonstration Sites and Candidate Marine Special Areas of Conservation

1.4 Approach to the Study

For the purpose of this study, recreation is defined as any outdoor activity, including land based or water based activity, which is undertaken for pleasure or enjoyment in leisure time.

The main objectives of the study were to review:

- the sensitivities of Marine Annex I and II features to recreational activities and their supporting infrastructure
- the type and extent of recreational activities in mSAC areas
- the potential effects of recreational activities generally in marine areas and specifically in relation to marine features
- good practice techniques for managing recreation from the UK and abroad

The information contained within this report was gained through primary and secondary research methods including a comprehensive literature review, site visits and detailed consultation. An eight week period of consultation followed distribution of the final draft report at the end of which a workshop was held to discuss the report's findings. This was followed by a further period of consultation.

The main elements of the study included:

1.4.1. Literature Review

A thorough paper-based and electronic literature review was undertaken to provide baseline information for the study. Key interest groups were contacted in the UK and abroad to identify appropriate sources. The bibliography at the end of the report fully references the material reviewed during the course of the study.

1.4.2. Site Visits

Site visits were undertaken to provide first hand accounts of use, impacts and management in mSAC areas. The site visits also ensured that the consultation process was effectively extended to designated sites and that the study was promoted at site level. Due to time and resource constraints, it was not possible to visit all twelve demonstration sites. However, following consultation with the steering group, the following five sites were selected for site visits:

- Plymouth Sound
- The Wash and North Norfolk
- Berwickshire and North Northumberland Coast
- The Lleyn Peninsula and the Sarnall
- Solway Firth

All Annex I and II features occur in one or more of the sites selected, with the exception of Bottlenose Dolphins (BD) and Lagoons (L). The sites were also chosen to reflect the differences between sites in terms of information availability, recreational intensity and administrative arrangements. Table 1.2 highlights these differences.

Information regarding the remaining seven sites was collected through liaison with relevant site managers, contacts and through literature review.

Table 1.2 The Selected Sites

Site	Administration	Available Information levels	Known Recreation levels	Features
Plymouth Sound	English	High	High	S,E,I
The Wash & North Norfolk Coast	English	Medium	Medium	S,M,I,CS
Berwickshire & North Northumberland Coast	English/Scottish	Medium	Medium	M,R,C,GS
The Lleyn Peninsula	Welsh	Low	Medium	E,R
The Solway Firth	English/Scottish	Low	Low	S,E,M

Key to features

E Estuaries
R Reefs
CS Common seal
GS Grey seals
S Sandbanks which are slightly covered by sea water at all times
M Mud & sand flats not covered by sea water at low tide
I Large shallow inlets and bays
C Submerged or partly submerged sea caves

1.4.3. Consultation

Consultation played a key role throughout the development of the study. This helped to ensure that all those with an interest in the study had the opportunity to comment on the issues being addressed and to contribute their local or national knowledge.

A variety of different consultation methods were employed during the study, including a pre-study consultation meeting, direct contacts with consultees and the development of national and local questionnaires.

1.4.3.1. Scoping Workshop with Interested Parties

In July 1997, a workshop was organised by CCW to discuss the project with groups and individuals who have an interest in the marine environment and/or recreation. The objectives of the meeting were to:

- ensure that participants were aware of, and understood the implications of, the Habitats Directive
- outline the purpose and structure of the UK Marine SACs Project
- outline the objectives of the recreation study
- receive comment and feedback on the proposals from recreational users

The central aim of the meeting was to reach a consensus on the importance of the project and to agree a co-operative approach among relevant authorities, mSAC site managers and recreational users.

The issues discussed and the concerns raised at this meeting were used to shape the aims and objectives of the study.

1.4.3.2. Consultees

A list of consultees was developed and over one hundred organisations and individuals were consulted, either directly or via questionnaires, during the course of this study. A list of the consultees can be found in appendix 1. The consultees were drawn from the following sectors:

- recreational participants and representative organisations
- feature specialists
- environmental organisations
- key individuals at site level

1.4.3.3. Questionnaires

To overcome time and resource constraints, two questionnaires were developed to encourage a structured response on particular issues. A *national questionnaire* sought to identify the views of organisations on specific issues such as the effectiveness of management initiatives. It was also designed to act as a scoping study to identify information on levels of activities and environmental material held by these organisations. A generic *site questionnaire* was also developed to identify recreational levels and management strategies within the demonstration site areas. The process was assisted by the provision of pre-paid envelopes which ensured that both national and local level questionnaires could be returned directly to the research group once they had been completed. Copies of these questionnaires can be found in appendices 2 and 3.

1.4.3.4. Site Questionnaires

There was no database available to the authors of this report which covered the local individuals and organisations in the demonstration sites who have an interest in the marine environment and/or recreation. Instead a new technique for site level questionnaire development was trialled. All of the national organisations and representative bodies on the study's consultation list were asked to forward site-specific questionnaires to any individuals in the demonstration site areas who they felt should be involved in consultation. This technique proved extremely successful and may be relevant to other projects which involve consultation at the local level.

The findings of the questionnaire surveys can be found in chapter 3 and in appendices 5 and 6.

1.5. How to Use this Guide

This guide consists of 8 chapters plus a separate supporting appendices document. The chapters divide into four distinct sections:

Chapter 1 provides an overall introduction to the study, outlining its background and detailing the approach taken in carrying out the work.

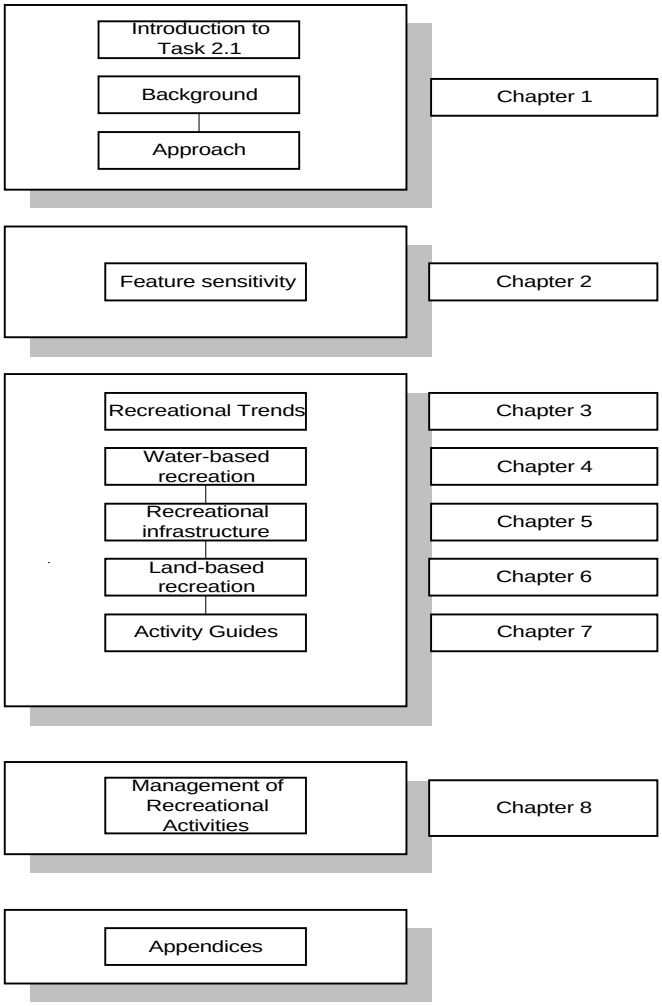
Chapter 2 describes each of the features for which the mSAC sites have been designated and briefly identifies their relative sensitivity.

Chapters 3-6 focus on the effects which recreational activities may have on the marine environment in general and on mSAC features in particular. Chapter 7 provides summary activity guides on the predominant recreational activities.

Chapter 8 looks at how some of the potentially negative effects of recreation, identified in preceding chapters, can be minimised through the use of management tools and techniques. It includes examples of good practice.

The appendices expands upon the information contained within the main part of the report.

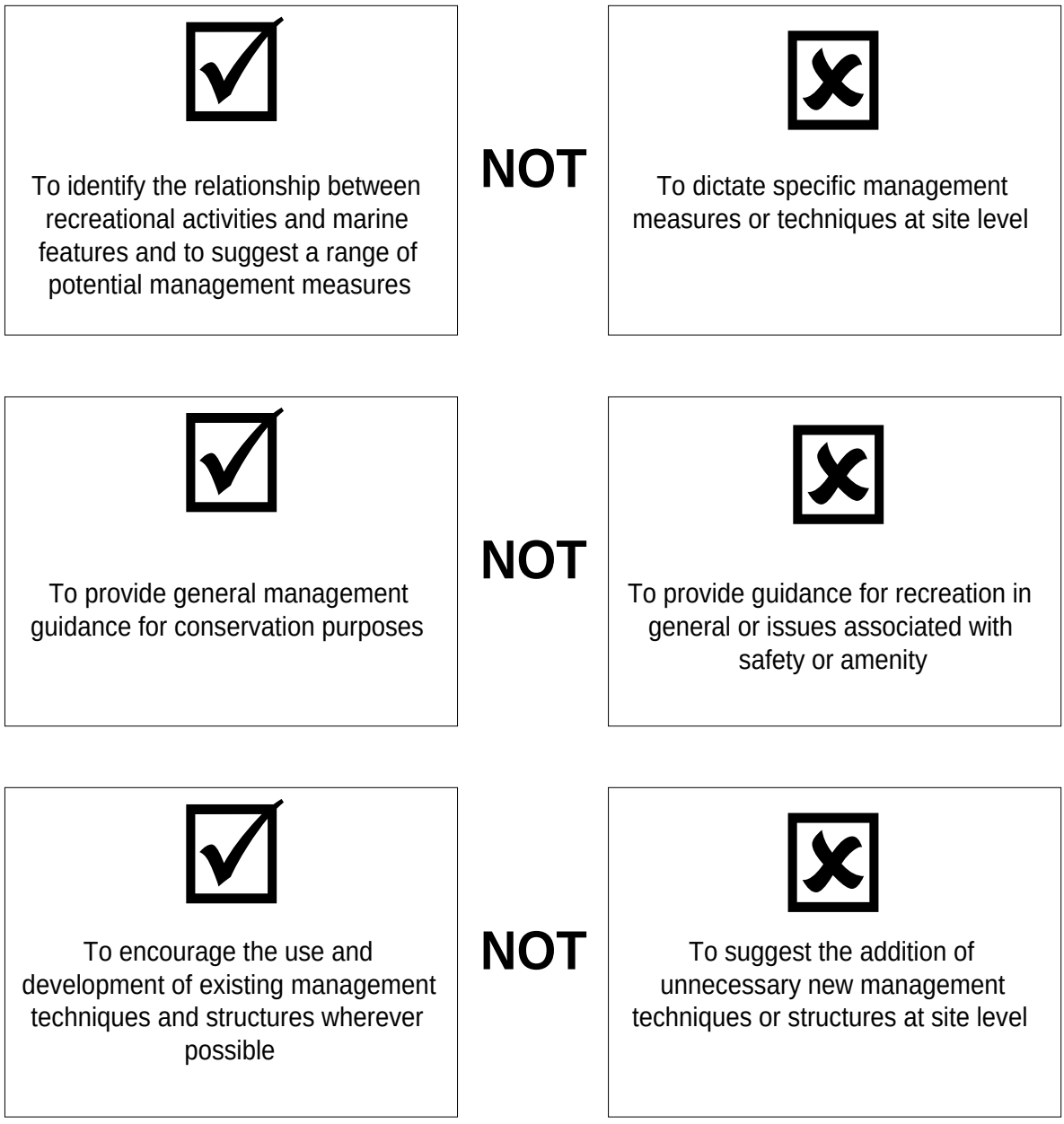
Figure 1.2 Structure of Report



1.6 Summary

Figure 1.3 summarises the overall objectives of the study.

Figure 1.3 Overall objectives of the study



2 Marine features and their sensitivity

2.1 Introduction

The emphasis of this chapter is on the sensitivity of the features listed in table 1.1. However, where appropriate, some consideration is given to typical species of an Annex I habitat, or any habitat of an Annex II species, in line with the following definition of a 'conservation feature' as expressed by the Council of Ministers:

"A natural or semi-natural feature for which a European site has been selected. This includes any Habitats Directive Annex I habitat, or specific component of their fauna or flora, or any Annex II species. Any habitat of a species for which a site has been selected, or typical species of an Annex II habitat, are also considered to be conservation features."

(Council Directive 92/43/EEC)

In a related series of studies, the UK Marine SACs Project provides a scientific review of mSAC features and their associated sensitivities, including consideration of ecology and sensitivity to human and natural change. Nine reports have been produced dealing with the following features:

- Zostera Biotopes — Davison, D.M (1998)
- Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks — Elliot, M (1998)
- Sea Pens and Burrowing Megafauna — Hughes, D.J. (1998)
- Subtidal Brittlestar Beds — Hughes, D.J. (1998)
- Maerl — Birkett, D.A.(1998)
- Intertidal Reef Biotopes — Hill, S. (1998)
- Infralittoral Reef Biotopes with Kelp Species — Birkett, D.A. (1998)
- Circalittoral Faunal Turfs — Hartnoll, R.G. (1998)
- Biogenic Reefs — Holt, T.J.(1998)

This chapter seeks to bridge the gap between the rigorous scientific nature of these reports and the needs of the end user, by providing a brief overview of the designated features and their potential sensitivities. It should be stressed that this is only a generalised starting point for relevant authorities, site managers and recreation participants when considering the relationship between feature sensitivity and recreational activities.

It is vital to bear in mind that many types of marine habitats are, by their nature, dynamic systems. They are constantly changing and reshaping through such processes as erosion and accretion. This makes an assessment of their vulnerability to different human activities extremely difficult. Such features require long term monitoring to determine precisely the changes that are taking place and the extent to which these are caused by human influences.

Further information on different approaches to assessing feature sensitivity are contained within Appendix 4. It should be noted that the method of sensitivity assessment examined in this appendix is only one example of how sensitivity can be measured. It is not the accepted method of the statutory agencies and it is only used in this study to highlight some of the issues and complexities associated with sensitivity assessment.

2.2 Estuaries

Estuaries can be defined as the downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. There is a gradient of salinity from fresh water in the river to increasingly marine conditions towards the open sea. Inputs of sediment from the river, shelter from wave action and, often, low current flows lead to the presence of extensive sediment flats. In short, estuaries are complex ecosystems interlinking the terrestrial and aquatic environments and are composed of an interdependent mosaic of subtidal, intertidal and surrounding terrestrial habitats.

2.2.1 Structure and Composition

Of all the Annex I features in the mSAC programme, estuaries are perhaps the most diverse and dynamic. For analytical purposes, they are divided into core areas, covering the intertidal and subtidal areas, and surrounding areas of associated terrestrial maritime and sub-maritime habitats, such as sand dunes and grazing marshes, linked to the estuary by their physical, chemical or biological processes. Estuaries support a mosaic of habitat types, some of which are also independently designated features under the Habitats and Birds Directives:

- intertidal mud and sand flats
- reefs
- subtidal sandbanks

Other important non-marine features which fall within the estuarine designation are:

- birds
- saltmarshes
- sand dunes

Saltmarshes and sand dunes are briefly reviewed below in terms of their importance to the overall estuarine system and their possible sensitivities.

2.2.2 Estuarine Hydrology

The two most important variables within the estuarine system, in terms of hydrology, are the amount of mixing which occurs between fresh water and salt water and the rate at which this mixing occurs. Levels of salinity within the system can have a significant influence on vegetated habitats and the animal and bird communities which they may support. There are six major factors which influence this mixing:

- river inflow
- precipitation (rain)
- evaporation
- tidal variations
- wind strength
- estuarine topography (shape and level of the ground surface)

Recreation alone is unlikely to be a major influence on any of these factors, although large-scale land claim for recreational infrastructure development may adversely affect tidal processes. There are other equally important variables within estuarine systems, such as sedimentation arising from port and harbour operations, which should be considered as part of the management process. These issues are discussed in chapter 5, and in more detail in a

related report of the UK Marine SACs project which details the effects of port and harbour activities (ABP Research,1999).

The tables below summarise the potential threats to estuaries from land and waterborne processes.

Table 2.1 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Estuary	High	Potential	Potential	High	None	Potential	Potential

Table 2.2 Land based processes

	Natural/ human-induced erosion	Compaction	Litter	Sound
Estuary	High	High	Potential	None

2.2.3 Saltmarshes

Saltmarshes often occur in estuaries adjacent to mudflats. Silt builds up at the top of the tidal range, and it is here that plant colonisation takes place. Salt marshes, with few exceptions, tend to support a moderately low diversity of vegetation (e.g. *Spartina* grasses). However, there are many benthic organisms living both on the surface and within the soils of the marsh. These macrofauna (larger than 1mm, e.g. *polychaete* worms), meiofauna (animals between 0.1mm and 1mm, e.g. small molluscs), and microfauna (organisms smaller than 0.1mm, e.g. protozoans and bacteria) are important sources of food for many shorebirds, seabirds and wildfowl.

Long and Mason (1983) provide detailed studies of the variety of European marshes which may be useful in determining the site level characteristics of this habitat. As with the overall estuarine system, saltmarsh processes are influenced by a number of external factors, including:

- exposure
- salinity
- temperature
- tidal range

Tidal range is perhaps the most prominent influence as all saltmarshes are within the intertidal zone and are, therefore, exposed to tidal immersion. The once daily (diurnal), or more commonly, twice daily (semi-diurnal) flooding of the saltmarsh and the associated impact of tidal waters, are likely to be the most important influence on its development. Ranwell (1972), for example, suggested that many species of *Spartina* are able to tolerate over three hours of submergence per tide. Marshes can also withstand severe buffeting, and can act as a buffer through the stilling of waves. It should be noted, however, that not all saltmarshes are inundated at least once a day. High saltmarsh may only be inundated a few times a year at the very highest tides.

The tables below summarise the potential threats to saltmarshes from land and waterborne processes.

Table 2.3 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Saltmarsh	High	High	Potential	High	None	High	Potential

Table 2.4 Land based processes

	Natural/ human-induced erosion	Compaction	Litter	Sound
Saltmarsh	High	High	Potential	None

2.2.4 Sand Dunes

Sand dunes are an essential buffer which provide protection for terrestrial areas from the effects of waves and wind. They also replenish near shore areas which may loose sediment following storms. The constant exchange between beach and dune is an important natural process and helps to maintain the stability of the system and the ecological diversity within the site. Dunes are also important systems as, in addition to absorbing wave stresses, they also shelter inland communities and help to protect the 'fresh' water-table from saline intrusion.

Dune based vegetation is generally considered to be fragile or vulnerable due to the nutritionally poor soils of dune systems, the hazards of being engulfed by sand and the possibility of drought. The dunes themselves are also extremely sensitive to disturbance.

Sand dunes have suffered significant damage from human activities. Many dune systems have been irreversibly changed by development, coastal defence work and by leisure activities. Indirect human impacts, such as the increasing rabbit population, have also had a profound effect on the habitat. However, it is only in the last 30 years that a scientific information base concerning these systems has begun to develop. For example, Carter (1995) suggests that dune systems may be more robust than originally thought, having shown the capacity to recover from repeated interference over the years.

The tables below summarise the potential threats to sand dunes from land and waterborne processes.

Table 2.5 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Sand dunes	High	None	None	High	None	Potential	Potential

Table 2.6 Land based processes

	Natural/human-induced erosion	Compaction	Litter	Sound
Sand dunes	High	High	Potential	None

2.3 Mud and Sand Flats Not Covered by Sea Water at Low Tide

Intertidal mudflats and sandflats are submerged at high tide and exposed at low tide. They form a major component of estuaries and embayments in the UK but also occur along the open coast. The physical structure of intertidal flats can range from the mobile, coarse-sand beaches of wave-exposed coasts to the stable, fine-sediment mudflats of estuaries and embayments. This habitat type can be divided into three broad categories: clean sands, muddy sands and muds, although in practice there is a continuous gradient between them. Within this range, the plant and animal communities present vary according to the type of sediment, its stability and the salinity of the water.

Mudflat areas are exposed at low tide and may extend for many square kilometres. Those mudflats which are adjacent to saltmarsh areas provide important feeding grounds for many shore and sea birds. They also offer important breeding sites for over-wintering birds. The richness of the fauna contained within the feature is a major determinant in the diversity and number of birds which feed from mud and sand flats. However, just as the macrofauna community is important for the species of birds which populate mud and sand flats, so birds contribute with other factors to the control of these communities through predation.

One of the main factors influencing the environment of intertidal areas is the degree of wave action. This is particularly the case for mud and sand flat areas as the intensity of the wave action will determine the sorting of the surface sands, gravels and silts. This is highlighted by Elliot (1998) who state that "increased littoral and tidal currents carry away finer material and leave coarser, well sorted sands and gravels whilst in more sheltered areas settlement of finer material is possible, as found on intertidal mudflats."

As with many other coastal features, mud and sandflats can be changed considerably by natural events. Periodic increases in wave action can severely alter the appearance of the intertidal region and storms can remove considerable amounts of material from sandbanks. In addition, increased rainfall can cause natural impacts on the feature including scouring of intertidal areas.

In addition to the physical characteristics of intertidal mud and sand flats, the biological communities within these features are also important to feature stability. Micro and macro biological species such as bacteria and *polychaete* worms contribute to the long term stability of the feature. Disturbance to the layering of the mud or sand flat can have consequences for these species. In particular, although some water breathing species have adapted to air exposure, such as *Scolelpis squamata*, many need to burrow into the sediment to avoid drying out and dying from air exposure.

There are a number of human pressures influencing mud and sand flats including:

- land claim for development
- squeeze through sea level rise
- provision of recreation facilities
- recreational activities
- dredging
- pollution/nutrient stimulation

Other factors that can affect mud and sand flat species include:

- salinity
- temperature
- dissolved oxygen content

It is unlikely that recreation could affect any of these factors to such a degree that it would have a significant effect on the feature or the species it supports.

The tables below summarise the potential threats to mud and sand flats from land and waterborne processes.

Table 2.7 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Mud and Sand flats	Potential	None	High	Potential	None	Potential	Potential

Table 2.8 Land based processes

	Natural/ human-induced erosion	Compaction	Litter	Sound
Mud and Sand Flats	Potential	Potential	Potential	None

2.4 Subtidal Sandbanks

Subtidal sandbanks are slightly covered by sea water at all times to depths of up to 20 metres below low water mark. They include muddy sands, clean sands and *maerl* beds (carpets of small, unattached, calcareous seaweed).

Unlike mud and sandflats, subtidal sandbanks are not exposed to drying out. However, as with many coastal features they are affected to varying degrees by wave action. For example, the subtidal sandbanks in the Solway Firth are heavily influenced by strong tidal streams, which can move the sandbanks some distance over the period of one tidal cycle.

Wave action, particularly during storms, may affect sandbanks up to a depth of 50m. This disturbance is likely to be more observable in shallow water areas and may result in a great deal of sediment transport. Often this movement of sediment in shallow or constricted areas can cause the water above the banks to become very turbid.

Subtidal sandbanks also support benthic or burrowing communities and, as with intertidal mud and sandflats, the nature and location of these communities is largely determined by the nature of the sediment which forms the sandbank.

There are a number of human activities and provisions that can have a long term effect on the stability of subtidal sandbanks. These include:

- dredging and aggregate extraction
- provision of recreational facilities (jetties and harbours etc.)
- pollution

As subtidal sandbanks are, by their nature, the result of relatively high energy conditions, they are likely to be flexible to changes caused by storms or human activities. For example, Poiner and Kennedy (1984) note an initial increase in species richness following dredging.

The tables below summarise the potential threats to subtidal sandbanks from land and waterborne processes.

Table 2.9 Water based Processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Subtidal Sand Banks	None	None	High	None	None	Potential	Potential

Table 2.10 Land based processes

	Natural/human-induced erosion	Compaction	Litter	Sound
Subtidal Sand Banks	None	None	Potential	None

2.5 Large Shallow Inlets and Bays

Large shallow inlets and bays are complex systems interlinking the terrestrial and aquatic environments and composed of an interdependent mosaic of subtidal, intertidal and surrounding terrestrial habitats. Several of these habitats types are proposed as Annex I interests in their own right. Large inlets and bays are large indentations of the coast, generally more sheltered from wave action than the open coast. They are relatively shallow, usually averaging less than 30m in depth.

Rias and voes are formed through fluvial erosion, whereas fjords evolved through glacial action. These significant differences in development result in various characteristic natural structures forming within the systems. Fjords tend to have a shallow seawards rock sill which causes uneven distribution of salinity throughout the feature. In contrast, rias, with constant seaward gradients throughout, tend to have evenly mixed salinity levels. This mixing of water bodies, as with estuarine systems, is an important characteristic of inlet and bay features.

In many tidal bays and inlets the upper intertidal area contains areas of mobile mudflats, perhaps with a landward wetland fringe. This stratification of habitats within the inlet and bay system can also be seen in the sediments which form the bed of the system. Generally, the sediments will grade seawards into silts, sands and even gravels. This differentiation of sediment bed is an important consideration as different sediment types may vary in their vulnerability to disturbance.

The description of sedimentology, benthic communities and disturbance under other feature headings in this chapter are also relevant to inlets and bays.

The tables below summarise the potential threats to inlets and bays from land and waterborne processes.

Table 2.11 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Inlets and Bays	High	Potential	Potential	High	None	Potential	Potential

Table 2.12 Land based processes

	Natural/human-induced erosion	Compaction	Litter	Sound
Inlets and Bays	High	High	Potential	None

2.6 Lagoons

Lagoons are areas of shallow, coastal salt waters, wholly or partially separated from the sea by sandbanks, shingle or, less frequently, rocks. Five main sub-types of lagoon have been identified in the UK, on the basis of their physiography, as meeting the definition of the habitat type. These include, isolated lagoons, percolation lagoons, silled lagoons, sluiced lagoons and lagoonal inlets.

Coastal brackish lagoons are the only marine priority habitat type in the UK. They are pond- or lake-like bodies of saline water of restricted tidal range, either wholly or partially separated from the adjacent sea, but with some influx of sea water. They are commonly shallow, often with a varying salinity range both above and below sea water levels. They offer an unusual habitat, often temporary, and invariably under pressure from pollution. Lagoons support a characteristic community of invertebrates and submerged flora, often of low diversity, but several of which are rare and protected under the Wildlife and Countryside Act (1981).

The sensitivity of a lagoonal site varies not only on a site-by-site basis but also across different time periods. The nature of sea-water exchange is critical to the survival of the habitat, but there is limited information on the natural variability of habitat and biotic characteristics. This makes assessment of its relative sensitivity and vulnerability to human influences difficult.

The tables below summarise the potential threats to lagoons from land and waterborne processes.

Table 2.13 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Lagoons	Potential	Potential	High	Potential	None	Potential	Potential

Table 2.14 Land based processes

	Natural/human-induced erosion	Compaction	Litter	Sound
Lagoons	High	High	Potential	None

2.7 Reefs

Reefs are widespread in Southern Europe and occur widely around the UK coast. They are very variable in form and in the communities that they support. Reefs are rocky marine habitats or biological concretions that rise from the sea bed. They are generally subtidal but may extend as an unbroken transition to the intertidal zone, where they are exposed to the air at low tide. Two main types of reef can be recognised: those where the structure is created by the animals themselves (biogenic reefs) and those where animal and plant communities grow on raised or protruding rock.

Reef communities, or 'hold-fast' communities, need to harness wave energy to survive. The plant and animal communities rely on turbulent conditions for nutrients, oxygen and carbon supplies. They are therefore well adapted to survive the extreme physical stresses imposed by waves and currents.

For safety reasons, water-based recreation, other than snorkelling, diving and the use of very shallow hulled craft, is unlikely to take place in the vicinity of reefs. However, land based recreation at low tide can have implications for intertidal reef habitats and communities through:

- collection of species (rock pooling)
- trampling
- littering

2.7.1 Intertidal Species

Rocky shores are dominated by *Fucales* or rock-weeds, represented by species in temperate climates such as, *Ascophyllum*, *Cystoseira* and *Fucus*. However, all of these plant species experience environmental stresses due to their location, which exposes them to immersion, desiccation and changes in water temperature and salinity.

It has been suggested that seaweeds and rock-weeds may suffer from nutrient deficiency but Mann (1972) concluded that some communities were able to overcome such natural limitations by storing nutrients during periods of high availability and using them for growth in the Spring and Autumn. These changes to the typical seasonal growth timing may have implications for recreational management as it suggests that the sensitivity of the plant may be greatest in its spring and autumn growth periods.

Intertidal and littoral ecosystems are exposed to human impact more frequently than any other marine system. However, it is difficult to determine generic sensitivities because of the complex relief of rocky shores. Some locational classifications do exist, which relate to where species are found on the shore (upper, mid and lower) and the levels of shading available. Alternatively species location may be determined by available space, rather than any other environmental control. These issues are considered in more detail by Hill *et al* (1998)

This problem with identification of sensitive areas is heightened by the fact that the community structure of some rocky shores is highly variable in time and space. Due to this variability, and the natural stress applied to the system as outlined above, impacts on one species can have serious community-wide consequences. With such a variety of natural fluctuations, human impacts may be difficult to determine without detailed and often long term investigations at site level.

The tables below summarise the potential threats to reefs from land and waterborne processes.

Table 2.15 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Reefs	Potential	High	None	None	None	Potential	Potential

Table 2.16 Land based processes

	Natural/Human-induced Erosion	Compaction	Litter	Sound
Reefs	Potential	Potential	Potential	None

2.8 Submerged or Partly Submerged Sea Caves

Sea caves can vary in size, from only a few meters to more extensive systems which may extend hundreds of metres into the rock. There may be tunnels or caverns with one or more entrances in which vertical and overhanging rock faces provide the principal marine habitat.

Sea Caves are intermediate features of coastlines which 'have been significantly changed by wave action and other marine processes after the sea level has stabilised' (Garrison 1996). Erosional forces from air, land and sea work together to change a rough and irregular primary into a modified secondary coast. The temporary state of these features should not, however, infer that their protection from potential impacts of human activities is secondary to that of other more static habitats.

At any given place on the secondary coast, cliff formation will be influenced by the nature and structure of the rocks and their level of exposure to the relative weathering forces such as wind, rain and wave action. Caves provide the most striking evidence of weathering and undermining. There are few stretches of coast along which the rocks are equally resistant to wave attack. Caves are excavated along belts of weakness of all kinds, and especially where the rocks are strongly jointed (e.g. Fingal's Cave - Outer Hebrides). Joints which run roughly parallel to each other form areas of weakness along which wave action can be especially effective.

This historical and long term evolution of the coastline and the development of sea caves is a natural result of erosion. From current research it would seem highly unlikely that any human recreational activity could have any significant impacts on the development of these features. However, this is not to say that other human actions, for example industry and coastal development, could not affect the rock strata which form the cave or the tidal flows which aid the development of the cave respectively.

The tables below summarise the potential threats to sea caves from land and waterborne processes.

Table 2.17 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Sea caves	None	None	None	None	None	Potential	Potential

Table 2.18 Land based processes

	Natural/Human-induced Erosion	Compaction	Litter	Sound
Sea caves	None	None	Potential	None

2.9 Grey & Common Seal

In general, it is the habitats for grey and common seals in which they are found that are to be protected under the Habitats Directive. The sensitivity of these habitats has been addressed in the previous sections. However, it is important that consideration is also given to the sensitivity of the species themselves to human activities. This may be as important an influence on current stocks and breeding patterns of seals as the protection of their habitats.

- Common Seal, *phoca vitulina*: The UK holds some 28,000 common seals, approximately 50% of the EC population. The species is found from Strangford Lough in Northern Ireland, through the south shores of the Clyde and clockwise round the coast to the Thames Estuary. Site selection has favoured sites that are suitable both as haul-out sites and also for pupping.

- Grey Seal, *halichoerus grypus*: The UK holds some 115,000 grey seals, approximately 50% of the world population and 95% of the EU population. There are breeding colonies all around the UK coast, from the Scilly Isles clockwise to the North Norfolk coasts. The colonies vary greatly in size. The largest breeding colonies have been selected for designation, based on pup productions. Colonies have also been selected to ensure coverage of the geographical range of breeding in the UK.

Rejinders (1981), suggests that UK populations of the grey and common seal each represent 40% of the world totals. Such figures highlight the international conservation importance of these populations.

Tourism based on wildlife watching, including grey and common seals, is a growing business which may often promote conservation interests. For seals, most of the activities take place on land as they are difficult to observe and track at sea. In particular, their presence in shallow coastal waters or at haul-out sites is a major attraction for wildlife watchers. Within these breeding and pupping sites, the seals are visible and, in some instances, actually accessible to the public from either land or boat.

For the purposes of this report, a distinction is made between those haul-out sites which are for breeding, pupping or resting as at each of these sites the sensitivity of the species differs.
There is a large body of information available about the land-side behaviour of seal species, including breeding conditions, pupping sensitivity and resting haul-outs. Brown and Prior (1997) suggest that the main on-land indicators of disturbance to seals are:

- interruption and disturbance of rest, resulting in lower fitness and health
- interference with nursing young, reducing their health
- separation of mother and pup, resulting in starvation and death of pups
- abandonment of haul-out sites

Observations have shown that when seals perceive a threat, they tend to race from their haul-out sites and enter the water. The length of retreats to water may be a good indication of the level of threat as perceived by the seal. However any flight response by the seals can be taken as evidence of disturbance. To quantify the reaction of hauled-out seals to human presence, Mortenson (1996) devised a scoring system to identify the intensity of the seals reaction. The definitions within this system are as follows:

Level 1 'alerting: head orientation of the seal towards the direction of any source of disturbance

Level 2 'movement: any movement of one or more seals from their resting position away in any direction from the disturbance source or towards the waters edge

Level 3 'flushing: one or more seals moving from haul-out sites into the water

Such a system is an easy and effective way of monitoring the effects and frequency of human disturbance at site level. The key impacts of such disturbance are on seal fitness and health and, in severe cases, possible mortality.

Disturbance issues are not the only potential threats to Grey and Common seals in the mSAC areas. These species are also sensitive to actively fished nets, debris, pollution and effects on the food web. Site managers and relevant authorities should give consideration to these potential threats when assessing recreation at site level.

The resilience of the seal population on the Wash has been closely monitored over the last decade following an outbreak of a serious virus in 1988 which was reported to have killed 50% of the population. Ten years later, new counts have revealed that the population is now approaching 1987 levels, before the outbreak of the virus. This recovery suggests that the seal population in the Wash area is remarkably resilient, even to potentially catastrophic events. The issue of disturbance to seals is dealt with in more detail in chapter 6.

The tables below summarise the potential threats to grey and common seals from land and waterborne processes.

Table 2.19 Water based processes

	Wave Erosion	**Turbidity**	**Sediment mixing**	**Immersion**	**Waterborne Sound**	**Waterborne pollution**	**Waterborne litter**
Grey Seal	None	Potential	None	None	High	High	High
Common Seal	None	Potential	None	None	High	High	High

Table 2.20 Land based processes

	Natural/Human-induced Erosion	**Compaction**	**Litter**	**Sound**
Grey Seal	None	None	High	High
Common Seal	None	None	High	High

2.10 Bottlenose Dolphins

Bottlenose dolphins are widely distributed in the North Atlantic, West African, Mediterranean and UK coastal waters. They occur predominantly in two areas in UK inshore waters – Cardigan Bay and the Moray Firth. The population in the inshore waters of the UK is probably between 300 and 500 individuals.

A fully-grown bottlenose dolphin is a large and formidable adversary, its only predators being killer whales and sharks which tend to take only the small or sick among the group. Studies have shown that most coastal bottlenose dolphins live in small groups of about 10 individuals, and are restricted to a 'home range'. The size of this 'range' varies, however, from population to population in different areas of the world.

When the 'home range' is in areas of human habitation, solitary dolphins frequently encounter divers, sailors and fishermen. After a while, they accustom themselves to human presence, and become very friendly and approachable. Tour operators tend to make the most of these encounters. Paying visitors may be inclined or encouraged to touch and feed the dolphins and this behaviour, if not monitored, may have long term effects on the dolphins' natural instincts to return to the group.

The sensitivity of the bottlenose dolphin depends largely on the dolphins' choice of home range, the activities which take place in the area, and the water quality. The species will tend to inhabit areas where there is adequate food and clean, hazard free waters in which to swim. Heightened sensitivity to recreation may result from a decline in water quality caused, for example, by increased sewage discharge or levels of marine litter. This could have a direct influence on the lower trophic species within the dolphins' food chain, with the knock on effect of driving the dolphins' favoured higher trophic species out of the vicinity, subsequently followed by the dolphins themselves. Discarded nets and fishing debris are also prime examples of potential hazards to dolphins.

The potential for 'noisy' activities to disturb marine mammals such as bottlenose dolphins has not been sufficiently quantified to reach a generalised conclusion. However, animals which stay in an area despite disturbance, possibly because of a lack of an alternative site, may suffer from elevated levels of stress. While able to 'cope' with such stress in the short term, repeated exposure could have long term impacts on the animal.

A useful conceptual framework for the management of noise and disturbance is a 'zone of influence' model. This specifies the various ranges at which a particular sound source might be expected to illicit a certain level of response. The sound thresholds at which these zones are set depend on the frequency components of the sound and the frequency sensitivity of the animals concerned. In addition, the actual ranges at which these threshold sound levels will be reached, depend on the intensity and frequency components of the sound source and the propagation conditions in the area.

For bottlenose dolphins both the horizontal range from the source of the noise and the depth of the receiver (underwater range) should be taken into account. However, fundamental data on the effects of recreational noise disturbance to marine mammals is sparse, and the understanding of the long term effects of noise-making activities is far from comprehensive.

The tables below summarise the potential threats to bottlenose dolphins from land and waterborne processes.

Table 2.21 Water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Bottlenose dolphin	None	Potential	None	None	High	High	High

Table 2.22 Land based processes

	Natural/Human-induced Erosion	Compaction	Litter	Sound
Bottlenose dolphin	None	None	Potential	Potential

2.11 Summary

The tables below summarise the potential waterborne and land originating threats to marine features.

Table 2.23 Potential threats to features from water based processes

	Wave Erosion	Turbidity	Sediment mixing	Immersion	Waterborne Sound	Waterborne pollution	Waterborne litter
Estuary	High	Potential	Potential	High	None	Potential	Potential
Saltmarsh	High	High	Potential	High	None	High	Potential
Sand dunes	High	None	None	High	None	Potential	Potential
Mud and Sand flats	Potential	None	High	Potential	None	Potential	Potential
Subtidal sand banks	None	None	High	None	None	Potential	Potential
Inlets and Bays	High	Potential	Potential	High	None	Potential	Potential
Lagoons	Potential	Potential	High	Potential	None	Potential	Potential
Reefs	Potential	High	None	None	None	Potential	Potential
Sea caves	None	None	None	None	None	Potential	Potential
Grey Seal	None	Potential	None	None	High	High	High
Common Seal	None	Potential	None	None	High	High	High
Bottlenose dolphin	None	Potential	None	None	High	High	High

Table 2.24 Potential threats to features from land based processes

	Natural/ Human-Induced erosion	Compaction	Litter	Sound
Estuary	High	High	Potential	None
Saltmarsh	High	High	Potential	None
Sand dunes	High	High	Potential	None
Mud and Sand flats	Potential	Potential	Potential	None
Subtidal sand banks	None	None	Potential	None
Inlets and Bays	High	High	Potential	None
Lagoons	High	High	Potential	None
Reefs	Potential	Potential	Potential	None
Sea caves	None	None	Potential	None
Grey Seal	None	None	High	High
Common Seal	None	None	High	High
Bottlenose dolphin	None	None	Potential	Potential

3 Recreation and the Marine Environment

Marine environments have been shaped over thousands of years by powerful natural forces. Throughout history, human activities have also had a profound influence on marine areas. It is relatively recently, however, that participation in recreational activities has grown to the extent that it has been linked to declining environmental quality in certain areas.

The recreational issues most frequently linked with environmental impacts range from physical actions such as infrastructure development, dredging and trampling to biological effects caused by sewage discharge, antifouling paint leaching and engine exhaust emissions.

This chapter highlights the significance of recreation in terms of participation rates and the nature of activities in mSAC areas. The following chapters 4-6 outline the potential for water-based and land-based recreation and its associated infrastructure to have an impact on marine environments in general and on mSAC areas in particular. Chapter 7 summarises these issues in the form of activity guides for individual recreational activities. Finally, chapter 8 identifies possible management approaches for minimising potential conflicts between recreational activities and the environment.

3.1 The Benefits of Recreation for Nature Conservation

The benefits of recreation for nature conservation objectives should also be considered. The fact that recreational participants actively seek pleasant environments in which to undertake their activities suggests that they are likely both to have an awareness of, and also to have an appreciation for the natural environment. Many regular participants are also likely to have an intimate knowledge of the environment in which they undertake their activities and may even be aware of changes taking place over time. Such knowledge can make an important contribution to understanding environmental change and the enthusiasm of many participants can ensure that environmental initiatives are successful.

In addition, tourism and recreation are becoming increasingly important economic sectors in many coastal areas. It is often the increased income generated by these sectors that enable improvements to be made in areas such as wastewater treatment. This has obvious benefits for nature conservation objectives.

Recreational participants may also be successful in campaigning collectively for improvements in the environments in which they undertake their activities. For example, Surfers Against Sewage has achieved a high profile in its campaign to improve water quality for the benefit of those taking part in immersion sports. Subsequent improvements in waste water treatment by water companies has benefits for nature conservation.

Similarly, beach recreationalists generally look for safe and clean bathing environments in which to undertake their activity. In recognising the need for some form of independent accreditation for beach and bathing water quality, the Blue Flag scheme and the Good Beach Guides have had a positive effect on environmental quality in a large number of locations. The former has now expanded to marinas.

For many recreational participants, their activities provide their only contact with the natural environment. This may act as a major catalyst for their wider understanding of environmental issues and support for conservation objectives. For some activities, such as wildlife watching, the quality of the environment and the species it supports will be even more intrinsically linked and such participants are likely to be amongst the most proactive of all recreational

participants. These activities also attract a good deal of conservation-related funding, largely because of the high participation rates but also because of its attractive image for sponsors.

3.2 The Importance of Recreation

The leisure industry is one of largest sectors of the UK economy, employing over 3 million people and with an annual turnover of £90 billion. Sport and physical recreation account for over £10 billion of consumer expenditure each year (Sports Council, 1997). The countryside is the destination of one third of all leisure day trip visits from home with 8% of day visits involving trips to the seaside or coast (Sports Council, 1993)

A survey carried out by Research Solutions Ltd in 1994, on behalf of the British Marine Industries Federation (BMIF), estimated that as many as 4 million people take part in boating activities in the UK each year. Land based recreational activities are also of growing importance. In 1997, the Sports Council for England (SPE) highlighted an increase in participation of flexible lifestyle activities such as walking and cycling, activities which are popular in coastal areas.

3.3 Trends in Recreational and Leisure Participation

Detailed national data concerning the levels of different types of recreation is scarce. The General Household Survey, *Living in Britain (1998)*, produced by the Office of National Statistics, does provide some useful data on recreational activities, including the following:

- informal activities, such as walking or cycling, are the most popular pursuits
- walking is the most popular activity with an estimated 68.2% of the population undertaking at least one leisure walk of 2 miles or more per year
- cycling is the second most popular activity with an estimated 21.4% of the population undertaking this activity
- watersport activities are also popular. It is estimated that almost 1 million people take part in sailing and motorboating activities each year

For water-based recreation, the only detailed national survey was undertaken by Leisure Consultants in 1989. As this survey was carried out at the height of the leisure boom in the late eighties and is nearly ten years old, it has been used only sparingly in this report. More up-to-date activity-specific information is used wherever possible in chapter 7.

Table 3.1 below summarises the information which is available concerning recreational participation.

3.3.1 Seasonal Trends

The seasonal variations of different activities can have implications for nature conservation. For example, management schemes may only be required for part of the year or not at all if the activity does not coincide with a site's most sensitive periods.

The main seasons for activities are:

- for the majority of outdoor activities the peak season is July to September
- shooting activities are linked to legal constraints and generally occur in October to December
- walking remains popular throughout the year but also peaks in July to September.

3.3.2 Trends in Participation

According to the House of Commons Environment Committee Report on Leisure Impacts (1995), there is no evidence to suggest that participation in any of the recreational activities which take place in coastal areas is growing significantly or has grown significantly over the last five years. This tends to be confirmed by other available data on leisure participation.

3.3.3 Membership Levels

Levels of club membership linked to specific recreational activities can often provide a useful indication of the extent to which an activity is formal or informal. This is an important indicator as to the easy of reaching participants with information passed through the clubs. In addition, many clubs promote voluntary management measures at the local level which, although often for safety or amenity purposes, may make a positive contribution to nature conservation.

Table 3.1 summarises the information which is available on membership levels of recreational clubs.

Table 3.1 Recreational participation and club membership levels

Activity	Membership of Governing Body	Estimated Popularity	% Users Who Have Membership
Walking	100,000 - Ramblers Association	28,700,000 visits pa	0.34%
Riding	62,536 - British Horse Society 37,458 - The Pony Club	1,300,000	7.7%
Running	n/a	2,200,000	n/a
Climbing	19,000 individual members, 9,000 club members - British Mountaineering Council	700,000 (England and Wales) figures are not sea cliff specific	2.7% individuals
Cycling (informal and mountain)	40,000 - British Cycling Federation, British Mountain Biking Federation, Cyclists Touring Club (combined)	8,200,000	0.48%
Camping and caravaning	285,000 - Caravan Club (family members - 700,000 people altogether) 252,000 - Camping and Caravaning Club	4.193m trips pa to caravan holiday homes 2.995m trips pa camping	10.4%
Caving	6,500 - National Caving Association	12,000 regular cavers 100,000 - 150,000 intermittent cavers	54.1% 0.043%
Shooting – game	112,000 - British Association for Shooting and Conservation	343,000 - game shooting	32.6%
4x4 Vehicles	n/a	100,000 - total number of competitors	n/a
Two wheeled	12,500 - The Auto Cycle Union 100,000 - The British Motorcyclists Federation	n/a	n/a
Sailing and board sailing including windsurfing & motor-boating	75,000 personal members 1,500 club affiliations - The Royal Yachting Association	Approx. 900,000	8.3%
Canoeing	22,000 individuals and 600 clubs – British Canoe Union	700,000	3.1%

Sub Aqua	52,247 members – British Sub-Aqua Club 51,700 members - PADI	Approx. 120,000	83%
Personal water crafting	n/a	17,000 personally owned	n/a
Water-skiing	14,000 - British Water Ski Federation	150,000 regular participants, 250,000 casual	9.3%
Angling	221,699 - National Federation of Anglers 35,000 - National Federation of Sea Anglers	2,500,000	0.1%
Ornithology/ Birdwatching	1 million - Royal Society for the Protection of Birds	2 million	50%

House of Commons Environment Committee (1995), UK CEED (1998)

3.4 Findings from the Questionnaire Surveys

As outlined in chapter 1, the distribution of a questionnaire survey to national and local representative organisations and individuals formed an important part of the consultation process for this study. This section provides an analysis of the findings, particularly in relation to participation trends in mSAC areas.

3.4.1 Response Rates

Of the 87 national questionnaires that were forwarded to organisations on the consultation list, 33 completed questionnaires were received, a response rate of approximately 29%.

The network approach that was used to forward site questionnaires proved successful with 98 completed questionnaires being received. As the total number forwarded by national organisations is not known, it is not possible to determine the response rate as a percentage. However, the questionnaires that were returned provided useful information regarding the types of activities that were undertaken in each site area.

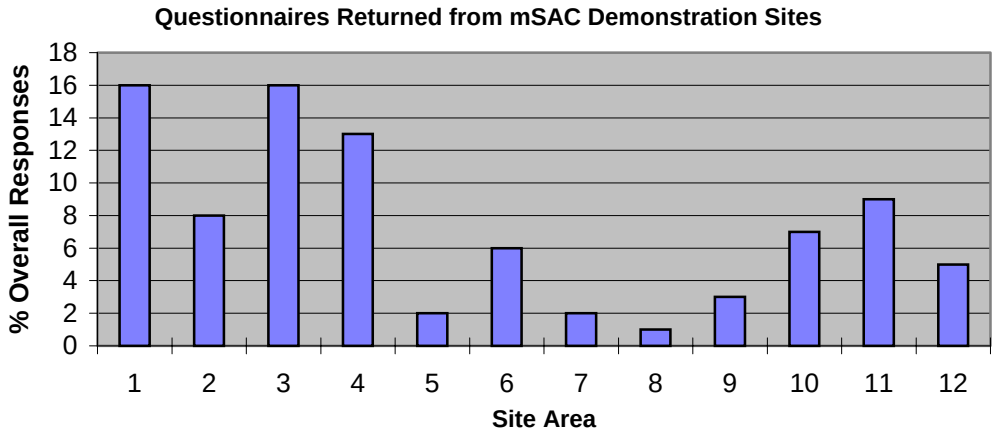
The majority of site questionnaires returned covered the English demonstration sites. A good response was also received from the Lleyn Peninsula and Strangford Lough. The response rate from Scottish sites was more limited, possibly because of the lower levels of recreation in many of these areas or as a result of the national organisational networks not extending to these areas. As a result, the following information analysis is predominantly from the English and Welsh sites.

In the following analysis, the twelve site areas correspond to the following numbers:

1. Plymouth Sound and Estuaries, England
2. Chesil and the Fleet, England
3. The Wash and North Norfolk Coast, England
4. Berwickshire and North Northumberland Coast, England & Scotland
5. Morecambe Bay, England
6. Solway Firth, England & Scotland
7. Papa Stour, Scotland
8. Loch Maddy, Scotland
9. Sound of Arisaig, Scotland
10. Strangford Lough, N. Ireland
11. Llyn Peninsula, Wales
12. Cardigan Bay, Wales

The graph below shows the response rate to the site questionnaires received from each demonstration area.

Figure 3.1



3.4.2 Evaluation of National Questionnaire Findings

3.4.2.1 National representation of leisure activities

Question 4.1 of the national questionnaire was concerned with identifying which leisure and recreational activities were of a direct interest to recreational representative organisations. This provides a useful indication of the effectiveness of using clubs to distribute environmental information to participants. Table 3.2 below illustrates the number of organisations with a direct interest in specific leisure activities.

This table clearly shows that water-based activities have higher levels of national representation than land based activities. This may be due to the fact that many land based activities are very informal activities which do not require club membership or expert knowledge for participation.

Table 3.2 Levels of representation for recreational activities.

Activity	Representation
Motorboating	18
Sailing	11
Personal watercrafting	9
Windsurfing	10
Dinghy Sailing	10
Water-skiing	9
Canoeing	9
Sub-Aqua	7
Swimming	8
Snorkelling	4
Sea fishing	12
Motor towed inflatables	5
Surfing	6
Bird watching	5
Day tripping	6
Walking/hiking	7
Dog walking	6
Fossil hunting	2
Horse riding	5
Cycling	5
Off-roading	4
Land yachting	1
Kite flying	0
Shoreline angling	10
Jogging	2

3.4.2.2 Provision of Information

To aid with the literature review, national organisations were asked whether they held or had commissioned research or other information concerning recreational activities and/or the marine environment (see question 2.1-2.4). The findings of this question supported the established opinion that there is a great deal of recreational and environmental information available. 58% of those organisations that responded stated that they did hold information concerned with the extent or volumes of recreational activities and / or the interaction of recreation with the environment. Of these, the following organisations offered to make information available for the development of this study:

- British Marine Industries Federation
- British Surfing Association
- British Water Ski Federation
- Chichester Harbour Conservancy
- Ceredigon County Council
- Environment Agency
- National Trust
- Pembrokeshire Coast National Park
- Royal National Lifeboat Institution

- Royal Society for the Protection of Birds
- Royal Yachting Association
- Scottish Canoe Association
- Tamar Estuaries Consultative Forum
- Welsh Yachting Association

3.4.2.3 National Organisational Comments

Organisations were given the opportunity to comment on management measures and generally on the development of the study (see question 3.3-3.6). Appendix 5 summarises these comments.

3.4.3 Evaluation of Local Questionnaire Findings

The following information is concerned with the findings of the local questionnaires.

3.4.3.1 Recreational Activities Occurring in mSAC Areas

Local respondents were asked to identify recreational activities which they had seen occurring in their local area (see question 2.1-2.2). Respondents were given a list and asked to tick relevant activities. This was to provide a very approximate indication of the perceived scale of activities in site areas. The following table illustrates the findings of this activity review.

Table 3.3 Activities observed in demonstration sites

Activity	Site												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Motorboating	12	8	17	12	0	5	2	1	3	8	10	5	86
Sailing	13	8	17	13	1	5	2	1	3	8	10	5	60
Personal watercrafting	8	6	14	8	0	4	0	0	1	4	10	5	75
Dinghy sailing	13	9	14	12	0	5	2	1	2	8	10	5	81
Water skiing	9	6	12	10	0	4	1	0	1	7	10	5	65
Canoeing	13	8	11	12	0	2	1	1	3	8	10	5	74
Sub aqua	9	6	4	11	0	3	2	1	3	8	9	3	59
Swimming	9	8	14	7	1	4	1	1	1	7	10	4	67
Snorkelling	8	4	3	5	0	0	1	1	0	2	8	3	35
Sea fishing	10	9	13	10	0	5	2	1	1	7	10	4	72
Motor-towed inflatables	4	5	7	3	0	2	0	0	0	2	7	3	33
Surfing	3	3	5	7	0	1	0	0	0	0	6	5	30
Bird watching	10	6	17	13	2	3	2	1	2	8	8	4	76
Day tripping	8	8	16	12	2	4	1	1	3	4	10	4	73
Walking/hiking	10	9	17	13	2	4	1	1	3	8	10	4	82
Dog walking	11	8	17	13	2	5	1	1	2	7	9	4	80
Fossil collecting	1	3	3	4	0	0	0	0	0	1	2	1	15
Horse riding	9	5	14	10	2	4	0	0	2	6	7	3	62
Cycling	11	6	12	11	2	2	0	1	3	8	8	3	67
Off roading	1	2	6	1	1	2	0	0	1	0	3	1	18
Land yachting	1	0	5	3	0	2	0	0	0	0	4	2	17
Kite flying	7	14	13	5	2	4	0	0	1	0	9	4	49
Shoreline angling	13	8	12	12	1	4	2	1	1	4	10	4	72
Jogging	9	4	12	7	2	3	0	0	2	6	7	4	56
Sand sculpting	3	0	1	2	0	0	0	0	0	0	1	2	9
Total	15	9	17	14	2	6	2	1	3	8	10	5	92

1. Plymouth Sound and Estuaries, England
2. Chesil and the Fleet, England
3. The Wash and North Norfolk Coast, England
4. Berwickshire and North Northumberland Coast, England & Scotland
5. Morecambe Bay, England
6. Solway Firth, England & Scotland
7. Papa Stour, Scotland
8. Loch Maddy, Scotland
9. Sound of Arisaig, Scotland
10. Strangford Lough, N. Ireland
11. Llyn Peninsula, Wales
12. Cardigan Bay, Wales

The table above illustrates that a number of activities are commonly observed in mSAC areas including:

- motorboating
- dinghy sailing

- walking/hiking
- dog walking

A number of other activities were also observed by respondents including:

- samphire gathering (Norfolk)
- caravaning (South Coast)
- gig rowing (Plymouth Sound)
- golf (Northumberland)
- flying (Strangford Lough)
- camping (Llyn Peninsula)
- wildfowling (various sites)

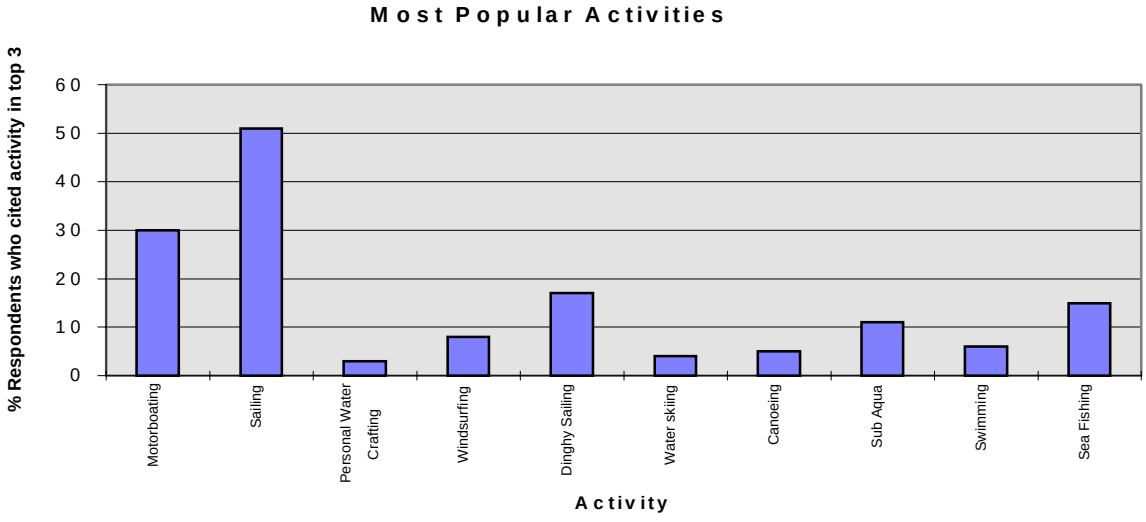
These figures confirm that a huge variety of recreational activities occur in and around mSAC sites.

3.4.3.2 Most Popular Activities

Respondents were questioned as to what they considered the most popular local activities to be and their perceptions as to the levels of these activities (see questions 2.3-2.5). Respondents were asked to suggest which were the three most common recreational activities that occurred within their local mSAC demonstration site area. The results for water-based and land-based activities are shown in the following diagrams. It should be noted that the following figures apply only to the situation within the *demonstration* site areas. However, the demonstration sites offer a great variety of recreational examples, in terms of the level and types of activity at each site, and are therefore a good indication of the possible recreational activities at other mSAC sites.

It should also be noted that surveys of this nature are largely subjective. However, perceptions of levels of recreation can be an important factor in understanding the extent of support for particular management methods and therefore the results of the survey are of general interest.

Figure 3.2 The Most Common Water-based Activities

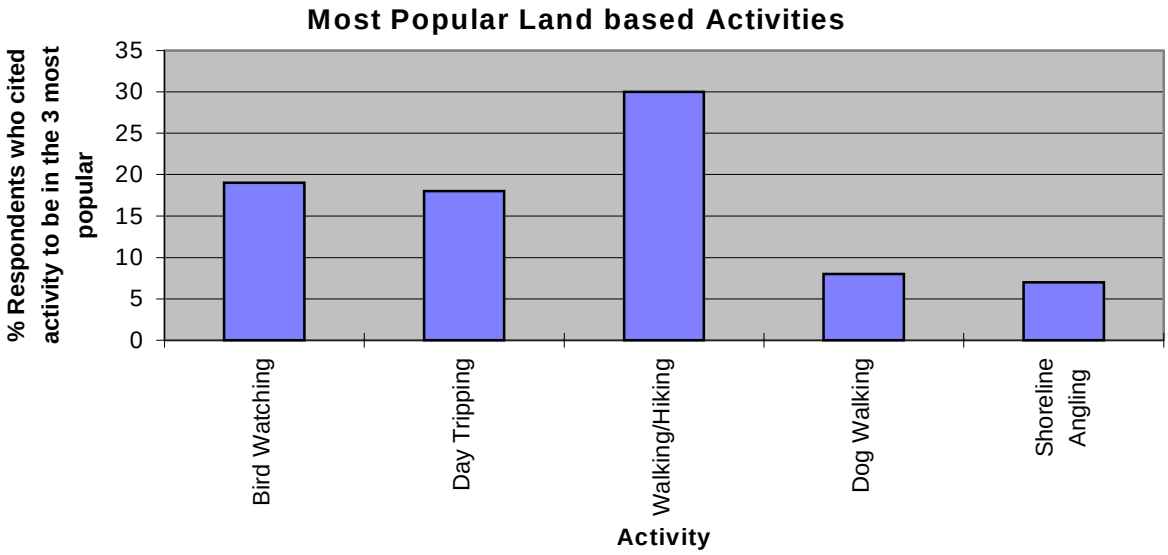


The responses from the questionnaires suggest that the following are the most commonly occurring water-based activities in the demonstration areas:

- motorboating

- sailing
- dinghy sailing
- sub aqua
- sea fishing

Figure 3.3 The Most Common Land-based Activities



The responses from the questionnaires suggest that the most common shore-based activities are:

- bird watching
- day tripping
- walking/hiking
- dog walking
- shoreline angling

Local respondents were also questioned as to whether they believed the levels of recreation occurring in their local area to be low, just right or overcrowded. The findings below may be skewed due to individual perceptions of recreation.

Table 3.4 Perception of recreational levels in mSAC sites

Activity	Overcrowded	Level about right	Low participation
Motorboating	1	29	2
Sailing	3	49	3
Personal watercrafting	1	4	1
Windsurfing		9	
Dinghy Sailing	1	12	
Water-skiing		5	
Canoeing		3	2
Sub-Aqua	7	4	1
Swimming		6	
Snorkelling			
Sea fishing		15	2
Motor towed inflatables			
Surfing		1	
Bird watching	1	20	
Day tripping	12	7	1
Walking/hiking	2	26	2
Dog walking		8	
Fossil hunting			
Horse riding			
Cycling		1	
Off roading			
Land yachting			
Kite flying			
Shoreline angling	1	7	
Jogging			
Sand sculpting			

Table 3.4 above suggests that the majority of respondents feel that levels of activity in mSAC areas are about right. Respondents were also asked to provide an estimation of the actual number of people who take part in specific recreational activities in each mSAC site. However, most respondents did not respond to this question.

3.4.3.3 Area specific comments from local respondents in mSAC areas

Local respondents were given the opportunity to comment on management measures and generally on the development of the study (see questions 3.3-3.5). Appendix 6 briefly reviews these comments

3.5 Summary

3.5.1 The Benefits of Recreation

1. The benefits of recreation for nature conservation should be considered when assessing management requirements.

3.5.2 Trends in Recreation and Leisure Participation

1. The seasonal variations of different activities can have implications for nature conservation, with the majority of recreational activities occurring in July to September.

2. There is no evidence to suggest that participation in any of the recreational activities which take place in coastal areas is growing significantly or has grown significantly over the last five years.

3.5.3 Questionnaire Findings

1. Water-based activities are more likely to have a national representative body than land based activities, which tend to be more informal.

2. Concern was raised about the use of management measures such as zoning for nature conservation which traditionally have been used for safety and navigation purposes.

3. The most popular water-based activities cited in the responses to the questionnaire were sailing and motorboating.

4. The most popular land based activities were thought to be walking and bird watching.

4 Potential Effects of Water-based Recreation

4.1 Introduction

This chapter looks at the potential effects of water-based recreation on the marine environment in mSAC areas. Specifically, it addresses the potential impacts arising from the following sources:

- engine emissions
- sound emissions
- antifouling paint leaching
- sewage and other waste discharges
- disturbance to wildlife
- erosion and turbidity

Chapter 7 introduces specific forms of water-based recreation and identifies the links between generic impacts and specific impacts of activities on mSAC features. Further information on water quality impacts can be obtained from a related study of the UK Marine SACs Project (Cole et al 1999)

4.2 Engine Emissions

Motorboats use a wide variety of different engines and transmission systems. This makes an assessment of the generic impact of emissions from such craft particularly difficult. The emissions themselves also vary in their importance. Some, such as carbon dioxide, are harmless to the local marine environment, although they may make a very small relative contribution to global environmental effects, such as climate change. Others, such as hydrocarbons, may impact upon the water column and sediment. To compound the difficulty in assessing emissions, there has been little research carried out specifically into the impacts of *marine* engine emissions on the environment.

This section attempts to identify the different emissions from motorboat engines and the potential impact of these emissions on the marine environment. It begins with a description of the different types of engine and drive systems commonly used.

It should be noted that ‘emissions’ are gases exhausted from engines. They should only be classed as ‘pollutants’ when they have an actual direct or indirect impact on the environment.

4.2.1 Types of Marine Engines

The vast majority of marine craft use one of the following engine types:

- 2 stroke engine fuelled by a petrol/oil mix or converted to propane
- 4 stroke engine fuelled by petrol or propane
- 4 stroke engine fuelled by diesel

Recreational craft engines come in two broad categories - outboard or inboard. These different engine types have markedly different emissions characteristics as outlined below.

Outboard engines are usually mounted at the rear of the vessel and have a self-contained drive unit. The small size, weight and low purchase price make outboard engines popular for smaller

craft. Most outboard engines are two stroke petrol units using an oil/petrol mix although four stroke outboards are growing in popularity and the use of propane gas for both 4 and 2 stroke engines is also becoming more popular.

As the name suggests, inboard engines are mounted inside the craft and drive is relayed through various different transmission systems such as shaft drive/propeller, stern drive/propeller, sail drive and water jet drive. The latter are used on personal watercraft.

Inboard engines tend to be used within larger craft and are usually fuelled by petrol or diesel. These engines are generally more powerful and are used where the weight and size of the unit are not the overriding consideration. Many inboard engines are marine derivatives of commercial automotive engines. Although diesel inboard engines are becoming increasingly popular, four stroke petrol engines are usually chosen where installation space is more limited or where higher power to weight ratios are required, as with watersports craft.

Electric engines are becoming increasingly popular on inland waterways, but due to limited power and range, they are not generally used in coastal areas.

4.2.2 Engine Emissions

During the combustion process, internal combustion engines of all types generally produce, in varying quantities, the following substances:

- Oxides of Nitrogen (NOx), a potential contributor to photochemical smog and to ozone layer damage
- Carbon Monoxide (CO), a toxic gas
- Carbon Dioxide (CO2), the most significant cumulative 'greenhouse gas'
- Hydrocarbons (HC), a constituent of photochemical smog
- Sulphur Dioxide (SO2), an element in acid deposition
- Lead, a toxic heavy metal
- Particulate matter, a potential carcinogen.

4 stroke engines generally produce higher CO, CO2, and NOx, but lower HC than 2 stroke engines. 2 stroke engines emit relatively high levels of HC in both burnt and unburned form, but low levels of NOx. Diesel engines are more fuel efficient than 4 stroke or 2 stroke petrol engines and therefore emit lower overall CO and CO2 However, they produce greater quantities of SO2, Nitrogen Dioxide and particulates. In terms of marine features, it is the effect of hydrocarbons and lead in the water column and sediment that are of key significance.

The impact of marine engine emissions on the environment has been the subject of much discussion over the last twenty years. Despite this, there has been relatively little original scientific research conducted on the subject in recent years, particularly concerning the potential impacts of emissions on specific habitats. There are studies which examine the implications of engine emissions on non-designated marine species and plants (e.g. the Institute of Applied Environmental Research in Sweden reviewed the potential effects on fish). However it should not be assumed that the findings of such reports have significant consequences for the assessment of the designated features within mSAC areas. Features other than the specific Annex I and II features designated within mSAC areas largely lie outside the remit of this report.

Legislation concerning marine engine emissions is to be taken forward in the forthcoming European Directive on marine engines which will specify common European emissions

standards. The standards will extend to emissions such as benzene, about which very little is known in the context of impacts on the Annex I and II habitats and species in mSAC areas.

4.2.2.1 Hydrocarbons

Modern outboard engines exhaust below the water surface and, as a result, all hydrocarbon emissions pass through the water. Most remain in the gas phase and are released directly to the atmosphere; the remainder condense and become suspended in the water column or form surface film until they degrade or are released into the atmosphere. Evaporation is the most significant factor in the removal of exhaust products. Hydrocarbons reach the sediment slowly due to the efficiency of the degradation process.

In response to proposed legislation on the Bodensee in the early 1990s, a study on the contribution of outboard engines to marine pollution was carried out by Barlett (FSRC, 1990) in conjunction with the International Council of Marine Industry Associations (ICOMIA). With the exception of one site, the highest concentrations of total hydrocarbons were found to be close to large municipal centres, or near the mouths of major rivers draining industrialised and urban catchment areas, rather than in heavily used boating areas. The report suggested that, in general, residues from outboard motor oils are likely to be negligible in relation to other sources of the hydrocarbon burden in the sediments.

This conclusion is also supported by the TNO Road Vehicles Research Institute (1991), which found that, at present, there is little environmental impact caused by marine engines. Hydrocarbon contamination of sediment is not, to any great extent, caused by the use of 2 stroke marine engines. Butcher (1982) also concluded that outboard engine use was not a major cause of hydrocarbon pollution of the water column, and although hydrocarbons in surface films were more problematic, evaporation was rapid.

However, recent research carried out by the State of California Air Resources Board (1998) found that two-stroke engines can discharge as much as one-third of the oil/petrol mixture unburned into the water. It concluded that there is potential for considerable impact from such emissions. Clearly, such contradictory evidence emphasises the need for further research in this area.

4.2.2.2 Lead

Butcher (1982) found that lead concentrations were increasing, but that at that time it did not create quality problems in the water column. However, long term build-up of lead in the sediment was considered to be of potential environmental concern. He concluded that sublethal and long term biological effects of leaded fuel cannot be entirely ruled out. The increased use of unleaded fuel has led to a decrease in, although not a total elimination of, the amount of lead in engine emissions.

4.2.3 Biodegradable Lubricants

Two stroke engines use a method of combustion which results in some unburned residual oil and partially burnt oil entering the marine environment through the exhaust. This leads to the familiar sight of small patches of oil forming on the water where 2 stroke marine engines are being run.

Whilst the environmental effects of these emissions are uncertain (see above), legislation has been implemented, or is being considered, in many countries with the aim of severely

restricting such emissions. In response, the oil companies are putting increased emphasis on the use of biodegradable lubricants for 2 stroke engines.

Although commonly used mineral oils eventually degrade, the process is very slow and such oils would not normally be defined as biodegradable. Therefore biodegradable lubricants are usually formulated from non-mineral oil fluids, both from vegetable sources such as rapeseed, and from manufactured esters with similar properties.

Biodegradable lubricants are designed to break down into carbon dioxide, water and biomass by the biological activity of micro organisms. The quantity of biomass formation depends on the extent of biodegradation while the speed of the biodegradation process depends on water temperature. In deeper, colder waters biodegradation takes longer than in warmer waters.

Whilst mineral oils remain the dominant lubricant in the marine market, increased use of biodegradable oil in 2 stroke outboard engines could reduce the magnitude of any hydrocarbon impacts on the marine environment. However, the biodegradation process produces a number of toxic by-products which have an unknown impact on the environment. Furthermore, by-products of the 2 stroke combustion process will continue to be emitted with the biodegradable lubricant.

The case for the use of biodegradable lubricants in 4 stroke engines is even less clear. It is also important that consumers are not misled into believing that the lubricant can be disposed of in a more casual manner than common non-biodegradable lubricants. In particular, the used product may contain non-biodegradable components and contaminants which, if disposed of incorrectly, will impact on the environment. There is also uncertainty over the recyclability of the used product.

4.2.4 Accidental Discharges

In many ways, accidental discharges of oil and fuel present a potentially more serious environmental risk than regular discharges from running engines. New European boat safety standards address the issue of fuel equipment in some detail and this should ensure that most boats at least have safe equipment. The handling of the oil/fuel by the boater and fuel dock attendant is another matter. Fuel docks are inspected to ensure safe functioning but incompetent handling of the pumps can cause problems if there is no sealed system in operation.

In most inland waterways the pumping of bilge water into the waterway is prohibited. However, although technically illegal in coastal areas, detection of bilge water pump out is notoriously difficult where discharge does occur and it is uncertain how much oil enters the marine environment in this way.

The discharge of oily bilge water can be minimised by the use of absorbent pads placed underneath the engine installation. These can be regularly cleaned or replaced to ensure the bilge water is not unduly contaminated.

4.3 Noise Disturbance

Noise may be defined as a sound which is *undesired* by the recipient and therefore the perception of a sound is of crucial importance in assessing potential 'noise nuisance'. The subjective nature of noise makes it one of the most difficult of all environmental impacts to quantify. The problem of noise nuisance assessment is compounded by the difference in

perception of noise between participants and non-participants and also between participants in the *same* activity.

Certain types of water-based recreation, such as personal watercraft activities, are considered to cause noise nuisance whether recorded sound levels of the activity are high or low relative to other sound sources. This is often because the 'quality', or tonal note, of a sound is more important to the listener's perception of that sound than its magnitude. However, this is an entirely subjective concept and is therefore unmeasurable. This creates problems with the assessment of whether a particular sound constitutes a noise nuisance.

Sound generated by recreational craft originate from a number of different sources including:

- craft hull striking or ploughing through waves (hull slap)
- boat generated waves striking the shore
- mechanical noise (from engines)
- deck and cabin fittings, people noise (human propulsion or interaction on board)

Noise disturbance relates largely to impacts upon other people rather than impacts upon the natural environment. Such issues lie outside the scope of this study. However, the potential impacts of noise disturbance on sublittoral and other marine communities are not known. In addition, disturbance to seals and dolphins and other wildlife is attributable to sound as well as to physical proximity and this is discussed below in more detail. Many representative and industry bodies produce codes of practice which address the issue of noise disturbance and these are highlighted in Chapters 7 and 8.

4.4 Antifouling Paints

4.4.1 Introduction

Boats spend a large proportion of their working life partly submerged in water. As with all objects subjected to long periods of time in the water, boat hulls become prone to colonisation by the many micro-organisms which inhabit the aquatic environment. This colonisation is known as fouling. The extent of infestation depends on a number of factors including water temperature, salinity and productivity of the organic matter on which the organisms feed.

Boat hulls are susceptible to all types of fouling irrespective of the material from which they are constructed. The fouling, if not attended to, causes increased drag on the hull, leading to increased fuel consumption, and can eventually cause significant damage to the boat structure. A heavily fouled vessel may also lose manoeuvrability. It is, therefore, necessary to apply some form of coating which will protect the hull against infestation. These coatings are generally known as antifouling paints and they are applied to the hull at regular intervals.

Antifouling paints usually contain a biocide, or toxin, held within the structure of the paint. The coating is designed to leach biocide slowly into the marine environment, preventing any organism adhering to the paint by poisoning the settling organisms.

The nature of a biocide is such that potentially it can have harmful effects, not only on the fouling organism it is designed to deter, but also on other marine life unconnected with fouling activity. It is the potential impact of these paints on marine life that is the subject of this section.

4.4.2 The Biocides

For many years tributyltin (TBT) was the favoured biocide for use in antifouling paints, although it was usually used in conjunction with other biocides such as copper. However, it became evident in the 1980s that its continued use was causing severe damage to shellfish communities and, in particular, dog whelk populations. This resulted in the implementation, in 1987, of a Europe-wide ban on the use of TBT in antifouling paints on boats under 25 meters. Its use is still permitted on craft over this length and in certain industrial and agricultural applications.

Before the widespread use of TBT, antifouling paints were commonly based on copper. The ban on TBT resulted in a shift back to paints which contain copper as the main biocide. Copper is included in antifouling paints most commonly as cuprous oxide, but also as cuprous thiocyanate and metallic copper powder. One of the main drawbacks of the return to predominantly copper based antifouling paints is that the copolymer type of paint, which was initially developed for use with TBT, is not as effective when used with copper biocides alone. Other drawbacks include its incompatibility with aluminium hulled craft and the relatively subdued colours that can be produced.

However, it is widely felt that although the performance of copper biocides cannot approach that of TBT, they remain the most effective of the alternatives for the foreseeable future. To achieve as high a performance as possible from current antifouling products, a 'booster' biocide is normally used as copper is not fully effective against all fouling species.

There is currently a great deal of research into alternative forms of biocides, particularly those of organic origin. These, however, tend to be less universally effective than other biocides and, in particular, may deter only specific types of fouling organism. As a result of these 'species-specific' characteristics, such biocides will almost always be used with other biocides, including copper. The organic biocides are also very expensive to develop and register. They are therefore usually developed and registered in other industries first, such as the agrochemicals industry, for use in other applications. Furthermore, although they are from organic sources there is no assumption that they are inherently less environmentally harmful than any other biocides.

Teflon based antifouling paint is also available, and has been used on racing yachts for a number of years. It is particularly suitable for racing due to its low friction surface, although it is not considered a particularly effective antifouling coating when used without a biocide. There has been some research into the use of silicon but this is at a fairly early stage and as silicon is rather soft it is not an easy material with which to work.

Antifouling paints utilising some form of copper biocide account for over 95% of the total antifouling market in the UK (personal communications) and this market share is likely to persist for a considerable time. It is on these antifoulants, therefore, that this section concentrates. This does not, however, imply that the other biocides are necessarily any more or less harmful, although there is little evidence available on their relative impacts.

4.4.3 Sources of Copper in the Marine Environment

Copper is a naturally occurring element and is essential as a trace element for metabolic processes in living organisms. However, it can also prove extremely toxic in high concentrations. Therefore if copper accumulates to a significant degree in the aquatic environment it can have a detrimental effect on marine life.

Copper is present in all human and animal wastes, and non-human activity, such as natural weathering, also leads to copper input into the environment. However, the major sources of copper contamination in inland and coastal waters are industrial wastewater discharges and atmospheric deposition, particularly from foundries and metal plating and cleaning operations. Fungicides, wood preservatives and boat antifouling paints can also contribute to high levels of copper in the aquatic ecosystem.

4.4.4 The Effects of Copper in the Marine Environment

Due to its complex nature and the uncertainty over its level of interaction with other substances, it is difficult to establish the precise effect of elevated levels of copper in the marine environment. Furthermore, although it may be possible to detect the presence of copper concentrations in sediments by sampling, it is rather more difficult to identify the source of such concentrations. Depending on the location, sediments can be highly mobile and resuspension of copper in the water column can result in the transportation of the metal to areas away from the main sources.

Therefore, before assumptions can be made concerning the impact of copper-based antifoulant on the marine environment, it is vital that further research is carried out. This should be focused on identifying the sources of elevated levels of copper found in the marine environment and establishing the exact nature of any subsequent environmental impact.

In 1984, a UK government commissioned report on copper, concluded that due to problems of quantifying the exact environmental effect of differing copper concentrations, it is difficult to generalise about the toxicity of copper to marine organisms. There is, however, evidence to show that certain species of fish and other marine organisms *are* sensitive to quite low levels of copper even though other species are relatively tolerant of much higher levels. Marine invertebrates are thought to be slightly more sensitive to copper than fish. Furthermore, evidence suggests that marine organisms have some capacity for adaptation to higher than normal levels of copper although sudden high inputs of the metal are likely to cause adverse effects in otherwise unexposed populations.

Significant copper accumulation is unlikely to occur in fast flushing open coastal areas, but can accumulate in the sediments of low flushing waters including streams, rivers and bays. The US National Oceanic and Atmospheric Administration found that between the late 1970s and 1990, levels of copper in marine organisms have steadily increased (World Resources 1992-93). This is an indication of increasing copper concentrations in the aquatic environment.

There are relatively few studies that specifically relate to the effect of copper based antifouling paints on the marine environment and none which examine the potential impact on the mSAC designated features. Those that do exist point to evidence of elevated levels of copper in the vicinity of shipyards and dry docks, whilst others found that marine organisms in the vicinity of a marina had higher levels of copper than those in an adjacent undeveloped bay.

The only research identified which specifically assesses the concentrations of copper in the vicinity of marinas is an undergraduate research project carried out at the University of Southampton (Newbold, 1993). This involved sampling sediment from several sites around Southampton Water to determine whether marina environments were associated with elevated concentrations of copper. The research found some evidence that copper based antifouling paints have an effect on copper concentrations on the surface sediment in the vicinity of the marinas sampled. However, due to the mobility of copper in the water column, it concluded that more research was required to determine whether the effluent from industrial processes in the area is contributing to such concentrations.

Some studies have been carried out into the effects of particular substances contained within copper-based antifoulants. For example, research into Ingarol 1051, a trizine herbicide used to boost the effectiveness of antifoulant paints, has suggested that it can result in reduced plant growth and a reduction in photosynthesis.

Some European countries including Denmark have now banned the use of certain biocides in antifouling paints. The bans have been based on evidence that such substances do indeed have a negative impact on the marine environment. However, this evidence is disputed by industry and other EU countries have been slow to follow suit.

4.5 Sewage and Other Waste Discharging

Pollution from a wide variety of human activities impacts upon water quality. Industrial discharges, agricultural run-off, municipal waste and oil spills all contribute to declines in water quality. One important source of aquatic pollution is human sewage discharge which enters the UK's coastal waters from several sources. Water company waste treatment plants are by far and away the largest single source of sewage, discharging millions of gallons of raw and treated sewage into rivers, lakes, estuaries and oceans daily. Another source of human waste discharge is boat-generated sewage and it is on this issue that the following section concentrates.

Craft that spend a large proportion of time in use and away from land require some type of toilet system for dealing with sewage. There is a large variety of different toilet systems available to the boat owner ranging from portable designs to fully installed systems. The choice of system depends on a number of parameters including system cost, the size of the boat, the availability of handling facilities, the type of use to which the boat is subjected and local and national regulations governing the system specification. The systems available include:

- portable toilet with integral waste tanks
- chemical re-circulating toilet
- sea toilet
- installed toilets with holding tank systems

It should be stressed that smaller craft with living accommodation are unlikely to have the room to retro-fit a holding tank system.

4.5.1 The Impact of Boat Sewage Discharge

Installed toilets with holding tank systems tend to have the least potential impact on the environment, providing it is possible to pump out the tank at suitable shore-side pump-out facilities. There are, however, very few of these facilities in coastal areas. As a result, those craft with such systems tend to pump out their tanks at sea. This is likely to have minimal impact where the operation is performed in open sea areas, well away from land, as the waste will be quickly diluted and dispersed by wave actions and currents.

Boats which have holding tanks and use land-side pump-out facilities do not contribute directly to marine pollution. This is, however, outside the control of the boat owner. Toilets which discharge raw or treated sewage overboard may contribute a number of potentially harmful pollutants to the marine environment. The resultant impact depends upon the flow characteristics of the water body and the proximity to sensitive marine features.

The effect of raw and treated sewage discharged from boats in fast flushing coastal areas is negligible in the context of its dilute nature and in comparison to sewage discharge from water companies' treatment plants. Boat sewage discharge in poor flushing estuarine areas, for example, inlets and bays, however, can have a significant localised impact on the environment. It is difficult to quantify this impact but it is likely to be greatest in areas which already suffer from environmental stresses from other sources such as agricultural run off. Whilst there has been research into the potential impacts of sewage on human health and aesthetic issues in the vicinity of popular anchorage sites and bathing beaches, little research has been carried out into its effect on the natural environment.

4.5.1.1 Biochemical Oxygen Demand

When human waste is discharged into the water, bacteria feed on the organic matter within the sewage. As the organic substances are decomposed by the bacteria, dissolved oxygen in the water is consumed. If large quantities of waste are discharged into the water the bacteria's biochemical oxygen demand (BOD) can seriously deplete dissolved oxygen levels in the water.

The reduction in dissolved oxygen levels can have serious consequences for fish and other flora and fauna, which depend upon oxygen for survival. High levels of BOD resulting from waste discharge are a particular problem in low flushing areas where water circulates only slowly. However, it should be noted that there are many other significant sources of high BOD including decaying plants and animal wastes.

4.5.1.2 Nutrient Enrichment

Human waste discharges contain phosphorus and nitrogen in varying quantities. Phosphorous and nitrogen are nutrients which are essential for plant growth. However, when present in the water in excessive quantities these nutrients can trigger algal 'blooms' which reduce light penetration through the water column. Populations of submerged aquatic vegetation or macrophytes which rely on light transmission for survival can be seriously affected by such blooms. As the algae die, the process of decomposition also increases BOD in a similar way to that of sewage decomposition.

4.5.1.3 Toxic Chemicals

Portable toilet effluent and some holding tank systems contain chemical additives used to disinfect, breakdown and deodorise waste. The most commonly used substances are chlorine, formaldehyde, ammonium and zinc compounds. All these chemicals, if discharged into the water in sufficient concentrations, are toxic to marine life and, therefore, have the potential to affect marine flora and fauna.

4.5.2 Grey Water Discharges

Grey water discharges originate from onboard sinks, showers and washing machines. These discharges may bring with them potential pollutants in the forms of soaps and detergents, food wastes and dyes. Of these pollutants, detergents are the most significant. Detergents often contain phosphates, which can contribute to nutrient enrichment as described above. Additionally they may contain chlorine which can be toxic to flora and fauna. However, grey water discharges from boats are in a very dilute form and the impacts are likely to be negligible from small craft.

4.5.3 Litter

Litter, whether on the land or in the water, can cause significant visual impact. In addition, litter which takes a long time to degrade can be harmful to wildlife through ingestion and entanglement. Whilst a very small proportion of the litter found in the marine environment may come from small craft, the vast majority enters coastal waters either from land or commercial vessels further out to sea. The majority of boat owners are unlikely to dispose of rubbish over the side of their craft as it would detract from their own enjoyment of the activity. Provided there are sufficient land-side disposal and recycling facilities, litter resulting from small craft is likely to be minimal.

4.6 Disturbance to Wildlife

This section provides a brief overview of the potential water based recreation to disturb the wildlife features on European marine sites. Appendix 7 identifies sources of more detailed research on these issues.

4.6.1 Impacts on Birds

There is a large degree of uncertainty over the results obtained from long term monitoring and research into the causes and effects of waterfowl disturbance. Due to the large number of variables which are involved and the degree to which each is observable, it is often difficult to assess the naturally occurring factors, such as the weather, which affect bird numbers in isolation from human influences. Furthermore, the complex ecological factors affecting waterfowl numbers are not always fully understood and may not even be apparent to an observer. Such interaction of natural and human influenced factors complicates the analysis of the long term effect of recreation.

There are a number of potential sources of direct disturbance to waterfowl from water-based craft including:

- Speed
- Sound
- Size
- Visual Intrusion
- Characteristics of Craft Movement

It is important to bear in mind, therefore, that disturbance is not related only to sound but also to visual presence. Therefore where waterfowl have a propensity to be disturbed, sailing, human-powered and motorised craft all have the potential to cause impacts.

4.6.1.1 The Effect of Disturbance

The effect which disturbance has on waterfowl varies greatly between the different species of bird and also depends upon the size and characteristics of the water body and the availability of alternative sites. Different species of birds react to disturbance in different ways and their sensitivity varies throughout the year depending on their specific activity at each location. Breeding and overwintering waterfowl are particularly sensitive to disturbance. This usually coincides with reduced intensity of recreational activities. However, it is important to note that some wintering waterfowl may begin returning as early as August, particularly if there has been a poor summer in the Arctic.

Depending on the magnitude of the disturbance, some birds may take flight temporarily, but return after the disturbance ends. Other birds may modify their feeding habits, whilst more sensitive species may suffer reduced breeding success or, ultimately, desert the site. When a bird is forced to take to the wing, energy intake ceases and energy expenditure greatly increases. At times of limited food supply and/or cold weather this could be life threatening for certain species. Where disturbance causes a bird to desert a particular site, the availability of suitable alternative sites is critical for the bird's survival. Furthermore, the site in which it settles may already be populated or may be of lower quality resulting in lower rates of energy intake.

In summary, the disturbance may result in:

1) Disturbance effects - which can be temporary but may have impacts on feeding, resting and energy intake of the bird

2) Significant population impacts - which can impact on local and national populations of particular species

Disturbance which results in permanent long term impacts on bird populations is generally of greater national importance than short term localised disturbance.

4.6.2 Impacts on Cetaceans and Mammals

Dolphins and porpoises frequently appear to be interested in human activity and will readily approach boats. For example, at Fort George in the Moray Firth, bottlenose dolphins readily come to boats, to bowride or just to escort them through the narrows. The resident population of bottlenose dolphins is northern Europe's biggest colony but there is now a concern that the increasing number of boats within the Firth could pose problems in the future. Engine sound and erratic manoeuvres can distract feeding dolphins and may even drive them away from the area. Aberdeen University in collaboration with Scottish Natural Heritage has produced a code of conduct for boats in the Moray Firth. Guidelines for minimising the impacts of recreational activities have been produced by DETR (1999)

Where boating takes place in the vicinity of seal colonies, it has the potential to cause disturbance. In particular, the presence of craft in shallow coastal waters frequented by seals or in the vicinity of haul-out sites can cause disturbance. The potential disturbance to seal pups is also important and may include disturbance at feeding and resting times and enforced separation from their mother. Impacts on seals from land based recreation are discussed in more detail in 6.6.1.

4.6.3 The Relative Importance of Recreational Disturbance

It is extremely difficult to assess the impact of boating-related wildlife disturbance in isolation from other sources of disturbance, both natural and human influenced. Wildlife may be disturbed not only by the boats themselves but also by the participants, particularly where the boats allow the users access to sensitive habitats.

As noted above, all types of craft have the potential to cause disturbance, whether wind, human or engine powered. It is very much at the local site level that the causes and effects of disturbance can be observed. It is also important to note that some disturbance studies have indicated that sailing may cause more disturbance at a national level than powered craft for the following reasons:

- sailing is a more widespread activity
- it occurs at most of the sites where bird counting takes place
- there is a relatively high level of winter activity
- participants spend a large proportion of time on or near the water.

However, it is the effects of a disturbance at a local level which is of relevance to site-specific management responses.

Motor boating and water skiing activities take place in relatively fewer locations than sailing and are less intensive in winter. Personal watercraft, on the other hand, can operate in shallower water than many sailing craft and their engine sound can add to any potential disturbance. However, there has been little research carried out into the impact of this disturbance. Small craft such as canoes and rowing boats may also cause disturbance in areas which are inaccessible to larger craft.

4.7 Erosion

Although bank erosion is largely a natural process it can be accelerated and accentuated by various human activities in, and around, the marine environment. The consequences of erosion can lead to important habitats being lost and the silt from the disappearing banks clogging up the waterways. The eroded material is also likely to contain high nutrient levels, which further deteriorates water quality. In fast flowing, open coastal areas, wash from recreational craft is unlikely to have any impact on bank erosion. In sheltered areas, there is more potential for impact, although it depends upon the characteristics of both the boat and also the shoreline itself. For example, the British Water Ski Federation estimates that on intensively used sheltered sites less than 0.5% of all waves which break on the shore are produced by water-ski craft.

4.7.1 Boat Generated Waves and Erosion

As a craft moves through the water, the water surface rises and falls, generating waves. At certain speeds (depending on the nature of the craft) waves from the front of the craft will meet with waves generated at the stern and a large trough can be generated behind the craft. In motorised craft where a propeller is fitted the trough may be accentuated. The magnitude of the resulting waves depends on a number of factors:

- the speed of the craft:
- the size of the craft:
- the craft displacement:

Other factors which may contribute to the magnitude of wash created by boats include:

- distribution of weight within the vessel
- the craft's volume as distributed along it's length (the prismatic coefficient)
- the underwater shape of the hull

4.7.2 Impact of Wash

Whilst it is the nature of the craft that influences the size of the waves, it is the nature of the water body and shoreline which are the main determinants of the actual impact of the waves. The following factors all influence the magnitude of impact that wash can have on shoreline erosion:

- type of sediment
- the orientation of the shoreline
- the profile of the shore
- bounce back from estuarine shores and hard flood protection schemes

Shorelines which are soft or easily eroded will suffer more from increased wave action than a rock face or rocky shoreline. This is illustrated by a study conducted by Zabawa and Ostrom (1980) which tested the impact of boat waves at five sites in Chesapeake Bay. It found that at four of the sites there was no increase in shore erosion which could be attributed to boating during the summer. In their analysis, the impact of wave energy is seen to crucially depend on the characteristics of the shore. The research found that a combination of the following shoreside characteristics will make the shoreline most susceptible to erosion:

- an exposed point of land in a cove
- a shoreline of easily eroded material
- a steep near shore gradient
- a location which experiences concentrated boating activity near to the shore
- the level of water on the shore

The distance of the craft from the shore has important implications for the possible impacts of its wash. The further a craft is from shore, the less impact its waves will have, as their energy will have dissipated on reaching the shore. The study suggested that a significant contribution to erosion from boat induced wash is likely only when there is a high frequency of boat passages close to the shore.

This illustrates the need to identify not only the nature of the boat induced waves but also the characteristics of the shoreline. The one site in the study which experienced a change in profile during the boating season, attributable to boat-derived wave energy, had a combination of the above four characteristics. These studies, although relevant, should however be treated with caution as they do not take into consideration differences in boat design, speeds and overlapping wash patterns.

4.8 Turbidity

In addition to the potential contribution boats make to bank erosion, the movement of boats through water can also cause disturbance to the bed of the water body, either through direct contact or through the effect of turbulence created by the vessel's passage. This disturbance is most evident in the form of the stirring up of fine sediments from the bottom of the water body which decreases water clarity in the water column. Such ‘turbidity’ can cause potential problems for both aquatic flora, which depend on light transmission through the water column for growth, and fauna which feed on the submerged vegetation. It can also smother and suffocate benthic communities.

4.8.1 Variables in Boat Induced Turbidity

Turbidity can be a result of a number of factors, some natural and some human induced. The extent of boat/propeller induced turbidity appears to be influenced by a number of variables relating both to the boat and engine and to the characteristics of the water body. These variables include the depth of the water, the speed and power characteristics of the craft, the characteristics of the propeller/water jet, the distance the boat travels from the shore, the duration and extent of boating activity and the characteristics of the water body sediments.

4.8.1.1 The Depth of the Water

Boats have a greater opportunity to create turbidity when travelling in shallower water as the downward pressure of water created by the craft reaches the sediment with greater energy.

4.8.1.2 The Effect of Engine Power

A more powerful engine has the capacity to create more turbidity than a smaller one. It is thought, however, that a planing boat may create less turbidity as the craft is effectively lifted out of the water and, therefore, causes less underwater disturbance.

4.8.1.3 Anchoring

The potential effects of permanent anchoring provisions such as swing moorings and pontoons are discussed in greater detail in chapter 5. However temporary anchoring while a craft is in use can have consequences for seabed vegetation and communities. Anchor drag caused by inappropriate anchoring can disturb the upper layers of the seabed sediment and caused localised particle suspension. Such drag can also cause damage to seabed habitats and species by cutting or breaking plants as it drags over the surface.

4.8.1.4 Propeller and Water Jet Action

The speed, size and direction of a propeller will all influence its possible impact on the water body bed. In general, a horizontally angled propeller will have a lesser effect on the bottom sediments as its energy will be more dissipated when reaching the water body bed than that of a propeller which is more vertical in orientation. Water jets, as used in personal watercraft, are likely to cause similar disturbance to propellers.

4.8.1.5 Duration and Extent of Boating Activity

The overall sediment disturbance may be related to the time that it has to settle between re-suspension.

4.8.1.6 Sediment Characteristics

Lighter sediments, such as silt, will be more easily suspended than larger particles such as gravel.

4.8.2 Sub-aqua Induced Turbidity

Sub-aqua activities can cause localised turbidity through the effects of ‘finning’, the kicking action of the feet. This can cause sediments to rise into the water column and, in popular diving areas, act to reduce the amount of sunlight filtering though the water column. This effect is likely to be only temporary in nature and mainly related to novice divers - experienced divers usually fin in a manner which does not cause disturbance.

4.8.3 The Relative Impact of Boat Induced Turbidity

Turbidity decreases the amount of light in the water column so affecting aquatic flora and fauna. However the relative contribution of boat-induced turbidity is still relatively unknown, particularly in coastal locations.

Although boat-induced turbidity may be relatively slight, the sensitivity of submerged aquatic vegetation to light changes makes it vulnerable to small changes in light penetration. Boat induced turbidity is often found to be the greatest during the most sensitive growth phases of submerged vegetation. Low densities of boat traffic are reported to be beneficial to vegetation conservation in some low flow areas because they arrest the process of natural succession and maintain a diversity of species.

It seems likely, however, that the increase in suspended sediments caused directly by boat activity may be small compared with the suspended sediment load present from other sources such as sediment increases during high runoff periods and changes due to tidal scour etc. Many site specific variables will play an important role in determining the overall contribution of boating to turbidity, and in particular the sensitivity of the features to increased turbidity.

4.8.4 Water Aeration

Water aeration is often cited as being a beneficial impact of boating. The presupposition is that the turbulence caused by the action of the propeller causes an increase in the dissolved oxygen content with resulting benefits for vegetation and wildlife. However, there is little research available which either confirms or contradicts this theory.

This issue has been addressed scientifically by Yousef (1974), who found that under certain conditions increases in the total dissolved oxygen content were noted following boating activity, although he noted that the oxygen transfer to the water body depends primarily on the oxygen deficit in the water column.

However, in comparison to natural wave generation, it is unlikely that motorised craft can contribute significantly to aeration in water bodies. Even if an individual boat does aerate the water this is likely to be more than offset by the turbidity created by the same craft and oxygenation is likely to be localised and temporary.

4.8.5 The Interdependence of the Variables

It should be noted that many of these effects are interdependent and cannot be separated. For example, the energy dispersed at the shore from boat-induced waves may not only have an effect on shoreline profiles, but may also cause an increase in sediment with a consequent intensification of turbidity.

In assessing the impact of boating on the physical characteristics of the water and the surrounding areas, it is essential that as many variables as possible are included in the analysis. Boating activities can affect the physical properties of the water but it is important that the impact is seen in the context of other variables with a similar impact. For example, the impact of boating on water clarity may, if observed in isolation, be large, but in comparison to the effect of a rainstorm, with consequent run-off and increase in suspended sediment, such impact may be negligible.

Non powered craft such as sailboards and dinghies tend to have less overall impact on marine features than powered craft. As they are not mechanically powered, they are not associated with issues such as engine emissions and noise, and oil and fuel spillage. In addition, they do not discharge sewage, although participants may be responsible for littering as with large craft. These craft can, however, have localised impacts on features through physical disturbance particularly at launch sites and in shallow areas.

4.9 Summary

4.9.1 Engine emissions

1. Research on the environmental impact of marine engine has tended to concentrate on the potential impact of 2 stroke outboard engines.

2. Available evidence suggests that marine engine exhaust emissions have limited observable impact on the Annex I & II features.

3. In particular, evidence of hydrocarbon loading in the marine sediment is inconclusive and lead concentration is not thought to be significant. This is not to discount the possibility that accumulation of emissions in the sediment may have the potential to cause longer-term impacts.

4. Accidental discharge of oil and fuel present can have a potentially significant effect on the marine environment, due to the concentrated nature of the pollutants that may reach the water

4.9.2 Noise Disturbance

1. Noise disturbance relates largely to impacts upon other people rather than impacts upon the natural environment. Such issues lie outside the scope of this study.

2. The potential impacts of noise disturbance on sublittoral and other marine communities are not known and there remains uncertainty about the extent to which dolphins and seals are sensitive to the sound of recreational activities.

4.9.3 Antifouling paints

1. There remains a large degree of uncertainty regarding the impact of copper on the marine environment.

2. Experimentally it has been demonstrated that copper ingestion above natural levels can prove toxic to marine organisms. However, in field studies, the effects have been shown to be variable.

3. The actual contribution of copper based antifouling paints to copper contamination in the marine environment is also uncertain.

4. Whilst there was a great deal of investigation into the effects of TBT on marine life there has been a lack of subsequent work on the replacement biocides. This information gap needs to be addressed in future research.

5. It is known than elevated concentrations of copper can occur in the vicinity of marina basins and in those areas where land side boat maintenance activities take place. However, there is no evidence to suggest that this is having a significant impact on the environment in those areas

6. In many areas, the concentration of copper in the marine environment directly attributable to leisure boats is negligible compared to that originating from land side industrial activities and commercial shipping.

4.9.4 Sewage Discharge and other Waste Discharges

1. The effect of raw and treated sewage discharge from boats in fast flushing coastal areas and open seas is negligible, particularly in the context of sewage discharge from water companies' treatment plants.

2. Boat sewage discharge in poor flushing estuarine and coastal bays and harbours can have a significant impact on human health and the aquatic environment.

3. In such areas where there are already low levels of dissolved oxygen and high levels of nutrients in the water, an increase in BOD and nutrient levels, resulting from boat sewage discharge, can damage marine fauna and flora.

4. Chemical toilet additives can have a localised impact on marine fauna and flora.

4.9.5 Disturbance to Wildlife

1. It is very difficult to assess the impact on species of boating-related disturbance in isolation from other sources of disturbance, both natural and human influenced.

2. Wildlife may be disturbed not only by the boats themselves but also by the participants, particularly where the boats allow the users access to sensitive habitats.

3. All types of craft, whether human, wind or engine powered, have the potential to cause disturbance.

4. Sailing is more widespread and more likely to occur in winter than motor boating and therefore has the potential to cause disturbance in more sites and at more times of the year.

5. Small craft such as canoes, rowing boats and personal watercraft have the potential to cause disturbance in areas which are inaccessible to larger craft.

6. The effect which disturbance has on waterfowl varies greatly between the different species of bird and also depends upon the size and characteristics of the water body and the availability of alternative sites.

7. Depending on the magnitude of the disturbance, some birds may take flight temporarily, but return after the disturbance ends. Other birds may modify their feeding habits, whilst more sensitive species may suffer reduced breeding success or, ultimately, desert the site.

8. Many boating activities such as water-skiing and personal watercrafting take place predominantly at high tide and therefore will not disturb feeding waders, but have the potential to affect roosting birds.

9. In addition to waterfowl, boating may cause disturbance to wildlife such as dolphins and seals although the impact of such disturbance is of uncertain magnitude.

10. Engine sound and erratic manoeuvres can distract feeding dolphins and may drive them away from an area. Where boating takes place in shallow coastal waters frequented by seals or in the vicinity of haul-out sites it can cause disturbance.

11. The main environmental impact of diving in off-shore waters is the collection of species for human consumption or as souvenirs, although this has little impact on annex I and II species.

4.9.6 Erosion and Turbidity

1. Boating may have a direct impact on vegetation through boat contact with banks, scouring and uprooting of submerged vegetation by hull, chains, oars and anchors and cutting of vegetation by propellers.

2. Indirectly, boats may impact on vegetation by the generation of wash and wake and the consequent effect of erosion and turbidity, although in open coastal areas this is likely to be insignificant in comparison to natural processes.

3. The impacts of boat-induced turbidity are likely to be insignificant in fast flushing coastal areas, but may be significant in localised areas in low flushing waters.

4. Sub-aqua may contribute to localised erosion and turbidity through direct contact with features and ‘finning’, the kicking action of the feet. The latter may cause sea bed sediments to rise into the water column, temporarily blocking light penetration.

5. Water aeration is an area which is often cited as being a beneficial impact of boating. However, in comparison to natural wave generation it is unlikely that motorised craft contribute significantly to aeration in water bodies.

5 Potential Effects of Boating-related Infrastructure

5.1 Introduction

This chapter focuses on the potential effects which the infrastructure provided for water-based recreational activities may have in marine areas. Issues relating to infrastructure provided for land-based activities are referred to in chapter 6. The issues associated with facilities provision for water-based recreational activities are also addressed in a related report on port and harbour operations ABP Research (1999).

The physical infrastructure to facilitate water-based recreation ranges from an informal parking area and launch site, through swinging mooring provision to fully serviced marina operations. Boatyards and yacht clubs are also essential to many of the water-based activities.

The potential impacts of recreational infrastructure may occur both when the facility is being constructed, if it is a new facility, and also while it is in use. During the construction of recreational infrastructure, the magnitude of the impact upon designated marine features depends upon factors such as the specific location of the development, the scale of the scheme, construction methods and project design and implementation. The provision of such infrastructure can also have consequences for the focus and concentration of boating activities. New marina development in undeveloped areas may extend the range of boats, allowing them to visit remoter locations otherwise inaccessible due to time constraints or the risk of being weather-bound.

Impacts may be physical in nature, such as destruction of habitat, or biological, such as changes in water quality brought about by development.

While there are examples of boating facilities on the open coast, the majority of facilities are situated in more sheltered estuarine locations or harbours. Indeed the cost of facilities on the open coast and the associated planning constraints make it unlikely that many further developments will take place in this type of location. A significant number of coastal developments in the last 20 years have, however, taken place in more sheltered locations in the intertidal zone.

The method of construction depends on the type of conditions in which it is being built and the scale of the project. For example, the favoured location for a marina operator is one that is convenient for land and water access. Ideally, it should also provide a natural sheltered basin requiring the minimum of physical modification and therefore entailing minimum construction costs. However, there are very few, if any, of these locations remaining in which development would be permitted. Therefore, new developments are likely to take place in locations which require a greater degree of physical modification to the site, or in existing ports and harbours.

5.2 Modification of Habitats

Estuaries have always been affected by human exploitation. The major direct impacts on the areas have come from land claim for industrial and agricultural purposes, coastal protection work, port expansion and water-based recreational developments, including recreational infrastructure. Damage has also been caused by mineral extraction, bait digging, industrial and agricultural pollutants and barrages, which alter the tidal regime.

In a comprehensive study of the UK's estuaries in 1989, the then Nature Conservancy Council looked at the reasons for the continuing pressures on the resource. It found that of all land claim activities at that time in the zone, marinas and provision for water based recreation accounted for 11.5% of the land claim cases by number and 18.5% of all land claim proposals by number.

Whilst the recession of the early 1990s slowed down the growth in the demand for leisure boating facilities, the economic recovery has once again placed pressure on facilities provision and there are a growing number of planning applications being placed, mainly for extension to existing facilities. It is unlikely, however, that demand will reach the levels once predicted by the RYA, at the height of the economic boom, of 3000-4000 new boats per annum requiring deep-water berths.

It is important to note that the provision of berthing facilities for recreational craft does not necessarily have to result in habitat *loss*. Saltmarshes in their natural state already provide half-tide berths for many boats. However, the potential impact of such berthing provision on soft habitats and related species needs to be examined at the site level.

The following section looks at specific aspects of boating facilities development.

5.2.1 Breakwaters

The creation of a fixed artificial breakwater, by the deposition of large quantities of stones or the building of a concrete structure, is often the first stage in a large-scale coastal development. Behind this structure, the marina basin itself is constructed. The environmental impact of a fixed breakwater is related largely to the effect that such a structure may have on the flow of the water in its vicinity. Where it reduces tidal amplitude significantly the breakwater may affect coastal processes and therefore erosion and accretion along the coastline.

The base of fixed breakwaters can cover a large area of the bed of the water body and this is likely to have an effect on the organisms which inhabit the bottom sediment.

Breakwaters also have a visual impact, but this issue lies outside the scope of this report.

5.2.2 Dredging Operations

Dredging undertaken in relation to commercial port and harbour activities is considered in more detail in ABP Research (1999).

Dredging is often required during the construction and modification of marinas (‘capital dredging’) and it is usually essential for the continuing maintenance of channels and basins (‘maintenance dredging’). Without dredging, channels can quickly silt up and prevent navigation by all but the smallest craft.

Dredging can cause long term effects including increased turbidity and, depending on the scale of the dredging operation, possible changes in flow characteristics of the water body. Large scale dredging can remove entire benthic communities which inhabit the water bed. There is some evidence, however, that the impact of the turbidity caused by such dredging operations is short term in nature and limited in extent (Bendel, 1986). It is also the case that dredging can improve water quality in some areas by enhancing water depth and flow characteristics.

The disposal of the resultant dredge spoil in coastal areas can result in the release of contaminants such as heavy metals, resuspension and dispersion of sediments and smothering

of benthic communities. Disposal of spoil from dredging activities is tightly controlled by legislation mainly designed to prevent the deposition of contaminated sediment in sensitive environments.

All dredging activities require disposal licensing by the Ministry of Agriculture, Food and Fisheries (MAFF). Before such a licence is granted there is a requirement that all beneficial uses of dredge material should have been considered, including intertidal/subtidal habitat creation/restoration. Licences are often refused if there is evidence that the dredge spoil contains large concentrations of heavy metals or contaminates such as TBT. It should be noted that contamination from metals is largely the result of industrial activities unrelated to leisure boating. It is also important to bear in mind, that where contaminated spoil is able to be removed, this can reduce concentrations of contaminants in the areas from which it is removed, although the resultant impact on the chosen disposal site is an important consideration.

Although the impact of the required dredging activities depends on the size of the development, it is those new developments which modify the intertidal habitat that will have potentially the greatest physical impact. For example, a large-scale development with permanent breakwater provision and landside development is likely to require either a substantial area of land claim and/or flooding of existing land.

5.2.3 Pontoons

Pontoons are put in place either by piling into the waterbed or by anchorage. This may result in short term disturbance, possible loss of habitat and cause localised turbidity but is unlikely to have significant long term effects. Indeed the piling often provides ideal habitat for a range of molluscs and other organisms. The pontoon structure may have an impact on current flow and other coastal processes but this is likely to be fairly minimal in all but the largest projects. The cumulative effect of a large number of pontoons in a localised area may also have an effect on coastal processes but little work has been carried out to quantify such effects.

5.2.4 Lock Provision

Locked marina basins are generally required in those locations which normally experience wide tidal ranges. The cost of lock provision is high and installation is usually undertaken for reasons of engineering necessity. Locked basins have, however, occasionally been required for aesthetic reasons where the marina developer or planning authority has sought to provide a facility at permanent high tide.

The effect of marinas with locked basins on water flow characteristics and consequent impacts on fauna and flora are likely to be of a larger magnitude than that of similar non-locked marinas. Intertidal habitat is also permanently lost from locked basins.

5.3 Impacts on Water Quality

In terms of water quality changes resulting from facilities development, these relate mainly to those facilities which require extensive in-water infrastructure, particularly in the form of artificial fixed breakwaters. Potential changes brought about by such infrastructure may include increases in water temperature, decreases in dissolved oxygen levels and increases in concentrations of certain other pollutants such as copper from antifouling paints.

The slowing in the speed of currents and mixing may promote the growth of microscopic plants and phytoplankton whilst sedimentation of suspended inorganic and organic materials may

increase. The resultant increase in turbidity reduces light penetration and may smother benthic communities. It may also reduce the quantity of dissolved oxygen in the water, so causing harmful shortages when demand from various organisms is high. This is especially apparent close to the bed of the water body where there is a high demand for oxygen from the benthic communities (Bendel, 1986).

There may be a significant trade off between the desire to improve flow characteristics in a sheltered marina basin, by dredging the navigation channel, and the desire to minimise the scale and impact of dredging activities for reasons outlined above. There are, however, a number of other methods utilised for improving water flow in marina basins including the provision of culverts in the basin walls and the installation of pumping systems.

5.4 The Relative Effects of Marinas and Swinging Moorings

Swinging moorings in coastal areas are preferred by some boaters because of their informality and relatively low price. They are also considered, by many people, to offer a more aesthetically pleasing mooring than a berth in a marina shared by many other boats.

There is much debate on the relative environmental merits and disadvantages of different types of mooring provision and these issues are discussed below.

5.4.1 Wave Energy and Sediment Disturbance

It has been claimed that boats on swinging moorings and on-line moorings break up the wash of passing motorised craft and therefore reduce the incidence of erosion in those areas. This is possible in narrow channels with banks consisting of easily erodible material. However, it is unlikely to have a major effect overall. It is also said that the obstruction such moorings cause to part of a channel acts as an informal speed limiter.

The anchoring of individual swing moorings, particularly where they have been in place for a long period of time, is unlikely to have much of an effect on sediment disturbance as they use ‘clumps’ or sometimes chains which are buried and very rarely drag. However, any drag which may be caused by anchorages can have localised impacts on sediment and benthic communities and this may be amplified in those areas which experience a large increase in swing mooring provision. This issue may also have some relevance to temporary anchorages. However, most locations are not currently experiencing significant growth in such provision.

5.4.2 Management Considerations

A modern, well-equipped marina is able to provide a large number of facilities not available to a boater moored at informal moorings. For example, waste disposal facilities, toilet pump-out and dry storage may all contribute to reducing the potential environmental impacts of boating activities. In addition, it is easier, in a marina, to restrict any actions by a boater which have the potential to damage the environment. For example, the scraping of anti-fouling paints can be, although is not always, better controlled on land in marinas and boatyards than on mudbanks at low tide. Some of these issues are expanded on in the management section below.

5.5 Impacts from Land Side Facilities

Following construction, the operational impacts of the facility will depend upon how it is subsequently used and managed. Facilities management can have a potentially significant role to play in minimising environmental impacts arising from the use of the facility. The provision of adequate facilities for the reception of various wastes, the adoption of run-off minimisation strategies and effective general site management can all improve the environmental performance of a facility.

It is evident that there is a large variability in the effectiveness of management practices at different facilities. On the whole, the largest and most modern marinas have the most impressive facilities and often the most effective management practices. However, smaller size and high quality management are not mutually exclusive and many smaller boating facilities have exemplary management practices.

A key feature of marinas, boatyards and yacht clubs is the extent to which owners of craft carry out their own maintenance activities either in the water or on the land. This can make it difficult for facilities' managers to ensure that all activities within the facility are undertaken in a responsible manner, particularly in the case of waste management and materials handling. It only takes one irresponsible action by a boat owner to create an environmental problem. The relationship between such activities and overall facilities management is a key consideration where such issues relate to mSAC sites.

The nature of owner-maintenance activities and other commercial operations means that there is the potential for various substances used in boating facilities, including paints, resins and other chemicals to leach into water via surface run-off and storm water drains. This may have an impact on local marine features and the fauna and flora communities which they support. However, site managers should be aware that there are many untraceable point discharges just as likely to cause impact.

5.5.1 Launch Areas

Where craft are launched from established slipways and launch points, it is unlikely that significant additional impacts will occur from the launching itself. Most of these launch areas have been chosen to be accessible at high and low tides and therefore this minimises disturbance to sediment. The construction of new launch areas may cause impacts on marine features similar to those discussed above, but the magnitude of such impacts will depend upon the scale of the facility and the environmental characteristics of the site.

However, should craft be launched from unofficial access points, it is possible that some damage may accrue through trampling, erosion, turbidity and disturbance to wildlife, depending upon the characteristics of the launch site. It should be noted that such impacts are not inherent features of the craft themselves but are caused by irresponsible use and behaviour.

5.5.2 Lift Out Areas

Many marinas, boatyards and yacht clubs have lift out facilities which enable a boat to be lifted onto the shoreside. These range from hydraulic cranes to chain winch slipways. The majority of lift out areas have high pressure hose wash down facilities available.

The high pressure washing down of a boat after lift out can result in significant quantities of antifouling paint being removed. The resulting water and paint mixture invariably drain

directly or via the storm drain into the water. As a result, there may be a potential build up of biocide concentrations in the vicinity of the facility.

5.5.3 Maintenance Areas

Maintenance areas are a further potential source of water contaminants. Most marinas and all boatyards have commercial maintenance areas, usually under cover, and also areas where boat owners can carry out their own maintenance on their craft. The latter may be in dry berthing areas, against walls or on scrubbing grids.

In these areas, pressure washing, shotblasting, scraping and painting operations may take place. Where containment is limited, the waste residues from such activities invariably drain via surface and storm drains to foul sewers and/or into the water. In some commercial facilities, the maintenance work is carried out while the boats remain on winch trolleys over the water, leading to direct run-off into the basin.

Activities involving other potential pollutants, including oil, fuel and paints are also undertaken in these areas but these are generally easier to handle and disposal is fairly straightforward. Most larger facilities have designated areas for the safe disposal of such materials.

5.5.4 Procedures for Oil or Chemical Spills to Land and Water

Toxic substances may enter the water in the event of an accident. It is the responsibility of the facilities management to minimise the likelihood of such an accident. In particular, oil and chemical storage facilities should be isolated by bunds to prevent drainage to surface water and emergency response procedures should be in place.

Mechanical appliances, such as lift out systems, can also be potential sources of oil and other harmful substances entering the water.

5.5.5 Fuel Docks

Those facilities which have fuel facilities require authorisation from local authorities. The facilities must comply with certain safety standards for a licence to be granted and this should reduce the potential for environmental impact. However it does not prevent accidental spills of fuel during operation. In addition, the authorities do not refer to methods of containment or emergency response procedures.

5.5.6 Cleaning of Craft in Water

High pressure hoses are available at some boating facilities for cleaning of boats whilst in the water. However, in general, boat owners use buckets and mops for cleaning decks and upper hull areas. Most boat cleaning materials consist of conventional detergents. In sufficiently concentrated quantities, these may pose a risk to water contamination, particularly where the products consist of chlorine and/or phosphate-based ingredients.

5.6 Summary

1. The magnitude of potential environmental impacts caused by boating facilities developments depends on factors such as the actual location of the development, the scale of the scheme, construction methods and project design and implementation.

5.6.1 Modification of Habitats

1. Those marina developments that irreversibly modify existing natural habitats are likely to cause the most significant impacts. In particular, where land claim is part of the development, the potential to modify the habitat is greater.

2. Dredging may induce turbidity and, depending on the scale, may affect tidal regimes. In addition, deep dredging may disturb large benthic communities on the water bed, although evidence of long term impact is limited.

3. There is a trade off between maintaining adequate flushing characteristics of marina basins by dredging and causing increases in turbidity by the dredging operation.

4. Dredge spoil disposal can have impacts on species and seabed communities through increased turbitity and smothering.

5.6.2 Impacts on Water Quality

1. Evidence suggests that water quality in a low flushing marina basin can undergo a number of changes. In particular, water temperature may increase, dissolved oxygen levels may decrease, and there may be increases in certain pollutants such as copper from antifouling paints.

2. Terrestrial and non-marine invertebrates, abundant in sand dunes and salt marshes, are unlikely to be affected by marina developments unless the construction involves significant modification of their habitats through land claim.

3. Aquatic estuarine communities, including algae, worms and molluscs, are greatly affected by the loss of estuarine area through land claim and locked basins. This also has a detrimental effect on fish and bird populations which feed on the organisms.

5.6.3 Impacts from Land Side Facilities

1. The impact of boating facilities' operations is dependent to a large degree on the nature of the management procedures on site.

2. A large variety of toxic chemicals and oils and fuels are handled at boatyards and marinas. Poor management of such materials has the potential to cause significant localised impact on the marine environment.

3. The provision of adequate facilities for the reception of various wastes, the adoption of run-off minimisation strategies and effective general site management can all improve the environmental performance of a facility.

6 Potential Effects of Land-based Recreation

6.1 Introduction

In this report, land-based recreational activities are defined as those which take place only on land (e.g. walking, horse riding), but which may affect intertidal or offshore areas of mSACs. The infrastructure required for land-based activities, such as car parking, is considered but infrastructure used primarily for water-based activities is covered in chapter 5.

Land-based activities can include:

- walking/hiking/dog walking
- horse riding
- beach recreation
- bait digging/species collection
- wildlife watching
- angling/wildfowling and hunting
- cycling/recreational vehicles

The following specific environmental issues associated with these activities are considered in this chapter:

- soil compaction and erosion
- littering and marine pollution
- disturbance to wildlife
- fire

6.2 Soil Compaction

Most land-based recreational activities carried out in the vicinity of marine features, whether carried out on foot, horseback or vehicle, exert forces on the surface of that feature which can result in compaction. The magnitude of the pressure and the characteristics of the feature will determine the nature of any impact.

Impacts can include:

- erosion of soils and upper levels of less durable marine features
- changes in the level and diversity of vegetation within a site or feature
- changes in feature density, porosity and penetrability

Changes to a feature associated with soil compaction do not necessarily imply a significant adverse impact. There is an important difference between change and impact and this can only be determined at the specific site-level.

6.2.1 Assessing the Magnitude of Soil Compaction

It is possible to make an assessment of the magnitude of soil compaction caused by different activities by reviewing the different static ground pressures exerted by activities. This involves

dividing the weight exerted by an activity on the ground by the area in contact with the ground. An example of this methodology is shown in Table 6.1.

Table 6.1 Soil Compaction Measures

Activity	Average of total Weight (g)	Ground contact area (cm^2)	Pressure (g/cm^2)	Source of data
Human				
Bare footed	73,000	262	279	Liddle (unpublished)
Shoes	73,000	406	180	Liddle & Grieg-Smith (1975)
Animal				
Horse & rider (shoes only)	613,000	140	4,380	Liddle (unpublished)
Vehicle				
Trail-bike	229,000	114	2,008	Eckert et al (1979)
Quad bike	140,000	1,400	100	Slaughter et al (1990)
Saloon car and driver	1,282,000	855	1,500	Liddle & Greig-Smith (1975)
Four wheel drive Toyota, loaded four people and gear	2,500,000	1,483	1,686	Liddle (unpublished)

Liddle (1997)

The greatest static pressure is exerted by horse and rider, mainly because of the small ground area over which the weight is spread, followed by motorised vehicles. This has implications for those features which are particularly sensitive to compaction, such as sand dunes, where activities such as horses riding are likely to occur.

In those areas where wildfowling takes place, there may be observable trampling effects on vegetation, although because the activities tend to take place in tidal areas, compaction impacts are likely to be minimal. Wildfowling is likely to cause less overall trampling-related impacts than an activity such as dog walking for example, as levels of participation in wildfowling are at a much lower level.

6.2.2 Natural Factors Influencing Soil Compaction

Marine features are supported by underlying layers of rock and soil which determine their overall resilience to ground pressure. The different natural characteristics are just as important in determining the impact of recreational activities, as are the relative ground pressures exerted by those activities. Uneven, stony or rocky ground, as found on rocky shores, results in a person's weight being distributed over a much smaller area. In such an area, the static pressure of a person can be greater than that of a vehicle, with associated implications for sensitive rocky shore vegetation.

For example, in areas where underwater reefs extend to the shore, people who go 'rock pooling' or gathering rock pool species at low tide can exert a significant static ground pressure, with consequential implications for density and diversity of species.

Conversely, soft ground such as mudflats, sandflats and saltmarsh enables the load of a person to be spread over a greater area and therefore results in lower ground pressure. However,

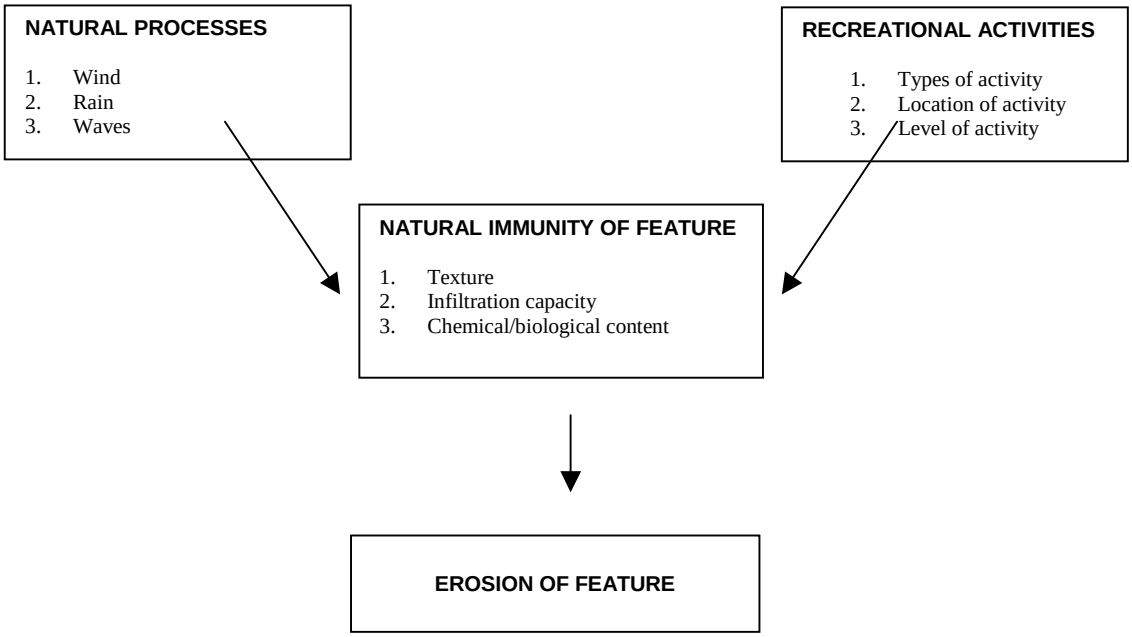
communities found in such habitats can be very vulnerable to even low pressure activities, particularly if they live in the upper layers of the mud or sand flat. Heavy vehicles accessing these areas therefore have the potential to cause significant damage to such communities.

6.3 Erosion

As with soil compaction, erosion of a feature is also caused by exertion of pressure. However, the greatest erosional forces exerted on a feature come from natural sources such as rain, wind and, in the intertidal area, wave action. At a site level, these forms of erosion will be much more significant than that caused by recreation. However, as recreational activities tend to be concentrated along specific access routes or in small areas, their impact can be magnified, causing significant erosional patches within a site or feature. Such erosion is particularly evident in coastal areas frequented by walkers and in the vicinity of heavily used access points.

The rate of erosion is not simply dependent upon the intensity of activities in the vicinity of a feature. It is also related to the erodibility of the soil, which in turn is linked to its texture, its capacity to absorb and filter water and its organic and chemical content. Figure 6.1 illustrates this relationship.

Figure 6.1 The Causes of Erosion



UK CEED (1998)

Soft coastal habitats tend to face the greatest risk of erosion from both natural processes and also human activities, including recreation. Recreation may have a particular erosional impact on sand dunes and sand flats. Table 6.2 summarises the main causes of erosion on marine features.

Table 6.2 Causes of Feature Erosion

Feature	Soil Type	Erosional Impact of Recreation	Main Causes of Erosion (descending order of magnitude)
Sand dune	Sands	✓	• Wind action • Recreation - access routes to beaches • Off-road vehicles and horse riding
Mudflat	Silt/mud	✓	• Wave action • Recreation - accessing water at low tide
Sand flats	Sands	✓	• Wind and wave action and runoff • Recreation - motorised vehicles can destabilise upper surface level and make it more vulnerable to natural erosion
Sandbanks	Sand covered by sea water	✗	• Wave and storm action
Rocky shores	Rocks and gravel	✗	• Insignificant erosion
Sea caves	Rock	✗	• Wind and wave action

UK CEED (1998)

Key

✓ Significant recreational impact
✓ Small recreational impact
✗ Little or no recreational impact

6.3.1 Shrinking Beaches

Many of the UK's shorelines, consisting of soft rock expanses, mud and sand flats, are undergoing a process of 'retreat', whereby the sea is eroding the intertidal features in front of static sea defences. Such shrinking is largely a result of a number of natural processes, including wave and wind actions and sea level rise. However, these processes can be accentuated by erosional pressures caused by recreational activities.

The decrease in the width of sandy beaches, which is common throughout Europe, can have a serious effect upon the ability of the habitat to support indigenous species. It can also have a significant impact upon its amenity value for tourism and recreation. It can also have the knock-on effect of putting greater recreational pressure on other similar sites. The impact on tourist incomes could have important indirect effects on the environment as less money may be available for management and nature conservation purposes.

6.4 Modification of Habitat

Wherever land- or water-based recreational activities take place in formal or semi-formal areas, car parking and toilet facilities are usually required by participants. At a launch site, car parking often needs to cater for car and trailer. At marinas, boatyards and yacht clubs where boats are moored on water, car parks will invariably cater for just the participant's car. However, larger facilities often have a significant land area set aside for dry boat storage and owner maintenance.

The construction of car parks and other landside development, such as offices and boat associated businesses will often entail extensive site preparation, including levelling, concreting, tarmacing and other subsequent construction work. Generally, the larger the facility required, the greater the potential for significant permanent environmental impact.

However, it should be borne in mind that although the provision of new car parking facilities in some areas can cause environmental impacts, it may be that, over the long term, the magnitude of such impacts may be less than the impacts of continuous unmanaged parking in sensitive areas, such as in between sand dunes. The sacrifice of a less important area in terms of nature conservation may be beneficial in the long term for the protection of the overall site.

6.5 Littering

Although the source of most marine pollution is industrial activity and agriculture, recreational activities can contribute to localised pollution issues. Perhaps the most obvious issue linked to recreation in coastal areas is that of discarded litter. Although the amenity impact of litter is more significant than its environmental impact, discarded litter can have direct impacts on both plant and animal species which inhabit designated coastal features. The following section reviews some of the different types of litter and their possible implications for the environment.

6.5.1 Plastic

Much of the plastic found in coastal areas is derived from accidental spillage from ships or from factories close to rivers. There is no doubt, however, that in areas of intensive recreational activities, litter from participants can contribute to localised problems.

Food and equipment packaging tends to be the most commonly discarded item connected to recreational activities. These can enter the marine environment either because of deliberate littering or from overflowing or inappropriately designed waste bins.

The very characteristics that make plastic so useful - strength, durability and light weight - tend to make it the most persistent and visible form of rubbish. Not only is plastic litter unsightly, it can be dangerous to birds and animals. Birds and fish can often mistake plastic floating in the water for food and, once ingested, it can cause severe internal injuries. Wildlife can also become caught up in discarded plastic, with four pack plastic holders being a particular problem.

6.5.2 Paper

Discarded paper is largely an aesthetic issue and is unlikely to have any significant environmental impacts on features or their associated flora and fauna.

6.5.3 Glass Bottles and Jars

Discarded glass containers are unlikely to cause direct damage to a marine feature, but can ignite fires in the vicinity of a feature. This can have a severe effect on the vegetation and species in those areas. In addition, glass and broken glass can be hazardous to small mammals which live in the vicinity of the designated areas.

6.5.4 Dog Faeces

Dog walking is one of the most popular recreational activities in coastal areas. The problems associated with dog faeces are largely an amenity issue and cause little or no significant impacts to marine features.

6.5.5 Angling Line and Lead Weights

Accidentally or deliberately discarded nylon line and netting have no impacts on the geomorphology of designated habitats but can have an impact on designated species, such as seals, particularly in the vicinity of typical haul out sites. Line and equipment discarded in intertidal areas can also adversely affect wading birds by becoming entangled around their legs. Ingested lead weights can cause serious illness in marine wildlife.

6.5.6 Discarded Shotgun Cartridges

Spent shotgun cartridges from wildfowling and other hunting activities are unlikely to have any significant impact on marine features, other than those related to amenity, although they may cause impacts to wildlife if ingested.

6.6 Disturbance to Wildlife

A considerable amount of research has been undertaken on the disturbance effects of recreation. This is summarised below. A list of key sources of research is provided in Appendix 7.

Land-based recreation can disturb species both through presence of participants and also through direct interference. Liddle (1997) suggests that there are three levels of disturbance which may affect a species:

1. the species is aware of the physical presence of the recreational participant but there is no contact (e.g. wildlife watching) and it may or may not alter its behaviour as a result.
2. the species may have its habitat physically modified by an activity (e.g. pathway creation, camping activities). The consequences of this disturbance may be positive or negative for the species.
3. the species may come into direct and damaging contact with humans (e.g. wildfowling, fishing or vehicle collision).

Different types of recreational activities have different levels of interaction with species and therefore different levels of disturbance or impact. Table 6.3 is taken from Duffus and Dearden (1990) and links recreational activities to the types of wildlife disturbance identified by Liddle (as 1,2,3 above). It suggests that the provision of recreational infrastructure such as toilets, roads and visitor centres has a much greater potential to disturb wildlife than the recreational activity itself. However, it also indicates that recreational activities involving dogs or vehicles have the greatest potential to cause impacts.

Table 6.3 Recreation and Disturbance to Wildlife

	Types of Disturbance		
Activity	**1**	**2**	**3**
Walking	2	1	
Walking with dogs	4	1	
Horse riding	3	2	
Trial-bike	5	2	?
Bird watching	1	1	
Animal photography	1	1	
4x4 (off road vehicle)	5	3	?
Hunting with rifle on foot	2	1	0-5B
Hunting with shotgun	2	1	0-5B
Hunting with dogs only	5	2	0-5B
Fishing from bank	2	2	0-5B
Fishing by wading	2	2	0-5B
Camping in wilderness	2	2	?
Camping in campsite	4	4	
Presence of toilets	4	4	?
Car park frequently used	4	4	?
Large development (visitor centre)	5	5	0-5
Presence of roads	2-3	2-3	

Duffus and Dearden (1990)

Key:
1= low effect
5= high effect
B 0= hunting unsuccessful
B 3 = animal injured
B 5 = animal killed

6.6.1 Disturbance to Seals

Within the mSAC demonstration project the only *designated* species susceptible to land-based recreational disturbance are Common and Grey Seals. The following section identifies disturbance issues associated specifically with these two species. See 4.6 for discussion of impacts arising from water-based recreation.

Tourism and recreation based wildlife watching is a growing and lucrative business and is presently unconstrained by specific legislation. The attraction of seal watching is increasingly promoted by companies and individuals involved in these activities.

Seals are quite elusive in the water and so are most commonly visible whilst ashore. Here they can be very susceptible to disturbance, particularly while resting, breeding and rearing young. Seal watching activities can contribute to disturbance on land, especially as people can have direct and often unrestricted access to them while they are out of the water.

A recent report to SNH by Brown and Prior (1998) concluded that the most significant source of human disturbance to breeding sites on Mousa SAC was from recreational activities.

A research study looking at the effects of human disturbance on the maternal behaviour of grey seals at Donna Nook in Lincolnshire (Lidgard, 1996) showed that females preferred to give

birth in areas of low disturbance and that pups born in such areas gained weight more quickly than pups born in areas of greater disturbance levels. However, the study was unable to conclude that these differences in weight gain were as a direct result of human impacts. During periods of high human disturbance, females were more protective towards their pups and the pups were more vigilant. The study suggests that these behavioural changes may divert energy away from the pup leading to reduced growth rate and increased pup mortality. In conclusion the report suggested that:

"Overall it does not appear that the Grey Seal population at Donna Nook is in jeopardy from human disturbance. The colony has dramatically increased in size since 1990, the mortality rate of pups is similar to that reported in other UK colonies and the weaning and growth rate of pups is higher than those reported in other colonies" Lidgard (1996).

The breeding season is an important consideration as it coincides with the 'low' season for most recreational activities. However, in the Scilly Isles, the breeding season for Grey Seals begins in July, whereas in South West England it begins in late August to early September and becomes progressively later in a clockwise direction around the country. As a result, the Grey Seal breeding season may actually coincide with summer activities in certain locations or areas. In the breeding and pupping season, the species is more vulnerable to disturbance than at other times of the year and therefore, even with fewer recreational participants, the potential for disturbance to have an impact is greater. Common seals are particularly vulnerable to recreation as their breeding and moulting season lasts from June to August coinciding with the 'peak' tourist and recreational season.

The study by Brown and Prior (1998) found that recreational participants who carried cameras or camcorders approached the seals much more closely than those without, and that the closer approaches resulted in greater levels of disturbance. This study also showed that not all people visiting the site caused disturbance. Almost 40% of the visitors observed caused no disturbance at all. However, 40% did cause serious disturbance resulting in the seals abandoning the haul out site for a period of time.

6.7 Disturbance to birds

Many land-based activities have the potential to disturb birds including walking - particularly with dogs - wildfowling and bait collecting. The potential impacts of bait collecting are considered in more detail through the UK Marine SACs Project in a related report by Fowler (1999).

There has been a great deal of research undertaken on the impacts which wildfowling has on wildlife. However, there is limited research available on the impact which the activity may have on marine features.

Many studies have been conducted which examine the correlation between wildfowling and significant population impacts. There is some evidence to suggest that wildfowling may cause disturbance to the feeding and roosting grounds of non-quarry species. This will depend upon the intensity of the activity on the site and the feeding and roosting requirements of quarry and on-quarry species. However, the evidence linking episodes of disturbance to longer term population changes is much less clear and there are many other significant factors also having an effect. A list of the key references relating to disturbance studies is provided in Appendix 7.

6.8 Fire

Some of the species supported by designated intertidal features are susceptible to fire damage. This risk is particularly prevalent in the peak season when vegetation can become tinder dry and a single spark can cause a fire. Discarded cigarettes and glass have, in the past, been the main cause of such fires. However, the problems associated with peak season fires have recently grown with the development of the disposable barbecue and the increasing desire of recreational participants to be self sufficient in terms of food provision.

This issue was highlighted on the site visit to the Solway Firth mSAC demonstration site. Rangers in the area reported scorch marks on the ground and spoke of their concern about potential damage of the site through accidental fires. Where used too close to dry vegetation, disposable barbecues can decimate large areas of vegetation in sensitive areas. Vegetated sand dunes are particularly susceptible as people often light barbecues in close proximity to car parks or in-between sand dunes in an attempt to avoid the wind.

6.9 Summary

1. Intertidal areas can come under considerable pressure from recreational activities as not only do they support a variety of land based activities, such as walking and horse riding, but they also provide access channels to the water for waterside recreation.

2. There are a range of potential impacts which land-based recreational activities may have on the natural environment. Some will be as a direct result of the activity (e.g. erosion caused by trampling), whereas others are indirect (e.g. the clearing of land to provide parking or other facilities).

3. Changes to the feature associated with land-based recreation do not necessarily lead to impacts. The level of acceptable change determines the stage at which a site-level change will become an impact.

6.9.1 Soil Compaction

1. Impacts associated with trampling vary according to the nature of the site, the soil which constitutes the feature, and the levels and types of recreational activities.

2. Impacts are particularly severe in and around sand dune areas. This is because these areas form major access points to beaches and also possibly because participants are unaware of their significance and vulnerability.

6.9.2 Erosion

1. As with soil compaction, erosion of a feature is also caused by exertion of pressure. However, the greatest erosional forces exerted on a feature come from natural sources such as rain, wind and, in the intertidal area, wave action

2. As recreational activities tend to be concentrated along specific access routes or in small areas, their impact can be magnified, causing significant erosional patches within a site or feature. Such erosion is particularly evident in coastal areas frequented by walkers and in the vicinity of heavily used access points. Recreation may have a particular erosional impact on sand dunes and sand flats.

6.9.3 Modification of Habitat

1. The construction of car parks and other landside development often involves extensive site preparation and can result in feature modification and impact.

   Over the longer term, the magnitude of impacts from formal car parking may be partially offset by a reduction in the impacts associated with unmanaged parking in sensitive areas, such as in between sand dunes.

6.9.4 Littering

1. Recreational participants may be a localised source of litter, although much of the litter found on beaches and intertidal areas originates from other landside sources or from ships.

6.9.5 Disturbance to Wildlife

1. Seals are a particularly attractive species for wildlife watchers. As a result, accessible colonies of seals in mSAC areas are coming under increasing pressure from visitors. These visitors can cause disturbance to the seals, although the long-term impacts are uncertain.

2. Disturbance to birds may result from many activities. The evidence of the impact of these short term events on wider population levels is not conclusive.

6.9.6 Fire

1. Where used too close to dry vegetation, disposable barbecues can decimate large areas of vegetation in sensitive areas. Vegetated sand dunes are particularly susceptible as people often light barbecues in close proximity to car parks or in-between sand dunes in an attempt to avoid the wind.

7 Activity Guides

7.1 Introduction

This chapter builds on the information in previous chapters to provide, in the form of activity guides of recreational activities that take place in and around European marine sites. The individual activity guides provide the following information for each activity:

- participation rates
- key activity characteristics
- methods of disseminating information to users
- locations where the activity is likely to take place
- environmental effects
- impacts on features (high, medium, low)
- availability of codes of practice
- address of governing body

The table of environmental effects for each activity is based both on the information contained within preceding chapters and also on a consideration of the characteristics of the activity and the typical location in which it occurs. Although there is limited scientific information detailing the specific cause and effect relationships of changes in marine features over time, the summary tables provide a starting point for identifying which activities are likely to have an impact upon marine features. It should be stressed that the tables are not designed to be definitive guides to the impact of activities at specific sites - this can only be determined by site assessment. It is also vital to consider recreational activities in the context of natural factors and other human influences not connected with recreation.

The reader should take the following key issues into account in relation to the information contained within this chapter:

1. The intensity of both land and water-based recreation in European marine sites is determined largely by the accessibility of the area to those people who wish to take part in the activity.

2. Recreational activities can have a wide range of impacts on the marine environment. These range from physical effects such as trampling to biological effects such as the suspension of hydrocarbons in the water column. However, the impacts of an activity upon a feature depends upon the ecological requirements of that feature (its sensitivity) and the likelihood of the activity occurring at a damaging level.

3. The *potential* for an activity to have an impact on a marine feature does not imply that it *will* have an impact on that feature or that an observed impact at one site will occur at all sites.

4. Only investigation on a site specific basis, preferably over time, can determine the actual link between recreational activities and observed changes in marine features.

5. Where the impacts of an activity are uncertain, the Department of the Environment, Transport and the Regions (1998) suggests that the precautionary principle should be applied. This implies that such uncertainty should not be used as a justification for postponing measures to protect the environment. However, there should be strong circumstantial evidence of cause and effect before implementing specific controls on activities.

A Motorboating

A.1 Participation Rates

There are approximately 367,000 motorboats owned in the UK making it the second most popular choice of craft after sailing boats. This figure represents only owner-user craft and does not include the many people who hire craft for use on the water.

The largest concentration of motorboats is on the south coast with the Solent and Poole Harbour areas being a particular focus of activities.

A.2 Characteristics of Activity and Management Issues

- Motorboating is predominantly a male activity spanning the age range 35-54 year olds.
- Participants are likely to be associated with local clubs and/or the national representative organisation of the activity, the Royal Yachting Association. All participants will at some point deal directly with the marine industry (e.g. chandlers, equipment suppliers etc.).
  ⇒ *Voluntary management measures and education programmes developed in conjunction with clubs and the industry will reach a high proportion of participants and have been shown to be successful.*
  ⇒ *If byelaws are necessary, the involvement of local clubs and industry is essential to ensure the transfer of information to the end user and to aid with enforcement of the regulation. Byelaws are location specific and strategies for providing information should reflect this.*
- The activity tends to be family orientated with 68% of participants taking part with family members.
  ⇒ *Information targeted at children, as well as encouraging responsibility from an early age, is likely also to reach their boating parents.*
- Generally, all but the smallest boats will require slipways or moorings for water access.
  ⇒ *Known access points to the water can be good locations for promoting environmental information.*
  ⇒ *Programmes developed in conjunction with marina operators are an effective method of targeting berth holders.*
- Leading publications for this activity are *Motorboat and Yachting* and *Motorboats Monthly* with circulations of 20,400 and 15,000 respectively.
  ⇒ *Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.*

A.3 MSAC Features Where Activity Takes Place

The category of motorboat covers a huge range of craft from small open craft with outboard motors through day boats to multi-million pound motor yachts. The ability of the craft to access shallow waters will depend upon their draft (the depth of the hull in the water), including engine drive system and propeller. Small craft with outboard motors can be launched from informal access points as well as public slipways and are able to access relatively shallow waters as the drive leg and propeller can be hoisted manually out of the water. However, most boat users avoid shallow water to prevent propeller fouling. Larger and faster craft can only be

launched from slipways or will be moored on swing moorings or in marinas. These craft tend to head for large open expanses of water.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓ (smaller craft only)	
Sandbanks	✓	
Inlets and Bays	✓	
Reefs	✓(smaller craft only depending on water depth)	
Lagoons	✓ (smaller craft only)	
Sea Caves	✓ (smallest craft only)	
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

A.4 Summary of Potential Environmental Impacts

- The launching of craft from formal/constructed access points is likely to have minimal impact on marine features except where it involves trampling and scouring of the feature.
- The launching of craft from informal non-constructed access points may result in compaction and erosion of features both on the land and in the intertidal area.
- Swing moorings have minimal impact on marine features, except where anchors drag and disturb sediment and benthic communities, or where craft maintenance takes place on water or on mud/sand flats at low tide. These effects can be amplified in those few areas which experience a large increase in swing mooring provision.
- Existing marina berthing has no impact on marine features, although new infrastructure development and maintenance activities do have an impact, particularly where it involves land claim and significant dredging (see chapter 5).
- There is little evidence to suggest that marine engine emissions have a significant impact on marine features.
- Noise disturbance is largely an amenity issue, although it may impact upon seals and dolphins. However, identification of the cause of disturbance is difficult as it can be caused by a number of contributory factors. These include the noise of the craft and its occupants, the proximity to the seals, the visual effect of the activity and the availability of a good means of escape.
- Antifouling paint may be a significant *localised* source of heavy metal in the marine sediment, but its effects have not been quantified, particularly in the context of other sources of heavy metals such as industry, commercial shipping and agriculture.
- Impacts from antifouling paints may be observable where present in high concentrations, particularly in low flushing estuaries and inlets and bays. Such concentrations are most likely to result from maintenance activities in marinas and boatyards or owner-maintenance activities on mud banks and sand flats.
- Sewage discharge from craft can have localised impact on marine features, particularly in low flushing estuaries and inlets and bays, where it may contribute to reduced oxygen availability. However, its impact in fast flushing areas is negligible.
- Although most litter in the marine environment is from sources other than water-based recreation, irresponsible behaviour from some boat users may contribute to the problem.
- Disturbance to wildlife caused by motorboats will vary depending upon the type of activity, the time it takes place and the vulnerability of the wildlife.

- Disturbance is observable at feeding, mating and roosting times but is extremely difficult to quantify and should be examined on a case by case basis. Vulnerable periods for some wildlife coincides with the low season for boating.
- Boat wash may cause localised erosion of marine features but its impact is generally minimal in the context of natural effects.
- Turbidity caused by boat movement is only observable in shallow, low flushing marine areas. It may have some localised impact on marine features, but many of these areas are avoided by motor boat users because of propeller fouling.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Launching[1]	◗	◗	◗	◗	◗	◗		◗		◗	◗	◗
Anchoring	◗	◗	◗	◗	◗	◗	◗	◗		◗	◗	◗
Swing mooring berthing[2]	◗	◗	◗	◗	◗	◗	◗	◗		◗	◗	◗
Marina berthing	see marina fact file											
Engine emissions[4]	❍	❍	❍	❍	❍	❍	❍	❍		❍	❍	❍
Noise disturbance										◗	◗	◗
Antifouling paints[5]	◗	❍	❍	❍	◗	❍	❍	❍		◗[9]	◗[9]	◗[9]
Sewage and other discharges[6]	◗	❍	◗	◗	◗	❍	❍	❍		◗	◗	◗
Disturbance to wildlife[7]	◗*	◗*	◗*	◗*	◗*	◗*	◗	◗		◗*	◗*	❍
Erosion and turbidity[8]	◗	❍	❍	❍	◗	❍	❍	◗				

Key to impacts

Blank Square- not applicable

❍- minimal

◗- observable, likely to be location specific

◗* - observable at certain times, minimal at other times

●- appreciable

Notes

1 physical impact on feature
2 anchor drag and maintenance activities carried out at low tide
3 this refers specifically to the impact of maintenance activities, such as hull scraping on mud banks at low tide
4 impact of craft berthed at existing marinas, but not including new developments which are dealt with below
5 only used on larger craft
6 toilets only fitted on larger craft

7 presence of craft in proximity to wildlife
8 dependent on depth of water and speed of craft
9 ingestion of heavy metals

A.4.1 Codes Of Practice

- Tidelines, 1997 – Available from the Royal Yachting Association
- Navigate with Nature, 1998 – Available from the British Marine Industries Federation

A.4.2 National Representative Bodies

Royal Yachting Association
RYA House
Romsey Road
Eastleigh
Hants SO50 9YA
Tel: 01703 627400

Royal Yachting Association
Scotland
Caledonia House
South Gyle
Edinburgh EH12 9DQ

Royal Yachting Association
N. Ireland
Northern Ireland Sports
Council
Upper Malone Road
Belfast BT9 5LA

Welsh Yachting Association
4, Llys Y Mor
Plas Menai
Caernarfon
LL55 1UE

B Sailing – Yachts

B.1 Participation Rates

There are estimated to be around 500,000 sailing craft currently in use in the UK, including yachts and dinghies. It is estimated that there are 900,000 people in the UK who take part in sailing activities every year. The Royal Yachting Association (RYA) is the national representative body for sailing activities and currently has 86,000 members. This figure also includes motor boat users who are members. There are also 1,500 clubs and organisations affiliated to the RYA. Not all members of local clubs are also individual members of the RYA.

B.2 Characteristics of Activity and Management Issues

- Sailing participants (including dinghy sailors) are fairly evenly spread between male and female. 40% of participants are 15-24 years old, 30% are 25-44 and 30% are over 45.
- Sailing participants tend to be aware of marine environmental issues.
  ⇒ *Participants are likely to be receptive to environmental information and keen to encourage responsibility in other boat users.*
- Participants are likely to be associated with local clubs and/or the national representative organisation of the activity, the Royal Yachting Association. All participants will at some point deal directly with the marine industry (e.g. chandlers, equipment suppliers etc.).
  ⇒ *Voluntary management measures and education programmes developed in conjunction with clubs and the industry will reach a high proportion of participants and have been shown to be successful.*
  ⇒ *If byelaws are necessary, the involvement of local clubs and industry is essential to ensure the transfer of information to the end user and to aid with enforcement of the regulation. Byelaws are location specific and strategies for providing information should reflect this.*
- This activity tends to be family orientated with 72% of participants taking part with family members.
  ⇒ *Information targeted at children, as well as encouraging responsibility from an early age, may also reach their boating parents*
- Tuition is often undertaken to gain the general skills required for the activity.
  Environmental information provided by trainers is likely to be effective in reaching target audience
- Generally, all but the smallest boats will require slipways or moorings for water access.
  ⇒ *Known access points to the water can be good locations for promoting environmental information.*
  ⇒ *Programmes developed in conjunction with marina operators are an effective method of targeting berth holders.*
- Main targeted publications for this activity are *Yachting Monthly, Yachting World, Yachts and Yachting and RYA Magazine* with circulations of 41,400, 31,500, 45,000 and 86,000 respectively. Sailing Today and Practical Boat Owner are also popular publications within the sailing fraternity.
  ⇒ *Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.*

B.3 MSAC Features Where Activity Takes Place

For day boats and cruisers which are trailed, access is likely to be overwhelmingly via public access slipways, although some may launch from beaches. Larger cruising craft are kept on swing moorings, on pontoons at sailing clubs or within marinas. Within mSAC areas, the swing moorings are generally within estuaries, within the vicinity of intertidal mud and sand flats and sandbanks, or within large shallow inlets and bays.
Large areas of open water are the favoured locations for sailors, and therefore most of the activities will be concentrated on estuaries, and large inlets and bays within the mSAC areas.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓	
Sandbanks	✓	
Inlets and Bays	✓	
Reefs	✓ (small craft only)	
Lagoons		✓
Sea Caves		✓ (not possible for sailing navigation)
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

B.4 Summary of Potential Environmental Impacts

- The launching of craft from formal/constructed access points is likely to have minimal impact on marine features except where it involves trampling and scouring of the feature. Although an existing slipway may have a continuing impact on a feature, site designation suggests that the site can support the facility with its current level and type of use and maintenance. However, if the usage levels of the site increase greater impacts may occur, such increase therefore require close monitoring.
- The launching of craft from non-constructed access points may result in compaction and erosion of features both on land and in the intertidal area.
- Anchor drag from swinging moorings may disturb sediment and benthic communities.
- Where craft maintenance takes place on water or on mud/sand flats at low tide sediment and benthic communities may by exposed to contamination from anti-foulant products.
- Existing marina berthing has no impact on marine features, although new infrastructure development and maintenance activities do have an impact, particularly where it involves land claim and significant dredging (see chapter 5).
- Sailing craft will often use the auxiliary engine for lengthy voyages and when the wind is either too light or in an unfavourable direction where tacking against the wind is necessary. When manoeuvring at slow speed it is likely that the craft will be in shallower waters where emissions especially from 2 stroke engines will have the potential to cause greater impacts.
- When in sail the main and foresail can often emit a loud crackling noise. This together with visual intrusion may cause nearby shorebirds to be disturbed.
- Antifouling paint may be a significant *localised* source of heavy metal in the marine sediment, but its effects have not been quantified, particularly in the context of other sources of heavy metals such as industry, commercial shipping and agriculture.
- Impacts from antifouling paints may be observable where present in high concentrations, particularly in low flushing estuaries and inlets and bays. Such concentrations are most likely to result from maintenance activities in marinas and boatyards or owner-maintenance activities on mud banks and sand flats.

- Sewage discharge from craft can have localised impact on marine features, particularly in low flushing estuaries and inlets and bays where it may contribute to reduced oxygen availability. However, its impact in fast flushing areas is negligible.
- Although most litter in the marine environment is from sources other than water-based recreation, irresponsible behaviour from some boat users may contribute to the problem.
- Disturbance to wildlife caused by sailing craft will vary depending upon the type of activity, the time it takes place and the vulnerability of the wildlife.
- Disturbance is observable at feeding, mating and roosting times but is extremely difficult to quantify and should be examined on a case by case basis.
- Nationally, sailing has a more significant impact upon wildlife than other forms of water based recreation because it is more widespread than other water-based recreational activities and tends to take place throughout the year, sometimes coinciding with vulnerable periods for wildlife.
- Localised impacts may be caused by anchor drag and boat grounding.
- Turbidity caused by boat movement is not applicable to sailing craft.

Issue	mSAC Feature												
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Launching[1]	◗	◗	◗	❍	❍	❍				❍	❍	❍
Anchoring	◗	◗	◗	◗	◗	◗	◗[9]			❍	❍	❍
Swing mooring berthing[2]	❍	❍	❍[3]	❍	❍	❍	❍			❍	❍	❍
Marina berthing	see marina fact file											
Engine emissions[4]	❍	❍	❍	❍	❍	❍	❍			❍	❍	❍
Noise disturbance										❍	❍	❍
Antifouling paints[5]	◗	❍	◗	◗	◗	❍	❍			◗[10]	◗[10]	◗[10]
Sewage and other discharges[6]	◗	❍	❍	❍	◗	❍	❍			◗	◗	◗
Disturbance to wildlife[7]	◗*	◗*	◗*	◗*[8]	◗*	◗*	◗*			◗*	◗*	❍
Erosion and turbidity	❍	❍	❍	❍	❍	❍	❍					

Key to impacts
Blank Square - not applicable
❍- minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1. physical impact on feature
2. anchor drag and maintenance activities carried out at low tide
3. this refers specifically to the impact of maintenance activities, such as hull scraping on mud banks at low tide
4. generally used only for low speed manoeuvring
5. only used on larger craft
6. toilets only fitted on larger craft
7. presence of craft in proximity to wildlife
8. impacts of anchor drag on benthic/bottom dwelling communities
9. depth of reef will determine access by craft
10. ingestion of heavy metals

Codes Of Practice

- Tidelines, 1997 – Available from the Royal Yachting Association
- Navigate with Nature, 1998 – Available from the British Marine Industries Federation

B.4.2 National Representative Body

Royal Yachting Association
RYA House
Romsey Road
Eastleigh
Hants SO50 9YA

Royal Yachting Association
Scotland
Caledonia House
South Gyle
Edinburgh EH12 9DQ

Royal Yachting Association
N. Ireland
Northern Ireland Sports Council
Upper Malone Road
Belfast BT9 5LA

Welsh Yachting Association
4, Llys Y Mor
Plas Menai
Caernarfon LL55 1UE

C. Dinghy Sailing and Windsurfing

C.1 Participation Rates

The participation rates for dinghy sailing are included in the overall figures for sailing (500,000 sailing craft and 900,000 people in the UK who take part in sailing activities every year). There is no specific break down for dinghy sailing. There are estimated to be around 46,000 windsurfing craft in the UK with 600,000 people participating in the activity each year. Many of those participating in this activity do so on inland sites, although there are no figures on this.

C.2 Characteristics of Activity and Management Issues

C.2.1 Dinghy Sailing

- Participants are generally young and may be having their first experience of boating.
  ⇒ *Information targeted at children, as well as encouraging responsibility from an early age, may also reach their boating parents*
- Some dinghy sailors (and nearly always those engaged in racing) capsize from time to time.
  ⇒ *Many participants are aware of environmental issues, particularly in relation to water quality concerns (Surfers Against Sewage has been an effective lobby group promoting improvements in water quality on behalf of 'immersion' sports), and are likely to prove receptive to environmental information.*
- Participants are more likely to be associated with clubs or national bodies.
  ⇒ *Education programmes run in conjunction with sailing clubs and equipment suppliers are likely to be the most effective media for reaching participants.*
  ⇒ *If byelaws are necessary the involvement of local clubs is essential to ensure the transfer of information to the end user and to aid with enforcement of the regulation. Byelaws are very location specific and strategies for providing information should reflect this.*
- Tuition is often undertaken to gain the general skills required for the activity.
  ⇒ *Environmental information provided by trainers is likely to be effective in reaching target audience.*
- Slipways or moorings are not necessary to enable water access, although the former are used. Craft are also kept at sailing clubs or carried by car to access points. Access points usually have car parking facilities.
  ⇒ *Known access points to the water or car parks used by participants may be effective locations for promoting environmental information.*
- The main targeted publication for this activity is *Yachts and Yachting* with a circulation of 45,000. There are also a large number of informal class association magazines with limited circulation.
  ⇒ *Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.*

C.2.2 Windsurfing

- This activity is male orientated (80%).
- Participants are generally young with 68% in the age range 17-34, 12% are students.
- Participants are likely to have a strong sense of independence and are sometimes characterised as "loners".

- Windsurfing is an immersion sport with participants spending at least a proportion of time in the water.
  ⇒ *Many participants are aware of environmental issues, particularly in relation to water quality concerns (Surfers Against Sewage has been an effective lobby group promoting improvements in water quality on behalf of 'immersion' sports), and are likely to prove receptive to environmental information.*
- They are less likely to be associated with local clubs and/or the national representative body, the Royal Yachting Association. All participants will at some point deal directly with the marine industry (e.g. chandlers, equipment suppliers etc.).
  ⇒ *Environmental information developed in conjunction with windsurfing equipment suppliers is likely to be an effective way of reaching participants as these organisations will have direct contact with the end users and are generally considered credible sources of information about the activity.*
  ⇒ *Voluntary zoning can be effective but needs to be developed in conjunction with local clubs or industry to ensure success.*
  ⇒ *If byelaws are introduced the involvement of local clubs and industry is essential to ensure the transfer of information to the end user and to aid with enforcement of the regulation.*
- Tuition is commonly used, particularly amongst juniors. The RYA's windsurfing training schemes are heavily used.
  ⇒ *Recognised teaching establishments would be a good place to provide targeted information.*
  ⇒ *Promotion of environmental information by a 'personality', known to windsurfers, may encourage support of local management initiatives.*
- Slipways or moorings are not necessary to enable water access, although the former are used. Craft are also kept at sailing clubs or carried by car to access points. Access points usually have parking facilities.
  ⇒ *Known access points to the water or car parks used by participants may be effective locations for promoting environmental information.*
- Main targeted publications for this activity are *Boards* and *Carve* with circulations of 15,900 and 20,000 respectively.
  ⇒ *Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.*

C.3 MSAC Features Where Activity Takes Place

All but the largest sailing dinghies can be transported on roof racks or trailers and can often be carried to a launch point. This means that, in theory, the craft can be launched from any location to which landside access can be gained. Most dinghies tend to be launched from sailing clubs or public access points. Windsurfers are often launched from less formal access points such as beaches and mud and sand flats.

The craft have shallow hulls, enabling them to access shallow water areas which are usually off limits to larger craft. Access for dinghies is, to some extent, constrained by the depth of the centre board, although this can be lifted. As windsurfers may spend a proportion of their time in the water, either accessing deeper water or falling off their craft, the activity does not generally take place in the vicinity of reefs or other underwater obstruction. Windsurfers may as a result, however, trample on submerged marine features.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓ (mainly as launch points)	
Sandbanks	✓	
Inlets and Bays	✓	
Reefs	✓	
Lagoons	✓	
Sea Caves		✓
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

C.4 Summary of Potential Environmental Impacts

- The launching of craft from designated access points is likely to have minimal impact on marine features except where it involves trampling and scouring of the feature.
- The launching of craft from informal access points, which is relatively common for small dinghies and windsurfers, may result in compaction and erosion of feature and damage to vegetation.
- Although most litter in the marine environment is from sources other than water-based recreation, irresponsible behaviour from some boat users may contribute to the problem.
- Disturbance can be caused to wildlife by the presence of dinghies and windsurfers in areas inaccessible to larger craft, including nesting sites. The impact will vary depending upon the type of activity, the time it takes place and the vulnerability of the wildlife.
- Disturbance is observable at feeding, mating and roosting times but the impact is extremely difficult to quantify and should be examined on a case by case basis.
- Dinghy sailing and windsurfing is more widespread than other water-based recreational activities and tends to take place throughout the year, sometimes coinciding with vulnerable periods for wildlife.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Launching[1]	◗	◗	◗	❍	◗	◗		◗		◗*	◗*	❍
Noise disturbance										❍	❍	❍
Disturbance to wildlife[2]	◗*	◗*	◗*	❍	◗*	◗*	◗[4]	◗		◗*	◗*	❍
Erosion and turbidity[3]	❍	❍	❍	❍	❍	❍	❍					

Key to impacts
Blank Square - not applicable
❍- minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 physical impact on feature
2 presence of activity in the vicinity of wildlife
3 trampling and scouring
4 whilst accessing the water via rocky shores

Codes Of Practice

- Tidelines, 1997 – Available from the Royal Yachting Association
- Navigate with Nature, 1998 – Available from the British Marine Industries Federation

C.4.2 National Representative Body

Royal Yachting Association
RYA House
Romsey Road
Eastleigh
Hants SO50 9YA
Tel: 01703 627400

Royal Yachting Association
Scotland
Caledonia House
South Gyle
Edinburgh EH12 9DQ

Royal Yachting Association
N. Ireland
Northern Ireland Sports
Council
Upper Malone Road
Belfast BT9 5LA

Welsh Yachting Association
4, Llys Y Mor
Plan Menai
Caernarfon
BT17 9JU

D Personal Water Crafting

D.1 Participation Rates

The ownership of personal water craft (PWC) is currently estimated at approximately 17,000. This does not include the large number of participants who hire craft, the majority of which are on inland sites. Following the demise of the Personal Watercraft Association in 1996, the activity has been taken under the umbrella of the RYA although relatively few participants are individual members.

D.2 Characteristics of Activity and Management Issues

- Over the last five years significant changes have occurred in the personal watercraft market. The development of sit down craft with up to four seats has resulted in personal watercrafting becoming a more family focused activity with a corresponding move away from single person stand-up craft.
- However, the activity remains male orientated and focused on a young market.
  ⇒ *The use of a well known personality connected with the activity may be an effective way to promote environmental initiatives to participants.*
- Participants are unlikely to be associated with local clubs and/or the national representative organisation of the activity, the Royal Yachting Association.
  ⇒ *Environmental information aimed at participants would be most effectively targeted through personal watercraft equipment suppliers as these organisations have direct contact with the end users and are often considered a credible source of information.*
  ⇒ *If byelaws are necessary the involvement of local clubs and industry is essential to ensure the transfer of information to the end user and to aid with enforcement of the regulation. Byelaws are very location specific and strategies for providing information should reflect this.*
- Tuition is often not required as users will teach themselves, although the Royal Yachting Association and some manufacturers provide training courses.
  ⇒ *Environmental information developed in conjunction with trainers and manufacturers may be an effective method of targeting participants.*
- Slipways or mooring are not required to enable water access but car parking is required.
  ⇒ *Known access points to the water or car parks used by participants as well as hire companies can be good locations for promoting environmental information.*
- The main targeted publication for this activity is *Jet Skier and Personal Watercraft magazine* with a circulation of 7,000.
  ⇒ *The publication is keen to promote good practice advice to its readers.*

D.3 MSAC Features Where Activity Takes Place

Personal watercraft are shallow hulled craft propelled by water jets rather than propellers. This design allows them to operate in relatively shallow areas. Generally, the craft are launched from trailers, although they can be carried short distances where access is more difficult. The need for the participant to travel at speed suggests that larger open areas of water are preferred to smaller enclosed water bodies.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓ (at high water)	
Sandbanks	✓	
Inlets and Bays	✓ (if large enough)	
Reefs	✓ (at high water)	
Lagoons	✓ (if large enough)	
Sea Caves		✓
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

D.4 Summary of Potential Environmental Impacts

- The launching of craft from formal/constructed access points is likely to have minimal impact on marine features except where it involves trampling and scouring of the feature. However, where such a facility encourages high levels of usage, the nature conservation value of the site may be affected.
- The launching of craft from non-constructed access points, which is relatively common for personal watercraft, may result in compaction and erosion of features and damage to vegetation.
- There is little evidence to suggest that emissions from two-stroke engines used by personal watercraft have an observable impact on marine features.
- The relatively high pitch and irregular beat of a personal watercraft engine, combined with a tendency for personal watercraft to be used close to the shore at relatively high speeds, can create a noise nuisance. However, sound tests have shown the magnitude of the sound to be little different from that of other motorised craft.
- Although most litter in the marine environment is from sources other than water-based recreation, irresponsible behaviour from some boat users may contribute to the problem.
- The small size, shallow draft and jet drive systems of PWC allow the craft to enter areas which are not normally navigable for other motorised craft. This may cause physical disturbance to sensitive habitats and sound disturbance to wildlife. Although other small craft are able to access similar areas, the ability of PWC to enter such areas under power provides greater potential for disturbance of wildlife and physical damage to features. However, there is limited evidence as to any resultant impacts.
- There is no evidence to suggest that the magnitude of turbidity caused by jet driven craft is any different to that caused by conventional craft. However, their ability to access shallow areas is likely to cause greater localised turbidity which may have an impact on submerged vegetation in lagoons and low flushing areas.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Launching[1]	◗	◗	◗	❍	◗	◗		◗		◗*	◗*	❍
Engine emissions	❍	❍	❍	❍	❍	❍	❍			❍	❍	❍
Noise disturbance										◗	◗	◗
Disturbance to wildlife[2]	◗*	◗*	◗*	❍	◗*	◗*	◗	◗		◗*	◗*	◗*
Erosion and turbidity[3]	◗	❍	❍	◗	◗	◗	❍	◗				

Key to impacts
Blank Square- not applicable
❍- minimal
◗ - observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 physical impact on feature
2 presence of craft in proximity to wildlife
3 trampling, scouring - in water impacts depend upon the depth of water and speed of craft

D.4.1 Codes Of Practice

- Tidelines, 1997 – Available from the Royal Yachting Association
- Navigate with Nature, 1998 – Available from the British Marine Industries Federation
- Managing Personal Watercraft – a guide for local and harbour authorities, 1998 – Available from the Royal Yachting Association

D.4.2 National Representative Body

There is no governing body for informal activities, although the RYA provides training opportunities and welcomes membership from PW users, and affiliation by PW clubs.

Royal Yachting Association
RYA House
Romsey Road
Eastleigh
Hants SO50 9YA
Tel: 01703 627400

Royal Yachting Association
Scotland
Caledonia House
South Gyle
Edinburgh EH12 9DQ

Royal Yachting Association
N. Ireland
Northern Ireland Sports
Council
Upper Malone Road
Belfast BT9 5LA

Welsh Yachting Association
4, Llys Y Mor
Plas Menai
Caernarfon
LL55 1UE

E Water Skiing

E.1 Participation Rates

Water skiing is an increasingly popular sport in the UK. Estimates suggest 150,000 people water ski on a regular basis and possibly up to 250,000 participate on a casual basis. There are currently 10,000 members of the British Water Ski Federation.

E.2 Characteristics of Activity and Management Issues

- The activity is male orientated with 72% of participants in the age range 25-44.
- Most craft used for informal water skiing activities are of conventional design and use outboard engines.
- An increasing proportion of craft are designed as dedicated water ski craft often with hulls designed to maximise planing efficiency and inboard engines powered by propane.
- The sport has a number of high profile participants, competing successfully at an international level.
  ⇒ *The use of a well known personality connected with the activity may be an effective way to promote environmental initiatives to participants*
- Participants are likely to be associated with local water-ski specific clubs and/or the national representative organisation of the activity, the British Water Ski Federation. All participants will at some point deal directly with the marine industry (e.g. chandlers, equipment suppliers etc.).
  ⇒ *Voluntary codes of practice and education programmes run through local or national representative clubs, and in conjunction with equipment suppliers and hirers effectively target participants.*
  ⇒ *Voluntary zoning can be effective but needs to be developed in conjunction with local clubs or industry to ensure success.*
  ⇒ *If byelaws are necessary the involvement of local clubs and industry is essential to ensure the transfer of information to the end user and to aid with enforcement of the regulation.*
- Tuition is often required to achieve the basic skills for this activity.
  ⇒ *Environmental information provided by trainers is likely to be effective in reaching target audience.*
- Slipways or mooring are required to enable water access for water ski craft.
  ⇒ *Known access points to the water can be good locations for promoting environmental information to this group.*
- The main targeted publication for this activity is *Sportsboat and Water-ski International* magazine a with circulation of 14,000.
  ⇒ *Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.*

E.3 MSAC Features Where Activity Takes Place

This activity is generally restricted to large open areas of open water which have the capacity for supporting larger motorised craft. Any underwater obstructions such as reefs will be avoided for safety reasons.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓ (if sufficient water depth	
Sandbanks	✓ (if sufficient water depth)	
Inlets and Bays	✓	
Reefs		✓
Lagoons		✓
Sea Caves		✓
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

E.4 Summary of Potential Environmental Impacts

- The launching of craft from designated access points is likely to have minimal impact on marine features except where it involves trampling and scouring of the feature.
- The launching of craft from informal access points may result in compaction and erosion of feature and damage to vegetation.
- The seasonal nature of water skiing and the small number of craft used exclusively for the activity, would suggest that the impact of engine emissions in coastal areas is negligible.
- Many dedicated water ski craft use propane fuel which has fewer hydrocarbon emissions than conventionally fuelled craft.
- Noise disturbance is largely an amenity issue, but it may impact upon seals and dolphins, although there is limited evidence to support this.
- There is little research on the impact of water skiing on wildlife other than wildfowl, or on summer populations of wildfowl.
- Because of the seasonal nature of water skiing and the relatively small number of sites where it takes place, disturbance to wildlife tends to be localised.
- Where disturbance to wildlife by water skiing has been observed, it ranges from the birds taking to flight, to redistribution around the site or desertion of the site.
- The British Water-ski Federation have observed that there is no sediment disturbance by water ski boats in water areas where the depth is greater than two meters.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Launching[1]	◗	◗	◗	❍	❍	❍				❍	❍	❍
Anchoring[2]	❍	❍	❍	❍	❍	❍				❍	❍	❍
Swing mooring berthing[3]	❍	❍	❍	❍	❍	❍				❍	❍	❍
Marina berthing	see marina fact file											
Engine emissions	❍	❍	❍	❍	❍	❍				❍	❍	❍
Noise disturbance										◗	◗	◗
Disturbance to wildlife[4]	◗*	◗*	◗*	❍	◗*	◗*				◗*	◗*	❍
Erosion and turbidity[5]	◗	❍	❍	❍	◗	❍						

Key to impacts
Blank Square - not applicable
❍- minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 physical impact on feature
2 minimal as anchoring very rarely occurs
3 anchor drag and maintenance activities carried out at low tide
4 presence of craft in proximity to wildlife
5 dependent on depth of water and speed of craft

E.4.1 Codes Of Practice

- Tidelines, 1997 – Available from the Royal Yachting Association
- Navigate with Nature, 1998 – Available from the British Marine Industries Federation
- Numerous Leaflets Available from The British Water Ski Federation

E.4.2 National Representative Organisation

British Water Ski Federation
390 City Road
London EC1V 2QA
Tel: 0171 8332855
Fax: 0171 8375879

Scottish Water Skiing Association
Rockville
6 Letham Road
Perth
EH8 9JZ

F Sub Aqua and Snorkelling

F.1 Participation Rates

The British Sub-Aqua Club (BSAC) membership for 1995 was 52,247 individuals and 1,000 qualified snorkellers (1996). The Professional Association of Diving Instructors (PADI) issued 51,741 certifications to UK divers in 1997. In total there are estimated to be 110,000 to 120,000 active divers in Great Britain. Snorkelling is largely an informal activity and participation rates are unquantifiable, other than for those who are members of BSAC.

The table below shows the breakdown of member qualifications for BSAC members in 1996.

Qualification	Number of Members Qualified
Under Training	8,000
Novice Diver	15,500
Dive Leader	6,400
Snorkellers	1,000
Sports Diver	12,500
Advanced Diver	8,000

F.2 Characteristics of Activity and Management Issues

F.2.1 Sub Aqua

- This activity has a wide range of participants, with young to middle-aged men and women taking part.
- Tuition is necessary to gain the skills required for the activity. A number of representative bodies offer appropriate diving tuition, including, the British Sub Aqua Club (BSAC), the Professional Association of Diving Instructors (PADI) and the Sub Aqua Association.
  ⇒ *Environmental information provided by trainers is likely to be effective in reaching target audience.*
- This group is likely to be associated with clubs or national bodies, particularly in the novice stages of the activity. Once the participant has gained the level of 'sport diver' there can be a migration away from clubs to informal participation with friends or family.
  ⇒ *Voluntary codes of practice and education programmes which are run through local or national representative clubs, and in conjunction with equipment suppliers, effectively target participants. PADI runs a project called AWARE (Aquatic World Awareness, Responsibility and Education) which runs educational programmes in the UK targeted at divers, snorkellers and water enthusiasts.*
- Diving areas are usually accessed by motorised craft. The size of the craft can vary with small craft launched from public access points and larger craft from moorings.
  ⇒ *Known access points to the water can be good locations for promoting environmental information to this group.*
- The main targeted publications for this activity are *Diver* and *Scuba World* with circulations of 52,300 and 22,000 respectively. Other important publications include *Sport Diver* and *Scuba World.*
  ⇒ *Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.*

F.2.2 Snorkelling

- This activity has a wide range of participants including the very young and very old and is undertaken by both men and women.
- Tuition is not necessary to gain the skills required for the activity.
- Many sub aqua clubs have junior and snorkelling sections. However, snorkelling activities which are undertaken outside of a club environment do not have a representative body.
- There is no publication focusing on this activity.
  ⇒ *Tourist information centres, coastal tourist attractions, equipment suppliers and areas where this activity is commonly undertaken are likely to be the only means of targeting environmental information at snorkelling participants.*

F.3 MSAC Features Where Activity Takes Place

Whilst snorkelling can take place in relatively shallow water, and therefore could occur in the vicinity of all the intertidal and subtidal marine features, diving is mainly a deep water activity and will therefore take place in the vicinity of deeper mSAC features, such as estuaries and inlets and bays and around deeper reefs and lagoons. The main constraints are the ability of craft to provide access for divers to such features and their attraction for divers. Sea caves are a more specialist diving location.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓ (snorkelling only)	
Sandbanks	✓ (snorkelling only)	
Inlets and Bays	✓	
Reefs	✓	
Lagoons	✓	
Sea Caves	✓ (experienced divers only)	
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

F.4 Summary of Potential Environmental Impacts

- Diving activities can cause disturbance to wildlife and erosion of features in the vicinity of dive sites, although observable impacts are generally confined to those caused by irresponsible removal of or damage to species rather than the activity itself.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Launching[1]	◗	◗	◗	❍	❍	❍		❍		❍	❍	❍
Anchoring[1]	◗	◗	◗	◗	◗	◗	◗	◗	◗	❍	❍	❍
Swing mooring berthing[1]	❍	❍	❍	❍	❍	❍	❍	❍		❍	❍	❍
Marina berthing[1]	see marina fact file											
Engine emissions[1]	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Noise disturbance[1]										◗	◗	◗
Antifouling paints[1]	◗	❍	❍	❍	◗	❍	❍	❍	❍	❍	❍	❍
Sewage and other discharges[1]	◗	❍	❍	❍	◗	❍	❍	❍	❍	◗	◗	◗
Disturbance to wildlife[1,2]	◗*	◗*	◗*	◗*	◗*	◗*	◗	◗	◗	◗*	◗*	❍
Erosion and turbidity[1,3]	❍	❍	❍	❍	◗	❍	❍	◗	❍			

Key to impacts
Blank Square - not applicable
❍ - minimal
◗ - observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 where boats used
2 presence of activity in the vicinity of wildlife
3 physical impact on feature
4 potential impact from divers' nitrogen bubbles

F.4.1 Codes Of Practice

- Navigate with Nature, 1998 – Available from the British Marine Industries
- Ten Ways Brochure – Available from Professional Association of Diving Instructors
- Project AWARE – Professional Association of Diving Instructors
- Numerous Leaflets Available From The British Sub Aqua Club

- The Scottish Sub Aqua Club is currently in the process of developing a code of practice

F.4.2 Federation National Representative Body

The British Sub Aqua Club
Telford's Quay
Ellesmere Port
Cheshire L65 4FY
Tel: 0151 3506200
Fax: 0151 3506253

Scottish Sub Aqua Club
The Cockburn Centre
40 Bogmoor Place
Glasgow PE1 1UA

Welsh Association of Sub-Aqua Clubs
10 Neuadd Road
Gwaun Cae Gurwen
Annonford BT22 1PF

Professional Association of Diving Instructors
Unit 7
St Philips Central
Albert Road
Bristol
BS2 0PD
Tel: 0117 300 7234
Fax: 0117 971 0400
www.padi.co.uk

G Sea Fishing and Shore Line Angling

G.1 Participation Rates

The National Federation of Anglers has an estimated membership of 200,000 currently, and the National Federation of Sea Anglers has 37,000 members (1998).

G.2 Characteristics of Activity and Management Issues

G.2.1 Shoreline Angling

- Regular participants tend to be male orientated and of an older age range.
- Although the activity itself is usually solitary, there is a strong fraternal element amongst participants.
- They are unlikely to be associated with local clubs and/or the national representative organisation of the activity.
  ⇒ *Environmental awareness raising programmes run in conjunction with local fishing equipment suppliers are likely to be the most effective method of targeting participants as these organisations have direct contact with the end users and are often considered a credible source of information.*
  ⇒ *Voluntary zoning can be effective but needs to be developed in conjunction with local industry or clubs to ensure success.*
  ⇒ *If byelaws are necessary the involvement of local clubs and industry is essential to ensure the transfer of information to the end user and to aid with enforcement of the regulation.*
  ⇒ *Tourist information centres, coastal tourist attractions and areas where this activity is commonly undertaken provide other means of targeting environmental information at participants.*

G.2.2 Sea Angling

- Sea anglers either own, charter or hire craft for the activity.
  ⇒ *Voluntary codes of practice and education programmes run in conjunction with boat operators, hire companies and equipment suppliers can effectively target participants.*
- Official tuition is not required, although many participants seek assistance at first. This assistance is likely to be very informal and may only consist of talking with other more experienced anglers.
- Main targeted publications for this activity are *Sea Angler*, *Improve Your Sea Fishing* and *Improve Your Sea Angling* with circulations of 49,250, 31,700 and 22,500 respectively.
  Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.

G.3 MSAC Features Where Activity Takes Place

The location of shoreline angling will be dictated by access routes to the area and the distance equipment has to be carried. In addition, areas which traditionally have good 'catching' rates are also attractive to anglers. Local marine features play a part in the choice of location for shoreline fishing as they can be an important determinant in the size of the fish population.

The areas in which sea fishing take place will be determined by the requirements of the craft to access and operate over certain marine features as well as the fish populations in different areas.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓	
Sandbanks	✓	
Inlets and Bays	✓	
Reefs	✓	
Lagoons	✓	
Sea Caves		✓
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

G.4 Summary of Potential Environmental Impacts

- Shoreline fishing activities can cause compaction and erosion impacts where participants seek to access the water in sensitive areas.
- Bait digging for recreational fishing can have significant impacts on the communities and ecological balance of mud and sand flats and rocky shores (see related species collection study, Fowler 1999).
- Irresponsibly discarded fishing tackle can have an impact on wildlife both on shore and in the water.
- Shoreline angling and sea fishing can take place in the vicinity of seal and dolphin habitats and may lead to disturbance.
- Disturbance to other wildlife caused by shoreline fishing will vary depending upon its proximity to wildlife habitats, the time it takes place and the vulnerability of the wildlife.
- Although shoreline fishing is a quiet activity associated with limited movement of participants, the activity takes place throughout the year and participants often seek out locations which are inaccessible for other activities. Where these locations coincide with wildlife habitats, disturbance to wildlife may be observable, particularly at feeding, breeding and roosting times.
- For sea fishing, disturbance to wildlife caused by the motorboats required to access fishing sites will vary depending upon its proximity to wildlife and the vulnerability of the wildlife to disturbance. Where the activity is undertaken on a large scale, impacts on fish stocks may be discernible.
- Except in erodible shoreline fishing areas, the activity's contribution to erosion is minimal.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Recreational bait collecting[1]	◗	◗	◗	❍	◗	◗	◗	◗		❍	❍	❍
Launching[2]	◗	◗	◗		❍	❍		❍		❍	❍	❍
Anchoring[2]	◗	◗	◗	◗	◗	◗	◗	◗		❍	❍	❍
Swing moorings[2]	❍	❍	❍	❍	❍	❍	❍	❍		❍	❍	❍
Marina berthing[2]	see marina fact file											
Engine emissions[2]	❍	❍	❍	❍	❍	❍	❍	❍		❍	❍	❍
Noise disturbance[2]										◗	◗	◗
Discarded fishing tackle										◗	◗	◗
Disturbance to wildlife	◗*	◗*	◗*	◗*	◗*	◗*	◗	◗		◗*	◗*	❍

Key to impacts
Blank Square - not applicable
❍ - minimal
◗ - observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 disturbance to benthic communities
2 sea angling

G.4.1 Codes Of Practice

- Numerous Leaflets Available From the National Federation of Anglers
- Numerous Leaflets Available From the National Federation of Sea Anglers
- Navigate with Nature - British Marine Industries Federation

G.4.2 National Representative Organisation

National Federation of Anglers
Halliday House
Eggington Junction
Derby
DE65 6GU

Tel: 01283 734 735 Fax: 01283 734799

National Federation of Sea Anglers
51A Queen Street
Newton Abbott
Devon
TQ12 2QJ

Tel: 01626 331330 Fax: 01626 331330

H Sea Kayaking and Canoeing

H.1 Participation Rates

The British Canoe Union is the UK governing body representing 24,000 canoeists and 600 affiliated clubs.

H.2 Characteristics of Activity and Management Issues

- These activities tend to attract young participants who are characterised by a strong sense of independence. However, it is not restricted to young people and is popular throughout the 30-50 age group.
  ⇒ *The use of a well known personality connected with the activity may be an effective way to promote environmental initiatives to participants.*
- As informal activities, participants are less likely to be associated with local clubs and/or the national representative. However, there is a sector within this activity that is represented by groups from affiliated clubs, this is usually associated with competition fishing.
  ⇒ *Environmental awareness raising programmes run in conjunction with local equipment suppliers are likely to be the most effective method of targeting participants as these organisations have direct contact with the end users and are often considered a credible source of information.*
- Although an informal activity a number of participants do undertake some form of training and the British Canoe Union's coaching qualifications include qualifications specific to sea kayaking and canoeing.
  ⇒ *Trainers can be a good source for information transfer to the end user. The British Canoe Union Yearbook also contains a section on environmental matters and includes environmental awareness issues in its coaching qualification tests.*
- Slipways or mooring are not required to enable water access but car parking is required.
  ⇒ *Known access points to the water can be good locations for promoting environmental information to this group*
- Main targeted publications for this activity are *Canoe Focus* and *Canoe-Camper* with circulations of 18,000 and 1,000 respectively

H.3 MSAC Features Where Activity Takes Place

These craft are able to be launched from any area that can be accessed from the landside and can access all mSAC features.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓	
Sandbanks	✓	
Inlets and Bays	✓	
Reefs	✓	
Lagoons	✓	
Sea Caves	✓ (only those that are accessible)	
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

H.4 Summary of Potential Environmental Impacts

- The launching of craft from designated access points will have minimal impact on marine features.
- The launching of craft from informal access points, which is relatively common for canoes and sea kayaks, may result in compaction of feature and damage to vegetation.
- Disturbance can be caused to wildlife by the presence of sea kayaks and canoes in areas inaccessible to larger craft, including nesting sites. The impact will vary depending upon the type of activity, the time it takes place and the vulnerability of the wildlife. However, the representative body has a proven record of supporting voluntary restrictions in appropriate areas during the nesting season.
- Disturbance is observable at feeding, mating and roosting times but the impact is extremely difficult to quantify, particularly as the activity is relatively rare.
- Erosion to marine features may be caused by participants in immersion sports, such as sea kayaking and canoeing, making direct contact with the feature, although they will tend to avoid areas with underwater obstructions such as reefs.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Launching[1]	◗	◗	◗		◗	◗	❍	◗		◗*	◗*	❍
Noise disturbance										❍	❍	❍
Disturbance to wildlife[2]	❍	❍			❍	❍	❍	❍	❍	❍	❍	❍
Erosion and turbidity[3]	❍	❍	❍		❍	❍	❍	❍				

Key to impacts
Blank Square - not applicable
❍- minimal
◗ - observable, likely to be location specific
◗* - observable at certain times, minimal at other times
● - appreciable

Notes
1 trampling and scouring
2 presence of activity in the vicinity of wildlife
3 trampling

H.4.1 Codes Of Practice

- Tidelines, 1997 – Available from the Royal Yachting Association
- Navigate with Nature, 1998 – Available from the British Marine Industries Federation
- Earning a Welcome – Available from the British Canoe Union
- A Series of Access Leaflets – Available from the British Canoe Union

H.4.2 National Representative Body

The British Canoe Union
John Dudderidge House
Adbolton Lane
West Bridgeford
Notts
NG2 5AS

I Infrastructure for Water Based Recreation- Slipways, Marinas, Swing Moorings, Boatyards and Sailing Clubs

I.1 Introduction

The physical infrastructure to facilitate water-based recreation ranges from an informal parking area and launch site, through swinging mooring provision to fully serviced marina operations. Boatyards and yacht clubs are also essential to many of the water-based activities.

The potential impacts of recreational infrastructure may occur both when the facility is being constructed, if it is a new facility, and also while it is in use. During the construction of recreational infrastructure, the magnitude of the impact upon designated marine features depends upon factors such as the specific location of the development, the scale of the scheme, construction methods and project design and implementation. During use, potential impacts will depend upon how a facility is managed.

Impacts may be physical in nature, such as destruction of habitat, or biological, such as changes in water quality brought about by development or activities taking place in the vicinity of a facility.

I.2 MSAC Features Where Facilities are Located

While there are examples of boating facilities on the open coast, the majority of facilities are situated in more sheltered estuarine locations or harbours. The cost of facilities on the open coast and the associated planning constraints make it unlikely that many further developments will take place in this type of location. A significant number of coastal developments in the last 20 years have, however, taken place in more sheltered locations in the inter tidal zone.

The method of construction depends on the type of conditions in which it is being built and the scale of the project. For example, the favoured location for a marina operator is one that is convenient for land and water access. Ideally, it should also provide a natural sheltered basin requiring the minimum of physical modification and therefore entailing minimum construction costs. However, there are very few, if any, of these locations remaining in which development would be permitted. Therefore, new developments are likely to take place in locations which require a greater degree of physical modification to the site or which are part of port and harbour or urban regeneration projects.

	Likely to occur	Unlikely to occur
Estuaries	✓	
Mud and Sand Flats	✓ (swing moorings)	
Sandbanks	✓ (swing moorings)	
Inlets and Bays	✓	
Reefs		✓
Lagoons	✓ (swing moorings/sailing clubs)	
Sea Caves		✓
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

I.3 Summary of Potential Environmental Impacts

- The magnitude of potential environmental impacts caused by boating facilities developments depends on factors such as the actual location of the development, the scale of the scheme, construction methods and project design and implementation.
- Those marina developments that irreversibly modify existing natural habitats are likely to cause the most significant impacts. In particular, where land claim is part of the development, the potential to modify the habitat is greater.
- Isolated swing moorings and limited pontoon provision are likely to have the least relative impact, although their cumulative impact may be more significant in the vicinity of those features which are already experiencing stress from other sources, such as agriculture, industry and also other recreational activities.
- Dredging may induce turbidity which, depending on the scale, may affect tidal regimes. In addition, deep dredging may disturb large benthic communities on the sea bed, although evidence of long term impact is limited.
- There is a trade off between maintaining adequate flushing characteristics of marina basins by dredging and causing increases in turbidity by the dredging operation.
- The disposal of dredge spoil may have the beneficial result of removing contaminants from marine sediment, many of which are from industrial and agricultural sources, although the location of disposal is an important issue as is the resuspension of the contaminants in the water column.
- Disposal may also cause potential problems associated with the smothering of sea bed communities.
- Evidence suggests that water quality in a low flushing marina basin can undergo a number of changes. In particular, water temperature may increase, dissolved oxygen levels may decrease, and there may be increases in certain pollutants such as copper from antifouling paints.
- Terrestrial and non-marine invertebrates, abundant in sand dunes and salt marshes, are unlikely to be effected by marina and other facilities development unless the construction involves significant modification of their habitats through land claim.
- Aquatic estuarine communities, including algae, worms and molluscs, are greatly affected by the loss of estuarine area through land claim and locked basins. This also has a detrimental effect on fish and bird populations which feed on the organisms.
- The impact of boating facilities' operations is dependent to a large degree on the nature of the management procedures on site.
- The provision of adequate facilities for the reception of various wastes, the adoption of run-off minimisation strategies and effective general site management can all improve the environmental performance of a facility.
- Quantities of antifouling paint may enter the water in the vicinity of boat lift out areas, where craft are washed down, and in maintenance areas, where craft are scraped. These activities can remove a large amount of paint which invariably enters water from the landside. Where present in significant concentrations, the biocides have implications for marine organisms, although there is limited data available to confirm the nature and scale of such impacts.
- An existing slipway may have a continuing impact on a feature, site designation suggests that the site can support the facility at its current level and type of use. However, if usage levels of the facility increase greater impacts may occur, such increase therefore require close monitoring.

Issue	mSAC Feature											
	Low flushing estuaries	Fast flushing estuaries	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Low flushing large shallow inlets and bays	Fast flushing large shallow inlets and bays	Reefs (if water is deep enough to accommodate	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Construction of new in-water facility	❍	❍			❍	❍	◗			◗	◗	◗
Existing swing mooring berthing[1]	❍	❍	◗[2]	❍	❍	❍	❍	❍		❍	❍	❍
Capital Dredging	●	●	●	●	●	●	●	●		❍	❍	❍
Maintenance Dredging	◗	◗	◗	◗	◗	◗	◗	◗		❍	❍	❍
Noise disturbance[3]										◗	◗	◗
Antifouling paint concentration around facility[4]	◗	◗	◗	◗	◗	◗	◗	◗		❍	❍	❍
Sewage and other discharges[5]	◗	❍	❍	❍	◗	❍	❍	❍		◗	◗	◗
Disturbance to wildlife[6]	◗*	◗*	◗*	❍	◗*	◗*		◗		◗*	◗*	❍
Erosion and turbidity[7]	◗	❍	❍	❍	◗	◗	◗	◗		❍	❍	❍

Key to impacts

Blank Squares - not applicable

❍ - minimal

◗ - observable, likely to be location specific

◗* - observable at certain times, minimal at other times

●- appreciable, although depends upon scale of operation

Notes

1 anchor drag and maintenance activities carried out at low tide

2 this refers specifically to the impact of maintenance activities such as hull scraping on mud banks at low tide

3 impact of operations at facility, not including impacts of construction

4 concentrations of biocide in the vicinity of facility, not including general impacts of antifouling paints

5 concentrations of sewage and other discharge in the vicinity of facility, not including general impacts

6 disturbance to wildlife during operation of facility, not including impacts of construction

7 impacts due to operation of facility, not including general impacts of recreational activities

I.3.1 Codes Of Practice

- Tidelines, 1997 – Available from the Royal Yachting Association
- Navigate with Nature, 1998 – Available from the British Marine Industries Federation
- The Code of Practice for the Construction and Operation of Marinas and Yacht Harbours, 1992 – Available from The Yacht Harbour Association (free to members £40.00 to non-members)

I.3.2 Useful Contacts

The Yacht Harbour Association
Evegate Park Barn
Smeeth
Ashford
Kent TN25 6SX
Tel: 01303 814434

Royal Yachting Association
RYA House
Romsey Road
Eastleigh
Hants SO50 9YA
Tel: 01703 627400

Royal Yachting Association - Scotland
Caledonia House
South Gyle
Edinburgh EH12 9DQ

Royal Yachting Association - N. Ireland
Northern Ireland Sports Council
Upper Malone Road
Belfast BT9 5LA

J. Walking, Hiking, Dog Walking

J.1 Participation Rates

The Ramblers' Association has 123,401 members (1998), and the Long Distance Walkers Association had 5,496 members in 1990. However, the actual figures for the number of people participating in some form of walking or hiking are much higher. The UK government's Living in Britain document (1998) suggests 68% of the population undertakes at least one leisure walk of 2 miles or more per year

J.2 Characteristics of Activity and Potential for Awareness Raising

- Walking, hiking and dog walking are popular activities amongst all sections of society.
- Hikers tend to be younger and from a more affluent background with a long term interest in outdoor activities. They tend to have an awareness of environmental issues connected with their activity.
  ⇒ *Environmental awareness raising programmes run in conjunction with outdoor equipment suppliers are likely to be an effective method of targeting participants as these organisations have direct contact with the end users and are often considered a credible source of information.*
- The majority of participants are unlikely to be associated with local clubs and/or the national representative organisations.
  ⇒ *Voluntary management measures and education programmes developed in conjunction with clubs will reach a relatively small proportion of walkers..*
  ⇒ *Known access points to popular walking areas or commonly used car parks can be good locations for promoting environmental information to non-affiliated participants. In particular, appropriate signs detailing area features can be effective.*
- The activities tend to be family orientated.
  ⇒ *Information targeted at children, as well as encouraging responsibility from an early age, is likely also to reach other family members.*
- Main targeted publications for these activities are *Country Life* and *Country Living* with circulations of 42,600 and 180,300 respectively.
  The former regularly carry extensive articles on environmental issues

J.3 MSAC Features Where Activity Takes Place

	Likely to occur	Unlikely to occur
Sand dunes	✓	
Saltmarshes	✓	
Mud and Sand Flats	✓ (at low tide)	
Sandbanks		✓
Inlets and Bays	✓	
Reefs	✓ (at low tide)	
Lagoons	✓	
Sea Caves		✓
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

J.4 Summary of Potential Environmental Impacts

- Impacts associated with trampling will vary according to the nature of the site, the soil which constitutes the feature, and the levels and types of recreational activities.
- Where access to sensitive mSAC features is possible, walkers can cause significant soil compaction.
- Car parking associated with walking activities can cause habitat loss and damage to existing habitats through erosion and soil compaction.
- Impacts from trampling and informal car parking are particularly acute in and around estuarine sand dunes, with participants generally unaware of the habitats' sensitivity. Damage to vegetation from trampling and also from fire can be observed in these areas.
- Walkers can be a localised source of litter, although much of the litter found on beaches and intertidal areas originates from other landside sources or from ships.

  Landside recreational activities can cause disturbance to both plants and animals within mSAC areas. This can be as a result of noise, species collection or the mere presence of participants in close proximity to wildlife. Levels of disturbance are difficult to assess as the sensitivity of different species to disturbance varies greatly.

Issue	**mSAC Features**										
	Sand dunes	Saltmarsh	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Trampling	●	◗	❍		❍	❍[1]	❍				
Erosion	●	●	❍		❍	❍	❍				
Car parking	●	●			◗				❍	❍	
Litter/waste[3]									◗*	◗*	❍
Plant and wildlife disturbance	●	◗			❍	◗*	❍		◗*	◗*	❍
Fire risk	●								❍	❍	

Key to impacts

Blank Square - not applicable

❍ - minimal

◗ - observable, likely to be location specific

◗* - observable at certain times, minimal at other times

●- appreciable

Notes

1 rocky shores

2 unmanaged parking

3 most impacts relating to litter are connected with visual amenity rather than damage to a feature and are therefore n/a

J.4.1 Codes Of Practice

- Ramblers Association Fact Sheet No 6 – Advice and Information for Leaders of Rambles – Available from the Ramblers Association

J.4.2 Governing Body

The Ramblers' Association
1-5 Wandsworth Road
London
SW8 2XX
Tel: 0171 3398500
Fax: 0171 339850

Long Distance Walkers Association
21 Upcroft
Windsor
Berks
SL4 3NH
Home Tel: 01276 65169

K. Horse Riding

K.1 Participation Rates

Around 1.3 million people take part in horse riding activities each year. The British Horse Society has over 62,000 members and the Pony Club has over 37,000 members.

K.2 Characteristics of Activity and Management Issues

- Horse riding is a predominantly young, female orientated activity (3:1 female). 1.3 million riders are under 21 years and 43% of all adult riders are in the age bracket 16-24.
- This recreational activity can be divided into two main groups: owner riders and those who ride through local trekking or horse clubs. The former are likely to ride alone or in pairs. The latter are likely to ride in larger groups.
  ⇒ *Voluntary management measures and education programmes developed in conjunction with clubs and equipment suppliers will have a good chance of succeeding.*
- Most riders will undergo some tuition when first starting the activity. 15% of participants have achieved Foundation level, 40% Participation level: 40% Performance level and 5% Excellence
  ⇒ *Environmental information provided by trainers is likely to be effective in reaching target audience.*
- Main targeted publications for this activity are *Gallop*, *Horse and Pony* and *Horse and Rider* with circulations of 100,000, 58,500 and 38,000 respectively.
  ⇒ *Education programmes run in conjunction with user magazines can raise awareness of marine environmental issues and management schemes.*

K.3 MSAC Features Where Activity Takes Place

This activity is likely to take place in the vicinity of those marine features to which land side access can be gained.

	Likely to occur	Unlikely to occur
Sand dunes	✓	
Saltmarshes	✓	
Mud and Sand Flats	✓	
Sandbanks		✓
Inlets and Bays	✓	
Reefs		✓
Lagoons		✓
Sea Caves		✓
Grey Seal		✓
Common Seal		✓
Bottlenose Dolphin		✓

K.4 Summary of Potential Environmental Impacts

- Impacts associated with trampling will vary according to the nature of the site, the soil which constitutes the feature, and the levels and types of riding activities.

- Horse and rider will generally cause greater *individual* static ground pressure than walkers or cars. Impacts from trampling by horse are particularly acute in and around sand dunes, with participants generally unaware of the habitats' sensitivity.
- Damage to vegetation from trampling can also be observed in these areas.
  Horse riding may cause disturbance to both plants and animals within mSAC areas. This can be as a result of physical damage or the mere presence of participants in close proximity to wildlife. However, any impact is unlikely to be significant.

Issue	mSAC Features										
	Sand dunes	Saltmarsh	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Trampling	●	❍	❍		❍	❍[1]	❍				
Erosion	●	❍	❍		❍	❍	❍				
Physical Infrastructure	●[2]				◗				❍	❍	
Plant and wildlife disturbance	●	●			❍		❍		❍	❍	❍

Key to impacts
Blank Square - not applicable
❍- minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 rocky shores
2 unmanaged parking

K.4.1 Codes Of Practice

- Codes of Practice are available but these are specific to road safety and do not cover environmental issues.

K.4.2 Governing Body

British Horse Society
British Equestrian Centre
Stoneleigh
Warwickshire
CV8 2LR

The Pony Club
NAC
Stoneleigh Park
Knelworth
Warwickshire
CV8 2RW

L Bird Watching

L.1 Participation Rates

Membership of the RSPB now exceeds 1 million people. 8% of adults have been bird watching at some time in the last 2 years and 3% of adults consider bird watching to be their hobby. (RSPB, 1998)

L.2 Characteristics of Activity and Management Issues

- Bird watching is common in two age groups. Both young and older people are well represented in RSPB membership but people of middle ages are less involved in bird watching activities.
- They are likely to be members of the national representative organisation of the activity, the Royal Society for the Protection of Birds, which represents an estimated 50% of ornithologists or bird watchers.
  ⇒ *Codes of practice, information programmes and interpretative signing developed by the RSPB and other bodies such as the Wildfowl and Wetlands Trust are already well developed and generally adhered to by participants.*
- Participants will tend to have a keen awareness of environmental issues.
- Main targeted publications for this activity are *Birdlife,* an RSPB publication for younger members, and *Wildfowl and Wetlands*, with circulations of 77,000 and 34,000 respectively. Birds is the central publication produced by the RSPB and is circulated to the majority of its membership.
  Both publications carry extensive news items and features on environmental issues.

L.3 MSAC Features Where Activity Takes Place

	Likely to occur	Unlikely to occur
Sand dunes	✓	
Saltmarshes	✓	
Mud and Sand Flats	✓	
Sandbanks	✓ (from landside or boat)	
Inlets and Bays	✓	
Reefs	✓	
Lagoons	✓	
Sea Caves		✓
Common Seal	✓	
Grey Seal	✓	
Bottlenose Dolphin	✓	

L.4 Summary of Potential Environmental Impacts

- Impacts associated with bird watching will be similar to those relating to walking and hiking.

- The impacts of trampling will vary according to the nature of the site, the soil which constitutes the feature, and the levels and types of bird watching activities.
- Although impacts from trampling and informal car parking are particularly acute in and around estuarine sand dunes, these areas are not usually frequented by large numbers of bird watchers and therefore their impact is likely to be minimal.
- Bird watching activities can cause disturbance to both plants and animals within mSAC sites. This can be as a result of physical damage or the mere presence of participants in close proximity to wildlife. The use of boats by bird watchers also has implications for wildlife disturbance and erosion or turbidity of the feature. Where bird watching sites coincide with seal haul out areas there can be localised disturbance at certain times. However, bird watchers will generally be very careful to avoid disturbance and therefore their impact is likely to be minimal in other areas.

Issue	**mSAC Features**										
	Sand dunes	Saltmarsh	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Trampling	●	◗	❍		◗	❍[1]	❍				
Erosion	●	●	◗		◗	❍	❍				
Physical Infrastructure	●[2]				●[2]				❍	❍	
Litter/waste	❍	❍	❍		❍				❍	❍	❍
Plant and wildlife disturbance	●	◗		❍	❍	◗*	❍		◗*	◗*	
Fire risk	●								❍	❍	

Key to impacts
Blank Square - not applicable
❍- minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 rocky shores
2 unmanaged parking

L.4.1 Codes Of Practice

- Code of Conduct for Birdwatchers – Available from the RSPB
- Information and advice is also available from the British Ornithologists Union

L.4.2 National Representative Organisation

The Royal Society for the Protection of Birds
The Lodge
Sandy
Bedfordshire
Tel: 01767 680551
Fax: 01767 692365

The Wildfowl and Wetlands Trust
Slimbridge
Gloucestershire
GL2 7BT

M. Wildfowling

M.1 Participation Rates

It is estimated that more than 340,000 people take part in game shooting each year. The British Association for Shooting and Conservation has over 120,000 members. The membership of the Association for Shooting and Conservation has increased by an estimated 8,000 members since 1995.

M.2 Characteristics of Activity and Management Issues

- The typical wildfowler tends to be male and has an average age of 43 years.
- Participants tend to have an awareness of environmental issues.
- They are likely to be associated with the national representative organisation of the activity, the British Association for Shooting and Conservation, which represents an estimated 36% of wildfowlers.
  ⇒ *Voluntary codes of practice and education programmes run through local or national representative clubs effectively targets participants.*
  ⇒ *Memoranda of understanding developed with landowners, including nature conservation agencies, can be an effective mechanism for managing the activity.*
- Both formal and also informal tuition is often required to achieve the basic skills for this activity.
  ⇒ *Environmental information provided by trainers is likely to be effective in reaching target audience.*
- The main targeted publication for this activity is *Shooting and Conservation* with a circulation of 112,000.
  ⇒ *This publication carries extensive news items and features on environmental issues.*

M.3 MSAC Features Where Activity Takes Place

	Likely to occur	Unlikely to occur
Sand dunes		✓
Saltmarshes	✓	
Mud and Sand Flats	✓	
Sandbanks		✓
Inlets and Bays	✓	
Reefs		✓
Lagoons	✓	
Sea Caves		✓
Grey Seal	✓ (at haul out sites)	
Common Seal	✓ (at haul out sites)	
Bottlenose Dolphin		✓

M.4 Summary of Potential Environmental Impacts

- In areas where wildfowling takes place, the activity may lead to trampling impacts on vegetation.

- It is difficult to determine the impact of shooting levels on migratory populations in the context of other variables such as the natural factors affecting breeding season success.
- There is considerable uncertainty about the number of birds shot and how this relates to the size of the overwintering population. There is however extensive research available on the potential impacts of wildfowling on birds. See appendix 7 for references as to more detailed studies.

Issue	mSAC Features										
	Sand dunes	Saltmarsh	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Trampling		◗	◗		◗						
Erosion		❍			❍						
Physical Infrastructure											
Litter/waste[1]		◗	◗						❍	❍	
Plant and wildlife disturbance		◗*	◗		◗*		◗				
Fire risk		❍			❍		❍				

Key to impacts
Blank Square - not applicable
❍- minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 spent shotgun cartridges

M.4.1 Codes Of Practice

- Available from the British Association for Shooting and Conservation

M.4.2 National Representative Body

British Association for Shooting and
Conservation
Marford Mill
Rosset
Wrexham
Clwyd
LL12 0HL

Tel: 01244 573000

N. Quad Biking

N.1 Participation Rates

There are no figures available which estimate the number of regular participants for this activity. So far in 1998 the Auto-Cycle Union (ACU) has issued 123 licences for quad bikes, showing a small increase over the last 3 years. The equipment is also available for hire at a growing number of outlets.

N.2 Characteristics of Activity and Management Issues

- Although originally used for agricultural purposes, over the last five years these vehicles have increasingly been used for recreational activities.
- The activity is male orientated and focused on a young market.
- They are less likely to be associated with local clubs and/or the national representative organisation of the activity, the Auto-Cycle Union.
  ⇒ *Voluntary management measures and education programmes developed in conjunction with equipment suppliers and hire companies may be effective in targeting participants.*
  ⇒ *Information contained in operating manuals may also be a good method of targeting.*
- Tuition is often not required as users can be self-taught.

N.3 MSAC Features Where Activity Takes Place

	Likely to occur	Unlikely to occur
Sand dunes	✓	
Saltmarshes	✓	
Mud and Sand Flats	✓	
Sandbanks		✓
Inlets and Bays	✓	
Reefs		✓
Lagoons		✓
Sea Caves		✓
Grey Seal	✓(at haul out sites)	
Common Seal	✓(at haul out sites)	
Bottlenose Dolphin		✓

N.4 Summary of Potential Environmental Impacts

- Quad biking is still a relatively rare activity in mSAC areas and therefore its effects on features are likely to be minimal overall, although impacts are observable where it takes place, particularly if the activity is undertaken in estuarine sand dune areas.
- The activity can have implications for soil compaction and can cause damage to vegetation.
- Noise disturbance is an issue if the activity occurs close to seal breeding and pupping sites or areas which support over wintering waterfowl.
- Accidental spillage of oil and petrol may require consideration at site level, particularly in areas with a relatively high participation in this activity.

Issue	mSAC Features										
	Sand dunes	Saltmarsh	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Compaction	●		❍		◗						
Erosion	●		❍		◗						
Physical Infrastructure											
Litter/waste[1]	◗		◗		◗						
Plant and wildlife disturbance	●		❍		◗*				◗	◗	
Fire risk	◗		❍		❍						

Key to impacts
Blank Square - not applicable
❍ - minimal
◗ - observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 Oil

N.4.1 Codes Of Practice

- Sound Control, Notes for Guidance, Land Access and Recreation Association – Available from the Auto-cycle union
- Code of Conduct for Drivers and Riders in the Countryside, Land Access and recreation Association – Available from the Auto-cycle Union
- Access Guide for Motorised Recreation in the Countryside, Land Access and Recreation Association – Available from the Auto-cycle union
- British Motorcycle Sport & Leisure Environment Policy, Land Access and Recreation Association – Available from the Auto-cycle union

N.4.2 National Representative Organisation

Auto-Cycle Union
ACU House
Wood Street
Rugby
Warwickshire
CV21 2YX
Tel: 01788 540519
Fax: 01788 573585

O. Wildlife Watching, including Seal and Dolphin Watching

O.1 Participation Rates

In 1994, the number of people watching seals and dolphins on commercial trips was approximately 15,000 (personal communication), but many more people watch seals and dolphins informally from private boats and from the shore.

O.2 Characteristics of Activity and Management Issues

- There is no socio-demographic information available relating to participants of this activity.
- There are no established national organisation representing participants or commercial operators.
  ⇒ *Codes of practice and information programmes developed with operators may be an effective method of targeting participants.*
- Participants will tend to have an interest in environmental issues.
- Often this activity will be undertaken during the course of other recreational activities, such as walking. Some participants visit an area specifically to view seals at haul out sites or take a boat trip to see dolphins.
  ⇒ *Codes of practice and information could be promoted at known access points for these activities, possibly through the use of signboards.*

O.3 MSAC Features Where Activity Takes Place

	Likely to occur	Unlikely to occur
Sand dunes	✓	
Saltmarshes	✓	
Mud and Sand Flats	✓	
Sandbanks	✓	
Inlets and Bays	✓	
Reefs	✓	
Lagoons	✓	
Sea Caves		✓
Grey Seal	✓	
Common Seal	✓	
Bottlenose Dolphin	✓	

O.4 Summary of Potential Environmental Impacts

- Seals and dolphins are particularly attractive species for wildlife watchers. As a result, accessible colonies of seals and dolphins in mSAC area are coming under increasing pressure from visitors. These visitors can cause disturbance to seals, although disturbance to dolphins is less evident. However, there is limited data available as to the long-term impact which seal and dolphin watching may have on populations.

Issue	mSAC Features										
	Sand dunes	Saltmarsh	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Compaction			❍		❍	❍					
Erosion			❍		❍	❍					
Litter/waste			❍		❍	❍					
Plant and wildlife disturbance			❍		❍	❍			◗*	◗*	◗

Key to impacts
Blank Squares - not applicable
❍ - minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

O.4.1 Codes of Practice

- Guidelines to minimise disturbance to cetaceans from whale watching operation and from recreational activities – available from DETR
- The Scottish Marine Wildlife Operators are currently developing a voluntary code of practice
- The Dolphin Space Programme – Available from the Whale and Dolphin Conservation Society
- A report called Seal Watching in the UK and Republic of Ireland published by International Fund for Animal Welfare also contains useful information on seal watching

O.4.2 Useful Addresses

Seal Conservation Society
25 Mallwick Road
Aberdeen
Scotland
AB16 6RF

Whale and Dolphin Conservation Society
Alexander House
James Street West
Bath
BA1 2BT

IFAW
Warren Court
Park Road
Crowborough
East Sussex
TN6 2GA

P Beach Recreation

This group of activities encompasses land and water based activities including sunbathing, swimming, rock pooling and beach games.

P.1 Participation Rates

As an informal activity that can take place wherever people are able to gain access to a beach, it is difficult to quantify the number of participants, although tourism figures suggest that 8% of all countryside day trips are taken in coastal locations.

P.2 Characteristics of Activity and Management Issues

- The activity is popular amongst all sections of society.
- The diversity in participants suggests that information provided at site level will be most effective in promoting responsible behaviour.
  ⇒ *Signs at popular locations and information provided at tourist information centres and tourist attractions are likely to be the most effective methods of promoting environmental good practice at specific locations. Information in libraries, schools and on TV and radio can play a more general role in encouraging awareness of environmental issues related to beach recreation. There is also a role for travel agents and tour companies in information dissemination.*

P.3 MSAC Features Where Activity Takes Place

This activity can take place in the vicinity of marine features which are generally accessible from the land side.

	Likely to occur	Unlikely to occur
Sand dunes	✓	
Saltmarshes	✓	
Mud and Sand Flats	✓	
Sandbanks		✓
Inlets and Bays	✓	
Lagoons	✓	
Reefs	✓	
Sea Caves		✓
Common Seal	✓	
Grey Seal	✓	
Bottlenose Dolphin	✓	

P.4 Summary of Potential Environmental Impacts

- Most impacts from beach recreation in mSAC areas result from parking in non-designated areas and access to beach areas through estuarine sand dunes.
- Litter from beach recreation can be a localised problem.
- The demand for clean beaches and bathing water from beach recreationalists has had a positive effect on environmental quality in many locations - labelling schemes such as the

Good Beach Guide and the Blue Flag scheme can contribute to increased awareness of the issues.

- Beach recreation can have an observable impact on vegetation and wildlife, if undertaken in sensitive areas, and/or if it involves irresponsible species collection, including rock pooling.
- The increasing use of portable barbecues particularly in the vicinity of estuarine sand dunes, is increasing the risk of fire in these areas and also litter.

Issue	mSAC Features										
	Sand dunes	Saltmarsh	Mud and sand flats not covered by sea water at low tide	Sandbanks which are slightly covered by sea water at all times	Large shallow inlets and bays	Reefs	Lagoons	Submerged or partly submerged sea caves	Grey seal	Common seal	Bottlenose dolphin
Trampling	●		❍		❍	❍[1]	❍				
Erosion	●		❍		❍	❍	❍				
Physical Infrastructure	●[2]		❍		❍	❍	❍				
Litter/waste	◗		◗		◗	◗	◗		◗*	◗*	❍
Plant and wildlife disturbance	●		❍		❍	◗*	❍		◗	◗	❍
Fire risk	●		❍		❍	❍	❍				

Key to impacts
Blank Square - not applicable
❍ - minimal
◗- observable, likely to be location specific
◗* - observable at certain times, minimal at other times
●- appreciable

Notes
1 rocky shores
2 unmanaged parking

P.4.1 Codes of Practice

- None available

P.4.2 Useful Addresses

English Tourist Board
Thames Tower
Blacks Road
Hammersmith
London
W6 9EL

Scottish Tourist Board
22 Ravelston Terrace
Edinburgh
AB31 3TW

Welsh Tourist Board
Brunnel House
2 Fitzalan Road
Cardiff
SY23 3AL

Northern Ireland Tourist Board
St Annes Court
59 North Street
Belfast
BT1 1NB

8. Recreational Management: Tools and Techniques

8.1 Introduction

This chapter outlines a variety of tools and techniques which may be used for managing recreational activities in European marine sites. It also highlights a number of case study examples of successful management schemes from the UK and abroad. It should be stressed from the outset that the examples focus exclusively on those used for conservation purposes. Management for amenity and safety purposes lies outside the scope of this report.

It is important to note that the fundamentals of the strategies outlined in this chapter are transferable across many sites. However, the key to determining whether such strategies are successful at the local level lies in effective consultation and liaison between relevant authorities, site managers and the recreational participants in the area. In particular, early consultation on the need for particular management techniques, and the methods by which it may be achieved, improve the chances of successful implementation.

It is also vital to bear in mind that many human activities occur within the coastal zone. Each of these activities has different implications for the environment. When attempts are made to identify the impact of recreation, it is essential that environmental changes caused both by natural occurrences and also by human activities other than recreation be considered. The benefits of recreation for nature conservation should also be taken into account as outlined in chapter 3.

The first part of this chapter looks at mSAC designation in the context of the existing planning system and nature conservation designations. The following sections outline management tools and techniques for addressing recreational impacts, ranging from voluntary to regulatory approaches.

8.1.1 mSAC in the Context of the Planning System

Local authority consent is required for developments occurring within their jurisdiction, although certain 'permitted developments' are consented under General Development Orders. Although developments beyond MLWM do not normally fall within the auspices of local authority control, all associated landside access and infrastructure development requires local authority consent. These consents are subject to appeal to the respective Secretary of State.

Local authority policy is set out in unitary development and structure plans, at county level, and local plans, at district and borough level. Different plans are applicable across the UK and within the individual countries. In addition, many coastal local authorities have now completed, or are in the process of drawing up, coastal strategies designed to provide a strategic overview of all planning matters related to coastal areas. Furthermore, regional planning is becoming an increasingly important third tier of control in England.

In response to increasing pressures on the coast and the confusing division of institutional responsibility, there has been a move towards a more integrated approach to coastal management in recent years. Various agencies and bodies are currently involved in developing plans and policies which have relevance to the marine environment. These include: Local Environment Agency Plans (LEAPS); catchment management plans; estuary, firths and harbour management plans; heritage coast management plans; coastal recreation strategies; and

coastal zone management plans. Each of these management strategies has a specific function, although in certain areas there may be considerable overlap.

To support the development of these plans, the formation of fora and dissemination groups encompassing a wide range of interest groups has become increasingly common. This has extended the decision making process beyond traditional structures.

Many of these plans, policies and fora may already exist on European marine sites or may be in the process of being established.

8.1.2 Plans and Projects

These guidelines focus on the management of activities. Operations requiring permissions or consents such as development proposals are subject to a separate assessment process , briefly described below. Relevant authorities and other competent authorities are responsible for processing and making decisions on consents, authorisations, licences and permissions sought in mSAC areas. These are known as 'plans or projects' and although they are dealt with by relevant and competent authorities they do not fall directly within the remit of management schemes. Instead, DETR/WO recommends the establishment of advisory mechanisms or procedures by the management groups for handling such applications.

The competent authorities are required to consider, in consultation with the nature conservation bodies, whether an application is likely to have a significant effect on the mSAC site. Where it is determined that the plan or project is likely to have such an effect, either by itself or in combination with other plans or projects, a more detailed assessment is required. Depending on the location, size, scale and significance of the proposal, this assessment may be in the form of either an environmental impact assessment (EIA) or an alternative type of assessment. The choice of assessment technique by the competent authority is based on the advice of the statutory nature conservation agencies.

The Department of Environment, Transport and the Regions (DETR) in their guidance document, *European Marine Sites in England and Wales: A Guide to the Conservation Regulations* (1998) suggests that the precautionary principle should underlie the decision making process, but that each proposal must be judged on its own individual merits. Even where a proposed plan or project is shown to have a significant effect on the site, there are provisions for approving the application, for reasons of overriding public interest, including those of a social or economic nature. In such cases, Member States are required to instigate compensatory measures to maintain the overall conservation status of the Annex I & II features.

8.1.3 European marine sites in the Context of Other Conservation Designations

Within the coastal environment there are many different nature conservation designations designed to protect, maintain or enhance various elements which form integral parts of the marine environment. Some are concerned with landscape conservation, specific species protection or habitat protection, for example. Table 8.1 illustrates various coastal designations, including SACs and SPAs, their conservation role and their likely influence on recreation.

When considering the role played by legislation and designation in coastal protection and management of human activities it is important to highlight the existence in Scotland of a common law right of recreation on the foreshore. This right to undertake leisure activities can greatly limit the ability of relevant authorities and site managers to restrict activities in Scottish

sites. This places even greater emphasis on the value of voluntary management techniques and consultation. Scottish Natural Heritage is in the process of producing a publication which examines Scottish legal requirements concerning this right of access.

Table 8.1 Comparison of coastal designations

DESIGNATION	LEGAL ORIGINS	CONSERVATION ROLE	INFLUENCE ON RECREATION
National Park (NP)	Established under the National Parks and Access to the Countryside Act 1949	Preservation of aesthetic qualities, protection of wildlife, historic and architectural interests	Provides access and facilities for public outdoor recreation, in line with the conservation requirements of the site
Area Of Outstanding Natural Beauty (AONB)	This designation only covers England and Wales. ANOBs have also been designated in Northern Ireland under Article 14 of the Nature Conservation and Amenity Lands (Northern Ireland) order 1985.	To preserve and enhance the natural beauty of designated areas	
Heritage Coast (HC)		To conserve and manage the finest stretches of coast	Acknowledgement of leisure interests and facilitation of water-based recreation opportunities
National Scenic Areas (NSA)	Designation covers Scotland only. Initially established under the Town and Country Planning Act 1972 and amended in the Town and Country Planning Act Scotland 1986.	To preserve aesthetic and scenic quality. Predominantly a land-scape designation.	The designation carries no specific powers which may influence recreation but it does provide a requirement to give consideration to the landscape value of the site in decision making.
Site of Special Scientific Interest (SSSI)	Wildlife and Countryside Act 1981 (as amended 1985)	To protect flora and fauna, geological and physiological features of national significance. (only applies to areas above Mean Low Water Mark - Mean Low Water Springs in Scotland)	Certain activities which are considered potentially damaging to the foreshore may be prohibited or managed
Area of Special Scientific Interest ((ASSI) Northern Ireland only)	Nature Conservation and Amenity Lands Order 1985 (as amended)		
Local Nature Reserve (LNR)	National Parks and Access to the Countryside Act 1949	Preservation and enhancement of wildlife, habitats, geological features and provision of areas for research (only applies to areas above Mean Low Water Mark)	Activities which may damage the scientific interest of the area will be managed to lessen or remove their impact or relocated to less sensitive sites
National Nature Reserve (NNR)	Wildlife and Countryside Act 1981 (as amended 1985)		
Marine Nature Reserve (MNR)	Wildlife and Countryside Act 1981 (as amended 1985)	Relates to the area between the high water mark (HWM) and seaward to the territorial boundary	
Special Protection Area (SPA)	EC Directive 79/409 on the Conservation of Wild Birds (the Birds Directive)	Preservation, maintenance of diversity of habitats for rare and vulnerable birds and migratory species	The management of recreation is, as with SSSIs, relative to the activity and the sensitivity of the area, and may be through various schemes of management
Special Area of Conservation (SAC)	EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora	Maintenance of the diversity of Europe's wildlife by protecting vulnerable habitats and the plants and animals that depend on them. Compliments the Birds Directive	
Ramsar	Convention on Wetlands of international Importance especially as Waterfowl Habitat 1971	Protection and wise use of wetland habitats of international importance	

UK CEED (1998)

8.2 Management Tools

This section outlines a number of tools that can be used to aid the effective development and implementation of management techniques.

8.2.1 Consultation

The importance of consultation within the management process is stressed by the DETR:

> *'To enable the activities of local individuals and enterprises and of statutory users of marine areas to be sustained, together with the conservation of habitats and species, it is essential to promote understanding between all relevant bodies' (DETR 1998).*

To formalise this process, the government suggests that a joint management group, set up by the relevant authorities, should include provision for an advisory group made up of local bodies and individuals with an interest in the mSAC area. In addition, expanded public consultation should take place on any substantive management proposals. Government advice makes clear that this process should continue after designation has been achieved to ensure that management schemes remain effective.

From a recreation perspective, it is clearly important for the relevant governing bodies, clubs and individuals to be fully involved in this process from the outset. The management initiatives targeted at such participants will only be as successful as the number of recreational participants who support and participate in the process.

It is essential that these bodies are made up of as wide a range of individuals and organisations as possible including representatives from governing bodies, clubs and industry. Organisations and individuals, other than those in traditional policy or decision making positions, should also be encouraged to become involved.

To keep advisory groups to a manageable size, sub-groups or working parties should be established to examine specific topics and feed in to the advisory group.

8.2.2 Community Involvement

The involvement of the local community during the development and implementation of management schemes is increasingly seen as fundamental to their success. Involvement can range from voluntary management by the community to a form of shared responsibility with relevant authorities and site managers. Involving the community or local recreational participants provides a way for an individual's interest in management schemes to be channelled into support for the project. Community involvement can also assist with participation in management schemes and potential enforcement action as it gives local participants a fuller understanding of the scheme and its benefits.

Community involvement can benefit both voluntary and regulatory schemes of management and can also provide relevant authorities with an insight into what management methods will be most effective at the local level. It is usually instigated by relevant authorities or site managers through the development of locally led topic groups or seminars. In this way, the involvement of the local community can also provide an excellent source of information on the current status of the environment, the nature of local recreational activities and the effectiveness of the scheme once it is in place.

8.2.3 Communication

The success of a management technique, whether it is voluntary or regulatory, is likely to be related to how effectively its messages are communicated to the target audience. Effective communication can provide the opportunity for groups and individuals with an interest in the marine environment and /or recreation to:

- learn about each others' views on issues of mutual interest
- exchange information and ideas
- contribute to the development of management initiatives

Often it can be difficult to access information regarding other organisations in the local area. In particular, there are rarely any established consultation databases for site specific areas.

The development and provision of guides, such as those highlighted in the boxes is an excellent way of promoting and supporting the exchange of information on management schemes, particularly in those areas which encapsulate a wide range of human activities.

Who's Who in the Solway

At a seminar in June 1994, a wide range of organisations were invited to the Solway Firth partnership to air their views and concerns about the Firth. Common concerns were expressed over the lack of opportunity for many different interests to exchange information and communicate with each other on a regular basis. In response, the Solway Firth Partnership produced a guide listing many of the organisations likely to have a view about how the Firth should be managed. The aim of *Who's Who in the Solway* was to:

- make clear the roles, responsibilities and activities of the many organisations working in the Firth
- identify up-to-date information on any particular aspect of the Firth
- provide the general public with an informative guide to the managers, planners and users of the Firth and where to go for information and advice
- provide a checklist of organisations whose knowledge or skills may be sought during the preparation and implementation of the Solway Firth Strategy
- encourage individuals and organisations to network, exchange information and to collaborate more effectively.

Port of Plymouth Water Events Diary and Handbook

Published by the Queens Harbour Master, this guide has a calendar of all sailing and water events for the year and also highlights bylaws and speed restrictions in the area. In addition it provides information on the structure of the estuary management process together with the purpose and objectives of SAC management. It also provides useful telephone numbers and information concerned with local navigation.

8.2.3.1 Developing a Communications Strategy

A number of methods can be used to communicate environmental and management messages to recreational participants. These methods will vary depending on the profile of the recreational group in question. One of the most important considerations is whether or not participants are members of national organisations and/or local clubs. If this is the case, such associations can be used as direct links with recreational participants to spread management messages.

However, the majority of recreational participants, particularly those who participate in informal activities such as walking or cycling, may well be very difficult to reach through conventional channels. This is also the case for some of the watersport activities which occur in European marine sites, particularly those undertaken by a younger audience who are less likely to be associated with particular clubs, for example, windsurfing or personal water crafting. These 'individual' sports need particular attention when drawing up a communications strategy.

8.2.4 Education and Interpretation

A Suggested Strategy

The following strategy for communicating with recreational participants is based upon the lessons learnt from the Navigate with Nature project.

Step 1: Identification of key interest groups and messages
This will include those most affected by management decisions.

Step 2: Consultation
This should take place before initial material development and continue during development of material.

Step 3: Identification of most appropriate information media
This may include leaflets, flyers, booklets, web sites, signs etc.

Step 4: Identification of most effective method of distribution
Direct mail out to recreational participants is an ideal method, particularly when carried out with the co-operation of clubs or industry. Distribution through recreation-related shops, information centres, tourist attractions, clubs etc. are other effective methods. Inserts and features in recreational magazines and local newspapers can be a way of targeting participants not affiliated to clubs. The information could also be displayed at local events, whether related to nature conservation or a particular recreational pursuit.

Step 5: Monitoring and evaluation
Uptake rates of material is one key indicator of the extent to which a target audience has been reached. However, follow-up evaluation by questionnaire or through contact with user clubs is essential to understand the participants' reaction to the material and whether it will have any influence on their behaviour.

Step 6: Project development
The strategy should remain flexible so that the findings of the evaluation stage can be built into the future development of the overall programme.

One of the key aims of the government's Sustainable Development Strategy (DoE, 1994) is 'to ensure that leisure activities are a major means of creating awareness of, and appreciation for, the environment'. It is important to stress that for many people, recreational activities are the *only* means by which they access the natural environment. Leisure activities should therefore be seen as a major opportunity to engage with the public on environmental issues in general and on specific policy issues, such as the Habitats Directive. This will help to engender popular support for the management policies.

Whether the management technique employed at the site is voluntary or regulatory, education and interpretation are a valuable tool in achieving policy goals. Effective awareness raising at a site level can be used to overcome some of the obstacles associated with the acceptance and support of new management schemes. Figure 8.1 illustrates this process.

It is important that the message of 'if it is not broken, don't fix it' is central to communications with end users. If new management measures are required for a site a clear and thorough explanation should be given as to why a particular course of action has been chosen. This should include an explanation of why new methods are required, what they hope to achieve, what the implications are for the end user and, perhaps most importantly, what direct benefits there are for the environment and also the end user.

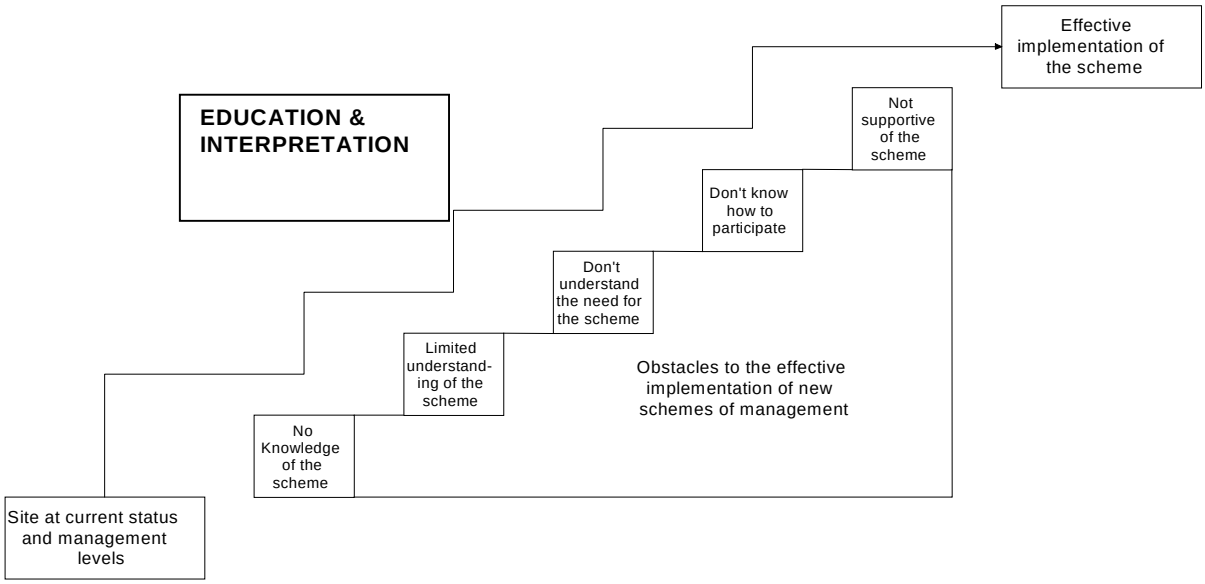
The effective targeting of educational information is of vital importance. Monitoring an educational programme is also an essential tool to ensure it is providing the required information in an effective format. This is paramount for recreation, given its susceptibility to changes in social, political and economic trends.

Entrenched behaviour can be difficult to change. Participants may feel that where they have been using a location for some time they should not have to change their activity, particularly where they see no obvious evidence of damage. Such views may be entirely understandable and this is where education can play a key role in increasing peoples' awareness.

Appropriate and well targeted education is a key step in the effective implementation of any management scheme and is, therefore, a core element in good practice. Often in the planning

and budgetary process for management insufficient thought is given to the role of education. As a result limited funds may be available for staff or resources for education. Nonetheless, with creative planning, ingenuity and dedication, marine interpretation and education can be extremely effective in developing public support and understanding of the marine environment and therefore commitment to management schemes.

Figure 8.1 Education and Interpretation: Overcoming Obstacles



UK CEED (1998)

Green Boat Campaign, Canada

The Canadian Coast Guards *Green Boat Programme* is a multi-faceted initiative to educate recreational boaters about reducing their environmental impact. The centrepiece is a boat user guide, *Protecting the Aquatic Environment*, which has been in circulation for two years. Over 100,000 copies in five editions (including a French version) have been produced and circulated and there are outstanding requests for another 70,000 copies. The key to the program's success has been attributed to the development of numerous formal and informal partnerships with a wide range of parties.

At the very centre of the Canadian Coast Guards approach is the belief that protecting the marine environment is a shared responsibility and that the best way to protect the environment is through a collective effort from all sectors of the boating community. Direction is provided through Recreational Boating Advisory Councils which have been established across the country to advise the Coast Guard on the development of services, policies and strategies for minimising the impact of recreational boating on the marine environment.

The Green Boat programme consists of several components, including publications and a number of initiatives, including the *Green Boat Check* - a voluntary environmental inspection of craft and the distribution of '*Enviro-kits'* - free bilge absorbent pads supplied as part of an Environmental Boaters Kit

The Ride Smart Manual, Rider's Guide to Personal Watercraft, Canada

'Ride Smart' provides personal watercraft users with a user friendly manual containing all the necessary information for undertaking the activity in a safe and responsible manner. The information contained within the booklet was compiled from research, publications, interviews, observations of the craft in use and, most importantly, from co-operation with personal watercraft manufacturers and users.

The manual provides useful information on the craft itself, how to ride it and how to return to shore. It also provides users with information regarding wash and speed restrictions on Canadian waterways.

The manual is produced in a user friendly format with humorous illustrations to promote the core messages contained within the text. In addition, it provides information on personal watercraft training courses and centres.

Navigate with Nature

The Navigate with Nature project provides an example of the way in which non-affiliated participants may be targeted. It is a joint initiative of the British Marine Industries Federation (BMIF) and UK CEED and is also sponsored by the DETR, RSPB, Perkins and Marina Developments Ltd. It focuses on reaching recreational boat users through industry. Whether members of clubs or not, most users will at some stage interface with the industry which provides the boats and equipment necessary to take part in recreational boating activities. Interestingly, this has proved a particularly effective way of targeting Personal Watercraft users, from whom the highest proportionate response was received in the Navigate with Nature pilot project.

The project provides user friendly information on issues regarding the use and cleaning and maintenance of recreational craft. Additionally, it seeks to improve user awareness and appreciation for the natural environment by citing important information about the marine environment. Although run at a national level, it is based on a series of site-specific project areas involving locally targeted and distributed information. To date the following areas have been targeted:

Poole harbour
Chichester harbour
The Humber and Tees estuaries
West Midlands canal system
The Norfolk and Suffolk Broads and Coasts
The Thames
Essex Estuaries
Plymouth Sound

In addition, nationally focused inland and coastal material has been produced for distribution at national boating events and to supplement the demand for information generated through the public relations element of the project. An integral part of the project has been detailed research and monitoring of boat user attitudes in case study areas. This has focused on the attitude of boat users to the environment, their attitude to the Navigate with Nature programme and behavioural changes that it may have inspired. A high proportion of boat users has responded to mailed out questionnaires and their views on the project have helped shape its development.

8.2.5 Information and the Decision Making Process

The availability of high quality, reliable information is a key requirement for the effective development and implementation of management in marine areas. Previous chapters have already outlined the need for such information in relation to feature and recreation characteristics, type and intensity of recreational activities and feature sensitivity.

Although a considerable body of knowledge exists concerning some of these issues, there are large information gaps, as outlined in previous chapters. It is not always accessible or may not be applicable to different sites. Whether the information is useful or not, management decisions will invariably be based, at least in part, on value judgements.

The use of value judgements is a fundamental part of decision making, even where scientific information is readily available. However, the way in which these judgements are made, and are seen to be made, is of importance to the management process. If the process is less than

transparent it can lead to a great deal of disagreement between those individuals and organisations affected by the subsequent decision.

Effective planning and management of recreational activities in mSAC areas should, therefore, be based on the best available scientific information complemented by the input of organisations and local individuals.

In cases where there is insufficient data, the value judgements may be based on the precautionary principle. This states that:

- Where it is assumed that there are real threats of serious damage to the environment, lack of full scientific information should not be used as a justification for postponing measures to prevent such damage occurring. (DETR 1998)

When considering the application of the principle, regard should be given to the magnitude of the impact and the risk of the impact happening. However, the precautionary principle can be exploited by some individuals to find support for their position. The consultation process for this project has highlighted this as a concern of many recreational representatives who feel it is being used to limit their activities in certain areas. It should, however, be stressed that the precautionary principle, as promoted by government, is not designed to curtail those activities which cannot be shown to be harmless. It is more a 'stop gap' policy mechanism which gives decision makers 'breathing space' to assess more fully the costs and benefits of potential management decisions and, where necessary, to undertake further research.

The authors suggest that a consideration of historic, present and future trend data is instrumental in enabling effective decision making. This will help to place current activities in the context of long term natural and human influences and suggest possible future outcomes. Table 8.2 outlines some of these data sets.

Table 8.2. Information Required for Effective Decision Making

Category of Data set	**Data set**	**Sub set**
Historic	Feature	Quality, quantity and location
Historic	Recreation	Types, levels, and location
Historic	Geology	Sediment, formation and location
Present	Feature sensitivity	Estuary, inlets, sea caves etc.
Present	Recreational use of site	Water side and land side
Present	Industrial use of site	Type, location
Present	Urban use of site	Type and location
Present	Rural use of site	Type and location
Present	Water regimes	Depth, currents, temperature, salinity
Present	Sediment transport	Direction, intensity, duration
Present	Management strategies	Voluntary, regulatory
Future	Recreation	Types, levels and location

The table of information above is by no means exhaustive. As sensitivity assessment and management decision methods improve, the relevance of other additional forms of data will become apparent.

During the course of this project it has become evident that, although there is a variety of information available regarding the types and levels of recreational activities currently occurring in mSAC sites, this information is often not comparable between sites. This is largely because the information collection and evaluation methods differ greatly. In addition,

there are a number of examples of one-off surveys of recreational activities which are methodologically flawed.

Future recreational management in European marine sites would benefit greatly from the development of a standardised survey methodology which could be used in all future reviews of mSAC sites. There are many methods available for the evaluation of recreational types and levels with two example of good practice shown below.

JNCC Coastal Directories

The Joint Nature Conservation Committee (JNCC) has sought to tackle the limited availability of environmental baseline date around the British coastline through the development of a series of coastal directories. These provide an authoritative, up-to-date and wide ranging analysis of the characteristics of the various coastal areas, the activities which take place within them, the relevant authorities with responsibility for management in those areas and management initiatives which are taking place. From an mSAC perspective, the directories are less useful as they cover huge areas of coast which do not relate directly to mSAC boundaries. However, they are an example of the type of resource which would be worthwhile compiling specifically for the mSAC areas.

Poole Harbour Recreational Survey

Over a summer period a series of aerial surveys were carried out to determine the number of recreational craft on the water, the nature of these craft and the location of craft. To provide a comprehensive review, the surveys were undertaken during the week, at weekends and over the August bank holiday weekend. This provided an accurate reflection of the range and intensity of activities and identified the peak periods. One interesting result of this process was the extent to which the actual levels recorded were significantly less than the perceived levels of recreation in the Harbour.

8.3 Summary SWOT Analysis of Management Tools

Community Involvement

Strengths

- Support of the local community results in easier implementation of initiatives
- Community involvement can be a very cost effective tool
- Research can be undertaken by local individuals
- Provides an effective link between relevant authorities and end users
- Encourages a sense of ownership and involvement

Weaknesses

- Time consuming to develop
- Difficult to identify which groups or individuals should be involved
- Costly monitoring possibly required to ensure effectiveness
- Fails to target problem users or those not interested in the environment or local area
- Difficult to maintain momentum

Opportunities

- Local resident associations can provide an easy link to local communities
- Local communities have a growing awareness for environmental issues
- Opens up access to local funds for projects

Threats

- Objectives of the group can be hijacked by a powerful or vocal individual or group

Education and Interpretation

Strengths

- Provides easily understandable information
- Supports voluntary or regulatory techniques
- Can be targeted at specific sites or audiences
- Not prescriptive
- Can monitor attitude and opinion
- Updated material can be produced relatively quickly
- Different methods available for carrying information e.g. leaflets, signs, booklets
- No set cost for production of material
- Creative planning can result in effective material being produced relatively cheaply

Weaknesses

- Difficult to get users to read material
- Difficult to monitor effectiveness
- Difficult to target independent users
- Potentially short shelf life - material can become outdated quickly
- Expensive - electronic methods of information transfer can be costly

Opportunities

- Receiving increasing attention from government as a means of addressing management issues
- Sponsorship - commercial organisations may financially support educational initiatives as they often have a large number of deliverables with which organisations can promote their involvement
- New multi-media campaigns could prove to be successful particularly with a younger audience
- Interactive web sites could provide an effective way of monitoring responses to campaigns

Threats

- Education programmes are not considered core techniques in achieving management goals and often receive only limited funds
- Effective communication with target audience can be difficult

8.4 Management Techniques

The designation of European marine sites has taken place within the context of existing patterns of use. It should not be assumed therefore that the requirement to *maintain* the conservation interest is necessarily incompatible with existing activities within sites. It is only through site level assessment that the need for particular management schemes will be manifest.

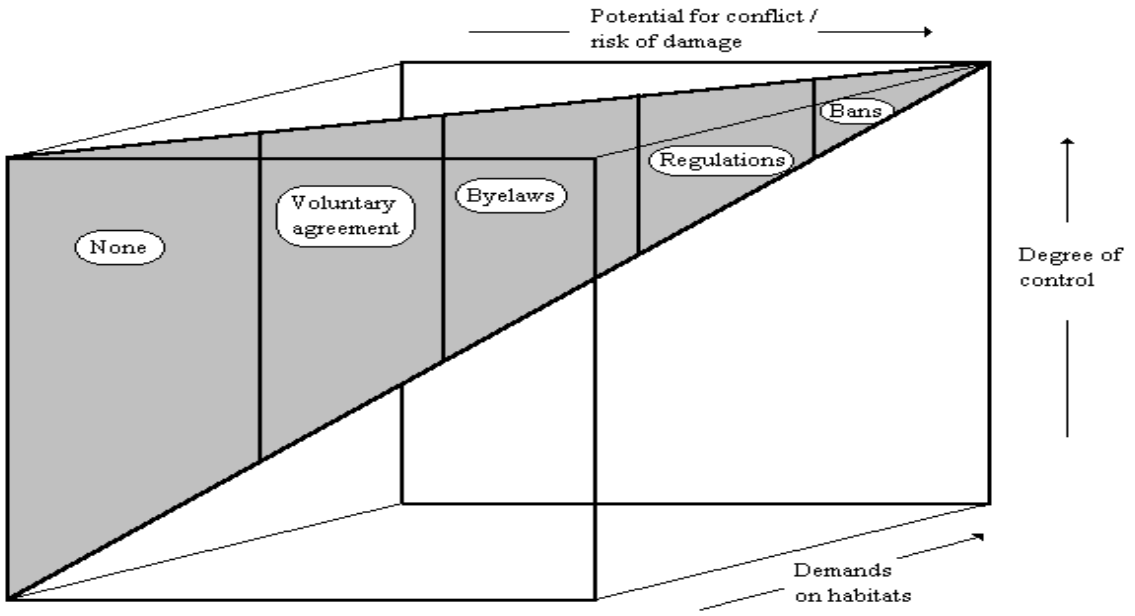
There are a variety of management methods available for the management of recreation in coastal areas. These techniques can in some cases work as stand alone actions but more often will be used in combination with other measures. It is important that relevant authorities and site managers are aware of management measures that are already in place at site level, whether for conservation objectives or for safety and amenity purposes. The latter may well be contributing indirectly to the SAC's objectives.

Where new measures are required, existing structures may provide the most appropriate management route. In areas with few existing mechanisms for managing recreational activities, there is the opportunity to build comprehensive consultation into the initial development of the strategy.

A wide range of management strategies are available to reduce the potential conflict between water-based recreation and marine features. These can include liaison between interested parties, effective zoning, constraints on activities and changes in habitat management. Such measures can be undertaken from a voluntary approach or through regulation.

Figure 8.2 below illustrates how the management techniques proposed on site should correspond to the need for management and should not be more restrictive or binding than necessary.

Figure 8.2



A hierarchical approach to activity control in a variable environment

Huggett (1995)

8.5 Schemes of Voluntary Management

Successful management schemes for mSAC areas rely on the support and collaboration of the recreational users of the area. Where such support is strong, it is likely that voluntary management at site level can be effective in addressing the potential impacts arising from recreation.

Voluntary measures of management have a number of distinct advantages over their regulatory counterparts:

- they engender greater ownership from the local recreational community which may encourage a system of self policing, both of local participants and also new participants in the area who may be unaware of the local scheme
- they require fewer resources for enforcement making them more cost effective
- they provide a positive two way communications link between relevant authorities, site managers and recreational participants

Voluntary methods can facilitate a valuable two way dialogue with participants, many of whom have an in-depth knowledge of the environment in which they walk, boat etc. and any existing problems in those areas. They may also offer good suggestions as to how problems can be overcome, based on their experience of the activity. By encouraging such ownership, management of the areas can be enhanced both in terms of effectiveness and cost.

Although the effectiveness of the voluntary approach is widely recognised, there are some drawbacks to its use. For example, where few user representative groups exist, or in areas with very high proportions of informal activities, it may be difficult to achieve voluntary restraint. It is also important to note that some environments may be unable to sustain a 'wait and see' approach to voluntary management.

The following sections outline various voluntary management techniques which can be used in mSAC areas.

8.5.1 Volunteer Programmes

Volunteers can play an important role in the protection of mSAC areas. They can be instrumental in supporting public education and awareness efforts. They can also contribute to increasing community participation in the process of protecting and maintaining mSAC areas. Research, monitoring, education and office and administrative tasks can all be supported through volunteer action and effectively free up valuable resources both in terms of time and money for mSAC officers and relevant authorities.

In addition, they provide a hands-on opportunity for the public to become involved in the protection and preservation of their local mSAC area.

Solway Firth Wardens

The Solway wardens exist as a backup network supporting the Solway Coast AONB. They consist of local people from a range of ages, skills and backgrounds, linked by a concern for the environment and the enthusiasm to mobilise this concern The Solway Rural Initiative co-ordinates and supports the wardens, providing tools, insurance and training. The different areas in which wardens can operate are:

conservation
survey and research
leading guided walks
educational work
patrolling the shore
practical estate work
administration and clerical support

It is important that wardens are well trained, knowledgeable and helpful. The development of similar volunteer programmes to help with these tasks in mSAC areas would be a valuable addition to any mSAC management scheme.

The Sea Turtle Protection Society, Greece

The Sea Turtle Protection Society provides essential research on and protection for Loggerhead turtles which nest on breeding beaches in Greece. The society relies on volunteers from around the world to actively participate in the programme for a minimum of four weeks in the nesting and hatching season (May to October). Initially, adverts for volunteers were placed in conservation journals and magazines but following the success of the programme, word of mouth and adverts in the internal publication of the society have been sufficient to secure the 700 volunteers required each year.

The society rewards volunteers with on-site training in turtle monitoring and tagging techniques and provides them with the opportunity to observe the species at close quarters. In return, volunteers provide essential field research and actively participate in educational programmes targeted at local tourists and hoteliers. The programme has been running for a decade and has to date resulted in the compilation of valuable primary research and the designation of the main breeding area of Zaykinthos as a marine protected area.

This scheme of volunteer work is extremely effective for nature conservation purposes as it is cost effective and the society is provided with volunteers of different nationalities who can effectively communicate with tourists at the site.

8.5.2 Local Liaison Groups.

Consultation with and between users is essential for agreeing and implementing sustainable management objectives. Local liaison groups can be formed to help with the communication of information to all parties and to encourage them to participate in local management discussions.

Such liaison groups will often need to be ‘kick started’ by one group or individual who sees the potential benefits that may arise from such a consortium. Although this may require resources in terms of funding and time, the outcome can be cost effective and worthwhile.

Southampton Water Recreational

The Southampton Water Recre
comprises the organisations and rep

Local harbourmasters
Local yacht clubs
Water-ski federation
PWA
Local sailing associations
Local rowing clubs
Local universities
District and county councils
RYA
Local windsurfers

The liaison group is comprised of
water recreational community in
authorities. The development of the
for debate and open discussion. Su
for taking the management process
co-operation and partnership.

Port of Plymouth Marine Liaison Committee

The liaison committee allows for communication between users, the Queens Harbour Masters, who chair this group and the management group, and English Nature. The committee has several sub groups that allow for more specific issues to be addressed. It comprises representatives from:

Landscape conservation
Town/Parish Councils
Nature conservation groups
Navigation/rescue
Crime abatement
Archaeology
Recreation
Commerce
Moorings
Research
Fisheries

Solway mSAC: Windsurfing

The West Cumbria windsurfing club is affiliated to the RYA and was formed in 1989 from a group of windsurfers who got to know each other while sailing on the Westwater. The principle reason for inauguration was to fight a blanket ban on windsurfing in the Westwater imposed by the National Trust. The club aims to be a focal point for windsurfers to put forward their ideas and concerns about development affecting them in the area and to act as a recognised contact point for local authorities.

The group has a place on a forum set up by the Lake District National Park Authority and a close relationship with local authorities caring for the Solway Coast.

The Ontario Marina Operators Association (OMOA), Canada

This association is comprised of over 500 marinas, marine dealers, yacht clubs, and associate companies who have been working together since 1967 to promote sustainable recreational boating in Ontario.

Recently OMOA has developed a programme which promotes an interactive hands on approach to protecting the marine environment. In association with a number of *Clean Marine* partners, *the Clean Marine Practices* programme has been developed.

The programme allows all involved in recreational boating to participate in, promote and enforce good environmental practices. The partners in the programme encourage marina operators to sell and install Y-valve seals which ensure that all sewage generated on board is distributed to the waste holding tanks and not pumped out directly into the water.

In the future, the partners are also looking to work with individual marinas to develop safe and environmentally protected sites. In addition, the programme offers a clean marine practice handbook which is accompanies by a day long seminar.

St. Abbs Voluntary Marine Reserve, North Northumberland and Berwickshire mSAC

The main attraction of these waters to divers is the quality of the marine environment which contains spectacular underwater scenery, exceptionally clear water conditions of up to ten meters and a wide variety of species where arctic and gulf stream waters meet. These conditions regularly attract divers from Northern and Middle England who can dive from the shore as well as from boats. As a result the area can become very congested at popular times. In response, the Berwickshire divers have produced a guide to diving in the reserve which includes a code of practice with advice on conservation.

Following a history of poor relations between recreational scuba divers, local residents and in-shore fishermen, divers imposed a voluntary ban on collecting around St Abbs Head in 1976. In 1984, local fishermen, divers and conservationists co-operatively created the St Abbs and Eymouth Voluntary Marine Reserve to safeguard the marine environment of a 9 km stretch of the Berwickshire coast.

The establishment of the reserve through local liaison has helped reduce collection by divers in the area, although the voluntary arrangements have little effective control over the longer term threats from pollution and in-shore fishing.

8.5.3 Codes of Practice

As noted in chapter 7, environmental codes of practice can be useful voluntary management techniques. If effectively developed and followed by the end user such codes can be a cost effective method for minimising the effects of recreation. The provision of such codes can also encourage recreational participants to become interested in the marine environment as well as motivate them to look after it.

It has been estimated that approximately sixty individual sports and leisure activities have codes of practice (House of Commons Environment Committee, 1994), although not all of these cover environmental issues. Most codes have been drawn up by the governing bodies to prevent or minimise damage or nuisance caused by recreational activities.

Although the quality of the code is of primary importance, the effectiveness of its communication and distribution to the target audience will determine its success. Because of limited monitoring of the efficacy of codes of practice, it is unclear how effective many of them are in addressing the key issues. It is also important to bear in mind that continued funding is required to maintain momentum during the implementation of a code.

The development of codes of conduct which cover the three important issues of conservation, amenity and safety can be cost effective. In addition, most recreational participants consider safety issues to be of the greatest importance, particularly for an activity such as diving. Codes which provide such information may therefore receive a greater readership and be ‘taken on board’ by more participants. However, the provision of too much information in a code of conduct can result in end users being unwilling to read it.

Personal Watercraft Code of Conduct, Pembrokeshire, UK

This code was developed through consultation with Pembrokeshire personal watercraft group, the Pembrokeshire Coast national Park, Pembrokeshire County Council and the coast guard to promote the responsible use of personal and fact powered water craft within Pembrokeshire.

It identifies the need for training and boat handling skills. In addition, it outlines the importance of the site for nature conservation and providers users with a checklist of sites to avoid at particular times of the year due to the needs of local wildlife.

Canoeists Code of Conduct, UK

The Canoeist's Code of Conduct issued by the British Canoe Union includes the Central Council for Physical Recreation water sports code. This encourages members to make or comply with suitable arrangements for access to the water and to behave responsibly while on the water. The code also includes a reminder to 'avoid using areas important for wintering wildfowl, nesting birds and spawning fish in the appropriate season'. An interpretative leaflet, 'Canoeists and Wildlife' describes birds, animals and plants commonly seen by participants.

Recreational Power Craft Strangford Lough, UK

The Strangford Lough management committee began consultation on a code of conduct for recreational powered craft in 1995. The code was considered necessary because the committee had received a number of complaints about personal water crafting and water skiing and there was a build up of pressure for bylaws to be introduced to ban those activities in certain areas. The committee felt that the code of conduct, summarised below, would be a more acceptable and cost effective approach to dealing with the issue.

This code was given the support of the Strangford Lough Management Committee, Sports Council for Northern Ireland, Ards Borough Council, Down District Council, Royal Yachting Association (N.I), Association of Strangford Lough Yacht Clubs, Northern Ireland Federation of Sub-Aqua Clubs and was originally published in June 1995.

Indications showed that the code was a useful measure in reducing conflict. The code has been given further practical support through the development and three year trial of buoyed signs at mooring areas to remind users of the voluntary code and the need to reduce speed within 200 meters of any shoreline including islands.

Voluntary Code of Conduct

Recreational Power boat users in Strangford Lough should:
Avoid mooring areas as sites for recreation. Any passage in these areas should be at low speed to minimise wash and disturbance, i.e. not exceeding five knots
Elsewhere avoid areas within 200 meters of the waters edge at any state of the tide, except for take off and landing operations. Dive boats, anglers etc., approaching or leaving sites within 200 meters of the waters edge should do so at low speed as in 1 above.
Approach the shoreline, raft or slipway in as direct a manner as possible when within 200 meters of the waters edge
Avoid polluting or spoiling the Lough or its islands or shoreline by careless disposal of packaging, oils or fuels, and dispose of all refuse ashore in a responsible manner.
Observe and respect signs or markers on slipways, shore, or islands where it is indicated that landing or takeoff is not permitted.
Stay well clear of seals and birds to avoid causing disturbance.
Observe the principles of good seamanship, avoid causing excessive wake or wash and respect the rights of other Lough users by extending due care and courtesy to them.

Please create an awareness and observance of these principles with other Lough users

Divers Code of Practice for Strangford Lough

Conservation
Strangford Lough is a Statutory Marine Nature Reserve. many species within the Lough are rare, slow growing or sensitive to human interference. Shellfish Stocks are already under considerable pressure from fishing.

The collection of any plant or animal within the reserve is strongly discouraged.
Do not use spear-guns, spears, gaffs, etc.
Dive carefully- careless fining shows incompetence and damages marine life.
Seals are protected by law and are particularly sensitive to disturbance at haul out sites. Bird and seal colonies should not be approached.
Dive boats should keep to a slow speed (5 knots) when within 200 m of the shore to minimise wash and disturbance.
Leave wrecks undamaged for the enjoyment of other divers. All 'finds' must be reported to HM coast guard, who acts for the Receiver of Wrecks in Northern Ireland.
Notify the Environment and Heritage Service or HM Coast Guard if you see pollution within the Lough.

Take nothing but photos - leave nothing but bubbles

The British Marine Industries Federation (BMIF) Environmental Code of Practice

It is not only codes of practice for recreational *users* which can have a positive effect on the marine environment. In 1996, as part of the Federation's environment programme, the BMIF developed a comprehensive environmental code of practice for marine companies. It includes detailed information and advice for marina and boatyard operators on materials handling, waste management, run-off minimisation and emergency response procedures. The code will appear in an updated CD-ROM format in late 1999.

8.5.4 Interpretative Maps

Maps are a useful resource for putting across complex management information in a clear and easily understandable form. However, they can be expensive to develop as interpretative tools, particularly if a licence has to be purchased from the Ordinance Survey or Hydrographical Office.

Environment Australia

Environment Australia, the Australian environment ministry is to launch a major initiative over the coming year improving the use of interpretative maps for the transfer of environmental information. This will be achieved by an investment of $3.2 million for the accelerated development of the Australian coastal atlas: an interactive electronic internet service containing information on the coastal and marine environment.

World Resources Institute

In 1998 the World Resources Institute produced a map-based indicator of threats to the world's coral reefs. This provides the first map based global analysis of the condition of coral reefs and makes a significant advance in understanding and communicating the condition of coral reefs.

8.5.5 Hotlines

Recreational participants can provide an excellent source of up to date information on the current state of the marine environment, and in particular in relation to pollution incidents or the occurrence of prohibited activities.

The Environment Agency Emergency Hotline

The Environment Agency provides a hotline number which can be used to report environmental pollution incidents relating to air, land and water. The hotline is open 24 hours and covers all regions in England and Wales. It enables people who witness incidents of pollution in their local environment to contact the Agency and report the incident so that local agency staff can be dispatched to deal with the pollution incident swiftly.

This hotline number is promoted on many of the Agency's internal publication as well as in external publications.

A joint development of this service between the Environment Agency and relevant authorities could prove extremely useful to the development of management responses to pollution incidents within mSAC areas.

Bait Digging, Solway Firth

In 1998, the local newspaper for the Solway Firth area, reported the threat that organised gangs of bait diggers were posing to local species populations. The article suggested that bait diggers were travelling from other areas of the country to collect species and also highlighted the fact that bait collection is banned on many stretches of the North Eastern coastline because of over exploitation. The article finished by offering a contact number to anyone with information regarding this activity.

Although the article was designed to engender local antipathy of outsiders involved in the activity, the provision of a contact number was successful in enabling relevant authorities to gather up to date information on the bait digging issues from local users of the coastline.

8.6 Voluntary/Regulatory Approaches

8.6.1 Zoning

Zoning may be entirely voluntary, it may be enacted through regulatory mechanisms such as byelaws (see below) or it may be a mixture of both. The decision as to where the balance lies is likely to depend upon the extent of user co-operation in the development of the scheme.

The technique can be implemented on a spatial basis, whereby different activities are allocated specific areas of a water body or on a temporal basis, whereby activities are controlled at certain times of the day or at certain times of the year. The latter may include closed seasons. The scale of spatial zoning can range from policies designed to encourage or discourage activities across counties or national parks through the allocation of water bodies for primary uses to the setting aside of parts of a site for different activities.

Zoning is often used as a management technique for addressing safety or amenity issues. Its use is also increasingly being considered for the management of activities for nature conservation purposes. This may often include buffer zones or exclusion zones which seek to protect particularly sensitive features from the potential impacts of recreational activities. Such zones may also be used to improve particular areas of the site which may have undergone detrimental changes in the past as a result of recreational activities.

Many recreational representative groups have expressed concern, however, about the use of zoning as a nature conservation management tool. Traditionally this tool has been used purely for safety reasons. Two types are officially recognised: 'areas to be avoided' and 'prohibited areas'. Each has an internationally agreed definition which has been used throughout the world and which is understood and generally observed by craft users. Recreational representative groups have therefore expressed the concern that the widespread use of zoning for purposes other than vessel safety may dilute the safety impacts of zoning as generally understood by mariners.

To date, zoning has rarely been used as a tool for achieving conservation objectives alone. Often nature conservation gains will be a by-product of the central safety and navigation objectives of the scheme.

The following case studies of Skomer, Pulau Seribou and Chesapeake Bay provide examples of the use of zoning primarily for nature conservation purposes. It should be noted however that these are examples applying to areas with special conservation designations - the first being a marine nature reserve and the second a marine national park. The Chesapeake Bay example is one which is potentially more applicable to mSAC areas.

Skomer Marine Nature Reserve

Management schemes based on the zoning model have been developed for Skomer Marine Nature Reserve. The zones are based upon an assessment of the sensitivity of marine communities to damage resulting from human activity. The greatest protection is given to those areas where the most sensitive communities are found and where the communities are most vulnerable to damage through human activities.

Zoning information has been presented to all users of the marine site in the form of a simple coloured map. This example of zoning and information presentation can be seen below:

Pulau Seribou Marine National Park, Indonesia

This zoning scheme, outlined in the table below, provides nature conservation protection to hawksbill turtles and reef features and habitats, while at the same time enabling scientific research and recreation in appropriate areas. By restricting recreation and tourism in the core turtle and reef areas, it not only provides a sanctuary zone for the features but, also, provides pristine research areas essential for the monitoring and evaluation of feature and species development and status.

Zone & Objectives	Compatible Uses	Restrictions
Hawksbill turtle sanctuary Protection of the nesting, resting and breeding habitats of the hawksbill turtle (*Eretmochelys imbricata)* to enable recovery of the breeding population.	Routine patrol, enforcement action and periodic inspection by marine park staff Non-manipulative, non-extractive research, subject to written consent and in the company of marine park staff	Access by all except marine park staff and accompanying researchers Damage, alteration or collection of products. Disturbance of turtles Disturbance to nests or removal of eggs
Coral Sanctuary Protection of representative samples of reef organisms for replenishment of damaged or depleted areas	Routine patrol, enforcement action and periodic inspection . Non-extractive scientific research, subject to written consent and in the company of marine park staff	Access by all but marine park staff and accompanying scientists Damage, alteration or collection of reef products
Intensive use and tourism development zone Development of tourist facilities and recreational activities, and protection of reefs and associated habitats, communities and species from the adverse effects of these developments	Approved construction of tourist or private lodgings and boat docking facilities. Navigation and operation of boats except as restricted by recreational area regulations Recreational activities except as restricted by recreational area regulations	Operation of motorised vessels at more than 15 km/h, except in boat passage lane or water-skiing areas

Salm & Clarke 1984

Chesapeake Bay Zoning Strategy

One of the most comprehensive examples of zoning for nature conservation is in the Chesapeake Bay area of the US. The main components of the plan include spatial and temporal speed limits and minimum wake zones in protected areas. Noise level limits and limited zoning of certain activities such as water skiing and rowing are also in place. The complexity of the regulations of the plan reflect the desire of the administration to address many areas of concern in one comprehensive plan. For example there are five different speed limits which apply to different parts of the management area and some of these change according to the time, day or season. Floating buoys with information signage mark each zone

Whilst the plan has received widespread public support, it has been criticised by user groups for its complexity. For example, the buoys sometimes drift from their correct positions whilst their signage is often difficult to read from a distance and loses its paint over a short period of time.

8.7 Regulatory Approaches

Where voluntary techniques are unlikely to succeed or have already failed, it may be necessary to instigate a regulatory approach to management for nature conservation. Before looking to set up such controls, however, it is important to determine what controls already exist, how effective they are and what statutory powers are vested amongst existing bodies in the area. A number of byelaws are already likely to exist in mSAC areas but new ones can be costly to introduce and bring with them the problem of enforcement, particularly on the water. The results of a consultation exercise on bylaws was published by DETR October 1998 and the findings are summarised below.

8.7.1 Byelaws

Byelaws give legal support to action on the ground, offer a clear basis for enforcement and can highlight broader aims and objectives. However, it can be difficult to achieve and maintain local support for such measures and enforcement can be difficult without appropriate funds. Byelaws should not, therefore, be considered as the first course of action to deal with difficulties or conflict resulting from recreational activities and their use should be avoided where problems are minor or occasional. However, if voluntary action or self regulation is not practicable, or has not proved effective at site level, byelaw management may be required.

An Inter-Departmental Working Party chaired by the Department of the Environment, Transport and the Regions was set up in 1994 to review the effectiveness of existing local authority powers to make byelaws to regulate coastal recreational activities. The following information is based on their findings and recommendations. The working party reviewed five specific principal powers of byelaws, including those designed to:

- regulate the activities taking place on the sea-shore and on promenades
- licence pleasure boats for commercial purposes
- regulate public bathing (primarily for safety reasons)
- regulate speed, use and noise of pleasure boats
- promote good rule and government in their area

Following a discussion paper and subsequent consultation, the working party concluded that there were significant improvements which could be made to byelaw making powers and made specific recommendations.

Throughout the review, the working party looked at the three main aims of recreation management: public safety; protecting amenity; and preventing environmental damage. For the purpose of this study, the latter issue is of most concern. Recommendations specific to the former may, however, be extremely valuable for the wider management of the mSAC site.

When considering issues of environmental decline or impact the working party acknowledged that “assessing damage to the environment is difficult as only limited research is available in this area.” Site managers should bear this factor in mind when considering byelaws as possible management tools for their site.

The working party made 59 recommendations for the use of byelaws in the management of recreation on the coast. Many of these recommendations have relevance to management for amenity, safety and nature conservation purposes and for a more detailed review site managers and relevant authorities should refer to the DETR document, *Review of Byelaw Powers for the*

Coast: Report of the Inter-Departmental Working Group, October 1998. The working party's main recommendations on the future use of byelaws included:

1. Local authority powers for making and enforcing byelaws should be modernised and consolidated.
2. Any powers must include the ability to provide exclusive bathing zones – i.e. areas where all types of craft, powered and non-powered, can be excluded. However, such zones should not force users of craft too far out to sea.
3. In addition to specific powers, local authorities should be given more general byelaw powers (with safeguards to prevent indiscriminate use) to regulate activities affecting the wider environment.
4. Any extension of, or amendment to, byelaw powers should not conflict or overlap with powers held by other authorities.

Point 3 above is of direct relevance to mSAC area management and nature conservation issues. The discussion paper highlighted a number of gaps in the coverage of existing byelaw powers and many of these were with regard to protecting the environment. The working party considered that where another relevant authority did not have a specific power, local authorities should have the power to regulate coastal recreation activities in order to protect the wider environment. The working party made four specific recommendations regarding byelaw protection for the wider environment:

1. Local authorities should be given a general power to regulate coastal recreation activities which are outside the responsibility of other relevant authorities for the purpose of protecting the wider environment.
2. The framing of such powers should, as far as is practicable, take account of the need to regulate as yet unforeseen or largely undeveloped forms of recreational activities.
3. Any such power should include appropriate safeguards to prevent indiscriminate use, appropriate consultation, and ensure that the power is used reasonably.
4. This power should not conflict with, overlap or supersede existing powers held by other authorities.

Other aspects of the discussion that also have implications for nature conservation include the control of launch points. Earlier chapters of this study suggested that environmental impacts can occur when a recreational participant is accessing the water. The byelaw discussion paper highlighted that the control of launching and landing points for craft is one way of exercising a degree of control over watercraft users. For example, some local authorities operate schemes requiring third party insurance as a condition for using local authority controlled launch points. This, however, can only be applied to powered craft and so cannot effectively work as a management tool for the wider recreational community.

The use of personal watercraft was also raised in the document. However, the working party found that most concern was placed on the potential dangers posed to other users of the sea, noise nuisance and the difficulties of enforcing existing controls. These aspects relate in most part to amenity issues and do not therefore have specific relation to nature conservation issues. In relation to the management of this particular type of activity, a specific guide for local and harbour authorities for the management of personal watercraft has been developed.

The use and management of personal watercraft often presents many problems for local and harbour authorities. This is due in general to the wide and often divergent views on the use of personal watercraft around our coasts. In response to this a consortium of groups with interests in this particular recreational activity have collaborated to produce a guide for the effective management of this activity in close inshore waters, a *Practical Guide to the Management of*

Personal Watercraft (1998) This guide does offer some useful information for the management of this activity. It is, however, only targeted at busy beaches and harbours and does not therefore deal with personal watercraft issues arising on the undeveloped and remote coast, particularly areas of high nature conservation importance.

8.7.2 Enforcement

If regulatory controls are not supported by the end user it is likely that they will require enforcement measures to ensure that they are adhered to. Such measures can take the form of policing of the site by relevant authorities. However, this is often a very expensive method of control both financially and in terms of time required to monitor and maintain regulatory measures. A programme of education and interpretation to gain the support of the end user for regulatory controls is a much more cost-effective management tool.

Prior to the development or discussion of new regulatory management techniques for site areas relevant authorities, site managers and recreational users must reach some agreement on the methods, implementation, funding and policing of such schemes.

Good Practice in Policing and Enforcement, Langstone Harbour, UK

One third of the harbour is protected by the Farlington Marsh local nature reserve and an area of mud flats and islands owned by the RSPB. The 2,000 hectares of the harbour have been notified as SSSI on account of the importance of the intertidal zone, its plant life and the birds that it attracts. The harbour is used for sailing, board sailing, fishing, pleasure boating and water-skiing.

A water-ski zone has been defined for use between March and October within which a ten knot speed limit does not apply. With the scheme operated on a voluntary basis, many water skiers ignored the boundaries of the restriction and entered the reserve. By agreement with the Langstone harbour Board, the Langstone Harbour Water Skiers Association is now responsible for policing the zone. All skiers must obtain a licence and become members of the association and display the licence on the bow of ski boats.

The scheme ensures that all skiers are aware of the bylaw e.g. the limits to the zone, speed restrictions, direction and time of skiing within the zone and the position of the nature reserve. The scheme has ensured that transgressors of the rules are easily identified.

8.7.3 Practical Management Techniques

In addition to managing recreational impacts on marine features it may also be possible to reduce the potential for certain impacts by sensitive modification of habitats. This may take the form of bank stabilisation measures, provision of additional refuges for wildlife and habitat restoration.

8.7.4 Integrated Management: A Suite of Management Methods

Often a number of different management methods can work together to provide effective site management. This is particularly the case for techniques such as voluntary zoning, regulatory byelaws and education and interpretation. Often education can be used to support other practical methods of nature conservation at site level. When used together, the different management techniques can effectively support one another and provide added value.

Wildfowling, Lleyn, North Wales

The British Association for Shooting and Conservation has developed an award winning demonstration site at Lleyn Ystumyllyn SSSI in North Wales to show how nature conservation, shooting and farming interests can co-exist. The BASC's long-term aim is to develop integrated management strategies both nationally and at estuary and wetland level, in which the location and positioning of shot and unshot land would be agreed to the mutual advantage of all user and conservation interests.

The BASC issues a series of codes of practice which are distributed to its member clubs. These cover legal and safety requirements, identifying the prey species, details of close seasons, a code of shooting etiquette and advises against shooting out-of-range birds. There is also a conservation code covering habitat and wildfowl conservation, the establishment of reserves and refuges and their management.

8.8 Summary SWOT Analysis of Management Techniques

Volunteer Programmes

Strengths
- Cost effective
- Provides an excellent hands-on learning experience for volunteers
- Provides a direct link between recreational participants and relevant authorities
- Improves end user appreciation for the marine environment
- Provides practical conservation measures for the protection of the environment e.g. litter cleanups and beach cleaning exercises
- Provides an excellent source of information regarding the state of the local environment

Weaknesses
- Time consuming for site managers and relevant authorities in the initial development period
- Quality of information, research or any undertaking has to be closely monitored

Opportunities
- Local clubs or networks can be used to provide a basis for volunteers

Threats
- Poor targeting problem users or people who have little interest in the environment
- Requires effective organisation to be successful
- Momentum easy to lose if not driven forward by site managers or group leaders

Local Liaison Groups

Strengths
- Improves local community involvement
- Provides good indication of local community attitudes
- Good method for reaching consensus
- Extends the decision making process to the local community
- Provides a link to local community resources

Weaknesses
- Provides a stage for airing personal grievances
- Time consuming to reach decisions
- Skewed by one or two particularly strong or vocal parties
- Unmanageable if the group is too large

Opportunities
- Group could be developed from other existing networks or club groups to save time

Threats
- The people who you most want to involve may not be interested in participating
  Strong parties could use it for their own agenda

Codes of Conduct

Strengths
- Acceptability - usually written by, or with input from, user groups
- Provides good educational support for site level voluntary initiatives
- Cheap and easy to produce
- Targeting - can be specific recreational groups or sites
- Provides information for nature conservation, amenity and safety issues
- Straight forward - easily understood by the end user
- Flexibility - can be amended to take account of new recreational trends or locations

Weaknesses
- Difficult to distribute directly to the end user
- Difficult to determine effectiveness
- Difficult to ensure end users read it or act upon it
- Over-use -the number of codes now available may reduce impact
- Targeting non-affiliated independent users is extremely difficult

Opportunities
- Club networks - used to effectively distribute material
- Monitoring - to determine the usefulness and effectiveness of current codes of practice
- A centrally held database of recreational codes could provide a useful resource for participants and other interested parties
- Improve end user appreciation for the environment

Threats
- Usefulness difficult to monitor - problem to justify expenditure as the benefits of the programme are not obvious
- Educational based initiatives are often not given consideration in budgetary allocation and are therefore not easy to fund

Interpretative Maps

Strengths
- Easily and quickly understood by end users
- Contain large amounts of varied data

Weaknesses
- Expensive to produce, particularly if producing many copies
- Landward and seaward data may not be comparable
- Justifications for management decisions not offered

Opportunities
- Useful information can be placed on the back of the map
- Effectively used on signs at access points

Threats
- Obtaining permission for use from the appropriate authorities can be difficult to achieve

Hotlines

Strengths

- Provides a direct line of communication between end user and Relevant Authority
- Provides up to date information regarding the state of the water environment
- Confidentiality - can provide information without face to face contact
- Many people prefer to talk on the phone rather than face to face
- Easily publicised
- Response rates are easy to monitor
- Provides an effective way of self-policing the local boating environment

Weaknesses

- Expensive to set up, run and monitor
- Time - for the number to become well known and used
- Hoax calls could cause funds to be wasted

Opportunities

- The number could be publicised through educational material, codes of practice or signs at the site
- Effective in developing a database of local participants with an interest in the environment

Threats

- Use of hotline for the wrong reasons

Zoning

Strengths

- Flexibility - able to cater for lots of different recreational activities
- Site specific - therefore fully reflect the needs of the site
- Amenity and safety advantages in addition to nature conservation
- Easy to understand and participate in
- Involvement of many organisations in the consultation process
- Levels of protection - depending on particular sensitivities of features
- Voluntary approach - can be applied in association with recreation clubs

Weaknesses

- Consensus difficult to achieve
- Strategies will not work without the support of educational and interpretative campaigns
- Difficult to alter or change once established
- Associated with amenity or safety - usefulness for nature conservation may be overlooked
- Difficult to distinguish specific zones while out on the water
- Enforcement difficult

Opportunities

- Complementary with amenity and safety objectives
- Zoning is becoming a more widely recognised tool of management and is therefore becoming easier to promote

Threats

- The complex nature of human uses of the coast can make it difficult to successfully implement zoning strategies
- New zoning in an area for other purposes may confuse participants and adversely effect safety

Byelaws

Strengths

- Can work as a last choice option for management in areas where voluntary measures are not effective
- Can help to support voluntary led management systems that are ignored by a minority

Weaknesses

- Can be difficult to enforce
- Can by expensive to develop and promote
- Can alienate local communities and reduce the levels of trust and partnership between site managers and users of the site

Opportunities

- Gives power to the relevant authorities to enforce management measures if they have the resources

Threats

- Can sour relations between users and managers

8.9 Summary

8.9.1 Approach to Management

1. In many areas, there is little consensus on whether a problem exists in the first place which needs to be managed. Where a problem is generally recognised, it is difficult to reach agreement as to the best way to solve it.

2. Management can often be seen by participants as an excuse to bring in controls on all activities, irrespective of their impacts or lack of them. Managers may view recreational participants as an impediment to achieving effective conservation practices.

3. These problems are compounded in the case of the Habitats Directive and the designation of SACs by limited promotion of its purpose and objectives. Therefore there is limited understanding of the benefits of designation by the end user.

4. The designation of mSAC areas has taken place within the context of existing patterns of use. It should not be assumed therefore that the requirement to *maintain* the conservation interest is necessarily incompatible with existing activities within mSAC areas.

8.9.2 Consultation

1. Early consultation on the need for particular management techniques and the method by which it will be achieved, including funding and policing, will improve the chances of successful implementation.

2. From a recreation perspective, it is clearly important for the relevant governing bodies, clubs and individuals to be fully involved in this process from the outset.

3. It is vital that, prior to the development of new management strategies, an attempt is made to reach a consensus between relevant authorities, site managers and recreational interests on the need for management

4. It is particularly important that the maxim ‘if it is not broken, there is no need to fix it’ should be the starting point for management.

5. If new management measures are required for a site, a clear and thorough explanation should be given as to why a particular course of action has been chosen. This should include an explanation of why new methods are required, what they hope to achieve, what the implications are for the end user and, perhaps most importantly, what direct benefits there are for the environment and also the end user.

8.9.3 Information

1. The availability of high quality, reliable information is a key requirement for the effective development and implementation of management in marine areas. Consideration of historic, present and future trend data is instrumental in enabling effective decision making.

2. Organisations other than those in traditional policy making positions should be encouraged to become involved in the decision making process through the effective transfer and translation of scientific information.

3. The use of value judgements is a fundamental part of decision making, even where scientific information is readily available. However, the way in which these judgements are made, and are seen to be made, is of importance to the management process.

4. The precautionary principle can be exploited by some individuals to find support for their position. The consultation process for this project has highlighted this as a concern of many recreational representatives who feel it is being used to limit their activities in certain areas.

5. Rather than being seen as a threat, the identification of gaps in information can provide an important opportunity to facilitate an informed discussion over issues of management. It can also promote the formulation of attempts to address such gaps by, for example, joint commissioning of research.

8.9.4 Education and Interpretation

1. Leisure activities are a major opportunity to engage with the public on environmental issues in general and specific policy issues, such as the Habitats Directive, in particular. This will help to engender popular support for the management policies.

2. Whether the management technique employed at the site is voluntary or regulatory, education and interpretation are a valuable tool in achieving policy goals. Effective awareness raising at site level can be used to overcome some of the obstacles associated with the acceptance and support of new management schemes.

3. The effective targeting and continuous monitoring of educational information is of vital importance.

8.9.5 Integration of Management Plans

1. Where the need for management has been identified, it is essential for relevant authorities and site managers to be aware of management schemes that are already in place at site level, whether for conservation objectives or for safety and amenity purposes. The latter may well be contributing indirectly to conservation objectives

2. It is vital that management for conservation purposes does not conflict with, or in any way prejudice, existing safety or navigational measures.

3. Where possible, the mSAC management framework should build on existing management structures, for example estuary management initiatives, and should avoid duplication and/or conflict with existing structures.

4. It is vital that all relevant authorities are brought together at an early stage, and continue to work together in the development of management measures

5. Before looking to set up new regulatory controls, it is important to determine what controls already exist, how effective they are and what statutory powers are vested amongst existing bodies in the area.

6. Often a number of different management methods can work together to provide effective site management. This is particularly the case for techniques such as voluntary zoning, regulatory bylaws and education and interpretation. Often education can be used to support other practical methods of nature conservation at site level.

8.9.6 The Voluntary Approach

1. The value of encouraging people to support voluntarily conservation and management measures, rather than being required to do so, is widely recognised. Successful management schemes for mSAC areas rely on the support and collaboration of the recreational users of the area.

2. Zoning is increasingly being considered for managing recreational activities for nature conservation purposes. Many recreational representative groups have expressed concern, however, about the use of zoning for purposes other than vessel safety. The latter includes internationally agreed terms and definitions which are used throughout the world. It is felt that the extension of zoning for nature conservation purposes may compromise safety requirements.

3. Environmental codes of practice are useful tools for voluntary management. If effectively developed and followed by the end user, such codes can be a cost-effective method for minimising the effects of recreation. The provision of such codes can also encourage recreational participants to become interested in the marine environment as well as motivate them to look after it.

8.9.7 The Regulatory Approach

1. Before looking to set up new regulatory controls it is important to determine what controls already exist, how effective they are and what statutory powers are vested amongst existing bodies in the area.

2. Prior to the development of new regulatory management schemes, relevant authorities, site managers and recreational participants themselves must reach agreement on the methods, implementation, funding and policing of such schemes.

3. Regulatory control should be supported with educational and communication strategies which outline the need for management and the benefits of management for the end user.

8.9.8 Implementation of Management Plans

1. Continuous monitoring and evaluation of the information on which management decisions are based is essential to ensure judgements based on this information remain relevant.

2. In addition to monitoring the quality of information prior to the development of management initiatives, it is also essential that the management techniques themselves are continually reviewed and evaluated once implemented.

3. It is important that a degree of flexibility is built into management regimes to enable a response to changes in the level, seasonality and location of recreational activities.

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Glossary & Acronyms

Annex I Habitats	A natural habitat listed in Annex I of the Habitats Directive for which Special Areas of Conservation can be selected.
Annex II Species	A species listed in Annex II of the Habitats Directive for which Special Areas of Conservation can be selected.
BATNEEC	Best Available Technology Not Entailing Excessive Cost
Biodiversity	"The variability among living organisms from all source including, (biological diversity) *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems." (UN Convention on biological Diversity, 1992.)
Biotope	The 'habitat' (i.e. the environment's physical and chemical characteristics) together with its recurring associated community of species, operating together on a particular scale.
Birds Directive	The abbreviated term for Council Directive 79/409/EEC of 2 April 1979 on the Conservation of Wild Birds. This Directive aims to protect bird species within the European Union through the conservation of populations of certain birds and the habitats used by these species.
BMIF	British Marine Industries Federation
BPEO	Best Practical Environmental Option
Capital Dredging	Improvement of dredged channels, or creation of new channels or deep areas for newly constructed berths
CCW	Countryside Council for Wales
Characteristic Species	Special to or especially abundant in a particular situation or biotope. Characteristic Species should be immediately conspicuous and easily identified (Hiscock, 1996).
Competent Authority	Any Minister, government department, public or statutory undertaker, public body or person holding a public office that exercises legislative powers.
Conservation Feature	A natural or semi-natural feature for which a SAC/SPA has been feature selected. This includes any Habitats Directive Annex I habitat, or specific component of their flora and fauna, or any Annex II species and any population of a bird species for which an SPA has been designated under a Birds Directive. Any habitat of a species for which a site has been selected, or typical species of an Annex I habitat, are also considered to be conservation features (SNH, 1997).

Conservation Objective	A statement of the nature conservation aspirations for a site, expressed in terms of the favourable condition that we wish the species and/or habitats for which the site has been selected to attain. Conservation objectives for European marine sites relate to the aims of the Habitats and Birds Directive (SNH, 1997).
DOENI	Department of the Environment for Northern Ireland is the statutory nature conservation agency and the licensing authority for the disposal of dredge material (equivalent of EN/SNH, MAFF/SOAEFD and EA/SEPA).
Dominant Species	The most visually conspicuous species.
EA	Environment Agency
EN	English Nature
ESPO	European Sea Ports Organisation
European Marine Site	A European site (SAC/SPA) which consists of, or so far as it consists of marine areas.
Favourable Conservation Status	A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function throughout the EU in the long term. The condition in which the habitat or species is capable of sustaining itself on a long term basis.
Habitats Directive	The abbreviated term for the Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Flora and Fauna. It is the aim of this directive to promote the conservation of certain habitats and species within the EU.
Harmful Substance	Any substance which, if introduced to the sea, is liable to create hazards to human health, harm living resources and marine life, damage amenities interfere with other legitimate uses of the sea, and includes any substances subject to control by the Convention. (ICS,1997)
IMO	International Maritime Organisation
Intolerance	The ability a habitat, community or individual (or individual colony) of a species to cope with an external factor.
Introduced Species	Any species introduced by human agency into a geographical region outside its natural range. The term includes non-established (‘alien’) species and established non-natives, but includes hybrid taxa derived from introductions (‘derivatives’) (Eno *et al*, 1997).
JNCC	Joint Nature Conservancy Council

Maintenance Dredging	Preservation of navigational channels and berths
Management Scheme	The framework established by the relevant authorities at a European marine site under which their functions are exercised to secure, in relation to that site, compliance with the requirements of the Habitats Directive.
Maritime Activity	A human-induced operation which occurs in the marine or coastal environment.
MCA (MSA)	Maritime and Coastguard Agency (previously the Marine Safety Agency)
Monitoring	Surveillance undertaken to ensure that formulated standards are being maintained. The term is also applied to compliance monitoring against accepted standards to ensure that agreed or required measures are being followed.
Natura 2000 network	The European network of protected sites established under the Birds Directive and the Habitats Directive (SACs andSPAs).
Non-native (species)	A species that has been introduced by human agency (deliberately or otherwise) to an area where it has not occurred in historical times (taken as being since 500 years before present) and which is separate from and lies outside, the area where natural range extension could be expected. The species has become established in the wild and has self-maintaining populations. (Eno *et al*, 1997).
Operations which may cause deterioration or disturbance	Any activity or operation taking place within, adjacent to or remote from a European marine site that has the potential to cause deterioration to natural habitats for which the site was designated, or disturbance to the species and its habitat for which the site was designated.
Plans and Projects	Any proposed development that is within a relevant authority's function to control, or over which a competent authority has a statutory function to decide on applications for consents, authorisations, licences or permissions .
Polluter Pays Principle	When production processes threaten or cause damage to the environment, the cost of necessary environmental measures should be borne by the producer and not society at large, giving incentives to reduce pollution.
Precautionary disturbance Principle/Approach	The assumption that where there are real threats of damage to the environment, lack of scientific information should not be used as a justification for postponing measures to prevent such damage occurring.
Recoverability	The ability of a species to return to its former status once conditions return.

Regulations	The abbreviated term for the Conservation (Natural Habitats &c.) Regulations 1994. The equivalent legislation for Northern Ireland is the Conservation (Natural Habitats &c.) Regulations 1995. This is the legislation that transposes the requirements of the Habitats and Birds Directive into UK law.
Relevant Authority	The specific competent authorities identified in the Regulations, who have powers or functions which have, or could have, an impact on the marine environment within, or adjacent to, a European Marine site.
RYA	Royal Yachting Association
SEPA	Scottish Environment Protection Agency
Sensitivity	The intolerance of a habitat, community or individual (or individual colony) of a species to damage or death from an external factor (Hiscock, 1996).
Site of Special Scientific Interest	An area of land or Water Notified by the Nature Conservancy Council or its successor country agencies under the Wildlife and Countryside Act 1981 as being of special nature or geological importance.
SOAEFD	Scottish Office Environment, Agriculture and Fisheries Department (Licensing authority for the disposal of dredged material in Scotland)
SNH	Scottish Natural Heritage
Special Area of Conservation(SAC)	A site of Community importance designated by the Member States where the necessary conservation measures are applied for the measurement or restoration, at a favourable conservation status, of the habitats and or species for which the site is designated.
Special Protection Area(SPA)	A site designated under the Birds Directive by the Member States where appropriate steps are taken to protect the bird species for which the site is designated.
Statutory Nature Conservation Agency	The statutory national nature conservation bodies are the Countryside Council for Wales, English Nature, Scottish Natural Heritage and their Joint Nature ConservationCommittee and the Department for the Environment (Northern Ireland).
Suspended Sediment	A measure of the mass of particles in suspension per volume of water (IADC/CEDA, 1998).
Sustainable Development	The use of resources to meet the needs of the present compromising without the ability of future generations to meet their own needs.

Turbidity	An optical property of water related to light attenuation. Turbidity increases as the amount of suspended sediments in the water column increase (IADC/CEDA, 1998).
UK CEED	The UK Centre for Economic and Environmental Development
Voluntary Principle	An approach to site management based on the regulation of activities through the use of statutory controls.
VTS	Vessel Traffic Services direct ships within a harbour area
Vulnerability	The exposure of a habitat community or individual (or individual colony) to an external factor to which it is sensitive (Hiscock, 1996).
Waste	Useless, unneeded or superfluous matter which is to be discarded (ICS, 1997)

Appendices

APPENDIX 1

Consultees involved in the study

Organisation	Name
ABP – Associated British Ports	Graham Rabbitts
ABP Research	Anne Morcom-Harneis
ADAS	Mr W Davies
Arfordir	Gordon Hall
Association of Pleasure Craft Operators	Mr R Johnstone
Association of Scottish Yacht Charters	Secretary
Bournemouth University	Vincent May
British Association of Shooting and Conservation	Patrick Green
British Canoe Union	Mr Quaife
British Marine Industries Federation	Chris Corcoran
British Marine Industries Federation	Rhona Fairgrieve
British Sub-Aqua Club	Charlotte Hope
British Surfing Association	Information Officer
British Waterski Association	Barry Odell
Cardigan Bay Forum	Project Officer
Central Council of Physical Recreation	Stephen Saddler
Ceredigion County Council	Liz Allen
Chichester Harbour Conservancy	Philip Couchman
Coastnet	David Masters
Convention of Scottish Local Authorities	Tim Stone
Countryside Commission	Ray Woolmore
Countryside Council for Wales	Margaret Hill
Countryside Council for Wales	Adam Cole-King
Countryside Council for Wales	Martyn Evans
Countryside Council for Wales	Eros Jones
Countryside Council for Wales	Clare Eno
Countryside Council for Wales	Sarah Soffe
Countryside Recreation Network	Joanna Hughes
Crown Estate Commissioners	Tahid Rahman
Crown Estate Commissioners	Jon Parr
Cruising Association	Ted Osborn
Dee Estuary Strategy	Alan Jemmet
DoE & Highways Agency	Huw Thomas
English Nature	Graeme Hayes
English Nature	Neil Fletcher
English Nature	Jo Crix
English Nature	Victoria Copley
English Nature	Helen Davies
English Nature	Helen Vine
English Sports Council	Alison Bullar
English Tourist Board	Mike Kennedy
Environment & Heritage Service DoE NI	Martin Bradley
Environment Agency	Andrew Graham
HM Coastguard – North West Sector	Mr D Thiel
Highland Council	Peter Tevendale
Highland Council	John Rennilson
Local Government Association for England	Information Officer
Lundy Nature Reserve	Ms L Cole
Marine Biologist	Sue Wilson

Marine Biologist	Peter Reece
Marine Conservation Society	Sam Pollard
Marine Ecology and Sailing	Roger Lankester
Marine Safety Agency	David Thompson
Mountaineering Council of Northern Ireland	Mr Dawson Stefox
Mountaineering Council of Scotland	John Morrison
N/W Association of Sea Angling Clubs	Roland Sharpee
National Association of Boat Angling Clubs	Frank White
National Association of Boat Angling Clubs	Bob Deacon
National Association of Fisheries & Angling Consultatives	Mark Hatcher
National Federation of Chartered Skippers	Nick Light
National Federation of Sea Anglers	David Rowe
National Federation of Sea Anglers	Frank Nesbitt
National Trust	Joe Burgon
National Trust for Scotland	Kevin Rideout
North Wales Coastal Forum	Mr J Nicholson
Northern Ireland Tourist Board	Kristine Gillespie
Northumberland County Council	Frank Fortune
Pembrokeshire Coast National Park	Charles Mathieson
Personal Watercraft Federation	Graham Stuart
Professional Association of Diving Instructors	Suzanne Pleydell
Queens Harbour Master	Simon Gooder
RSPB	Duncan Hugget
RSPB (Scotland)	Caroline Davies
Ramblers Association	Alan Mattingly
Ramblers Association	Beverly Penny
Ramblers Association of Scotland	Ellen McCance
Royal National Lifeboat Institution	Peter Bradley
Royal Yachting Association – Northern Ireland	Patrick Knatchbull
Royal Yachting Association – Scotland	Stewart Boyd
Royal Yachting Association	Jerry Eardley
SEPA	Anne Bird
Scottish Canoe Association	Ailsa Spindler
Scottish Countryside Activities Council	Dr B Nesbitt
Scottish Countryside Rangers Association	Mr A McKillop
Scottish Environmental & Outdoor Centres	Sheila Small
Scottish Federation of Sea Anglers	Steve Bailey
Scottish Natural Heritage	Katherine Hayward
Scottish Natural Heritage	Kathy Duncan
Scottish Natural Heritage	Steve Atkins
Scottish Natural Heritage	Sandy Downie
Scottish Sports Association	Bob Aitkin
Scottish Sports Council	Ian Davenport
Scottish Sub Aqua Club	Murray MacCullum
Scottish Tourist Board	Neil Black
Scottish Trust for Underwater Archaeology	Information Officer
Scottish Water Skiing Association	Alan Murray
Scottish Wildlife and Countryside Link	Jennifer Anderson
Seal Conservation Society	Peter Haddow
Shetland Isles Council	Katie Gillham
Skomer Nature Reserve	Blaise Bulimore

Sports Council for Northern Ireland	Stephen Wilson
Sports Council for Wales	Brian Goffee
Sports Council for Wales	John Harrison
Strangford Lough Management Committee	Caroline Nolan
UK CEED	Catherine Saunders
UK CEED	Jonathan Selwyn
UK CEED	Sam Richardson
UK Marine SACs Project	John Torlesse
Ulster Federation of Rambling Clubs	Miss M Doyle
University of Newcastle	John Benson
Wales Tourist Board	Nigel Adams
Wales Tourist Board – Antur Cymru	Chris Coleman
Welsh Association of Sub Aqua Clubs	Belinda Osborne
Welsh Cycling Union	Rae Hughes
Welsh Federation of Sea Anglers	June O'Sullivan
Welsh Local Government Association	Victoria Winckler
Welsh Yachting Association	Peter Lloyd
Western Isles Council	Andrew Roger
Wildlife Link	Martin Harper
World Wildlife Fund	Sarah Jones

APPENDIX 2

National Questionnaire

NATIONAL GROUP QUESTIONNAIRE

We welcome your participation during the development of this important study. By completing the following questionnaire you will be playing a vital role in a project that seeks to identify good management practices for marine recreation in the UK and in Europe.

1. PROFILE

1.1 Name .....

1.2 Organisation .....

1.3 Address .....

.....

.....

Postcode .....

Telephone .....

1.4 In which of the following recreational pastimes does your organisation have a direct interest.

WATER BASED	LAND BASED
Motorboating	Bird watching
Sailing	Day tripping
Personal Water crafting 'jet skiing'	Walking/hiking
Windsurfing	Dog walking
Dinghy sailing	Fossil hunting
Water skiing	Horse riding
Canoeing	Cycling
Sub-aqua	Off roading
Swimming	Land yachting
Snorkelling	Kite flying
Sea fishing	Shoreline angling
Motor towed inflatables	Jogging
Surfing/body boarding	Sand sculpting

1.5 If there are any other recreational activities with which your organisation is concerned please list them below;

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.....

.....

.....

2. INFORMATION HELD BY YOUR ORGANISATION

2.1 Does your organisation have any reports or studies concerning the extent and volume of any recreational pursuits within the UK or specific demonstration site areas?

YES NO

2.2 If YES would it be possible for UK CEED to see this information?

YES NO

2.3 Does your organisation have any reports concerning the interaction of recreation with the environment?

YES NO

2.4 If YES could this information be made available to UK CEED for the purpose of this study?

YES NO

3. MANAGEMENT OF RECREATION

3.1 Please tick any of the following recreational management measures that have been used to manage recreational activities that your organisation represents;

Activity zoning (e.g. specific area for windsurfing, water-skiing etc.)

Time zoning (e.g. restrictions at certain times of the year, season, week or day)

Bylaws (e.g. speed restrictions)

Exclusion zones (e.g. no-go areas)

Buffer zones (those areas surrounding exclusion zones which have a certain degree of management)

3.2 For each management measure you have ticked, in 3.1 above, please circle the number which best describes your opinion of the general effectiveness of the strategy, where,

1 = Always effective
2 = Often effective
3 = Rarely effective

Activity zoning	1	2	3
Time Zoning	1	2	3
Bylaws	1	2	3
Exclusion Zones	1	2	3
Buffer zones	1	2	3

3.3 For any measure that you have rated as having an effectiveness level 3, please state why in your opinion it is ineffective.

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3.4 For any measure you have rated as having an effectiveness level of 1, please state why in your opinion it is effective.

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3.5 If possible please give examples of where this effective management measure is in operation.

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3.6 Do you wish to add any comments regarding the issues raised by this project?

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Thank you for completing this questionnaire. Please return it before 1 June in the pre-paid envelope provided

APPENDIX 3

Local Questionnaire

LOCAL QUESTIONNAIRE

We welcome your participation in this important study. We want the end result to fully reflect the situation at site level and to ensure that recommendations are practicable and effective. By completing the following questionnaire you will be playing a vital role in identifying good management practices for marine recreation in the UK and in Europe.

1. PROFILE

1.1 Name .....

1.2 Organisation .....

1.3 Address .....

.....

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.....

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Postcode .....

Telephone .....

If you are responding on behalf of an organisation please answer questions 1.4 - 1.6 below followed by the remaining questions in this questionnaire. If you are responding in a personal capacity please move on to section 2 - On site information.

1.4 Does your organisation represent the interests of any recreational user group?

YES NO

1.5 If YES how many members in your local area do you represent?

.....

.....

1.6 Please list the recreational activities that you organisation represents?

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.....

.....

2. ON SITE INFORMATION

2.1 Please tick any of the following recreational activities which you have observed occurring in your local area.

WATER BASED	LAND BASED
Motorboating	Bird watching
Sailing	Day tripping
Personal Water Crafting ‘jet skiing’	Walking/hiking
Windsurfing	Dog walking

Dinghy sailing	Fossil hunting
Water skiing	Horse riding
Canoeing	Cycling
Sub-aqua	Off roading
Swimming	Land yachting
Snorkling	Kite flying
Sea fishing	Shoreline angling
Motor towed inflatables	Jogging
Surfing/body boarding	Sand sculpting

2.2 If there are any other recreational activities not mentioned above which also take place please list them below;

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2.3 Please list what you feel are the three most popular recreational activities that take place in your local area.

A. .....

B. .....

C. .....

2.4 For each activity listed in 2.3 above, please circle the number which best describes your opinion of the level of that activity. Numbers 1-3 represent the following levels of activity;

1 = Overcrowded
2 = Level of activity is OK
3 = Very low participation

Activity A:	1	2	3
Activity B:	1	2	3
Activity C:	1	2	3

2.5 Are you able to estimate how many individuals undertake the activities listed in 2.3 above, and if so, please state your best guess. Note: We are aiming to establish the extent of recreational use by all recreational users and not just those affiliated to groups or clubs.

Activity A

Per day.....

Per week.....

Per month.....

Per year.....

Activity B

Per day.....

Per week.....

Per month.....

Per year.....

Activity C

Per day.....

Per week.....

Per month.....

Per year.....

3. MANAGEMENT STRATEGIES

3.1 Please tick any of the following recreational management measures which you are aware of in your local area.

Activity zoning (e.g. specific area for windsurfing, water-skiing etc.)

Time zoning (e.g. restrictions at certain times of the year, season, week or day)

Bylaws (e.g. speed restrictions)

Exclusion zones (e.g. no-go areas)

Buffer zones (those areas surrounding exclusion zones which have a certain degree of management)

3.2 For each management measure you have ticked, in 3.1 above, please circle the number which best describes your opinion of it's effectiveness. Numbers 1-3 represent the following levels of effectiveness;

1 = Always effective
2 = Often effective
3 = Rarely effective

Activity zoning	1	2	3
Time zoning	1	2	3
Bylaws	1	2	3
Exclusion zones	1	2	3
Buffer zones	1	2	3

3.3 For any measure that you have rated as having an effectiveness level of 3, please state why in your opinion it is ineffective and how it could be improved.

3.4 Are there any other recreational management techniques employed in your local area that are not listed in 3.1 above? Please list them below;

3.5 Do you wish to add any comments regarding the issues raised by this project?

Thank you for completing this questionnaire. Please return it before 1 June 1998 in the pre-paid enveloped provided.

APPENDIX 4

An Approach to Sensitivity Assessment

The following information regarding sensitivity assessment provides just one example of how such a review can be undertaken. It is not an example of the specific techniques and procedures followed by the Countryside Agencies, and in no way reflects the views and opinions of the agencies.

ASSESSING FEATURE SENSITIVITY

Sensitivity analysis has been carried out on coastal sites mainly to assess the possible effects of oil spills. More recently, a number of projects have been assessing the sensitivity of marine areas to recreational use.

1. *'Sensitivity'* was defined by Hiscock (1996) as 'the intolerance of a habitat, community or individual of a species to damage or death from an external factor". It is important to distinguish between intolerance, (*intolerance* - the inability of a habitat, community or individual (or individual colony) or a species to cope with exposure to an external factor) which brings about death or reduces populations to levels from which recovery is impossible or very unlikely, and intolerance to damage from which recovery and survival may be possible with repair of the damage. Assessment of sensitivity therefore needs to take account of *'recoverability'* – the ability of a species to return to its former status once original conditions return (MacDonald et al 1996). However, the Habitat Directive Regulations do not include characteristics of the activity within the guidance on assessment criteria and in addition some of these factors may not be relevant to the sensitivity of the site features.

2. Changes in behaviour, displacement from breeding or feeding grounds or long and short term disturbance may be important indicators of responses to stressors, but they may also occur as part of the natural long-term life cycle of specific species.

3. For marine recreational activities, it may be possible to assess feature *vulnerability*, (*vulnerability* - the exposure of a habitat, community or individual (or individual colony) to an external factor to which it is sensitive (Hiscock, 1996), both geographically (spatially) and also across time periods (temporal). Some organisms may not be vulnerable/sensitive to a particular action if they are frequently exposed to a particular stress. However, the same species in another location, which does not commonly experience this stress, may be sensitive/vulnerable because natural resistance to the stress or acceptance of the activity has not evolved. However, there is insufficient knowledge about the recoverability of many marine habitats and species that may be vulnerable to marine recreation.

4. Assessment of sensitivity to recreational use has typically focused on 'spatial' vulnerability – the existence of a species or habitat in a given location that is likely to be affected by a specified activity. This must take account of the time scale over which changes occur. For example, a recreational activity that has the potential to cause damage may only occur when the species at risk is absent. As recreational activities are now carried out throughout the year, impacts may increase particularly on species that locate in the area on a seasonal basis. For example, improved wetsuit technology has extended the season for immersion sports into the winter season. Often such activities will access the water via intertidal sand and mudflats. At high tide potential effects will be limited, but at low tide these mud flat areas are used by wintering waterfowl for food and rest. Disturbance may occur to species that only use the site during the winter period.

5. The potential for an increase in the conflict between nature conservation interests and recreational interests thus becomes greater as new and seasonally unrestricted recreational activities introduce new stresses into the marine environment. Conflicts between innovative new uses and established ones may bring about changes in the location of activities and so spread the stresses on marine species and habitats to new areas. However, there is only limited understanding of these effects as species and communities can be highly sensitive to some stresses and not at all sensitive to others.

6. Sensitivity assessment is a flexible approach that can be applied at any geographical or temporal scale. It is consistent with both sustainable management and the development of sustainability indicators. The key feature of sensitivity assessment is that it takes a holistic approach to the impacts of activities on the environment, identifying those areas most susceptible to change (whether positive or negative). It considers the tolerances and thresholds of features to different types and scale of activity and is flexible to emerging trends.

7. Sensitivity assessment should be an integral part of any project planning process and is not scale limited. It has demonstrable benefits in that it provides the baseline upon which more detailed studies and assessments can be carried out (perhaps at EIA level if necessary).

8. Some approaches to sensitivity assessment use a flow diagram template against which case studies can be tested. This provides a pathway through the process of decision making, making it easily understood. It relies on a simple set of questions asked at key points. The response provides a particular pathway to the next step of the process.

9. Sensitivity assessment can also help to identify the most critical assets within an area to be protected whilst allowing sustainable management for the optimal (but not maximum) use of marine resources. The more comprehensive and reliable the information which feeds into the assessment process, the smaller the critical areas identified are likely to be. The critical areas are of course the core areas for management and will be based upon sensitivity of the features and existing and potential activities within the area as well as external factors.

10. *The Process of Sensitivity Assessment*

It is generally agreed that the following questions need to be asked in order to identify the levels of sensitivity of a feature and the vulnerability induced by recreational activities.

10.1 *What are the Characteristics of the Feature?*

The size, abundance, rarity, robustness, distribution, and social importance of the feature need to be reviewed. The level and format of the information which is currently available will dictate the effective completion of this step in the process. relevant authorities, site managers and recreational participants should be aware of issues concerned with quality assurance of the information base and questions need to be asked about the following:

- the source of information
- reliability of data and information
- completeness of data/information
- levels of understanding of this information

Once these questions have been considered, if lack of information restricts the decision making process further, information requirements should be highlighted and appropriate research undertaken. It is especially important to identify both *Characteristic Species (* special or especially abundant in a particular situation or biotape. Characteristic species should be immediately conspicuous and easily identified (based on Hiscock & Connor, 1991 in Hiscock, 1996) and *Keystone Species* (biologically structuring species that are vital to the ecological integrity of communities, and whose absence would cause the community to significantly alter, dysfunction or disappear (Masters & Gee, 1995).

10.2 *To What is the Feature Sensitive?*

Relevant authorities, site managers and others involved in the policy process should be aware of the possible implications of natural processes and human uses of the site and their effects on its sensitivity. Furthermore they should take steps to assess the vulnerability of the site and its species. This will be dependent upon the available data and information. Consideration should be given to the quality of the information and if necessary further research should be commissioned to aid the development of policy and practices.

10.3 *What are the Characteristics of the Activity?*

For each mSAC site, consideration should be given to a range of both natural and human criteria. These include the area's size and extent, naturalness and fragility. Specific recreational issues include diversity and levels of activities, aesthetic appeal, cultural significance, etc.

10.4 *What are the Levels of Acceptable Change (LACs)?*

The levels of stress imposed on a site, feature or community will have implications for its overall stability. High species richness is maintained in communities at intermediate scales of disturbance. However, additional levels of stress may cause damage or disruption to the feature or community. It is essential to establish the limits of recoverability with respect to specified disturbances for natural and managed communities. The extent to which a community may be disturbed before it shifts to a less desirable form should also be assessed. The sensitivity assessment should provide a basis for judging the probability and acceptability of these threats. The checklist boxes below summarise the main issues to be considered:

Figure 1 Feature Issues to Consider

- What features are located in the site (both habitats and species)?
- Is the value of the habitat geological, archaeological or geomorphological or as a home for keystone species?
- How resilient are the habitat's geological, archaeological and geomorphological features?
- Are keystone species valuable at a community level or at an individual species level?
- To what extent do external stresses, including those caused by recreational activities, affect the habitat, species or community?
- Is the habitat/species able to cope with stresses (is it robust?)
- Is the habitat/species able to recolonise following exposure to an external factor?
- Is the species able to avoid the effects of such exposure by temporary emigration or withdrawal into shell or shelter?
- Is this ability to avoid the effects driven by other factors, eg proximity of other populations, barriers to spread?

Figure 2 Recreational Issues to Consider

- Are human influences direct – physical damage, disturbance, degradation?
- Are the levels of these impacts occasional, regular or constant?
- Are human influences indirect, eg competition for space, water, quality, noise?
- Are the levels of these effects occasional, regular or constant?
- Where do these impacts take place?
- Are the locations static or do pressure points change depending on the season?
- Are they land side or water side effects?

10.5 *Sensitivity levels*

The above process should provide the following information

a. Assessment of sensitivity of a habitat or species, at the level of the species' ability to cope/recolonise/avoid.

b. Identification of the source of disturbance and assessment of its effects on the habitat and species' sensitivity. For example, if the stress is repeated but the organism has strategies for temporary avoidance, the species suffers damage but is able to cope.

Once this process has been completed, it may be possible to devise a scale of sensitivity to summarise the findings. Having identified the component impact associated with a maritime activity (a sensitivity *factor*), it may be possible to assess the *factor intensity*, i.e. the magnitude of a factor on a pre-defined scale.

In practice, for many species it will not be possible to assign their sensitivity to more than a simple scale of neutral, sensitive, neutrally sensitive or damaged, and so for many sites the simple allocation of species, sites, features and communities to a sensitivity scale of *benign*, *neutral* or *damaged* will be the initial level at which sensitivity can be assessed. There will be overlapping sensitivities, thus in a specific area one species may be very sensitive to particular recreational activities whereas others are unaffected. Judgements need to be made about the geographical resolution to which sensitivities will be applied. Nevertheless, it is essential to recognise that habitats, processes and organisms are often finely tuned to disturbance, but that once a sensitivity threshold has been crossed, recovery may be slow or impossible.

It should be possible to use the following or similar statements to judge the level of sensitivity:

a. The action positively effects the process or organism.
eg marina construction provides a new rocky habitat for limpets.

b. The habitat, processes or organisms are sensitive to short term disturbance, eg birds fly from feeding areas when disturbed by a passing vessel, then settle back to the earlier state.

c. If a disturbance is repeated or sufficiently intense, organisms move to alternative areas, although they may re-occupy the area if the source of disturbance is removed, eg a change of wind direction requires change in launch points or accidental spillage of fuel causes localised bird mortalities. This level of disturbance may also affect organisms' breeding rates.

d. The habitat, process or organism is sufficiently sensitive that if further stresses from other activities occur it will be seriously damaged and become fatally sensitive. For example, a small breeding population already adversely affected by climate is disturbed by increase in water-based recreation during breeding season (this is probably sub-lethal).

e. The habitat, process or organism is so sensitive to this effect that it will die or change irrevocably.

11. Summary

a. To assess the possible negative or positive implications of recreation on specific marine features or species, it is important to have an understanding and appreciation of the often variable and complex nature of these features.

b. It is important that observed changes are not automatically attributed to human disturbance.

c. To place observed changes within the context of natural variations over time and the variety of human uses of the coast it is important to make an assessment of the sensitivity, recoverability and vulnerability of designated site features.

d. It is also important to distinguish between ‘intolerance’ to an action from which recovery is impossible and 'intolerance' to an action from which recovery and survival may be possible.

e. Sensitivity assessment provides a robust, flexible and holistic approach.

Note The Marlin project supported by the Marine Biological Association is developing a biological sensitivity database. Its website is www.marlin.ac.uk

APPENDIX 5

Organisational Responses to Questionnaire

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
Exclusion zones (total bans) often lead to conflict and illegal use. Time zoning intensifies activity over shorter time periods. Management through clubs is important.	Club membership should be strongly supported. National legislation for boat registration and insurance and driving training needed. Clubs can't control non members.
	Sea Safety Initiative to increase safety awareness around coast, getting sea users to change attitude and behaviour.
	See work done by heritage coast forum.
Nursery areas at sea. Fisheries offices in UK don't have financial resources for officers to police these areas.	No use asking public to be environmentally aware if government. won't fund departments to carry out their duties. Under funded fisheries offices allow people to get away with breaking rules.
	W. coast of Scotland has few restrictions on activities, generally those on boats respect the environment, (with a few exceptions). Litter overboard is a problem, but it is vast area therefore hard to police.
	Management measures need to be arrived at through common consent, and be as non restrictive and few in number as possible.
Exclusion/buffer zones costly in time and resources to enforce. Penalties are minimal. Lack of awareness in LAs of their powers to enforce laws.	Education and public awareness best ways to manage coastal recreation. In some cases (e.g. sea fishing) enforced bylaws and high penalties for infringement is needed.
Bylaws to reduce boat speeds inshore of 300m during period May-Sept. rarely effective as Arun District Council only has one slow patrol boat that can't apprehend offenders.	
Most existing management measures have wide public acceptance. Contraventions usually due to ignorance or thoughtlessness.	Average boat user is in sympathy with aims of Habitats and Birds Directives, they go for quiet enjoyment, have no wish to damage the features. First attempts by single interest conservation bodies frequently ignorant of wider issues.

BMIF doesn't support exclusion zones, not satisfactory solution to management issue, and distort principle of areas as national assets for all to enjoy. All activities can be accommodated and managed through temporal/spatial zoning.	Public access to watersport activities and legal rights of navigation vital to long term economic well being of the industry. Personal watercraft etc. mustn't be marginalised by regulation.
All management measures need enforcement. Always problem of non-club members not meeting codes of practice.	
	For all management measures the support (following consultation with them) of the national governing body would be very useful in achieving a successful outcome.
Unless there is a genuine understanding on the part of the visitors as to why they are excluded from an area this is generally ineffective.	
Lack of or poor 'policing' through lack of local authority or NT resources. Not convinced that putting more resources in is the best solution though.	
Management for nature conservation should not be confused with management for amenity or safety. The overriding requirement for management in coastal areas is that of safety of navigation.	Many management measures are in use on the coast but often they will be for amenity or safety purposes not nature conservation.

APPENDIX 6

Local Comments

Plymouth Sound and Estuaries

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
Activity zoning and Bylaws seem to be totally ignored in upper reaches of Lynner River.	Worry that bureaucracy will inhibit the development for boarding esp. at the cheaper end now Plymouth is becoming expensive. Already experiencing a shortage of new people into the industry. Slowness of councils etc. with business improvements/expansions.
Public unaware of time limits and buffer zone distances.	HM Coastguard/RNLI/MSA/ RUSPA etc. have initiatives separately/jointly to target groups specifically identified as high risk or statistically prominent in an attempt to reduce the no. of incidents needing assistance from rescues services.
	Plymouth Sound comes alive in summer which is great. Restricting water activities would be ridiculous and too many people would think about leaving the area to go to an area where their activity isn't frowned upon.
	SSC is already represented by the Port of Plymouth Marine Liaison Committee, which reports to the Tamar Estuaries Consultative Forum, which manage the area very well.
	Are very satisfied with the current liaison between PPSA and English Nature.
	New water sports centre of excellence should bring regulation of activities.

Chesil and the Fleet

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
Local skiers club help harbour master patrol at weekends, stickers displayed on licensed boats.	Local water skiing club run for over 20 years, good relationship with all other water users, RSPB and harbour management.
	Portland Harbour commercial port now. Recreation levels expected to inc. Not known if introduction of fees will keep numbers at a manageable level. People can use the Fleet for free = impact on
	With the budget for effective policing/enforcement south coast waters are reasonably protected.
	Main conflicts appear to be polarisation of various groups - Sailors (in general) appear to have arrogance associated with e.g. those who ride horses on busy roads. Jet skiers generally from similar breed to the "hells angel" fraternity.
Bylaw with timing restriction of vessels speeds inshore of 300m rarely effective due to lack of resources to combat offenders, Arun council only has one slow patrol boat.	
Bylaws and zoning are effective but on many occasions people ignore speed restrictions in Poole harbour, as well as jet skiers who ride outside the designated zones.	
	The small speed boats are allowed too close to the shore where there are people bathing and in the popular areas for mooring up boats in the bay, one cannot enjoy lunch without a jet ski or water skier zipping by at speed.

The Wash and North Norfolk

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
	Do not try to alter the balance as these areas tend to control themselves.
	Better signage needed in public/launching areas. activity zoning works mainly by other users advising. Similar bylaws are often a well kept secret.
	Local councils could do more to enforce restrictions where they are in place.
	Over crowding with day trippers on summer Sundays and bank holidays.
Buffer zones are meaningless extensions of exclusion zones and cause confusion.	Very effective activity zoning in the wash and N.Norfolk SAC, largely by consent (resorts attract most rec. visitors). Areas such as the N.Norfolk coast sustain a wide range of rec. use with little if any conflict.
Enormous pressure for water rec. and lot of publicity from media to this area of coast. Strictly limited points of access to the sea causes congestion.	Managed rec. = denial of the purpose of rec. Organised boating professional and safe but in the minority, most just want to do 'own thing'. Better access to existing areas may = less spreading. NNDC isn't effective in regulation. Public ignorance.
So little generally known about activities and their subsequent pressures in the wash at present that a valued assessment of management measures employed isn't possible at this time.	
No effective policing of bylaws.	Excessive bait digging probably the most damaging activity to the ecology of the foreshore area, it should be more rigorously controlled. Other rec. activities generally at moderate level and don't appear to have particularly adverse effects on area.
Bylaws not policed or enforced regularly.	
River speed limit not policed.	
With an MOD bombing range in the area time zoning is very effective as are the exclusion zones.	This area of the SAC is used quite a lot by the general public.

Berwickshire and North Northumberland

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
Bylaws largely ignored by visitors because of complicity.	
	Recreational use of this coast seems to be at an entirely acceptable level.
Difficulty in policing bylaws and expense of prosecution not commensurate with level of fines.	
	The local community think that the guidelines set down within the marine reserve do not apply to them and the dumping of refuse and building materials causes problems.
	Against formal restrictions where there are no problems/conflicts arising or conceived.
Speed restrictions aren't observed unless marine police present (usually once a year). Also exclusion zones and bylaws not observed, especially by jet skiers who appear to take delight in ignoring them.	Jet skiing, apart from the speed and danger to swimmers, is noisy and intrusive and spoils enjoyment of other users in the area.
No enforcement of bylaws. More signs needed to explain bylaws.	
	Voluntary measures work with some groups (those affiliated to a club) but individuals not in clubs often difficult to requite. Groups need to be sure of each others requirements. People don't have right to do everything everywhere.
Bait diggers have no respect for zoning or bylaws. Buffer zones have no clarity of purpose.	Buffer zones are a threat to my sport, they are a grey area on the foreshore and have no place there.

Solway Firth

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
	Public access to the coast, particularly for cycling, is too limited. Too much rubbish washed up on to the shoreline.
Policing activity zoning and exclusion zones is difficult in many cases. Increasing ranger/warden presence would help.	

Morecambe Bay

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
	Have management plans between themselves and English Nature. They strictly observe the wildlife act and are very pro-active with conservation.
	Lack of enforcement of bylaws, education usually better than legislation.
Lack of funding from government to LAs. No use having these strategies if there are no funds to implement them. Anything can work on paper, but practicalities are very different.	In future more time must be given to consultation.
Bylaws only prohibit "reckless" navigation.	

Papa Stour

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
	It is a remote area and does not, as far as they know, have the volume of visitors to make management measures as those suggested necessary.
Would be lucky to see any boats except commercial fishing craft.	Instead of using an outlying island it would have been far more effective to have used the ports of Lerwick or Scalloway.

Loch Maddy

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
	Essential current unrestricted access to natural environment. maintained. Pollution from fish farms unpleasant when calm, but important for local economy. Consideration should be given to noisy activities, e.g. Jet skis, aren't problem yet but could be in future.

Sound of Arisaig

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
	In Clyde area are little in way of restrictions on activities. Generally boat users respect environment. and majority refrain from polluting it. Litter overboard is matter of concern, but is large area and marine laws hard to police.

Strangford Lough

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
Only National Trust bylaws are available which have low penalties and are consequently rarely used.	Rec. use in Strangford Lough still seen as a major development asset. Zoning of activities has been identified by conservation bodies as essential to deliver conservation needs of wintering birds in particular. Progress is likely to be slow and difficult.
	Local people are largely aware of value of the environment and treat it with respect. Isn't a heavy influx of summer visitors and no significant strain on environment except sewage outfalls but new sewage plant being built to improve problem.
	Lough substantially used by day boats and diving inflatables/ribs usually launched and recovered the same day.
A lot of work to be done, but a mixture of zones and bylaws likely to be way forward.	
Zones are rarely effective due to complacency of users.	
Bylaws just introduced and minimally sign posted, no patrol or other enforcement system.	Don't know what the mSAC project is.

Llyn Peninsula

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
Lack of local council resources to enforce bylaws (zones being part of the bylaws).	Only significant problem is the continuous noise from personal watercraft and the lack of consideration for other people.
Activity and exclusion zoning should be heavily marked out. No point putting buoys in the sea to mark out a zone without notices saying why they are there.	Anything with a motor should be licensed and may be for a specified area so that zoning and bylaws are handed over with the license. perhaps licensing should include age restrictions and qualifications.
	There are many areas of conflicting interests which could be resolved by local liaison committees e.g. jet skiing - swimmers, surfers and wildlife.
Exclusion zones are rarely effective because they are voluntary and not policed.	
Bylaws are not policed in any form so no one takes any notice and they are not openly displayed so people are generally unaware of them.	
Ignorance of bylaws and exclusion zones, inadequate supervision.	
Bylaws such as speed restrictions are often ignored (power boats and jet skis etc.) and they are rarely enforced as it appears councils have difficulty doing so.	
Buffer zones rarely effective because of difficulties of segregation.	
	Many water sports in area, good practice from harbour master all work together. Vital to local economy. unrestricted access to sports continues. If council allowed to manage area this will happen. Must encourage water sports to help local economy.

Cardigan Bay

COMMENTS ON MANAGEMENT	GENERAL COMMENTS
	We should be able to use the water at all times, like in Europe where everyone can go canoeing all year round. Say up to 16:00 then fishermen can use the water.
No resources to police the bylaws.	Greater collaboration between agencies is required to have any real control of policy.
Buffer zones cause more problems than they solve. Either manage an area properly or not at all.	
Time zones tend to be ignored by long distance visitors. Some people aren't aware of the zones and they are not effectively supervised.	
	We fully support sensible restrictions to pleasure craft in environmentally sensitive areas.
	Area isn't overcrowded at any time during the year. Local community has reasonable influence on good and controlled activities, and environment. not under great pressures from excessive numbers of holiday makers.

APPENDIX 7

Further Reading on Disturbance

Disturbance Related Further Reading

General Useful Overviews

Boyle SA & Samson FB (1983) Nonconsumptive outdoor recreation. An annotated bibliography of human wildlife interactions.

Burton R (1988) Review of the effects of recreation on waterbirds on enclosed water bodies. RSPB Conservation Advice (Ed d Ward)

Hockin D, Ounsted M, Gorman M, Hill D, Keller V & Barker MA (1992) Examination of the effects of disturbance on birds with reference to its importance in ecological assessments. J Environ Manage 36: 253-286

Keller V (1995) Auswirkungen menschlicher storungen auf Vogel – eine literaturubersicht Des Ornithologische Beobachter 92: 3-38 (effects of human disturbance on birds – a literature review)

Publ. Dept Interior, Fish & Wildlife Service, special scientific report – Wildlife, No. 252, Washington DC.

Tuite CH, Hanson PR & Owen M (1984) Some ecological factors affecting winter wildfowl distribution on inland waters in Britain and the influence of water-based recreation. J Appl Ecol 21: 41-62

Power Boats and Jetskis

Bamford AR, Davies SJF & Delft, R van (1990) The effects of model power boats on waterbirds at Herdsman Lake, Perth Western Australia. The Emu 90(4): 260-265

North West Water Authority (1988) Jetskis and funcraft – environmental impact assessment. NW Water, Warrington.

PIANC (1995) Guidelines for the use of certain powered craft such as wakerscooter, personal watercraft, waterbike, jetski, wave runner, seadoo, on controlled waters. Report of working group no 6, suppl. To Bull .No 86

Sailing Boats

Batten LA (1977) Sailing on reservoirs and its effects on waterbirds. Biol Conserv 11: 49-58

Bossert A (1992) Bootsfahraverbotszonen in Naturschutzgebieten (Banning boats in littoral zones on lakes) Orn. Beob 89(4): 225-230

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