

Cardigan Bay Special Area of Conservation Management Plan

This document has been produced jointly by:

Ceredigion County Council, the Countryside Council for Wales, Environment Agency Wales, North Western and North Wales Sea Fisheries Committee, Pembrokeshire Coast National Park Authority, Pembrokeshire County Council, South Wales Sea Fisheries Committee, Trinity House and Dêr Cymru Welsh Water,

with support from the EC LIFE-Nature Programme.



PREFACE

The 1990s 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 European network of Special Areas of Conservation (SACs) being one of the main vehicles to achieving this. Among the habitats and species specified in Annexes I and II of the Directive, several are marine features, and SACs have already been selected for many of these in the UK.

In early 1996, the southern part of Cardigan Bay was one of two sites submitted by the UK Government to the EC as a candidate Special Area of Conservation (cSAC) for its bottlenose dolphins (*Tursiops truncatus*), the other site being the Moray Firth in Scotland. The Cardigan Bay cSAC is one of over 330 cSACs in the UK. Since late 1996, nine organisations with statutory responsibilities for the site have been working together, as a group of 'relevant authorities' (RAs). Their aim, to establish an appropriate scheme of site management.

Recognition of the importance of local community involvement in this process was expressed at an early stage, largely through the establishment of a liaison structure to enable effective communication between a wide variety of sectoral interests and the relevant authority group. The resulting 'liaison groups' have played a major role in developing the site's scheme of management, in particular the development of this management plan.

Whilst this current document focuses on the bottlenose dolphins, there have recently been new additions to the list of features for the Cardigan Bay cSAC as well as an extension to its landward boundary. Furthermore, the Pen Llyn a'r Sarnau cSAC in the north of Cardigan Bay has had bottlenose dolphin added to its list of features – giving a total of three bottlenose dolphin SACs in the UK. New features for the Cardigan Bay cSAC are; 'Reefs', 'Sandbanks which are slightly submerged by sea water all the time', 'Submerged or partially submerged sea caves', 'Grey Seal (*Halichoerus grypus*)', 'River Lamprey (*Lampetra fluviatilis*)' and 'Sea Lamprey (*Petromyzon marinus*)'. Following a period of public consultation these proposed site modifications were transferred by the National Assembly for Wales to the European Commission. It is intended that the future inclusion of any new features within the sites management plan will be addressed as part of the planned review of site management.

A summary of this document forms the basis for a special sixth edition of the Cardigan Bay cSAC newsletter '*Tir a M[^]r*', distributed in 2001.

Copies of this plan can be obtained from:

Mike Camplin, Countryside Council for Wales, Winchway House, Winch Lane, Haverfordwest, SA61 1RP
Tel: 01437-771300. Fax 01437-767672. **e-mail: m.camplin@ccw.gov.uk**

or

Liz Allan, Department of Environmental Services & Housing, Ceredigion County Council, Penmorfa, Aberaeron, SA46 OPA. Tel: 01545-572142 Fax: 01545-572117. **e-mail: liza@ceredigion.gov.uk**

Alternatively, take a look at the Cardigan Bay web site where you can download the document at:

<http://www.ceredigion.gov.uk/cbsac/>

Any comments on the plan should be sent to:

Liz Allan, Department of Environmental Services & Housing, Ceredigion County Council, Penmorfa, Aberaeron, SA46 OPA. Tel: 01545-572142 Fax: 01545-572117. **e-mail: liza@ceredigion.gov.uk**

SUMMARY

The conservation of the bottlenose dolphins of Cardigan Bay is of local, national and international importance. Society has a duty to seek to protect these magnificent animals and their habitat from anything which would undermine their long term survival.

Bottlenose dolphins range widely throughout UK waters and considerably further afield, but Cardigan Bay is one of the very few areas around the UK where significant numbers are known to occur regularly. For this reason, efforts have been made to manage parts of the Bay to conserve the local dolphin population. This began in 1992 with the establishment of the voluntary Ceredigion Marine Heritage Coast, and has led most recently to the Cardigan Bay candidate Special Area of Conservation (cSAC) being identified under the European Habitats and Species Directive (Habitats Directive).

The aim of the Habitats Directive is the maintenance or restoration of habitats and species of European importance at a favourable conservation status. Conservation measures must be established which correspond to the ecological requirements of the habitats and species for which SACs are designated. Appropriate steps must be taken to avoid significant disturbance or deterioration of an SAC's habitats and species.

The Habitats Directive is given effect in Great Britain by legislation commonly referred to as the Habitats Regulations. These Regulations set out in detail the duties and powers of the organisations responsible for implementing the Directive. The key provisions in relation to marine SACs in Wales can be summarised as follows:

- i. a duty on all public and statutory bodies to exercise their functions in accordance with the requirements of the Directive, assisted by advice from the Countryside Council for Wales.
- ii. certain statutory bodies (called relevant authorities) may jointly establish a management scheme under which they may exercise those functions.

This plan arises from these provisions. Whilst it is primarily the responsibility of the relevant authorities, the local community has played a significant role in its development.

The conservation objectives for the site are to maintain, within their natural variation, the distribution and abundance of the cSAC's bottlenose dolphins. Establishing a mechanism to achieve these objectives has required a review of what is known about the dolphins and about human use of the bay, such as oil and gas exploration, sea fisheries, waste disposal and recreational activities. Each factor which may affect the bottlenose dolphins has been carefully considered to determine the type and likelihood of any effect it may have upon the animals and their habitat. Current management of these factors has been examined and, where it was felt appropriate, each relevant authority has proposed new or altered management actions to address perceived or potential impacts on the dolphins. A summary has been compiled of all relevant management arrangements and the organisations responsible.

In most cases there is considerable uncertainty as to whether an activity is, or is not, having an effect on the bottlenose dolphins. Local research is relatively limited and there has been a need for careful extrapolation and interpretation of cetacean research from other locations around the world. Even where an impact is present, showing irrefutable evidence that an activity is or is not adversely affecting the site's bottlenose dolphins is difficult, since it would require more detailed local knowledge than is currently available with existing scientific capabilities and resources. It is essential, therefore, that a precautionary management approach is followed on behalf of the dolphins, to take actions early enough to minimise potentially serious or irreversible harm. Management decisions will need to take into account reasonable predictions of likely effects of human activities on the animals, despite a relative paucity of supporting scientific evidence.

Many potentially significant activities affecting SACs, particularly proposed coastal and offshore developments, are subject to specific requirements for the prior assessment of their impacts. These requirements are additional to the measures set out in this management plan. Also, no existing activity is known, at its current level, to constitute a clear and present danger to the long-term survival of the bottlenose dolphins. This view, the existing management regime, and the impact assessment procedures for many new operations, has resulted in a need for few changes to

Cardigan Bay SAC Management Plan – SUMMARY

current management. However, this position is based on current levels of knowledge. Future research and monitoring may indicate that changes are required.

The development of this plan, whilst enabling communication between the relevant authorities and the local community about the management of the site as a whole, has been a long and complex process. The plan will continue to require significant maintenance since management of the site is an iterative process informed by research, monitoring and surveillance. Records will be kept of monitoring results, progress on identified actions and management effectiveness, with regular review of these and the plan as a whole. The conservation status of the site's bottlenose dolphins and the management of activities is to be reported to the UK government and EC at six yearly intervals.

HOW TO USE THIS DOCUMENT

Box 1.

This document follows a logical and open approach to assessing and describing the Cardigan Bay cSAC's management requirements. The approach taken is sequential, largely along the lines of; “audit”, “plan” and “review”. The content and purpose of each section is given below:

- Section 1. An introduction to the background and legal framework of the Special Area of Conservation (SAC). It aims to provide the reader with a basic understanding of the purpose and underlying management principles of an SAC.
- Section 2. A summary description of the Cardigan Bay cSAC. The summary addresses the environmental and socio-economic conditions and makes reference to further information resources. Its aim is to put the site into context, provide information relevant to management of the site and to highlight areas for which there is a lack of information.
- Section 3. This section describes the value of the site in terms of the bottlenose dolphins, and its potential as an educational and scientific resource. This section aims to tease out further information relevant to developing a scheme of site management.
- Section 4. The conservation objective for the site. An explanation is given of how the objective is defined and how it will be monitored. Aims to provide an understanding of the site's main objective and its development.
- Section 5. Each factor that influences or may influence the bottlenose dolphins is described. The current and potential effects on the bottlenose dolphins are considered alongside existing management and socio-economic requirements to determine the need, or otherwise, to modify existing management or introduce something new. Actions are specified where required. This section aims to provide a logical and transparent explanation for the development of any site management.
- Section 6. A summary of the management actions derived in section 5. The body responsible for the action and a timescale are provided. This section aims to provide a handy summary of how potential or current threats to the bottlenose dolphins will be addressed and who will be responsible.
- Section 7. Site management will require regular review as circumstances in Cardigan Bay change over time. This section explains the mechanism and timetable for such a review process.

CONTENTS

PREFACE	i
SUMMARY	ii
HOW TO USE THIS DOCUMENT	iv
CONTENTS	v
1. INTRODUCTION	1
1.1 The purpose of this management plan	1
1.2 Legal obligations	1
1.3 Policies of the relevant authorities	2
1.4 The Life Project	3
1.4.1 Background	3
1.4.2 Human Activities	3
1.4.3 Dynamics and Sensitivity Characteristics	4
1.4.4 Further Information	4
2. SITE DESCRIPTION	6
2.1 General information	6
2.1.1 Location	6
2.1.2 Site Management	9
2.1.2.1 Marine Management Responsibilities	9
2.1.2.2 Liaison Framework for the cSAC	14
2.1.3 Land and seabed ownership	15
2.1.4 Maps of the site	15
2.1.4.1 Navigation, bathymetry, sea bed substrates and tidal strengths	18
2.1.4.2 Geology & Geomorphology	18
2.1.4.3 Coastline	18
2.1.4.4 Marine Communities	18
2.1.5 Photographic coverage	20
2.1.6 Zones	20
2.2 Environmental Information	21
2.2.1 Physical	21
2.2.1.1 Climate	21
2.2.1.2 Exposure	21
2.2.1.3 Turbidity	21
2.2.1.4 Temperature	22
2.2.1.5 Salinity	24
2.2.1.6 Stratification & Fronts	24
2.2.1.7 Tides	25
2.2.1.8 Sediment transport	25
2.2.1.9 Geology & Geomorphology	25
2.2.1.10 Topography	26
2.2.2 Chemical	26
2.2.3 Biological	27
2.2.3.1 Benthic flora, fauna and communities	27
2.2.3.2 Other significant marine flora, fauna and communities	27
2.2.3.3 The bottlenose dolphins	28
2.3 Human Activities	32

Cardigan Bay SAC Management Plan – CONTENTS

2.3.1	Mining	32
2.3.2	Ports and Harbours	32
2.3.3	Fisheries	33
2.3.3.1	Sea Fisheries	33
2.3.3.2	Migratory Salmonids	33
2.3.3.3	Sea Angling	34
2.3.4	Military	34
2.3.5	Archaeology	35
2.3.6	Leisure	36
2.3.6.1	Tourism	36
2.3.6.2	Recreation	36
2.3.6.3	Education and interpretation	38
2.3.7	Scientific research	39
2.3.8	Management for nature conservation	41
3.	EVALUATION OF THE cSAC	44
3.1	The site in wider perspective and implications for management	44
3.2	Evaluation	45
3.2.1	Evaluation for nature conservation	45
3.2.1.1	Size and Range	45
3.2.1.2	Diversity	46
3.2.1.3	Naturalness	46
3.2.1.4	Rarity	46
3.2.1.5	Fragility	46
3.2.1.6	Typicalness	47
3.2.1.7	Recorded history	47
3.2.1.8	Ecological position	47
3.2.1.9	Potential for improvement or restoration	48
3.3.2	Evaluation of the cSAC for public use, access, education and interpretation	48
3.3.3	Evaluation for research and study	48
4.	CONSERVATION OBJECTIVE, LIMITS & MONITORING	49
4.1	Introduction	49
4.2	Explanation of the structure of the conservation objective	49
4.3	The identification and selection of attributes for the Cardigan Bay bottlenose dolphins	50
4.4	Objective, limits and monitoring	51
4.5	Current condition of the feature	51
4.6	Surveillance of additional attributes	52
4.7	Further work needed	52
5.	FACTORS WHICH INFLUENCE OR MAY INFLUENCE THE BOTTLENOSE DOLPHINS.	54
5.1	Introduction	54
5.1.1	Main Impact Mechanisms	56
5.1.1.1	Disturbance	56
5.1.1.2	Collisions	57
5.1.1.3	Pollution	58
5.1.1.4	Entanglement & Ingestion	58
5.1.1.5	Pathogens	59
5.1.1.6	Prey depletion	60
5.1.1.7	Habitat Impacts	61
5.1.2	Assessing certain types of operation	62

Cardigan Bay SAC Management Plan – CONTENTS

a.	Plans and projects	62
b.	Environmental Impact Assessment	64
5.1.3	Generic management options	65
5.2	Natural factors	68
5.3	Human induced factors	73
5.3.1	Coastal Development & Defence	73
5.3.2	Aggregate Extraction	77
5.3.3	Navigational Dredging (including capital projects)	79
5.3.4	Cables and Pipelines	84
5.3.5	Electricity Generation	87
5.3.5.1	Fossil fuels	87
5.3.5.2	Nuclear	87
5.3.5.3	Alternative (Offshore energy structures)	89
5.3.6	Effluent Disposal	92
5.3.7	Land Runoff	97
5.3.8	Historical Activities	99
5.3.9	Commercial Boat Trip Operators	101
5.3.10	Recreational Activities	104
5.3.10.1	Swimming, snorkelling and diving	104
5.3.10.2	Recreational vessels	105
5.3.11	Commercial filming and photography	110
5.3.12	Research Activities	113
5.3.13	Military Activities	116
5.3.14	Shipping	118
5.3.15	Offshore Oil & Gas	121
5.3.16	Marine Archaeology & Salvage	125
5.3.17	Fishing	127
5.3.18	Littering	135
5.3.19	Non-Native Marine Species	140
5.3.20	Climate Change	143
5.4	Other considerations relevant to management of the cSAC	145
5.4.1	Legislation for marine SACs	145
5.4.2	Public Rights	145
5.4.2.1	Navigation	145
5.4.2.2	Sea Fisheries	145
5.4.2.3	Access to the foreshore	146
5.4.3	Owner/occupier objectives	146
5.4.3.1	Crown Estate Commissioners	146
5.4.3.2	Leases of land within the cSAC made by the Crown Estate Commissioners	146
5.4.3.3	Harbour authorities	146
5.4.4	Environmental Considerations	146
5.4.4.1	Range of the bottlenose dolphin and its prey	146
5.4.4.2	Management and monitoring of the marine environment	147
5.4.4.3	Level of current knowledge	147
5.4.4.4	Lack or awareness and understanding	147
5.4.5	Resources	148
5.4.5.1	The Life Project	148
5.4.5.2	EU Objective 1 Funding	148
6.	SUMMARY LIST OF ACTIONS	150
	Additional Actions	168
7.	RECORDING, REVIEW AND REPORTING	169
7.1	Recording	169

Cardigan Bay SAC Management Plan – CONTENTS

7.2	Review	169
7.2.1	Review of condition of the bottlenose dolphin population against the conservation objectives	170
7.2.2	Review of implementation of management actions	170
7.2.3	Review of the effectiveness of management actions on factors	171
7.2.4	Review of what management is required	171
7.2.5	Review of the conservation objectives	171
7.3	Reporting	171
8.	REFERENCES	173
Appendix 1		177
Extracts from the Conservation (Natural Habitats &c.) Regulations 1994 (SI 1994/2716)		177
Regulation 3: General duties of competent authorities		177
Regulation 5: Identification of relevant authorities for marine areas		178
Regulation 6: Identification of competent authorities		178
Regulation 33: Advice by CCW for European marine sites		178
Regulations 34 and 35: Management schemes for European marine sites		178
Regulations 48 to 53: Consideration of plans and projects		179
Appendix 2		184
Maps		184
Appendix 3.		186
Research and study literature for bottlenose dolphins in Cardigan Bay.		186
Appendix 4		192
Boat users guide.		192
Appendix 5		194
Passenger boat operators code of conduct.		194
Appendix 6.		196
Cardigan Bay marine mammal work in 1998.		196
Cardigan Bay marine mammal work in 1999.		199

.....

TABLES

Table 1.	Features and current status of marine SACs in Wales	7
Table 2.	Visitor numbers for Ceredigion 1990	36
Table 3.	Boat types in the Marine Heritage Coast 1993	37
Table 4.	Proportion of Boat types present during bottlenose dolphin sightings at MHC sites over the summer months, 1994-1997	37
Table 5.	Visitor and Educational Centres in southern Ceredigion	38
Table 6.	Cardigan Bay cSAC conservation objective performance indicators for monitoring favourable condition.	51
Table 7.	Generic Management Options	67
Table 8.	Regulation of marine cables and pipelines	85
Table 9.	Dŵr Cymru Welsh Water Waste Water Treatment Works	92
Table 10.	Dŵr Cymru Welsh Water - Intermittent Discharges	93
Table 11.	Dŵr Cymru Welsh Water SPS Emergency Discharges	95
Table 12.	Closest vessel during dolphin-boat encounters.	106
Table 13.	Analysis of Fishing Activities in Cardigan Bay cSAC	127
Table 14.	Certain Sea Fisheries Committee byelaws applying to certain fishing activities in Cardigan Bay cSAC.	129
Table 15.	Management Options for fishing activities in Cardigan Bay cSAC	131

Cardigan Bay SAC Management Plan – CONTENTS

Table 16.	Fisheries Management Actions	132
Table 17.	Further, Desirable, Fisheries Management Actions	134
Table 18.	Welsh sources of litter recorded in Beachwatch'98	135
Table 19.	Summary of the prohibition on disposal of garbage in the Merchant Shipping Regulations, 1988.	137
Table 20.	Admiralty Charts	184
Table 21.	Kingfisher Charts	184
Table 22.	Kingfisher in use cable awareness charts	184
Table 23.	Yachtsmen's Charts	184
Table 24.	British Geological Survey charts for Cardigan Bay.	185

FIGURES

Figure 1.	Life supported marine SACs around the UK	3
Figure 2.	Cardigan Bay cSAC	6
Figure 3.	Candidate SACs in Wales with marine features	7
Figure 4.	The three UK bottlenose dolphin SACs.	9
Figure 5.	Original structure of the Cardigan Bay cSAC Liaison Framework	14
Figure 6.	Current structure of the Cardigan Bay cSAC Liaison Framework	15
Figure 7.	Indicative bathymetry of Cardigan Bay cSAC from recent acoustic surveys.	16
Figure 8.	Indicative distribution of seabed substrates and community types within Cardigan Bay cSAC.	17
Figure 9.	Intertidal communities around New Quay. From the CCW phase one intertidal survey.	19
Figure 10.	Mean surface sea temperature in winter.	22
Figure 11.	Mean surface sea temperature in summer.	22
Figure 12.	Stratification of the water column in the summer months.	24
Figure 13.	DERA Aberporth range and coastal observation points.	35
Figure 14.	Ceredigion Marine Heritage Coast Area	41
Figure 15.	The distribution of bottlenose dolphin sightings within Cardigan Bay	45
Figure 16.	Attribute Monitoring.	50
Figure 17.	Consideration of development proposals affecting SPAs and SACs.	63
Figure 18.	The distribution of the radionuclide Caesium 137 around the UK in 1973.	88
Figure 19.	Effluent treatment, transfer and disposal sites in and adjacent to Cardigan Bay cSAC	93
Figure 20.	Total boat traffic at study sites in 1994, 1998 and 1999.	107

1. INTRODUCTION

This section provides an introduction to the background and legal framework of the Special Area of Conservation. It aims to provide the reader with a basic understanding of the purpose and underlying management principles of a Special Area of Conservation (SAC).

1.1 The purpose of this management plan

The conservation of the bottlenose dolphins of Cardigan Bay is of local, national and international importance. Society has a duty to seek to protect these magnificent animals and their habitat from anything which would undermine their long term survival.

Bottlenose dolphins range widely throughout UK waters and considerably further afield, but Cardigan Bay is one of the very few areas around the UK where significant numbers are known to occur regularly. For this reason, efforts have been made to manage parts of the Bay as protected areas specifically to conserve the local dolphin population. This began in 1992 with the establishment of the voluntary Ceredigion Marine Heritage Coast, and has led most recently to the Cardigan Bay candidate Special Area of Conservation (cSAC) being identified under the European Habitats and Species Directive¹ (Habitats Directive).

The aim of the Habitats Directive is the maintenance or restoration of habitats and species of European importance to a favourable conservation status². Conservation measures must be established within SACs which correspond to the ecological requirements of the habitats and species for which the sites were designated. Appropriate steps must be taken to avoid disturbance to species and the deterioration of habitats for which the sites have been designated.

The purpose of this management plan is to set out how these obligations will be met in relation to the Cardigan Bay cSAC. To this end, this plan:

- is based upon the current state of knowledge about the bottlenose dolphins and their relationship with their environment;
- is a working document for use by the authorities responsible for managing the cSAC, and others;
- describes a means of *communication* between the authorities with responsibility for preparing it, and the wider constituency of interested parties;
- identifies gaps in knowledge, how they will be addressed and any resource requirements.
- identifies and attributes actions to be taken to conserve the bottlenose dolphins in Cardigan Bay.
- will be kept under review.

1.2 Legal obligations

The Habitats Directive is given effect in Great Britain by legislation commonly referred to as the Habitats Regulations³. These Regulations set out in detail the duties and powers of the organisations

¹ Council Directive 92/43/EEC. The conservation of natural habitats and of wild flora and fauna.

² Favourable conservation status, for both habitats and species, is defined in Article 1(e) of the Habitats Directive. For species, the definition is as follows:

“The conservation status will be taken as favourable when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is it likely to be reduced for the foreseeable future
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.”

³ The Conservation (Natural Habitats, &c.) Regulations 1994. - (Some relevant extracts are given in Appendix 1)

responsible for implementing the Directive. The Regulations are long and complex, and relevant extracts are given in Appendix 1. The key provisions in relation to marine SACs can be summarised as follows:

- i. all public and statutory bodies must have regard to the requirements of the Habitats Directive in exercising all their functions;
- ii. in relation to marine areas, all public and statutory bodies with functions relevant to marine conservation, must exercise them in accordance with the requirements of the Directive;
- iii. certain types of statutory bodies (called “relevant authorities”)⁴ may establish management schemes for marine SACs, under which they shall exercise their functions. (The relevant authorities for the Cardigan Bay cSAC are described on page 9).
- iv. the nature conservation body (CCW in Wales) must advise the other relevant authorities as to the conservation objectives for a site, and any operations which may cause deterioration or disturbance to the habitats or species for which a site is designated. This is a separate duty to the establishment of a management plan, although the plan is to be guided by this advice. CCW’s advice to the other relevant authorities for the Cardigan Bay cSAC is contained in a separate document which can be obtained from CCW.

This management plan arises from (iii) above. It has been prepared by the relevant authorities for the site, in consultation with others. It describes how each relevant authority intends to comply with the requirements of the Habitats Directive in relation to the Cardigan Bay cSAC. It is also intended to act as guidance to others as to the management requirements of the cSAC.

At the time of writing, Cardigan Bay is a candidate SAC. This means that it has been proposed by the UK Government to Europe, but not yet designated. Designation, if the site is accepted, is time-tabled to occur by 2004. This means that the obligations outlined above do not yet apply as matter of law. However, it is the policy of the UK Government and the National Assembly for Wales (NAW) that candidate SACs should be protected as if they were already designated⁵.

1.3 Policies of the relevant authorities

The ultimate responsibility for ensuring compliance with the requirements of the Habitats Directive in Wales, both generally and in relation to individual SACs, lies with the NAW and the UK Government. No single relevant authority can have overall responsibility for the Cardigan Bay cSAC, since none has all the necessary powers. Each relevant authority is individually responsible for complying with its own obligations. However, by jointly preparing, implementing and reviewing this plan, it is anticipated that the relevant authorities will be able to more effectively achieve the aims of the Habitats Directive in relation to this site, than if they each acted alone. This joint approach also enables communication with local people and other interested parties about the plan as a whole.

Conserving the species and habitats of SACs forms only one of the many functions of each of the relevant authorities, all of which exist primarily for other purposes and who act under other legislation. However, all the relevant authorities must of course comply with their obligations. All are committed to the conservation of the bottlenose dolphins of Cardigan Bay and to the successful implementation of this management plan.

The policies and jurisdictions of the Cardigan Bay cSACs relevant authorities are given in section 2.1.2.1 ‘Marine Management responsibilities’.

⁴ Defined in Regulation 5 of the Habitats Regulations (see Appendix 1)

⁵ DETR. 1998. European Marine Sites in England & Wales: A Guide to the Conservation (Natural Habitats &c.) Regulations 1994 and to the preparation and Application of Management Schemes. pbl. HMSO.

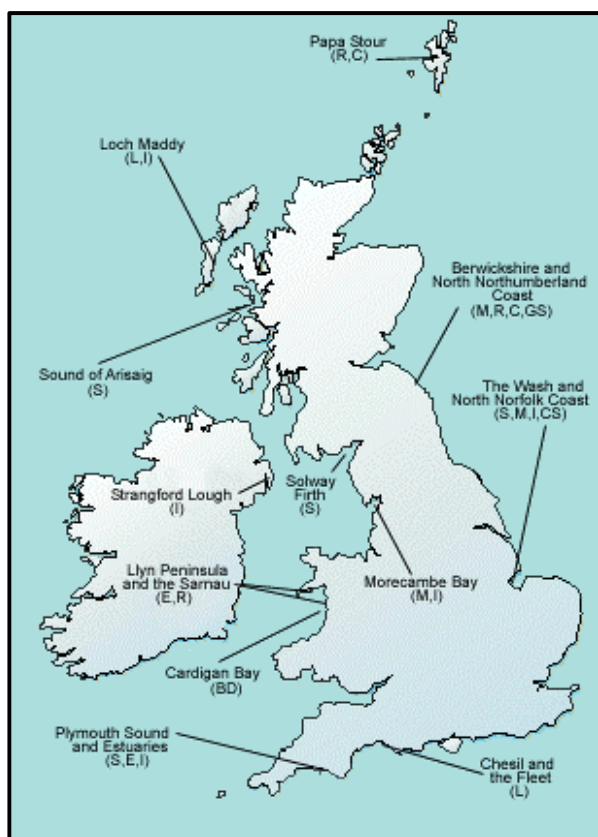
also:

Planning Guidance (Wales): Technical Advice Note (5) Nature Conservation and Planning. HMSO

1.4 The Life Project

1.4.1 Background

To manage specific habitats and species effectively there needs to be clear understanding of their distribution, their 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 for 12 of the candidate marine SAC sites. Cardigan Bay cSAC is one of these 12 sites and has received support for site specific projects supporting the development of the site's management scheme. These include:

- Publications, literature and public events
- Collation of bottlenose dolphin information
- Comparative trials of monitoring methodologies
- Research into potential dolphin prey and PCB pollution

Figure 1. Life supported marine SACs around the UK

Two key generic components of the Life Project have been to:

1. Assess the interactions that can take place between human activities and the Annex I and II interest features,
2. Assess the dynamics and sensitivity characteristics of Annex I and II interest features.

1.4.2 Human Activities

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, (complete),
- recreational user interactions, (complete),
- collecting bait and shoreline animals, (complete),
- water quality in lagoons, (complete),
- water quality in coastal areas, (complete),
- aggregate extraction, (in draft),
- and fisheries (complete).

These seven areas 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 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. They will also provide a valuable resource for industry, user and interest groups who have an important role in advising relevant authorities.

1.4.3 *Dynamics and Sensitivity Characteristics*

A diverse series of sub-features of the Annex 1 marine habitats were identified as requiring a scientific review, based on the following criteria:

- key constituent of several candidate SACs;
- important components of Annex 1 habitats in defining their quality and extent;
- extensive information exists requiring collating and targeting, or there is minimal knowledge needing verification and extended study.

This resulted in the compilation a nine-volume review series, each providing an "Overview of Dynamics and Sensitivity Characteristics for Conservation Management of Marine SACs" for the following sub-features:

Vol 1	<i>Zostera</i> Biotopes
Vol II	Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks
Vol III	Sea Pens and Burrowing Megafauna
Vol IV	Subtidal Brittlestar Beds
Vol V	Maerl
Vol VI	Intertidal Reef Biotopes
Vol VII	Infralittoral Reef Biotopes with Kelp Species
Vol VIII	Circalittoral Faunal Turfs
Vol IX	Biogenic Reefs.

Each report was produced initially by appropriate specialists from the wider scientific community in the respective subject. These reports have been reviewed through an extensive process involving experts from academic and research institutions and the statutory nature conservation bodies.

The results of these reviews are aimed primarily at staff in the statutory nature conservation bodies who are engaged in providing conservation objectives and monitoring advice to the marine SAC management schemes. However these reports will be a valuable resource to other relevant authorities and those involved in the broader network of coastal-marine protected areas. In order to reach out to a wider audience in the UK and Europe, a succinct 'synthesis' document⁶ has been prepared as a complement to the detailed nine-volume series. This document will summarise the main points from the individual reviews and expand on linkages between biotopes, habitats and sites and related conservation initiatives.

1.4.4 *Further Information*

Copies of these and other reports as well as general information about the Life project is available via the internet at: <http://www.english-nature.org.uk/uk-marine/>

or by contacting,

⁶ Jones, L. A., Hiscock, K., & Connor, D. W. 2000. *Marine habitat reviews, a summary of ecological requirements for the conservation and management of marine SACs*. Peterborough, JNCC: (UK Marine SAC Projects Report) ISBN.1857165225.

**The Life Project Team
UK Marine SACs Project
English Nature
Northminster House
Peterborough PE1 1UA**

**Tel (01733) 455233
Fax (01733) 568834
E-mail: tim.hill@english-nature.org.uk**

2. SITE DESCRIPTION

This section provides a summary description of the Cardigan Bay cSAC. The summary addresses the environmental and socio-economic conditions and makes reference to further information resources. Its aim is to put the site into context, provide information relevant to management of the site and to highlight areas for which there is a lack of information.

2.1 General information

2.1.1 Location

The Cardigan Bay cSAC is sited off south Ceredigion and north Pembrokeshire in the southern part of Cardigan Bay. The landward boundary runs along the coast, generally at the mean high water mark, from Aberarth to just south of the Teifi Estuary. The site extends approximately twelve miles offshore, see Figure 2.

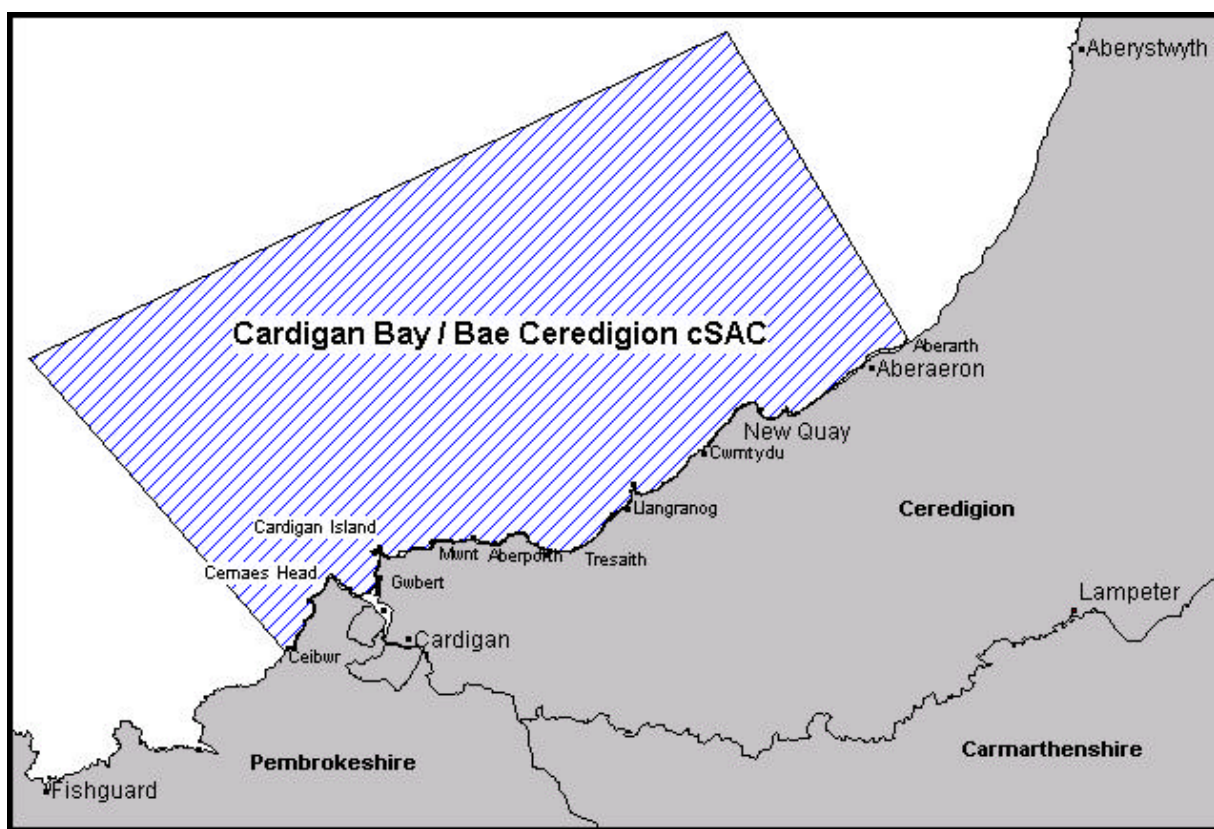


Figure 2. Cardigan Bay cSAC

Of the candidate and possible SACs in Wales, the Cardigan Bay cSAC is one of seven sites selected for marine features. These sites are shown in Figure 3.

Three sites in the UK have been selected as SACs for their bottlenose dolphins, Cardigan Bay and Pen Llyn a'r Sarnau in Wales and the Moray Firth in Scotland. The relative positions of the three sites is shown in Figure 4.

Figure 3. Candidate SACs in Wales with marine features

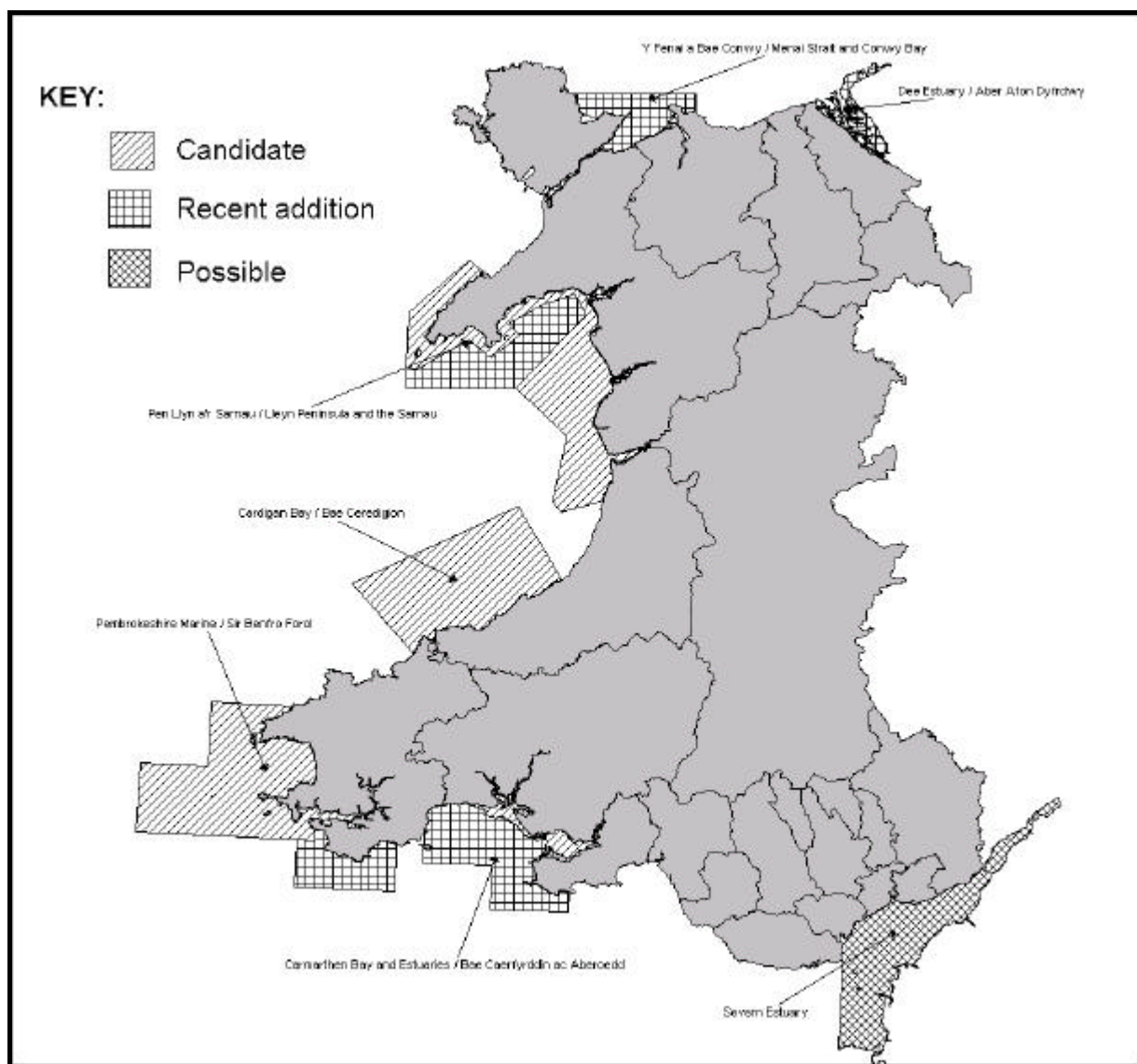


Table 1. Features and current status of marine SACs in Wales

KEY: Candidate sites, names and features in bold, proposed new additions in normal font.

Site	Status	Features
Dee Estuary	Candidate, (recent addition)	Mudflats and sandflats not covered by sea water at low tide, Vegetated sea cliffs of the Atlantic and Baltic coasts, <i>Salicornia</i> and other annuals colonising mud and sand, Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>), Sea lamprey (<i>Petromyzon marinus</i>), River lamprey (<i>Lampetra fluviatilis</i>).
Menai Strait and Conwy Bay	Candidate, (recent addition)	Sandbanks which are slightly covered by sea water all the time, Estuaries, Mudflats and sandflats not covered by sea water at low tide, Large shallow inlets and bays, Reefs, Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>), Submerged or partially submerged sea caves, Sea lamprey (<i>Petromyzon marinus</i>), River lamprey (<i>Lampetra fluviatilis</i>).

Cardigan Bay SAC Management Plan – *SITE DESCRIPTION*

Table 1. Continued...

Site	Status	Features
Pen Llyn ar Sarnau	Candidate	Reefs Estuaries
	Candidate, (recent addition)	Sandbanks which are slightly covered by sea water all the time, Mudflats and sandflats not covered by sea water at low tide, Coastal lagoons, Large shallow inlets and bays, Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>), Submerged or partially submerged sea caves, River lamprey (<i>Lampetra fluviatilis</i>), Bottlenose dolphin (<i>Tursiops truncatus</i>), Otter (<i>Lutra lutra</i>), Grey seal (<i>Halichoerus grypus</i>).
Cardigan Bay	Candidate	Bottlenose dolphin (<i>Tursiops truncatus</i>)
	Candidate, (recent addition)	Sandbanks which are slightly covered by sea water all the time, Reefs, Submerged or partially submerged sea caves, Grey seal (<i>Halichoerus grypus</i>), Sea lamprey (<i>Petromyzon marinus</i>), River lamprey (<i>Lampetra fluviatilis</i>).
Burry Inlet: Estuary and saltmarsh	Candidate, (name now changed)	Estuaries, Atlantic saltmeadows (<i>Glauco-Puccinellietalia maritima</i>), Salicornia and other annuals colonising mud and sand.
Carmarthen Bay and estuaries	Candidate, (recent addition, new name)	Sandbanks which are slightly covered by sea water all the time, Mudflats and sandflats not covered by sea water at low tide, Large shallow inlets and bays, Sea lamprey (<i>Petromyzon marinus</i>), River lamprey (<i>Lampetra fluviatilis</i>), Allis shad (<i>Alosa alosa</i>), Twait shad (<i>Alosa fallax</i>), Otter (<i>Lutra lutra</i>).
Pembrokeshire Islands	Candidate (name now changed)	Reefs, Estuaries, Large shallow inlets and bays, Grey seal (<i>Halichoerus grypus</i>),
Pembrokeshire Marine	Candidate, (recent addition, new name)	Sandbanks which are slightly covered by sea water all the time, Mudflats and sandflats not covered by sea water at low tide, Coastal lagoons, Atlantic saltmeadows (<i>Glauco-Puccinellietalia maritima</i>), Submerged or partially submerged sea caves, Sea lamprey (<i>Petromyzon marinus</i>), River lamprey (<i>Lampetra fluviatilis</i>), Allis shad (<i>Alosa alosa</i>), Twait shad (<i>Alosa fallax</i>), Otter (<i>Lutra lutra</i>).
Severn Estuary	Possible	Estuaries, Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>), Sandbanks which are slightly covered by sea water all the time, Mudflats and sandflats not covered by sea water at low tide.
	Possible (recent)	Reefs, Allis shad (<i>Alosa alosa</i>), Twait shad (<i>Alosa fallax</i>), Sea lamprey (<i>Petromyzon marinus</i>), River lamprey (<i>Lampetra fluviatilis</i>).

2.1.2 *Site Management*

2.1.2.1 Marine Management Responsibilities

a. The Relevant Authorities

The regulation and management of sea areas within UK Territorial waters takes place under a complex system of legislation and policies operated by a range of statutory bodies with different and sometimes overlapping jurisdictions. The legislation providing for the designation and management of SACs reflects this, by vesting the responsibility for SAC management jointly in a large number of statutory bodies, termed competent authorities⁷. Each competent authority is required to exercise those of its functions which are relevant to the management of SACs in a way which secures compliance with the requirements of the Directive. Thus, no single statutory body has overall responsibility to achieve the appropriate management of SACs, rather each competent authority must contribute to that process in accordance with its statutory remit.

Rather than by creating significant new powers for competent authorities, the Habitats Regulations provide for the management of marine SACs largely by placing additional responsibilities on competent authorities in the exercise of their existing functions.

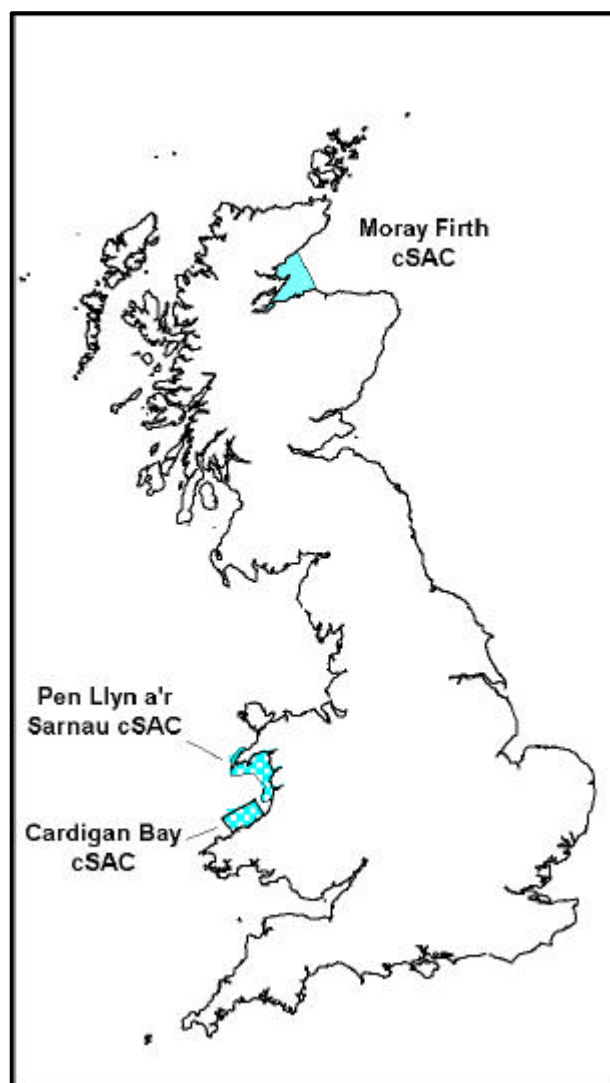
Figure 4. The three UK bottlenose dolphin SACs.

The Habitats Regulations enable certain competent authorities, termed relevant authorities to establish a management scheme under which they shall exercise their functions⁸. This management plan is intended to fulfil that provision.

In addition to the statutory provisions, it is government policy that the management of the site takes into account public and community interests, through involving such interests in the development and implementation of the management plan.

The development of this management plan is therefore the joint responsibility of the site's relevant authorities, which are the following bodies:

- Ceredigion County Council (CCC)
- Countryside Council for Wales (CCW)
- Environment Agency Wales (EAW)
- North Western and North Wales Sea Fisheries Committee (NW&NWSFC)
- Pembrokeshire Coast National Park Authority (PCNPA)



⁷ Defined in Regulation 6 of the Habitats Regulations (see Appendix 1)

⁸ Defined in Regulation 34 & 35 of the Habitats Regulations (see Appendix 1)

- Pembrokeshire County Council (PCC)
- South Wales Sea Fisheries Committee (SWSFC)
- Trinity House (TH)
- Dŵr Cymru Welsh Water (DCWW)

b. Relevant Authority duties and powers

Ceredigion County Council

The County Council is a multi-purpose authority with responsibilities covering the environment, transport, education, social services, housing and economic development. The following duties, responsibilities and activities are of particular relevance to the SAC:

- Lead Authority for establishing a management scheme for the Cardigan Bay SAC
- Town and Country Planning (Development Plan and Development Control)
- Coastal Defence
- Economic development and tourism
- Coastal management (Marine Heritage Coast, interpretation, etc.)
- Beach management
- Harbour authority
- Emergency Planning
- Water quality monitoring
- Countryside access
- Foreshore lease holder

Countryside Council for Wales

The Countryside Council for Wales is the Government's statutory advisor on sustaining natural beauty, wildlife and the opportunity for outdoor enjoyment in Wales and its inshore waters. The national wildlife conservation authority. CCW:

- give advice to Government, local authorities and others to help them make well-informed decisions on matters which affect the environment;
- maintain the natural beauty of the land and coast by encouraging appropriate efforts of landowners and land managers;
- ensure and enhance the survival of species and their habitats, and protect geological features, on National Nature Reserves and Sites of Special Scientific Interest, and, wherever possible, beyond such designated areas;
- monitor change in habitats and species and in the landscape;
- promote access to the countryside for enjoyment whilst respecting the landscape, wildlife, work patterns and rural traditions;
- help those who work in the countryside to strike a balance between sustaining country products, such as timber and food, with maintaining landscape character and wildlife;
- ensure that all forms of recreation in the countryside are in harmony with the needs of wildlife and appropriate land management;

- increase people's understanding and appreciation of the countryside, its wildlife and habitats;
- persuade everybody in Wales to join CCW, in various ways, as a partner in our aims;
- seek effective policies and other means of protecting the countryside, its habitats and wildlife;
- provide information on all our work.

Environment Agency Wales

The Environment Agency covers the whole of England and Wales, comprising the Environment Agency Wales and seven Regions in England. It has a wide range of duties and powers relating to different aspects of environmental management, and is required and guided by Government to use these duties and powers in order to help achieve the objective of sustainable development.

Although it only has duties and powers to protect some environmental resources, it needs to contribute to other aspects of environmental management, even if these are the responsibility of others. The Agency's vision is "a better environment in England and Wales for present and future generations".

As the principal regulator of pollution and water management, the Agency has a key role to play in ensuring that operations it authorises, and activities it undertakes, do not have an adverse effect on Natura 2000 sites. The Agency has statutory duties under the Habitats Directive to review all existing permissions (including consents and authorisations) which might be affecting European sites. The Agency will be assessing the likely significance of any permissions that potentially affect the Cardigan Bay cSAC.

North Western and North Wales Sea Fisheries Committee

The NW&NWSFC is a statutory body constituted under the Sea Fisheries Regulation Act 1966 to regulate, protect and develop fisheries for shellfish and to regulate the fishing for or taking of seafish. Since 1992 Sea Fishery Committees (SFCs) have also been under a duty to have a regard for the conservation of the wider marine environment, in addition to more specific responsibilities recently introduced arising from the EU Habitats and Birds Directives.

The jurisdiction of the NW&NWSFC is currently between Cardigan in Ceredigion and Millom in Cumbria, and to the 6 nautical mile offshore fishery limit.

Pembrokeshire Coast National Park Authority

The Pembrokeshire Coast National Park Authority is a single purpose authority set up in 1996, as part of local government re-organisation in Wales.

The Environment Act 1992 sets out two purposes for National Parks in England and Wales:-

1. Conservation: "to conserve and enhance the natural beauty, wildlife and cultural heritage of National Parks";
2. Education and recreation: "to promote opportunities for the understanding and enjoyment of the special qualities (of the Parks) by the public".

National Parks are also required to "seek to foster the economic and social well-being" of local communities within the National Parks.

The National Park Authority (NPA) has a number of statutory functions and responsibilities. It is the sole local planning authority for the area within its boundaries. Land use policies which guide development in the National Park are currently set out in the Dyfed Structure Plan and the NPA's Local Plan. The Local Plan also includes a specific policy on cSACs in the Park. Both plans will, in due course, be superseded by a joint Unitary Development Plan which is being prepared jointly with Pembrokeshire County Council, to cover the whole of Pembrokeshire, and not just the National Park. The NPA is also required to set out its management policies for the National Park in a National Park Management Plan (in preparation), which will also contain strategic objectives and targets for

management of the National Park.

The NPA holds a regulating lease of the foreshore between Ceibwr and Poppit Sands, at the southern end of the cSAC, over which it has byelaw making powers. The NPA also promotes "best practice" by water-based recreational users via voluntary codes of conduct and liaison with groups such as Harbour Users associations within the National Park. The Pembrokeshire Outdoor Charter Group (facilitated by the National Park) is a principal mechanism for the development of best practice and dissemination of information amongst outdoor centres, many of which regularly use the marine environment adjoining the National Park coastline.

Pembrokeshire County Council

The County Council is a multi-purpose authority with responsibilities covering the environment, transport, education, social services, housing and economic development. The following duties and activities are of particular relevance to the SAC:

- Town and Country Planning (Development Plan and Development Control)
- Coastal Defence
- Economic development and tourism
- Coastal management
- Beach management
- Emergency Planning
- Water quality monitoring

South Wales Sea Fisheries Committee

The SWSFC is a statutory body constituted under the Sea Fisheries Regulation Act 1966 to regulate, protect and develop fisheries for shellfish and to regulate the fishing for or taking of seafish. Since 1992 SFCs have also been under a duty to have a regard for the conservation of the wider marine environment, in addition to more specific responsibilities recently introduced arising from the EU Habitats and Birds Directives.

The jurisdiction of the SWSFC is currently between Cardiff and Cardigan, and to the 6 nautical mile offshore fishery limit which arising from outlying islands means up to 22 miles offshore in some areas. Various reviews are in progress which may result in changes in both lateral and seaward extent.

Dŵr Cymru Welsh Water

Dŵr Cymru Welsh Water is appointed by the Secretary of State for Wales to be the water and sewerage undertaker for Wales under the Water Industry Act 1991.

As such, the Company is entrusted with supplying its customers with clean, wholesome drinking water and disposing of their sewage waste, whilst furthering conservation in all of its activities.

Whilst the Company has no water supply interest within the boundaries of the cSAC, it does have a number of sewage outfalls which dispose of effluent, directly or indirectly to the marine boundary of the site⁹.

DCWW is committed to undertaking all its work in such a way as to protect the environment and with respect to sewage disposal is pledged to the eventual provision of full treatment and disinfection at all of its works which discharge to sea or estuary, including those to be found within the Cardigan Bay SAC.

Trinity House Lighthouse Service

⁹ See Figure 17 on page 93.

Cardigan Bay SAC Management Plan – *SITE DESCRIPTION*

Trinity House Lighthouse Service is the General Lighthouse Authority for England, Wales, the Channel Islands and Gibraltar. It provides aids to general navigation around the coasts of its areas of responsibility: lighthouses, light vessels, buoys, beacons and radio-navigation systems.

c. Competent Authority Duties and Powers

There are many competent authorities. The most important ones in terms of this site are the Ministry of Agriculture Fisheries and Food (MAFF), the Defence, Evaluation and Research Agency (DERA) and the Ministry of Defence (MoD).

The Ministry of Defence lost its crown immunity in 1998, which means that it is now required by law to comply with relevant legislation in all areas of environmental management and protection.

A description and history of DERA's activities is given on page 34.

MAFF are responsible for issuing consents for a variety of marine plans or projects under a variety of legislation such as the Food and Environment Protection Act 1985. MAFF also provide advice to government on fisheries issues.

2.1.2.2 Liaison Framework for the cSAC

To encompass and incorporate views, suggestions and concerns of the wider public and especially members of the local community, a series of sectoral interest or 'Topic Groups' were established in 1997. These groups and the mechanism by which they interfaced with the relevant authority group is shown in Figure 5.

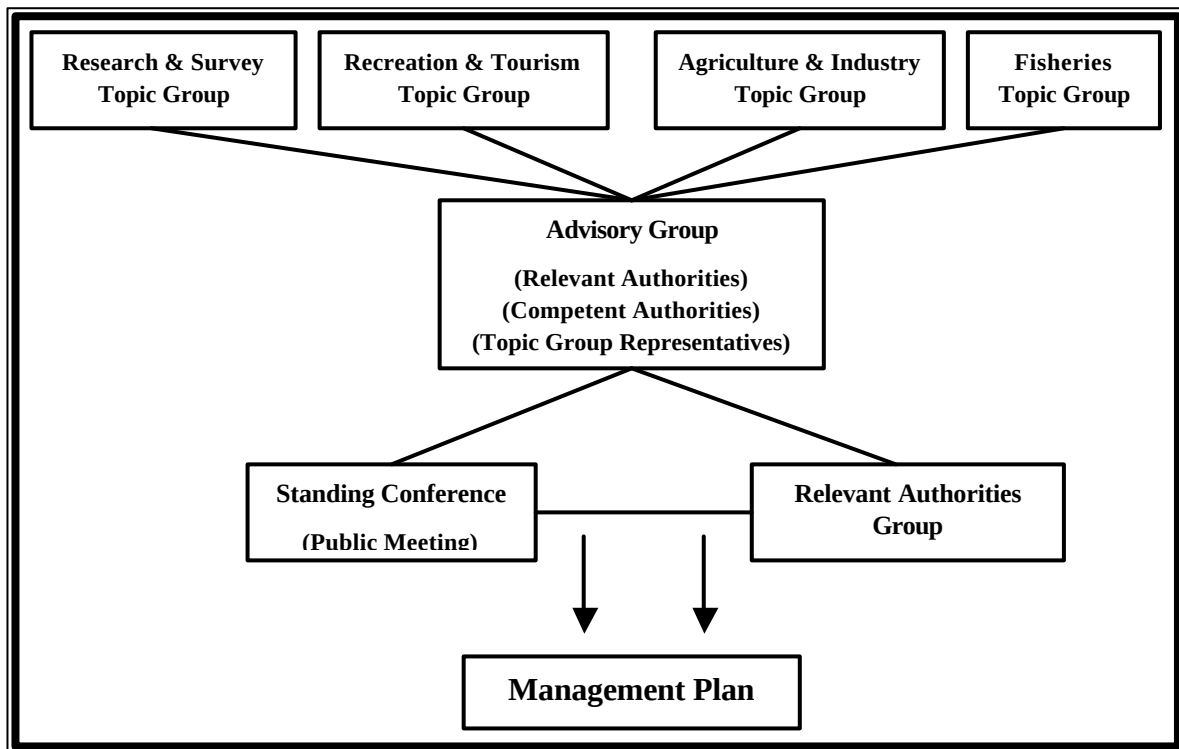


Figure 5. Original structure of the Cardigan Bay cSAC Liaison Framework

Each topic group contained a representative from a relevant authority to assist in the administration of the group, to clarify cSAC requirements, and to provide up to date information and feedback from the relevant authority group. Representatives from each topic group meet at intervals with the relevant authorities group, some relevant authority 'members' and several competent authorities in a forum called the advisory group. This was the main interface for the exchange of information between all interested parties.

Topic groups have made a significant contribution to several areas of the management plan's development, including a review of current knowledge, development of the site's conservation objective and input into the structure and content of the management plan document from an early stage.

A review of the liaison framework took place in the summer of 2000, and this resulted in the formation of a new liaison structure so as to better represent the level and type of liaison interest now shown. This has resulted in the replacement of Topic Groups and Advisory Group by a single 'Liaison Forum'. Membership of this forum is open to anyone wishing to participate in the sites development and maintenance.

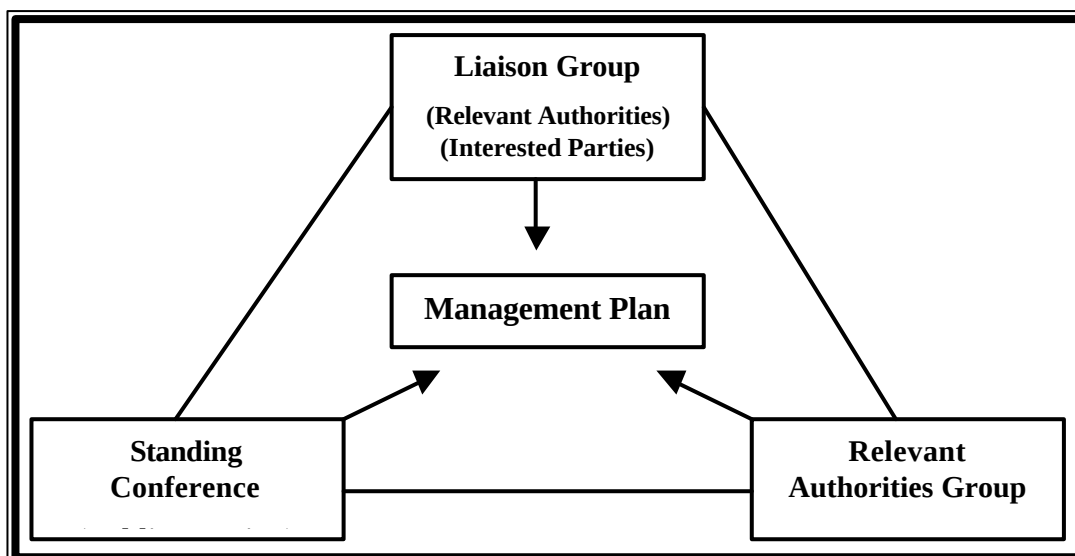


Figure 6. Current structure of the Cardigan Bay cSAC Liaison Framework

To ensure a wide representation of views, beyond those of the topic group members, an annual standing conference was initiated in 1997. This continues to provide an opportunity for review of the year's progress and for individuals to provide or receive information and ideas.

2.1.3 *Land and seabed ownership*

As with most of British inshore waters, the sea bed within the Cardigan Bay cSAC is owned by the Crown and is managed on their behalf by the Crown Estate Commissioners (CEC). Small parts of the site are leased by the CEC to third parties such as the local authorities (CCC, PCC, PCNPA). These areas are used, for example, for the placing of boat moorings, and specific conditions are applied to their use. For example, the foreshore (between Mean Low Water and Mean High Water) within the National Park is leased to PCNPA.

2.1.4 *Maps of the site*

A series of biogeographic maps exist for the area covered by the Cardigan Bay cSAC. Map types and potential sources are given below or in Appendix 2.

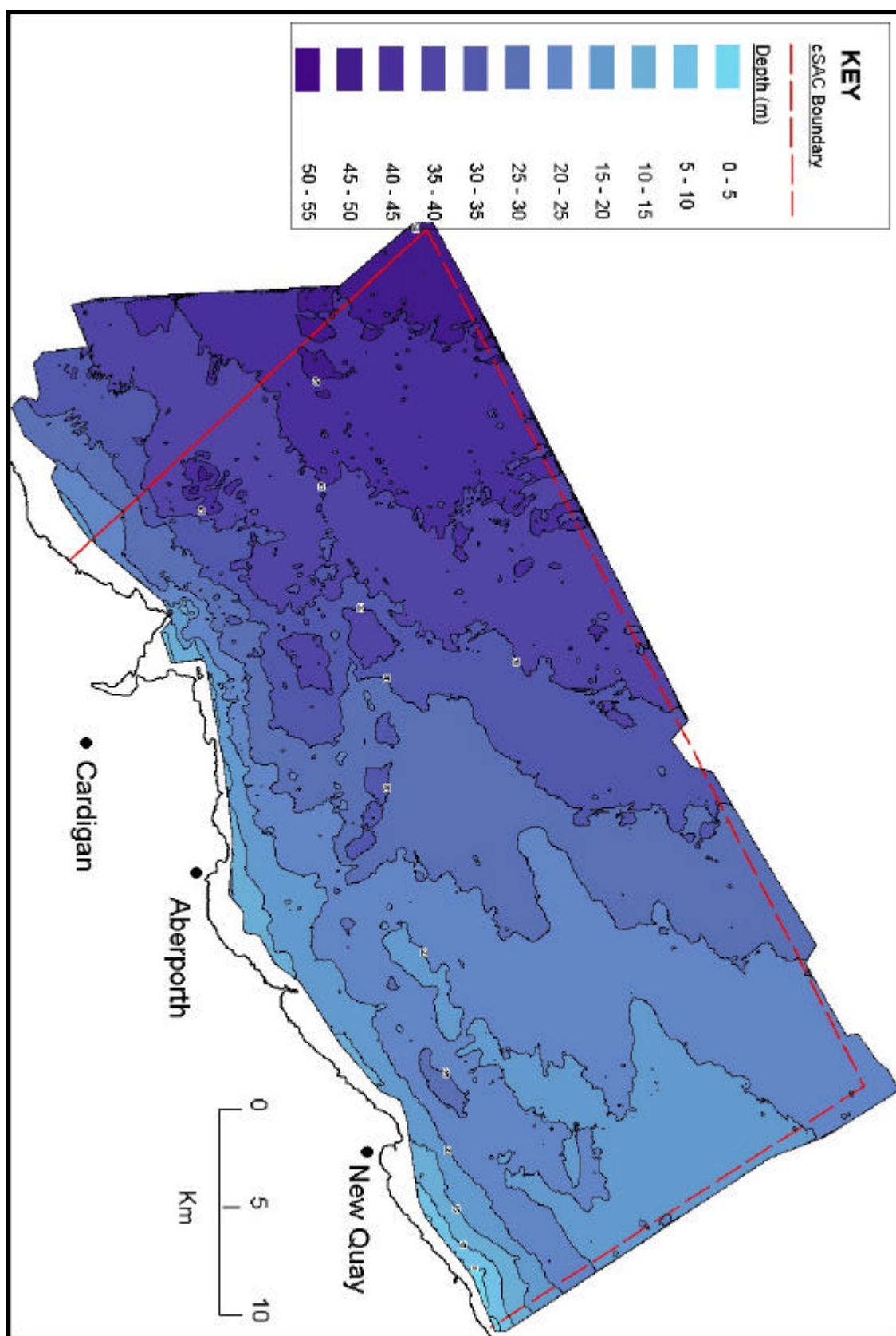


Figure 7. Indicative bathymetry of Cardigan Bay cSAC from recent acoustic surveys.

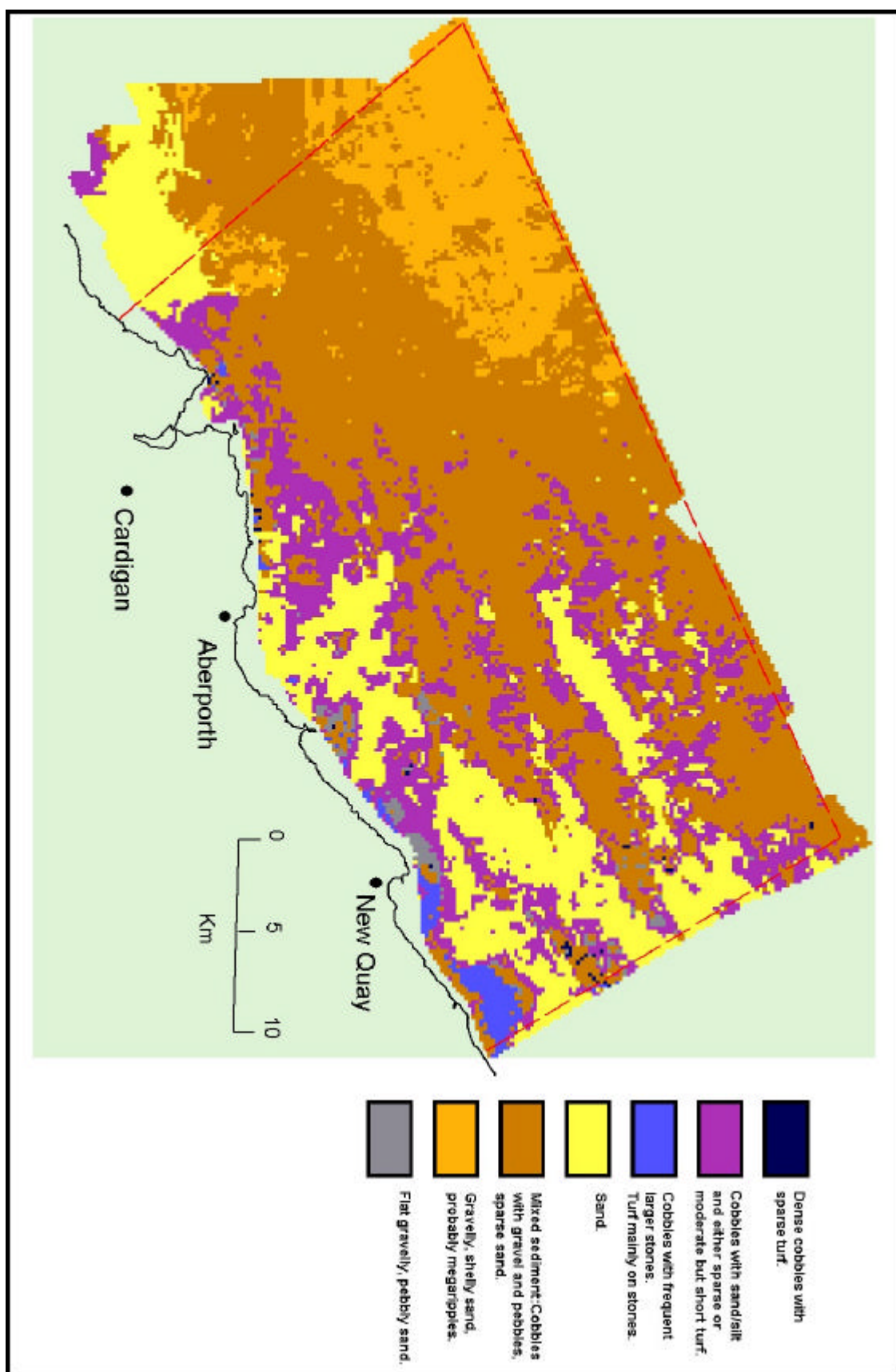


Figure 8. Indicative distribution of seabed substrates and community types within Cardigan Bay cSAC.

2.1.4.1 Navigation, bathymetry, sea bed substrates and tidal strengths

Marine charts provide a variety of information, from bathymetry¹⁰ to seabed substrata and obstructions. Several different types of marine charts cover Cardigan Bay. A list of relevant ones available from by the Hydrographic Office is given in Appendix 2.

Recent broad scale acoustic discrimination system surveys of Cardigan Bay have provided information for the development of bathymetric maps and the distribution of seabed substrates. These are held on GIS¹¹. Examples of these are given in Figure 7. and Figure 8. below.

2.1.4.2 Geology & Geomorphology

The British Geological Survey provide a series of charts of bedrock, quaternary and seabed sediments for Cardigan Bay. A list of relevant charts is given in Appendix 2.

2.1.4.3 Coastline

The Ordnance Survey provide a series of maps at a variety of scales covering the coastline and land mass adjacent to Cardigan Bay. The most commonly used scales are:

Ordnance Survey 1:50,000 scale Land Ranger Series maps, colour

Ordnance Survey 1:25,000 scale Path Finder/Outdoor Leisure Series maps, colour

Ordnance Survey 1:10,000 scale maps, black and white

Ordnance Survey 1:2,500 Landline maps

2.1.4.4 Marine Communities

Sublittoral

Broadscale maps (and descriptions) of Cardigan Bay's underwater marine communities are shown in the Marine Nature Conservation Review area summary¹² and Great Britain overview of benthic marine ecosystems¹³. Recent broad scale acoustic discrimination system surveys of Cardigan Bay have developed maps of the distribution of seabed communities. These are held on GIS. An example is given in Figure 7 above.

Intertidal zone

A large proportion of the Welsh coast has been surveyed and mapped by the Countryside Council for Wales Phase 1 Intertidal Survey, and the intertidal area adjacent to the cSAC boundary is included within the area surveyed. This ongoing survey has resulted in the production of marine biotope¹⁴ maps of the intertidal. These are held on GIS. An example showing New Quay bay is given in Figure 8.

¹⁰ Bathymetry: Depth of water below the level of lowest astronomical tide.

¹¹ Geographical Information System

¹² Brazier, D.P., Holt, R.H.TF., Murray, E., & Nichols, D.M. 1999. *Marine Nature Conservation Review Sector 10. Cardigan Bay and North Wales: area summaries*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).

¹³ Hiscock, K., ed. 1998. *Marine Nature Conservation Review. Benthic marine ecosystems of Great Britain and the north-east Atlantic*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).

¹⁴ **Biotope**: The *habitat* (i.e. the environment's physical and chemical characteristics) together with its recurring associated *community* of species, operating together at a particular scale.

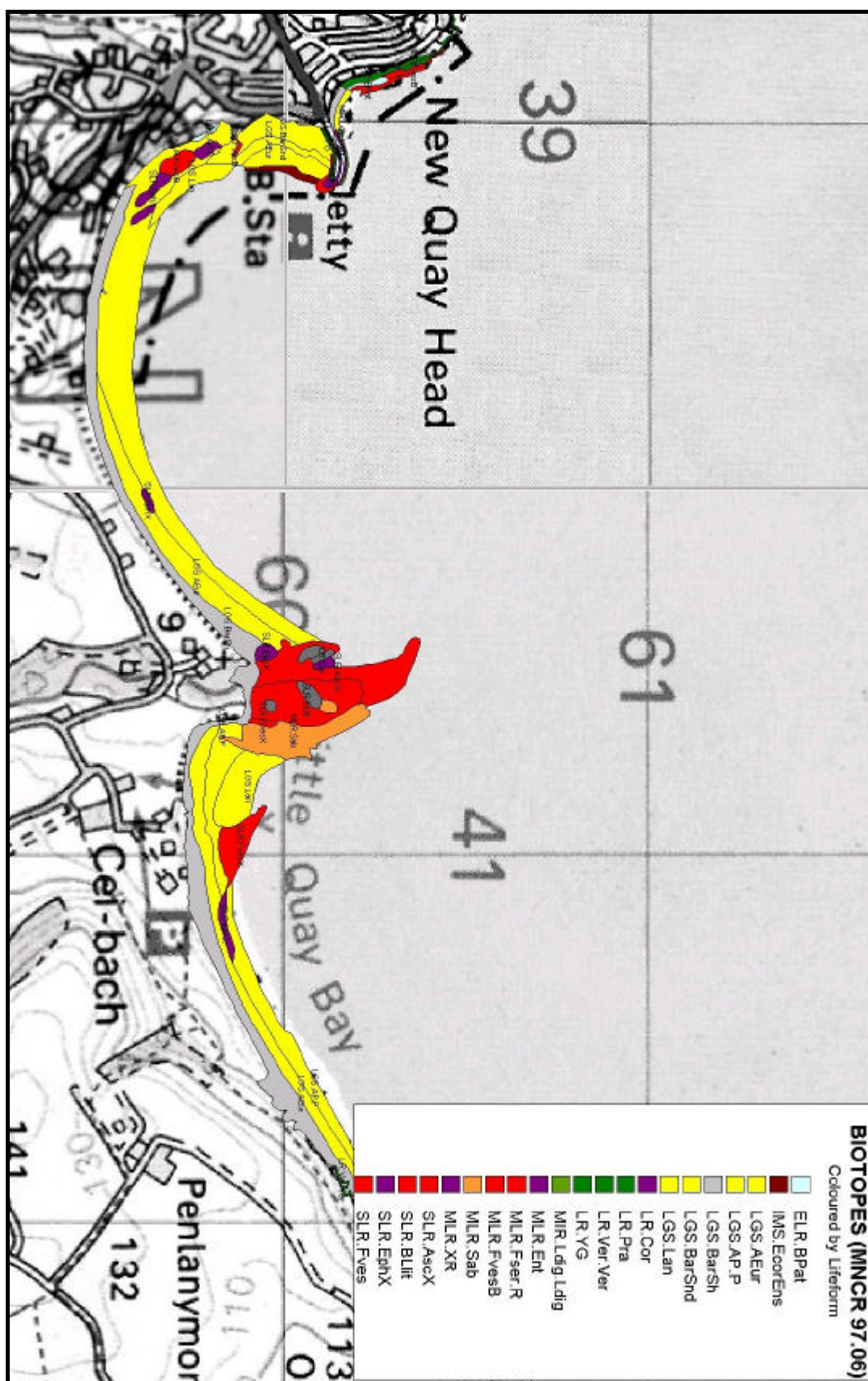


Figure 9. Intertidal communities around New Quay. From the CCW phase one intertidal survey.

Reproduced with the permission of the controller of HMSO © crown copyright.

2.1.5 *Photographic coverage*

Little of the Cardigan Bay sea area has been formally photographed other than by satellite passes. Most formal photographic coverage of Cardigan Bay has been of satellite or aerial images of the coastline. In the late 1990's CCW commissioned aerial photographs of the Cardigan Bay cSAC coastline for their Phase 1 Intertidal Survey. These were taken at low water spring tide.

Aerial photographs of the county, including coastal areas, have been taken regularly since the 1940's. There is a directory of UK aerial photograph collections¹⁵ and aerial photographs are available from *The Control Registry for Photography* in Cardiff.

There is a poor photographic record of the Cardigan Bay seabed and its marine communities, though some photographs and video footage have been taken as a result of the few marine biological surveys conducted in the area. Many additional photographs may have been taken by recreational divers.

Old photographs of the coast do exist (though no collections have been located) and these can provide an impression of the level and types of coastal activity that used to occur within the site.

Photographs of the bottlenose dolphins have been taken during recent photographic identification surveys as well as opportunistically by local community members and visiting tourists.

2.1.6 *Zones*

Many activities in Cardigan Bay are zoned. These include certain recreational, military and fishery activities. There are also 'zones of influence' for each of the Bay's relevant authorities, areas over which they have jurisdiction.

Cardigan Bay does not easily fall into readily identifiable physical or biological zones as the fluid nature of the marine environment blurs lines of demarcation between physical and chemical processes. However, there are likely to be key habitats or areas of particular importance to the bottlenose dolphins and it may be possible eventually to use this information to better compartmentalise the site as an aid to management. These zones may be based not only on dolphin preferences but also on physiographic features such as depth, substrate and currents, and/or maritime activities. One aim of such zoning would be to reduce detrimental impacts on the bottlenose dolphins through, for example, reducing the occurrence of disturbing activities in important dolphin areas whilst allowing disturbing activities to continue in non sensitive areas.

Whilst it is currently possible to tentatively identify some such areas, considerable further research is required to enable any definitive zoning of the site. This knowledge shortfall is currently being addressed, in part, by research projects supported by CCW and the EU Life programme, for example:

- Broad scale acoustic discrimination system surveys have mapped the bathymetry and distribution of seabed communities within the Cardigan Bay cSAC;
- A project to sample benthic fish within the cSAC will improve our knowledge of the variety, distribution and abundance of potential seabed prey (in winter) of the bottlenose dolphins;
- Comparative trials of monitoring methodologies is providing further information on dolphin distribution.

¹⁵ Directory of aerial photographic collections in the United Kingdom. 1999. NAPLIB. ISBN 0953043614

2.2 Environmental Information

Information in this section applies to Cardigan Bay as a whole except where specific reference is drawn to the cSAC.

2.2.1 *Physical*

This section provides a very brief summary of physical information for Cardigan Bay. A more comprehensive review of the environment of Cardigan Bay can be found in Nicholls *et al* (1992)¹⁶. The following sections draw largely from this report.

2.2.1.1 Climate

Cardigan Bay is just within the boreal biogeographic region¹⁷ and has a temperate climate. Warmer lusitanian waters extend north as far as the Celtic deep. The climate shows strong seasonality for several environmental parameters such as temperature, rainfall, water turbidity and wind strength.

2.2.1.2 Exposure

Cardigan Bay is one of the largest bays in the British Isles, measuring over 100km (60 miles) across its westernmost extent from the Llyn Peninsula to St. David's Head. The bay has a mainly open coastline, exposed to the prevailing south-westerly and westerly winds. South-westerly gales generally occur from October through to March. As the Irish Sea is relatively sheltered, the majority of waves reaching the Cardigan Bay coast are locally generated, of fairly short period and therefore steep. A substantial swell also develops during prolonged periods of high winds. During the winter months when gales are common, the wave height exceeds 1m for about half the time, compared to about a quarter of the time during the summer months. Depending on the wind direction, small embayments within the SAC may provide some shelter during stormy conditions in the areas of New Quay, Ynys Lochdyn, Aberporth, Mwnt and in the Teifi estuary.

2.2.1.3 Turbidity

Parts of the Irish Sea have a marked seasonal variation in turbidity and this is particularly true in Cardigan Bay. This is, in part, due to the shallow nature of the Bay, but largely due to the seasonality of wind strength and rainfall.

During the summer months, suspended sediments settle out in the relatively calm bay, reducing turbidity. During the winter when high winds increase bottom sediments are mixed throughout the water column and produce turbid surface waters. Turbidity of inshore waters is strongly affected by outflow from the rivers. Within the SAC, the turbidity round the Aeron, Ina, and Teifi rivers, as well as smaller outflows, increases markedly when the rivers are in spate. Sediments from the Gwaun and Nevern Rivers adjacent to the southern boundary of the site are also carried into the SAC by tidal currents, and together these turbid waters often form darker coloured bands that spread out from the estuaries and follow the line of the coast.

¹⁶ Nichols, C., Havard, M. and Warren, L.M. 1992. *An evaluation of the use and efficacy of statutory and non-statutory designations for the conservation of Cardigan Bay*. Report for The Countryside Council for Wales, University of Wales, Cardiff.

¹⁷ The north east Atlantic can be divided into several distinct biogeographical areas. Boreal waters (cold temperate) extend down the Irish sea whilst lusitanian waters (warm temperate) spread up the east Atlantic coast from the Mediterranean.

2.2.1.4 Temperature

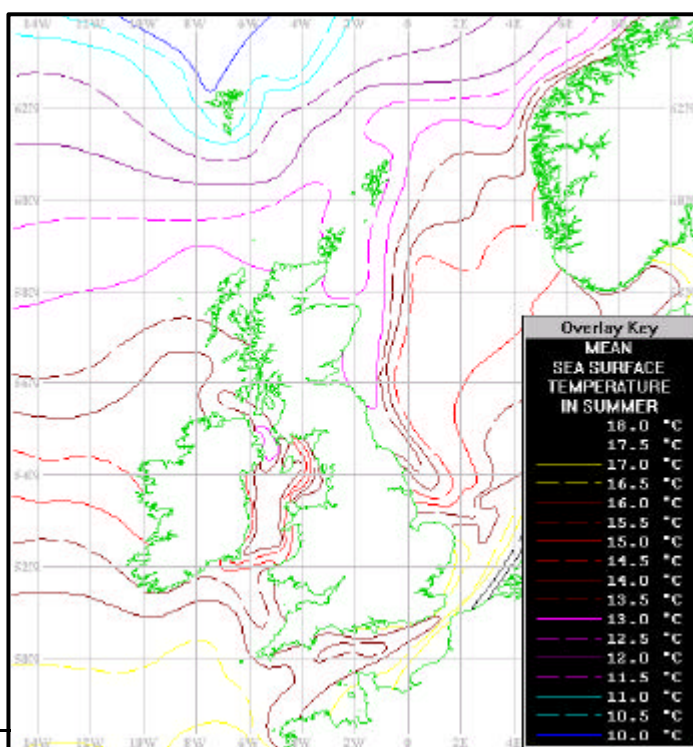
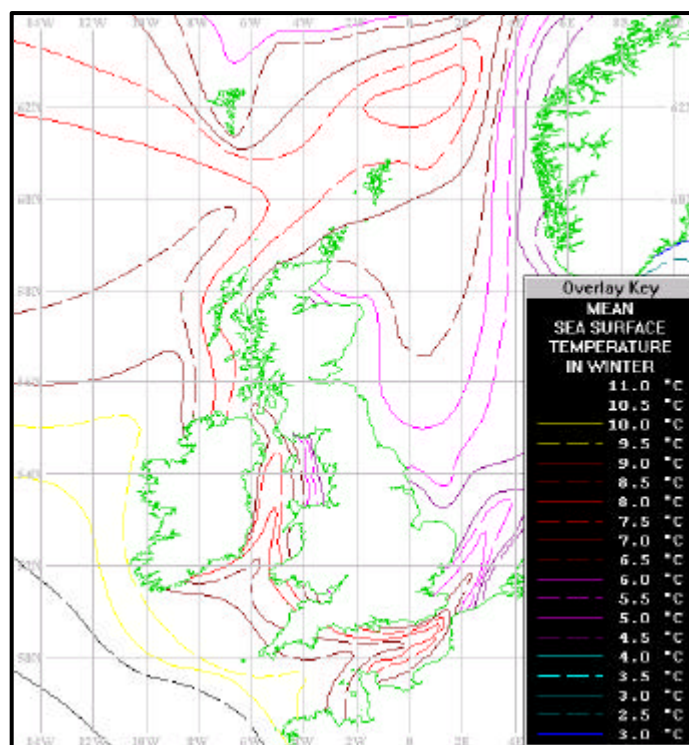
The mean annual sea temperature in St. George's Channel is just over 11°C with little variation¹⁸, although shallow coastal areas are subject to larger fluctuations. The mean surface temperature at the mouth of the Bay in August is 15°C. Within Cardigan Bay, there are fairly large fluctuations in water temperature, influenced by proximity to land, as well as in response to seasonal changes, and the shallowness of the bay itself.

Figure 10. Mean surface sea temperature in winter.

Reproduced from the UK digital marine atlas courtesy of CEFAS

Local water temperatures are affected by the substantial input of fresh water into Cardigan Bay, and this also affects the Bay's salinity and water quality, particularly locally. Seasonal stratification occurs in the shallower waters of

Cardigan Bay, due to weak tidal currents, with warmer, fresher water lying above colder, more saline



water. Surface temperatures of coastal waters are lowest in February (5°C in the inner part of Cardigan Bay to 7.5°C in the outer part), and warmest in July/August when they may reach 20°C inshore and about 14-16°C offshore¹⁹.

Average sea bed temperatures are only slightly lower than those of the surface waters in winter, but the difference in summer is greater with temperatures up to 2°C lower at depth²⁰.

Figure 11. Mean surface sea temperature in summer.

Reproduced from the UK digital marine atlas courtesy of CEFAS

¹⁸ Smith, J., Yonow, N. and Elliott, R. 1995. *The coast of Dyfed and South Glamorgan: an Environmental Appraisal*. Field Studies Council, Shrewsbury. ISBN 1 851532 994

¹⁹ Nichols *et al* (1992).

²⁰ Smith *et al* (1995)

2.2.1.5 Salinity

Within the Irish Sea the annual mean salinity is characterised by a decrease from south to north and from the centre of the channel to the sides. Salinity within Cardigan Bay is influenced not only by incoming Atlantic water, but also by freshwater input from rainfall, run-off from rivers and estuaries within the bay as well as the Severn, and the effects of evaporation, currents and mixing. Surface salinities within the Bay in summer are generally less than 34 parts per thousand, decreasing towards the shore. Mean salinity in the outer parts of the Bay ranges from <34.5ppt in August to <34.6ppt in February, while in the inner waters, average salinity ranges from <34.2ppt in August dropping to about <33.3 in February²¹. During the summer months when the inshore waters of Cardigan Bay are stratified, salinity also varies with depth with fresher water overlying more saline water, particularly near the mouths of rivers and estuaries.

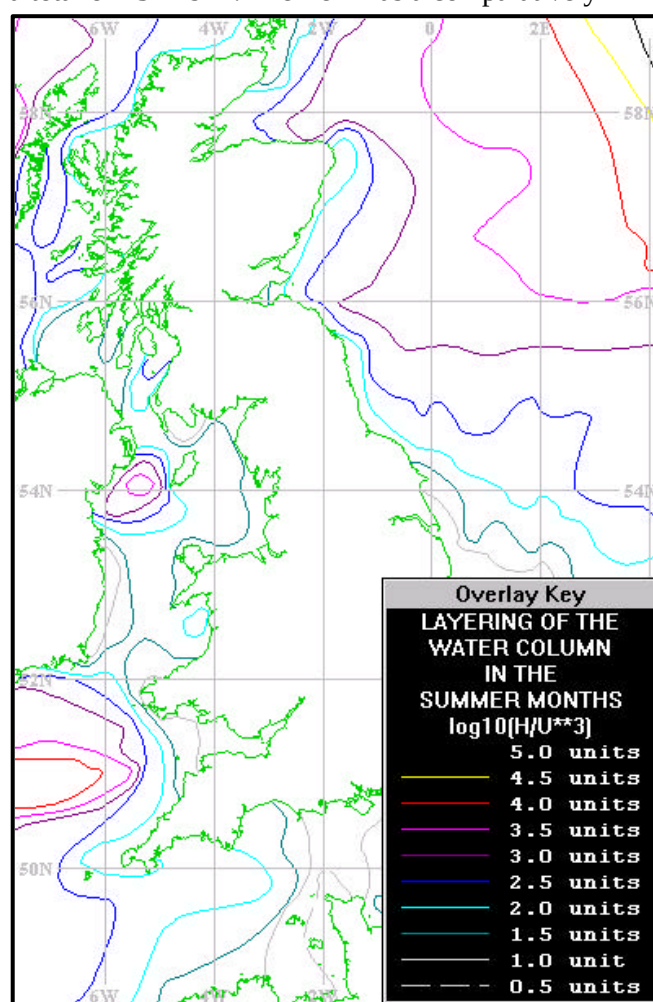
Rainfall into the Irish Sea contributes a volume of water equal to about one third of the riverine input. Cardigan Bay receives an average freshwater flow from rivers of $113\text{m}^3\text{s}^{-1}$. Of this, the Teifi contributes $31\text{m}^3\text{s}^{-1}$, the Dyfi $39\text{m}^3\text{s}^{-1}$ and others a total of $43\text{m}^3\text{s}^{-1}$ ²². The Teifi has a comparatively small estuary with a proportionally greater outflow of freshwater than larger estuaries in the Bay²³. Rivers adjacent to the SAC include the Aeron, Ina and Teifi, which contributes the greatest input of freshwater into this area. Smaller streams also flow into the SAC, and freshwater from the rivers Nevern at Newport and the Gwaun at Fishguard also affect salinity, particularly in the southern inshore waters of the SAC. River discharges are highly variable; the peak flow of a major river in flood can be up to 400 times the flow during a drought. The largest inputs to Cardigan Bay occur during the months December to February and the smallest in July²⁴.

2.2.1.6 Stratification & Fronts

Satellite infra red images show the surface waters of Cardigan Bay to be warmer than the water outside the bay in St. George's Channel.

Figure 12. Stratification of the water column in the summer months.

Reproduced from the UK digital marine atlas courtesy of CEFAS



²¹ Nichols *et al* (1992)

²² Field Studies Research Council. 1992. *Environmental Assessment St. George's Channel Blocks*. A report to Marathon Oil UK Ltd. Field Studies Council Research Centre, Pembroke.

²³ Jones, R. 1992. *The estuaries of Cardigan Bay*. In: Gritten, R. (Ed.) *Proceedings of Cardigan Bay in Crisis? Conference*. Plas Tan-y-Bwlch, Maentwrog. 27 February – 2 March, 1991. Snowdonia National Park Authority. pp. 19-21.

²⁴ Field Studies Research Council (1992)

Studies have shown that for at least part of the summer months stratification of the water occurs within the bay with warm freshwater overlying denser, cooler and more saline, waters. It is thought that the weak currents within the Bay, particularly the northern corner, contribute to this.

The stratification breaks down along a line running south of Trwyn Cilan and along this ‘front’ there are strong horizontal gradients of surface temperature, salinity, density and turbidity²⁵. Figure 11 shows stratification of the water column in summer. Conditions for frontal formation are most likely to occur along the $\log_{10}(H/U^{**3}) = 2.0$ units contour.

2.2.1.7 Tides

The Irish Sea is a relatively enclosed body of water with moderate tidal ranges. For southern Cardigan Bay, mean spring tidal ranges are approximately 4-5m. Tides in this area are predominantly semi-diurnal, with a period of 12h 25min between two successive high or low waters. High or low water times are progressively later as one goes north along the Cardigan Bay coast. The tide enters the Bay from St. George’s Channel with a weak average flow northwards of both surface and bottom currents, running north during flood tides and south during the ebb²⁶.

Tidal current strength is generally low within the bay (max 1.8 kts) and little is known about water transport patterns. The weakest tidal currents are within Tremadoc Bay, increasing to the south and west. Currents are slightly stronger near headlands and estuaries; the strongest currents along the SAC coast run between Cardigan Island and the mainland.

2.2.1.8 Sediment transport

There is limited knowledge on the sediment movement within and into Cardigan Bay. Estimations of coastal sediment transport regimes are being made as part of the Ceredigion Shoreline Management Plan.

2.2.1.9 Geology & Geomorphology

The geology of the sea bed influences the type and abundance of marine life that lives there. The type of rock, its hardness, solubility, inclination and orientation are all important to some degree.

The geology of Cardigan Bay has been recorded by Dobson and Whittington²⁷ as consisting of an almost complete arc of Pre-Cambrian and Lower Palaeozoic rocks (the basement rocks) cradling a post-Palaeozoic sedimentary basin (with Mesozoic and Cainozoic sediments). It shows a south-west to north-east trend characteristic of the Irish Sea as a whole, extending from St. George’s Channel to the coastline of Tremadoc Bay, where the Mesozoic to Tertiary basin is strongly faulted against the basement. These features are shown on the British Geological Survey Solid Geology sheet²⁸ for the area which specifically excludes the Quaternary sediments, that completely cover Cardigan Bay except for small areas of exposed basement rocks..

During the middle to late Pleistocene, the area was subject to periods of intense erosion during glaciations, and sequences of glacial and glacio-marine sediments were deposited in the area, particularly

²⁵ Bowers, D.G. 1992. *The physical oceanography of Cardigan Bay*. In: Gritten, R. (Ed.) *Proceedings of Cardigan Bay in Crisis? Conference*, Plas Tan-y-Bwlch, Maentwrog 27 February – 2 March, 1991. Snowdonia National Park Authority. pp. 15-18.

²⁶ Field Studies Research Council (1992)

²⁷ Dobson M., R. and Whittington R., J. 1987. *The geology of Cardigan Bay*. *Proc. Geol. Ass.* 98 (4) pp331-353.

²⁸ See Appendix 2

in the Celtic Trough. Quaternary deposits are shown on the BGS Quaternary Geology sheet²⁹ for the area. These are widespread, and the only exceptions are limited to areas of rock which outcrop close inshore off Bardsey and the north Pembrokeshire coast.

The distribution of seabed sediments is largely dependent on tidal current speed; gravels occur where the currents are strongest and muds where water energy is lowest. The coastal areas of Cardigan Bay are generally dominated by sands, with narrow intrusions of gravel around the sarnau, and in the ‘gutter’ areas adjacent to New Quay. Gravelly sediments and areas of exposed boulders and bedrock mainly occur in regions dominated by strong tidal currents or wave action, such as headlands³⁰. A map of sediment distribution in Cardigan Bay is given in Figure 7.

2.2.1.10 Topography

Cardigan Bay is a relatively shallow and gently sloping embayment of the Irish Sea, reaching 50m generally in the outer parts of the bay towards St. George’s Channel. Most of the cSAC is less than 30m deep, with deeper areas of 30-40m depth off Aberporth and in the south western corner of the site. Because of the general shallowness of the bay, wind and wave action dominate the physical dispersion processes.

Detailed information on the bathymetry within Cardigan Bay is quite poor. A general indication can be gleaned from the Admiralty charts for the area (see Appendix 2) or, far better, from recent acoustic surveys (see Figure 6).

2.2.2 Chemical

Chemicals may enter the cSAC by various routes and the potential impacts of these are influenced by the physical features of Cardigan Bay, migration by tidal movements and through sediment transport. The ingress of river water from the adjacent land and direct discharges of effluents may also influence the water quality of Cardigan Bay.

The limited marine monitoring undertaken in Cardigan Bay has found the water quality to be good but sediment monitoring has found a single highly contaminated sample (PCBs) in Aberystwyth harbour which is thought to originate from a local source.

The riverine inputs are influenced by land use and the subsequent run off and discharge of effluents have the potential to enable chemicals to pass down the rivers and into the cSAC.

The majority of the discharges to the cSAC, consented by EAW, are of domestic sewage effluent with a few being from an industrial source. However, diffuse run off and effluent from agricultural land and the continuing impact from historic mining activity provide the major inputs in this part of Cardigan Bay. The consented discharges, and also the major rivers at their freshwater limit e.g. Teifi, are routinely monitored by EAW to, in part, provide some information on loadings of chemicals entering the Bay.

Some limited microbial monitoring is also undertaken by EAW over the summer months each year, to assess the quality of bathing waters at those beaches identified in accordance with the EC Bathing Waters Directive. Ceredigion County Council also undertakes similar monitoring at a number of other non-identified beaches in their county.

²⁹ See Appendix 2

³⁰ Field Studies Research Council (1992)

2.2.3 *Biological*

2.2.3.1 **Benthic flora, fauna and communities**

Little is known about the seabed flora and fauna of Cardigan Bay cSAC. Recent surveys are sparse but include diver and infaunal studies by the Marine Nature Conservation Review and infaunal sampling as part of the BIOMOR project³¹. Recent broadscale surveys include CCW contracted acoustic surveys of the cSAC's sublittoral and CCW's Phase One Intertidal Survey (Figure 7 and Figure 8)

The cSAC is largely sedimentary in form consisting of a mosaic of mud, sand gravel and pebble patches. Sediments generally become finer to the west with depth. Shallow areas close to shore are occasionally bouldery with extensive cobble patches and a few rocky outcrops.

Benthic marine life within the cSAC therefore lives largely in or on sediments and is dominated by invertebrate animals such as worms, anemones, molluscs and brittlestars. Sufficiently stable substrates support sessile organisms such as hydroids, bryozoa and barnacles. Inshore rock and boulders whilst limited in extent support a good variety of animals, red and brown algae. Communities present display characteristics typical of mobile and sediment scoured rock. The relatively turbid waters and high mobility of much of the substrata close to shore tend to reduce the floral component of the bay. Only the near shore rock and boulder and large rocky structures such as the Sarnau support significant algal populations.

Intertidal communities are typical of exposed conditions. Substrates from small boulders to sand are highly mobile. Organisms find it hard to exist under these extremes and diversity is quite low, though typical of the conditions. Areas of reef show typical zonation of algal and faunal turfs, with extensive barnacle and mussel zones. The high level of suspended sand in the nearshore waters provides suitable conditions for the honeycomb worm (*Sabellaria alveolata*) which forms extensive reefs of national importance from the middle of the intertidal down into the shallow sublittoral along most of the cSAC.

Summary descriptions of the benthic (seabed) habitats and substrates of Cardigan Bay are given in Brazier (1999)³².

2.2.3.2 **Other significant marine flora, fauna and communities**

Seals

Southwest Wales supports internationally important numbers of the grey seal (*Halichoerus grypus*). Whilst grey seals are known to range throughout the cSAC, most of the important pupping beaches occur in Pembrokeshire. There are however a significant number in south-western Ceredigion. From the Teifi Estuary area pupping numbers diminish rapidly northwards up the coast, with Cemaes being of greatest importance. Seals, like dolphins are highly mobile, and whilst pupping sites have a strong south western distribution adult seals are commonly seen in the sea or hauled out all up Wales' west coast.

Cetacea

Several species of cetacean other than bottlenose dolphins are sighted within the Cardigan Bay cSAC. The most common of these is the harbour porpoise which makes up nearly 30% of sightings in the

³¹ Mackie, A.S.Y., Oliver, P.G. & Rees, E.I.S. 1995. *Benthic biodiversity in the southern Irish Sea. Studies in marine biodiversity and systematics from the National Museum of Wales: BIOMOR reports*, 1 : 263pp

³² Brazier *et al* (1999)

cSAC (as recorded on the SeaWatch Foundation regional database). Pilot and minke whales as well as orcas have also been sighted within the cSAC, though infrequently.

Birds

Significant auk and kittiwake interest occurs within the cSAC, the colonies at Craig ad agar SSSI south of New Quay representing the greater source of this. Good numbers of scoter duck occur in the northern half of the bay, outside the cSAC.

2.2.3.3 The bottlenose dolphins

Bottlenose dolphins are a cosmopolitan species, widely distributed in a range of mainly nearshore coastal habitats from tropical to temperate seas, in sheltered and exposed areas of estuaries, lagoons, continental coasts, and also in pelagic waters offshore and around oceanic island coasts. The species appears to be absent only from polar waters³³. In Britain, bottlenose dolphins have been recorded most frequently in coastal waters, predominantly in two areas: Cardigan Bay and the Moray Firth. In addition, small groups have been recorded regularly elsewhere in UK waters, including along the Cornish, Devon and Dorset coasts, in the waters around the Hebrides, off the Irish coast particularly in the Shannon Estuary, and occasionally in offshore waters of the North-east Atlantic, Irish Sea and St. George's Channel³⁴. The status of bottlenose dolphins in British and Irish waters is unknown; worldwide, the species is threatened in some areas by fisheries and net bycatch as well as habitat degradation and other anthropogenic influences.

There are thought to be two ecotypes of this species, with pelagic offshore populations being generally larger in form than those in tropical inshore waters. In cold British and Irish waters, bottlenose dolphins are amongst the largest examples of this species in the world, reaching lengths of 3-4.1m. Bottlenose dolphins inhabiting warmer nearshore waters are generally smaller at around 2-2.5m in length. Newborn calves are roughly one third adult length, averaging about 1m long.

Bottlenose dolphins are generalist and opportunistic feeders, eating a wide range of fish, crustaceans and molluscs. The dolphins' adaptability, particularly in diet and feeding strategies, has contributed to this species' success in diverse habitats. Bottlenose dolphin feeding behaviour, social structure and reproduction vary from population to population according to differences in their local environment.

A long-lived species, these animals may survive in the wild for 40-50 years or more³⁵. However, males commonly have a shorter lifespan of 25-35 years, while females are known to have lived over 50 years.³⁶ Despite their long lifespan, the reproductive rate of bottlenose dolphins is low. Females produce a single calf every 2-6 years, following a gestation period of about one year, and the pregnancy rate does not appear to decrease with age³⁷. The timing of birth varies greatly within the species and local populations may show distinct seasonality of births, or produce young year-round, even at similar latitudes. It is likely that many interacting factors influence the timing of birth. However, calving periods

³³ Klinowska, M. 1991. *Dolphins, Porpoises and Whales of the World*. The IUCN Red Data Book, IUCN, Gland and Cambridge.

³⁴ Evans, P.G.H. 1992. *Status review of cetaceans in British and Irish waters*. Unpublished report to the Department of the Environment, UK Mammal Society Cetacean Group Report/Sea Watch Foundation, Oxford.

³⁵ Hohn, A.A. 1990. *Reading between the lines: analysis of age estimation in dolphins*. (in Leatherwood, S. & Reeves, R. R. (eds) *The bottlenose dolphin*. Academic press. London. pp575-585).

³⁶ Thompson, P. and Wilson, B. 1994. *Bottlenose Dolphins*. WorldLife Library Series, Colin Baxter Photography Ltd. , Grantown-on Spey, Scotland.

³⁷ Kasuya, T., Izumisawa, Y., Komyo, Y., Ishino, Y. and Maejima, Y. 1997. *Life history parameters of bottlenose dolphins off Japan*. IBI Reports 7:71-107.

Cardigan Bay SAC Management Plan – *SITE DESCRIPTION*

are probably timed to take advantage of seasons when food is particularly abundant and, where predation is an important factor, when fewer predators are around³⁸.

Bottlenose dolphins are highly social animals. Although occasionally found alone, individuals of this species are more often seen in groups ranging in size from a few individuals up to several hundred. These larger aggregations of dolphins are seen more often in areas of exposed, open coastline or offshore waters, than in sheltered habitats close inshore³⁹. This variation in average herd size could be related to foraging strategies and the increased protection from predators provided by larger groups.

Bottlenose dolphin social structure varies from population to population, but in general their associations are relatively fluid and they live in 'fission-fusion' societies rather than family groups. They tend to swim together in bands with other individuals of similar reproductive state, often forming long-term associations within groups that change in composition and interact with each other. For example, pregnant females and mothers with calves may gather together in bands which may include related individuals. The strongest social bonds are between mothers and young calves during the suckling and weaning periods. Calves are weaned after about 18 months, but continue to associate closely with the mother for 3 to 6 years until they leave to join mixed groups of other juveniles. Sub-adults remain in these bachelor groups until they reach sexual maturity which, in the wild, ranges from 7-12 years of age for females and 10-13 years old for males⁴⁰. Sexually mature males tend to move about individually or in small groups, in some areas forming long-term partnerships or alliances of 2-3 males that travel from one band to another searching for receptive females⁴¹. Males commonly have only brief associations with females for mating and do not play a part in rearing the young calves.

Bottlenose dolphins have been seen all round the Welsh coast since the early part of this century, but mainly throughout Cardigan Bay where they are reported most frequently inshore from about Aberystwyth to the Teifi Estuary. Along this southern coastline, dolphins are often sighted within the SAC off headlands and in more sheltered areas near New Quay, Ynys Lochtyn, Aberporth, Mwnt, and the Teifi Estuary⁴². The coast between New Quay and Cemaes Head has also been the area of greatest observer effort over the years.

Bottlenose dolphins are seen year-round in Cardigan Bay. The number of individuals increases during the summer months and into autumn, reaching a peak in late September and October⁴³. The size of groups also tends to increase throughout the summer, and in late September and October quite large aggregations of more than 60 individuals may be seen⁴⁴. The dolphins are reported less frequently and in

³⁸ Urian, K.W., Duffield, D.A., Read, A.J., Wells, R.S. and Shell, D.D. 1996. *Seasonality of reproduction in bottlenose dolphins (Tursiops truncatus)* Journal of Mammalogy. 77(2): 394-403.

³⁹ Shane, S.H., Wells, R.S. & Wursig, B. 1986. *Ecology, behaviour and social organization of the bottlenose dolphin: a review*. Marine Mammal Science, 2(1), 34-63.

⁴⁰ Smolker, R.A., Richards, A.F., Connor, R.C. & Pepper, J.W. 1992. *Sex differences in patterns of association among Indian Ocean bottlenose dolphins*. Behaviour, 123(1-2), 38-69.

Grellier *et al* (1995)

Connor, R.C., Richards, A.F., Smolker, R.A., Mann, J. 1996. *Patterns of female attractiveness in Indian Ocean bottlenose dolphins*. Behaviour 133, 37-69.

Felix, F. 1997. *Organization and social structure of the coastal bottlenose dolphin Tursiops truncatus in the Gulf de Guayaquil, Ecuador*. Aquatic Mammals 23(1): 1-16.

Kasuya *et al* (1997)

⁴¹ Connor, R.C., Smolker, R.A. & Richards, A.F. 1992. *Two levels of alliance formation among male bottlenose dolphins (Tursiops sp.)* Proceedings of the National Academy of Sciences, U.S.A., 89. 987-990.

⁴² Grellier *et al* (1995)

⁴³ Evans (1992), Grellier *et al* (1995)

⁴⁴ Grellier *et al* (1995)

Cardigan Bay SAC Management Plan – *SITE DESCRIPTION*

fewer numbers during the winter months, but this may partially be a reflection of poorer weather conditions and fewer observers watching the coast.

Using mark-recapture techniques, it has been estimated that in the early 1990's there were about 127 bottlenose dolphins in Cardigan Bay⁴⁵. The majority of individual bottlenose dolphins identified during this study were seen more than once, and a substantial proportion of these animals have also been recorded in more than one year⁴⁶. Some dolphins have been identified in the Bay every year for periods of five years and more, while others appear to return to the area after a gap of one or two years⁴⁷.

Although the full range covered by the Cardigan Bay dolphins is not known, minimum inshore ranges of identified dolphins vary from about 160km² (62mi²) to at least 774km² (300mi²). Individuals recorded regularly along the southern coast of the Bay have also been seen both north and south of the cSAC⁴⁸. Dolphins identified in Cardigan Bay have not been reported from other areas of Welsh, English or Irish coastal waters. However, it appears that several dolphins regularly sighted off the southwest coast of England were seen a few years ago along the Pembrokeshire coast⁴⁹. Information to date suggests that Cardigan Bay dolphins represent a mobile and wide-ranging population of variable individual residence.

Cardigan Bay dolphins appear to use the area for all essential activities including feeding, socialising and nurture of young. Observations and strandings records indicate that their diet includes a range of benthic and pelagic fish species⁵⁰. Newborn and very young calves have been reported in the Bay from April into September, suggesting a seasonal pattern to calving⁵¹. The distribution and movement of prey are believed to influence the distribution and movement patterns of cetaceans, and feeding activities have been recorded throughout the inshore waters of the Bay. Understanding of the behaviour of Cardigan Bay dolphins is still in its infancy, but we now know that, like the dolphins in the Moray Firth in Scotland, bottlenose dolphins in Cardigan Bay occasionally injure and kill harbour porpoises⁵². So far, this unexplained behaviour has not been recorded in other communities of this species outside the UK. However, bottlenose dolphin infanticide, which may be related, has been recorded in the Moray Firth⁵³.

The majority of dolphins identified in Cardigan Bay have injuries or lesions on their skin. This is common in bottlenose dolphins world-wide, and the severity in Cardigan Bay is about average in comparison with other populations. A recent study has also found that temperature and salinity have had a more

⁴⁵ Arnold, H., Bartels, B., Wilson, B. And Thompson, P. 1997. *The Bottlenose Dolphins of Cardigan Bay: Selected Biographies of Individual Bottlenose Dolphins Recorded in Cardigan Bay, Wales*. Report to Countryside Council for Wales; CCW Science Report No 209.

⁴⁶ Grellier *et al* (1995)

⁴⁷ Arnold, H. & Mayer, S. 1995. *The ecology of bottlenose dolphins in Cardigan Bay, Wales, UK*. Abstracts of the 11th biennial conference on the biology of marine mammals 14-18 December 1995. Orlando, Florida.

Lewis, E. 1999. *A digital database of photographically identified bottlenose dolphins: Cardigan Bay, West Wales*. A report for Countryside Council for Wales.

⁴⁸ Grellier *et al* (1995)

⁴⁹ Wood, C.J. 1998. *Movement of bottlenose dolphins around the south-west coast of Britain*. Journal of Zoology, Lond., 246(2),155-163.

⁵⁰ Natural History Museum. 1995. "*Studies on the Biology of Cetacea*". A Report to the Welsh Office.

Muir, A.I., Spurrier, C.J.H., Banister, K., Harris, E.A., Gibson, D.I. and Clark, P.F. 1998. *The Ages, Stomach Contents, and Parasites of Cetaceans Stranded on the Coasts of England and Wales in 1997*, An Interim Report for the Welsh Office by The Natural History Museum, London. Ref: 003/95.

⁵¹ Grellier *et al* (1995)

⁵² Ross, H.M. & Wilson, B. 1996. *Violent interactions between bottlenose dolphins and harbour porpoises*. Proceedings of the Royal Society London, B vol 263 pp283-286

Jepson P. D. & Baker J. R. 1998. *Bottlenose dolphins (*Tursiops truncatus*) as a possible cause of acute traumatic injuries in Porpoises (*Phocoena phocoena*)*. Veterinary Record 143 pp614-615.

⁵³ Patterson, I.A.P., Reid, R.J., Wilson, B., Grellier, K., Ross, H.M., Thompson, P.M. 1998. *Evidence for infanticide in bottlenose dolphins; an explanation for violent interactions with harbour porpoises?* Proc. Royal Society, B., 265: 1167-1170.

Cardigan Bay SAC Management Plan – *SITE DESCRIPTION*

significant effect on skin condition than pollution⁵⁴. However, pollution is a real threat to the health of the Cardigan Bay dolphins and their environment. The dolphins are also vulnerable to diseases such as Brucellosis and morbilliviruses, as well as cross infections from interactions with humans⁵⁵.

Fishing and recreational activities too can have an adverse impact on the dolphins, causing injury, disturbance or death. At least one bottlenose dolphin calf has died in Cardigan Bay as a result of entanglement in a net⁵⁶. Local studies have found that dolphins show changes in diving behaviour and direction when high speed boats are nearby, while there is less visible reaction to tour boats when the boats keep their distance and reduce their speed and movements⁵⁷. However, lack of visible short-term reactions cannot be taken to indicate a lack of adverse impact in the short or long term. Factors including climate change, pollution, disease, fishing and recreational activities may all generate potentially harmful impacts; some or all of them together may also create a cocktail of impacts whose combined effects are unpredictable.

Further research is required in order for us to tell whether the population interacts with dolphins from other areas such as Ireland or the south of England, and whether the number of animals using Cardigan Bay is stable, increasing or declining. Assessing the abundance, health, reproduction and survival rates of such long-lived marine mammals is necessarily a long-term process.

⁵⁴ Wilson, B., Arnold, H., Bearzi, G., Fortuna, C., Gaspar, R., Ingram, S., Liret, C., Pribanic, S., Read, A.J., Ridoux, V., Schneider, K., Urian, K.W., Wells, R.S., Wood, C., Thompson, P.S., Hammond, P.S 1999. *Epidermal diseases in bottlenose dolphins: impacts of natural and anthropogenic factors*. Proc. Roy. Soc. Lond.B. 266:1077-1083.

⁵⁵ Law, R.J. 1994. *Collaborative UK marine mammal project: summary of data produced 1988-1992*. Fisheries research technical report No. 97, MAFF, Directorate of Fisheries Research, Lowestoft.

Grellier *et al* (1995)

Jepson, P.D., Brew, S., MacMillan, A.P., Baker, J.R., Barnett, J., Kirkwood, K.K., Kuiken, T., Robinson, I.R. & Simpson, V.R. 1997. *Antibodies to Brucella in marine mammals around the coast of England and Wales*. Veterinary Record (141) pp513-515.

Ross, H.M., Foster, G., Jahans, K.L., MacMillan, A.P., Reid, R.J. & Thompson, P.M. 1996. *Evidence of Brucella species infection in North Sea seal and cetacean populations*. Veterinary Record, 138: 647-648.

⁵⁶ Kirkwood, J.K., Bennet, P.M., Jepson, P.D., Kuiken, T., Simpson, B.R. & Baker, J.R. 1997. *Entanglement in fishing gear and other causes of death in cetaceans stranded on the coast of England and Wales*. Veterinary Record (141) pp94-98.

⁵⁷ Evans, P.J.H., Canwell, P.J., & Lewis, E.J. 1992. *An experimental study of the effects of pleasure craft noise upon bottle-nosed dolphins in Cardigan Bay West Wales*. (In Evans, P.G.H. (ed) *European research on cetaceans* - 6, European Cetacean Society, Cambridge).

CCC (1998)

2.3 Human Activities

This section describes the major human activities, current and past, occurring within the SAC.

2.3.1 Mining

The hinterland of the SAC coast lies to the south-west of the Central Wales Orefield, which occupies the area between Aberystwyth and Llanidloes. This was a major centre of mining activity, where lead, zinc and copper ores were sought in over 130 mines exploiting 50 or more veins⁵⁸.

In south Cardiganshire, mineralisation, also chiefly in the form of veins, occurs within Ordovician and Silurian turbidites (alternations of sandstone and shale). Much of this area is drained by the Teifi and its tributaries, but within the coastal strip there are a large number of small rivers draining north-westwards to the sea.

Within south Cardiganshire the principal area in which mining occurred was the Llanfair- Clydogau District (Bevins and Mason, 1997) situated to the east of the Teifi between Lampeter and Tregaron. This was mainly a lead mining area where the galena (lead sulphide) also yielded a relatively high silver content. There were also a few mines further down the Teifi Valley, and along the coast between Aberporth and New Quay.

Apart from galena, other minerals which are commonly present in the Central Wales Orefield include sphalerite (zinc sulphide), chalcopyrite (copper sulphide) and iron pyrites (iron sulphide). This sulphide mineralisation is commonly associated with quartz (silicon dioxide), calcite/dolomite (calcium carbonate/magnesium-calcium carbonate) and barytes (barium sulphate).

Although the history of mining in this area dates back to the Bronze Age, the main phase of mining activity commenced about 1750, reached a peak between 1850 and 1870, and was followed by a rapid decline with little, if any, exploitation after 1940.

2.3.2 Ports and Harbours

The former County of Cardiganshire (now Ceredigion) is well known for its seafaring traditions, both deep water ships and coasting vessels. Cardigan remained an active port until the 1950's. New Quay was an active port in the 18th and 19th century providing a sheltered harbour. The Harbour Company was formed in 1833 and the town quickly established a reputation for shipbuilding with shipyards situated along Traeth Gwyn and Cei Bach. Llangrannog established itself as a port in the late 18th century and shipbuilding still occurred until 1875. Most of the beaches provided a landing site for small sailing vessels throughout the 19th century and limekilns were built to roast the stone being brought into the bay by boat.

Currently, harbour activity within and adjacent to the SAC is centred on New Quay, Aberaeron and Aberystwyth. Mooring facilities are also available in the Teifi estuary although local concern has been expressed that navigation is becoming progressively restricted through the silting of the estuary. These harbours are mainly used by fishing vessels and recreational craft. Whilst the harbours are not as active as they once were for the fishing industry, the popularity of recreational craft has been increasing. Moorings and marinas (Aberystwyth) for these craft are more common than they once were and there remains the requirement to maintain navigable depths within harbours. This results in occasional dredging by the County Council, as the Harbour Authority for Ceredigion.

⁵⁸ Bevins, R., E. 1994. *A mineralogy of Wales*. National Museum of Wales, Cardiff, 146pp.

2.3.3 Fisheries

2.3.3.1 Sea Fisheries

Historically, Cardigan Bay supported large herring fisheries between the 14th and 19th centuries. Records from the 18th century show annual landings of up to 739 million herring. Since then the herring fishery has declined, and the emphasis of the fishery has changed to lobsters, crabs, rays, dogfish, prawns and scallops.

Records from the 19th century indicate that the traditional fleet working in the area has been of small vessels, with very few fishermen operating from local ports all year round. This pattern remains evident in current fishing activity, and probably reflects the physical exposure of the Bay and the relative lack of sheltered fishing grounds.

Most of the fishing vessels working the inshore part of the cSAC (0-6 nautical miles from baselines) are from the small fishing ports of Cardigan, Aberporth, Llangrannog, New Quay and Aberaeron. These are generally small (under 10m) vessels, mostly engaged in potting for crab and lobster, with a small amount of fishing with static and mobile nets for sea fish.

Crabs and lobsters are the mainstay of the local fishing fleet at present. Although nominally a year-round fishery, most fishermen concentrate their effort during the spring, summer and early autumn. The shallow, exposed waters of the Bay discourage potting during the stormy winter months. Drift and set nets are used occasionally during the summer months to take sea fish, with some scallop dredging taking place in the autumn.

A small number of larger vessels work in the outer part of the cSAC (beyond 6 nautical miles). These are principally the larger beam trawling and scallop vessels, prevented from working closer to shore under SFC byelaws.

The cSAC extends out to the 12 nautical mile limit, and French registered vessels are allowed access to the 6-12nm area in the outer, south western part of the site.

A small fish processing plant exists in New Quay, processing molluscan and crustacean shellfish caught from within and outside the cSAC.

Management

There is a public right of fishery in UK tidal waters. This generally extends to all species of sea fish, and does not discriminate between persons or classes of persons. The UK fisheries authorities have legal powers to regulate this public right, for example in relation to particular sea areas, the removal of certain species, and the use of certain types of gear. The Sea Fisheries Committees and MAFF enforce many such measures in Cardigan Bay. Further information is set out later in this document.

2.3.3.2 Migratory Salmonids

During the 19th century salmon were heavily exploited commercially in the Teifi estuary by estuary seine nets, fixed nets and coracle nets.

Today, four seine nets operate in the Teifi estuary (downstream of Cardigan Bridge, just into the SAC area between Cardigan Island and Cemaes Head), catching an average of 130 salmon and 200 sea trout annually. The number of licences available is controlled by a Net Limitation Order, promoted and administered by the EAW with approval of the National Assembly of Wales (NAW). Operation of these nets is controlled by bylaws issued by EAW with the approval of NAW.

Management

Fishing for migratory species of fish (salmon, sea trout, and eels) both at sea and in rivers is regulated by the Environment Agency Wales.

Fishing with seine nets is carefully managed. Only licensed fishermen can use seine nets for salmon fishing, and the number of licences is controlled by a Net Limitation Order, promoted and administered by EAW with approval by the National Assembly for Wales (NAW). Operation of these nets is controlled by byelaws issued by EAW with the approval of NAW. These byelaws limit the times and seasons of operation. For example, the close season runs from 31st August to 1st April, and all fish caught between 1st April and 1st June must be returned alive. There is also a close time in fishing in the open season between 0600 on a Saturday and 1200 the following Monday.

2.3.3.3 Sea Angling

Sea angling has become a popular pastime with good fishing from the Teifi estuary and beaches and rocks along the coastline, for species such as flounder, bass, mackerel, whiting, dogfish and conger.

2.3.4 Military

Military use of Cardigan Bay (see Figure 12) is largely coordinated and controlled by the Defence Evaluation and Research Agency (DERA) base at Aberporth. DERA Aberporth is an amalgamation of three separate sites developed in the late 1930s and now includes the main base, the Rangehead area (just outside the perimeter fence) and the airfield at Blaenannerch two miles away.

From its earliest days, a number of Observation Posts (OPs) were commissioned on small pockets of land along the coast from which the trajectory of projectiles fired into the Cardigan Bay Range Danger Area could be observed (see Figure 12). Over the years, these OPs have been developed to accommodate optical, electro-optical, radar and radio equipment. A number of these OPs remain in use to this day.

The RAF airfield was formally "closed" and handed over to care and maintenance in 1946 and was not used for some 5 years thereafter. It was reopened in 1951 as the RAE Aberporth airfield site and equipped with a hard surface in 1956. Its use from 1951 has been confined to the flying of (manned) trials and communication aircraft; the flying of targets for the Range having been transferred initially to RAF Valley (manned aircraft and towed drogues) and eventually (by 1951) to RAF (later RAE) Llanbedr, which now provided for the flying of drone targets also.

Over the years, the primary task at Aberporth has concentrated on antiaircraft weapons, be they ground, sea or air-launched. Its role in the development of other weapons (guided bombs, anti-ship missiles, lasers etc.) should not however be overlooked. Whereas during the early years the greater majority of trials undertaken at Aberporth involved ground-launched firing with few aircraft trials, the current situation is quite the reverse. Nowadays as much as 95% of trials carried out on the Range involve aircraft and only a very small number of ground firings are undertaken.

The Aberporth Range has played a major part in the development, evaluation and service practice of virtually every guided weapon to enter service with the United Kingdom (UK) Armed Forces, and for an equally large number of projects that never saw service. The Range now constitutes a facility within DERA, which is an Executive Agency of the UK Ministry of Defence (MoD) responsible to the Secretary of State for Defence. On behalf of the UK MoD and its contractors the establishment continues to provide a safe and controlled environment for the conduct of guided weapons and aircraft system trials, together with the instrumentation required to control and monitor these trials activities in accordance with both customer needs and the maintenance of safety.

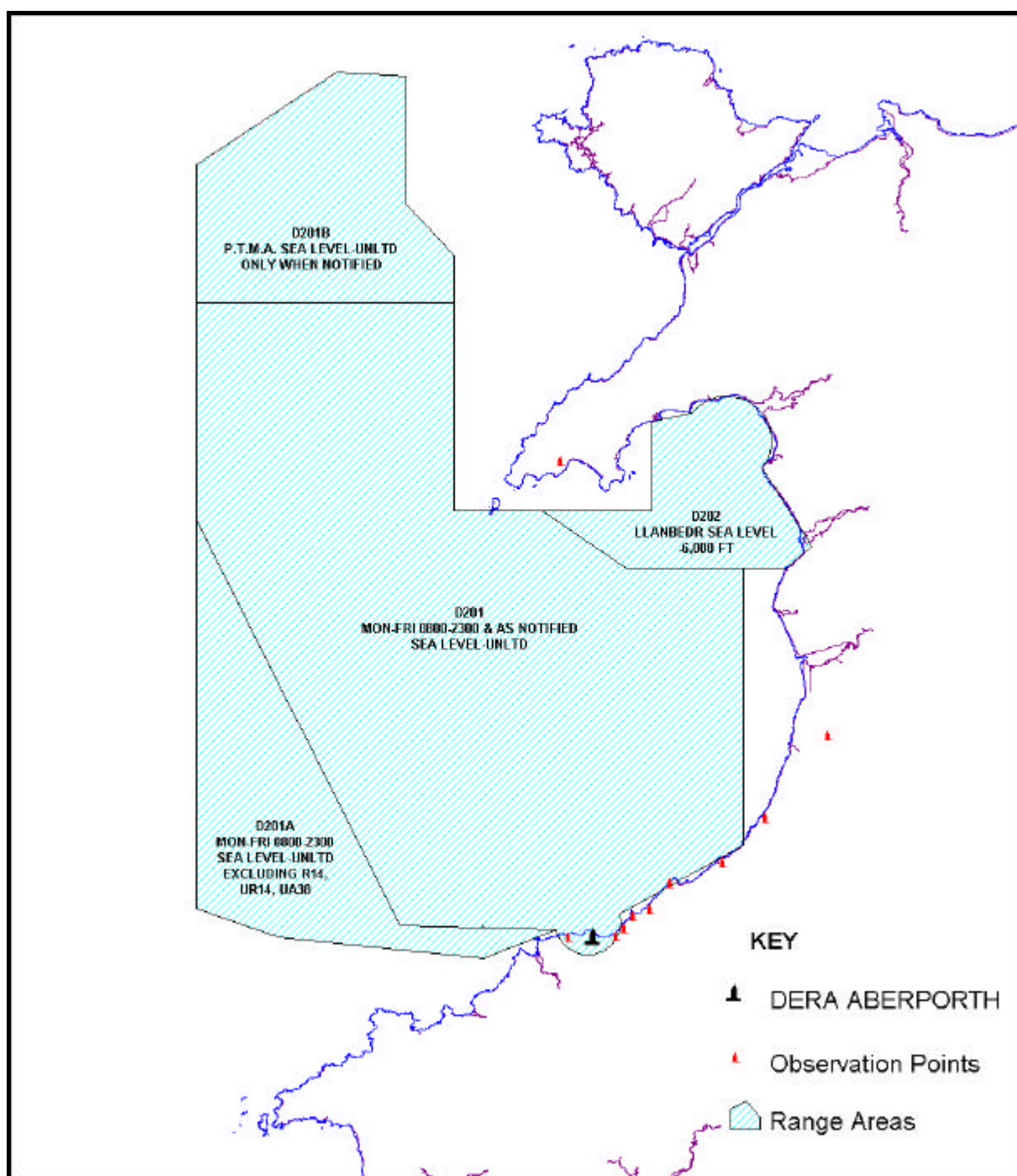


Figure 13. DERA Aberporth range and coastal observation points.

2.3.5 Archaeology

Sites of coastal archaeological interest are recorded in a study undertaken by Dyfed Archaeological Trust in 1996. (Cardigan Bay Coastal Survey) The post medieval feature of the natural harbours at Cwmtudu, Llangrannog, Tresaith and Penbryn are of particular interest. The study identifies the lack of information available on the precise location and condition of sunken vessels in the area, and recommends a pilot project involving the Dyfed Archaeological Trust and the Nautical Archaeological

Society to assess the nature and frequency of wreck sites, both in inshore waters and in the intertidal zone.

2.3.6 Leisure

2.3.6.1 Tourism

Tourism represents an important part of the local economy with 4% of full-time and 16% of part-time jobs in the industry (1991 Census of Employment). Statistics available for the mid-Wales area indicate that the origin of domestic visitors was West Midlands (39%), Wales (19%) and S.E. England (17%) (1991). Ceredigion's main attractions have traditionally been associated with a quiet enjoyment of the countryside and managed attractions or activities have been something of a rarity.

The number of staying visitors in the area between Aberaeron and Cardigan in 1990 (more recent data not available) was nearly 392,000, (Table 2.) and it has been calculated that direct tourist expenditure in Ceredigion as a whole for staying visitors was in the order of £52m.

The infrastructure supporting this interest is widespread, from gift shops and caravan parks to recreational boat facilities and wildlife cruises. The summer months see a large influx of people not present over the winter months. This has necessitated a corresponding increase in the capacity of the local infrastructure (such as the treatment and disposal of waste water) to cope with the annual peak.

Trends in tourism indicate that there is likely to be a growth in activity and specialist interest holidays, with a trend towards an appreciation of environmental matters and pursuits. There is also likely to be a demand for higher quality facilities, attractions and accommodation linked to the appreciation of the environment in the broadest sense.

Table 2. Visitor numbers for Ceredigion 1990

Zone	Area	No. of staying visitors
1	Borth	172,182
2	Aberystwyth	292,036
3	Tregaron	32,366
4	Aberaeron	69,015
5	New Quay	144,752
6	Lampeter	31,938
7	Llandysul	7,129
8	Llangrannog/Aberporth	108,727
	Total	927,270

2.3.6.2 Recreation

There are mooring facilities for 133 boats at New Quay; 80 at Aberaeron; and 200 at Cardigan, with yachting and boating clubs located at Aberaeron, New Quay, Tresaith, Aberporth, and Cardigan. Canoe and windsurf hire facilities are also available. Diving activities occur along the coast and there are diving clubs in Cardigan, Aberaeron and Aberystwyth.

Cardigan Bay SAC Management Plan – *HUMAN ACTIVITIES*

A study of boating activity along the Ceredigion MHC (Marine Heritage Coast) was undertaken during the summer months in 1993 by the former Ceredigion District Council (Marine Heritage Coast 1993). Timed watches of New Quay harbour, Cei Bach and Traeth Gwyn, Llangrannog, Tresaith and Aberporth recorded the number and type of craft launched during the time period, and the number and type of craft at sea within the survey area. Ceredigion Council's Beach Officers' daily report sheets from Aberporth, Tresaith and Llangrannog were also analysed for information on boating activity.

Table 3. Boat types in the Marine Heritage Coast 1993

Boat type	Proportion of all records of launches and boats at sea
canoe	30.0%
sail	28.4%
speedboat	14.7%
rowing/outboard dinghy	10.2%
sailboard	6.2%
cabin/motor cruiser	4.8%
jet ski	0.7%

Table 4. Proportion of Boat types present⁵⁹ during bottlenose dolphin sightings at MHC sites over the summer months, 1994-1997

Boat types	Aberporth % of dolphin sightings with boats present	New Quay % of dolphin sightings with boats present	Ynys Lochtyn % of dolphin sightings with boats present
canoe	13	21	18
fishing	4	4	3
sailing	19	13	13
small boat	34	14	33
speedboat	21	15	18
visitor pleasure boat	4	33	15
jet ski	1	0	0
other	1	0	0

New Quay and Aberporth were the main launching areas with launching rates of 4.7 per hour and 2.7 per hour respectively, compared to an average launching rate throughout the area of 2.3 per hour. Boat types, both launching and at sea, are shown in Table 3.

⁵⁹ Within 1Km.

A subsequent study, supervised by Ceredigion County Council and conducted by several hundred MHC volunteers, the Marine Mammal Disturbance Survey⁶⁰ (1994-1997), also recorded boating activity and bottlenose dolphin sightings from sites at New Quay, Ynys Lochdyn and Aberporth. This was intended to be a three year study, but the level of support received from the volunteers meant that this study period could be extended. In 1998 a fourth site was added at Mwnt.

2.3.6.3 Education and interpretation

Many of the current educational programmes in Ceredigion reflect the interpretation of features of protected sites and areas and are based in and around Visitor Centres. Educational methods include static and inter-active displays, guided walks, waymarked trails, special events, leaflets, and illustrated talks. Visitor facilities in southern Ceredigion are shown in Table 5.

In addition to these facilities and site based programmes, guided walks, boat trips and talks are undertaken as part of Ceredigion Council's Coast and Countryside Section programme along the Heritage Coast. Two hour wildlife cruises were introduced into the Section's annual Walks & Talks programme in 1994. These were introduced to:

- demonstrate the economic viability of developing environmentally sensitive wildlife cruises as opposed to 'dolphin watching' boat trips (i.e. trips focussed exclusively on dolphins).
- develop closer working relationships with the boat operators
- encourage the development of wildlife boat trips by the commercial boat operators themselves as part of a sustainable tourism philosophy

In 1995, two of the boat operators became Heritage Coast Volunteer Wardens, and began to use this as a marketing tool in their operations. Wildlife boat trips are now available from both New Quay and Aberaeron.

Interpretation boards, some linked to waymarked trails, are sited at a number of other areas owned by the National Trust, Ceredigion County Council, Wildlife Trust (West Wales) and at the privately owned land opposite Cardigan Island. Aberporth Community Council have provided an interpretative board for the seaside car park, and the Urdd Centre in Llangrannog has sited panels on the coastal paths. Cardigan have plans for the provision of new walk information by Menter Aberteifi.

Table 5. Visitor and Educational Centres in southern Ceredigion

Centre	Organisation	Annual nos.
Aberaeron Sea Aquarium	Private	14-17,000
Cardigan Bay Marine Wildlife Centre New Quay	Private/SeaWatch Foundation	10,000 (1998)
Denmark Farm, Llangybi	Shared Earth Trust	
Llanerchaeron	National Trust	
New Quay Heritage Centre	New Quay Town Council / Ceredigion County Council	2,800 (1998)
Cardigan Heritage Centre	Private	

⁶⁰ Ceredigion County Council. 1998. *A report on Marine Mammal Disturbance (1994-1997)*. Ceredigion County Council. Aberaeron.

Cardigan Bay SAC Management Plan – HUMAN ACTIVITIES

Red Kite Centre, Tregaron	Ceredigion County Council	
Urdd Centre, Llangrannog	Urdd Gobaith Cymru	
Welsh Wildlife Centre, Cilgerran	The Wildlife Trust (West Wales)	

MHC Information boards with details of the Code of Conduct are sited at Cei Bach, New Quay, Llangrannog, Tresaith and Aberporth. In 1998, posters were sited in all beach display units containing information on the MHC, Cardigan Bay SAC and the Pen Llyn a'r Sarnau SAC. Marine Strandings Project posters are also sited at a variety of launch places along the coast. Other UK and international Codes of Conduct have also been distributed at various outlets.

The annual Ceredigion Tide tables contains information about the county's marine protected areas. Friends of Cardigan Bay have produced a leaflet, '*Cardigan Bay and the bottlenose Dolphin*' and also a booklet. The former Dyfed Wildlife Trust, now Wildlife Trust (West Wales) have produced a leaflet containing information on cetacean sighting 'hot spots' in Cardigan Bay.

The 1995 Ceredigion MHC Plan attempted to review all available interpretation from a variety of organisations, including the Heritage Coast, and to identify a number of projects that would enhance people's interest and understanding of the issues of the area, rather than to actively promote them.

The Plan suggested that all future marine interpretation should build on work produced to date by adopting a co-operative approach with others for future productions. A co-operative approach was adopted in the organisation of annual marine events. These events brought together a wide number of statutory and non-statutory organisations with an interest or responsibility for the marine environment. By staging these events at Aberaeron Sea Aquarium and New Quay Yacht Club, further links were also established with the community, private sector and recreational groups. The Friends of Cardigan Bay also hold a *Festival of the Sea* public event in Aberystwyth every year.

Work with local schools is seen as an important part of the educational process. The three primary schools at New Quay, Llanarth and Cross Inn regularly take part in education/interpretation projects with the Ceredigion's Coast & Countryside Section, such as the Marine Mural and the World Ocean Day banners. Both the Cardigan Bay Marine Wildlife Centre and the Aberaeron Sea Aquarium have plans to further develop education and interpretation facilities at their venues. In 1999, Sea Watch organised a series of training weekends from the Cardigan Bay Marine Wildlife Centre for volunteer observers interested in conducting watches for cetaceans. The Centre recently undertook a survey of local schools to establish requirements for marine wildlife education in the area.

2.3.7 Scientific research

Whilst there have been records of bottlenose dolphins in Cardigan Bay since the 1920's⁶¹, research of the dolphins has only really increased in the last few decades.

Facilities for research within the bay are however quite poor. There are no major marine research stations near by (the School of Ocean Sciences at Menai Bridge is the closest) and, for boat work, there is a lack of non-drying harbours with adjacent research facilities. The University of Aberystwyth provides a local centre of research but does not have a specific research interest in the Bay's bottlenose dolphins. Facilities for cold storage of stranded cetacean carcasses have however been provided in the past by the University. The Marine Strandings Project, a significant contributor of cetacean information in the bay, has facilities for removal and storage of dead strandings. The local Marine Wildlife Centre at

⁶¹ Evans, P.G.H. and Scanlan, G. 1989. *Historical status changes of cetaceans in British and Irish waters*. European Research on Cetaceans 3. (Ed. P.G.H. Evans and C. Smeenk). European Cetacean Society, Cambridge. pp 51-57.

Cardigan Bay SAC Management Plan – *HUMAN ACTIVITIES*

New Quay does provide the opportunity for acting as a logistical base for any activity out of New Quay Harbour, the focus for dolphin interest within the bay.

Recent research projects, conducted in the Bay during 1998 and 1999 are given in Appendix 6. Few of these projects form part of long-term initiatives. The most significant long term studies conducted within the bay in recent years include work by Terry Bristow – now continued by the New Quay dolphin Monitoring Group, the Marine Strandings Project – which now forms part of a collaborative Celtic project, research and sightings recording by SeaWatch Foundation, and research by Greenpeace and Aberdeen University.

2.3.8 *Management for nature conservation*

This section addresses the presence and management requirements of other nature conservation designations that already occur within the cSAC.

Ceredigion Marine Heritage Coast

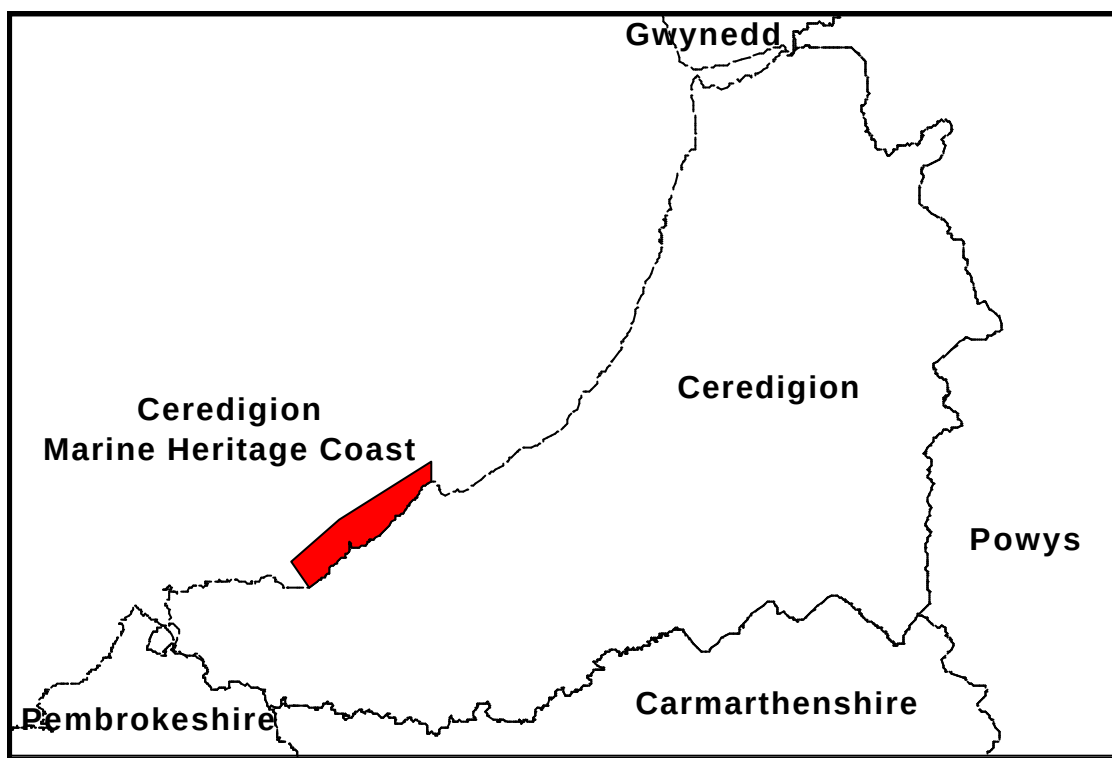


Figure 14. Ceredigion Marine Heritage Coast Area

The Ceredigion Marine Heritage Coast (MHC) was established in 1992 following Ceredigion District Council's resolution to “endorse the conservation interests of the New Quay to Tresaith coastal zone as being worthy of special planning treatment”. The previous year, a petition containing 668 names of New Quay residents and visitors had called for the Council to consider extending the low water mark boundary of the Heritage Coast between New Quay and Tresaith one mile seaward because of concerns for the local bottlenose dolphin population. Its’ current status is that of a voluntary marine protected area.

The aim of the Marine Heritage Coast⁶² is to “manage the defined area for the conservation of its natural resources - flora, fauna, geology and landscape aspects”. The public consultation exercise following the submission of the petition had revealed that the development of public awareness and appropriate use of the area relating to recreation, conservation and economic utilisation was considered crucial to achieving this aim.

The objectives of MHC management⁶³ were therefore agreed as being:

- to protect and enhance marine habitats and communities.

⁶² Ceredigion District Council. 1992. *Ceredigion Marine Heritage Coast: An introductory report*. Ceredigion, Aberaeron.

⁶³ Ceredigion County Council. 1998. *Marine Heritage Coast Management Plan 1998 - 2000*. Ceredigion County Council, Aberaeron.

- to provide interpretation and educational facilities that will generate interest, appreciation and commitment for marine conservation.
- to manage recreational activities in a way compatible with nature conservation interests
- to support sustainable forms of tourism that recognise the cultural, social and environmental well-being of the coastline.
- to use the MHC to promote marine conservation and the concept of coastal zone management along the wider Ceredigion coastline.
- to provide the administrative structure to enable effective communication and informed decision-making with all departments and outside organisations.

A feature of the MHC is the extent to which local people are actively involved in the area's management. The issue of marine mammal disturbance from local boating activity had been the main concern expressed by local people during the initial consultation stages, and it was apparent that it was this issue that needed to be addressed first. The integration of community knowledge of natural features into protected area management is considered by many to be crucial. However, on this issue, information available locally varied from individual to individual. Whilst studies on this subject had been undertaken in the UK and other countries, and guidelines produced for good boating practice, it was nevertheless decided to introduce a survey that involved local people⁶⁴ for a number of reasons:

- to build on local community interest and support for the MHC by actively involving them in producing their own science;
- to raise public awareness of the issue and to influence local behaviour whilst at sea;
- to obtain further information that would help guide future management.

The MHC has continued to stress the importance of linking the need for continued research and monitoring, and for community involvement with management. Information gleaned has been transferred into best practice advice and distributed widely. A Boat Users Guide⁶⁵ has been produced offering advice if cetaceans are encountered, and these are now distributed by the Harbourmasters at the main launching sites of New Quay, Aberaeron and Aberystwyth. The Afon Teifi Fairways Committee distribute the Boat Users Guide to all Cardigan mooring holders. In consultation with the local fishermen, a speedboat zone was introduced in 1995 that offers a safe, unrestricted speed area suitable for speedboats.

In 1997, the commercial passenger boat operators agreed a Code of Conduct⁶⁶ for their operations. The operators also participate in the survey and monitoring programme, and this data is used to guide the Code's annual review. At this time, some of the operators expressed an interest in becoming more involved in informing speedboat/motorboat users of the MHC whilst at sea. Some operators and the New Quay Harbourmaster in 1998 took part in a warning "yellow card" scheme⁶⁷ to encourage compliance to the Code of Conduct of those they witnessed not adhering to the Code.

Within the Ceredigion area there are also two stretches of Heritage Coast: New Quay to Tresaith and Pen-peles to Gwbert.

⁶⁴ Ceredigion County Council. 1998. *A report on marine mammal disturbance 1994-1997*. Ceredigion County Council, Aberaeron.

⁶⁵ See Appendix 4.

⁶⁶ See Appendix 5.

⁶⁷ Verbal warnings.

Fisheries

None of the fisheries management measures currently in place in Cardigan Bay have been implemented for nature conservation purposes alone. However, the current regulatory regime places constraints on fishing activity that may have benefits for dolphins.

The absence of any fisheries measures to protect nature conservation does not indicate a lack of commitment or mechanism for introducing such measures. Indeed, three pieces of legislation would either allow or support the introduction of such measures:

Sea Fisheries (Wildlife Conservation) Act 1992

Since 1992 the NW&NWSFC and the SWSFC, Environment Agency, and MAFF / National Assembly for Wales have been required to consider the implications for marine wildlife in the exercise of their fisheries management powers.

Conservation (Natural Habitats &c.) Regulations 1994

These require statutory bodies to use their powers in a way that complies with the aims of the Habitats Directive. Within the Cardigan Bay cSAC, this places obligations on the SFCs, Environment Agency and Welsh Office to ensure that their powers are used in a way that contributes towards the conservation objectives of the site.

Environment Act 1995

This Act enables SFCs to make byelaws to control fishing expressly for the protection of marine environmental features, including wildlife and also archaeology.

3. EVALUATION OF THE cSAC

This section describes the value of the site in terms of the bottlenose dolphins, and its potential as an educational and scientific resource. This section aims to tease out further information relevant to developing a scheme of site management.

3.1 The site in wider perspective and implications for management

The Cardigan Bay cSAC is intended to form part of the EC suite of Natura 2000 sites comprising both SACs and Special Protection Areas (SPAs) for birds. As part of this suite the Cardigan Bay cSAC has an important role in contributing towards the favourable conservation status of bottlenose dolphins across European waters.

There are several different mechanisms used for cetacean protection in UK territorial waters. The use of a site based approach to species protection should be seen as an important step forward, providing a

Box 2

Other legal obligations with respect to bottlenose dolphin

There are a range of legal obligations relating to the bottlenose dolphin derived from other international treaties and legislation. These include:

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The bottlenose dolphin is listed in Appendix II of the Convention, but is treated as having Appendix I status (strictly controlled in international trade) within the European Union, and internal commercial trade is prohibited;
- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). The species is listed in Appendix II of the convention, which prohibits intentional killing, taking, injuring, and sale;
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The species is listed in Appendix II of the Convention, and is the subject of the Agreement on small cetaceans of the Baltic and North Seas (ASCOBANS) made under the Convention.

Biodiversity Plan

In compliance with the requirements of the Convention on Biological Diversity, the UK prepared the Biodiversity Action Plan (BAP) and, as a component of the BAP an Action Plan for small dolphins which includes bottlenose dolphin.

UK legislation

The obligations to provide strict protection for the bottlenose dolphin and to regulate trade in the species or products derived from it, are implemented within the UK and its territorial waters, through a variety of legislation notably:

- the Conservation (Natural Habitats, &c) Regulations 1994;
- the Wildlife and Countryside Act 1981; and
- EC Regulations 338/97 and 939/97.

focus for improved management, awareness and understanding. However, bottlenose dolphins are a

mobile species living in a highly dynamic environment and, as a result, they may be affected by influences occurring well outside their current range or some distance from the SAC. It is important therefore that site protection is viewed as only one of many tools required for conservation of the species, both in a UK, European and global context.

3.2 Evaluation

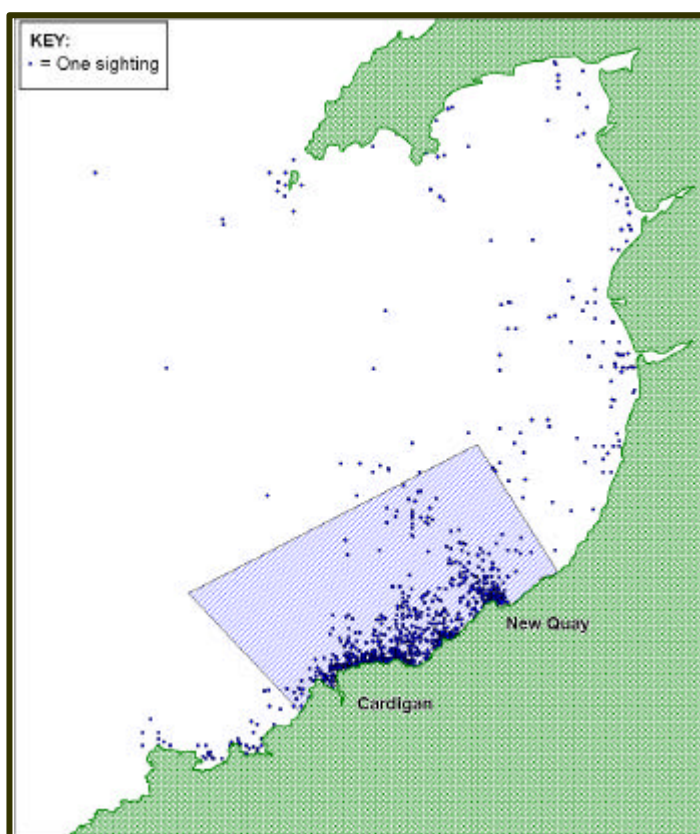
This section provides an evaluation of the sites value in terms of nature conservation, education and research.

3.2.1 Evaluation for nature conservation

3.2.1.1 Size and Range

Figure 15. The distribution of bottlenose dolphin sightings within Cardigan Bay

(Courtesy of SeaWatch Foundation Sightings Database)



The cSAC encloses the areas thought to contain physical and biological factors essential for the life of the bottlenose dolphins. However, bottlenose dolphins in Cardigan Bay may have a wide range and this is certainly known to extend beyond the boundary limits of the cSAC. Identified individuals known to occur within the site have been recorded further up and down the coast. Bottlenose dolphins are also occasionally seen well out in the Irish Sea and also over the intertidal zone when the tide is in⁶⁸.

Whilst the range of the population may be quite large, research suggests that the population size is not. Following a five year photographic study in Cardigan Bay in the early 1990's, the population was estimated at about 127 individuals⁶⁹. Populations of this size are generally acknowledged to be small and vulnerable to impacts. A population model developed for a similar number of bottlenose dolphins in the Moray

Firth, Scotland, predicts that this apparently isolated Scottish population is declining.

This and other population viability analyses have demonstrated that adult survival has the greatest impact on population persistence. The loss of a only few individuals from a population of this size, particularly

⁶⁸ Arnold *et al* (1997); Evans (1992)

Baines, M., Pierpoint, C. And Earl, S. 1997. *A Cetacean sightings database for Wales and an evaluation of Impacts on Cetaceans from the Sea Empress Oil Spill*, CCW Sea Empress Contract Report No. 227. pp 1-66. (Re: sightings records since 1928 + records outside SAC + offshore)

⁶⁹ Arnold *et al* (1997)

adult females, would represent a significant reduction in the capability of such a population to maintain itself in the long term⁷⁰.

3.2.1.2 Diversity

Whilst this site has been selected for a single species, the bottlenose dolphins, it does support a diverse variety of other marine species and habitats including many of considerable conservation value⁷¹.

3.2.1.3 Naturalness

The naturalness of the Cardigan Bay bottlenose dolphins is a difficult value to assess. In comparison with terrestrial habitats, the marine environment is, in general, far more natural. One means of assessment is to consider the degree to which non-natural processes are present. Considering Cardigan Bay in these terms would indicate that it is quite natural; there is little in the way of industry, fishing activity is not highly intensive and most shipping movements occur outside the bay. There is not regular swimming with the dolphins nor are they fed. However, some human interaction with the dolphins is clearly significant and it would be naive to assume that it was not resulting in some change, however small, to their behaviour or lifestyle.

Analyses of tissues from dead strandings in the late 1980's and early 90's, have shown that the concentrations of some anthropogenically derived pollutants, including heavy metals and organochlorines (such as some polychlorinated biphenyls), were unnaturally high in the Bay's bottlenose dolphins⁷².

As predators at the top of food chains, the bottlenose dolphins are heavily reliant on a high degree of naturalness in their surrounding environment; impacts lower down in the food chain may be reflected, even magnified, in the condition of the bottlenose dolphins.

Maintenance of the current level of naturalness would require the prevention of any further increase in anthropogenic influences on the bottlenose dolphins. An improvement in naturalness would require a reduction in the current levels of anthropogenic influences on the bottlenose dolphins

3.2.1.4 Rarity

Although the bottlenose dolphin is not considered rare its status world wide is not known. Whilst not common in abundance, it is a cosmopolitan species, widespread in tropical and temperate waters around the world.

3.2.1.5 Fragility

Bottlenose dolphins are vulnerable not only to short term impacts but also to long term cumulative, chronic impacts. Impacts which appear insignificant may, over the long term or in combination with other impacts, result in significant and irreversible damage to the bottlenose dolphin's status. This is exacerbated by the fact that we are largely unable, with current scientific methods, to detect the effects of impacts on the bottlenose dolphins and their causal links. Successful detection, if possible, is likely to

⁷⁰ Sanders-Reed, C.A., Hammond, P.S., Grellier, K., Thompson, P.M. 1999. *Development of a population model for bottlenose dolphins*. Scottish Natural Heritage Research, Survey and Monitoring Report No. 156, Inverness.

⁷¹ See note in the Preface regarding recent proposed additions to the list of selected features for the site.

⁷² Law, R.J. and Allchin, C.R. 1994. *Organochlorines in the blubber of bottlenose dolphins (*Tursiops truncatus*) and harbour porpoise (*Phocoena phocoena*) from Cardigan Bay (Wales) and the Moray Firth (Scotland)*. ICES CM 1994/(E+N) 9:8pp.

Law, R.J., Allchin, C.R. and Morris, R.J. 1995. *Uptake of organochlorines (chlorobiphenyls, dieldrin; total PCB and DDT) in bottlenose dolphins from Cardigan Bay, West Wales*. Chemosphere, 30:547-560.

take a considerable period of time unless blatantly obvious. Even if cause and effect have been identified, any management action may well be too late to remedy the situation.

As top predators, bottlenose dolphins are vulnerable to changes in their environment. Small insignificant impacts on what may appear to be an unrelated habitat or community may result in significant impacts on the bottlenose dolphins. In addition, their endearing nature attracts considerable human attention, often resulting in increased disturbance.

The relatively small numbers of bottlenose dolphins in Cardigan Bay makes them fragile to small losses in numbers. The loss of relatively few dolphins, in say a stranding event, may represent a sizable proportion of the overall numbers and significantly reduce the ability of the population to sustain itself.

3.2.1.6 Typicalness

The characteristics of bottlenose dolphin populations around the world are quite varied, from size and diet to habitat preference and extent of home range. Whilst similarities exist with other bottlenose dolphin populations, the dolphins of Cardigan Bay can only be regarded as typical in that they vary in these and other aspects as much as any other dolphin group.

Within the UK the Cardigan Bay dolphins, like those of the Moray Firth in Scotland are clearly special in that the area is constantly in use and the same individuals regularly occur within the same areas.

3.2.1.7 Recorded history

The history of bottlenose dolphins in Cardigan Bay is unclear. During the 1920's and 1930's there were numerous references to bottlenose dolphins in the west Wales area⁷³. Strandings records (provided by the Institute of Zoology, Regent's Park, London) for the whole of the Welsh coast show that bottlenose dolphins have been present there since soon after the Natural History Museum (NHM) strandings scheme was initiated in 1913 (with 2 animals stranded in Gwynedd in 1916). Although it has been suggested that this species may not have been present in the area until the late 19th or early 20th century, it is difficult to be sure.

The UK Mammal Society Cetacean Group established recording of voluntary sightings in 1973. This is now maintained by Sea Watch Foundation. Since 1997 a regional copy of the Sea Watch Foundations sightings database has been established within west Wales.

In more recent years a variety of research, some of it long term but mostly short term, has been conducted on the dolphins within the bay. A list of literature pertaining to cetacean related projects conducted within Cardigan Bay is given in Appendix 3.

3.2.1.8 Ecological position

The bottlenose dolphin is a large carnivorous predator and sits at the top of marine food chains within Cardigan Bay. As a result, it is very reliant on the success of the trophic levels beneath it.

As both the dolphin and its prey can be highly mobile, there will be a wide spatial spread of the dolphin's ecological unit (i.e. the spread of the marine food web and environmental processes on which the bottlenose dolphin depends). This means that impacts some distance outside the Cardigan Bay cSAC may affect the bottlenose dolphins.

It will be important for management decisions to consider potential indirect impacts to the bottlenose dolphins even when the issue at hand may appear unrelated.

⁷³ Evans & Scanlan (1988)

3.2.1.9 Potential for improvement or restoration

There is considerable potential to reduce the current levels of anthropogenic impacts to raise the current level of naturalness of both the dolphins and their habitat. This is particularly the case in those areas which are of greatest importance to the dolphins.

Further research is required to identify the costs and benefits of reducing certain impacts. This should include consideration of long term, short term, cumulative and synergistic effects.

3.3.2 *Evaluation of the cSAC for public use, access, education and interpretation*

Bottlenose dolphins are attractive and gregarious animals. They draw considerable interest both from locals, tourists and education establishments.

Bottlenose dolphins are frequently visible at close range from the shore at several accessible locations within the site. Access by boat can be achieved during the summer months where dolphins might be viewed during one of the numerous wildlife cruises which work out of New Quay and Aberaeron. A marine wildlife interpretation centre exists in New Quay which focuses on cetaceans and will soon have live transmission of underwater dolphin vocalisations. The aquarium in Aberaeron contains displays about the bottlenose dolphins.

There is considerable potential for the site to provide an important and successful education resource both for education establishments and the general public. However, there is the potential for such use, through increased disturbance, to adversely affect the condition of the bay's bottlenose dolphins. Therefore, use of the site for education and interpretation will need to be carefully managed. Demonstrably good management will further enhance the site's educational value.

3.3.3 *Evaluation for research and study*

Despite the lack of local research establishments with cetacean expertise, there is great potential for Cardigan Bay to be used for research and study of bottlenose dolphins. Much is still to be learnt about the Cardigan Bay bottlenose dolphins, and there are many areas where further research could usefully inform site management.

Research will be hindered to some extent by the rather open and exposed nature of the site and the paucity of non-drying harbours. There is also the potential for research use to adversely affect the condition of the bay's bottlenose dolphins through increased disturbance. Therefore, use of the site for research and other similar activities will need to be carefully managed. Good management of this activity which includes, for example, the maintenance of a research project's record could help to further enhance the site's research value.

4. CONSERVATION OBJECTIVE, LIMITS & MONITORING

This chapter contains the conservation objective for the site. An explanation is given of how the objective is defined and how it will be monitored. This section aims to provide a brief understanding of the site's main objectives and their development.

4.1 Introduction

The purpose of the conservation objective is to define the nature conservation aspirations for the site's bottlenose dolphins. This gives a clear purpose to the management of the site and allows us to determine, through monitoring, whether or not the objective has been met and consequently the success or otherwise of site management.

(This section is based on information provided by CCW in fulfilment of Regulation 33 of the Conservation (Natural Habitats, &c.) Regulations 1994, which require CCW to advise the other relevant authorities as to the conservation objectives for the site. A copy of this advice is available from CCW on request.)

4.2 Explanation of the structure of the conservation objective

The structure of the conservation objective is largely based on CCW's publication 'A guide to the production of management plans for nature reserves and protected areas'⁷⁴, which contains a full explanation of the underlying principles.

The overall objective for the site is to maintain the Cardigan Bay Bottlenose Dolphin population at Favourable Conservation Status, as defined in the Habitats Directive. Monitoring the achievement of this objective can be achieved through use of a series of performance indicators.

The feature of the site - the bottlenose dolphin population - can be represented by a series of "attributes". These are measurable indicators indicative of the condition of the feature, such as the number of animals, or their distribution. For each attribute, a "target value" can be identified, which is believed to be indicative of the favourable condition of the feature, that is, the condition we wish the population to attain. (See Figure 16).

All attributes of a feature can be expected to display some natural variability. Therefore for a feature to be considered in favourable condition it does not necessarily require each attribute to be exactly at its target value. Upper and lower "limits of acceptable change" can be defined for each attribute, within which its value can fluctuate without giving cause for concern. An upper or lower limit may not necessarily be specified in all cases, as some types of change may not be considered to be of concern.

Monitoring⁷⁵ is carried out to determine the actual values of attributes, and where they lie in relation to the target and limits of acceptable change. Following monitoring, judgments can be made on the condition of the feature. (See hypothetical example, Figure 16.).

⁷⁴ Countryside Council for Wales.1996. *A guide to the production of management plans for nature reserves and protected areas*. Countryside Council for Wales. Bangor.

⁷⁵ 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.

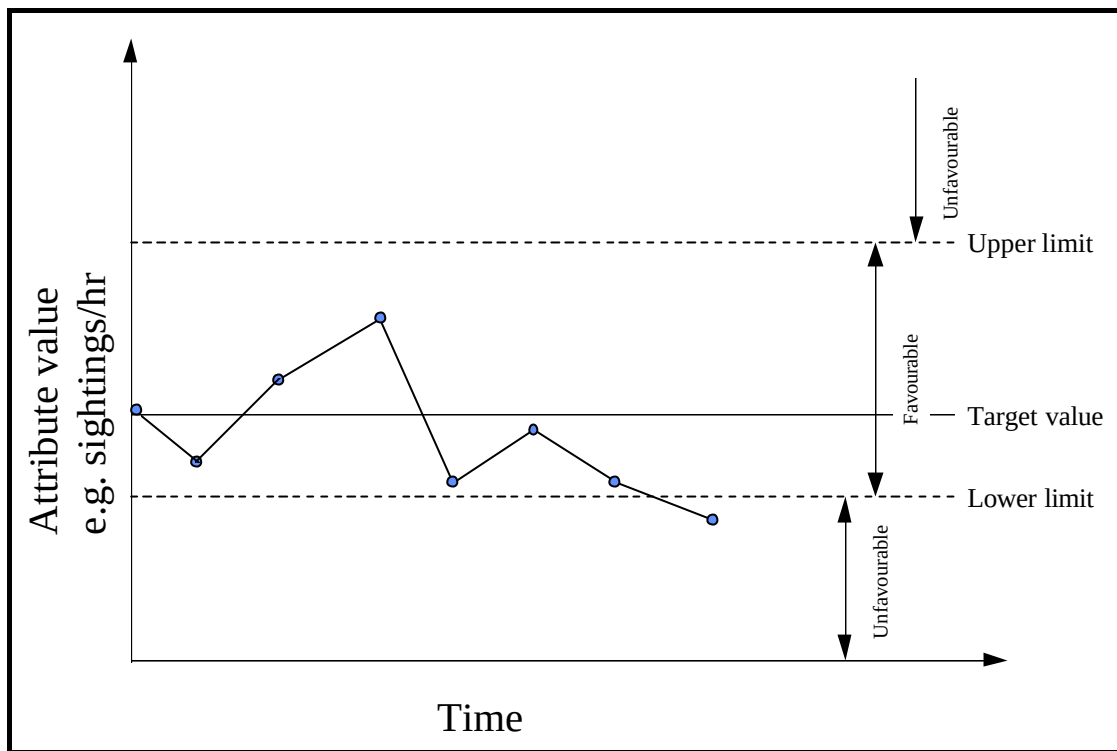


Figure 16. Attribute Monitoring.

The fluctuation of an attribute's value recorded over eight monitoring events. The condition of the feature eventually falls below the lower limit and becomes unfavourable. (Note: If in the very unlikely event that sightings/hr were used as an attribute there would probably not be an 'upper limit' at which sightings/hr became unfavourable.)

It is important to note that limits of acceptable change are identified to act as triggers for some form of response. This will initially be to seek to establish the cause of the change, followed, if necessary, by some form of management action. Limits of acceptable change may also reflect the effective precision with which monitoring can be undertaken. The breach of a limit means that the condition of the feature must initially be reported as unfavourable.

4.3 The identification and selection of attributes for the Cardigan Bay bottlenose dolphins

It is essential that each attribute reflects the condition of the feature and is measurable (monitorable) to a sufficient level of precision. The methods employed for monitoring each attribute must not undermine the achievement of the conservation objective. For example, were levels of disturbance to the dolphins from monitoring likely to result in unfavourable condition, the use of that monitoring method and possibly that attribute (were this its only available monitoring method) would be unacceptable.

Possible attributes for the Cardigan Bay bottlenose dolphins are:

- Total population size
- Abundance within the SAC
- Rate of change of abundance
- Distribution

- Reproductive success and mortality
- Population structure
- Health

Other possible attributes for the Cardigan Bay cSAC are:

- Indicators of Habitat condition

Two of these, ‘bottlenose dolphin abundance’ and ‘distribution within the cSAC’, have been chosen for monitoring and are given in Table 6. with the conservation objective for the site. As knowledge of the dolphins improves and with the development of improved monitoring methods it may be pertinent to monitor further attributes.

4.4 Objective, limits and monitoring

The methods to be used in monitoring bottlenose dolphin abundance and distribution are currently being determined. Whilst the exact nature of the attribute and target values will be determined by the methods employed it is anticipated that; mean abundance within the SAC will initially be calculated annually but with seasonal means being used if possible; the distribution of the bottlenose dolphins will be determined by estimating mean abundance in several locations either annually or seasonally as appropriate.

Table 6. Cardigan Bay cSAC conservation objective performance indicators for monitoring favourable condition.

CONSERVATION OBJECTIVE – PERFORMANCE INDICATORS	
To contribute to maintaining the Cardigan Bay cSAC bottlenose dolphin population in favourable condition, where the following attributes are recorded within their limits of acceptable change (LACs)	
<i>Favourable Condition</i>	
Attribute	Target and limits
Mean abundance of bottlenose dolphins within the cSAC	Target: To be determined (long term) Upper LAC: None required Lower LAC: ‘Current’ level (to be determined)
Mean abundance of bottlenose dolphins within areas X, Y, Z (selected areas, of greatest importance to the dolphins)	For each identified area: Target: To be determined (long term) Upper Limit: None required Lower Limit: ‘Current’ level (to be determined)

4.5 Current condition of the feature

Target values and limits of acceptable change, which are indicative of favourable condition, will eventually be defined for each attribute chosen to monitor favourable condition of the site’s bottlenose dolphins. Despite the many studies of bottlenose dolphins in Cardigan Bay it has been difficult to determining targets which represent favourable condition. For example, we have no information as to how rapidly or widely the population size and distribution of bottlenose dolphins using Cardigan Bay naturally fluctuates, nor at what position within its range of fluctuation the population currently exists.

Local initiatives and recent studies conducted as part of the Life project have been attempting to redress this balance.

The bottlenose dolphin is not as widespread in UK waters as it once was and, though unmeasured, it is probable that human activities have had some affect on the dolphins. For example, evidence from a limited number of strandings suggests that dolphins using the bay carry high levels of organochlorines (OCs), particularly polychlorinated biphenyls (PCBs). These toxins are known to cause a variety of deleterious effects in mammals.

With this lack of knowledge there is a potential to specify incorrect values for targets and limits. Therefore, adopting a precautionary⁷⁶ approach, the initial values for abundance and distribution will be taken to represent the minimum level acceptable. i.e. the lower limit of acceptable change. The limit and target values will be refined as our knowledge increases sufficiently to enable us to do so. Initial values will be determined either during monitoring trials or from a primary monitoring event once a monitoring programme is in place.

4.6 Surveillance of additional attributes

It is not yet considered possible or appropriate to use some of the potential attributes described in section 4.3. The identification and selection of attributes for the Cardigan Bay bottlenose dolphins above as a means of measuring the condition of the site's bottlenose dolphins. Some of these are, instead, considered priorities for surveillance and are listed below. Surveillance, whilst hopefully helping to reveal changes in the status of the cSAC's dolphins, will also improve our knowledge of the population, possibly to the extent of eventually enabling full use of the attribute to properly monitor bottlenose dolphin condition.

In addition to the surveillance of these additional attributes, many of the factors affecting the bottlenose dolphin population and its habitat will also need to be subject to surveillance. This is described in section 5. of this management plan, dealing with the factors affecting the feature and the management response.

Priority Attributes for surveillance:

- Reproductive success and mortality
- Population structure
- Health

4.7 Further work needed

Considerable further work, beyond that recently undertaken, is required to refine the targets and limits of acceptable change. This work requires time, the knowledge required will emerge only slowly as information is gathered from monitoring and surveillance projects.

It is also important to see the site's conservation objective in a wider view, one in which we understand more fully the dolphins' environmental requirements and population dynamics such as habitat and diet

⁷⁶ precaution: '*Prudent foresight*'. Concise Oxford English Dictionary. Fifth Edition.

'A measure taken in advance to prevent something undesirable from happening'. Concise Oxford English Dictionary. Tenth Edition.

Cardigan Bay SAC Management Plan – *CONSERVATION OBJECTIVES*

preferences, range and mobility. Whilst some of this information will undoubtedly come from monitoring and surveillance projects, some further targeted research beyond current projects such as the broadscale seabed habitat survey will be required.

5. FACTORS WHICH INFLUENCE OR MAY INFLUENCE THE BOTTLENOSE DOLPHINS.

Within this section each factor that influences or may influence the bottlenose dolphins is described. The current and potential effects on the bottlenose dolphins are considered alongside existing management and socio-economic requirements to determine the need, or otherwise, to modify existing management or introduce something new. Actions are specified where required. This section aims to provide a logical and transparent explanation for the development of any site management.

5.1 Introduction

Section 5 of the document has 5 main sub section:

- 5.1.1 Main Impact Mechanisms

Describes the main mechanisms by which the favourable conservation status of Cardigan Bays bottlenose dolphins could be adversely affected.

- 5.1.2 Assessing certain types of operation

Describes the legislative background and procedures for assessing the potential for certain types of operation to adversely affect site integrity.

- 5.1.3 Generic management options

Defines a series of generic management options that are then used in sections 5.2 and 5.3.

- 5.2 Natural factors

Examines the potential for key natural factors, such as sea temperature and climate, to adversely affect favourable conservation status, and where relevant proposes management actions.

- 5.3 Human induced factors

Examines the potential for human induced factors, such as recreational boating and oil & gas exploration, to adversely affect favourable conservation status, and where relevant proposes management actions.

‘Factors’

Within the context of this document ‘factors’ are both natural processes and human activities that have the potential to affect features of European marine sites. Section 5 identifies and assesses the relevance of factors that may influence, either positively or negatively, the Cardigan Bay bottlenose dolphins.

For each factor described in Sections 5.2 and 5.3, there is a brief:

Extent of the activity

- description of the activity and its current status, including distribution and intensity,

Mechanism for effect on the feature

- description of the mechanism(s) by which it may affect the dolphins,

Management response

- description and consideration of existing management and an evaluation of any need to modify current management, monitoring or surveillance of the activity,
- description of actions to maintain aspects of existing management and implement new measures in existing management, monitoring and surveillance.

Cardigan Bay SAC Management Plan – *FACTORS*

Where appropriate this review, and assessment of management requirements, has been provided by the relevant authority with regulating powers over the factor being addressed. All the actions identified in this review are listed as a summary table in section 6.

The factors are not presented in any order of priority for action, but are grouped roughly into similar types. It should be noted that factors act together on the bottlenose dolphins, possibly synergistically, and forming a cumulative impact.

5.1.1 Main Impact Mechanisms

Many of the natural influences addressed within section 5.2 and activities addressed within section 5.3 have the potential to impact on the dolphins in similar ways. To avoid repetition, the most common mechanisms are described below and are extensively cross referenced, where appropriate, from within the assessment of each factor.

5.1.1.1 Disturbance

It is recognised that a range of human activities have the potential to disturb cetaceans, although it is difficult to assess the effects of disturbance. Under current UK⁷⁷ and European⁷⁸ wildlife legislation, it is illegal to deliberately disturb bottlenose dolphins. However, defining ‘disturbance’ and the need to prove any disturbance as deliberate weaken this legislation significantly. This weakness in the legislation has been brought to the attention of the relevant government departments by CCW, the other UK country agencies and Wildlife & Countryside Link (WCL). However, leaving aside a precise legal definition, it is generally accepted that ‘disturbance’ in the current context is used to refer to any action which results in a change in the behaviour or physiology of an animal or group of animals, and it is to this definition of disturbance that this document works. Two main forms of disturbance occur; harassment, where there is repetitive close interaction with the dolphins; and noise which may constitute part of harassment or cause disturbance in its own right.

a. Noise

Sound travels far more efficiently through water than air. Low frequency sounds can travel thousands of miles through water. Dolphins use sound as their primary sense for communication, navigation and hunting. They rely, like humans, on a specific range of sound frequencies. Anthropogenic noise in the marine environment is a potential source of disturbance to the dolphins. Increases in the intensity or changes in frequency of underwater noise levels are likely to cause dolphins to move away from the source, at least initially, and in some cases permanently. Such noise may also increase physiological stress, change behaviour patterns including foraging, communication and navigation, or injure the animals. Adverse effects on the dolphins’ energy budget in response to disruptive noise may affect their health and thus their reproductive success and survival.

The shock waves created by powerful underwater explosions can contain sufficient energy to injure or kill dolphins. Seismic surveys using high pressure air guns produce sound waves that may be audible for tens of kilometers from the survey vessel⁷⁹. Dolphins and their prey are known to avoid an area for several kilometres round a seismic vessel. Continuous or loud repetitious noise, especially of a limited frequency range, may not only disrupt normal behaviours but also damage the dolphins’ ability to hear and communicate, and could encourage them to abandon an area entirely.

Most anthropogenically created underwater noise in the shallow coastal waters of Cardigan Bay originates from boat activity. Most of the noise generated by boats comes from the engine and

⁷⁷ Wildlife and Countryside Act (1981) as amended.

⁷⁸ The Conservation (Natural Habitats, &c.) Regulations (1994) - (*Taken as the Habitats & Species Directive transposed into UK law*)

⁷⁹ Goold, J.C. 1996. Acoustic assessment of populations of common dolphin *Delphinus delphis* in conjunction with seismic surveying. J. Mar.Biol.Ass. UK **76**:811-820.

Engas, A., Lokkeborg, S., Ona, E. & Soldal, A.V. 1993. Effects of seismic shooting on catch availability of cod and haddock. Institute of Marine Research, Norway Fiskeri og Havet, No. 9.

Lokkeborg, S. and Soldal, A.V. 1993. The influence of seismic exploration with airguns on cod (*Gadus morhua*) behaviour and catch rates. ICES Mar.Sci.Symp., **196**:62-67.

transmission, and through propeller cavitation. The operating condition of this equipment can significantly affect the intensity and frequency of noise developed. Other, potentially significant, generators of underwater sound include the oil and gas industry, underwater construction, dredging and dumping operations and military ordnance tests. Just like other animals it is likely that dolphins are startled by sudden unexpected noise. They might be most likely to habituate to sounds which are predictable and unvarying⁸⁰, particularly if suitable alternative areas are not readily available.

b. Harassment

Boating and other activity not only generates noises that can disturb cetaceans, but the behaviour and volume of operations in an area may also inadvertently or directly harass the animals. The mechanism for this type of disturbance is comprehensively defined within the New Zealand Marine Mammal Protection Regulations 1992, where the term ‘Harass’ includes “... *to do any act that causes or is likely to cause injury or distress to any marine mammal, or disrupts significantly or is likely to disrupt significantly the normal behavioural patterns of any marine mammal.*” Vessels in close proximity, travelling at high speed and/or behaving erratically in the vicinity of dolphins may elicit a range of subtle physiological responses as well as more observable or acoustically detectable changes in behaviour. The effects of such disturbances are difficult to assess. However, cetacean responses to boats in the vicinity may include movement away from vessels, as well as changes in ventilation, vocalisation and social behaviour patterns⁸¹.

Dolphin response to vessels also varies with boat type and behaviour; quieter boats travelling at high speed appear to cause more disturbance than slower, larger boats that emit higher intensity noise⁸². Dolphins are more likely to become tolerant of predictable or regular boating activities, such as the slow movement of a large displacement vessel along a steady course. If disturbance persists, animals may move away for relatively short periods, or abandon an area altogether. However, emigration may not always be an option, if their social and biological requirements are not available in alternative locations. In such cases, there may be adverse effects on the dolphins in the long term, including reductions in health, reproductive success and survival.

5.1.1.2 Collisions

Boat activity in the vicinity of dolphins may result in inadvertent collisions with dolphins resulting in injury or death. The probability of collisions, which is typically low, increases with the density of dolphins and vessels, their proximity to each other and the dolphin’s physical or social condition. In Cardigan Bay, no dolphins are known to have been killed by boat collision, but there has been one dead harbour porpoise whose lesions were suspected to have been caused by a propeller⁸³. Dolphins are also more capable of avoiding collision from a vessel if the vessels’ course is predictable and if there is an adequate room or depth for escape.

⁸⁰ Gordon, J.C.D., Gillespie, D., Potter, J., Frantzis, A., Simmonds, M., Swift, R. 1998. The effects of seismic surveys on marine mammals. In: Centre for Marine & Petroleum Technology, Seismic & Marine Mammals Workshop Documentation. 23-25 June 1998, LSE, London.

⁸¹ Arnold, H. 1997. The Dolphin Space Programme: The development and assessment of an accreditation scheme for dolphin watching boats in the Moray Firth. A Report for Scottish Wildlife Trust, Scottish Natural Heritage and the EU LIFE Programme. Inverness.

⁸² Evans, P.G.H., Canwell, P.J. and Lewis, E.J. 1992. An experimental study of the effects of pleasure craft noise upon bottle-nosed dolphins in Cardigan Bay, West Wales. In: Evans, P.G.H. (ed.) European Research on Cetaceans - 6. European Cetacean Society, Oxford. pp 43-46.

⁸³ Kirkwood *et al* 1997

5.1.1.3 Pollution

Pollution in the marine environment can be highly complex in nature, and may have either a direct effect on the bottlenose dolphins, or an indirect effect, by reducing the availability of food to that species or changing the habitat significantly⁸⁴. With the current level of regulation of discharges to air and water, the most significant UK sourced pollutants can be chemicals that were only discharged in substantial amounts a long time ago. Highly persistent toxic substances, such as organochlorines (that degrade very slowly) and heavy metals (that never degrade), can remain a problem for decades or centuries after they were released into the environment.

This is probably the case in Cardigan Bay, where bottlenose dolphins may be accumulating, or have accumulated, significant amounts of polychlorinated biphenyls (PCBs) and perhaps some heavy metals through bioaccumulation⁸⁵ and biomagnification⁸⁶ via the food chain on which they depend. Regulated sources of these contaminants are tiny compared with the amounts already in the marine environment. Toxic burdens of persistent chemicals (particularly those stored in blubber) such as organochlorine compounds may remain within a population for some time, a proportion being passed from mother to calf during gestation and weaning.

As a top predator, the bottlenose dolphin is very reliant on the success of the trophic levels beneath it. The dolphins and their prey may range widely and thus become exposed to pollutants over a wide geographical area. In this situation the contamination status of Cardigan Bay may not be the only, or even the most important, factor in the influence that pollution has on the dolphins encountered there. Relatively high levels of organochlorines, or heavy metals such as mercury, could be leading to chronic effects on the health of the dolphins (acute effects are far less likely) and may reduce their ability to resist disease or reproduce. The routes by which these contaminants accumulate in the Cardigan Bay dolphins are, however, very uncertain, and a considerable amount of research will be required to understand them and their significance for the continued well-being of the Cardigan Bay dolphin population.

5.1.1.4 Entanglement & Ingestion

Bottlenose dolphins may become entangled in underwater debris and equipment particularly in fishing gear such as rope, line and netting⁸⁷. Marine debris including fishing hooks and line may also be ingested directly, or inadvertently within or attached to prey items, causing internal injury and death⁸⁸. Primary sources of debris are litter and active, lost and discarded fishing and angling gear. The harder the debris is to detect the greater the likelihood of entanglement. Likelihood of entanglement will be density (of bottlenose dolphins, fishing gear, debris and litter) dependent. Significant problems have been identified elsewhere in the world with mono and multi-filament nylon line and netting.

⁸⁴ Morris, R.J., Law, R.J., Allchin, C.R., Kelly, C.A., Fileman, C.F. 1989. Metals and organochlorines in dolphins and porpoises of Cardigan Bay, west Wales. *Mar. Poll. Bull.* **20**(10): 512-523.

Law, R.J. 1994. Collaborative UK Marine Mammal Project: Summary of data produced 1988-1992. MAFF Fisheries Technical Report No. 97, Directorate of Fisheries Research, Lowestoft

⁸⁵ Bioaccumulation is the net accumulation of a substance within an organism resulting from the rate of uptake exceeding the rate of loss through excretion or metabolism.

⁸⁶ Biomagnification is the increase in amount of a substance per organism up the food chain as a result of the transfer of substances from prey to predator. i.e. a predator takes on the entire pollution burden of all its prey.

⁸⁷ Wells, R.S., Hofmann, S., Moors, T.L. 1998. Entanglement and mortality of bottlenose dolphins, *Tursiops truncatus*, in recreational fishing gear in Florida. *Fishery Bulletin*, **96**(3):647-650.

Mann, J., Smolker, R.A. and Smuts, B.B. 1995. Responses to calf entanglement in free-ranging bottlenose dolphins. *Mar.Mamm.Sci.* **11**:100-106.

⁸⁸ Gorzelany, J.F. 1998. Unusual deaths of two free-ranging Atlantic bottlenose dolphins (*Tursiops truncatus*) related to ingestion of recreational fishing gear. *Marine Mammal Science*. **14**(3):614-617.

As dolphins breathe air, entanglement underwater may result in drowning. Animals may also die due to choking, restriction of blood vessels or during removal from gear. Struggling animals typically injure themselves in an attempt to get free or during removal. For example, a young bottlenose dolphin calf died in Cardigan Bay in 1994 as a result of severe abdominal injuries; the injuries it sustained indicated that it was probably entangled in a net and fatally injured during removal⁸⁹. Linear cuts and indentations around the head and fins are typical signs of a once entangled dolphin. Ingested items are known to cause internal injury and death.

It is often difficult to document bycatch of marine mammals in small-scale coastal gill net fisheries due to difficulties in placing observers in these fisheries. In such cases, identification of bycatch may rely on documentation of physical evidence of entanglement in stranded animals. For example, harbour porpoises are known to be entangled in small-scale gill net fisheries that operate seasonally along the coasts of North Carolina⁹⁰, Virginia, and Maryland, but these by-catches are not reported to state or federal agencies

Analysis of dead stranded dolphins is one way in which we are able to look for evidence of entanglement problems within the bay, and a strandings programme is currently in place. The largest single cause of death for cetaceans found along English and Welsh coasts between 1990-1995 was fisheries bycatch⁹¹. Accidental capture in fishing gear was also the single most important cause of death for harbour porpoises in Great Britain from 1988-1995⁹². Over 20% of examined harbour porpoises and other cetaceans stranded on the Welsh coast from 1989-1991 were found to have been caught in fishing gear⁹³.

However, not all bycaught cetaceans show clear net marks or other injuries, and the ability of even an experienced examiner to detect evidence of entanglement is often determined by the condition of the carcass. It is likely that among the harbour porpoise and other species of English and Welsh cetaceans in which physical trauma of unknown cause was diagnosed, there were further bycatch cases. It is therefore possible that the true incidence of bycatch in UK stranded cetaceans has been underestimated⁹⁴. Similarly, studies in North Carolina show that evidence of fisheries interaction such as net marks, removed appendages, slit abdomens, attached gear and propeller cuts diminish with deteriorating condition of the carcass⁹⁵. This too suggests that evidence from strandings underestimates the impact of human interactions on cetaceans.

5.1.1.5 Pathogens

Bottlenose dolphins are susceptible to a range of macroscopic and microscopic parasites and, like many wild animals, often support naturally high parasite burdens. Whilst most parasites typically have a preferred host in which they are most successful, certain pathogens are able to exist in multiple host species, although the type and degree of effect on their host often varies.

⁸⁹ Kirkwood et al 1997

⁹⁰ A. Read, T. Cox, S. Barco, J. Evans, D. Gannon, H. Koopman, B. McLellan, K. Murray, A. Pabst, C. Potter, M. Swingle, V. Thayer, K. Touhey, & A. Westgate. 1997. *Documenting bycatch of marine mammals in coastal fisheries: observations of stranded harbour porpoises along the Mid-Atlantic coast*. Fifth Annual Atlantic Coastal Dolphin Conference. University of North Carolina.

⁹¹ Kirkwood, J.K., Bennet, P.M., Jepson, P.D., Kuiken, T., Simpson, V.R. and Baker, J.R. 1997. Entanglement in Fishing Gear and Other Causes of Death in Cetaceans Stranded on the Coast of England & Wales, *The Veterinary Record*, **141**: 94-98.

⁹² Law 1994; Kirkwood et al 1997

⁹³ Baker & Martin 1992

⁹⁴ Kirkwood et al 1997

⁹⁵ Touhey, K., Hohn, A., and V. Thayer. 1997. *Detecting Evidence of Human Interaction in Stranded Bottlenose Dolphins: It's Conditional*. Fifth Annual Atlantic Coastal Dolphin Conference. University of North Carolina.

Certain human activities, particularly those that put dolphins in contact with other mammals or their waste products, increases the potential for transmission of any such organisms to the bottlenose dolphins. Humans touching dolphins, the introduction of relocated dolphins, human and cattle wastes are all methods by which this could potentially occur.⁹⁶

Whilst increasing the burden of existing parasites will be detrimental to the dolphins, it is the introduction of a virulent novel parasite or parasite strain, one to which they are not already exposed, which may have the most rapid and serious effect. It should be noted however that immunosuppression resulting from other impacts on the bottlenose dolphins is probably of greater threat in facilitating the rapid spread and increased host mortality of a parasite. The spread and impact of Morbillivirus in striped dolphin populations of the Mediterranean⁹⁷ and seals of the Dutch Wadden Sea⁹⁸ possibly as a result of PCB induced immunosuppression, for example, illustrates this well.

5.1.1.6 Prey depletion

Bottlenose dolphins, in general, are known to feed on a variety of fish and invertebrates such as molluscs⁹⁹ and crustaceans. As opportunistic feeders, different dolphin populations in different habitats have different diet preferences. Unfortunately there is very little information on the diet of the Cardigan Bay dolphins. Existing information is based upon a few dolphin autopsies and observation of surface feeding behaviour. From visual observations it is believed that pelagic and seasonal fish such as mackerel, herring, sprat, bass, sewin (sea trout), salmon and mullet form a proportion of their diet within the bay¹⁰⁰. The turbidity of local waters and the general nature (behaviour) of the bay's dolphins has made observations of underwater feeding behaviour difficult. Analysis of the acoustic behaviour of dolphins as well as their distribution and that of their prey may in the future improve our understanding of dolphin diet. Research projects are currently trying to identify potential dolphin prey on or near the seabed.

Certain human activities have the potential to reduce the prey available to the bottlenose dolphin both in variety and abundance. This can be through direct removal of the prey species by fishing activities or by impact on the prey or their habitat through noise, pollution, fisheries and marine development.

A reduction in the diversity, abundance or size of prey, or changes in their distribution will detrimentally impact the dolphins energy balance and may result in a change in dolphin distribution, reduced growth rate, reproductive success and survival. In addition, toxic contaminants like PCBs that are stored in fatty tissues will be mobilised when starving animals draw on their blubber reserves for nourishment. The degree of effect is likely to be largely determined by the level of reliance of the dolphins on the species of prey affected.

⁹⁶ A summary of anthropogenically derived or transmitted pathogens which may affect bottlenose dolphins is given in Grellier *et al* (1995).

⁹⁷ Aguilar, A., & Raga, J.A. 1990. *Mortality of dolphins in the Mediterranean Sea*. *Politica Cientifica*, 25: 51-54 (in Kuiken, T., Bennett, P.M., Allchin, C.R., Kirkwood, J.K., Baker, J.R., Lockyer, C.H., Walton, M.J., Sheldrick, M.C. 1993. *Is there a link between PCB levels and cause of death in harbour porpoises (*Phocoena phocoena*)?* In: Evans, P.G.H. (Ed.) *Research on Cetaceans - 7*. Proceedings of the seventh annual conference of the European Cetacean Society, Inverness, U.K., February, 1993. 195-197)

⁹⁸ Brouwer, A., Reijnders, P.J.H., and Koeman, J.H. 1989 Polychlorinated biphenyl (PCB)-contaminated fish induces vitamin A and thyroid hormone deficiency in the common seal (*Phoca vitulina*). *Aquat. Toxicol.*, 15: 99-106 in Kuiken *et al* (1993).

⁹⁹ Mostly Cephalopod molluscs such as squid and cuttlefish.

¹⁰⁰ Arnold, H. 1993. Distribution, abundance, and habitat use of bottle-nosed dolphins in Cardigan Bay, Wales, 1992. In: Evans, P.G.H. (Ed.) *European Research on Cetaceans – 7*. European Cetacean Society, Oxford. pp. 63-66

5.1.1.7 Habitat Impacts

Many activities have the potential to alter or detrimentally affect the sea bed and its marine communities. As a top predator, bottlenose dolphins are heavily reliant on the condition of the trophic levels beneath them in their food chain. Changes to the dolphins habitat may ultimately result in changes to the abundance or distribution of their prey.

The presence of a pollution burden within sea bed communities may result in some of this being passed up the food chain to the dolphins. Bioaccumulation and biomagnification may result in high pollutant burdens in the dolphins.

5.1.2 Assessing certain types of operation

a. Plans and projects

In addition to relevant authorities' functions in managing activities through the management scheme, they and other competent authorities have certain specific statutory functions to decide on applications for consents, authorisations, licences and permissions. These are "plans or projects" (p/ps) under the Habitats Directive. At present, only certain types of operations affecting marine and coastal areas (e.g. planning applications, discharge consents, transport and works orders) are specifically defined as p/ps in the UK Habitats Regulations. However, guidance from the European Commission¹⁰¹ makes it clear that the 'Habitats' Directive indicates a broad interpretation should be taken to 'plan' and 'project'. Further UK Regulations are to be enacted to apply the Directive's requirements about p/ps to other types of operation, but at time of writing it is not known to which types of operation the new Regulations will apply.

The 1994 Habitats Regulations set out the procedure that must be followed for the consideration of a p/p. This is summarised in Figure 17., which is taken from Planning Guidance issued by the former Welsh Office (*Planning Guidance (Wales) Technical Advice Note (TAN) 5: Nature Conservation and Planning*. Welsh Office, November 1996). In essence, the process is as follows: For any proposed p/p, the competent authority should make an initial consideration, in consultation with CCW, to establish whether or not it is likely to have a significant effect. They may proceed where it is not likely to have such an effect. If a significant effect is likely, either alone or in combination with other p/ps, an appropriate assessment must be undertaken to establish whether the p/p will have an adverse effect on the integrity of the site. If the assessment reveals that it will not have an adverse effect, the p/p may proceed.

Although the process outlined in Figure 17. is applied specifically to the consideration of proposed developments by planning authorities, similar steps are applied by the Regulations to any type of p/p. A p/p for which consent has been given but which has not yet been implemented, must be reviewed as soon as practicable by the competent authority, under a similar process to that set out in Figure 17.

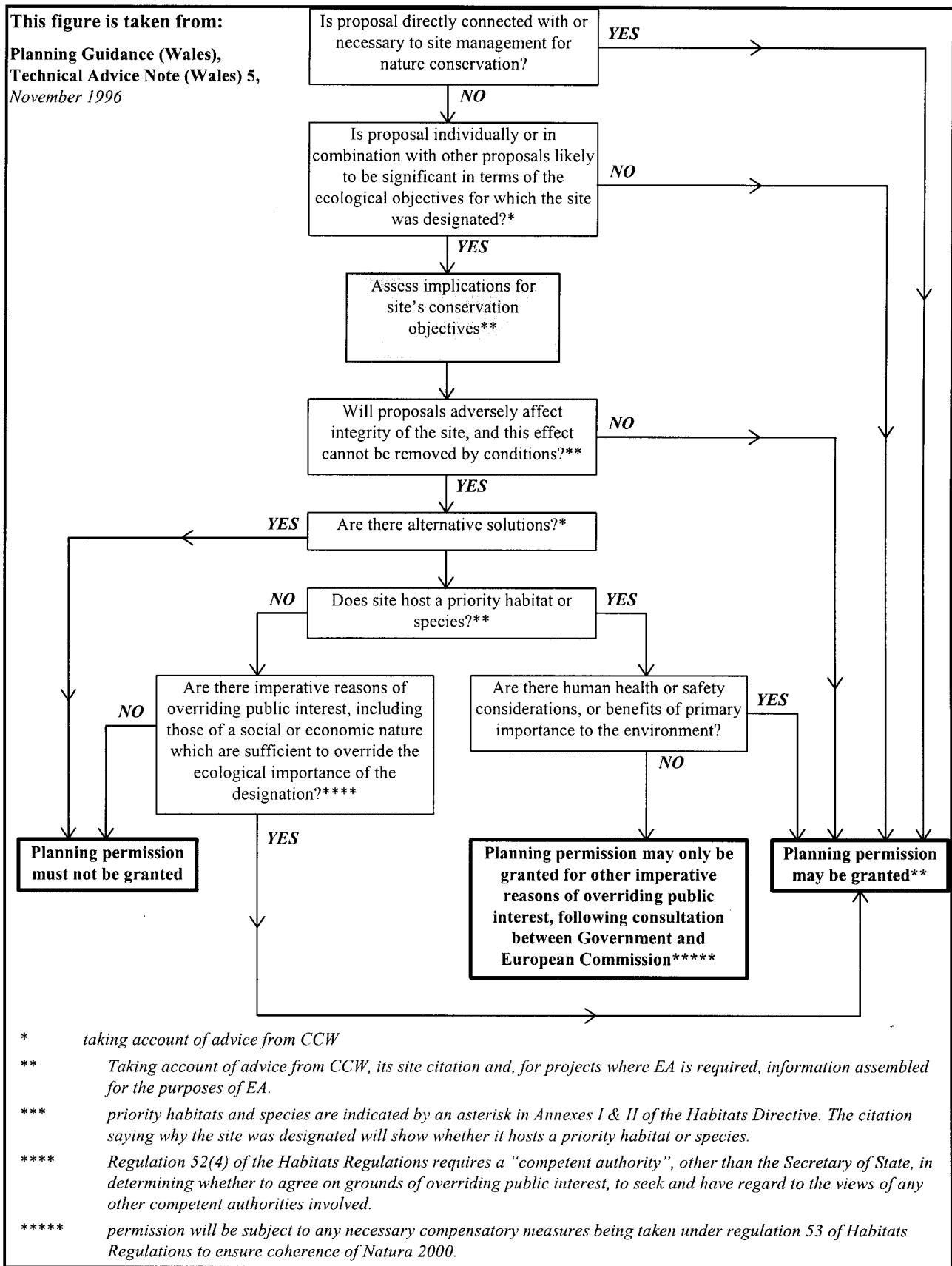
The decision about whether or not to give consent to a p/p affecting an SAC is made by the competent authority which would normally be responsible for authorising it. This authority should seek the advice of CCW who will, on request, advise on the significance of any activity or p/p which has the potential to affect the Bottlenose dolphins.

A fuller account of the procedure relating to PPs is contained in:

- *Planning Guidance (Wales) Technical Advice Note (TAN) 5: Nature Conservation and Planning* (Welsh Office, November 1996);
- *European marine sites in England & Wales* (Welsh Office and DETR, June 1998);
- *The Birds and Habitats Directives: Outline Government Position* (DETR, May 1998);
- *Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. (European Commission April 2000).

¹⁰¹ *Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission. April 2000.

Figure 17. Consideration of development proposals affecting SPAs and SACs.



b. Environmental Impact Assessment

Box 3.

Environmental Impact Assessment

It is important not to confuse an “appropriate assessment” of a plan or project in an SAC with an “Environmental Impact Assessment” (EIA). Under EIA legislation, which is separate to the Habitats Directive, certain types of development (e.g. planning consents, highway construction, afforestation) must undergo an assessment of their environmental effects. These requirements¹⁰² apply irrespective of whether there is an SAC involved, and would normally address a wider range of nature conservation and environmental aspects than the features of an SAC. Where an SAC is likely to be affected by a development requiring an EIA, it will be taken into account as part of the EIA, and the EIA may itself be used to fulfil the requirement for an appropriate assessment.

It is not practical to identify in this management plan the types of operation likely to affect the bottlenose dolphin population or its habitat which would be subject to EIA. It is considered sufficient to identify which should be considered as plans or projects under the Habitats Directive and hence which may require appropriate assessment. In each case, the competent authority responsible for considering a proposed operation must ensure that it complies with both sets of requirements. Some types of operation will require appropriate assessment but not EIA, and vice versa.

¹⁰² Town and Country Planning (Environmental Impact Assessment (England and Wales) Regulations. 1999.)

5.1.3 Generic management options

To assist in determining what type of actions need to be taken in managing activities which may affect the bottlenose dolphins, a series of broad management responses has been drawn up and agreed by the sites relevant authorities. These are shown in Table 7. below.

Following consultation of the draft management plan the sites relevant authorities agreed the following general approach that they would take when considering what changes, if any, to existing management of activities is required.

Where there is a lack of information about existing activities (i.e. there is insufficient information to determine whether or not they are adversely impacting the bottlenose dolphins) then there should be some investigation (research) for possible impacts. In the absence of evidence one way or the other, it should not be assumed that the conservation of the dolphin population is compatible with current site use. However, the pattern of existing use has to be recognised. Therefore, the existing level of the activity should be maintained (as far as is possible) at current levels or less (i.e. not increased) until there is some conclusion as to what levels are acceptable.

An increase in intensity of a current activity, significant change in distribution of a current activity or the development of a new activity should be treated as or in a way analogous to that for a plan or project. i.e. the increase or change should not be viewed as acceptable until it has been shown that it will not adversely affect site integrity.

Surveillance and / or monitoring of activities is required for activities that are known to adversely affect the bottlenose dolphins or for which there is uncertainty but a mechanism for effect is known. This will allow some early warning of potential increases in activity and provide a baseline of information if there is ever a need to investigate the cause of a loss of favourable condition.

It was appreciated that the degree to which each relevant authority could conduct surveillance or monitoring would vary, being influenced by available resources and the scope of the activity. The degree to which existing statutory and institutional arrangements enabled activities to be “maintained at current levels” would also vary. This was particularly noted as being the case for fisheries and also various recreational activities not subject to formal management or regulation.

Where a management response requires some form of action this is given in section 5.2 or section 5.3 after the rationale for each factor. A summary of all actions, comprising all of the actions generated in section 5 is provided in section 6.

For most factors there is considerable uncertainty as to whether they are, or are not, having an effect on the bottlenose dolphins. Showing irrefutably that an activity is adversely affecting the bottlenose dolphins is very difficult indeed; the low level of knowledge, scientific capabilities and available resources all conspire to hinder this. Even where there is some information - for example through examination of the few bottlenose dolphin strandings suitable for autopsy - it is very difficult to determine the factors contributing to a dolphin's death. A high parasite burden may, for example be as a result of natural causes, anthropogenic causes such as pollution induced immunosuppression, or a combination of both.

It is essential that the ‘precautionary principle’¹⁰³ is followed on behalf of the dolphins, to take actions early enough to minimise potentially serious or irreversible effects. Management decisions will need to take into account reasonable predictions of likely effects of human activities on the animals, despite a paucity of supporting scientific evidence

¹⁰³ Precautionary Principle: “Even if it has not been demonstrated, but an activity is considered ‘likely’ to have a significant impact on the feature, appropriate actions should be taken to manage that activity to prevent the impact”. (This is just one of many differing definitions of the ‘Precautionary Principle’. Whilst most of the site’s relevant authorities sign up to this definition it should not be taken that all relevant and competent authorities relevant to Cardigan Bay cSAC site management would also.)

Table 7. Generic Management Options

Cod e	Judgement	Management
F1	The activity constitutes a plan or project.	• Apply Habitats Regulations 48-53.
F2	There is no known mechanism for the activity to affect the feature, and no evidence that it is having a significant adverse effect.	• Not considered further at present.
F3	There is no known mechanism for the activity to affect the feature, but there is evidence that it is having a significant adverse effect.	• Research • Activity surveillance • Experimental or trial management • Identify and implement operational limits.
F4	There is a known mechanism for the activity to have an effect, but there is insufficient evidence at present to determine whether or not it is having a significant adverse effect.	• Activity surveillance. • Precautionary management including use of operational limits. • Research to determine whether there is an effect or not and inform operational limit setting.
F5	There is a known mechanism for the activity to have an effect, but evidence shows that it is not having a significant adverse effect at present.	• Activity surveillance. • Identify and implement operational limits.
F6	There is evidence to suggest that an activity is having a significant effect on the feature, but it is outside management control (i.e. natural process, or there is no current mechanism for management)	• Activity/factor surveillance. • If necessary, seek appropriate management mechanism, then implement appropriate management.
F7	There is evidence to suggest that an activity is having a significant adverse effect and the mechanism is known.	• Identify and implement management measures. • Identify and implement operational limits.

5.2 Natural factors

The marine environment provides the bottlenose dolphins with the conditions under which they are able to live and flourish. A change to certain environmental parameters such as tidal currents, sediment regimes and wave exposure could possibly degrade or even improve the conditions required by the bottlenose dolphins.

a. Current Status

Descriptions of the current status of environmental conditions within Cardigan Bay are given in section 2.2.

b. Mechanism for effect on the feature

i. Exposure

Wave exposure influences the degree of water mixing, water turbidity, dynamism of sea bed substrates and the level of physical turbulence that the shallow coastal waters and their marine life receives.

Differences in behaviour and possibly size exist between sheltered water and open coast bottlenose dolphins and the level of exposure may influence this to some degree. It has also been suggested that small populations of highly resident dolphins tend to be found in geographically closed habitats, while larger populations of both resident and transient animals are often found in open habitats.¹⁰⁴

It is not known what effect, if any, changes to the overall exposure within Cardigan Bay may have on its bottlenose dolphins.

ii. Currents /Tidal Regimes

Bottlenose dolphin distribution and behaviour patterns are highly flexible and may vary from site to site. Short-term movements of the dolphins are often affected by tidal state, which also affects bathymetry and access to certain prey. In some areas around the world, activities such as feeding and resting are strongly related to current strength and tide state, whereas in other locations no significant relationship has been found between tidal regime and dolphin distribution or behaviour. However, coastal bottlenose dolphins tend to move with concentrations of food, both with and against the tide.

There is little evidence to date suggesting that bottlenose dolphin distribution and activity patterns in Cardigan Bay are influenced by tidal regimes or current strength. Although feeding behaviour has been observed near headlands and estuaries, where the generally weak inshore currents tend to be stronger, the dolphins have also been recorded feeding in most other coastal and offshore areas from the north to south of Cardigan Bay. Recent studies within the SAC addressing the possible relationship between dolphin behaviour, site use and tidal flow could provide further insight into any relationships between Cardigan Bay dolphins and local tidal regimes.

Tidal influences also affect the movement of marine sediments. Contaminant inputs from within and south of the Bay are generally circulated in a northerly direction, and may settle out into sediments or remain in the water column during the approximate 13 day flushing time¹⁰⁵ (time taken for natural processes to replace the waters of the bay and to ‘flush through’ any water borne pollutants).

Contaminant inputs from the southern Irish Sea and the coasts of England and south Wales may also be

¹⁰⁴ Ballance, L.T. 1990. Residence patterns, group organization, and surfacing associations of bottlenose dolphins in Kino Bay, Gulf of California, Mexico. In: Leatherwood, S. and Reeves, R.R (Eds.) *The bottlenose dolphin*. Academic Press, San Diego, pp. 267-283.

¹⁰⁵ Nichols *et al* (1992)

washed into Cardigan Bay on the northerly residual and surface current flows. The levels of contaminants carried by currents may affect the dolphins as top predators in the Cardigan Bay marine ecosystem.

iii. Habitat

The nature of sea bed habitats are a determining factor in the type, diversity and abundance of species living in and on the sea floor (see Figure 8. page 17). Sea bed communities are often highly specific to particular habitat types: small alterations in silt fraction of sediment, current strength and wave exposure can make an enormous difference. Alteration to any of the fundamental environmental parameters such as current strength, wave exposure, depth, temperature, substrate, geology, light and siltation which influence distribution of benthic species may result in an alteration in the distribution and abundance of some of the dolphins prey.

Sediments and sediment mobility in conjunction with tidal currents and weather conditions also affect the turbidity of coastal waters, which may influence the diversity and distribution of dolphin prey species. (See *Turbidity* below).

Sediments also act as a sink for trace metals and other pollutants that may be released when sands and gravels are disturbed by dredging, bottom trawling, or similar activities that disrupt the seabed. Changes to sediment movement and deposition may alter the pollutant burden that is biologically available and may be passed on to the dolphins.

A number of dolphin characteristics have been attributed to habitat variation, including density, group size and residence patterns of bottlenose dolphins in different populations¹⁰⁶. Bottlenose dolphin behaviour (particularly feeding) and population characteristics vary in different habitats.

Dolphins living in large, open areas composed of numerous habitat types have been found to spend more time hunting, feeding and travelling between dispersed patches of food than those in restricted passes or channels that tend to concentrate fish and invertebrates migrating through on a daily/tidal and seasonal pattern¹⁰⁷.

Differences in density, group size and residence patterns of bottlenose dolphin populations have also been attributed to variations in habitat. Research on other bottlenose dolphin populations has shown that in general, group size tends to increase with increased water depth or openness of the habitat. It has also been suggested that small populations of highly resident dolphins tend to be found in geographically closed habitats, while larger populations of both resident and transient animals are often found in open habitats¹⁰⁸.

Research suggests that habitat alteration could potentially disrupt the social behaviour, food supply and health of bottlenose dolphins.

iv. Turbidity

Studies in other areas have found that seasonal and short term prey distribution and abundance are related to variations in turbidity¹⁰⁹, as well as water temperature, tidal flow speed and direction. Studies have also found that the distribution of many species of bottlenose dolphin prey is directly related to turbidity. There are indications that an area with muddy substrates that averages <1m visibility may be

¹⁰⁶ Shane, S.H., Wells, R.S. & Wursig, B. 1986. Ecology, behaviour and social organization of the bottlenose dolphin: a review. *Marine Mammal Science*, 2(1), 34-63.

¹⁰⁷ Shane *et al* (1986)

¹⁰⁸ Ballance (1990).

¹⁰⁹ Cyrus & Blaber 1987 as cited in Cockcroft, V.G. 1992. Incidental capture of bottlenose dolphins (*Tursiops truncatus*) in shark net: an assessment of some possible causes. *Journal of Zoology, London (A)*, 226: 123-134

generally unsuitable for bottlenose dolphin prey species, and that dolphins may also avoid areas of high turbidity in warmer waters where there might be potential shark predators¹¹⁰. Research along the South African coast also suggests that seasonal, and perhaps shorter term environmental fluctuations of water temperature and turbidity govern the abundance and distribution of bottlenose dolphin prey in inshore areas¹¹¹. Cardigan Bay bottlenose dolphins have been observed in both clear and turbid waters, but their use of areas during varying states of water clarity has not yet been studied.

v. Depth

In general, bottlenose dolphin group size tends to increase with increased water depth or openness of the habitat. (See Figure 7 page 16). Preliminary indications suggest that Cardigan Bay dolphins may follow similar patterns. Mean dolphin group size is larger (12.35 individuals) in the deeper, more exposed waters of the Bay generally found greater than 3km (approx 2 miles) from shore than it is in the shallower waters (8.52 individuals) closer inshore¹¹².

The reasons for these variations of group size may be related to foraging techniques and protection from predation. Shallow, inshore waters often provide relatively predictable, evenly distributed food resources associated with reefs or flat areas of seabed. When feeding on benthic prey, the bottlenose dolphin has to invest more energy in diving for deeper prey items than shallow ones. Shallow, enclosed areas may also provide protection from predation, though predation of bottlenose dolphins in Cardigan Bay is not currently known to be an issue.

In more open waters, schooling fish are the predominant prey available to the dolphins. Larger groups of dolphins combining their sensory capabilities increase the probability of locating these patchy but rich food sources and provide the number of individuals necessary to cooperatively locate and herd prey. Larger groups in open waters may also provide better protection from predators.

vi. Climate & Seasonality

Climate encompasses regional conditions of temperature, humidity, rainfall etc. and is therefore covered in more detail within the relevant following sections. However, in general terms changes to the Cardigan Bay climate may result in improved or worsened conditions for its bottlenose dolphins. Climatic changes may not only affect the bottlenose dolphins directly, but possibly more importantly affect lower levels of the food chain on which they rely.

In general, some bottlenose dolphin behaviour has been related to seasonal changes in weather conditions. Seasonal variations in bottlenose dolphin group size have been noted in some locations around the world, including both increases and decreases in group size during the winter. However, some populations of a similar latitude differ in the degree of seasonality they show, showing some or none¹¹³.

There appears to be a seasonal pattern in group size of bottlenose dolphins using Cardigan Bay, with a peak in late September and October. The number of individuals using the area also appears to peak in late autumn. The reasons for such seasonal patterns in Cardigan Bay dolphins have not yet been identified. It is possible that seasonal peaks in feeding frequency seen in Texas and Florida dolphin populations may relate to dolphins building up fat stores in preparation for winter. In some tropical locations, bottlenose dolphin calves are born year-round, while in other populations calving appears to be

¹¹⁰ Cockcroft, V.G., Cliff, G & Ross, G.J.B. 1989. Shark predation on Indian Ocean bottlenose dolphin *Tursiops truncatus* off Natal, South Africa. *South African Journal of Zoology* 24: 305-310.

¹¹¹ Cockcroft, V.G. 1992. Incidental capture of bottlenose dolphins (*Tursiops truncatus*) in shark net: an assessment of some possible causes. *Journal of Zoology, London (A)*, 226: 123-134.

¹¹² Grellier *et al* (1995)

¹¹³ Shane *et al* (1986)

seasonal. In the temperate waters of Cardigan Bay, newborn calves have been observed between May and September which suggests that breeding takes place during a similar period¹¹⁴.¹¹⁵

Some coastal bottlenose dolphins in higher latitudes show a clear tendency towards seasonal migration, while those in warmer waters show localised seasonal movements that probably have much to do with movements of food and need for safety in reproduction. In at least one case, off western Florida, movements of bottlenose dolphins correlated with movements of mullet. The fact that this species preys on many different food items may explain why their movement patterns are not as predictable as those of some other cetaceans.

vii. Sea Temperature

Short and long term abundance and distribution of prey species are related to a variety of natural environmental conditions, including sea temperature. An autumn feeding peak noted in a Texas population of bottlenose dolphins was most pronounced where water temperatures dropped significantly¹¹⁶. Recent research has also found that sea temperature is correlated with the prevalence and severity of skin lesions on bottlenose dolphins in Cardigan Bay and a number of other populations worldwide¹¹⁷. Sea temperature is thought to be a key limiting factor to the worldwide distribution of this species. Whilst they are seen commonly in the Moray Firth in Scotland and occasional sighting have been made further north, bottlenose dolphins are not thought to extend into arctic waters. The Cardigan Bay dolphins appear therefore to be toward the northern range of the species. (For temperature ranges in Cardigan Bay see Figure 10. and Figure 11. on pages 22 and 22).

viii. Salinity

Short and long term fluctuations in salinity may have a direct effect on the dolphins' susceptibility to infections and to their general health. For example, skin lesions in a variety of worldwide bottlenose dolphin populations, including those in Cardigan Bay, have been found to be correlated with salinity. Dolphins living in waters with the lowest salinity had the highest prevalence and severity of epidermal lesions¹¹⁸. The diversity and distribution of prey species is also strongly influenced by salinity, and dramatic changes in the natural characteristics of Cardigan Bay waters could result in changes in prey availability, with impacts on the dolphins' energy budget, distribution, individual health and reproduction.

ix. Fronts

Fronts are regions of strong horizontal density gradients in the ocean. The strong horizontal pressure gradients generated at the front often balanced by the Coriolis force¹¹⁹, leading to strong along-front currents. When these two forces are not perfectly balanced, vertical circulations can be generated at the front. These vertical circulations have the potential of bringing deep, nutrient-rich waters into the well-lit surface waters, and stimulating phytoplankton growth. Fronts are typically the site of subsurface patches of phytoplankton, however, we do not have a good understanding of the physical and biological processes that maintain these patches.

An increase in productivity and diversity is usually associated with marine fronts. However, the scale and nature of the Cardigan Bay front is unlikely to reflect the increases in productivity and diversity associated with the larger oceanic fronts. Its importance to the bottlenose dolphins and the impact which

¹¹⁴ Dolphin gestation is about 12 months

¹¹⁵ Grellier *et al* (1995)

¹¹⁶ Shane *et al* (1986)

¹¹⁷ Wilson *et al* (1999)

¹¹⁸ Wilson *et al* (1999)

¹¹⁹ Force generated by the turning of the earth.

may result from its loss or alteration are unknown. Likely areas of frontal formation are shown in Figure 12. on page 24).

c. Management Response

i. Rationale

Changes to any of the above natural variables has the ability to affect the bottlenose dolphins, either directly or more likely indirectly through changes to prey distribution and abundance. Natural changes to these processes are outside any management control and negative impacts on the dolphins as a result of this are considered acceptable. However, many of these natural processes can be influenced by humans to a lesser or greater degree and management controls may exist to provide a means of managing such activities. Consideration of the potential for human activities to alter natural processes and thereby effect the bottlenose dolphins is given in the following section.

Bottlenose dolphin communities are not known to be resident further north in the UK than the Moray Firth, and this is believed to represent the northern limit of their normal natural range. Sea temperature is the key influencing factor on the dolphins range, and any reduction to sea temperatures in Cardigan Bay would bring this northern limit closer. Global trends are currently showing an increase in sea temperature and variation in the flow and direction of the Atlantic drift current may also result in increases or decreases in temperature.

Individuals existing close to the edge of their natural range are typically, though not always, less able to tolerate increases in 'stress' than individuals living towards the centre of their natural range.

There is limited knowledge on the sediment movement into and within Cardigan Bay and the influences of this on the cSAC habitat. There is a need to review the likely impact on the SAC of pollutants in the sediments.

ii. Type of Response

F6: There is evidence to suggest that the factors are having a significant effect on the feature, but they are outside management control (i.e. natural process, or there is no current mechanism for management).

iii. Actions, including links to other policies/plans/measures

- Maintain a watching brief on natural processes in Cardigan Bay and the Irish Sea, noting alterations or trends that may be anthropogenically influenced.
- Ensure that consideration of plans and projects (see page 62) take full account of the potential for alterations to be made to natural processes and the potential effects these may have on the bottlenose dolphins and their habitat.
- There is limited knowledge on the sediment movement into Cardigan Bay and influences on the cSAC. There is a need to review the likely impact of pollutants in the sediments.
- Promote research which aims to gain a better understanding of the key habitats of the bottlenose dolphins and the key natural factors that determine their importance.

5.3 Human induced factors

One key component of the Life Project (see section 1.4) was to assess the interactions that can take place between human activities and the Annex I and II interest features on the twelve Life supported sites. 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 were:

- port and harbour operations, (complete),
- recreational user interactions, (in draft),
- collecting bait and shoreline animals, (complete),
- water quality in lagoons, (in draft),
- water quality in coastal areas, (complete),
- aggregate extraction, (in draft),
- and fisheries (complete).

The reports from these studies as well as general information about the Life project is available via the internet at: <http://www.english-nature.org.uk/uk-marine/>

or by contacting,

The Life Project Team
UK Marine SACs Project
English Nature
Northminster House
Peterborough PE1 1UA

Tel (01733) 455233
Fax (01733) 568834
E-mail: tim.hill@english-nature.org.uk

5.3.1 Coastal Development & Defence

a. Extent of the activity

Coastal Development

Development along the coast is generally focussed on existing settlements. Along the coastline there are also a number of caravan sites and other forms of holiday accommodation that were developed principally during the 1960s. Water-based development within the SAC is generally associated with the existing harbours at Aberaeron and New Quay. Other harbour / boating facilities adjoining the SAC are centred on Aberystwyth and the Teifi estuary.

In response to development opportunities arising from EU Objective 1 funding, local organisations have mooted the possibility of developing Aberaeron and New Quay harbours. Such proposals would be subject to environmental appraisal to determine their potential to impact on the bottlenose dolphins (as well as their wider environmental impacts).

The framework for the planning of development is outlined below. The potential impacts of new development on water quality is dealt with in under 'Effluent Disposal', page 92.

Coastal Defence

The Shoreline Management Plan will provide information about coastal processes that will inform decisions about coastal defence requirements.

b. *Mechanism for effect on the feature*

Coastal developments, especially those that relate to harbours and foreshores, have the capacity to have a localised effect upon the dolphin population during their construction. Possible effects are increased noise and permanent changes to dolphin habitat, e.g. as a result of possible effects upon coastal processes. In addition, activities associated with new development might also have direct impacts upon the dolphin (e.g. water based developments). See ‘Recreational Activities’, page 104 and ‘Commercial Boat Trip Operators’, page 101.

Any coastal defence projects arising from the Shoreline Management Plan could give rise to increases in noise, short-term changes to water quality and changes in sediment processes which could in turn have localised impacts on the dolphin and its behaviour.

c. Management Response

i. Rationale

The coastline bordering the Cardigan Bay SAC is of exceptional landscape quality. It includes a range of coastal scenery - high cliffs, open coast, sheltered bays and the entrance to the Teifi estuary. Development is focused around a number of coastal towns and villages and their associated tourist developments. Much of the coastline is undeveloped although there are areas where there is pressure for recreational and residential development, particularly close to existing settlements.

The development of land (to mean low water mark) is regulated through the planning system. This system reconciles the needs of development, encouraging the optimum use of existing resources and the principles of sustainability.

The Planning Framework:

The planning system is operated primarily by local authorities; Ceredigion County Council, Pembrokeshire County Council and Pembrokeshire Coast National Park Authority. The National Assembly for Wales has reserve and appellate powers, together with advisory functions.

Local Authorities

Local Authorities prepare development plans to guide future development. The development plans which apply to the Cardigan Bay SAC are:

- The Dyfed Structure Plan

This sets out strategic policies.

- The Ceredigion Local Plan
- PCNPA local plan (containing policy for SAC)

These set out detailed policies to guide development together with proposals for specific sites. The Ceredigion Local Plan will not become a formal adopted plan and will retain advisory status. The PCNPA local plan was adopted in 1999.

In general, local planning policies place great emphasis on the high quality of the natural environment and seek to promote sustainable development. Specifically, the Ceredigion and Pembrokeshire County Council Local Plans¹²⁰ provide that any proposals for water-based development will only be permitted where:

¹²⁰ Ceredigion Local Plan, Policy TRC28, Preseli Pembrokeshire Local Plan, Policies RL8 & RL7

- there is no adverse effect on public safety
- there is no adverse effect on nature conservation or visual amenity interests of the coast, in particular the candidate SAC areas. (In relation to the SAC, the Habitats Directive does not in any event generally permit developments which will have adverse effects on the sites features)
- there is no adverse effect on beach, foreshore or inshore activities.

Structure and Local Plans will be replaced in due course by Unitary Development Plans (UDPs). To assist in the preparation of UDPs in mid and west Wales, a Strategic Planning Forum has been formed to establish a planning framework for the preparation of individual UDPs. The Forum has adopted a general objective of developing UDP strategies, policies and proposals that fully reflect the principles of sustainability, and move towards the principles of sustainable development¹²¹.

Proposals for the development of land, including the change of use for buildings, require planning permission. Applications are made in the first instance to local planning authorities who are required to determine applications in accordance with the development plan, unless material considerations indicate otherwise. Material considerations include advice given by central government and the National Assembly for Wales in Planning Guidance (Wales) and circulars. Specific advice relevant to the Cardigan Bay SAC is given in Technical Advice notes concerning coastal planning and nature conservation.¹²²

Shoreline Management Plans

The system of plans also provides a framework for dealing with coastal defence. Shoreline Management Plans (SMPs) set out a strategy for sustainable coastal defence within a 'sediment cell' (in this case the Cardigan Bay Cell, which covers an area between Bardsey Sound, Gwynedd and St. Ann's Head, Pembrokeshire). As far as the southern part of Cardigan Bay is concerned, two SMPs are currently being prepared (covering Ceredigion and Pembrokeshire) that will provide guidance on coastal defence, taking account of natural coastal processes, coastal defence needs and environmental considerations. The main objectives in preparing the SMP are to:

- improve understanding of coastal processes;
- predict the likely future evolution of the coast;
- identify all assets which are likely to be affected by coastal change;
- identify research and survey requirements; and
- facilitate consultation between those bodies with an interest in the shoreline.

Operations identified within SMPs must be compatible with the conservation requirements of the cSAC.

Plans and Projects

The Habitats Regulations¹²³ require that development and development plans are considered against the conservation importance of the SAC. See 'Plans and Projects', page 62.

It is not possible to anticipate the exact nature of development proposals that might be submitted to the local planning authorities and these will need to be considered on a case by case basis within the context

¹²¹ 'Draft Strategic Planning Statement', Mid & West Wales Strategic Planning Forum (Sept. 1998).

¹²² Planning Guidance (Wales): Technical Advice Notes (Wales) - Coastal Planning (14); Nature Conservation and Planning (5) (See also Figure 15 on page 63).

¹²³ The Conservation (Natural Habitats &c) Regulations 1994

of relevant policies and procedures. However, the most likely type of proposal at the waterside might be expected to relate to works or enhancements to existing harbours and coastal protection.

There are certain procedures that planning authorities (as Competent Authorities) are required to undertake in order to fulfil, in part, the requirements of the Habitats Regulations. See page 177.

- A review of extant planning permissions and other consents.
- The consideration of new plans and projects.

ii. Type of response

F1: Development proposals constitute a plan or project.

iii. Actions, including links to other policies / plans / measures

- Treat relevant coastal development as a Plan or Project.
- Review extant planning permissions.
- Follow procedures outlined in TAN (5) when dealing with applications for planning permission affecting the SAC.
- Ensure that the SAC is taken fully into account in the preparation of Unitary Development Plans (UDPs) for Ceredigion and Pembrokeshire.
- Ensure that the SAC is taken fully into account in the production of the Shoreline Management Plan.
- Carry out an appropriate environmental assessment of any coastal protection/defence projects likely to affect the Cardigan Bay SAC.

5.3.2 Aggregate Extraction

a. Extent of the activity

No marine aggregate extraction is currently occurring within Cardigan Bay and at present there are no known plans for exploitation of this resource within or adjacent to the site. However, the Bay consists largely of sands and gravels which may potentially be suitable for future extraction.

b. Mechanism for effect on the feature

A variety of dredging methods are used for aggregate extraction. The degree to which each of the following effects may occur is in part determined by the equipment and methodology employed.

i. Sea Bed Effects

Aggregate extraction of coarse and fine grained sea bed sediments results in localised destruction of seabed habitats and species. The dredging operation and the removal of unwanted fine fractions from the dredged aggregate results in resuspension and settlement of fines on the sea bed surface, possibly some distance from the dredge site. This may smother organisms and clog delicate feeding and breathing structures. The area and range of the effect depends on local hydrology as well as particle size.

The removal of sediments may affect the sea bed sediment regime both locally and possibly some distance from extraction. This may result in changes to habitat, community and bottlenose dolphin prey distribution.

ii. Noise

Aggregate dredging is noisy and may involve the use of several vessels on a standard 'back and forth' route. See 'Noise' page 56.

iii. Pollution

Any pollutants bound within the dredged sediments may be remobilised either in solution or bound to fines. Pollutants may also be released from the dredger and associated shipping. These may become biologically available, be assimilated, and enter the food chain. Certain substances subject to bioaccumulation and biomagnification would be of greatest threat to top predators such as the bottlenose dolphin. See 'Pollution' page 58. However, sediments with a low 'fines' fraction are typically preferred for aggregate extraction and these sediments may, generally speaking, contain less bound pollutants than those with high 'fines' content.

iv. Collisions

Increased shipping movements will result in an increased potential for collisions between vessels and with dolphins. See 'Shipping', page 118 and 'Collisions', page 57.

c. Management Response

i. Rationale

Marine aggregate dredging is currently authorised by licences issued by the Crown Estate which are supported by a 'Government View' (GV) issued by the DETR. The process of issuing a GV is currently non-statutory but the Department has publicised its intention to introduce a statutory authorisation

system, based on the Town and Country Planning Act procedures, when a legislative opportunity arises (it is hoped that they will come into force late in 2000). These new regulations will affect England, Wales and Northern Ireland (Scotland will have its own regulations). The National Assembly for Wales will then be the competent authority for Wales, and DETR for England. The competent authority will determine new applications and review existing licenses. The review of consents procedure has been given some consideration and will be carried out under the new regulations.

For non-Crown Estate land, that is, for example, in the jurisdiction of Local Planning Authorities, planning permission applies for aggregate extraction. A dredging application will be considered as a plan or project under Article 6(3) of the Habitats Directive. Under the draft new regulations licenses may be given for up to 15 years, with reviews at 5 years and 10 years.

At present the criteria to be satisfied for an applicant to obtain a favourable GV are set by individual departments consulted by DETR during the process of consulting on the application - particularly MAFF who have responsibility for marine environmental protection, fishing policy and coastal protection. DETR intend publishing formalised planning guidance for dredging to accompany the new statutory procedures so that all involved in the process understand the Government's policy and criteria.

This will be framed in more detail as development of the guidance proceeds. It is likely to require the provision of information on a wide range of topics such as the extent of the potential resource and existing reserves, and assessment of the potential effects of dredging on the marine environment and on coastal protection.

No marine aggregate dredging activity currently occurs within Cardigan Bay. However, as much of the bay consists of coarse sediments there is the potential for future exploitation. Any new developments would constitute plans and projects and the appropriate competent authorities should therefore ensure that the potential impacts on the bottlenose dolphins and their habitat are fully addressed in any assessments.

ii. Type of Response

F5: Whilst there is a known mechanism for this activity to have an effect on the dolphins and in particular their habitat, the activity does not occur at present within or adjacent to the SAC.

F1: The activity constitutes a 'plan or project'. See page 62.

iii. Actions, including links to other policies/plans/measures

- Treat as Plan or Project.
- Ensure that any proposals for aggregate extraction within Cardigan Bay are appropriately assessed by the relevant competent authority (currently DETR, possibly changing to NAW), addressing the potential impacts of both the dredging and associated shipping movements on the bottlenose dolphins and their habitats.

5.3.3 Navigational Dredging (including capital projects)

a. Extent of the activity

Dredging is a fundamental requirement for most harbours and ports¹²⁴. Within this section dredging can be defined as, the excavation of material from the seabed and the relocation of the excavated material elsewhere for disposal. In general, dredging may be undertaken for a variety of purposes including navigation, flood control and for beach nourishment purposes. In Ceredigion, dredging is carried out to improve navigation and falls into two categories:

Maintenance Dredging:

Maintenance dredging is the routine / periodic removal of material in approach channels and basins to assist safe access for vessels. This may vary from an almost continuous activity throughout the year to an infrequent activity occurring only once every few years. Generally, for the purpose of a disposal licence, if a period of 10 years has lapsed between a new and previous dredge, the operation will be treated as capital dredging where disposal at sea is involved.

Capital Dredging:

Capital dredging is the excavation of sediments for the first time so as to increase water depths in an area to accommodate vessels (excavation therefore generally takes place in 'virgin' material). Arising from disposal licensing requirements, capital dredging also includes the removal of material from previously dredged areas where sedimentation has since occurred and has not been disturbed by further dredging over a period of time (10 years or greater).

i. **Within the site**

Maintenance dredging requirements at New Quay and Aberaeron harbours are as follows:

New Quay: Some 3000 tonnes of sand are removed annually from the main harbour and Penpolion and is deposited at Dolau for beach replenishment purposes. These operations are carried out at low tide, using shore plant.

Aberaeron: Material is removed from the harbour at intervals of approximately 4 years and has been used for sea defence. There is a need to dredge the inner Harbour (Pwll Cam). Previous dredging activity has been temporarily suspended because the methods used (tipping over the sill for the tide to carry away) were no longer acceptable to Environment Agency Wales. Any new scheme would be likely to fall within the 'capital dredging' category in view of the timescales involved (see above).

ii. **Adjacent to the site**

Aberystwyth: The dredging of the harbour channel is carried out every 2 years whilst the inner harbour (including the marina) is dredged approximately every 4 years. Selected suitable dredged material has been used to replenish South Beach, Aberystwyth.

Cardigan: Limitations on navigation within the Teifi estuary have given rise to concern amongst boat users. Levels on the bar are similar to those of 60 yrs ago, but the channel moves around. Proper marking of the channel could limit the need for dredging. There is no dredging regime currently in place and the County Council has previously commissioned consultants to investigate options for capital and

¹²⁴ Further information on interactions between Port & Harbour operations and features of UK marine SACs can be found in: 'ABP Research. 1999. *Good practice guidelines for ports and harbours operating within or near UK European marine sites*. English Nature, UK Marine SACs Project. pp120.' This report is available with other related information at: <http://www.english-nature.org.uk/uk-marine/>

maintenance dredging within the estuary to improve navigation. This issue is to be considered as part of the process of preparing a Teifi Estuary Management Plan (to be published in June 2000), also taking account of the high conservation value of the estuary.

Fishguard & Milford Haven: Dredging is not known to have taken place in Fishguard Harbour for some time, though it is presumed there will be the occasional requirement for it. Significant dredging is required occasionally from Milford Haven waterway. Several studies to select an alternative spoil dumping ground have taken place since the early 1990's when concerns were raised about increased sedimentation within the Skomer Marine Nature Reserve.

b. Mechanism for effect on the feature

The potential impacts of dredging upon the bottlenose dolphin and its habitat are two-fold: firstly as a result of the dredging itself and secondly as a result of the disposal of the dredged material. These impacts can relate to activities both within and adjacent to the SAC.

i. Habitat impacts

Direct impacts are typically in the form of removal or smothering of benthic habitats and communities. Loss of fine fractions during dredging and disposal operations (if at sea) results in settlement of fines on the sea bed, possibly some distance from the site of the operation. This distance depends on local hydrology and particle size. Removal (dredging) or accretion (disposal) of sediments may, in the long-term, affect the sediment regime locally and possibly at some distance. Impacts on the dolphins' habitat may affect abundance and distribution of dolphin prey. See 'Prey Depletion' page 60.

ii. Noise

Vessel based navigational dredging is noisy and involves the use of several vessels on a standard 'back and forth' route. Effects are likely to be negligible when using shore plant, as is currently the case at New Quay. See 'Noise', page 56.

iii. Pollution

Pollutants bound within the dredged sediments may be remobilised either in solution or bound to fines. Pollutants may also be released from the dredger and associated shipping. These may become biologically available, be assimilated, and enter the food chain. Certain substances subject to bioaccumulation and biomagnification would be of greatest threat to top predators such as the bottlenose dolphin. See 'Pollution', page 58.

iv. Collisions

Increased shipping movements will result in an increased potential for collisions between vessels and with dolphins. See 'Shipping', page 118 and 'Collisions', page 57.

c. Management Response

i. Rationale

Harbour activity within and adjacent to the SAC is centred on New Quay, Aberaeron and Aberystwyth. These harbours are mainly used by fishing vessels and recreational craft. The County Council, as the Harbour Authority for Ceredigion, has responsibility for navigation in these harbours and their dredging is generally required to maintain navigable depths.

Mooring facilities are also available in the Teifi estuary where local concern has been expressed that navigation is becoming progressively restricted through the silting of the estuary.

In addition to the Habitats Regulations, the following legislation can have a bearing on proposals for dredging and disposal:

- Coast Protection Act 1949;
- Deposits in the Sea (exemptions) Order 1985;
- Environment Act 1995;
- Environmental Protection Act 1990;
- Food and Environment Protection Act (Part 2) 1985 (FEPA);
- Harbour Act 1964
- Harbour Works (Assessment of Environmental Effects) Regulations 1988;
- Harbour Works (Assessment of Environmental Effects) (Amendment) 1996;
- Landfill Tax Regulations 1996;
- Waste Management Licensing Regulations 1994;
- Town and Country Planning Act 1990;
- Various local harbour powers

Consents issued for navigational dredging may, therefore, be numerous and be required from several competent authorities. Most commonly within the Bay, consents are issued by CCC (Harbour Act 1964), NAW (Food and Environment Protection Act (Part 2) 1985 (FEPA)) but undertaken by MAFF on their behalf, DETR (Coast Protection Act 1949).

There is a requirement under the Habitats Regulations to review existing consents, and any new dredging developments would certainly constitute plans and projects and be subject to the significance/appropriate assessment procedure for the purposes of the Habitats Directive (see Figure 17. page 63). Competent authorities should therefore ensure that the potential impacts on the bottlenose dolphins and their habitat are fully addressed in such assessments.

Almost all potential effects of dredging and dumping on the bottlenose dolphins are secondary in nature. Due to the small nature of dredging events in Cardigan Bay harbours it is unlikely that any one dredging operation, if properly managed, would be large enough to have a significant impact in its own right. Proper avoidance of sensitive areas and proper analysis of sediment composition prior to choosing the most appropriate disposal methods would probably mitigate the potential for such single event impacts. However, dredging events are typically recurrent and whilst possibly not significant in their own individual right may, cumulatively, have the potential for long term impact on the dolphins either directly or through their habitat and food.

ii. Type of Response

F1: The activity constitutes a plan or project.

iii. Actions, including links to other policies/plans/measures

Actions

- Treat all navigational dredging as a plan or project.
- Review extant maintenance dredging operations and produce Dredging Plans to provide a framework/procedure for proposals for dredging within Ceredigion.
- Use the best practicable environmental option for the disposal of dredged material.

Cardigan Bay SAC Management Plan – *NAVIGATIONAL DREDGING*

- Establish a code of practice for dredging and disposal in and adjacent to the SAC.

Cardigan Bay SAC Management Plan – *NAVIGATIONAL DREDGING*

Links: Other coastal management plans

- Ensure that any proposals for navigational dredging are assessed in the context of the relevant Shoreline Management Plan.
- The possibility of improving dredging in the Teifi estuary to improve navigation will be explored within the Teifi Estuary Management Plan.
- Ensure the Teifi Estuary Management Plan is consistent with the SAC Management Plan.

5.3.4 *Cables and Pipelines*

a. Extent of the activity

Around the UK, submarine cables have been installed for many years for the transmission of electrical power and for telecommunications. Submarine pipelines on the site are limited to outfalls used for the discharge of effluents to coastal waters.

i. Within the site

There are currently no submarine cables or submarine oil or gas pipelines on this site.

ii. Outside the site

The nearest oil and gas pipelines exist between refineries in Milford Haven to the south and around the Morecambe, Hamilton, Lennox and Douglas oil and gas fields to the north.

b. Mechanism for effect on the feature

i. Survey

Prior to installation, operators will survey the sea bed to establish ground conditions and determine the ideal route. Such surveys are directed at the sediment surface and generally use sonar equipment rather than the larger acoustic methods used in geological surveys. See 'Noise', page 56.

ii. Installation

Cables and pipelines may be laid across the surface of the seabed but are more usually laid in a trench. The equipment used to install cables and pipelines on the sea bed generally causes a brief period of localised disturbance resulting in changes to turbidity and sediment loads in the water column. This may affect the dolphins by directly causing them to avoid the area, or if persisting over longer periods, through effects on their habitat.

iii. Operation

Fractures to pipelines can occur (for instance in the Mersey Estuary). A fracture to an oil pipeline inside or outside the site, could lead to oil pollution within the cSAC. See 'Pollution', page 58.

c. Management Response

i. Rationale

The installation of a submarine cable or pipeline requires the consent of a range of statutory bodies. The main consents needed, and the bodies involved, are summarised in the tables below. As the installation of a submarine cable or pipeline undoubtedly constitutes a plan or project (see 'Plans or Projects', page 62) consideration of the likely significance of pipeline or cable installation on the bottlenose dolphins will need to be taken into account in determining whether or not a consent is issued.

Environmental Impact Assessment (EIA)

Both the installation of cables and pipelines are subject to environmental impact assessment legislation. (see Box 3 page 64) This requires that an environmental statement should be prepared that looks at the impacts an installation will have, considers alternative proposals, and identifies the least damaging option.

Cardigan Bay SAC Management Plan – *CABLES & PIPELINES*

The EIA process is open to public scrutiny, and places certain obligations on developers to publicise their proposals. The process places a formal obligation upon developers to consider the impacts that a proposal would have upon wildlife, and to minimise them. The environmental statement also ensures that the consenting authority has all the available environmental, social and economic information concerning a development at its disposal when it takes decisions.

Table 8. Regulation of marine cables and pipelines

Activity	Necessary Consent	Authority
Installation between mean HW & Mean LW (Cables and Pipelines)	Easement from landowner	Landowners
Cables and Pipelines	Planning Permission under Town & Country Planning Act 1990	Local Planning Authority
Cables and Pipelines	Navigational Consent under s34 Coast Protection Act 1949	Ports Division, DETR
Cables and Pipelines	Possible 'Appropriate Assessment' for Consents under Habitats Regulations.	Competent Authority
Pipelines only	FEPA licence under s5 the Food and Environment Protection Act 1985	MAFF / National Assembly for Wales (NAW)
Installation beyond mean LW (Cables and Pipelines)	Lease from Crown Estate Commissioners under the Crown Estates Act 1961	Crown Estate Commissioners
Cables and Pipelines	Navigational Consent under s34 Coast Protection Act 1949	Ports Division, DETR
Cables and Pipelines	Possible 'Appropriate Assessment' for Consents under Habitats Regulations.	Competent Authority
Pipelines only	FEPA licence under s5 the Food and Environment Protection Act 1985	MAFF / NAW
Additional requirement for power cables	Environmental Statement under Electricity and Pipeline Works (Assessment of Environmental Effects) Regulations 1990	Secretary of State for Trade & Industry.
Specific requirement for oil and gas pipelines	Pipeline authorisation under s1 of the Pipe-lines Act 1962.	Secretary of State

Table 8. *Continued*

Activity	Necessary Consent	Authority
	Pipeline authorisation under s20 of the Petroleum and Submarine Pipelines Act 1975	Secretary of State for Trade & Industry
	Environmental Statement under Electricity and Pipeline Works (Assessment of Environmental Effects) Regulations 1990	Secretary of State for Trade & Industry
	Environmental Statement under The Offshore Petroleum Production and Pipe-lines (Assessment of Environmental Effects) Regulations 1998	Secretary of State for Trade & Industry
	Possible 'Appropriate Assessment' for Consents under Habitats regulations.	Competent Authority

There are currently no cables or pipelines (except effluent outfalls) on site, though there is the potential for new pipelines or cables to be installed in the future. Whilst the likely requirement for oil or gas pipelines appears to be diminishing (see 'Offshore Oil & Gas', page 121), the current promotion of offshore energy structures development may result in a need for submarine cables.

ii. Type of Response

Installation of Cables & Pipelines

F1: The activity constitutes a plan or project.

iii. Actions, including links to other policies/plans/measures

- Treat the installation of submarine pipelines or cables as a plan or project.
- Ensure Environmental Impact Assessment legislation is followed.

5.3.5 *Electricity Generation*

5.3.5.1 Fossil fuels

a. Extent of activity

i. Within the site

No fossil fuel power stations exist within the cSAC.

ii. Outside the site

No fossil fuel power stations exist directly adjacent Cardigan Bay.

b. Mechanism for effect on the feature

The development and running of fossil fuelled power stations could influence the Cardigan Bay environment in a variety of ways.

- Pollution through emissions and from plant operations. See ‘Pollution’, page 58.
- Changes to local environmental parameters e.g. use sea as cooling waters. See ‘Habitat Impacts’, page 61 and ‘Natural factors’, page 68.

c. Management Response

i. Rationale

New fossil fuelled power stations may be proposed adjacent to Cardigan Bay in the future, though the likelihood of this is believed very small. Any new power station development would be assessed both as a plan or project and under the EIA Regulations.

ii. Type of Response

F1: The activity constitutes a plan or project.

iii. Actions

- If development proposals arise which may affect the SAC, ensure appropriate assessments take place which properly address the SAC interests.

5.3.5.2 Nuclear

a. Extent of activity

i. Within the site

No nuclear fuel power stations exist within the cSAC.

ii. Outside the site

To the north of the SAC the former nuclear plant at Trawsfynydd in Snowdonia has been closed for many years. On Anglesea there is the Wylfa nuclear power station, which has been closed recently due

to a fault. At the northern end of the Irish sea the Sellafield nuclear reprocessing plant is currently operational.

b. Mechanism for effect on the feature

The development and running of nuclear power stations could influence the Cardigan Bay environment in a variety of ways.

- Pollution through emissions and from plant operations. See ‘Pollution’, page 58.
- Changes to local environmental parameters e.g. use sea as cooling waters. See ‘Habitat Impacts’, page 61 and ‘Natural factors’, page 68.

c. Management Response

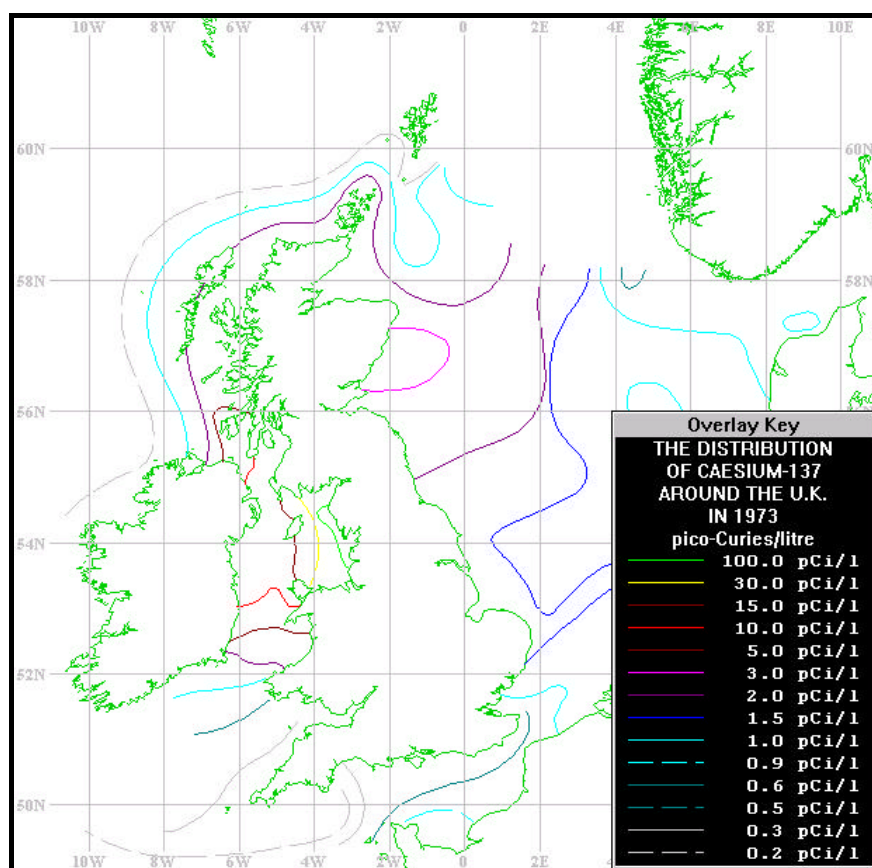
i. Rationale

The Trawsfynydd plant, when operational, was relatively self contained both in terms of cooling waters and emissions. Discharges were largely into an adjacent lake though some did enter the sea via a discharge into the Afon Prysor. The plant has now been closed for some time and there has been no fuel on site for over three years. The plant is not therefore thought to require further management consideration at present though this may change in the event of any future decommissioning.

Figure 18. The distribution of the radionuclide Caesium 137 around the UK in 1973.

Reproduced from the UK digital marine atlas courtesy of CEFAS.

Sellafield reprocessing plant has disposed of radioactive effluent into the sea for some time. Dispersing levels of radionuclides (such as Caesium-137) from the site are measurable down the Irish Sea (see Figure 16). Emissions have been more tightly regulated in recent years though concerns have been expressed from as far away as Scandinavia as a result of recorded plutonium levels attributed to the Sellafield plant. Emissions from Sellafield may need to be reviewed in the future if the THORP reprocessing



plant comes on line. The levels of radionuclides taken up by bottlenose dolphins, and their significance to the dolphins health, is unknown. However, research has shown that harbour porpoise stranded on Irish Sea shores possess higher levels of Caesium 137 than other areas around the UK.

Whilst new nuclear fuelled power stations may be proposed adjacent to Cardigan Bay in the future, the likelihood of this is believed very small. Such a development would require consideration under the procedures for a 'plan or project'.

ii. Type of Response

F1: The activity constitutes a plan or project.

iii. Actions

- If development proposals arise which may affect the SAC, ensure appropriate assessments take place which properly address the SAC interests.

5.3.5.3 Alternative (Offshore energy structures)

This section covers the construction and operation of structures seaward of low water mark, for generating electricity from wind, wave or tidal power. Other types of operation (e.g. oil/gas exploitation) are dealt with elsewhere.

a. Extent of the activity

A variety of structures such as wind and current turbines typically make use of wind, wave and tidal movement. There are presently no such structures either within the SAC or elsewhere in Cardigan Bay. However, alternative energy sources are being promoted by the UK government as part of its commitment to reduce CO₂ emissions and reach a target of 10% of electricity supply being met from renewable sources. There have been preliminary expressions of interest by developers in placing offshore wind turbines at various sites in Cardigan Bay, but as yet, no formal proposals.

Little is known by the authors of this management plan about the suitability or otherwise of the SAC or its vicinity for these structures, but this is clearly a developing area which may become more significant in the near future. In addition to environmental and landscape/seascape considerations, the constraints on development are principally suitable environmental conditions, transport of the structures to the site and costs of connection to the national grid.

b. Mechanisms for effects on the feature

The types of structures may vary enormously - single turbines or "farms" of many tens or hundreds of turbines, placed anywhere from just offshore or in waters up to 20 m deep, although 5-10 metres is more likely. The Sarnau of Cardigan Bay are likely to attract interest as potential siting grounds due to their shallow depth and distance offshore. Tidal structures usually make use of areas with high rates of tidal flow such as narrows, headlands and estuaries. Wave power generators require a good sea swell. Structures may be floating, self supporting or anchored in the seabed.

Therefore, although the type of effects would vary greatly according to individual circumstances, it is possible to make some general conclusions.

Construction/placement of structures and associated cabling

i. Noise

From vessels and construction equipment. See 'Noise', page 56.

ii. Water quality

The construction/placement activities are likely to cause short term, localised changes in turbidity and sediment loads in the water column. This may affect the dolphins by directly causing them to avoid the area, or if persisting over longer periods, through effects on their habitat.

iii. Pollution

Contamination of water and/or sediments by chemicals used on or within the structures (e.g. grouting, antifouling coatings). See 'Pollution', page 58.

Operation/maintenance

i. Vessels

Depending on the maintenance requirements, there may be significant increases in vessel traffic, servicing the offshore structures. See 'Shipping', page 118.

ii. Noise

Any structures with moving parts (e.g. wind or tide-driven turbines, wave-riding buoys) are liable to generate noise, which may interfere with the dolphins' communication, navigation and prey location. See 'Noise', page 56.

iii. Seabed effects

The presence of structures on or anchored to the seabed may cause changes to the local sedimentology/geomorphology, e.g. causing scouring or deposition. This may cause changes to the benthos and hence might affect dolphin prey availability. It is also important to note that very little is known about why this area appears to be attractive to bottlenose dolphins - it may be related to the quality or morphology of the seabed. See 'Habitat Impacts', page 61.

iv. Pollution

Contamination of water by chemicals used on the structures (e.g. antifouling coatings). Increased risk of ship collisions resulting in accidental release of cargo. See 'Pollution', page 58.

Further information sources.

An assessment of the environmental effects of offshore wind farms can be found in, 'METOC. 1999. *An assessment of the environmental effects of offshore windfarms*. Report to the Energy Technology Support Unit. Report No. 920.' This report identifies several areas requiring further work, including:

- Full characterisation of the noise and vibration generated by offshore wind farms.
- Further study of the effect of noise and vibration on the biological environment.
- Assessment of the effects of wind farms on sediment transport and wave climate.

c. Management response

i. Rationale

This type of operation would require a number of statutory consents if occurring with the Cardigan Bay cSAC (see also section 5.3.4 relating to cables and pipelines):

- A consent under section 34 of the 1949 Coast Protection Act 1949 (works likely to interfere with navigation). The responsible authority is DETR Ports Division.

- A licence under section 5 of the Food and Environment Protection Act 1985 (deposit of articles on the seabed). The responsible authority is the National Assembly for Wales, although the licencing system is operated on behalf of the NAW by MAFF.
- A consent under section 36 of the Electricity Act 1989 (if more than 50 megawatts will be generated). The responsible authority is the Department of Trade and Industry.
- Planning permission under Town & Country planning legislation may also be required for associated onshore developments.
- In addition, a lease from the Crown Estate, as owners of the seabed, would be required.

The construction of offshore windfarms would clearly constitute a plan or project, and therefore the consents above would not be issued until the operation had been subject to the steps set out in Regulation 48 of the Habitats Regulations. Many schemes would also be subject to Environmental Impact Assessment.

ii. Type of response

F1: The activity is considered to constitute a plan or project for the purposes of the Habitats Directive. Therefore the impact on the SAC of each proposed development should be assessed on its individual characteristics.

iii. Actions, including links to other policies/plans/initiatives

- If development proposals arise which may affect the SAC, ensure appropriate assessments take place and address the SAC interests.
- Monitor the development of UK government policy/strategy with respect to the development of offshore alternative energy generation, and ensure that the SAC is appropriately considered in the development of such a policy, e.g. in any consultation exercises.
- RAs (or one of them) to write to government seeking information on their latest policy position.
- Promote research by DTI/Industry into the potential impacts on marine mammals (including bottlenose dolphins) of underwater noise and vibration arising from offshore windfarms and other 'at sea' alternative energy structures.

5.3.6 *Effluent Disposal*

a. Extent of the activity

Within and adjacent to the cSAC there are a number of coastal discharges, the majority of which are wastewater treatment works, treating domestic sewage.

i. Within the site

Effluent disposal points are found throughout the area of Cardigan Bay. Those that appear in, Table 9., Table 10. & Table 11. discharge into coastal, estuarial or freshwaters within or immediately adjacent to the site. Although Cardigan STW, its associated discharges, and two sites at Aberporth, are just outside the cSAC boundary, they have been included here because they serve a relatively large part of the local population and are extremely close to the site boundary. DCWW sewage effluent discharges are shown in Table 9., which also describes treatment processes, showing both the existing and planned treatment. All sites are consented by Environment Agency Wales. See Figure 17.

Table 9. Dŵr Cymru Welsh Water Waste Water Treatment Works

Site Name	NGR	Existing Treatment	Planned Treatment	Disinfection
Cardigan	SN 1720 4620	Secondary		Yes
Gwbert	SN 1590 5010	None	New local works or divert to Cardigan by 2005	
Aberporth	SN 2660 5152	Primary & microfiltration	None	Yes
Llangrannog	SN 3080 5420	Secondary	New works by 2005	To be provided
Llanina (New Quay)	SN 5035 5957	Primary	Add secondary by 2005	
Aberaeron	SN 4570 6340	None	Secondary by end 2000	
Aberarth	SN 4800 6420	Primary	Divert to Aberaeron	

Types of treatment:

PRIMARY TREATMENT: The purpose of primary treatment is to remove from the sewage much of the readily settleable material, such that the subsequent biological treatment is not overloaded. This is achieved in continuous flow tanks where the velocity of the sewage is reduced so that solids settle out and can be removed as sludge. The top liquor or 'settled sewage' passes forward to secondary treatment.

SECONDARY TREATMENT: Secondary treatment comprises biological oxidation of sewage by either (a) biological filtration (fixed bed reactor) followed by settlement of humus, or (b) the activated sludge process (suspended biomass reactor) followed by settlement of the sludge and separation of the surplus. The basic requirements for the viability of both processes are a food supply (the sewage), suitable organisms and an adequate supply of oxygen.

TERTIARY TREATMENT: Additional stages of treatment to further polish the effluent include (a) filtration, (b) nutrient reduction, (c) phosphorus removal (d) reed beds, (e) microfiltration and (f) ultra violet disinfection.

Cardigan Bay SAC Management Plan – *EFFLUENT DISPOSAL*

There are also a number of overflows connected to sewage pumping stations (SPSs) in the area, which are designed to operate only in cases of heavy rainfall in order to relieve pressure on the system and prevent sewage from flooding local properties. There are also a number of combined sewer overflows (CSOs) within the area. These act as relief valves, designed to discharge diluted sewage during periods of heavy rainfall when the receiving watercourse provides high dilution. These overflows may contain both domestic and trade effluent and storm water. Details of these two types of intermittent discharges are shown in Table 9.

Figure 19. Effluent treatment, transfer and disposal sites in and adjacent to Cardigan Bay cSAC

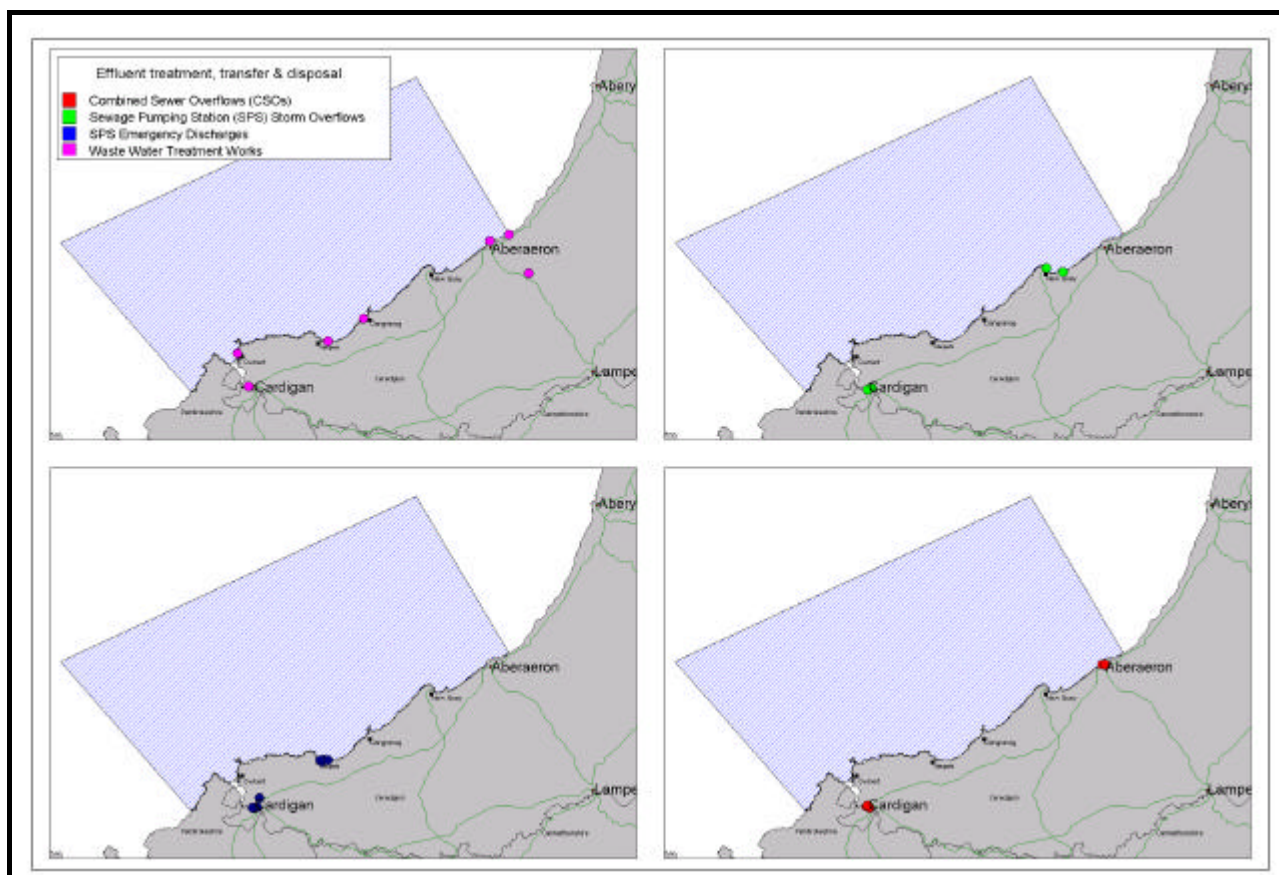


Table 10. Dŵr Cymru Welsh Water - Intermittent Discharges

Location	NGR (of discharge)	Description
Sewage Pumping Station (SPS) Storm Overflows		
Cardigan	SN 1825 4595	SPS No 1 Priory
Cardigan	SN 1800 4595	SPS No 2 Gloucester Row
Cardigan	SN 1775 4577	SPS No 3 South
New Quay	SN 3887 6018	Car Park SPS (Paragon)
New Quay	SN 4089 5968	Cei Bach SPS
Combined Sewer Overflows (CSOs)		
Aberaeron	SN 4548 6288	Wellington Street

Cardigan Bay SAC Management Plan – *EFFLUENT DISPOSAL*

Aberaeron	SN 4584 6283	Water Street
-----------	--------------	--------------

Table 10. Continued

Combined Sewer Overflows (CSOs)		
Location	NGR (of discharge)	Description
Aberaeron	SN 4576 6287	60m d/s A487 Road Bridge
Cardigan	SN 1800 4595	SSO Gloucester Row
Cardigan	SN 1761 4605	No 4
Cardigan	SN 1796 4594	No 5
Cardigan	SN 1773 4618	Queens Terrace

There are also a number of discharges of sewage from SPSs within the area, which discharge only in the case of an emergency. These are shown in Table 11.

Table 11. Dŵr Cymru Welsh Water SPS Emergency Discharges

Location	NGR (of discharge)	Description
Cardigan	SN 1796 4590	SPS No 5
Cardigan	SN 1823 4597	SPS No 1
Cardigan	SN 1780 4590	SPS No 3
Cardigan	SN 1766 4594	SPS No 4
Cardigan	SN 1850 4710	Felin Ban SPS
Aberporth	SN 2609 5165	Headland pumping station
Aberporth	SN 2583 5137	SPS No. 1
Aberporth	SN 2567 5152	SPS No. 2
Aberporth	SN 2660 5152	Waste Water Treatment Works

Most industrial premises in the area connect to sewers passing to DCWW STWs. There are also a number of small STWs belonging to the local authority and others, many of which serve holiday developments. In addition to these, there is one industrial site which discharges into the cSAC, Quay Fresh and Frozen Foods at New Quay. All sites are consented and monitored by Environment Agency Wales.

ii. Adjacent to the site

As well as effluent disposal points within the cSAC itself, it is necessary to consider disposal points beyond the site boundary which may have an influence on the water quality of the site. There are numerous small STWs and some industrial sites which discharge effluent into rivers flowing directly into the cSAC, such as the Teifi and the Aeron. Relative inputs from these are monitored directly, and by monitoring the quality of the rivers into which they flow.

It is also possible, given movements of tidal waters, that discharges well beyond the cSAC boundary may influence the quality of water within the site. However, it is obviously not feasible to examine every discharge at this stage, but investigations into any water quality problems experienced within the cSAC will not be limited to those sites listed above, but to any potential source.

b. *Mechanism for effect on the feature*

It is possible that human and domestic stock pathogens can enter the sea via sewage treatment works discharges since no disinfection processes are absolute, and many viruses can survive a very long time, particularly in sediments. There is the potential for infection of bottlenose dolphins by some of these. See ‘Pathogens’, page 59. Chemical inputs through effluent disposal can also affect bottlenose dolphins. See ‘Pollution’, page 58.

c. Management Response

i. Rationale

All discharges are controlled through a statutory system of licences known as discharge consents, issued by Environment Agency Wales.

No epidemic mortality of dolphins to a specific human or terrestrial animal pathogen has been recorded. Dilution of discharges is very high, even in low tidal energy environments such as Cardigan Bay, and there is no obvious mechanism for delivering a “challenge dose” of sufficient magnitude for a pathogen to cross a species barrier.

There is currently no evidence to support the idea that chemical quality from sewage and trade discharges, and sewage derived viral and bacterial pathogens, pose a significant risk to the Cardigan Bay dolphins *per se*. It is more realistic to expect pathogen mediated mortality to arise from impairment of the immune system occasioned by accumulation of immunosuppressive contaminants (possibly PCBs). All animals carry a significant burden of microbiological pathogens around with them all the time, and it is to these that they are most likely to succumb when resistance to disease is lowered.

Complete removal of all human and stock derived bacteria and viruses from marine inputs is not an option. Other sewage related issues, such as aesthetics, are being dealt with under current DCWW’s Asset Management Plan (AMP) investment arrangements.

Although these discharges are not thought to currently pose a significant risk, the Habitats Directive requires a review of relevant consents and permissions. See ‘Plans and Projects’, page 62.

ii. Type of Response

F1: The activity constitutes a plan or project

F4: There is a known mechanism for the activity to have an effect, but there is insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures

- Treat all effluent disposal consents as plans or projects.
- Environment Agency Wales will consider and review all consented and/or authorised discharges that are made to the sea, both inside the cSAC and within one spring tide excursion beyond the currently defined cSAC boundaries. This is because discharges outside the cSAC may influence it through tidal movement. Cardigan Bay current data are very limited, but for practical purposes the extension will be 4 nautical miles south westwards from Cemaes Head and 3.5 nautical miles north-eastwards from Aberarth, in a direction parallel to the shoreline. This is an initial view, and may be refined in future following national guidance.

5.3.7 Land Runoff

This section considers potentially contaminated surface water draining directly into the cSAC, or from more diffuse inputs influencing water quality in the cSAC from the River Teifi catchment or elsewhere.

a. Extent of the activity

Agriculture is the major industry in the region, occurring directly adjacent to the cSAC. Given the highly polluting nature of farm wastes, the collection, management and safe disposal of effluents, e.g. slurry, silage and sheep dip, are areas of concern as they can lead to the localised contamination of watercourses and potentially the cSAC. (See section 5.1.1.3 'Pollution'). Animal pathogens could also enter the cSAC via this route.

Changes in agricultural practices in recent years, often in response to European policy, have accelerated changes in land use. The upper Teifi in particular has seen a marked increase in sheep numbers, which has consequently placed a greater emphasis on the proper disposal of sheep dip. With the middle and lower Teifi having predominantly dairy and livestock farms, it is slurry and silage effluents that are of greater concern there.

The upper Teifi also suffers from the legacy of metal mining where run off from the abandoned spoil tips results in contaminated water running off into local watercourses.

Activities on industrial estates or other sites can also lead to accidental spills which can contaminate surface waters, although the area concerned has relatively few sites with the potential to discharge directly into the cSAC.

b. Mechanism for effect on the feature

Contamination from land run-off can lead to localised environmental problems, such as impacts on river water quality and biology from farm effluents e.g. sheep dips. These diffuse inputs can enter the coastal streams or the Teifi and Aeron catchments with the potential of subsequently impacting on the cSAC. EAW routinely monitors both these rivers and the water quality of each is considered to be of the highest standard. Some limited bacterial monitoring is also carried out at the EC Identified bathing beaches in the area in line with the requirements of the Bathing Waters Directive.

c. Management Response

i. Rationale

Land-use is obviously an important consideration as such a large area of land drains to the cSAC. Environmental impacts identified from current practices are largely well known and already subject to controls where they exist. For example, maintenance of bathing water is a key concern locally, and one where a number of organisations work together to minimise impacts from land run-off, amongst others. It is more likely that this factor will be considered and tackled for these other reasons than for dolphins, but this will ultimately mean risks to dolphins are reduced.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures

Cardigan Bay SAC Management Plan – *LAND RUNOFF*

- Continue to monitor river and coastal water quality data in the area and consider any influence land run-off might have on dolphin health and distribution.
- Maintain an ongoing programme of inspections of agricultural and industrial premises to ensure that risks are minimised and that owners/occupiers are aware of risks and implement best practice.^{125, 126}

¹²⁵ E.g. through use of *The Water Code: Code of Good Agricultural Practice for the Protection of Water*. 1998. MAFF, Welsh Office Agricultural Department. Available free from MAFF publications 0645-556000

¹²⁶ A range of Pollution Prevention Guidelines (PPGs) for industry, and site specific guidance is available from Environment Agency Wales.

5.3.8 *Historical Activities*

a. Extent of the activity

i. Within the site

Some historical activities may have left a legacy of problems that need consideration in managing the Cardigan Bay cSAC. Two are considered specifically in this section: metal mining and use of polychlorinated biphenyls (PCBs).

ii. Adjacent to the site

Past metal mining activity on land adjacent to the cSAC, especially in the catchments of the rivers Rheidol, Ystwyth, Clarach and the upper reaches of the Teifi, has left a legacy of spoil heaps of waste material at some sites. Discharges of metal contaminated water have, in many cases, had detrimental impacts on fish populations and the ecological quality of these watercourses.

PCBs were produced for a number of applications because of their chemical and thermal stability. Their manufacture was ceased in the 1970s and they are now included in the UK Red List of substances identified as priorities for reductions because of their environmental impacts. Sources are most likely to come from way beyond the cSAC boundary.

b. Mechanism for effect on the feature

With PCBs, existing environmental burdens, dispersed in coastal waters attached to sediments, are undoubtedly being accumulated in the food chain to a level in dolphin prey species which may have health implications for the dolphins themselves. PCBs are dispersed globally in the air, and this source will also contribute to the coastal water burden, both via rivers and directly to the sea. Elevated levels of PCBs have been found in dolphins in Cardigan Bay and in a sample of sediment taken from Aberystwyth harbour (outside of the cSAC boundary). Sediment PCB content from different sites in Cardigan Bay suggests that Aberystwyth has not been a major source of PCB in the Bay, and long distance particulate transport from more polluted areas may be much more important.

A relatively high level of accumulated mercury has been reported in dab (a species of flatfish) from Cardigan Bay, and possible sources will be investigated. Mercury can be bioaccumulated, and so dolphins could be at risk from eating some fish species, but mercury is found in fish species all around the world, and not enough is known about bottlenose dolphin food preferences to know whether Cardigan Bay dolphins are at risk from mercury. See 'Pollution', page 58.

c. Management Responses

i. Rationale

Follow up investigations by Environment Agency Wales into the PCB contamination of Aberystwyth Harbour suggest that the elevated levels reported from the 1994 sample were localised and no longer present¹²⁷. Further surveillance has since been undertaken and the results will be used to target any further investigations and to provide advice for any consequences for public health and marine species in Cardigan Bay.

¹²⁷ CEFAS (1997) Monitoring and surveillance of non-radioactive contaminants in the aquatic environment and activities regulating the disposal of wastes at sea, 1994. Aquatic Environment Monitoring Report No. 47, Lowestoft, pp 59

Research work is still under way to identify the route by which dolphins accumulate their clearly elevated PCB burden, but there are no obvious mitigation options open to regulators, even if it is discovered which fish species provide the main proportion of PCBs in their diet. It is essential that analytical data on dolphin (and other cetacean) tissue contamination from Cardigan Bay, and other sites, continues to be collected, so that any change in tissue burden with time can be assessed. Environment Agency Wales already supports the cetacean recovery programme sponsored by the DETR and Countryside Council for Wales and needs to plan, with other partners, to continue to gather appropriate data over a significant time period.

There is legitimate concern regarding the accumulation of organohalogens, such as PCBs, by dolphins. Although these chemicals are now likely to be acquired from diffuse sources, their role, and that of persistent organohalogen compounds, will be reviewed at the same time as the formal review of point source discharges. Opportunities for further regulation will also be considered by Environment Agency Wales.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures

Actions

- Continue to be vigilant over activities and pollutant sources which might threaten the integrity of the cSAC, and will take action based on a realistic assessment of risk.
- Continue to routinely monitor the river systems to determine the inputs and loadings of metals being discharged into coastal waters.
- Promote, in partnership with others, the reclamation of disused metal mines where there is significant environmental benefit.

Further actions for which there are currently inadequate financial support or regulatory powers.

- Undertake a monitoring programme to determine location and levels of PCBs and heavy metals in Cardigan Bay. To include water quality and sediment sampling, as well as food chain sampling, to demonstrate source, pathway and uptake.

5.3.9 Commercial Boat Trip Operators

a. Extent of the activity

i. Within the site

There are six passenger pleasure boats operating within the SAC between Easter and October. Two passenger pleasure boats, 'Ermol V' and 'Ermol VI' have been operating out of New Quay since the 1970's and offer regular, daily 30 minute, one hour and two hour trips to Birds Rock, Cwmtudu and Ynys Lochdyn. Three hour trips north of New Quay have been introduced in 2000. The 'Sulaire', owned by the manager of Cardigan Bay Marine Wildlife Centre, has also been operating for a number of years and offers longer trips around Cardigan Bay and caters for smaller groups who have a particular interest in various aspects of marine wildlife. 'Coastal Voyages' commenced operations in 1997 from the Sea Aquarium, Aberaeron and they, too, aim at the specialist end of the visitor market. 'Dunbar Castle 2' and 'Dunbar Castle 3', owned by the same person as the two 'Ermols', offer angling trips.

In 1997, the commercial passenger boat operators agreed a Code of Conduct for their operations. Some of the operators also participated in Cyngor Sir Ceredigion's survey and monitoring programme, and this data was used to guide the Code's annual review. Results of the Cyngor Sir Ceredigion's six year study have revealed that separation distances for encounters between passenger boats and dolphins increased during the study period and were significantly greater after the introduction of the boat operator's code than before. A conclusion from this study has been that the successful adoption of a code of conduct appeared to have reduced the likelihood those passenger boats would displace or otherwise adversely affect the behaviour of bottlenose dolphins

In 1994 a Licence was granted for one year to operate water-skiing off New Quay/Cei Bach. It was resolved in 1994 by the Public Services Committee of Ceredigion District Council that the Director of Administration be given authority to grant a Licence to only one such applicant in any one year for water sports at New Quay. A licence was issued in 1994 and 1995 to operate 'banana' rides from Aberporth to Tresaith. In both cases, restrictions on operational routes were imposed by Ceredigion Council, that took into account known sensitive areas for bottlenose dolphin use.

ii. Adjacent to the site

No regular commercial pleasure boat trips into or adjacent to the SAC from outside its boundary are known to occur.

b. Mechanism for effect on the feature

i. Noise

Commercial tour boats operate in close vicinity to the dolphins. However the vessels are typically of displacement type and relatively slow. For any vessel the level and frequency of noise produced can vary significantly with the condition of the engine and propeller. See 'Noise', page 56.

ii. Disturbance

Commercial tour boats operate in close vicinity to the dolphins and can induce changes in the dolphins behaviour. This may be represented for example by dolphins stopping their feeding behaviour to move away from or towards the vessels. Such disturbance may potentially result in a wide variety of effects from an impact on energy budgets to increased stress and immunosuppression. See 'Harassment', page 57.

iii. Collision

Increased boat activity in the vicinity of dolphins increases the likelihood of an accidental dolphin collision by boat or propeller. See ‘Collisions’, page 57.

iv. Pollution

Increased boat activity increases the risk of pollution through general boat operations and maintenance. Potential pollution could include litter, oil, hydrocarbon based fuels and antifoulants. These will increase the pollution loading on both the dolphins habitat and the dolphins themselves. See ‘Pollution’, page 58 and ‘Entanglement & Ingestion’, page 58.

v. Close human dolphin interaction

Tour boats provide the opportunity for close interaction between the dolphins and humans. Elsewhere in the world people often wish to touch the cetaceans and on occasion have been known to throw objects at them in the hope of eliciting a response, however no observations of this type of behaviour have been made in Cardigan Bay and it is not currently considered a problem. Physical contact may potentially result in the transfer of pathogens to and from the dolphins and even injury. Thrown objects may be ingested or strike the dolphins resulting in injury. Close and frequent interaction with the dolphins may habituate them to human activity. See ‘Pathogens’, page 59.

vi. Generation of an attitude that disturbance is acceptable

Participation in tour boat cruises may generate a public attitude that disturbance caused by the boats is acceptable. i.e. ‘If they can take a boat to look at the dolphins then so can I.’ Whilst some passengers may be aware of the disturbance and believe it to be acceptable, others may not appreciate there is an issue at all as they are unaware that disturbance is taking place.

vii. Increased awareness and education, understanding dolphin requirements.

The use of tour boats as a mechanism for increasing understanding and awareness of the bottlenose dolphins and their requirements is a benefit. Adherence to, and explanation of, good practice by the boat operators can engender a more responsible public attitude to recreational boating.

c. Management Response

i. Rationale

Despite the potential for commercial tour boat operations to significantly affect the bottle nose dolphins, it is clear that current voluntary mechanisms, such as the adoption of a boat operators code of conduct, are at least partially counteracting this. In addition, most commercial trip operators currently provide some form of interpretative narration explaining the dolphins’ requirements and the presence of the code of conduct.

The recent Port Waste Management Plan of 1999 established good waste management practice including the use of waste control measures on commercial trip boats and appropriate disposal services for refuse and oil waste at the harbour side.

Whilst all tour boat operators currently known to be working in the bay have signed up voluntarily to the boat operators code of conduct¹²⁸ (CoC), occasional transgressions of the code do occur. At present adherence to the voluntary code cannot be enforced, instead, abuses of the CoC have been addressed by the Harbourmaster and the Coast and Countryside Project Officer issuing verbal warnings as a

¹²⁸ See Appendix 5.

deterrent. Where it works, a voluntary approach is the best solution. On a world wide basis however there has been a general shift towards the use of stronger financial deterrents either by the use of an effective accreditation scheme or, more commonly, the use of statutory measures such as fines or the removal of a license.

The level of impact on the dolphins from commercial trip boats is related to the numbers of boat trips. One means of regulating the number of boat trips is by limiting the number of boats operating. At present, whilst a variety of different licenses may be required by an operator such as for launching, use of a mooring or hard standing and for safety, there is no single effective means of limiting the number of commercially operating boats.

To provide a means of discouraging code of conduct defaulters a legal requirement to adhere to it is required. This should, ideally, be through the issuing of a revocable operating license with clearly stated conditions under which the license would be revoked and for how long. In addition, there is a need to fix an operational limit on the number of commercial trips in the bay. This could be achieved through limiting the number of operating licenses available for a consent essential to the process of operating commercial tour boat trips. Both of these potential solutions require a review of current licensing arrangements.

It will continue to be important for the successes of the current regime to be maintained.

This should include a regular review of the code of conduct; continued encouragement and support in the provision of interpretative information during boat trips; zoning of operations; and provision of training to commercial boat operators to facilitate their inclusion in dolphin monitoring and surveillance schemes.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures

Link: Marine Heritage Coast Management Plan:

- Review and develop the Passenger Boat Code of Conduct with the boat operators at New Quay and Aberaeron.
- Continue to support the passenger boat operators in their Wildlife Boat Trips, by the preparation of information and the provision of regular training.
- Continue to involve pleasure boat operators in sightings/disturbance monitoring.
- Explore the possibility of an accreditation scheme for passenger boat operators.
- Explore mechanisms available to include the current voluntary Passenger Boat Code as a statutory condition for operation.
- Support the limitation of passenger boat licences.

.

5.3.10 Recreational Activities

An important factor in effectively managing the Cardigan Bay cSAC, and particularly recreational activities, is the level and quality of education and awareness held by those who use the cSAC and other areas of Cardigan Bay. Many of the actions in the following two recreation sections address the requirement to maintain awareness and education at a high level. As well as benefiting the management of recreational activities these will assist the management of many other activities addressed within this document.

5.3.10.1 Swimming, snorkelling and diving

a. Extent of the activity

i. Within the site

The Ceredigion coast is important for tourism. The number of staying visitors in the area between Aberaeron and Cardigan in 1990 was nearly 392,000. Many of these use the local beaches for recreation including swimming and snorkelling. Enhanced water quality, due to improved waste water treatment, at some beaches may further encourage these activities. SCUBA diving occurs along the coast and local diving clubs exist in Cardigan, Aberaeron and Aberystwyth. The quality of local diving does not however attract many holidaying clubs as these typically prefer to enjoy the greater water clarity and more attractive underwater topography found elsewhere in the UK.(e.g. Pembrokeshire).

ii. Adjacent to the site

Swimming, snorkelling and diving are popular and occur all along the Cardigan Bay coast, especially during the summer months. Diving is most popular around the Pembrokeshire coast.

b. Mechanism for effect on the feature

There is the potential for people swimming in the sea to purposely or incidentally interact with the bay's bottlenose dolphins. Close interaction, including physical contact, with dolphins may result in:

- dolphin harassment,
- physical injury to human or dolphin,
- increased risk of pathogen transfer between human and dolphin and vice versa.

Frequent close interaction between humans and dolphins may result in habituation of the dolphins to close contact with humans. A loss of 'wildness' such as this may result in altered behaviour, increased interaction with humans and all the potential impacts that these may cause.

Use of a boat to provide access to enable swimming with dolphins may result in dolphin harassment or collision between dolphin and boat. See following section on recreational vessels as well as sections on 'Harassment' (page 57), 'Noise' (page 56), 'Pathogens' (page 59), and 'Collisions' (page 57). Further information on interactions between recreation activities and SAC site features will be obtainable from the Life report, 'Saunders. C., Selwyn. J., Richardson. S., May. V. and Heeps. C. 2000. *Recreational User Interactions*. in prep.'¹²⁹

¹²⁹ On completion this report will be available from: <http://www.english-nature.org.uk/uk-marine/>

c. Management Response

i. Rationale

Although there has been swimming and diving with bottlenose dolphins adjacent to Cardigan Bay in the past, it is not thought to have been a significant problem. Elsewhere within the world close interaction with ‘wild’ dolphins is of a commercial nature and there is the potential for interest in this sort of venture to increase in Cardigan Bay. Such commercial scale activities are likely to become detrimental to the dolphins and should therefore not be permitted. There is also the potential for individuals to seek their own “close encounters”, and this might be encouraged if commercially organised interactions were available. To intentionally disturb a bottlenose dolphin is an offence under the 1981 Wildlife & Countryside Act and under the 1994 Habitats Regulations, except under certain defined circumstances. This legislation may be sufficient to discourage inappropriate commercial and non-commercial activity of this kind, although its effectiveness has been questioned. See ‘Harassment’, page 57.

Seeking out dolphins to swim with should be discouraged. However, it is appreciated that direct interactions with dolphins may be initiated by the dolphins themselves and guidance for human behaviour under these circumstances should be available in a form which moderates human behaviour and does not encourage the activity.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures.

- Discourage swimming with dolphins by provision of information in the Code of Conduct and other appropriate publications.
- Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.
- Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.

5.3.10.2 Recreational vessels

This section deals with non commercial recreational craft such as motor cruisers, speed boats, yachts, dinghies and canoes. Commercial trip boats are dealt with under ‘Commercial Boat Trip Operators’, page 101.

a. Extent of the activity

i. Within the site

There are mooring facilities for 133 boats at New Quay; 80 at Aberaeron; and 200 at Cardigan, with yachting and boating clubs located at Aberaeron, New Quay, Tresaith, Aberporth, and Cardigan. Canoe and windsurf hire facilities are also available.

Variation in the types of boats involved in dolphin encounters at different sites

The presence of boats in the vicinity of bottlenose dolphins was recorded in one thousand four hundred and thirty nine 15 minute intervals from 1995 to 1999, as part of a study into Cetacean Site Use & Boat Traffic on the Ceredigion Marine Heritage Coast¹³⁰. Most encounters were observed at New Quay (61%), even though no observations were carried out at this site in 1999. Encounters observed at Aberporth, Ynys Lochtyn and Mwnt represented 18%, 13% and 8% of all encounters respectively.

The types of boat most commonly recorded in encounters with bottlenose dolphins varied between study sites. Most passenger boat operate from New Quay, and most records of Visitor Passenger Boats (VPB) were therefore made at the New Quay study site (n = 355). There were fewer observations of VPBs at Ynys Lochtyn (40), and these again mostly involved boats based at New Quay. Dolphin encounters with VPBs were recorded only infrequently at Aberporth (11) and Mwnt (4).

Overall at New Quay, VPBs were recorded as the closest boat in 40% of encounters. The second most frequently recorded boat type, sailing boats, were present in 22% of encounters. At Aberporth there were a total of 253 encounters, mostly involving motor boats (36%), speedboats (23%) and sailing boats (21%). Of 187 encounters at Ynys Lochtyn, the predominant boat types were motor boats (26%) and VPBs (20%). At Mwnt, most encounters involved sailing boats (37%). Commercial fishing boats were recorded in a greater proportion of encounters at Mwnt (16%) than elsewhere (Table 5).

Table 12. Closest vessel during dolphin-boat encounters.

Total encounters are given for each site and as percentages for each type of boat involved.

C = canoe; CF = commercial fishing boat; MB = motor boat; O = other; SB = speedboat; SCY = sailing boat, under sail; VPB = visitor passenger boat. 'Other' types included tugs and other vessels employed on Aberporth military range.

Site	%C	%CF	%MB	%O	%SB	%SCY	%VP	total
Aberporth	7	6	36	2	22	21	4	253
Mwnt	4	16	14	14	13	37	2	118
New Quay	2	8	12	0	16	22	40	881
Ynys Lochtyn	4	5	36	2	17	17	20	187

A jetski was recorded as the nearest vessel in 1 encounter only, at Aberporth in 1994.

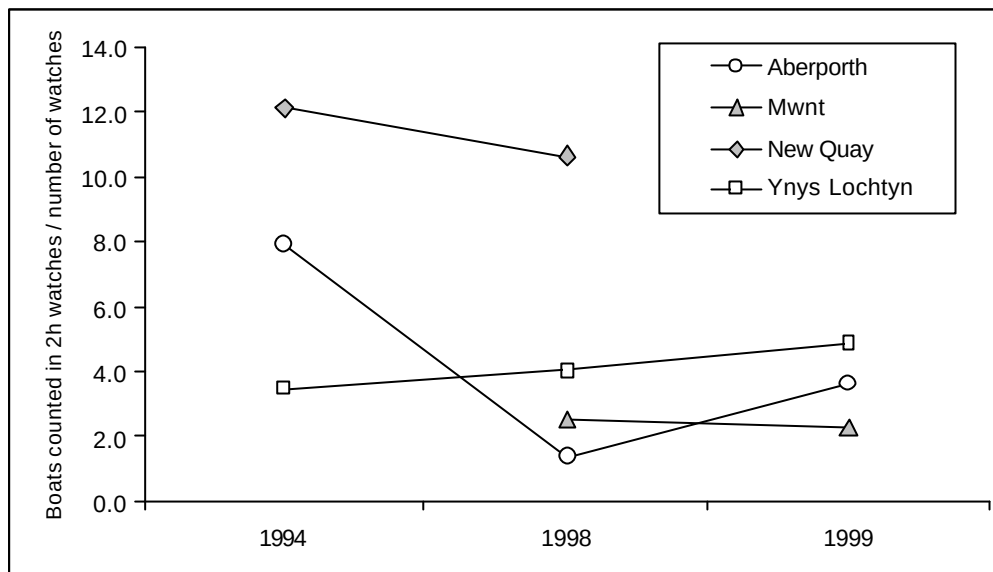
Levels of boat traffic in 1994, 1998 and 1999

Counts of the number of boats of different types were made for 2 hour watches in 1994, 1998 and 1999. These data allowed comparisons to be made of levels of boat use at the study sites over the duration of the project.

An index of the relative levels of boat traffic was calculated by dividing the total number of boats counted in 2 hour watches by the number of watches completed at each site. These data confirm that New Quay was 'busiest' site for boats, with approximately 3-4 times as much boat traffic recorded than at Ynys Lochtyn and Aberporth and 5-6 times as much as at Mwnt (Figure 20.). There is clearly poor correlation between dolphin site use and the relative number of boats that use each site: observers at New Quay and Mwnt, the sites with highest sighting rates of dolphins, recorded the highest and the lowest levels of boat traffic respectively.

¹³⁰ Pierpoint, C. and Allan, L. 2000 *Cetacean Site Use & Boat Traffic on the Ceredigion Marine Heritage Coast, West Wales 1994-1999*. Cyngor Sir Ceredigion

Figure 20. Total boat traffic at study sites in 1994, 1998 and 1999.



ii. Adjacent to the site

Facilities for recreational vessels are more extensive outside the SAC at locations such as Milford Haven, Aberystwyth, Barmouth, Porthmadog and Pwlllelli. In addition to these, there are numerous small slips and beaches for launching small vessels. Vessels enter the SAC from launching sites and safe havens further north and south of the site. Whilst some of these vessels may be visiting SAC waters, a proportion are in transit through the SAC.

b. Mechanism for effect on the feature

Vessel activity on the sea increases levels of through water noise. This may disrupt the ability of bottlenose dolphins to communicate, navigate and hunt prey. Boat activity close to dolphins may result in an avoidance response where the dolphins cease their current activity and move away from the vessel. An increase in boat activity may result in inadvertent collision with dolphins.

Intensive and irregular boat activity, through disruption of normal dolphin activity, may deleteriously affect the dolphins energy budget resulting in reduced survivorship and reproductive success. See 'Disturbance', page 56, and 'Collisions', page 57.

c. Management Response

i. Rationale

It is accepted that recreational use of these coastal waters will continue, and could increase in the coming years. It is also clear that there is the potential for recreational vessels to have a significant impact on the dolphins and an impact may currently be present of which we are unaware. It will therefore be necessary for organisations to work cooperatively to ensure that recreational activities are non-damaging and consistent with the aims of the SAC. Education will be an important management tool for achieving this objective. There should be an aim to ensure that all visitors, including boat users, are aware of the existence and purposes of the SAC. This could be achieved, in part, by providing interpretation and education facilities for local people and visitors that will generate interest, appreciation and a commitment to conserve the SAC and the SAC feature.

A Boat Users Guide¹³¹ has been produced offering advice if cetaceans are encountered, and these are now distributed by the Harbourmasters at the main launching sites of New Quay, Aberaeron and Aberystwyth. The Afon Teifi Fairways Committee distribute the Boat Users Guide to all Cardigan mooring holders. However, no indication has been found to show that the behaviour or recreational motor boat and speedboat users has changed since the introduction of the Code of Conduct^{132,133}.

Whilst further research is clearly needed, it is considered necessary to adopt a precautionary approach to management.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures

Link: Marine Heritage Coast Management Plan:

- Continue to keep Incident records and pass to relevant Harbourmaster for action.
- Withdraw launching rights where necessary.
- Develop activities zoning schemes where appropriate.
- Maintain information/code of conduct signs at Aberporth, Llangrannog, Tresaith, New Quay, Cei Bach.
- Maintain interpretative displays at local venues.
- Continue to provide occasional educational wildlife boat trips.
- Develop shore based guided walks.
- Organise annual marine environment public events.
- Continue to involve local people in monitoring projects.
- Ensure that Beach Officer records are maintained.
- Continue to undertake regular illustrated talks/presentations.
- Assess the effectiveness of the New Quay speedboat zone and review.
- Restore the Old Coastguard Lookout at Birds Rock, New Quay as a seabird & marine mammal lookout.

Other actions:

- Maintain information/code of conduct signs at Poppit Sands launching points.
- Discourage the development of commercial recreational activity which has the potential to disturb the bottlenose dolphins.
- Provide new information/code of conduct signs at Cardigan, Gwbert, Llanrhystud and Aberaeron.
- Maintain Ceredigion Marine Conservation information posters at beach display panels.

¹³¹ See Appendix 4.

¹³² Ceredigion, Aberaeron. Ceredigion County Council. 1998. *Marine Heritage Coast Management Plan 1998 - 2000*. Ceredigion, Aberaeron.

¹³³ Pierpoint, C. and Allan, L. 2000 *Cetacean Site Use & Boat Traffic on the Ceredigion Marine Heritage Coast, West Wales 1994-1999*. Cyngor Sir Ceredigion

Cardigan Bay SAC Management Plan – *RECREATIONAL ACTIVITIES*

- Continue to provide MHC/SAC information for inclusion in the Ceredigion Tide Time Tables.
- Ensure that the Council's Economic and Tourism Department carry information about the MHC/SAC in their publications.
- Regularly review the Ceredigion County Council's 'Boat Users Guide' and reproduce when necessary.
- Continue to provide MHC/SAC articles for the Ceredigion County Council's 'Seafarer' newsletter issued to all mooring holders.
- Determine whether behavioural reactions to dolphin watching boats are the result of reactions to boat noise or boating behaviour and/or volume.
- Keep records of boat launches at Aberaeron, Aberystwyth and New Quay.
- Devise a database to link data relevant to the SAC currently available in other Council departments.
- Obtain better information on the distribution of dolphins throughout Cardigan Bay to identify sensitive areas where speed restrictions are necessary.
- Assess current and future levels of recreational boat traffic, and determine which areas are used most intensively. Use these data to determine whether provision of launching or other facilities can be used to direct recreational traffic to areas that are not favoured by dolphins.
- Review local byelaws in light of the DETR's Review of Byelaw Powers for the Coast.
- Seek venue/s in Cardigan for interpretative displays.
- Explore, with existing Marine Interpretation centres, the possibility of establishing a SAC Interpretation Centre.
- Continue to make available the joint PCNPA and PCC 'fast craft code of practice' to boat users.
- Take account of the conservation requirements of the SAC in the development of any new codes of practice/conduct for water-borne activities off the Pembrokeshire coast.
- Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.
- Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.

5.3.11 Commercial filming and photography

a. Extent of the activity

cSAC status has already attracted increased media attention on the site, and future proposals for filming and photography of the dolphins are likely.

b. Mechanism for effect on the feature

Positive

i. Improved awareness

Increased media coverage, publicity and interpretative literature will raise public awareness of the bottlenose dolphins and their requirements. This may result in reduced impacts from recreational activities, increased voluntary initiatives and increased levels of finance for site management. However, increased awareness may also result in an increase in recreational activities in areas of dolphin activity and increased demand for commercial ‘dolphin watching’ boat trips.

Negative

ii. Disturbance

Most filming and photography requires use of boats to gain close access to the dolphins. This can increase levels of noise and harassment. See ‘Disturbance’, Page 56.

iii. Collision

Use of boats close to dolphins may result in collision with a dolphin and resulting injury or death. See ‘Collisions’, page 57.

c. Management Response

i. Rationale

The means of regulation of this type of activity are uncertain and open to differing legal interpretation. Commercial filming and photography of marine wildlife, either in or outside SACs, is not regulated or managed under specific legislation. However, under Regulation 39 of the 1994 Conservation Regulations, it is an offence “deliberately to disturb” a European protected species (which includes bottlenose dolphins). But it is open to legal question whether many filming or photography activities would constitute disturbance, let alone deliberate disturbance, of the Cardigan Bay cSAC bottlenose dolphins, and therefore open to question whether a court would consider these activities to be proscribed. Clearly much would depend on the specific nature of the activities undertaken.

Under Regulation 44 of the Conservation Regulations, licences may be granted (by CCW) for various purposes, including “scientific or educational purposes”, where CCW is satisfied that the action thus authorised will not be detrimental to the dolphin population. It is not known whether filming and photography could be said to constitute scientific or educational purposes, but arguably by being for “commercial” purposes, they could not be considered scientific or educational.

Responsibility for enforcing this legislation lies largely with the police and criminal courts. For obvious reasons - the ambiguity in the legislation, and the fact that these activities occur at sea - enforcement of this legislation would be very difficult.

Increased public awareness of the requirements of the bottlenose dolphins through the media and interpretative literature are important. However, field operations, both amateur and professional, have the potential to be detrimental to the bottlenose dolphins if not managed appropriately. Whilst these activities are currently only occurring at a low level of intensity they are likely to increase as interest in the site develops. They also act in a similar way and therefore cumulatively with scientific monitoring and research which may also increase as the SAC management gets properly underway.

The key issues are the intensity and duration of interaction with the dolphins and the exact manner in which each interaction is conducted. These characteristics need to be carefully managed to ensure maximum benefit but with minimal impact on the dolphins.

While certain types of damaging activity are prohibited (unless a licence is obtained from CCW), there are many types of photography, filming or research which are essentially unregulated. A potential means of monitoring and managing these activities is to initiate and maintain an advisory and approvals system under which all persons wishing to undertake research, boat based photography or filming to seek the advice of CCW on whether a licence is required, and whether a licence can indeed be issued and under what conditions the activity should be carried out. This would provide a means of:

- where possible and appropriate, CCW issuing a licence and attaching conditions to it;
- where a licence cannot be issued, CCW advising on the conditions which should be adhered to if the activity is to be pursued;
- where appropriate, CCW advising against carrying out the activity
- monitoring the levels of such activities, and modifying the advice given if required.

A list of applicants and a summary of their work could be maintained and made available on request (subject to confidentiality requirements) to improve cooperation between projects and reduce duplication of effort.

The above approach would benefit from the development of an agreed Code of Practice, for example developed jointly by CCW and independent dolphin conservationists and researchers, which can provide the basis for both licence conditions and project-specific guidance.

This advisory and approvals system could cover both commercial filming and research activities.

It is important that any public material about the bottlenose dolphins provides information which engenders a responsible public attitude towards them. The benefits of increased awareness through use of film and photographic media could be overbalanced by detrimental pressures if public information merely increases interest and encourages exploitation.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions including links to other policies/plans/measures

- Initiate and maintain an advisory and approvals system for all bottlenose dolphin research, photography and filming projects within Cardigan Bay. Each project will be required to seek advice and approval prior to initiating field work. Approval will require compliance with an approved code of practice and any project specific guidance issued. In addition, any project may require the issuing of a license under the Wildlife And Countryside Act (1981) (as amended) and The Conservation (Natural Habitats, &c.) Regulations 1994. Records of all such projects will be maintained and made available on request subject to confidentiality requirements.

- Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.
- Ensure, as far as possible, that the production of all media about dolphins includes as one of its aims the development of a responsible public attitude towards the dolphins.
- Seek clarification of the legislation, particularly with regard to the concepts of ‘disturbance’ and ‘deliberate’ and the purposes for which licences can be issued.
- Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.

5.3.12 *Research Activities*

a. Extent of the activity

Research into the bottlenose dolphins has occurred within and adjacent to the SAC for many years. Levels have generally been low, and even during the early 1990's when interest in cetaceans in the bay was raised, surveys were conducted relatively infrequently (a few days per month for part of the year). Whilst most studies are entirely passive, some require the ability to be in close proximity to the dolphins.

Research has taken a variety of forms, including acoustic studies, visual observations and photography, both on land and at sea. Research and monitoring of the bottlenose dolphins is likely to increase within the SAC as a result of its recent cSAC status. Indeed, research and monitoring of other cetacean species within Cardigan Bay also has the potential to increase, as recent studies of harbour porpoise and risso's dolphin show.

b. Mechanism for effect on the feature

Positive

i. Improved management

Monitoring of the bottlenose dolphins is a vital part of the Cardigan Bay cSAC management scheme and is essential in enabling effective and correct management of the site. Targeted research will provide site managers with answers to specific management questions facilitating effective and correct management of the site.

ii. Improved awareness

Increased interpretative products from scientific studies will raise public awareness and knowledge of the bottlenose dolphins and their requirements. This may result in reduced impacts from recreational activities, increased voluntary initiatives and increased levels of finance for site management.

Negative

iii. Disturbance

Many forms of research and monitoring requires the use of boats to gain close access to the dolphins. This can increase levels of noise and harassment. See 'Disturbance', Page 56. Increased awareness (see above) may result in an increase in recreational activities in areas of dolphin activity and increased demand for commercial 'dolphin watching' boat trips.

iv. Collision

Use of boats close to dolphins may result in collision with a dolphin and resulting injury or death. See 'Collisions', page 57.

v. Injury

Some scientific studies require the removal of tissue samples or affixing tags or electronic devices to the dolphins. Minor injury to the individuals concerned may result from some of these activities. On the basis of a series of reports the International Whaling Commission (IWC) concluded that biopsy sampling of individual cetaceans was not likely to produce any long-term deleterious effects. However, it was recommended that biopsy studies should be combined with ongoing photoidentification investigations to effectively monitor potential 'longitudinal effects' on known individuals.

c. Management Response

i. Rationale

Research and monitoring are an essential part of any management scheme. Increased public awareness of the requirements of the bottlenose dolphins through the media and interpretative literature are also important. However, field operations, both amateur and professional, have the potential to be detrimental to the bottlenose dolphins if not managed appropriately. These activities are likely to increase as interest in the site develops and as field monitoring and research for SAC management gets properly underway.

The key issues are the intensity and duration of interaction with the dolphins and the exact manner in which each interaction is conducted. These characteristics need to be carefully managed to ensure maximum benefit to our knowledge with minimal impact on the dolphins.

Under Regulation 39 of the 1994 Conservation Regulations, it is an offence “deliberately to disturb” a European protected species (which includes bottlenose dolphins).

Under Regulation 44 of the Conservation Regulations, licences may be granted (by CCW) for various purposes, including “scientific or educational purposes”, where CCW is satisfied that the action thus authorised will not be detrimental to the dolphin population. Responsibility for enforcing this legislation lies largely with the police and criminal courts. For obvious reasons - the ambiguity in the legislation, and the fact that these activities occur at sea - enforcement of this legislation would be very difficult.

Increased public awareness of the requirements of the bottlenose dolphins through the media and interpretative literature are important. However, field operations, both amateur and professional, have the potential to be detrimental to the bottlenose dolphins if not managed appropriately. Whilst these activities are currently only occurring at a low level of intensity they are likely to increase as interest in the site develops.

The key issues are the intensity and duration of interaction with the dolphins and the exact manner in which each interaction is conducted. These characteristics need to be carefully managed to ensure maximum benefit but with minimal impact on the dolphins.

While certain types of damaging activity are prohibited (unless a licence is obtained from CCW), there are many types of research, or photography and filming, which are essentially unregulated. A potential means of monitoring and managing these activities is to initiate and maintain an advisory and approvals system under which all persons wishing to undertake research, boat based photography or filming to seek the advice of CCW on whether a licence is required, and whether a licence can indeed be issued and under what conditions the activity should be carried out. This would provide a means of:

- where possible and appropriate, CCW issuing a licence and attaching conditions to it;
- where a licence cannot be issued, CCW advising on the conditions which should be adhered to if the activity is to be pursued;
- where appropriate, CCW advising against carrying out the activity
- monitoring the levels of such activities, and modifying the advice given if required.

A list of applicants and a summary of their work could be maintained and made available on request (subject to confidentiality requirements) to improve cooperation between projects and reduce duplication of effort.

The above approach would benefit from the development of an agreed Code of Practice, for example developed jointly by CCW and independent dolphin conservationists and researchers, which can provide the basis for both licence conditions and project-specific guidance.

This advisory and approvals system could cover both research and commercial filming/photography activities.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions including links to other policies/plans/measures

- Initiate and maintain an advisory and approvals system for all bottlenose dolphin research, photography and filming projects within Cardigan Bay. Each project will be required to seek advice and approval prior to initiating field work. Approval will require compliance with an approved code of practice and any project specific guidance issued. In addition, any project may require the issuing of a license under the Wildlife And Countryside Act (1981) (as amended) and The Conservation (Natural Habitats, &c.) Regulations 1994. Records of all such projects will be maintained and made available on request subject to confidentiality requirements.
- Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.
- Ensure, as far as possible, that the production of all media about dolphins includes as one of its aims the development of a responsible public attitude towards the dolphins.
- Seek clarification of the legislation, particularly with regard to the concepts of ‘disturbance’ and ‘deliberate’ and the purposes for which licences can be issued.
- Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.

5.3.13 Military Activities

a. Extent of the activity

i. Within the site

Most of the Cardigan Bay cSAC is within the control of the DERA Aberporth range (see Figure 13, page 35) who have been active in the area for 60 years. DERA aim to maintain the range as a safe testing area for the Ministry of Defence (MoD) and other customers, and provide a variety of navigation, tracking and data processing facilities. There are surface to air, air to surface, air to air and sea to sea guided weapon system firing trials. Missiles and some targets remain in the sea following trials. Trials involve the use of ships, aircraft, and target structures out at sea. A brief historical perspective of DERA Aberporth is given on page 34.

ii. Adjacent to the site

The DERA Aberporth testing range extends beyond the limits of the cSAC. Most major testing of live ordnance is believed to occur some distance offshore, beyond the north western edge of the cSAC. See Figure 13.

b. Mechanism for effect on the feature

Past and present military activities within the bay have the potential to result in three main impacts; pollution, physical injury, disturbance.

The presence of toxic materials and their leakage from munitions or targets used in the Cardigan Bay sea area may result (or have resulted) in increased contamination of marine life. Bottlenose dolphins are particularly at risk from any bioaccumulating substances present. See 'Pollution', page 58.

Explosions in the sea or adjacent to its surface may result in injury or death to bottlenose dolphins in the near vicinity. Objects 'falling from the sky' may cause injury. Disturbance may result from sudden bursts of underwater noise. Tests involving the use of active sonar may result in local disruption of bottlenose dolphin communication, navigation and feeding. See 'Disturbance', page 56. There is also a risk of ingestion of foreign objects in the sea resulting from military activity.

c. Management Response

i. Rationale

Tests supervised by DERA Aberporth occur sporadically and are not continuous. Use of live ordnance within trials has decreased in recent years, though its future use will be subject to the vagaries of customer demand. Most trials occur well out to sea, beyond the western limit of the cSAC.

Noise disturbance generated during occasional tests, whilst covering a wide area, is very short lived and is not considered to be of significant concern.

Tests involving the use of surface targets and live ordnance or projectiles of very high kinetic energy have the potential to result in the injury or death of dolphins present in the immediate area of the target. A similar potential exists for injury or death from falling debris following the use of airborne targets. The infrequency of tests, the small (though unpredictable for aerial targets) size of the areas of risk and the small area of the bay occupied at any moment in time by the dolphins results in a very low probability for dolphin presence in the areas of risk at the moment of impact. However the potential degree of damage

is high and means of removing or minimising this risk should be sought. The level of risk is already seen as high enough to ensure that humans are not present in risk areas during tests.

One clear solution would be to look for presence of dolphins in the areas of risk prior to a test and ensure that either:

- the test is postponed until the dolphins are no longer present in the areas of risk,
- the dolphins are ‘removed’ from the areas of risk prior to the test going ahead as scheduled.

The former is the simplest, but for some tests may result in considerable cost. The latter would likely require the use of some form of deterrent and would result in a period of disturbance that would tend to undermine the purpose of ‘removing’ the dolphins in the first place.

Identification of dolphin presence in the areas of risk is difficult. The distance offshore of the tests reduces the effectiveness of visual techniques despite the quality of optics available and currently in place. Despite this, DERA have recently put in place a mechanism for visually observing dolphin presence during tests. Acoustic methods may also be of benefit and DERA are currently liaising, on this issue, with CCW who have been conducting acoustic and visual monitoring trials.

The type and significance of any pollution which may result from expended ordnance within Cardigan Bay has not successfully been ascertained during development of this plan.

Due to the complex nature of these issues it was not appropriate for DERA Aberporth to attempt to resolve the issue in isolation. Consequently, the matter was referred to higher management authorities within DERA. Recently, a series of local procedures were agreed in order to ensure that DERA trials do not adversely impact on the marine mammal population of Cardigan Bay.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures

- Work alongside CCW in the development of an acoustic monitoring and detection system for deployment in Cardigan Bay.
- In the run-up to a firing trial, should dolphin, other cetacean or seal be observed in the area of risk the trial will be aborted.
- To avoid ‘disturbance’ no attempt will be made to move the dolphin, other cetacean or seal and the firing trial will continue to be fouled until the cause of the incursion has moved of its own free will outside of the risk area.
- As the size and location of the risk area will vary according to the particular trial scenario, these details will be identified within the associated trial specification in accordance with defined practice.
- DERA Aberporth Range Standing Orders will be amended to include an annex detailing the procedure to be observed in order to ensure that the area of risk is clear of dolphin, other cetacean or seal prior to a weapon firing trial.
- Provide advice (CCW) and facilitate the work of DERA in developing and maintaining cetacean surveillance during periods of ordnance testing.

5.3.14 Shipping

This section addresses the implications of commercial shipping. Fishing, recreational, boat trip and military vessels are addressed separately in other sections. Also, works associated with the maintenance of navigation such as dredging are addressed separately on page 118.

a. Extent of the activity

i. Within the site

The site is little used by commercial vessels (other than fisheries and tour boats).

There are no major ports within the SAC. There are small harbours at New Quay and Aberaeron mainly used by fishing vessels and recreational craft. These are too small and shallow to be used by most commercial shipping.

Larger vessels transiting the area would not generally enter Cardigan Bay itself, and their route would generally keep them well outside the SAC boundary.

ii. Adjacent to the site

The Irish Sea is an important route for commercial vessels. The number or types of vessels is unknown, but the Irish Sea to the west of Cardigan Bay is certainly heavily used by commercial shipping leaving or bound for ports in the Bristol Channel and Milford Haven, Liverpool Bay, east coast of Ireland, and further afield. Most, if not all of the larger vessels passing Cardigan Bay keep well west of Cardigan Bay itself (i.e. a line drawn between the Smalls and Holyhead), as there are no large ports or anchorages in the Bay and to enter it while transiting simply increases journey times.

The major exceptions to the above are the vessels using the port of Fishguard - the only major harbour in the area capable of taking large commercial vessels. There are around 8 ferry movements per day in/out of Fishguard, with most of the vessels rounding Strumble Head and sailing in an east-west direction between there and Rosslare. About half of all ferry movements are now high speed vessels.

Other small harbours in Cardigan Bay but outside the SAC boundary include Aberystwyth, Aberdyfi, Barmouth, Porthmadog, Pwllheli. As with the harbours inside the SAC, these are all used mainly or entirely by fishing and recreational craft.

b. Mechanisms for effects on feature

i. Noise

The larger vessels addressed by this section generate considerable amounts of relatively low frequency sound. Except for a negligible amount of local shipping most shipping noise is generated well offshore and contributes to raised background noise levels. See 'Noise', page 56.

ii. Collisions

Boat activity may result in inadvertent dolphin collision, the likelihood of this will be increased for the high speed vessels. However, most shipping movements follow a predictable course and can be heard approaching from some distance off. See 'Collisions', page 57.

iii. Pollution

Incidental and deliberate discharge of lubricants, fuel, refuse, etc.:

Routine ship-source pollution exists in many forms including flushing of ‘empty’ storage tanks with seawater, pumping out oily bilges and the disposal of refuse. These may affect the dolphins in a number of ways including toxic effects (to the dolphins and to their habitat), physical harm and entanglement. See ‘Pollution’, page 58, and ‘Entanglement & Ingestion’, page 58.

Shipping accidents:

The spillage of large quantities of oil or other, including toxic, substances could impact on the dolphins. The impacts could be through direct contact between the animals and the polluting substance, or through adverse changes to the dolphin’s habitat (e.g. reduction, displacement or contamination of food supply).

The actual impacts would vary greatly according to the nature of the polluting material, the size and location of any spill and its behaviour in the marine environment, including movement/dispersal, longevity, final sink etc. See ‘Pollution’, page, 58.

c. Management response

i. Rationale

Shipping in UK waters is regulated by a complex series of regulations contained in UK statutes and statutory instruments, and especially international conventions. It is not possible to summarise here even those that are relevant to environmental protection, since many of the regulations concerning safety of vessels and crews are relevant to the environmental impacts, and potential impacts of shipping. Of particular relevance are the international Conventions on Safety of Life at Sea (SOLAS), Preventing Collisions (COLREG) and prevention of pollution from ships (MARPOL). In the UK, statutory instruments, such as the Merchant Shipping Regulations, give effect to these international conventions. In practice, most routine or deliberate discharge of oil and litter from ships is prohibited in coastal waters. (See Littering page 135.)

The very low level of commercial shipping in the SAC and its immediate vicinity suggest that it is presently not likely to be a significant factor affecting the dolphin population, through any of the mechanisms identified above. Given the relatively low density of both ships and dolphins, the likelihood of collisions between dolphins and ships is low though possibly of greatest significance for high speed vessels. In relation to ship-source pollution, whilst unacceptable, the small size of most routine discharges relative to the size of the receiving environment means that they are unlikely to pose a serious threat in their own right but will, like vessel noise, act cumulatively with other similar impacts.

However, shipping-related effects might become of concern if there were a significant increase in vessel operations or vessel-source pollution in the area, so some form of surveillance is required.

It is not possible at present to undertake any systematic surveillance of commercial vessel activity, either within the site or in adjacent areas of the Irish Sea. However, it is worth noting in this context that among the recommendations of the Donaldson report¹³⁴ is that vessels, particularly those carrying potentially hazardous cargoes, should be monitored while in UK waters. There are also initiatives at a European and international level to improve the quality of data on vessel movements around the coast, for vessel safety and environmental protection purposes. This may take place through reporting by vessels to the Coastguard, automated vessel identification or even radar surveillance of busy shipping lanes. In due course therefore, data on vessel operations in and near Cardigan Bay may improve.

In the meantime, it is likely that any significant increases in vessel activity in the immediate area would almost certainly be associated with other operations, for example the development of offshore energy structures, oil/gas platforms or coastal developments requiring the carriage of material by sea. Any such

¹³⁴ *Safer ships, cleaner seas*. Cm 2560, May 1994, HMSO

developments may constitute plans and projects and be subject to the significance/appropriate assessment provisions of the 1994 Habitats Regulations, and probably require an Environmental Impact Assessment (EIA) under the EIA Regulations. Competent authorities should therefore ensure that the potential impacts of associated vessel traffic would be addressed in such assessments.

The deliberate discharge of polluting substances from vessels is governed by a range of legislation at a national and international level. Most significant discharges would be illegal, and therefore very difficult or impossible to subject to any kind of systematic surveillance. However, pollution incidents in the SAC should be identified on an opportunistic basis, such as through reporting by boat operators or the general public. Whilst pollution incidents within three nautical miles of the coast should be reported to EAW and incidents further out to the Coastguard, it appears that awareness of this, and an enthusiasm to report incidents, is lacking.

ii. Type of response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions, including links to other policies/plans/measures

- Raise awareness and enthusiasm for recreational boat users, fishermen and others to report pollution incidents.
- Ensure any appropriate/environmental assessments of offshore structures, or onshore developments, address the potential impacts of associated vessel movements.
- Ensure that oil spill and other emergency contingency plans adequately address the requirement to protect the bottlenose dolphin and its habitat in so far as they can.
- Advocate the implementation of the recommendations made in Lord Donaldson's report '*Safer ships, cleaner seas*'.

5.3.15 Offshore Oil & Gas

All activity relating to off-shore oil and gas in the Irish sea is currently limited to exploration, rather than exploitation. Factors that could influence bottle nose dolphins within the cSAC in the exploratory and exploitation phases are considered here, although the latter is a wholly unknown area at present.

a. Extent of activity

i. Within the site

One block within the cSAC has been licensed for exploration for oil and gas by the DTI. Seismic survey was carried out by ARCO in the early 1990s who have subsequently relinquished their license. There is currently no exploitation of oil and gas resources in the southern Irish sea.

ii. Adjacent to the site

All exploration activity has been or is being undertaken in blocks that lie to the north-west and south of the cSAC. Current levels of exploratory activity, ranging from seismic shooting to drilling in areas adjacent to the cSAC are low. Recently several oil companies holding exploration licenses for blocks within the bay have sought to surrender these to the DTI. In particular this means that whereas oil companies were previously required to conduct exploration drills as a condition of their license they are no longer required to do so where there are sufficient economic and geological reasons not to.

b. Mechanisms for effects on the features

i. Exploration

Seismic survey of the sea bed.

Seismic survey essentially involves the use of compressed air to generate high energy sounds, typically ranging between 10 and 200 Hz. Seismic shooting takes place via an array of air guns aimed at the sea bed. Intensive low frequency sounds penetrate the sea bed and are reflected back by different rock-types. The reflected sound waves are received by arrays of hydrophones, and reveal subsurface geological formations. During firing, high amplitude pulses lasting for ca. one second are emitted every 5-15 seconds. Water is an excellent conductor of sound, and sound (from man-made and natural sources) travels considerable distances through the water column. Seismic impulses travel large distances, beyond the area targeted for seismic survey. Small cetaceans have highly sensitive hearing, necessary for echolocation. Their hearing covers a very broad band width, and there is some overlap between sound frequencies emitted during the seismic activity and the hearing range of dolphins.

Research and monitoring carried out in the Irish sea and elsewhere suggests that seismic testing can adversely affect small cetaceans in the following ways:-

- Direct effects: Possible damage to hearing, e.g. from a sudden burst of seismic activity at close range; disruption/disturbance to normal behaviour patterns e.g. temporary evacuation of the area effected by seismic testing¹³⁵. See 'Disturbance', page 56.
- Indirect effects: Possible impact on prey species (e.g. fish) resulting in temporary redistribution in or changes in the behaviour of shoaling fish¹³⁶.

¹³⁵ Goold, J.C. 1996. *Acoustic assessment of populations of common dolphin Delphinus delphis in conjunction with seismic surveying*. J. Mar.Biol.Ass. UK 76:811-820.

Since all seismic activity has been/is being conducted outside the cSAC boundary, any effects on bottlenose dolphins using the cSAC are likely to derive from exploration in licensed blocks adjacent to the cSAC. The significance of any such impacts would be determined (in part at least) by the distance between the animals and the point-source of activity during the seismic survey. See 'Disturbance', page 56.

Shipping movements

In instances where exploratory activity moves beyond seismic survey, i.e. drilling, there is likely to be an increased level of localised shipping movements, associated with supplying the temporary drill rig (which could be on board a ship, or a "jack-up" rig). Activity may be highly localised, and of a temporary nature, whilst test drilling is in progress. It is unlikely that the area within the cSAC would be directly affected, however the dolphins could be indirectly affected by:-

Noise generated by shipping associated with drilling activity. See 'Disturbance', page 56.

- Pollution, e.g. from accidental spillages of fuel; rubbish; sewerage; bunkering/supply of drilling vessels/rigs with fuel (accidents during fuel transfer). See 'Pollution', page 58.
- Collisions between shipping and dolphins. See 'Collisions', page 57.

Drilling

All exploratory drilling has been carried out, or is being carried out in areas to the west and south of the cSAC. Influences on bottlenose dolphins could arise from the following:

- Pollution, e.g. oily water discharges, oil or fuel discharges/spillage's e.g. from rigs, well-heads or during bunkering operations (see above). Localised contamination of the sea bed as a result of disposal of drill cuttings and muds. Sewerage and litter. See 'Pollution', page 58 and 'Entanglement & Ingestion', page 58.
- Noise from drills. Sustained noise pollution from drilling activities could possible induce changes in dolphin behaviour in the vicinity of the rig, and further a field. See 'Disturbance', page 56.

ii. Exploitation

The range of factors that could influence bottlenose dolphins within the cSAC should exploration be followed by development and exploitation of oil and/or gas reservoirs in the vicinity of the cSAC are broadly similar to those above. They include:

- Pollution, from shipping associated with servicing of rigs, the rigs themselves, well-heads, pipelines and other infrastructure associated with extraction and movement of hydrocarbons, e.g.:
 - Oil pollution e.g. bunkering accidents; collisions between ships and rigs; fractured pipelines.
 - Sewerage
 - Litter from rigs and ships
- Contamination of the sea bed by drill cuttings and muds.
- Noise from shipping associated with servicing of rigs; drilling operations
- Collisions between dolphins and shipping.

¹³⁶ Dalen, J. and Knutsen, G.M. 1987. *Scaring effects on fish and harmful effects on eggs, larvae and fry by offshore seismic exploration*. In Merklinger, H.M. (Ed). *Progress in Underwater Acoustics*. Plenum Publishing Corp.

Engas, A., Lokkeborg, S., Ona, E. & Soldal, A.V. 1993. *Effects of seismic shooting on catch availability of cod and haddock*. Institute of Marine Research, Norway Fisker og Havet, No. 9.

- Catastrophic events: it is possible that a "blow-out" on a rig could have an effect on bottlenose dolphins in the cSAC, e.g. through initial noise and/or any resultant pollution and cleanup operation..

Any actual impacts from the factors listed above would depend on a number of variables e.g. the distance between the drilling operations and the seaward boundary of the cSAC, the locations of dolphins at the time of any incident likely to impact on them, and their subsequent behaviour, as well as the nature of individual incidents such as pollution.

c. Management response

The mechanisms by which oil and gas exploration/exploitation could affect the feature are, for the most part, reasonably well understood. There is, however, no evidence to suggest that oil and gas exploration is having an effect at present.

i. Rationale

The absence of oil and gas exploration within the cSAC, together with the relatively low levels of activity in neighbouring "blocks" that have been licensed by the DTI for exploration suggest that, at present, this is not a significant factor influencing the feature in the cSAC. This would appear likely to decrease following recent exploration pull outs by Marathon and Chevron the two companies with the largest holdings in the southern Irish Sea.

The bottlenose dolphins that use the cSAC are highly mobile, and (probably) range throughout the Cardigan Bay/southern Irish Sea areas. Oil and gas exploration & exploitation together with associated activities, e.g. shipping could have a significant influence on the dolphins that use the cSAC, even though these activities are/would be taking place outside the cSAC. Bottlenose dolphins are potentially "at risk" from disturbance caused by noise (seismic shooting in particular, but also noise caused by shipping and drilling) and from oil and other forms of pollution. Increases in shipping movements may also put individual animals at risk from collisions.

Oil and gas exploration (and any subsequent exploitation) in waters adjacent to the cSAC could give rise to concern: risks of disturbance, direct effects on individual animals from pollution, collisions etc. and degradation of the habitat could become significant. Future licensing rounds and seismic surveys proposals should be monitored, and competent Authorities should ensure that all potential impacts on the feature and the habitat within the cSAC are properly addressed in EIAs and via the significance/appropriate assessment provisions in the 1994 Habitats Regulations (see 'Plans and Projects', page 62). Competent Authorities should also satisfy themselves that oil spill and other emergency contingency plans adequately address the sensitivity of the cSAC and the requirement to protect the habitat as well as the feature of European importance. Surveillance and/or monitoring of the influences of this factor can only be carried out on a reactive basis, i.e. when exploratory or exploitative activities are notified/planned and then carried out. General surveillance of dolphin activity numbers and distribution within and adjacent to the cSAC should be established. Data collected will help to provide the information required for impact assessment.

ii. Type of response

F1: The activity constitutes a plan or project.

iii. Actions, including links to other policies/plans/measures

- Ensure, that EIAs and appropriate assessments under the 1994 Habitats Regulations are carried out, of all potential direct and indirect impacts of off-shore oil and gas exploration/exploitation.
- Ensure that oil spill and other emergency contingency plans adequately address the requirement to protect the bottlenose dolphin and its habitat in so far as they can.

Cardigan Bay SAC Management Plan – *OFFSHORE OIL & GAS*

- In the event of a marine pollution incident within the cSAC, or which could threaten the cSAC, ensure that appropriate consideration is given by the Environment Group to the requirements/sensitivities of bottlenose dolphins, and that this is reflected in the advice given to any marine or other response centre(s).

5.3.16 Marine Archaeology & Salvage

This section addresses potential impacts from underwater recovery operations including both archaeological and commercial salvage. It should be noted that whilst they have been grouped together here there can be significant differences between the two types of operation.

a. Extent of the activity

Marine archaeology and salvage from wrecks has taken place in the past within and adjacent to the Cardigan Bay cSAC. Levels have generally been very low and no known projects are currently in progress.

b. Mechanism for effect on the feature

Underwater operations (in particular use of tools) and associated boat traffic may cause localised disturbance and will increase underwater noise levels. Use of explosives may in addition result in direct injury or death to dolphins in the locality.

See relevant boat activity sections as well as ‘Disturbance’, page 56.

Removal of substrate during archaeological operations may result in localised smothering of adjacent sea bed communities and possible remobilisation of pollutants bound within the sediments.

c. Management Response

i. Rationale

Whilst there is some degree of regulation of both archaeological sites (e.g. ancient wrecks) and salvage operations e.g. recovery of a sunk or stranded vessel, the main management issue is the potential use of explosives.

Codes of conduct do not approve the use of explosives in archaeological studies, and for large scale salvage operations where they may be required there are strict licensing procedures for their use. However, licensing of explosives is by the Police¹³⁷ and relates to possession and use simultaneously. This effectively means that someone licensed to possess explosives in York by the local Police force may then use them off the Cardigan Bay coast without requiring any further consent. As a result there is currently no effective means of regulating the use of explosives.

Changes to the legislation regarding the control of explosives are clearly required.

Underwater marine archaeological or salvage work will usually also result in increased small boat traffic to and from the site. Larger vessels may be required for some salvage operations such as the recovery of cargo or the vessel itself. Both of these and any associated underwater operations are likely to result in an increase in underwater noise. Commercial salvage will by its nature generate far more disturbance than scientific archaeological studies. There is also the potential for pollution events to occur either from a vessel under salvage or through increased shipping movements. Current levels of disturbance are currently minimal (and expected to remain so) as very little archaeological or salvage work takes place. Most normal impacts are likely to be insignificant as far as the dolphins are concerned, though may act cumulatively with impacts from other activities. However, the use of explosives, whilst very infrequent, has the potential to result in a significant direct impact.

¹³⁷ Under The Control of Explosives Act (1991)

Whilst levels of this activity are unlikely to reach significant levels there is the potential for individual operations in sensitive areas to be a problem. Maintaining surveillance of the current levels through archaeological societies and diving clubs should therefore be conducted.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions including links to other policies/plans/measures

- Maintain surveillance on levels and distribution of underwater archaeological studies. Possibly through liaison with existing archaeological bodies and diving clubs such as Cambria Archaeology and the British Sub-Aqua Club.
- Argue for review of the legislation controlling the use of explosives (e.g. The Control of Explosives Act (1991)) to enable better management of their use within or adjacent to Welsh waters supporting cetacea, including the Cardigan Bay cSAC.

5.3.17 Fishing

a. Extent of the activity

i. Within the site

These factors have been taken from the Regulation 33 advice dated 14th March 1999. Potting and angling have been added to this list.

Table 13. Analysis of Fishing Activities in Cardigan Bay cSAC

Fishing Activity	Intensity	Is Activity Regulated	Possible effect on feature	Effects on dolphins seen here?
Towed Gear				
Trawling	Low	Y	Depletion of food. Disturbance of sea bed habitat	N N
Dredging	Low	Y	Depletion of food. Disturbance of sea bed habitat	N N
Static Gear				
Gill Nets (drift / fixed)	Low	Y	Entanglement Depletion of food	? N
Pots (crustacea / whelks)	Moderate / High	Y	?	N
Angling	Moderate / High	Y	Depletion of food	N
Seine Nets*	Low	Y	Depletion of food	N

*Four seine net licences are available under the current Net Limitation Order, which are the only licensed nets legally entitled to catch migratory salmonids within the SAC. They operate within the Teifi estuary itself. Seine nets are encircling nets, which are actively fished and consist of a single sheet of netting measuring not more than 173m long by 5.5m deep. One end of the net is held on the bank whilst the bulk of the net is paid out from the stern of a rowboat in a continuous movement. The boat moves out to mid-channel and then back to the shore in a semi-circle where the two ends of the net are brought together. The net is then hauled ashore and the live catch dispatched. Current bylaws limit the times and seasons when the nets can operate. There is a close time of 06.00 the Saturday to 12.00 noon the following Monday. The annual close season is 31 August to 1 April. However, under recent bylaws, all salmon captured between 1 April and 1 June must be returned alive. This measure has been introduced as part of a National package of bylaws designed to conserve large salmon, as the international stock is below sustainable levels, whilst still allowing the exploitation of sea trout.

ii. Outside the site

Fishing activity outside the cSAC has the potential to affect dolphins within the site, via the mechanisms considered in Table 13. above. It is not known whether such effects exist.

b. Mechanism for effect on the feature

Apart from occasional reports of entangled dolphins, there is little evidence of adverse effects of fishing activities on the site. However mechanisms by which fishing activity may affect dolphins are known from studies elsewhere. These are summarised below. It should be noted that there is currently no information to suggest that fishing activities within Cardigan Bay are likely to significantly affect the dolphin population.

Further information on the potential interaction between fisheries and SAC features is available in the 'Life' report, 'Gubbay, S. & Knapman, P.A. 1999. *A review of the effects of fishing within UK European marine sites*. English Nature (UK Marine SACs Project). 134 pages'¹³⁸.

i. Entanglement

Fishing activity and discarded or lost nets and lines can result in entrapment or entanglement of bottlenose dolphins. All available information indicates that entanglement of dolphins in this area is a rare event. It is highly unlikely that dolphins would come into direct contact with seine nets, which are relatively small and actively fished. If dolphins did come into contact with these nets their mode of operation means that dolphins could easily be released unharmed.

ii. Habitat damage

Mobile fishing gear may alter benthic habitats and marine life. The extent of such effects are determined by a variety of factors including gear type, fishing effort, the nature of the seabed and its marine life. Deterioration or alteration of sea bed habitats or marine life might alter prey abundance and distribution and thus indirectly affect the bottlenose dolphin population. There is currently no evidence of such effects on this site. See 'Prey Depletion', page 60 and 'Habitat Impacts', page 61.

iii. Prey Depletion

Fishing activities remove fish, cephalopods, crustaceans and molluscs from the sea. Many of these form the diet of the bottlenose dolphin. It is possible that this might diminish the amount of food available for dolphins; equally, the removal of competitors by fishermen might increase the availability of prey species for dolphins. The numbers of migratory salmonids and their significance as part of the dolphin's diet is unknown. There is presently no evidence of either of these indirect effects on this site. See 'Prey Depletion', page 60.

c. *Management Response*

i. Rationale

Sea fish

Factors relevant to the condition of the feature, an appraisal of their intensity, current management, possible effect, and record of effects being observed on bottlenose dolphins in Cardigan Bay are summarised in Table 13. above.

¹³⁸ This report is available at: <http://www.english-nature.org.uk/uk-marine/>

The current scale of sea fishing activity within Cardigan Bay is quite low. The most intensive activity taking place, potting, is relatively benign with respect to dolphins. The local Sea Fisheries Committees have implemented a range of controls to ensure these fisheries are sustainable, which should have the effect of protecting dolphin food supplies. Although certain types of netting have the potential to entangle dolphins, such entanglements are rare, and there are no indications that the current level of netting within the bay is of concern.

Migratory fish

EAW manages migratory salmonid stocks to ensure that exploitation is sustainable. EAW also takes into account conservation interests in the regulation of migratory salmonid fisheries. Present information would suggest that sufficient controls exist to protect the dolphin population. Therefore no further action is required.

Summary

The likelihood of a detrimental impact of fishing on the bottlenose dolphins might change in the future. It is thus appropriate to keep a watching brief to ensure that potential problems are identified before they threaten the dolphin population on this site.

ii. Operational limits and monitoring projects

Sea fisheries are public. Fishing can only be regulated in certain ways. Generally it is not possible to set operational limits on fishing intensity. Fisheries regulation in coastal waters is generally achieved through operational limits on fishing techniques. These may be either limits on production; or ‘technical measures’ that restrict fishing methods.

i National Legislation

National legislation sets quotas, minimum landing sizes, and specifies technical conservation measures. Many of the national controls transpose limits set by the EC Common Fisheries Policy. These controls are administered in Cardigan Bay by MAFF / NAW, and implemented in Cardigan Bay by the SFCs and MAFF working in concert.

ii Sea Fisheries Committee Byelaws

Two Sea Fisheries Committees are responsible for fisheries management in the area: the South Wales Sea Fisheries Committee (SWSFC) and the North Western & North Wales Sea Fisheries Committee (NW&NWSFC). Each SFC makes and enforces its own set of byelaws, tailored suit the fisheries in the area. The table below summarises some the main byelaws relevant to Cardigan Bay.

Table 14. Certain Sea Fisheries Committee byelaws applying to certain fishing activities in Cardigan Bay cSAC.

(NB this table only lists certain byelaws. There are other byelaws and regulations in force which fishermen must comply with that are not listed here.)

Factor	Byelaw	
	SWSFC	NW&NWSFC
Vessel size	14m within 3nm of LWM	15.24m, subject to condition in NW&NWSFC byelaw 9
Minimum landing sizes		see attached leaflet
Net mesh sizes	Other than trawls: byelaw 32	Trawls: see attached leaflet Byelaws 4, 6, 7, 8.

Cardigan Bay SAC Management Plan – *FISHING*

Length of nets & Restrictions on deployment		Byelaws 10 & 11
---	--	-----------------

Table 14. Continued

Factor	Byelaw	
Fishing areas (gill nets)	Restricted under byelaws 30, 31, 33, 34, 35 (however little relevance to this area)	Restricted under byelaws 24 & 25.
Fishing area (general)	Areas can be closed for certain fishing activities for the protection of stocks.	Areas can be closed for certain fishing activities for the protection of stocks.
Closed Season (scallops)	Fishing prohibited 1st July – 31st October, under byelaw 45.	Fishing prohibited between 1st July and 31st December under byelaw 20

Other notable regulatory activities include the SFC ‘V’ notching schemes for lobsters, which are being implemented through close cooperation with the fishing industry.

Throughout the year SFC officers enforce and monitor compliance with these measures.

iii. Type of Response

On the basis of the analysis set out above, and using the classification of management options described in Table 7. page 67, the management options for fishing activities in the Cardigan Bay cSAC are set out in Table 15. below.

Table 15. Management Options for fishing activities in Cardigan Bay cSAC

Fishing Activity	Management Option
Towed Gear	
Trawling	F4 (Surveillance; Consider need for Operational Limits)
Dredging	F4
Static Gear	
Gill Nets (drift / fixed)	F4
Pots (crustacea / whelks)	F2 (No action needed)
Angling	F4
Seine Nets	F4

iv. Actions, including links to other policies/plans/measures

The ‘Management Options’ listed above broadly indicate how future management of the Cardigan Bay cSAC will be achieved. This section aims to identify a series of management actions that describe how the SFCs intend to respond to the management options for the site.

Necessary Action

Cardigan Bay SAC Management Plan – *FISHING*

The actions listed in the table below will ensure compliance with the requirements of the Habitats Directive.

It should be noted that the apparent lack of action suggested by this table is misleading. The fisheries management bodies responsible for the site have a wide range of powers available to them to regulate fishing activity should there be assigns of harm to either the dolphins or their habitat. All fisheries managers are duty bound to apply the 'Precautionary Principle' with respect to the site.

The actions below require fisheries managers to be vigilant, whilst maintaining a *status quo* within the cSAC, reflecting the fact that most fishing practices in the Bay are well established and currently do not appear to have had a significant adverse effect on the dolphins. If fishing practices change, or evidence emerges that fishing is having adverse effects, then action can be taken swiftly: but until such time there appears to be no need to unnecessarily compromise the livelihoods of fishermen working in the cSAC.

Table 16. Fisheries Management Actions

Activity	Mgmt Option	Action	Responsibility	Time-scale
Towed Gear				
Trawling	F4	Maintain current regulatory regime. Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC, SWSFC	Ongoing; Possibly annual liaison?
Dredging	F4	Maintain current regulatory regime. Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC, SWSFC	Ongoing; Possibly annual liaison?
Static Gear				
Gill Net	F4	Maintain current regulatory regime. Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC, SWSFC	Ongoing; Possibly annual liaison?
Pots	F2	None currently required. Maintain a watching brief in case of problems.	NW&NWSFC, SWSFC	Ongoing
Angling	F4	Maintain current regulatory regime. Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC, SWSFC	Ongoing; Possibly annual liaison?
Seine Nets	F4	Maintain current regulatory regime.	EAW, NAW	Ongoing

Desirable Actions

A number of further actions can be identified that are desirable but not essential for the management of the site. These are summarized below. Execution of these actions might assist site management, but are

not absolutely critical at present. Some of these lie outwith the remit of the relevant authorities, and may also require additional funding.

Table 17. Further, Desirable, Fisheries Management Actions

Action	Description
Legislative Review	
To extend local management powers. (NB that this is wider than fisheries alone)	It may be useful to extend local fisheries management powers to cover the entire site, out to 12nm from baselines.
International Collaboration	
Adverse effects of activities in other countries. (Again wider than just fisheries)	The dolphins using Cardigan Bay seem to be part of a population that may range beyond the territorial seas of Wales. Harmful human activities outside the cSAC and Welsh waters could adversely affect the numbers of dolphins seen in the Bay. Encouraging other EC member States to adopt practices that would avoid harm to dolphins from the cSAC when they are further afield could bring great benefits.
Research	
Interactions between fishing methods and dolphins.	Literature study and field work to identify whether fishing practices in the Bay have an effect on dolphins and whether this is significant.
Monitoring	
Bycatch	Independent monitoring to confirm whether current view of low bycatch is accurate or not.
Surveillance	To investigate the effects of fishing activities on bottlenose dolphins and their habitats in Cardigan Bay.

5.3.18 Littering

a. Extent of the activity

Refuse and litter enters the marine environment from a variety of sources including; boats and shipping, down watercourses and drains, from beaches, and blown off the land.

Precise details on the distribution of litter within the SAC are not known.

Litter on Welsh beaches averaged 2432 items per kilometre in 1998 (MCS Beachwatch '98). Plastics consistently make up the largest proportion of beach litter, typically over 50%. The majority of litter is non-sourced but of the rest, fishing and tourist/recreational inputs are the largest.

Within the UK Wales has the second highest litter count per kilometre of beach, second only to Scotland. Welsh details of the 1998 MCS Beachwatch survey are given in Table 18.

Table 18. Welsh sources of litter recorded in Beachwatch'98

Source	No of Items	Items/km	%
Tourist/recreational	12471	718.3	29.5
Fishing	5915	340.7	14.0
Sewage related debris	2717	156.5	6.4
Shipping/galley waste	1660	95.6	3.9
Fly-tipped	259	14.9	0.6
Medical	28	1.6	0.1
Non-sourced	19174	1104.3	45.4
Total items	42224	2431.9	100
No. beaches surveyed		Length Surveyed (km)	
42		17.4	

Trends from annual beach clean surveys shown an rapid increase in the amount of litter on our beaches. Within the UK as a whole the MCS Beachwatch identified a 24% increase in number of items per kilometre between 1997 and 1998 and a near 200% increase since 1994.

b. Mechanism for effects on feature

i. Entanglement

Dolphins may become entangled in certain kinds of litter. This may restrict movement and result in injury, starvation and drowning. Line and netting are of particular hazard. See 'Entanglement & Ingestion', page 58.

ii. Ingestion

Dolphins are known to occasionally ingest items of litter directly or through their prey. These may cause internal injury or blockage and result in death.

iii. Sea bed effects

Sea bed communities and prey species may be damaged through entanglement or ingestion. Sessile organisms can be smothered by plastic debris which may affect their ability to feed and may cause sediments to become anoxic. See ‘Habitat Impacts’, page 61.

c. Management response

i. Rationale

Marine litter can enter the site from a wide variety of sources and from some distance away. Whilst most types of littering at sea are offences under the Merchant Shipping Regulations,¹³⁹ (the UK’s transposition of Annex V of MARPOL¹⁴⁰) and it is an offence to drop litter in any public place, (including beaches) under section 87 of the Environmental Protection Act (EPA), 1990, there is little policing of these and significant littering still occurs.

Merchant Shipping Regulations 1988 (Prevention of Pollution by Garbage):

These regulations apply to all shipping and boating, as well as to offshore platforms. They prohibit the disposal of plastics anywhere in UK territorial waters and the disposal of other types of pollutant within specific distances from nearest land.

In the Atlantic Ocean and Irish Sea the dumping of specific waste types is prohibited within specific distances.

Table 19. Summary of the prohibition on disposal of garbage in the Merchant Shipping Regulations, 1988.

>25 nautical miles from land	12 - 25 nautical miles from land	3 -12 nautical miles from land	0-3 nautical miles from land
Plastics Oily wastes	Plastics, lining & packaging material that floats Oily wastes	Plastics, lining & packaging material that floats Oily wastes Garbage if not ground to <25mm	No waste or rubbish of any kind may be thrown overboard

Improvements are needed both in the attitudes of mariners to littering and also to the provision of services to facilitate removal of waste in ports and harbours. Reductions in litter on beaches are made through beach cleaning operations including local council and voluntary beach cleaning events as well as improvements in waste water treatment facilities by DCWW. Removal of beach litter might appear to only address the problem once litter has come ashore and is of reduced risk to marine life. However, it is likely that a certain amount of beach litter is remobilised into the marine environment and so any removal from beaches is likely to be beneficial.

¹³⁹ Statutory Instrument 1998 No. 1377 The Merchant Shipping (Prevention of pollution by Garbage) Regulations 1998 and Statutory instrument 1998 No. 254 The Merchant Shipping (Prevention of Pollution) (Amendment) Order 1998

¹⁴⁰ Annex V of MARPOL 73/78 Regulations for the Prevention of Pollution by Garbage from Ships

Whilst the scale of any current ill effects on the Cardigan Bay dolphins are unknown, levels of marine litter are increasing within the UK and will therefore become an increasing threat to the bottlenose dolphins. Littering studies and coordinated strategies for the reduction of marine litter such as the Minch Project¹⁴¹ propose methods such as the following for reducing litter:

Reduction of litter from land based sources

- i. Provision of adequate rubbish disposal and recycling facilities for the public, along with publicity on their location etc.
- ii. Incorporation of beaches in local authority waste management plans.
- iii. Stricter enforcement of anti-littering laws to deter fly-tipping and littering by businesses and the public.
- iv. Rapid improvement by water companies of combined sewer overflow systems which service coastal towns.
- v. Encouragement by local authorities and relevant land owners of voluntary local initiatives such as Adopt-A-Beach and river clean ups.

Reduction of Pollution from Ships and Fishing Vessels:

- i. Effective development of comprehensive port waste management plans under the merchant Shipping (Port Waste Reception Facilities) Regulations 1997.
- ii. Further education and training of ship owners, ship operators, crews, port users, fishermen, and recreational boat users, with regard to their responsibility in preventing marine pollution.

Reduction of the Input of Sewage Related Debris:

- i. Labelling of sanitary products with the correct disposal information: Bag It and Bin It - Please Don't Flush It.
- ii. Provision of information and education to encourage the public to 'Bag it and Bin It'.
- iii. Education in schools on the issue of sanitary waste and its correct disposal.
- iv. Provision of disposal facilities for sanitary waste in all public toilets.

ii. Type of response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions including links to other policies/plans/measures

- Undertake surveys on beaches to identify whether they contain marine debris likely to entangle dolphins, and, if so, identify where beach collections would be most appropriate.
- Investigate the source of litter found during beach litter surveys in order to target action aimed at preventing littering at sea.
- Conduct beach litter surveys to determine whether education programmes or other controls have led to reductions in marine debris.
- Endeavour to support projects which will reduce the impact of litter on the Cardigan Bay bottlenose dolphins.

¹⁴¹ Marine Litter in the Minch: <http://www.w-isles.gov.uk/w-isles/minch/litter.htm>

5.3.19 *Non-Native Marine Species*

a. Extent of the activity

There are about 50 non-native marine species which have been introduced into British waters, including red algae, diatoms, angiosperms and invertebrates. Many of these still have a restricted distribution within the British Isles whilst several are widespread and occur, or are likely to occur, within the Cardigan Bay cSAC. In recent decades most introductions occurred between 1970 and 1979, the rate of spread varying significantly with each species¹⁴².

b. Mechanism for effect on the feature

The introduction of new non-native species into the bottlenose dolphins' ecological unit may result in changes which impact the dolphins. The effects of any individual non-native species may be negligible but could potentially be wide ranging.

Work by Rosenthal (1980)¹⁴³ and Kohler & Coutenay (1986)¹⁴⁴ categorised detrimental effects of introduced species, some of these, given in Eno *et al* (1997) include:

- Competition with native species,
- Concomitant introduction of new pests, diseases and parasites harmful to resident species,
- Habitat alteration, provision of new niches and changes in water quality,
- Trophic alterations, including dietary competition and predation,
- Spatial alteration, namely competition for space,
- Gene pool deterioration through hybridisation,

There may also be secondary effects, such damage to the sea bed from subsequent fishing/harvesting activity.

The effects of some species may be beneficial, such as improvements to water quality and the provision of a new food source to native species.

c. Management Response

i. Rationale

There is a variety of International and national legislation aimed at preventing or controlling the introduction and spread of non-native species, including:

- Bonn Convention
- Berne Convention
- Rio Convention
- Habitats Directive

¹⁴² Eno, N.C., Clark, R.A., Sanderson, W.G. (eds). 1997. *Non-native marine species in British waters: a review and directory*. JNCC, Peterborough

¹⁴³ Rosenthal, H. 1980. *Implications of transplantations to aquaculture and ecosystems*. Marine Fisheries Review, 42:1-14

¹⁴⁴ Kohler, C.C., & Courtenay, W.R. 1986. *American Fisheries Society position on introductions of aquatic species*. Fisheries, 11: 39-43

- EC Fish Health Directive
- Wildlife and Countryside Act (1981)
- Import of live fish (England and Wales) Act (1988)

Procedural guidelines and best practice are provided by the 1994 International Council for the Exploration of the Sea Code of Practice (ICES 1994) and the International Maritime Organisation (IMO).

The introduction to the wild of any animal not ordinarily resident or regularly visiting Great Britain is an offence under section 14 of the 1981 Wildlife & Countryside Act. Schedule 9 of the Act also contains named species of animals and plants which may not be released. The power to grant licences for the release of such organisms is held jointly by the NAW and DETR. Note however that it is not generally an offence to translocate or release animals or plants to the wild if they are normally resident in Great Britain, and if they are not named on Schedule 9 of the 1981 Act.

On the whole, very few introduced marine species become established in British waters, and of those which do, only a small proportion prove to be a threat to the environment. Ribera & Boudouresque (1995)¹⁴⁵ stated that, in general, 80% of introduced species have no effect on the indigenous community.

Unfortunately, the effects of non-natives can be environmentally disastrous. The effects are compounded by activities associated with their presence. Where a species is commercially important and present in sufficient numbers, it may be exploited, and, depending upon the method of collection or intensity of cultivation, may have impact upon the nature conservation interest of the area. The control of species which become a nuisance can have quite far reaching effects. For instance, mechanical removal or use of pesticides on a non-native would almost certainly affect non-target species, and there are many historical terrestrial examples of the disastrous use of biological control where a second non-native has been introduced to control the first only to preferentially or additionally target natives. Activities associated with introducing commercial species, for instance preparing the ground or installing culture equipment, also may have an important effect.

The potential effect of an introduction is hard to predict and control methods are generally ineffective. Indeed, no non-native has successfully been eradicated from British waters. The only way of preventing detrimental effects from occurring as a result of non-native introductions is to ensure they do not gain entry in the first place.

The greatest threat by non-natives to bottlenose dolphins is probably through the introduction of a disease or parasite. The most effective means of controlling this is to prevent translocation or release of marine mammals into the Cardigan Bay bottlenose dolphins range, or the range of other groups with which they interact. An operational limit for this type of activity should therefore be set to zero.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

iii. Actions including links to other policies/plans/measures

- All competent authorities should take due account of relevant national and international legislation on the control and prevention of the introduction/spread of non-native and alien species.

¹⁴⁵ Ribera, M.A., & Boudouresque, C.F. 1995. *Introduced marine plants with special reference to macro algae: mechanisms and impact*. Progress in phycological research, 11:187-269

Cardigan Bay SAC Management Plan – *NON-NATIVE MARINE SPECIES*

- Where powers exist, competent authorities reject applications for the translocation and release of bottlenose dolphins or other cetacea within the range of the Cardigan Bay bottlenose dolphins, or the range of other bottlenose dolphin groups with which they may interact.
- Maintain surveillance of the introduction and spread of non-native species which may adversely effect the condition of the Cardigan Bay cSAC bottlenose dolphin population.
- There is no provision in the WCA for controlling transfer and release of marine mammals. The potential benefits of seeking greater powers to control the translocation and release of marine mammals should be investigated.

5.3.20 *Climate Change*

a. Current Extent

Climate change is a global issue. Whilst effects are likely to differ on a global scale, locally they will effectively be uniform.

b. Mechanism for effect on the feature

Climate change occurs naturally, but in recent years it has become clear that human activities also have the potential to modify the earth's climate. Recently studied effects have included:

- Global warming, through an increase in 'greenhouse gas' emissions such as carbon dioxide and methane,
- Increased ultraviolet light exposure, resulting from reductions in stratospheric ozone due to break down by Chlorofluorocarbons (CFCs).

Environmental conditions are major factors in determining where flora and fauna are able to successfully live. Changes to these fundamental influences can result in significant changes to the health and distribution of marine flora and fauna.

The types of changes that climate change could cause in the UK are reasonably well predicted, but the rate and extent of the impacts are uncertain.

For the bottlenose dolphins and their habitat, changes to the following are likely to be most important:

- i. ultraviolet light exposure
- ii. sea temperature
- iii. currents
- iv. sea level
- v. turbidity
- vi. sediment transport
- vii. wave exposure
- viii. frequency and intensity of extreme climatic conditions

Some examples of potential effects are:

The movement of species and community distribution northwards as sea temperatures increase. Species preferring warm waters are able to exploit new habitat further north; species preferring colder waters can no longer live there and their southerly distribution is reduced. This could result in changes to the dolphins ecological unit which may result in a detrimental or beneficial impact on the dolphins.

There may be an increase in invasion and spread of non-native species from warmer latitudes as temperatures here become more favourable. See 'Non-Native Marine Species', page 140.

An increase in extreme climatic conditions such as storms, floods and droughts may result in increased intensity of periodic pollution and water turbidity. Flood events, particularly following drought, may result in increased flushing of topsoil and surface pollutants into the sea. Increased storm events and coastal erosion and flood may result in increased coastal pollution through damage to urban and commercial areas.

Further, more detailed, information on the potential effects of altering natural processes can be found in ‘Natural factors’, page 68.

c. Management Response

i. Rationale

Anthropogenic changes to climatic conditions may result in changes to a variety of ecological and environmental processes. The potential effects of these are hard to quantify and they may be positive or negative. In general however it would be reasonable to deduce that alterations to the natural processes on which the bottlenose dolphins or their ecological unit depend would likely result in a change to one or both. Managing the impacts of anthropogenic climate change on the bottlenose dolphin population is not within the capabilities of the site’s relevant and competent authorities. Nevertheless, such changes may be a significant factor affecting the feature, and these authorities should contribute accordingly to helping reduce climate change and take account of its potential effects when managing the site.

ii. Type of Response

F4: There is a known mechanism for the activity to have an effect, but insufficient evidence at present to determine whether or not it is having a significant adverse effect.

F6: The factor is considered to have (the potential) to have a significant effect on the feature, but it is entirely outside any local management control.

iii. Actions including links to other policies/plans/measures

- Maintain ‘watching brief’ surveillance of climate change through occasional liaison with relevant research institutions.
- Encourage and support policies which will reduce anthropogenically derived climate change.

5.4 Other considerations relevant to management of the cSAC

5.4.1 *Legislation for marine SACs*

A significant constraint on the development of marine SAC management plans is the nature of the legislation on which they are based and its interpretation. The Habitats Directive establishes the obligations of EU member states in relation to SACs, and in Great Britain the 1994 Habitats Regulations transpose these requirements into more specific powers and responsibilities of the competent (including relevant) authorities. The development of this management plan, and experiences on other marine SACs, has revealed uncertainties over the interpretation of the legislation.

At a superficial level, the legislation is relatively straightforward. Each relevant authority is required to exercise its functions so as to comply with the requirements of the Habitats Directive, and each is empowered to establish a management scheme in cooperation with the others, under which it will exercise those functions. However, an important task for a group of relevant authorities is to establish a common understanding of what exactly are the requirements of the Directive in relation to an individual site, and to integrate those requirements with the various other priorities that each authority invariably has. The UK legislation and associated government policy do not resolve much of the uncertainty. Although considerable progress has been made, further work is still required to clarify what are the steps each relevant authority should be taking in pursuit of the aims of the Habitats Directive.

Actions, including links to other policies/plans/measures

- Raise awareness in Government and elsewhere about the problems likely to be encountered with the implementation of marine SAC legislation. The outputs from The Life Project (see section 1.4), the aim of which is to provide experience of establishing marine SAC management schemes, will provide an opportunity to do this.
- Keep this management plan under review so that, in addition to improved understanding of the site itself, developments in understanding of the legislation can be taken into account.

5.4.2 *Public Rights*

5.4.2.1 Navigation

The entire area of the cSAC lies within tidal waters. Traditionally, there is a public right of navigation in UK tidal waters. The right of navigation includes anchoring, and does not generally discriminate between different types of vessel. In other words, any vessel, whether recreational or commercial, may navigate anywhere within the cSAC. This does not only apply to vessels operated by UK citizens. The waters of Cardigan Bay are also subject to a right of innocent passage by foreign registered vessels, under the UN Convention on the Law of the Sea. Commercial vessels are subject to a range of national, European and international legislation concerning safety and environmental protection.

5.4.2.2 Sea Fisheries

There is a traditional public right of fishery in UK tidal waters. This generally extends to any species of sea fish (except where protected from exploitation under other legislation) and does not generally discriminate between persons or classes of persons. There are powers available to the UK fisheries authorities to regulate the exercise of this right, for example in relation to particular sea areas, the removal of particular species/sizes, the use of particular types of gear. The fisheries within the cSAC are subject to a range of such regulatory measures. See page 129.

5.4.2.3 Access to the foreshore

There is a custom (though not actually a right) of public access to the foreshore. Specific provision for access to the foreshore in some parts of the site is made by Ceredigion County Council.

5.4.3 Owner/occupier *objecti ves*

5.4.3.1 Crown Estate Commissioners

The subtidal sea bed is generally owned by the Crown Estate and managed on behalf of the Crown by the Crown Estate Commissioners (CEC), under the Crown Estate Act 1961. The Crown Estate Commissioners have an obligation to maintain and enhance the value of the Crown Estate, including the marine estate.

The Crown Estate Commissioners are a competent authority under the Habitats Regulations, and therefore have certain duties and functions under the Habitats Directive and Regulations. See Appendix 1.

5.4.3.2 Leases of land within the cSAC made by the Crown Estate Commissioners

The Pembrokeshire Coast National Park Authority holds a regulating lease of the foreshore between Ceibwr and Poppit Sands, at the southern end of the cSAC, over which it has byelaw making powers. The objectives of PCNPA are given on page 11.

Ceredigion County Council holds leases for several small patches of foreshore. The objectives of CCC are given on page 10.

5.4.3.3 Harbour authorities

Ceredigion County Council are the harbour authority for all the harbours within the cSAC. Unless the harbour areas are leased from the CEC (see above), this does not strictly make them owner-occupiers. However, they represent a significant legal interest in the site. The objectives of harbour authorities are to maintain the safety of navigation and to regulate the use of harbours. Harbour authorities are also required to conform with a variety of environmental legislation, including of course the Habitats Directive and Habitats Regulations.

5.4.4 Environmental Considerations

5.4.4.1 Range of the bottlenose dolphin and its prey

Bottlenose dolphins roam over a wider area than the cSAC site. The limits of their range and to what degree they may interact with other groups of bottlenose dolphins is currently unknown.

Bottlenose dolphins feed on prey which may have travelled from some distance outside the cSAC, such as mackerel, salmon and herring.

The Cardigan Bay bottlenose dolphins may therefore be affected by factors occurring well beyond the limits of the cSAC and outside the regulatory powers of the Cardigan Bay cSAC relevant authorities. Whilst there is a legal responsibility on all UK competent authorities to undertake their duties so as to secure compliance with the Habitats Directive, many may be unaware of these responsibilities and how best to undertake them. See section below on awareness and understanding. Furthermore, it is possible that some factors which detrimentally affect the bottlenose dolphins are being applied outside UK

waters and the control of its competent authorities. E.g. the pollution of the seas by other countries, over fishing of migratory prey species of the bottlenose dolphin.

Actions, including links to other policies/plans/measures

- Distribute the management plan widely, in particular to competent authorities.
- Ensure all relevant departments within relevant authority organisations and local competent authorities are aware of responsibilities and best means of securing compliance.

5.4.4.2 Management and monitoring of the marine environment

Unlike a terrestrial site, there is no clear means of direct management (such as scrub clearance, grazing regimes and burning) of the bottlenose dolphins or of the habitat on which it relies. We are only able to contribute to the maintenance of a favourable condition by tailoring our management such that it enables natural processes to take their course.

A considerable proportion of condition and compliance monitoring as well as most site research and surveillance will need to take place on or in the sea. The marine environment poses considerable logistical, health and safety and resource constraints to those who undertake such work.

Actions, including links to other policies/plans/measures

- Make effective use of new technology to minimise the amount of work required at sea.

5.4.4.3 Level of current knowledge

Our knowledge of the Cardigan Bay bottlenose dolphins is poor. In particular, it is our lack of understanding of their particular requirements of the Cardigan Bay area as well as the extent and means by which human activities are effecting them, which act as a constraint to effective management. Recent work under the auspices of the Life project has made considerable inroads into collating existing information and developing our current level of understanding. Further Life projects are addressing monitoring requirements and the distribution of potential dolphin prey and PCB pollution. However, to answer some of the most fundamental management questions a comprehensive programme of research over many years is required. Such programmes are costly and, unfortunately, the completion of the Life project and the resulting lack of resources to fund such work will be a major constraint to effective site management. (See section below on resources.)

Actions, including links to other policies/plans/measures

- Seek funding to resource further essential research.
- Initiate more relevant research.

5.4.4.4 Lack of awareness and understanding

It is possible that competent authorities (and the general public) some distance from the cSAC will not consider the potential for their actions to affect a species on a site many miles away and of which they might not be aware.

Actions, including links to other policies/plans/measures

- Distribute the management plan widely, in particular to competent authorities.
- Ensure all relevant departments within relevant authority organisations and local competent authorities are aware of responsibilities and best means of securing compliance.

5.4.5 Resources

The development and implementation of the Cardigan Bay cSAC management plan has placed a considerable financial burden on those organisations responsible. These new responsibilities have not come with any new resources. Whilst the EU LIFE II project has helped support the development of the plan so far there has still been the need for a major resource investment by some of the site's relevant authorities. To date this has largely been in the form of staff time, though considerable resources have also been required to support community involvement and research. New management initiatives, improved surveillance and monitoring are all essential, and resource constrained, requirements of an effective site plan.

There is therefore the need for each relevant authority to be supported in carrying out its responsibilities under the Habitats Directive and UK Habitats Regulations. As the responsibilities are on-going and will now form part of each organisations core work, this support needs to come through core funding mechanisms. A lack of sufficient core support for such work inevitably results in a compromise to site management as each organisations responsibilities compete for existing resources. The issue of core funding support has been raised repeatedly at a high level within Government, most recently at the UK Marine SACs Project conference in November at Edinburgh.

There are several mechanisms for securing short term funding for specific projects such as EU INTERREG, LIFE and Objective One. Whilst limited in their application, opportunities to make use of these sources of 'aid' (they all require various levels of match funding) are being addressed by the sites relevant authorities.

5.4.5.1 The Life Project

Fortunately the Cardigan Bay cSAC has been one of twelve 'demonstration' SACs which secured European match funding under the LIFE II programme. This funding was secured by all the UK nature conservation agencies¹⁴⁶. The aim of 'The Life Project' in the UK was to assist the development of management schemes of the twelve sites and to use the experience developed during this to assist development of the other marine SACs around the UK. (See page 3)

The Life project funds have helped to support research and liaison projects on the site over the last few years but the project comes to an end in 2001. Beyond this, resources to support the management of the Cardigan Bay cSAC will either have to come from each relevant authority or from an external funding source. As funding within relevant authorities has not been increased in conjunction with the new SAC management responsibilities, an increase in each organisations revenue and targeted use of grant aid will be required.

5.4.5.2 EU Objective 1 Funding

West Wales and the valleys have qualified for Objective 1 status, the European Union's highest level of regional aid. A programme document ('Single Programme Document') that identifies priorities and measures for the period year 2000 to 2006 has been submitted to the EU. The potential for supporting SAC management through Objective 1 will be explored.

Actions, including links to other policies/plans/measures

¹⁴⁶ Countryside Council for Wales, English Nature and Scottish Natural Heritage, Joint Nature Conservation Committee

Cardigan Bay SAC Management Plan – *OTHER MANAGEMENT CONSIDERATIONS*

- Continue to identify and seek funding from internal and external sources.

6. SUMMARY LIST OF ACTIONS

This chapter contains a summary of the management actions derived in section 5. The body responsible for the action and a timescale are provided. This section aims to provide a handy summary of how potential or current threats to the bottlenose dolphins will be addressed and who will be responsible.

Monitoring (page 49)

Action	Responsibility	Timescale
Establish the parameters that are most indicative the condition of the Cardigan Bay bottlenose dolphins.	CCW	2000
Monitor the condition of the bottlenose dolphins using Cardigan Bay.	CCW	Establish in 2000/2001 Ongoing
Seek to develop least intrusive methods of monitoring whilst taking account of the requirement to effectively monitor the dolphin population condition.	CCW	Ongoing
Seek to develop more effective methods of determining the condition of the Cardigan Bay bottlenose dolphins.	CCW	Ongoing
Report the results of monitoring in accordance with the Habitats Directive and at least once every six years.	CCW	2004, then every six years

Research (page 49)

Action	Responsibility	Timescale
Continue to support cetacean strandings research.	CCW	Ongoing
Initiate and support research projects which will inform and improve management of the Cardigan Bay cSAC.	CCW	Ongoing

General Education and Awareness

Action	Responsibility	Timescale
Endeavour to support projects which will increase awareness and an understanding of the bottlenose dolphins requirements.	CCW	Ongoing
Develop and provide information which promotes responsible use of the countryside by increasing levels of understanding and awareness of the Cardigan Bay cSAC, its biological features, the threats it faces and how the site is managed.	CCW	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Natural Factors (page 68)

Action	Responsibility	Timescale
Maintain a watching brief on natural processes in Cardigan Bay and the Irish Sea, noting alterations or trends that may be anthropogenically influenced.	All CAs as appropriate	Ongoing
Ensure that consideration of plans and projects (see page 62) take full account of the potential for alterations to be made to natural processes and the potential effects these may have on the bottlenose dolphins and their habitat.	CAs	Ongoing
There is limited knowledge on the sediment movement into Cardigan Bay and influences on the cSAC. There is a need to review the likely impact of pollutants in the sediments.	EAW, MAFF	By 2002
Promote research which aims to gain a better understanding of the key habitats of the bottlenose dolphins and the key natural factors that determine their importance.	All RAs	Ongoing

Coastal Development (page 73)

Action	Responsibility	Timescale
Treat relevant coastal development as a Plan or Project.	CCC	Ongoing
Review extant planning permissions.	CCC/PCNPA	2000/1
Follow procedures outlined in TAN (5) when dealing with applications for planning permission affecting the SAC.	CCW	2000/1
Ensure that the SAC is taken fully into account in the preparation of Unitary Development Plans (UDPs) for Ceredigion and Pembrokeshire.	CCC/PCC/PCNPA	Ongoing
Ensure that the SAC is taken fully into account in the production of the Shoreline Management Plan.	CCC	Ongoing
Carry out an appropriate environmental assessment of any coastal protection/defence projects likely to affect the Cardigan Bay SAC.	CCC	Ongoing

Aggregate Extraction (page 77)

Action	Responsibility	Timescale
Treat as Plan or Project.	MAFF	Ongoing
Ensure that any proposals for aggregate extraction within Cardigan Bay are appropriately assessed by the relevant competent authority (currently DETR, possibly changing to NAW), addressing the potential impacts of both the dredging and associated shipping movements on the bottlenose dolphins and their habitats.	MAFF/DETR	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Navigational Dredging (including capital projects) (page 79)

Action	Responsibility	Timescale
Treat all navigational dredging as a plan or project.	CCC	Ongoing
Review extant maintenance dredging operations and produce Dredging Plans to provide a framework/procedure for proposals for dredging within Ceredigion.	CCC	2000/1
Establish a code of practice for dredging and disposal in and adjacent to the SAC.	CCC	2000/1
Use the best practicable environmental option for the disposal of dredged material.	CCC	Ongoing
Links		
Ensure that any proposals for navigational dredging are assessed in the context of the relevant Shoreline Management Plan.	CCC	Ongoing
The possibility of improving dredging in the Teifi estuary to improve navigation will be explored within the Teifi Estuary Management Plan.	CCC	2000/1
Ensure the Teifi Estuary Management Plan is consistent with the SAC Management Plan.	CCC	2000/1

Cables and Pipelines (page 84)

Action	Responsibility	Timescale
Treat the installation of submarine pipelines or cables as a plan or project.	CA	Ongoing
Ensure Environmental Impact Assessment legislation is followed.	CA	Ongoing

Electricity Generation

Fossil Fuels (power generation) (page 87)

Action	Responsibility	Timescale
If development proposals arise which may affect the SAC, ensure appropriate assessments take place which properly address the SAC interests.	CAs	Ongoing

Nuclear (power generation) (page 87)

Action	Responsibility	Timescale
If development proposals arise which may affect the SAC, ensure appropriate assessments take place which properly address the SAC	CAs	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

interests.		
------------	--	--

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Alternative (power generation) (page 89)

Action	Responsibility	Timescale
If development proposals arise which may affect the SAC, ensure appropriate assessments take place and address the SAC interests.	CAs	Ongoing
Monitor the development of UK government policy/strategy with respect to the development of offshore alternative energy generation, and ensure that the SAC is appropriately considered in the development of such a policy, e.g. in any consultation exercises.	CCW	Ongoing
RAs (or one of them) to write to government seeking information on their latest policy position.	CCW	2000
Promote research by DTI/Industry into the potential impacts on marine mammals (including bottlenose dolphins) of underwater noise and vibration arising from offshore windfarms and other 'at sea' alternative energy structures.	CCW	Ongoing

Effluent Disposal (page 92)

Action	Responsibility	Timescale
Treat all effluent disposal consents as plans or projects.	EAW	Ongoing
Environment Agency Wales will consider and review all consented and/or authorised discharges that are made to the sea, both inside the cSAC and within one spring tide excursion beyond the currently defined cSAC boundaries. This is because discharges outside the cSAC may influence it through tidal movement. Cardigan Bay current data are very limited, but for practical purposes the extension will be 4 nautical miles south westwards from Cemaes Head and 3.5 nautical miles north-eastwards from Aberarth, in a direction parallel to the shoreline. This is an initial view, and may be refined in future following national guidance.	EAW	As driven by the Habitats Directive

Land Runoff (page 97)

Action	Responsibility	Timescale
Continue to monitor river and coastal water quality data in the area and consider any influence land run-off might have on dolphin health and distribution.	EAW	Ongoing
Maintain an ongoing programme of inspections of agricultural and industrial premises to ensure that risks are minimised and that owners/occupiers are aware of risks and implement best practice.	EAW	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Historical Activities (page 99)

Action	Responsibility	Timescale
Continue to be vigilant over activities and pollutant sources which might threaten the integrity of the cSAC, and will take action based on a realistic assessment of risk.	EAW	Ongoing
Continue to routinely monitor the river systems to determine the inputs and loadings of metals being discharged into coastal waters.	EAW	Ongoing
Promote, in partnership with others, the reclamation of disused metal mines where there is significant environmental benefit.	EAW	Ongoing
Undertake a monitoring programme to determine location and levels of PCBs and heavy metals in Cardigan Bay. To include water quality and sediment sampling, as well as food chain sampling, to demonstrate source, pathway and uptake.	MAFF, EAW, NAW	As soon as funds available

Commercial Boat Trip Operators (page 101)

Action	Responsibility	Timescale
Review and develop the Passenger Boat Code of Conduct with the boat operators at New Quay and Aberaeron.	CCC/MHC	Ongoing
Continue to support the passenger boat operators in their Wildlife Boat Trips, by the preparation of information and the provision of regular training.	CCC/MHC	Ongoing
Continue to involve pleasure boat operators in sightings/disturbance monitoring.	CCC/MHC	2000 - ongoing
Explore the possibility of an accreditation scheme for passenger boat operators.	CCC/MHC	2000
Explore mechanisms available to include the current voluntary Passenger Boat Code as a statutory condition for operation.	CCC/MHC	2000
Support the limitation of passenger boat licences.	CCC/MHC	Ongoing

Recreational Activities

Swimming, snorkelling and diving (page 104)

Action	Responsibility	Timescale
Discourage swimming with dolphins by provision of information in the Code of Conduct and other appropriate publications.	CCC	2000-Ongoing
Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.	CCW	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Swimming, snorkelling and diving (page 104) *Continued*

Action	Responsibility	Timescale
Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.	CCW	Ongoing

Recreational vessels (page 105)

Action	Responsibility	Timescale
Continue to keep Incident records and pass to relevant Harbourmaster for action.	CCC/MHC	Ongoing
Withdraw launching rights where necessary.	CCC/MHC	Ongoing
Develop activities zoning schemes where appropriate.	CCC/MHC	2000/2001
Maintain information/code of conduct signs at Aberporth, Llangrannog, Tresaith, New Quay, Cei Bach.	CCC/MHC	Ongoing
Maintain information/code of conduct signs at Poppit Sands launching points.	PCNPA	Ongoing
Maintain interpretative displays at local venues.	CCC/MHC	Ongoing
Continue to provide occasional educational wildlife boat trips.	CCC/MHC	2000-Ongoing
Develop shore based guided walks.	CCC/MHC	Ongoing
Organise annual marine environment public events.	CCC/MHC	Annually
Continue to involve local people in monitoring projects.	CCC/MHC	Ongoing
Ensure that Beach Officer records are maintained.	CCC/MHC	Ongoing
Continue to undertake regular illustrated talks/presentations.	CCC/MHC	Ongoing
Assess the effectiveness of the New Quay speedboat zone and review.	CCC/MHC	2000
Restore the Old Coastguard Lookout at Birds Rock, New Quay as a seabird & marine mammal lookout.	CCC/MHC	2001
Discourage the development of commercial recreational activity which has the potential to disturb the bottlenose dolphins.	CCC/MHC	Ongoing
Provide new information/code of conduct signs at Cardigan, Gwbert, Llanrhystud and Aberaeron.	CCC	2000/2001

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Recreational vessels (page 105) *Continued*

Action	Responsibility	Timescale
Maintain Ceredigion Marine Conservation information posters at beach display panels.	CCC	Ongoing
Continue to provide MHC/SAC information for inclusion in the Ceredigion Tide Time Tables.	CCC	Annually
Ensure that the Council's Economic and Tourism Department carry information about the MHC/SAC in their publications.	CCC	Ongoing
Regularly review the Ceredigion County Council's 'Boat Users Guide' and reproduce when necessary.	CCC/MHC	Annually
Continue to provide MHC/SAC articles for the Ceredigion County Council's 'Seafarer' newsletter issued to all mooring holders.	CCC/MHC	Annually
Determine whether behavioural reactions to dolphin watching boats are the result of reactions to boat noise or boating behaviour and/or volume.	CCC	Ongoing
Keep records of boat launches at Aberaeron, Aberystwyth and New Quay.	CCC	2000-ongoing
Devise a database to link data relevant to the SAC currently available in other Council departments.	CCC	2001
Obtain better information on the distribution of dolphins throughout Cardigan Bay to identify sensitive areas where speed restrictions are necessary.	CCC/CCW	Ongoing
Assess current and future levels of recreational boat traffic, and determine which areas are used most intensively. Use these data to determine whether provision of launching or other facilities can be used to direct recreational traffic to areas that are not favoured by dolphins.	CCC/CCW	2000 - Ongoing
Review local byelaws in light of the DETR's Review of Byelaw Powers for the Coast.	CCC	Ongoing
Seek venue/s in Cardigan for interpretative displays.	CCC	2001
Explore, with existing Marine Interpretation centres, the possibility of establishing a SAC Interpretation Centre.	CCC	2000/1
Continue to make available the joint PCNPA and PCC 'fast craft code of practice' to boat users.	PCNPA/PCC	Ongoing
Take account of the conservation requirements of the SAC in the development of any new codes of practice/conduct for water-borne activities off the Pembrokeshire coast.	PCNPA/PCC	Ongoing
Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.	CCW	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Recreational vessels (page 105) *Continued*

Action	Responsibility	Timescale
Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.	CCW	Ongoing

Commercial filming and photography (page 110)

Action	Responsibility	Timescale
Initiate and maintain an advisory and approvals system for all bottlenose dolphin research, photography and filming projects within Cardigan Bay. Each project will be required to seek advice and approval prior to initiating field work. Approval will require compliance with an approved code of practice and any project specific guidance issued. In addition, any project may require the issuing of a license under the Wildlife And Countryside Act (1981) (as amended) and The Conservation (Natural Habitats, &c.) Regulations 1994. Records of all such projects will be maintained and made available on request subject to confidentiality requirements.	CCW	2000/1
Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.	CCW	Ongoing
Ensure, as far as possible, that the production of all media about dolphins includes as one of its aims the development of a responsible public attitude towards the dolphins.	CCW	Ongoing
Seek clarification of the legislation, particularly with regard to the concepts of 'disturbance' and 'deliberate' and the purposes for which licences can be issued.	CCW	Ongoing
Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.	CCW	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Research Activities (page 113)

Action	Responsibility	Timescale
Initiate and maintain an advisory and approvals system for all bottlenose dolphin research, photography and filming projects within Cardigan Bay. Each project will be required to seek advice and approval prior to initiating field work. Approval will require compliance with an approved code of practice and any project specific guidance issued. In addition, any project may require the issuing of a license under the Wildlife And Countryside Act (1981) (as amended) and The Conservation (Natural Habitats, &c.) Regulations 1994. Records of all such projects will be maintained and made available on request subject to confidentiality requirements.	CCW	2000/1
Continue to enforce the Wildlife and Countryside Act and Habitats Regulations in relation to the protection of bottlenose dolphins from deliberate harm or disturbance.	CCW	Ongoing
Ensure, as far as possible, that the production of all media about dolphins includes as one of its aims the development of a responsible public attitude towards the dolphins.	CCW	Ongoing
Seek clarification of the legislation, particularly with regard to the concepts of 'disturbance' and 'deliberate' and the purposes for which licences can be issued.	CCW	Ongoing
Continue to seek improvements to species protection legislation, in particular to Part I of the Wildlife & Countryside Act and Regulation 39 of the Habitats Regulations. Under current legislation, it is not an offence to harm or disturb a bottlenose dolphin unintentionally. Thus there are some potentially harmful activities (such as direct human-dolphin contact, high speed vessels approaching dolphins) which would not be offences under this legislation, since it would in most cases be very difficult to demonstrate that any resultant harm was deliberate, and of course in most cases it would not be deliberate.	CCW	Ongoing

Military Activities (page 116)

Action	Responsibility	Timescale
Work alongside CCW in the development of an acoustic monitoring and detection system for deployment in Cardigan Bay.	DERA	Ongoing
In the run-up to a firing trial, should dolphin, other cetacean or seal be observed in the area of risk the trial will be aborted.	DERA	2000/1-Ongoing
To avoid 'disturbance' no attempt will be made to move the dolphin, other cetacean or seal and the firing trial will continue to be fouled until the cause of the incursion has moved of its own free will outside of the risk area.	DERA	2000/1-Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Military Activities (page 116) *Continued*

Action	Responsibility	Timescale
As the size and location of the risk area will vary according to the particular trial scenario, these details will be identified within the associated trial specification in accordance with defined practice.	DERA	2000/1-Ongoing
DERA Aberporth Range Standing Orders will be amended to include an annex detailing the procedure to be observed in order to ensure that the area of risk is clear of dolphin, other cetacean or seal prior to a weapon firing trial.	DERA	2000/1-Ongoing
Provide advice (CCW) and facilitate the work of DERA in developing and maintaining cetacean surveillance during periods of ordnance testing.	CCW	2000/1-Ongoing

Shipping (page 118)

Action	Responsibility	Timescale
Raise awareness and enthusiasm for recreational boat users, fishermen and others to report pollution incidents.	EA, SWSFC, NW&NWSFC, CCC	Ongoing
Ensure any appropriate/environmental assessments of offshore structures, or onshore developments, address the potential impacts of associated vessel movements.	CAs	Ongoing
Ensure that oil spill and other emergency contingency plans adequately address the requirement to protect the bottlenose dolphin and its habitat in so far as they can.	CAs	Ongoing
Advocate the implementation of the recommendations made in Lord Donaldson's report ' <i>Safer ships, cleaner seas</i> '.	CCW via Wales Coastal Forum	Ongoing

Offshore Oil & Gas (page 121)

Action	Responsibility	Timescale
Ensure, that EIAs and appropriate assessments under the 1994 Habitats Regulations are carried out, of all potential direct and indirect impacts of off-shore oil and gas exploration/exploitation.	CAs	Ongoing
Ensure that oil spill and other emergency contingency plans adequately address the requirement to protect the bottlenose dolphin and its habitat in so far as they can.	CAs	Ongoing
In the event of a marine pollution incident within the cSAC, or which could threaten the cSAC, ensure that appropriate consideration is given by the Environment Group to the requirements/sensitivities of bottlenose dolphins, and that this is reflected in the advice given to any	CCW	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

marine or other response centre(s).		
-------------------------------------	--	--

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Marine Salvage and Archaeology (page 125)

Action	Responsibility	Timescale
Maintain surveillance on levels and distribution of underwater archaeological studies. Possibly through liaison with existing archaeological bodies and diving clubs such as Cambria Archaeology and the British Sub-Aqua Club.	CCW, RAs	Ongoing
Argue for review of the legislation controlling the use of explosives (e.g. The Control of Explosives Act (1991)) to enable better management of their use within or adjacent to Welsh waters supporting cetacea, including the Cardigan Bay cSAC.	CCW	Ongoing

Fishing (page 127)

Towed Gear - Trawling

Action	Responsibility	Timescale
Maintain current regulatory regime.	NW&NWSFC SWSFC	Ongoing
Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC SWSFC	Ongoing

Towed Gear - Dredging

Action	Responsibility	Timescale
Maintain current regulatory regime.	NW&NWSFC SWSFC	Ongoing
Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC SWSFC	Ongoing

Static Gear - Gill Net

Action	Responsibility	Timescale
Maintain current regulatory regime.	NW&NWSFC SWSFC	Ongoing
Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC SWSFC	Ongoing

Static Gear - Pots

Action	Responsibility	Timescale
Maintain a watching brief in case of problems.	NW&NWSFC SWSFC	Ongoing

Cardigan Bay SAC Management Plan – *SUMMARY LIST OF ACTIONS*

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Angling

Action	Responsibility	Timescale
Maintain current regulatory regime.	NW&NWSFC SWSFC	Ongoing
Apply additional management measures if significant effects are likely & site integrity at risk.	NW&NWSFC SWSFC	Possibly annual liaison.

Seine Nets

Action	Responsibility	Timescale
Maintain current regulatory regime.	EAW, NAW	Ongoing

Litter (page 135)

Action	Responsibility	Timescale
Undertake surveys on beaches to identify whether they contain marine debris likely to entangle dolphins, and, if so, identify where beach collections would be most appropriate.	CCC	2000/1
Investigate the source of litter found during beach litter surveys in order to target action aimed at preventing littering at sea.	CCC	2000/1
Conduct beach litter surveys to determine whether education programmes or other controls have led to reductions in marine debris.	CCC	2002
Endeavour to support projects which will reduce the impact of litter on the Cardigan Bay bottlenose dolphins.	CCW	Ongoing

Non-Native Marine Species (page 140)

Action	Responsibility	Timescale
All competent authorities should take due account of relevant national and international legislation on the control and prevention of the introduction/spread of non-native and alien species.	CAs	Ongoing
Where powers exist, competent authorities reject applications for the translocation and release of bottlenose dolphins or other cetacea within the range of the Cardigan Bay bottlenose dolphins, or the range of other bottlenose dolphin groups with which they may interact.	CAs	Ongoing
Maintain surveillance of the introduction and spread of non-native species which may adversely effect the condition of the Cardigan Bay cSAC bottlenose dolphin population.	CCW	Ongoing
There is no provision in the WCA for controlling transfer and release of marine mammals. The potential benefits of seeking greater powers	CCW	2001/2

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

to control the translocation and release of marine mammals should be investigated.		
--	--	--

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Climate Change (page 143)

Action	Responsibility	Timescale
Maintain 'watching brief' surveillance of climate change through occasional liaison with relevant research institutions.	SACRAG	Ongoing
Encourage and support policies which will reduce anthropogenically derived climate change.	RAs as appropriate	Ongoing

Constraints to Management

Legislation for marine SACs (page 145)

Action	Responsibility	Timescale
Raise awareness in Government and elsewhere about the problems likely to be encountered with the implementation of marine SAC legislation. The outputs from The Life Project (see section 1.4), the aim of which is to provide experience of establishing marine SAC management schemes, will provide an opportunity to do this.	All RAs	Ongoing
Keep this management plan under review so that, in addition to improved understanding of the site itself, developments in understanding of the legislation can be taken into account.	All RAs	Ongoing

Environmental Considerations (page 146)

Range of bottlenose dolphin and its prey.

Action	Responsibility	Timescale
Distribute the management plan widely, in particular to competent authorities.	All RAs	2000 - Ongoing
Ensure all relevant departments within relevant authority organisations and local competent authorities are aware of responsibilities and best means of securing compliance.	CAs & RAs	Ongoing

Management and monitoring of the marine environment.

Action	Responsibility	Timescale
Make effective use of new technology to minimise the amount of work required at sea.	CAs as appropriate.	Ongoing

Level of current knowledge.

Action	Responsibility	Timescale
Seek funding to resource further essential research.	All RAs	Ongoing

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Initiate more relevant research.	All CAs	Ongoing
----------------------------------	---------	---------

Cardigan Bay SAC Management Plan – SUMMARY LIST OF ACTIONS

Lack of awareness and understanding

Action	Responsibility	Timescale
Distribute the management plan widely, in particular to competent authorities.	All RAs and CAs	
Ensure all relevant departments within relevant authority organisations and local competent authorities are aware of responsibilities and best means of securing compliance.	All RAs and CAs	

Resources (page 148)

Action	Responsibility	Timescale
Continue to identify and seek funding from internal and external sources.	All RAs	Ongoing

Additional Actions

Further desirable actions which cannot be implemented at present. These may require changes to resource levels, legislature or management responsibility before implementation can take place.

Fisheries

See Table 17., page 134.

7. RECORDING, REVIEW AND REPORTING

Site management will require regular review as circumstances in Cardigan Bay change over time. This section explains the mechanism and timetable for such a review process.

At any given time, the current version of this plan can, at best, only be based on the current state of knowledge. As our understanding of the site improves, and changes take place in the physical, biological and socio-economic environment, it will be important to review and revise the management plan.

The Action Plan (section 6 above) identifies all the specific “projects” (items of work) arising from the parts of the plan dealing with conservation objectives and feature monitoring, and consideration of the factors affecting the bottlenose dolphins. The projects provide the basis for recording and review of the management plan.

7.1 Recording

It is essential that records are kept of all the actions taken towards each project identified in the Action Plan. In particular, the following must be recorded:

- results of survey and research projects
- results of monitoring of the condition of the bottlenose dolphin population
- results of surveillance or monitoring of factors
- the implementation of all of the actions in the management plan

It is also important to record any significant “events” that may affect the site and ultimately the bottlenose dolphins. Events might include unforeseen environmental events or human actions that would not already be identified through on-going surveillance of the factors identified in section 5, and also socio-political events that might affect the arrangements through which this management plan is implemented (e.g. developments in legislation or policy affecting the functions and priorities of relevant and other competent authorities).

In general, responsibility for recording actions and results associated with a project of work resides with the body responsible for the project. This information will be reported to the relevant authorities group at regular intervals so that a complete summary of the state of implementation of the management plan can be maintained.

Ideally records should be made as soon as possible after completion of a project. For on-going or composite projects (e.g. monitoring or surveillance programmes, or research projects), a suitable interval for recording progress needs to be defined. Ideally, record keeping will be part of the specification for each individual project.

7.2 Review

Record keeping is a pre-requisite to review of the management plan. Overall, the purposes of review are to:

- a) ensure that the site is being managed in accordance with the plan,
- b) ensure that the plan is suitable for achieving the objectives,
- c) enable the relevant authorities to report on the implementation of measures and the success of the plan in delivering the requirements of the Habitats Directive.

Responsibility for review of this management plan is held by all the relevant authorities, as these are the bodies with the statutory responsibility for preparing and implementing it. As with the preparation and implementation of the plan, all significant review of the plan will take place in consultation with other

interests in the site, in particular through the Advisory Group, Topic Groups and Standing Conference¹⁴⁷.

The appropriate timescales for review vary with the subject under review, and this is outlined below. In general however, elements of the plan should be reviewed annually, with major reviews at 6 yearly intervals (this is the reporting interval required by the Habitats Directive - see section 7.3 below).

An effective process of review of the management plan needs to address a number of areas namely:

- whether the objectives are being met
- whether agreed management actions have been implemented
- whether the management measures have had the desired effect on the factor affecting the feature
- whether the agreed management actions are appropriate
- whether the objectives themselves should be revised

Each of these is considered in turn below.

7.2.1 *Review of condition of the bottlenose dolphin population against the conservation objectives*

Ultimately, this is the most important element of the review of the management plan: whether it is achieving what it is meant to achieve. The purpose of the projects concerned with monitoring the condition of the bottlenose dolphins is to provide the information required for this aspect of the review.

If the objectives are met, changes in management actions are not required. If the objectives are not met, it is necessary to review other elements of the management plan, in order to determine what steps, if any, are required. A failure to meet the objectives may be for many different reasons, such as:

- agreed actions may not have been implemented
- agreed actions may have been implemented but may be inappropriate to the achievement of the objectives
- actions may be required but have not been agreed or implemented
- influence of factors outside any management control
- the objectives may not be achievable

As can be seen from section 4 of this plan, the conservation objectives are not precisely defined at present, and are, themselves, subject to review (see section 7.2.5 below). Even if the objectives were precisely defined, it may not be possible to determine with any certainty whether they are being met or not for a considerable period of time, owing to the difficulties of monitoring the relevant attributes

Timescale: The frequency with which it is possible and desirable to undertake this element of the review will be determined largely by the time-frame within which the monitoring can provide the necessary information. Ideally, this element of the review should take place as frequently as possible (up to annually), and should not in any case be less than once every 6 years. Monitoring of the condition of the bottlenose dolphin population is at present a long term project and the first review of this type may not be worthwhile for several years.

7.2.2 *Review of implementation of management actions*

It is necessary to determine whether or not the agreed management actions have been implemented. Each action identified in the action plan should be recorded and any agreed actions not implemented need to be identified. The relevant authorities (and other competent authorities) are the bodies

¹⁴⁷ A description of the sites liaison framework is given on page 14

responsible for most, if not all, of the actions arising from the management plan, and each is therefore responsible for ensuring that the projects in the action plan are implemented.

Timescale: This should take place annually.

7.2.3 *Review of the effectiveness of management actions on factors*

All of the management actions that are not concerned with the gathering of information, are concerned with managing factors rather than directly influencing the bottlenose dolphins. It is essential therefore to review whether the actions are having the desired effect on the factor - this requires monitoring of the factor. For example, it is important to know whether a litter awareness campaign (which can be recorded as an action taken) is having the desired effect in reducing litter.

Timescale: As with the monitoring of the condition of the feature, the timescale for this type of review is determined largely by the type of action and monitoring required. In general, review should be as frequent as possible (up to annually) and not less than once every 6 years.

7.2.4 *Review of what management is required*

The need to review what management actions are required can come either from the determination of whether or not the objectives are being achieved, or from other sources of information which suggest that the prescribed management actions should be changed

None of the actions in this plan arise from a recognition that the bottlenose dolphin population is in an unfavourable condition and that site management therefore needs to be changed. Our knowledge of the population, its condition and the factors affecting it is limited, and therefore many of the actions arise from a precautionary approach and the need to improve our understanding of the site. Research work, either on this site or relating to cetacean populations elsewhere, can provide valuable information which may warrant re-examination of the actions set out in this plan.

Timescale: Annually.

7.2.5 *Review of the conservation objectives*

As mentioned above, the conservation objectives themselves need to be subject to review. At present they are not precisely defined and an important area of work arising from this plan (see 'Monitoring' under 'Summary List of Actions', page 150) is to enable the objectives and associated monitoring to be refined. As our knowledge of the population improves, and techniques for monitoring its attributes are developed, it should be possible to improve the precision with which the objectives are expressed, both in terms of the attributes used and the targets and limits identified.

Timescale: The objectives should ideally be revised as soon as there are grounds to do so. However, as with monitoring of the condition of the population, the process of improving the objectives is a long term one and significant revisions of the objectives at frequent (e.g. annual) intervals is not possible.

7.3 *Reporting*

Under the Habitats Directive, the UK is required to report to the EC every six years, on the measures taken under the Directive and on the conservation status of the habitats and species identified in the Directive. Therefore for each SAC, including Cardigan Bay, the equivalent information is likely to be required, i.e. the measures taken, an evaluation of their effectiveness in conserving the bottlenose dolphins and the condition of the population on the site.

This statutory requirement for reporting serves several important functions:

- it provides a means of evaluating the effectiveness of SACs in contributing to the aims of the Habitats Directive, namely the achievement of favourable conservation status of habitats and species

of European importance;

- it enables the EC to monitor progress with the implementation of the Directive across all member states, including through SACs and other measures;
- it provides a means for the relevant authorities for each UK marine SAC to be held accountable for their actions, against the requirements of the legislation and, most importantly, against the condition of the habitats and species for which the sites are selected. Note that the government (In Wales, this means the National Assembly) has powers to intervene in management schemes;
- where factors are outside the control of the relevant authorities, it enables them to report that to Government, which is ultimately responsible to the EC for the implementation of the Habitats Directive in the UK.

The precise type and format of information that will need to be provided by the relevant and competent authorities to the UK government in relation to individual SACs has not yet been determined. However, this management plan is intended to contain all the information necessary to satisfy the Habitats Directive's requirement in relation to this site. Therefore it is likely that a copy of the plan itself, together with the information to be documented under sections 7.1 and 7.2 above, can itself constitute the "report" for this site.

8. REFERENCES

- ABP Research. 1999. *Good practice guidelines for ports and harbours operating within or near UK European marine sites*. English Nature, UK Marine SACs Project. pp120.
- Admiralty Chart 1410
- Annex V of MARPOL 73/78 Regulations for the Prevention of Pollution by Garbage from Ships
- Arnold, H. & Mayer, S. 1995. *The ecology of bottlenose dolphins in Cardigan Bay, Wales, UK*. Abstracts of the 11th biennial conference on the biology of marine mammals 14-18 December 1995. Orlando, Florida.
- Arnold, H., Bartels, B., Wilson, B. And Thompson, P. 1997. *The Bottlenose Dolphins of Cardigan Bay: Selected Biographies of Individual Bottlenose Dolphins Recorded in Cardigan Bay, Wales*. Report to Countryside Council for Wales; CCW Science Report No 209.
- Baines, M., Pierpoint, C. And Earl, S. 1997. *A Cetacean sightings database for Wales and an evaluation of Impacts on Cetaceans from the Sea Empress Oil Spill*, CCW Sea Empress Contract Report No. 227. Pp 1-66.
- Ballance, L.T. 1990. *Residence patterns, group organization, and surfacing associations of bottlenose dolphins in Kino Bay, Gulf of California, Mexico*. In: Leatherwood, S. and Reeves, R.R (Eds.) *The bottlenose dolphin*. Academic Press, San Diego, pp. 267-283.
- Bevins, R., E. 1994. *A mineralogy of Wales*. National Museum of Wales, Cardiff, 146pp.
- Bowers, D.G. 1992. *The physical oceanography of Cardigan Bay*. In: Gritten, R. (Ed.) *Proceedings of Cardigan Bay in Crisis?* Conference, Plas Tan-y-Bwlch, Maentwrog 27 February – 2 March, 1991. Snowdonia National Park Authority. pp. 15-18.
- Brazier, P., Holt, R., Murray, E., & Nichols, D.M. 1999. *Marine Nature Conservation Review Sector 10. Cardigan Bay and North Wales: area summaries*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).
- CEFAS (1997) *Monitoring and surveillance of non-radioactive contaminants in the aquatic environment and activities regulating the disposal of wastes at sea, 1994*. Aquatic Environment Monitoring Report No. 47, Lowestoft. pp 59.
- Ceredigion District Council. 1992. *Ceredigion Marine Heritage Coast: An introductory report*. Ceredigion, Aberaeron.
- Ceredigion District Council. 1993. *Marine Heritage Coast*. Ceredigion, Aberaeron.
- Ceredigion County Council. 1998. *A report on Marine Mammal Disturbance 1994-1997*. Ceredigion, Aberaeron.
- Ceredigion County Council. 1998. *Marine Heritage Coast Management Plan 1998 - 2000*. Ceredigion, Aberaeron.
- Cockcroft, V.G. 1992. *Incidental capture of bottlenose dolphins (*Tursiops truncatus*) in shark net: an assessment of some possible causes*. Journal of Zoology, London (A), 226: 123-134.
- Cockcroft, V.G., Cliff, G & Ross, G.J.B. 1989. *Shark predation on Indian Ocean bottlenose dolphin *Tursiops truncatus* off Natal, South Africa*. South African Journal of Zoology 24: 305-310.
- Connor, R.C., Richards, A.F., Smolker, R.A., Mann, J. 1996. *Patterns of female attractiveness in Indian Ocean bottlenose dolphins*. Behaviour 133, 37-69.
- Connor, R.C., Smolker, R.A. & Richards, A.F. 1992. *Two levels of alliance formation among male bottlenose dolphins (*Tursiops sp.*)* Proceedings of the National Academy of Sciences, U.S.A., 89. 987-990.
- Countryside Council for Wales. 1996. *A guide to the production of management plans for nature reserves and protected areas*. Countryside Council for Wales. Bangor.
- Cyrus & Blaber 1987 as cited in Cockcroft, V.G. 1992. *Incidental capture of bottlenose dolphins (*Tursiops**

- truncatus*) in shark net: an assessment of some possible causes. Journal of Zoology, London (A), 226: 123-134.
- Dalen, J. and Knutsen, G.M. 1987. Scaring effects on fish and harmful effects on eggs, larvae and fry by offshore seismic exploration. In Merklinger, H.M. (Ed). Progress in Underwater Acoustics. Plenum Publishing Corp.
- DETR. 1998. European Marine Sites in England & Wales: A Guide to the Conservation (Natural Habitats &c.) Regulations 1994 and to the preparation and Application of Management Schemes. HMSO.
- Directory of aerial photographic collections in the United Kingdom. 1999. NAPLIB. ISBN 0953043614
- Dobson M., R. and Whittington R., J. 1987. *The geology of Cardigan Bay*. Proc. Geol. Ass. 98 (4) pp331-353.
- Draft Strategic Planning Statement*. Mid & West Wales Strategic Planning Forum (Sept. 1998).
- Electricity and pipe-line works (assessment of environmental effects) Regulations 1990 (SI 1990 No.442)
- Engas, A., Lokkeborg, S. , Ona, E. & Soldal, A.V. 1993. *Effects of seismic shooting on catch availability of cod and haddock*. Institute of Marine Research, Norway Fiskeri og Havet, No. 9.
- Eno, N.C., Clark, R.A., Sanderson, W.G. (eds). 1997. *Non-native marine species in British waters: a review and directory*. JNCC, Peterborough
- Environment Agency Wales, North Ceredigion Local Environment Agency Plan (LEAP), Consultation Report, January 1999 (available from Environment Agency Wales).
- Environment Agency Wales, Teifi Valley Local Environment Agency Plan (LEAP), Consultation Report, January 1999 (available from Environment Agency Wales).
- European marine sites in England & Wales* (Welsh Office and DETR, June 1998);
- The Birds and Habitats Directives: Outline Government Position* (DETR, May 1998).
- Evans, E., 1995. *Traditional fishing in Wales*. Welsh Heritage Series No. 5. [Llanrwst: Gwasg Carreg Gwalch] 70pp.
- Evans, P.G.H. 1992. *Status review of cetaceans in British and Irish waters*. Unpublished report to the Department of the Environment, UK Mammal Society Cetacean Group Report/Sea Watch Foundation, Oxford.
- Evans, P.G.H. and Scanlan, G. 1989. *Historical status changes of cetaceans in British and Irish waters*. In: Evans, P.G.H. and Smeenk, C. (Eds.) European Research on Cetaceans 3. European Cetacean Society, Cambridge. pp 51-57.
- Evans, P.G.H., Canwell, P.J., & Lewis, E.J. 1992. *An experimental study of the effects of pleasure craft noise upon bottle-nosed dolphins in Cardigan Bay West Wales*. In: Evans, P.G.H.. (Ed) European Research on Cetaceans 6, European Cetacean Society, Cambridge.
- Felix, F. 1997. *Organization and social structure of the coastal bottlenose dolphin Tursiops truncatus in the Gulf de Guayaquil, Ecuador*. Aquatic Mammals 23(1): 1-16.
- Field Studies Research Council. 1992. *Environmental Assessment St. George's Channel Blocks*. A report to Marathon Oil U.K. Ltd. Field Studies Council Research Centre, Pembroke.
- Goold, J.C. 1996. *Acoustic assessment of populations of common dolphin Delphinus delphis in conjunction with seismic surveying*. J. Mar.Biol.Ass. UK 76:811-820.
- Gray, M.J., 1995. *The coastal fisheries of England and Wales, Part III: A review of their status 1992-1994*. MAFF Technical Report No. 100 [Lowestoft: Directorate of Fisheries Research]. 99pp at 79ff.
- Gubbay, S. & Knapman, P.A. 1999. *A review of the effects of fishing within UK European marine sites*. English Nature (UK Marine SACs Project). 134 pages
- Guidance notes on the Offshore Petroleum Production and Pipe-lines (Assessment of Environmental Effects) Regulations 1998 [Oil and Gas Directorate, Department of Trade and Industry].
- Hiscock, K., ed. 1998. *Marine Nature Conservation Review. Benthic marine ecosystems of Great Britain and*

- the north-east Atlantic*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).
- Hohn, A.A. 1990. *Reading between the lines: analysis of age estimation in dolphins*. In: Leatherwood, S. & Reeves, R. R. (eds) *The bottlenose dolphin*. Academic Press. London. pp575-585.
- Jepson P. D. & Baker J. R. 1998. *Bottlenose dolphins (Tursiops truncatus) as a possible cause of acute traumatic injuries in Porpoises (Phocoena phocoena)*. Veterinary Record 143 pp614-615.
- Jepson, P.D., Brew, S., MacMillan, A.P., Baker, J.R., Barnett, J., Kirkwood, K.K., Kuiken, T., Robinson, I.R. & Simpson, V.R. 1997. *Antibodies to Brucella in marine mammals around the coast of England and Wales*. Veterinary Record. 141: 513-515.
- Jones, R. 1992. *The estuaries of Cardigan Bay*. In: Gritten, R. (Ed.) *Proceedings of Cardigan Bay in Crisis?* Conference. Plas Tan-y-Bwlch, Maentwrog. 27 February – 2 March, 1991. Snowdonia National Park Authority. pp. 19-21.
- Kasuya, T., Izumisawa, Y., Komyo, Y., Ishino, Y. and Maejima, Y. 1997. *Life history parameters of bottlenose dolphins off Japan*. IBI Reports 7:71-107.
- Kirkwood, J.K., Bennet, P.M., Jepson, P.D., Kuiken, T., Simpson, B.R. & Baker, J.R. 1997. *Entanglement in fishing gear and other causes of death in cetaceans stranded on the coast of England and Wales*. Veterinary Record. 141: 94-98.
- Klinowska, M. 1991. *Dolphins, Porpoises and Whales of the World*. The IUCN Red Data Book, IUCN, Gland and Cambridge.
- Kohler, C.C., & Courtenay, W.R. 1986. *American Fisheries Society position on introductions of aquatic species*. Fisheries, 11: 39-43
- Law, R.J. 1994. *Collaborative UK marine mammal project: summary of data produced 1988-1992*. Fisheries research technical report No. 97, MAFF, Directorate of Fisheries Research, Lowestoft.
- Law, R.J. and Allchin, C.R. 1994. *Organochlorines in the blubber of bottlenose dolphins (Tursiops truncatus) and harbour porpoise (Phocoena phocoena) from Cardigan Bay (Wales) and the Moray Firth (Scotland)*. ICES CM 1994/(E+N) 9:8pp.
- Law, R.J., Allchin, C.R. and Morris, R.J. 1995. *Uptake of organochlorines (chlorobiphenyls, dieldrin; total PCB and DDT) in bottlenose dolphins from Cardigan Bay, West Wales*. Chemosphere, 30:547-560.
- Lewis, E. 1999. *A digital database of photographically identified bottlenose dolphins: Cardigan Bay, West Wales*. A report for the Countryside Council for Wales.
- Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission. April 2000.
- Matheson, C., 1929. *Wales and the sea fisheries*. [Cardiff: National Museum of Wales]. 100pp.
- METOC. 1999. *An assessment of the environmental effects of offshore windfarms*. Report to the Energy Technology Support Unit. Report No. 920.
- Muir, A.I., Spurrier, C.J.H., Banister, K., Harris, E.A., Gibson, D.I. and Clark, P.F. 1998. *The Ages, Stomach Contents, and Parasites of Cetaceans Stranded on the Coasts of England and Wales in 1997*. An Interim Report for the Welsh Office by The Natural History Museum, London. Ref: 003/95.
- Natural History Museum. 1995. *Studies on the Biology of Cetacea*. A Report to the Welsh Office.
- Nichols, C., Havard, M. and Warren, L.M. 1992. *An evaluation of the use and efficacy of statutory and non-statutory designations for the conservation of Cardigan Bay*. Report for The Countryside Council for Wales, University of Wales, Cardiff.
- Patterson, I.A.P., Reid, R.J., Wilson, B., Grellier, K., Ross, H.M., Thompson, P.M. 1998. *Evidence for infanticide in bottlenose dolphins; an explanation for violent interactions with harbour porpoises?* Proc. Royal Society, B., 265: 1167-1170.

- Planning Guidance (Wales): Technical Advice Notes (Wales) - Coastal Planning (14).
- Planning Guidance (Wales): Technical Advice Notes (Wales) - Nature Conservation and Planning (5).
- Read, A., Cox, T., Barco, S., Evans, J., Gannon, D., Koopman, H., McLellan, B., Murray, K., Pabst, A., Potter, C., Swingle, M., Thayer, V., Touhey, K. & Westgate, A. 1997. *Documenting bycatch of marine mammals in coastal fisheries: observations of stranded harbour porpoises along the Mid-Atlantic coast*. Fifth Annual Atlantic Coastal Dolphin Conference. University of North Carolina.
- Ribera, M.A., & Boudouresque, C.F. 1995. *Introduced marine plants with special reference to macro algae: mechanisms and impact*. Progress in phycological research, 11:187-269
- Rosenthal, H. 1980. *Implications of transplantations to aquaculture and ecosystems*. Marine Fisheries Review, 42:1-14
- Ross, H.M. & Wilson, B. 1996. *Violent interactions between bottlenose dolphins and harbour porpoises*. Proceedings of the Royal Society London, B. 263: 283-286
- Ross, H.M., Foster, G., Jahans, K.L., MacMillan, A.P., Reid, R.J. & Thompson, P.M. 1996. *Evidence of Brucella species infection in North Sea seal and cetacean populations*. Veterinary Record, 138: 647-648.
- Safer ships, cleaner seas*. Cm 2560, May 1994, HMSO.
- Sanders-Reed, C.A., Hammond, P.S., Grellier, K., Thompson, P.M. 1999. *Development of a population model for bottlenose dolphins*. Scottish Natural Heritage Research, Survey and Monitoring Report No. 156, Inverness.
- Smolker, R.A., Richards, A.F., Connor, R.C. & Pepper, J.W. 1992. *Sex differences in patterns of association among Indian Ocean bottlenose dolphins*. Behaviour, **123(1-2)**: 38-69.
- Smylie, M., 1998: *The herring fishers of Wales*. Welsh Heritage Series No. 6. [Llanrwst: Gwasg Carreg Gwalch] 125pp.
- Thomas, D., 1992: *Marine wildlife and net fisheries around Wales*. [Newtown: RSPB] 55pp.
- Thomas, D., 1993: *Marine wildlife and net fisheries in Cardigan Bay*. [Newtown: RSPB] 40pp.
- Wells, R.S., Scott, M.D. & Irvine, A.B. 1987. *The social structure of free-ranging bottlenose dolphins*. In: Genoways, H. (Ed.) Current Mammalogy. Vol. 1. pp. 247-305. Plenum Press, New York and London.

Appendix 1

Extracts from the Conservation (Natural Habitats &c.) Regulations 1994 (SI 1994/2716)

Regulation 3: General duties of competent authorities

3(1)

These Regulations make provision for the purpose of implementing, for Great Britain, Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (referred to in these Regulations as “the Habitats Directive”).

3(2)

The Secretary of State, the Minister of Agriculture, Fisheries and Food and the nature conservation bodies shall exercise their functions under the enactments relating to nature conservation so as to secure compliance with the requirements of the Habitats Directive.

Those enactments include -

- Part III of the National Parks and Access to the Countryside Act 1949
- section 49A of the Countryside (Scotland) Act 1967 (management agreements)
- section 15 of the Countryside Act 1968 (areas of special scientific interest)
- Part I and sections 28 to 38 of the Wildlife and Countryside Act 1981
- sections 131 to 134 of the Environmental Protection Act 1990.
- sections 2,3,5,6,7 and 11 of the Natural Heritage (Scotland) Act 1991 and these Regulations.

3(3)

In relation to marine areas any competent authority having functions relevant to marine conservation shall exercise those functions so as to secure compliance with the requirements of the Habitats Directive.

This applies, in particular, to functions under the following enactments -

- the Sea Fisheries Acts within the meaning of section 1 of the Sea Fisheries (Wildlife Conservation) Act 1992
- the Dockyard Ports Regulation Act 1865
- section 2(2) of the Military Lands Act 1900 (provisions as to use of sea, tidal water or shore)
- the Harbours Act 1964
- Part II of the Control of Pollution Act 1974
- sections 36 and 37 of the Wildlife and Countryside Act 1981 (marine nature reserves)
- sections 120 to 122 of the Civic Government (Scotland) Act 1982 (control of the seashore, adjacent waters and inland waters)
- the Water Resources Act 1991
- the Land Drainage Act 1991, and

- these Regulations

3(4)

Without prejudice to the preceding provisions, every competent authority in the exercise of any of their functions, shall have regard to the requirements of the Habitats Directive so far as they may be affected by the exercise of those functions.

Regulation 5: Identification of relevant authorities for marine areas

5

For the purposes of these Regulations the relevant authorities, in relation to a marine area or European marine site, are such of the following as have functions in relation to land or waters within or adjacent to that area or site -

- (a) a nature conservation body;
- (b) a county council, district council, London borough council or, in Scotland, a regional, islands or district council;
- (c) the National Rivers Authority, a water undertaker or sewerage undertaker, or an internal drainage board;
- (d) a navigation authority within the meaning of the Water Resources Act 1991(k);
- (e) a harbour authority within the meaning of the Harbours Act 1964(l);
- (f) a lighthouse authority;
- (g) a river purification board or a district salmon fishery board;
- (h) a local fisheries committee constituted under the Sea Fisheries Regulation Act 1966(m) or any authority exercising the powers of such a committee.

Regulation 6: Identification of competent authorities

6(1)

For the purposes of these Regulations the expression “competent authority” includes any Minister, government department, public or statutory undertaker, public body of any description or person holding a public office.

The expression also includes any person exercising any function of a competent authority in the United Kingdom.

Regulation 33: Advice by CCW for European marine sites

33(2)

As soon as possible after a site becomes a European marine site, the appropriate nature conservation body shall advise other relevant authorities as to -

- (a) the conservation objectives for that site, and
- (b) any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated.

Regulations 34 and 35: Management schemes for European marine sites

34(1)

The relevant authorities, or any of them, may establish for a European marine site a management scheme under

which their functions (including any power to make bylaws) shall be exercised so as to secure in relation to that site compliance with the requirements of the Habitats Directive.

34(2)

Only one management scheme may be made for each European marine site.

34(3)

A management scheme may be amended from time to time.

34(4)

As soon as a management scheme has been established, or is amended, a copy of it shall be sent by the relevant authority or authorities concerned to the appropriate nature conservation body.

35(1)

The relevant Minister may give directions to the relevant authorities, or any of them, as to the establishment of a management scheme for a European marine site.

35(2)

Directions may, in particular -

- (a) require conservation measures specified in the direction to be included in the scheme;
- (b) appoint one of the relevant authorities to co-ordinate the establishment of the scheme;
- (c) set time limits within which any steps are to be taken;
- (d) provide that the approval of the Minister is required before the scheme is established; and
- (e) require any relevant authority to supply to the Minister such information concerning the establishment of the scheme as may be specified in the direction.

35(3)

The relevant Minister may give directions to the relevant authorities, or any of them, as to the amendment of a management scheme for a European marine site, either generally or in any particular respect.

35(4)

Any direction under this regulation shall be in writing and may be carried or revoked by a further direction.

35(5)

In this regulation “the relevant Minister” means, in relation to a site in England, the Secretary of State and the Minister of Agriculture, Fisheries and Food acting jointly and in any other case the Secretary of State.

Regulations 48 to 53: Consideration of plans and projects

Assessment of implications for European site

48(1)

A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a

plan or project which -

- (a) is likely to have a significant effect on a European site in Great Britain (either alone or in combination with other plans or projects), and
- (b) is not directly connected with or necessary to the management of the site, shall make an appropriate assessment of the implications for the site in view of that site's conservation objectives.

48(2)

A person applying for any such consent, permission or other authorisation shall provide such information as the competent authority may reasonably require for the purposes of the assessment.

48(3)

The competent authority shall for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority may specify.

48(4)

They shall also, if they consider it appropriate, take the opinion of the general public; and if they do so, they shall take such steps for that purpose as they consider appropriate.

48(5)

In the light of the conclusions of the assessment, and subject to regulation 49, the authority shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site.

48(6)

In considering whether a plan or project will adversely affect the integrity of the site, the authority shall have regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given.

Considerations of overriding public interest

49(1)

If they are satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (2), may be of a social or economic nature), the competent authority may agree to the plan or project notwithstanding a negative assessment of the implications for the site.

49(2)

Where the site concerned hosts a priority natural habitat type or a priority habitat type or a priority species, the reasons referred to in paragraph (1) must be either -

- (a) reasons relating to human health, public safety or beneficial consequences of primary importance to overriding public interest, or
- (b) other reasons which in the opinion of the European Commission are imperative reasons of overriding public interest.

49(3)

Where a competent authority other than the Secretary of State desire to obtain the opinion of the European

Commission as to whether reasons are to be considered imperative reasons of overriding public interest, they shall submit a written request to the Secretary of State -

- (a) identifying the matter on which an opinion is sought, and
- (b) accompanied by any documents or information which may be required.

49(4)

The Secretary of State may thereupon, if he thinks fit, seek the opinion of the Commission; and if he does so, he shall upon receiving the Commission's opinion transmit it to the authority.

49(5)

Where an authority other than the Secretary of State propose to agree to a plan or project under this regulation notwithstanding a negative assessment of the implications for European site, they shall notify the Secretary of State.

Having notified the Secretary of State, they shall not agree to the plan or project before the end of the period of 21 days beginning with the day notified to them by the Secretary of State as that on which their notification was received by him, unless the Secretary of State notifies them that they may do so.

49(6)

In any such case the Secretary of State may give directions to the authority prohibiting them from agreeing to the plan or project, either indefinitely or during such period as may be specified in the direction.

This power is without prejudice to any other power of the Secretary of State in relation to the decision in question.

Review of existing decisions and consents, &c.

50(1)

Where before the date on which a site becomes a European site or, of later, the commencement of these Regulations, a competent authority have decided to undertake, or have given any consent, permission or other authorisation for, a plan or project to which regulation 48(1) would apply if it were to be reconsidered as of that date, the authority shall as soon as reasonably practicable, review their decision or, as the case may be, the consent, permission or other authorisation, and shall affirm, modify or revoke it.

50(2)

They shall for that purpose make an appropriate assessment of the implications for the site in view of that site's conservation objectives; and the provisions of regulation 48(2) to (4) shall apply, with the appropriate modifications, in relation to such a review.

50(3)

Subject to the following provisions of this Part, any review required by this regulation shall be carried out under existing statutory procedures where such procedures exist, and if none exist the Secretary of State may give directions as to the procedure to be followed.

50(4)

Nothing in this regulation shall affect anything done in pursuance of the decision, or the consent, permission or other authorisation, before the date mentioned in paragraph (1).

Consideration on review

51(1)

The following provisions apply where a decision, or a consent, permission or other authorisation, falls to be reviewed under regulation 50.

51(2)

Subject as follows, the provisions of regulation 48(5) and (6) and regulation 49 shall apply, with the appropriate modifications, in relation to the decision on the review.

51(3)

The decision, or the consent, permission or other authorisation, may be affirmed if it appears to the authority reviewing it that other action taken or to be taken by them, or by another authority, will secure that the plan or project does not adversely affect the integrity of the site.

Where that object may be attained in a number of ways, the authority or authorities concerned shall seek to secure that the action taken is the least onerous to those affected.

51(4)

The Secretary of State may issue guidance to authorities for the purposes of paragraph (3) as to the manner of determining which of different ways should be adopted for securing that the plan or project does not have any such effect, and in particular -

- (a) the order of application of different controls, and
- (b) the extent to which account should be taken of the possible exercise of other powers;

and the authorities concerned shall have regard to any guidance so issued in discharging their functions under that paragraph.

51(5)

Any modification or revocation effected in pursuance of this regulation shall be carried out under existing statutory procedures where such procedures exist.

If none exist, the Secretary of State may give directions as to the procedure to be followed.

Compensatory measures

53

Where in accordance with regulation 49 (considerations of overriding public interest) -

- (a) a plan or project is agreed to, notwithstanding a negative assessment of the implications for a European site, or
- (b) a decision, or a consent, permission or other authorisation, is affirmed on review, notwithstanding such an assessment,
- (c) the Secretary of State shall secure that any necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000 is protected.

Appendix 2

Maps

Table 20. Admiralty Charts

Chart Number	Chart title	Scale	Northern limit	Eastern limit	Southern limit	Western limit
1973	Cardigan Bay Southern Part	1:75,000	52°16'21"N	004°32'02"W	51°50'00"N	005°38'30"W
1972	Cardigan Bay Central Part	1:75,000	52°45'08"N	004°01'35"W	52°04'30"N	004°44'18"W
1971	Cardigan Bay Northern Part	1:75,000	53°00'24"N	004°01'30"W	52°34'30"N	005°07'57"W
1484	Plans in Cardigan Bay	1:15,000	N/A	N/A	N/A	N/A
Plan Insets:	Fishguard Bay, Newport Bay, Approaches to Cardigan, Aberporth, Aberaeron, Aberystwyth, Aberdovey, Barmouth					
1512	Plans on the Llyn Peninsula	1:18,000	N/A	N/A	N/A	N/A
Plan Insets:	Mochras Lagoon, Approaches to Porthmadoc, Porthmadoc Harbour, Pwllheli, Saint Tudwal's Roads, (also Porth Dinllaen on north Llyn)					
1410	Saint George's Channel	1:200,000	53°00'00"N	003°51'08"W	51°40'27"N	007°10'00"W
1121	Irish Sea with Saint George's Channel and North Channel	1:500,000	55°43'00"N	002°31'59"W	51°09'00"N	007°32'00"W
1123	Western Approaches to Saint George's Channel and Bristol Channel	1:500,000	52°50'00"N	002°30'00"W	49°41'48"N	010°28'12"W

Table 21. Kingfisher Charts

Title of Chart	Kingfisher Chart Code	Northern Limit	Eastern Limit	Southern Limit	Western Limit	Decca Navigator Chain
Smalls Area	KW151-3B	51°25'N	004°05'W	52°14'N	006°05'W	South West British Chain (1B)
Cardigan Bay Area	KW152-4A	52°54'N	004°02'W	52°14'N	006°20'W	North British Chain (3B)

Table 22. Kingfisher in use cable awareness charts

Title of Chart	Northern Limit	Eastern Limit	Southern Limit	Western Limit
Irish Sea	55°40'N	003°00'W	52°00'N	007°00'W

Table 23. Yachtsmen's Charts

Chart Number	Chart title	Scale	Northern limit	Eastern limit	Southern limit	Western limit
C61	St. George's Channel. Wales to East Coast of Ireland.	1:270,000	53°36'00"N	002°55'00"W	51°50'00"N	007°15'00"W
Plan insets:	Porthmadoc, Aberystwyth, Tremadoc Bay, Barmouth, Aberdovey, Menai Strait, Cardigan, New Quay, Dublin Bay, Wexford, Arklow, Wicklow, Dunmore East					

Table 24. British Geological Survey charts for Cardigan Bay.

Description	ISBN Number	Product Description
UK and continental shelf (UTM series) geology	0751812900	52N 06W Cardigan Bay (S)
1:250 000 maps UK and continental shelf (UTM series) geology	0751812838	52N 06W Cardigan Bay (S)
1:250 000 maps LTK and continental shelf (UTM series) geology	0751812854	52N 06W Cardigan Bay (including part 52N 08W Waterford(Ss))
1:250 000 maps UK and continental shelf (UTM series) geology	0751812846	52N 06W Cardigan Bay (including part 52N 08W Waterford(Ss))
1:250 000 maps LIK and continental shelf (UTM series) geology	0751812870	52N 06W Cardigan Bay (including part 52N 08W Waterford (Q))
1:250 000 maps UK and continental shelf (UTM series) geology	0751812862	52N 06W Cardigan Bay (including part 52N 08W Waterford(Q))

Appendix 3.

Research and study literature for bottlenose dolphins in Cardigan Bay.

Anon. 1992. *Trends in cetacean Strandings on the British Coastline*. A report by the Natural History Museum, London.

Arnold, H. (1993) *Distribution, abundance and habitat use of bottle-nosed dolphins in Cardigan Bay, Wales, 1992*. In: Evans, P.G.H. (Ed.) *European Research on Cetaceans - 7*. European Cetacean Society, Cambridge, pp63-66.

Arnold, H. and Mayer, S. 1995. *The ecology of bottlenose dolphins in Cardigan Bay, Wales, UK*. Abstracts of the Eleventh Biennial Conference on the Biology of Marine Mammals, 14-18 December, 1995, Orlando, Florida.

Arnold, H., Bartels, B., Wilson, B. And Thompson, P. 1997. *The Bottlenose Dolphins of Cardigan Bay: Selected Biographies of Individual Bottlenose Dolphins Recorded in Cardigan Bay, Wales*. Report to Countryside Council for Wales; CCW Science Report No 209., pp 67.

Assinder, D. 1991. *Sources and distribution of artificial radionuclides in North Wales coastal regions*. In: Gritten, R. (ed.) *Proceedings of "Cardigan Bay in Crisis?" conference*, Plas Tan-y-bwlch, Maentwrog, 27th February – 2nd March, 1991. Snowdonia National Park Authority. Pp 71-81.

Baines, M.E. 1993. *Marine Mammal Monitoring During the Seismic Exploration of Block 107/21 in Cardigan Bay, Autumn 1993*. A preliminary report from West Wales Marine Mammal Monitoring Group, Dyfed Wildlife Trust.

Baines, M., Pierpoint, C. And Earl, S. 1996. *Cetaceans recorded by the West Wales Grey Seal Census, 1992 to 1994*. Report for Dyfed Wildlife Trust.

Baines, M.E., Earl, S.J. Pierpoint, C.J.L. and Harries, R. 1997. *Cetaceans recorded by the West Wales grey seal census*. In: Evans, P.G.H. (Ed.) *European Research on Cetaceans 10*. European Cetacean Society, Cambridge. p.141.

Baines, M., Pierpoint, C. And Earl, S. 1997. *A Cetacean sightings database for Wales and an evaluation of Impacts on Cetaceans from the Sea Empress Oil Spill*. CCW Sea Empress Contract Report No.227. Pp 1-66.

Baines, M., Pierpoint, C & Earl, S. 1998. *Sightings in Wales*. Issue 1: April 1998. Nekton, Newport., Haverfordwest, Wales

Baker, J.R. 1992. *Causes of Mortality & Parasites & Incidental Lesions in Dolphins & Whales from British Waters*. The Veterinary Record, 130: 569-572.

Baker, J.R. & Martin, A.R. 1992. *Causes of mortality and parasites and incidental lesions in harbour porpoises (*Phocoena phocoena*) from British waters*. Vet. Record 130:554-558.

Baker, J.R. 1992. *Skin disease in wild cetaceans from British Waters*. Aquat. Mam. 18(1): 27-32.

Bartley, R., Hodge, P., and Mason, D. 1991. *The effect of boat noise on bottlenose dolphins*. Report for Marconi Underwater Systems. pp15.

Bowden, K.F. 1955. *Physical oceanography of the Irish Sea*. MAFF Fishery Investigation Series II. 18(8). 66pp.

Bowden, K.F. 1980. *Physical and dynamic oceanography of the Irish Sea*. In: Banner, F.T., Collins, M.B. and Massie, K.S. (eds.) *The North-west European Shelf Seas: The sea bed and the sea in motion II*, Physical and chemical oceanography and physical resources. Elsevier, Amsterdam. pp 391-413.

Bowers, D.G. 1992. *The physical oceanography of Cardigan Bay*. In: Gritten, R. (Ed.) *Proceedings of Cardigan Bay in Crisis? Conference*, Plas Tan-y-Bwlch, Maentwrog 27 February - 2 March, 1991. Snowdonia National Park Authority. pp. 15-18.

Branson, A. 1996. *Wildlife Reports*. Br. Wildl. 7(5): 318.

- Brazier, P, Holt, R, Murray, E., Nichols, D. 1999. *Marine nature conservation review Sector 10. Cardigan Bay and north Wales: area summaries*. Coasts and seas of the United Kingdom-MNCR series. Joint Nature Conservation Committee, Peterborough.
- Ceredigion District Council. 1992. *Ceredigion Marine Heritage Coast: An introductory report*. Ceredigion, Aberaeron.
- Ceredigion District Council. 1993. *Marine Heritage Coast*. Ceredigion, Aberaeron.
- Ceredigion County Council. 1998. *A Report on Marine Mammal Disturbance 1994-1997*. Ceredigion, Aberaeron.
- Ceredigion County Council. 1998. *Marine Heritage Coast Management Plan 1998 - 2000*. Ceredigion, Aberaeron.
- Edwards, R. and Sime, H. (eds). 1998. *The sea empress oil spill*. Proceedings of the international conference held in Cardiff, 11-13 February, 1998. Terence Dalton Publishers.
- Environment Agency. 1999. *The state of the environment of England and Wales: Coasts*. The Environment Agency.
- Evans, D.M. & Thomason, H. 1990. *Tourism and recreational developments*. In: Smith, H.D. & Geffen, A.J. (eds) *The Irish Sea: An environmental review. Part 4: planning, development and management*. Irish Sea Study Group, Liverpool University Press. pp. 71-101.
- Evans, P.G.H. 1976. *An analysis of sightings of Cetacea in British waters*. Mammal Review. 6(1):5-14.
- Evans, P.G.H. 1980. *Cetaceans in British waters*. Mammal Review 10, 1-52.
- Evans, P.G.H., Harding, S., Tyler, G., Hall, S. 1986. *Analysis of cetacean sightings in the British Isles, 1958-1985*. Unpublished Report to the NCC, Peterborough by the Cetacean Group of the UK Mammal Society. 71pp.
- Evans, P.G.H. and Scanlan, G. 1989. *Historical status changes of cetaceans in British and Irish waters*. In: Evans, P.G.H. & Smeenk, C. (Eds.) *European Research on Cetaceans 3*. European Cetacean Society, Cambridge. pp 51-57.
- Evans, P.G.H., Canwell, P.J. and Lewis, E.J. 1992. *An experimental study of the effects of pleasure craft noise upon bottle-nosed dolphins in Cardigan Bay, West Wales*. In: Evans, P.G.H. (Ed.) *European Research on Cetaceans - 6*. Proceedings of the 6th annual conference of the European Cetacean Society, San Remo, Italy, February 1992. pp 43-46. European Cetacean Society, Cambridge.
- Evans, P.G.H., 1992. *Status review of cetaceans in British and Irish waters*. UK Mammal Society Cetacean Group Report, University of Oxford.
- Evans, P.G.H., Lewis, E.J. and Fisher, P. 1993. *A study of the possible effects of seismic testing upon cetaceans in the Irish Sea*. Report to Marathon Oil U.K. Sea Watch Foundation, Oxford.
- Evans, P.G.H. 1996. *Whales, Dolphins and porpoises*. In: Barne, J.H., Robson, C.S., Kaznowska, S.S. & Doody, J.P. (Eds.) *Coasts and Seas of the United Kingdom*. Chapt. 5.15. Region 12; Wales: Margram to Little Orme. Joint Nature Conservation Committee, Peterborough.
- Field Studies Research Council. 1992. *Caernarfon and Cardigan Bays: An environmental Appraisal*. Report for Hamilton Oil Company Ltd. 71pp.
- Field Studies Research Council 1992. *Environmental Assessment St. George's Channel Blocks*. A report to Marathon Oil U.K. Ltd. Field Studies Council Research Centre, Pembroke.
- Fraser, F.C. 1974. *Report on Cetacea stranded on the British Coasts from 1948 to 1966* Report No. 14. British Museum (Natural History) London, 65pp.
- Gibson, D.I., Harris, E.A., Bray, R.A., Jepson, P.D., Kuiken, T., Baker, J.R., Simpson, V.R. 1998. *A survey of the helminth parasites of cetaceans stranded on the coast of England and Wales during the period 1990-1994*. Journal of Zoology, 244(4): 563-574
- Goold, J.C. 1996. *Acoustic assessment of populations of common dolphin Delphinus delphis in conjunction*

with seismic surveying. J. Mar.Biol.Ass. UK 76:811-820.

Green, M. and Elliott, D. 1993. *Surveys of wintering birds and cetaceans in northern Cardigan Bay, 1990-93*. A Report for Countryside Council for Wales, Bangor, CCW Science Report No. 60. pp32.

Grellier, K., Arnold, H., Thompson, P., Wilson, B., Curran, S. 1995. *Management Recommendations for the Cardigan Bay Bottlenose Dolphin Population*. A report to the Countryside Council for Wales by University of Aberdeen, Dept. of Zoology, Cromarty. CCW Contract Science Report 134., pp 68.

Gritten, R. (Ed.) 1991. *Proceedings of Cardigan Bay in Crisis? Conference*, Plas Tan-y-Bwlch, Maentwrog. February-March 1991, Penrhyndeudraeth.

Hope-Jones, P. 1984. *Cetaceans seen in the Irish Sea and approaches, late summer 1983*. Nature in Wales (new series) 3(1 & 2):62-64.

Hope-Jones, P. and Okines, D. 1990. *Records of cetaceans off Bardsey, 1975-89*. An.Rep. Bardsey Bird and Field Observatory, 33, p57-60.

Huckbody, A.J., Taylor, P.M., Hobbs, G. & Elliott, R. 1992. *Caernarfon and Cardigan Bays: An environmental appraisal*. Field Studies Council Research Centre for Hamilton Oil Company.

Hunter, C.A. & Morris, R.J. 1987. *Use of a modified sonobuoy for studies on wild bottlenose dolphins*. Aquatic Mammals, 13: 99-102.

Irish Sea Study Group. 1990. *The Irish Sea: An Environmental Review*. Part 1: Nature Conservation. Liverpool University Press. pp 404.

Irish Sea Study Group. 1990. *The Irish Sea: An environmental review*. Part 2: Waste inputs and Pollution. The Irish Sea Study Group, Liverpool University Press. 165pp.

JNCC. 1993 *Observations in the southern Irish sea on the effects of seismic surveys on seabirds and cetaceans*. Report for Marathon Oil U.K. Ltd.

JNCC 1994. *Observations of seabirds and cetaceans in the Irish Sea*. Report for Chevron U.K.

JNCC 1995. *European seabirds at sea databases: seabird and cetacean UKDMAP datasets version 2.1*. Peterborough, JNCC.

Jepson, P.D., Brew, S., MacMillan, A.P., Baker, J.R., Barnett, J. Kirkwood, J.K., Kuiken, T., Robinson, I.R. & Simpson, V.R. 1997. *Antibodies to Brucella in marine mammals around the coast of England and Wales*. The Veterinary Record. 141: 513-515.

Jepson, P.D., Bennett, P.M., Allchin, C.R., Baker, J.R., Kuiken, T. Rogan, E., Lockyer, C., Law, R.J., Walton, M.J. and Kirkwood, J.K. 1998. *Chronic PCB exposure is associated with infectious disease mortality in harbour porpoises stranded in England and Wales 1990-1996*. Abstracts of the World Marine Mammal Science Conference, Monaco, January 1998, p. 68.

Jepson, P.D. and Baker, J.R. 1998. *Bottlenosed dolphins (Tursiops truncatus) as a possible cause of acute traumatic injuries in porpoises (Phocoena phocoena)*. Veterinary Record **143**: 614-615.

Jones, J. and Franklin, A. 1997. *Monitoring and surveillance of non-radioactive contaminants in the aquatic environment and activities regulating the disposal of wastes at sea, 1994*. CEFAS. Aquatic Environment Monitoring Report 47, 1997 pp 1-59.

Jones, S.R., Jeffs, T.M. 1991. *Near surface sea temperatures in coastal waters of the North Sea, English Channel and Irish Sea*. MAFF, Lowestoft, UK.

Jones, R. 1992. *The estuaries of Cardigan Bay*. In: Gritten, R. (Ed.) *Proceedings of Cardigan Bay in Crisis? Conference*. Plas Tan-y-Bwlch, Maentwrog 27 February - 2 March, 1991. Snowdonia National Park Authority. pp. 19-21.

Kennedy, K. 1998. *Pen Llyn a'r Sarnau candidate SAC: Review of human activities*. CCW Contract Policy Research Report No. 98/5, Countryside Council for Wales. pp.68.

Kirkwood, J.K., Bennet, P.M., Jepson, P.D., Kuiken, T., Simpson, V.R. and Baker, J.R. 1997. *Entanglement in*

- Fishing Gear and Other Causes of Death in Cetaceans Stranded on the Coast of England & Wales*. The Veterinary Record, **141**: 94-98.
- Law, R.J., Fileman, C.F., Hopkins, A.D., Baker, J.R., Harwood, J., Jackson, D.B., Kennedy, S., Martin, A.R. & Morris, R.J. 1991. *Concentrations of trace metals in the livers of marine mammals (seals, porpoises and dolphins) from waters around the British Isles*. Mar.Poll.Bull. 22(4): 183-191.
- Law, R.J., Jones, B.R., Baker, J.R., Kennedy, S., Milne, R. & Morris, R.J. 1992. *Trace metals in the livers of marine mammals from the Welsh coast and the Irish Sea*. Mar. Poll. Bull. 24:296-304.
- Law, R.J. & Whinnett, J.A. 1992. *Polycyclic aromatic hydrocarbons in muscle tissue of harbour porpoises (*Phocoena phocoena*) from UK waters*. Marine Pollution Bulletin 24(11):550-553.
- Law, R.J. 1994. *Collaborative UK Marine Mammal Project: Summary of data produced 1988-1992*. MAFF Fisheries Technical Report No. 97, Directorate of Fisheries Research, Lowestoft.
- Law, R.J. and Allchin, C.R. 1994. Organochlorines in the blubber of bottlenose dolphins (*Tursiops truncatus*) and harbour porpoise (*Phocoena phocoena*) from Cardigan Bay (Wales) and the Moray Firth (Scotland). ICES CM 1994/(E+N) 9:8pp
- Law, R.J., Allchin, C.R. and Morris, R.J. 1995. *Uptake of organochlorines (chlorobiphenyls, dieldrin; total PCB and DDT) in bottlenose dolphins from Cardigan Bay, West Wales*. Chemosphere, **30**:547-560
- Law, R.J., Blake, S.J., Jones, B.R. and Rogan, E. 1998. *Organotin compounds in liver tissue of harbour porpoises (*Phocoena phocoena*) and grey seals (*Halichoerus grypus*) from the coastal waters of England and Wales*. Marine Pollution Bulletin, 36: 241-247.
- Lee, A.J., Ramster, J.W. (eds.) 1981. *Atlas of the seas around the British Isles*. MAFF, Directorate of Fisheries Research, Lowestoft.
- Lewis, E.J. and Evans, P.G.H. 1993. *Comparative ecology of bottle-nosed dolphins (*Tursiops truncatus*) in Cardigan Bay and the Moray Firth*. In: Evans, P.G.H. (Ed.) European Research on Cetaceans 7, European Cetacean Society, Cambridge, pp. 57-62.
- Lewis, E. 1999. *A digital database of photographically identified bottlenose dolphins: Cardigan Bay, West Wales*. A report for Countryside Council for Wales.
- Mackie, A.S.Y., Oliver, P.G., & Rees, E.I.S. 1995. *Benthic biodiversity in the southern Irish Sea*. Studies in Marine Biodiversity and Systematics from the National Museum of Wales. BIOMOR Reports, 1: 263pp.
- MAFF Fisheries Laboratory. 1998. *Assessment of Metals in Estuarine Sediments*. Environment Agency. R&D Technical Report P7.
- Mayer, S.J., Arnold, H.C., Evans, P.G.H. 1991. *Preliminary findings from a photo-identification study of bottle-nosed dolphins (*Tursiops truncatus*) in Cardigan Bay, Wales, during 1990*. In: Evans, P.G.H. (Ed.) European Research on Cetaceans 5, European Cetacean Society, Cambridge, pp 45-46.
- Mayer, S.J. and Arnold, H.C. 1991. *Bottlenose dolphins (*Tursiops truncatus*) in Cardigan Bay, West Wales. Proceedings of Cardigan Bay in Crisis?* Conference, Snowdonia National Park Authority, p34-35.
- Mayer, S. and Neild, C. 1994. *Research on Whales and Dolphins in British Waters or The UK Government's Imaginary Contribution to Cetacean Protection*. Greenpeace UK, London. 23pp.
- Mills, D.J.L. 1991. *Marine nature conservation review*. Benthic marine ecosystems in Great Britain: A review of current knowledge. Cardigan Bay, North Wales, Liverpool Bay and the Solway. (MNCR Coastal Sectors 10 and 11), NCC, CSD Report No. 1174.
- Mills D.J.L. 1998. *Cardigan Bay and north Wales (Cwm-yr-Eglwys, Newport Bay to Rhos-on-Sea)* (MNCR sector 10). pp297-314. In: Hiscock, K. Marine nature conservation review. Benthic marine ecosystems of Great Britain and the north-east Atlantic. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).
- Morgan-Jenks, M. 1992. *Cetacean recording and monitoring on Enlli*. Bardsey Bird & Field Observatory

Annual Report, 1992, pp 62-72.

Morgan-Jenks, M. 1997. *Risso's dolphin survey, Ynys Enlli 1997: a pilot study*. Report for Friends of Cardigan Bay, November 1997.

Morgan Jenks, M. 1999. *Risso's dolphin project and cetacean survey, Ynys Enlli, 1998*. Report for Friends of Cardigan Bay.

Morris, R.J., Law, R.J., Allchin, C.R., Kelly, C.A., Fileman, C.F. 1989. *Metals and organochlorines in dolphins and porpoises of Cardigan Bay, west Wales*. Mar. Poll. Bull. **20(10)**: 512-523.

Morris, R.J. 1991. *The New Quay Dolphins: A study of the natural history and behaviour of a wild, resident group of dolphins living off the west coast of Wales in an area of considerable human activity*. A report for the World Wide Fund for Nature (WWF) on the study period October 1986 - 1990. 141pp.

Muir, A.I., Spurrier, C.J.H., Banister, K., Harris, E.A., Gibson, D.I. and Clark, P.F. 1998. *The Ages, Stomach Contents, and Parasites of Cetaceans Stranded on the Coasts of England and Wales in 1997*. An Interim Report for the Welsh Office by The Natural History Museum, London. Ref: 003/95.

Nash, R.D. 1990. *Fish assemblages in the Irish Sea*. In: Irish Sea Study Group. *The Irish Sea: An Environmental Review - Part I: Nature Conservation*. Liverpool University Press. pp 325-333.

Natural History Museum. 1995. *Studies on the biology of cetacea*. A report for the Welsh Office. Ref. WEP/100/154/6.

Nichols, C., Havard, M. and Warren, L.M. 1992. *An evaluation of the use and efficacy of statutory and non-statutory designations for the conservation of Cardigan Bay*. Report for The Countryside Council for Wales, University of Wales, Cardiff.

Northridge, S. 1990. In: *The Irish Sea: An Environmental Review -Part 1: Nature Conservation*. Irish Sea Study Group, Liverpool University Press. pp 293-324.

NRA (National Rivers Authority) 1990. *The quality of rivers, canals and estuaries in England and Wales*. NRA, London.

Penrose, R. 1997. *Sea Empress oil spill (SEOS) - West Wales. Review of marine mammal strandings from the West Wales coast 1991-96*. Report to SEECC, Marine Environmental Monitoring, 13pp.

Pierpoint, C. and Allan, L. 2000 *Cetacean Site Use & Boat Traffic on the Ceredigion Marine Heritage Coast, West Wales 1994-1999*. Cyngor Sir Ceredigion.

Pierpoint, C., Baines, M. and Earl, S. 1999. *Field Trials of the POD - an acoustic data logger to monitor harbour porpoise activity in Newport Bay, Pembrokeshire*. CCW Science Report No.348.

Potts, G.W., Swaby, S.E. 1999. *Marine & Estuarine Fishes of Wales: review of the monitoring programmes for Wales 1994 to 1998; and update 1998-1999*. CCW Contract Science Report No. 349. Bangor.

Sea Empress Environmental Evaluation Committee. 1998. *The environmental impact of the Sea Empress oil spill*. Final Report. 135p. London: HMSO.

Sheldrick, M.C. 1976. *Trends in the strandings of cetacea on the British coasts 1913-72*. Mammal Rev. 6: 15-23.

Sheldrick, M.C. 1979. *Cetacean strandings along the coasts of the British Isles 1913-1977*. In: Geraci, J.R. & St. Aubin, D.J. (Eds.) *Biology of Marine Mammals: Insights through strandings*. U.S. Marine Mammal Commission, Washington D.C., pp 35-53.

Sheldrick, M.C. 1989. *Stranded whale records for the entire British coastline, 1967-1988*. Investigations on Cetacea 22: 248-329.

Smith, J., Yonow, N. and Elliott, R.(Field Studies Council Research Centre) (1995) *The coast of Dyfed and South Glamorgan - an Environmental Appraisal*. Field Studies Council, Shrewsbury. ISBN 1 851532 994.

Spurrier, C., Harris, E., Gibson, D. and Crimmen, O. 1997. *The ages, stomach contents, and parasites of cetaceans stranded on the coasts of England and Wales in 1996*. An interim report for the Welsh Office by

The Natural History Museum, London. Ref: 003/95.

Stronach, A. 1993. *Observations in Cardigan Bay on the effects of seismic surveys on seabirds and cetaceans, 28 Oct. - 11 Nov. 1993*. A report for ARCO British Ltd.

Tappin, D.R., Chadwick, R.A., Jackson, A.A., Wingfield, R.T.R., and Smith, N.J.P. 1994. *The geology of Cardigan Bay and the Bristol Channel*. HMSO, London.

Thomas, D. 1993. *Marine Wildlife and Net Fisheries in Cardigan Bay*. A Report for Countryside Council for Wales, Bangor, CCW Science Report No. 96.

Welsh Office. 1994. *Environmental Digest for Wales*. Government Statistical Service. 185pp.

Wenden, Tony. 1990. *Cardigan Bay Marine Wildlife: Cetaceans 1990*. Unpublished report, Aberporth. 14pp.

Wilson, B., Arnold, H., Bearzi, G., Fortuna C., Gaspar R., Ingram, S., Liret C., Pribanic S., Read A.J., Ridoux V., Schneider K., Urian K.W., Wells, R.S., Wood C., Thompson P.M., Hammond, P.S. 1997. *Epidermal disease in wild bottlenose dolphins: Can environmental or anthropogenic factors explain variability among populations?* Annex 7 in Final report: The Influence of Environmental Contaminants on Skin Disease in Bottlenose Dolphins to MAFF and DETR, pp 86-100.

Wilson, B., Arnold, H., Bearzi, G., Fortuna, C., Gaspar, R., Ingram, S., Liret, C., Pribanic, S., Read, A.J., Ridoux, V., Schneider, K., Urian, K.W., Wells, R.S., Wood, C., Thompson, P.M., Hammond, P.S. 1999. *Epidermal diseases in bottlenose dolphins: Impacts of natural and anthropogenic factors*. Proc. R. Soc. Lond.B. 266:1077-1083.

Wood, C.J. 1998. *Movement of bottlenose dolphins around the south-west coast of Britain*. Journal of Zoology, Lond., **246**(2):155-163.

Appendix 4

Boat users guide.

COO YMARWEDDIAU

Cychod
Byddwch yn ofalus wrth ddefnyddio cychod er mwyn diogelu'r pŵl ynddynt ac er mwyn parhau pawb arall sydd yn defnyddio'r môr.

Dolffinaid/Lamhyddion
Os dwech i'w drws y mamaliaid môr hyn yn y môr, a wneud os gweirch yn dda.
Gadw at gryfnder a llywyr cysw, neu arall yn raddol. Peidiwch â mynd at eu nôl, tra rwsu-rwsut na chwisio eu twydd na'u cyllwdd.
Cymwch ofel atbering i osgoi doffinaid gyda'u hepl.

Môrta
Peidiwch tarfu ar forol na'u hepl ar y traeth. Gladewch lonydd iddynt gan y gall unrhyw ymgeis i fynd allan achosi pryder iddynt.
Cadwch reolaeth ar gŵn a chadwch hwy i llywdd oddi wrth forol.

Adar
Wrth twydd cadwch 100m i llywdd o'r clogwyn yn ystod y tymor brodo. Rhwng 1 Hyd Ochrall 31.
Peidiwch twyddio unrhyw beth tuag at haid o adar sydd yn nythu neu'n twyddo ar y môr.
Dylid osgoi gwneud unrhyw swm arnysgwyl yn agos i'r clogwynn.

Pysgota
Peidiwch taflu taci pysgota i llywdd. Ewch ag of adael gyda chi er mwyn i'r materu'n iawn.

Beiciau Dŵr
Peidiwch larsio na defnyddio beiciau dŵr.

Delffars
Cadwch at Gôd Ymddyddad Cŵn Nodwy'r Tandwr Fydan, os gweirch yn dda.

CODE OF CONDUCT

Boats
Please operate all boats with care and attention for the safety of occupants and respect for all other sea users.

Dolphins / Porpoise
If these marine mammals are encountered at sea please:
Maintain a steady speed and course, or slow down gradually.
Do not chase, manoeuvre erratically, turn towards or attempt to feed or touch them.
Take extra care to avoid dolphins with their young.

Seals
Do not interfere with seals or their pups on the beach. Please leave alone as any attempt to approach may cause stress.
Control dogs and keep them away from seals.

Birds
When sailing keep 100m out from cliffs in the breeding season, 1 March to 31 July.
Do not sail directly towards nests of birds nesting or feeding on the sea.
Please avoid unnecessary noise close to cliffs.

Fishing
Do not discard fishing tackle.
Please take it home for proper disposal.

Jet skis
Please do not launch or operate jet-skis.

Divers
Please observe the BSAC Code of Conduct.



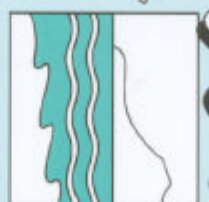












BOAT USERS GUIDE

Mae amodl Cersidiglen yn arbering. Mae rhan fawr ohono yn Arfordir Treftadaeth godidog gyda thiruniau trawadol, ac mae yna ardalod cadwraeth cenedlaethol pwysig.

gyda'r llywyd natur neyd. Mae orio'r llywyd yn llusgo tu hunain ar greigiau cilfachau lawel; a gwellf manafistad y môr megis Llannihydd yr Harbwr a'r Doffin. Tynwyd ym fynydd yn agos i'r tan.

Yn ychmonegol at hyn cael antalliad a phrintigion morol llwger yn byw ar grefesi Serrau yn Welling ac o lemn aber yr afon Ddyl ac mae yn gwneud hyn yn ardal arbennig ac yn rhyngwladol bywysg am ei bywyd natur morol.

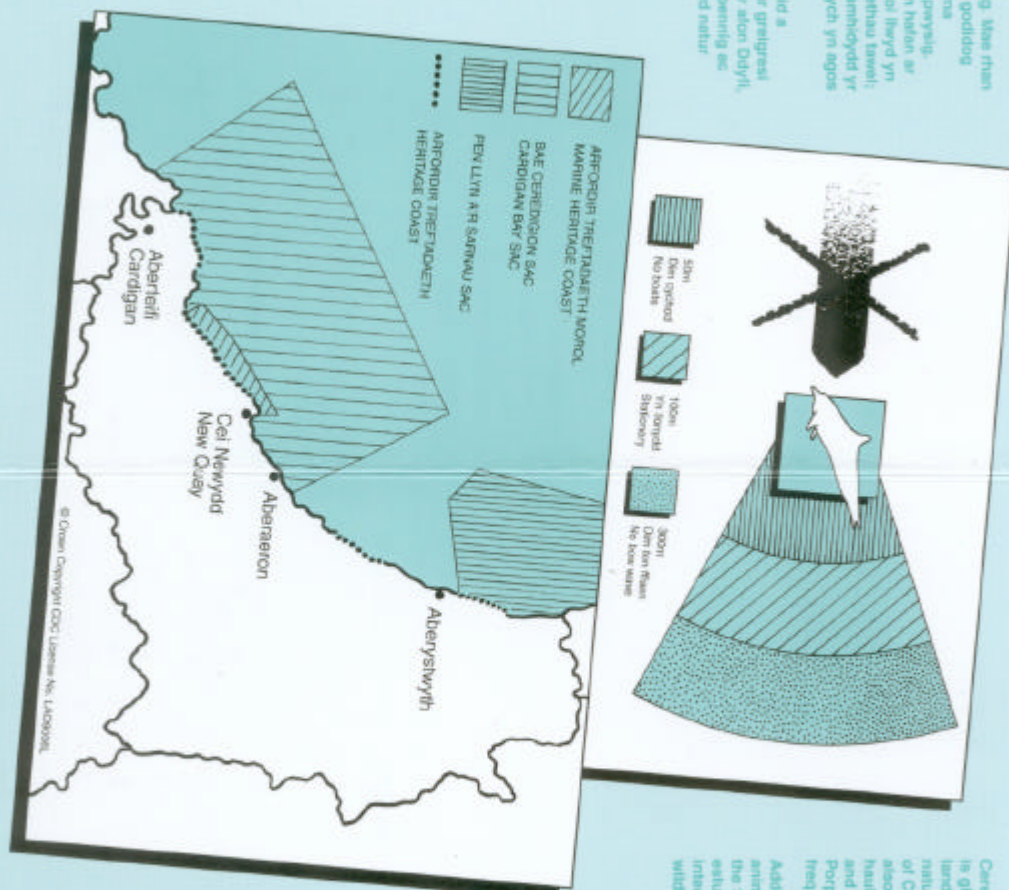
Y bwriad y tu cefn i arddeddi
mwrdd a phobloger mawr yr Arfordir
Trefluddeith Mwrdd ac Arddai
Gaeafwrdd Ardderdd Bae
Ceredigion yw diogelu poblogaeth
dresaf y Bae o dddeurth 130 o
dddiolffidau Trwyn Poch.

Muse Ardaloedd Cadwraeth
Arbering Pen Llyn a'r Barmau yn
cosio sicrhau fod y bwyd natur yn
y creigesi a'r ardaloedd yn cael ei
dymal

Mae ymchwil wreiddiog y gall
cychwyn modur sy'n symud yn
grŷm effeithio ar ddiagnostig a
llambyddion, null ai dryw eu
darw neu ofnewydd bod sŵn eu
portannau'n tamaru ar eu gallu i
teifi eu hunain trwy ddiagnostio
adfeistau.

A wneudh ein cynorthwyo i ddigolur ardal hon sydd mor atbenig i gyffwr. Gallwch wneud hyn drwy:

- beidia throni' cŷlyngiadau cŷlymyder
- fabyddiaid arferon da mewn cyfodol ger bywyd gwyft
- ddilyn y Cŵd Ymawmddiad
- searod wrth yr Adran yr Ailoddr a Chlef Gwlad os gwyddoch am unrhyw un sydd yn poeni bywyd natu yn fwrddol



Cardigan's coastline is special. A large part is glorious Heritage Coast with its stunning landscapes, and there are important national nature conservation areas. The coastal waters of Cardigan Bay are a haven for marine wildlife also. Grey seals use the secluded coves to haul out on rocks; seabirds breed on the cliffs; and marine mammals such as Harbour Porpoise and Bottlenose dolphin are frequently seen close inshore.

Add to this the diverse and colourful marine animals and plants living on the rocky reefs of the Sarrau at Waikōwhiri and within the Dyer estuary, and it makes this an outstanding and internationally important area for its marine wildlife.

Marine protected areas such as the Cardigan Bay Special Area of Conservation (SAC), aim to protect the Bay's resident population of approximately 130 bottlenose dolphins. The Pen Llyn at Sarnau SAC aims to ensure that the reef and estuary habitats with their associated wildlife are maintained.

Research has shown that dolphins and porpoises can be affected by power boats operating at speed, either by causing a collision or by their engine noise interfering with the animals' sensitive echolocation system.

Please help us to protect this area that is special to many. You can do this by:

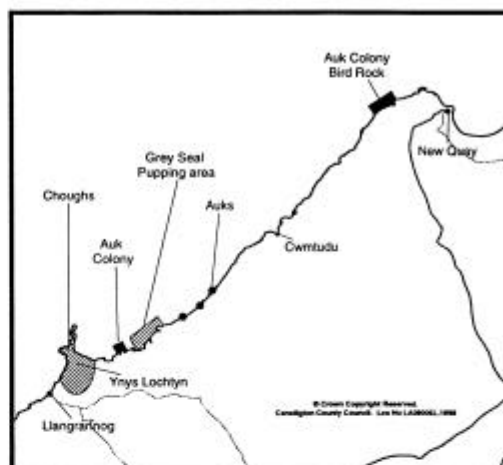
- not breaking speed limits
- adopting good boating practice near wildlife
- following the Code of Conduct
- reporting any incident of deliberate harassment of wildlife to the Coast and Countryside Section

Man gatt yr hunderbætur yr anafarðafelldiðdyrnu myrðendana línara? Sennast við hana. Eftir því hvernig eru þeirri kyngrógnid ölfgræmer á nokkurn mál aðbættu. The Hunderbætur is aþróttuð í vöðvum lúttuþingum frá dættuðum. Maximum penalty Eftir for breaking by-laws speed limits.

Commercial Passenger Boat Code

General

Seals



Birds

Cetaceans

Further information:

Liz Allan,
Department of Environmental Services &
Housing, Ceredigion County Council,
Penmorfa,
Aberaeron,
Ceredigion
SA46 0PA

Côd I Ddefnyddwyr Cychod Masnachol

Lluniwyd y Côt hwn gan swyddogion Cyngor Sir Ceredigion ar y cyd â pherchnogion a chapteniaid cychod masnachol sy'n gweithio o Gei Newydd ac Aberaeron. Defnyddiwyd y cyngor / y wybodaeth orau bosib i baratoi y Côt hwn er mwyn sicrhau na therfir ar fywyd gwyllt yr ardal. Mae'r canllawiau hyn yn berthnasol i bawb sy'n rhedeg cychod masnachol.

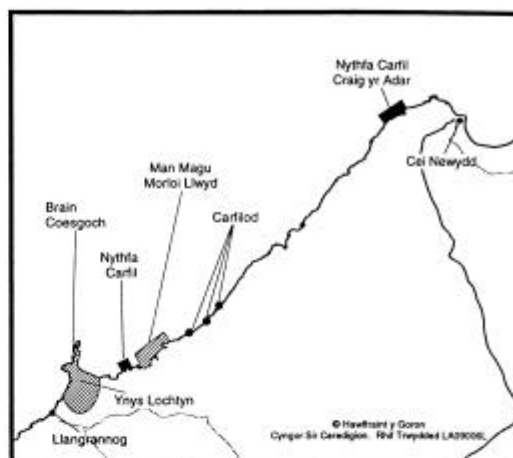
Rydym yn cydnabod fod Ardal Gadwraeth Forol Ceredigion a darpar Ardal Gadwraeth Arbennig Bae Ceredigion yn ardaloedd tra phwysig ar gyfer bywyd gwyllt morol, felly rhaid dilyn y canllawiau canlynol bob amser.

Cyffredinol

- Cyfyngiad Cyflymdra o 8 not o fewn yr Ardal Gadwraeth Forol
- Cyfyngiad Cyflymdra o 8 not o fewn 300 metr o'r linell llanw uchel ar hyd rhannau eraill o'r Bae
- Cadwch at gyfyngiadau cyflymdra yr Harbwr
- Y tu allan i'r ardaloedd a nodwyd, dylid mabwysiadu ymddygiad priodol wrth ddod wyneb yn wyneb â bywyd gwyllt
- Dylid nesáu mor araf â phosib at unrhyw gildraeth h.y. lleihau'r pwysau ar y throli cyn i'r cwch ddod i olwg y gildraeth. D.S. Os bydd gwyntoedd tua'r tir gall hyn olygu y gellir clywed cychod cyn iddynt ddod i'r golwg
- Ni ddylech symud y cwch yn ormodol pan fyddwch yn agos i'r traeth. Dylid osgoi diffodd a thanio injan y cwch yn aml yn ogystal ag angori'r cwch neu ei gadw yn ei unfan am amser hir. Os bydd yn rhaid symud llawer ar y cwch oherwydd yr amodau ar y pryd, ni ddylech dreulio gormod o amser mewn un safle
- Dylid esbonio ymddygiad priodol i ddefnyddwyr cyn agosáu at y cildraethau h.y. dweud wrthynt na ddylent symud yn sydyn, ond yn hytrach sicrhau bod eu camera ganddynt yn barod gan gadw proffil isel a'u lleisiau'n dawel
- Ni ddylid glanio'r cwch ar ran uchaf y traeth pan fydd y llanw'n uchel. Dylid cadw o leiaf pellter hyd cwch o linell y llanw. Gadewch y traeth yn araf gan ddefnyddio cyn lleied o throli ag sy'n bosib.

Morloi

- Cadwch bellter o 50 metr o'r safleoedd pysgota / hela a nodwyd ar y map
- O ganol mis Awst ymlaen cadwch bellter o 50 metr o'r safleoedd geni a nodwyd ar y map
- Dylid osgoi anelu pen blaen y llong yn union i gyfeiriad y morloi wrth nesáu atynt
- Gwylwch wrth nesáu at y lan am forloi benyw a all fod o dan y dwr, gan fod y mwyafrif ohonynt ar y gwaelod, ychydig o fetrau oddi ar y lan. Peidiwch â gosod y cwch rhwng y fam a'i morloi bychan ac osgoi blocio mynediad i gildraethau cul a bas
- Gwylwch am unrhyw arwyddion a fydd yn cyfleu fod y morloi yn aflonyddu h.y. nofio'n gyflym yn ôl



ac ymlaen, edrych at y cwch â llygaid mawrion, neu ddeifio'n sydyn fel petaent mewn panig. Os bydd yr anifeiliaid yn parhau'n nerfus neu'n wyladwrs, dylech ystyried ymadael. Os byddant yn symud yn ôl i'r dwr, rydych wedi tarfu arnynt a dylech ymadael ar unwaith, gan wneud hynny mor dawel â phosib er mwyn osgoi rhuthrad pellach.

Adar

- O fis Mawrth i ganol mis Gorffennaf dylech gadw pellter o 50 metr o nythfeydd y Carfilod a nodwyd ar y map
- Dylid nesáu â gofal a hynny mor araf â phosib. Dylech fod yn barod i fynd oddi yno yn dawel os byddant yn aflonyddu mewn unrhyw fodd (pennau'n siglo yn ôl ac ymlaen, symud yn sydyn).

Morfilod

- Ni ddylid mynd ymlaen at unrhyw forfil unigol yn uniongyrchol
- Ni ddylid defnyddio'r throli o fewn 300 metr i gyrraedd y morfilod
- Dylid cadw'r cwch yn llonydd neu symud yn araf nid llai na 100 metr o unrhyw forfil unigol neu grŵp - gadewch iddynt hwy ddod atoch chi
- Peidiwch â chylchdroi o amgylch unrhyw unigolyn neu grŵp
- Dylid osgoi 'tyrru' o amgylch anifeiliaid
- Peidiwch â mynd oddi ar y trywydd penodedig er mwyn gweld mwy o anifeiliaid.

Am wybodaeth pellach cysylltwch a:

Liz Allan,
Adran Gwasanaethau Amgylcheddol a Thai,
Cyngor Sir Ceredigion,
Penmorfa,
Aberaeron,
Ceredigion
SA46 OPA

Appendix 6.

Cardigan Bay marine mammal work in 1998.

Contact/ Researcher	Organisation	Species	Project Details	Methodology	Availability of Results	Cooperation
Liz Allan/Ceredigion Marine Heritage Coast Volunteer Wardens	Ceredigion County Council	BND	<u>Area covered:</u> New Quay, Ynys Lochtyn, Aberporth. Mwnt=new additional site in 1998. <u>Period:</u> 10/7-28/9/98: aiming at 4days/wk (Fri-Mon.), 8hrs/day/site Continuation of annual July-September survey begun in 1993, recording dolphin occurrence and behaviour as well as details of boat traffic from same sites along the Heritage Coast.	Fieldwork: Shore based surveys Timed watches by volunteer wardens recording visual observations from fixed shore sites	Compilation of 1998 results in progress; data being analysed.	Good; over 200 volunteer wardens from local communities, etc. Data will be included in WWCS ¹ as in previous years.
Holly Arnold	CCW/LIFE Contract	BND	<u>Area covered:</u> Cardigan Bay, UK and international waters <u>Period:</u> September 1998 - present Compilation and review of existing information relevant to bottlenose dolphins in the Cardigan Bay cSAC.	Literature search and review, liaison with other relevant contacts and researchers.	Work is ongoing: monthly progress reports submitted.	Contract in progress: involves continuing liaison with researchers in Cardigan Bay and further afield.
Mick Baines, Chris Pierpoint, Sarah Earl	Nekton		<u>Area covered:</u> Cardigan Bay Pembrokeshire Coast <u>Period:</u> As feasible in suitable weather throughout 1998	Fieldwork: Boat based + shore surveys		Good. Cooperation with CCW, SeaWatch and SMRU in ongoing projects.
	for SMRU	Grey Seals	Opportunistic continuation of Photo id project	During boat work	Results write-up ongoing; data being analysed	
	for CCW	HP	Acoustic monitoring trials with mobile 'pod' hydrophone in conjunction(when feasible) with visual observations of same area from shore.	Acoustic recordings of HP & BND clicks + shore based visual observations	Poster presentations at ECS Conference, April 1999 + forthcoming report to CCW.	
	For CCW/SeaWatch	Cetaceans	WWCS database maintenance and analysis	Data entered in Access database + Annual newsletter	Newsletter will be issued Spring/summer 1999	
Terry Bristow, Julie Hopkins, Nick Glanville	'New Quay Dolphin Monitoring Group'	BND	<u>Area covered:</u> New Quay harbour <u>Period:</u> Initially aimed at timed watches 4-7 hrs/day each day year- round, but extent of coverage not known. Continuation of T. Bristow visual observations and identification of dolphins (visual id only) from 1989-1997 in New Quay Harbour area + collection of incidental sightings reports for New Quay area. Completion of M.Phil thesis based on 1989-1997 data: The behaviour and relationships of a population of bottlenose dolphins in Cardigan Bay (1998).	Fieldwork: shore based. Some timed watches recording visual observations + collection of incidental sightings reports for New Quay area. Timed watches ceased in favour of recording opportunistic sightings. Methodology/effort not known.	Web site gives number of days dolphins seen/month from New Quay May 1998-present. Results currently unavailable	Outline information provided.
Terry Bristow	University of Wales, Bangor					

Cardigan Bay marine mammal work in 1998 *Continued*

Contact/ Researcher	Organisation	Species	Project Details	Methodology	Availability of Results	Cooperation
Jean Bryant	New Quay Animal Hospital	Marine wildlife	<u>Area covered:</u> New Quay + occasionally Cwmtudu <u>Period:</u> Very occasional during 1998 Occasional continuation of recording bottlenose dolphin sightings when personally observed. Jean and Alan Bryant noted their BND sightings for many years, mainly unrelated to watch effort.	Recording date & time of dolphin sightings during walks along the coast.	Results not written up. Raw data available.	Good. WWCSO or CCW welcome to make copies of their data.
Lisa Groth	Univ. Denmark Supervisor: Christina Lockyer Danish Inst. for Fisheries Research	BND	<u>Area covered:</u> Ynys Lochtyn <u>Period:</u> October 1998 (+ Jan., April & July 1999) BND seasonal presence and behaviour at Ynys Lochtyn for MSc project	Fieldwork: shore based Timed shore watches; recording visual observations	Results unavailable as study is ongoing through Summer1999	Good.
Steve Hartley	Independent/New Quay Marine Wildlife Centre	Cetaceans	<u>Area covered:</u> Cardigan Bay, St. George's Channel to Ireland <u>Period:</u> Spring to late Autumn, 1998 Continuation of providing commercial wildlife watching boat trips from New Quay + boat charter for other work. Shorter trips mainly between New Quay and Cemaes Head, longer trips around the bay and to Ireland. Some 2-4 day trips organised for SeaWatch customers.	Fieldwork: boat based Visual observations of cetaceans by Steve/passengers recorded in log book together with locational and trip details.	Results not written up; trip logs kept and available to anyone interested.	Good. Data to SeaWatch + available to CCW and WWCSO. Long-term working relationship with most people mentioned in this table.
Emily Lewis	CCW/LIFE Contract	BND	<u>Area covered:</u> Cardigan Bay <u>Period:</u> Sept. 1998 - March 1999 Compilation and comparison of BND photographs taken in Cardigan Bay 1989-1998.	Photo compilation, comparison + development of database with photographs and sightings details of individually identified dolphins.	Final report and database received by CCW Feb.1999	Contract completed, including liaison with SeaWatch and Mick Baines re access to photographs
Megan Morgan-Jenks	Independent/Friends of Cardigan Bay (FoCB)	Risso's dolphins + other cetaceans	<u>Area covered:</u> Ynys Enlli (Bardsey Island) <u>Period:</u> 2nd week in April + all of August 1998 Continuation of work begun in 1997 and initiation of a longer term study of cetacean ecology in the area, including photo-identification of Risso's dolphins (not feasible in 1998).	Fieldwork: shore based + boat based Visual observations recorded from shore sites and boats + occasional listening to cetaceans via hydrophone deployed from the boat.	Copy report of 1998 results is in Haverfordwest Marine Library (HL).	Good; data from this and previous Ynys Enlli work has been given to WWCSO.

Cardigan Bay marine mammal work in 1998 *Continued*

Contact/ Researcher	Organisation	Species	Project Details	Methodology	Availability of Results	Cooperation
Bob Morris	Independent	BND	<u>Area covered:</u> New Quay <u>Period:</u> Occasional during Spring, Summer, Autumn 1998 Continuation of interest in New Quay BNDs since 1986. Occasional use of fixed hydrophone in New Quay Harbour for listening to BNDs; sediment sampling for chemical/heavy metal analysis + occasional cetacean melon blubber samples collected from stranded animals to Robin Law, MAFF for PCB and other analyses.	Fieldwork: shore based Details unknown	Not known/ chemical analyses results will be published by MAFF.	Long term association with members of the community in New Quay area.
Rod Penrose	Marine Mammal Monitoring for DETR	Cetaceans, turtles	<u>Area covered:</u> Welsh Coast <u>Period:</u> Year-round Strandings Co-ordinator for Wales	Collection of strandings information; collection and sampling of dead stranded cetaceans and turtles; transporting suitable carcasses to London or Liverpool for necropsy.	Annual reports to CCW (in confidence) + results published as available through DoE, MAFF, IoZ	Good
SeaWatch/Peter Evans	SeaWatch	Cetaceans BND	<u>Area covered:</u> Cardigan Bay; Irish Sea <u>Period:</u> Spring through Autumn	Fieldwork: boat based Effort-related observations by Steve/passengers during commercial boat trips Fieldwork: shore based surveys	Data will be included in any SeaWatch reports/analyses	Good. Data available to WWCS D and CCW through Steve Hartley
Munro Taylor	Friends of Cardigan Bay (FoCB)	Cetaceans	<u>Area covered:</u> Aberystwyth to Bardsey <u>Period:</u> Spring/summer in suitable weather conditions 2-3 line transect surveys (following same transects as set 1995 + other suggested by PGHE) in northern Cardigan Bay to record cetacean presence.	Fieldwork: boat based Following line transects and recording visual observations of cetaceans.	Results not written up: raw data given to CCW and being analysed within WWCS D	Good. Data given to CCW and WWCS D.

Key: ¹WWCS D = West Wales Cetacean Sightings Database. BND = Bottlenose dolphin. HP = Harbour porpoise.

Cardigan Bay marine mammal work in 1999.

Contact/ Researcher	Organisation	Species	Project Details	Methods used	Availability of Results	Cooperation
Liz Allan/Ceredigion Marine Heritage Coast Volunteer Wardens	Ceredigion County Council, Dept. of Environmental Services & Housing	BND	<u>Area covered:</u> Ynys Lochdyn, Aberporth, Mwnt <u>Period:</u> aiming at 4 days/wk (Fri-Mon.), 8hrs/day/site Continuation of annual July-September survey begun in 1993, recording dolphin occurrence and behaviour as well as details of boat traffic from sites along the Marine Heritage Coast. + organisation of World Oceans Day Wales Cetacean Watch (Protocol & Forms devised by: L. Allan, H. Arnold, M. Baines, C. Pierpoint; Analysis: C. Pierpoint)	Fieldwork: Shore based surveys Timed watches by volunteer wardens recording visual observations from shore sites	1998/99 + all previous data analysed by C. Pierpoint. See Pierpoint & Allan 2000-HL1937 Results being analysed; report due June 2000	Good; over 200 volunteers from local communities have participated over the years. Data will be included in WWCS¹ as in previous years. Over 40 volunteers from round Wales participated.
Holly Arnold	CCW/LIFE Contract	BND	<u>Area covered:</u> Cardigan Bay, UK and international waters <u>Period:</u> September 1998 –April 2000 Compilation and review of existing information relevant to bottlenose dolphins in the Cardigan Bay cSAC + Involvement in initiating/protocol development/organising World Oceans Day Wales Cetacean Watch	Literature search and review, liaison with other relevant contacts and researchers.	Work is ongoing: monthly progress reports and mid-contract report submitted.	Contract in progress.
Mick Baines, Sarah Earl w/C. Pierpoint	Nekton for CCW for CCW For CCW For CCW For SeaWatch/CCW For WWF/Wildlife Trusts JMP	HP HP/bnd Cetaceans HP Fish sp. HP	<u>Area covered:</u> Cardigan Bay & Pembrokeshire Coast <u>Period:</u> As feasible in suitable weather throughout 1999 Acoustic monitoring trials with mobile ‘pod’ hydrophone in conjunction(when feasible) with visual observations of same area from shore. Acoustic monitoring trials re bnd abundance and distribution within the SAC WWCS¹- database maintenance and analysis Report presenting analysis of sightings data for evidence of HP breeding grounds off the Welsh coast Survey of benthic fish species (potential dolphin prey species) within the Cardigan Bay cSAC Monitoring and collecting evidence to support a case for a harbour porpoise SAC in south west Wales. + Involvement in organising World Oceans Day Wales Cetacean Watch	Fieldwork: Boat based + shore surveys Acoustic recordings of HP & BND clicks + shore based visual observations Fieldwork: from June 1999 to May 2000 Data entered in Access database + Annual newsletter Analysis of data from West Wales Sightings Database Sampling trawls within the cSAC in 2000 Acoustic recordings and shore based visual observations	Results write-up ongoing; data being analysed Poster presentation at ECS Conference, April 1999 + report to CCW. Work ongoing Newsletter for 1998 and 1999 to be issued; work ongoing. Report submitted Jan.2000 Report submitted March 2001. Work ongoing	Good. Cooperation with CCW, SeaWatch in ongoing projects.

Cardigan Bay marine mammal work in 1999 *Continued*

Contact/ Researcher	Organisation	Species	Project Details	Methods used	Availability of Results	Cooperation
Terry Bristow, Julie Hopkins, Nick Glanville Terry Bristow	‘New Quay Dolphin Monitoring Group’ University of Wales, Bangor	BND	<u>Area covered:</u> New Quay harbour <u>Period:</u> Year-round Continuation of B. Morris, then T. Bristow visual observations and recording from 1989-1997 in New Quay Harbour area + collection of incidental sightings reports for New Quay area. Completion of M.Phil thesis based on 1989-1997 data: The behaviour and relationships of a population of bottlenose dolphins in Cardigan Bay (1998).	Fieldwork: shore based Timed watches recording visual observations + collection of incidental sightings reports for New Quay area. Thesis/results unavailable; paper for publication in progress	Web site gives number of days dolphins seen/month from New Quay May 1998-April 2000. Thesis submitted and approved; copy and results currently unavailable	Partial information on website; meetings w/ CCW MCO.
Paul Gregory	University of Plymouth (Supervisor: J. Troisi)	BND	<u>Area covered:</u> New Quay <u>Period:</u> Summer 1999 BND presence & behaviour inshore New Quay area related to tide state and prey availability.	Fieldwork: shore based	Thesis: ‘Diurnal movement patterns of the bottlenose dolphin population of Cardigan Bay W. Wales in relation to tides and boat presence.’ In prep. For completion early summer 2000.	Good. Data to be sent to WWCS D.
Lisa Groth	Univ. Denmark	BND	<u>Area covered:</u> Ynys Lochtyn <u>Period:</u> October 1998 + Jan., mid-April to mid-May & July 1999 BND presence and behaviour at Ynys Lochtyn for MSc project.	Fieldwork: shore based Timed shore watches; recording visual observations	Method/results unavailable; write-up in prep. for completion summer 2000.	Good.
Steve Hartley	Independent/New Quay Marine Wildlife Centre	Cetaceans	<u>Area covered:</u> Cardigan Bay, mainly inshore <u>Period:</u> Spring to late Autumn, 1999 Continuation of providing commercial wildlife watching boat trips from New Quay + boat charter for other work. Shorter trips mainly between New Quay and Cemaes Head, longer trips around the bay to Fishguard.	Fieldwork: boat based Visual observations of cetaceans by Steve/passengers recorded in log book together with locational and trip details.	Results not written up; trip logs kept and available to anyone interested.	Good. Data to SeaWatch + available to CCW and WWCS D. Long-term working relationship with most people mentioned in this table.
Emily Lewis	CCW/LIFE Contract	BND	<u>Area covered:</u> Cardigan Bay <u>Period:</u> Sept. 1998 - March 1999 Compilation and comparison of bottlenose dolphin photographs taken in Cardigan Bay 1989-1998.	Photo compilation, comparison + development of database with photographs and sightings details of individually identified dolphins.	Final report and database received by CCW; full results/database unavailable	Contract completed.

Cardigan Bay SAC Management Plan – APPENDIX 6.

Megan Morgan-Jenks	Independent/ Friends of Cardigan Bay (FoCB)	Risso’s dolphins + other cetaceans	<u>Area covered:</u> Ynys Enlli (Bardsey Island) <u>Period:</u> August 1999 Continuation of cetacean and boat traffic recording conducted in 1997 and 1998. Transects offshore of Bardsey conducted during study period by Munro Taylor/Mark Simmonds (WDCS).	Fieldwork: shore based + boat based Visual observations recorded from shore sites and boats + occasional listening to cetaceans via hydrophone deployed from the boat. Records also kept of boat traffic during fieldwork 1997, 1998, 1999.	1999 data being analysed	Good; information re sightings has been given to WWCS.
--------------------	--	---	--	---	--------------------------	--

Cardigan Bay marine mammal work in 1999 *Continued*

Contact/ Researcher	Organisation	Species	Project Details	Methods used	Availability of Results	Cooperation
Bob Morris	Independent	BND	<u>Area covered:</u> New Quay <u>Period:</u> Occasional during Spring, Summer, Autumn 1999 Continuation of interest in New Quay BNDs since 1986. Use of fixed hydrophone in New Quay Harbour for listening to BNDs; sediment and benthic fish (dogfish) sampling for DETR.	Fieldwork: shore based Details unknown	Preliminary report re sampling submitted to DETR; results to be published jointly with CEFAS/R.Law.	
Rod Penrose	Marine Mammal Monitoring for DETR	Cetaceans, turtles	<u>Area covered:</u> Welsh Coast <u>Period:</u> Year-round Strandings Co-ordinator for Wales	Collection & collation of strandings information; collection and sampling of dead stranded cetaceans and turtles; transporting suitable carcasses to London or Liverpool for necropsy.	Annual reports to CCW (in confidence) + results published as available through DoE, MAFF, IoZ.	Good
w/C. Pierpoint	for CCW	HP	Report on HP strandings re the use of Welsh coastal habitats as calving and nursery grounds	Collation and analysis of Welsh HP strandings data	Report submitted Jan.2000	
w/C.Pierpoint	for JNCC	marine turtles	Development of database detailing all available information on UK marine turtle strandings to date.	Collation of data and development of database	UK Marine turtle database now with JNCC	
Chris Pierpoint	Independent	Cetaceans, turtles	<u>Area covered:</u> Welsh Coast <u>Period:</u> Analysing and writing up results of data from CCC Marine Heritage Coast cetacean and boat traffic surveys 1994-1999.	Collation, review and analysis of data	Report completed April 2000.	Good
	Ceredigion County Council/CCW					
	w/Marine Mammal Monitoring	Marine turtles	Creating marine turtle database for JNCC with Marine Mammal Monitoring + Involvement in protocol development/organising World Oceans Day Wales Cetacean Watch.		UK Marine turtle database now with JNCC	
Sea Watch	Sea Watch Foundation	Cetaceans	<u>Area covered:</u> Cardigan Bay; Irish Sea (other areas in UK waters) <u>Period:</u> Links with some graduate/undergraduate projects + S. Hartley boat trips.	Fieldwork: Boat based (S. Hartley)		Good.
	For CCW	Fish sp.	Survey of benthic fish species (potential dolphin prey species) within the Cardigan Bay cSAC	Sampling trawls within the cSAC in 2000	Report submitted March 2001	
Munro Taylor	Friends of Cardigan Bay (FoCB)	Cetaceans	<u>Area covered:</u> Offshore transects west of Bardsey + inshore areas between Aberystwyth and Tremadog Bay <u>Period:</u> August 1999 (Bardsey) + occasional inshore transects during summer Occasional line transect surveys recording cetacean sightings in northern inshore waters of Cardigan Bay + deeper areas off Bardsey with WDCS in conjunction with Bardsey Risso's dolphin shore surveys.	Fieldwork: boat based Pilot survey of The Deeps area west of Bardsey during August + occasional boat surveys along transects from Aberystwyth to Tremadog Bay between shore and longitude 4°30', recording visual observations of cetaceans.	Boat logs, cetacean recording sheets held by Munro Taylor.	Good.

Key: ¹WWCSD = West Wales Cetacean Sightings Database. BND = Bottlenose dolphin. HP = Harbour porpoise.