



**ISCOPE – Irish Scheme for Cetacean  
Observation and Public Education**

**(Final Report 2003-2005)**

*Final Report*

**Prepared by Simon Berrow, Pádraig Whooley and Dave Wall**

on behalf of the Irish Whale and Dolphin Group  
Merchants Quay, Kilrush, Co Clare

**ISCOPE was funded by**



SUPPORTED BY THE HERITAGE COUNCIL



LE CUIDIÚ AN CHOMHTAIRLE OIBREACHTA



**Environment &  
Heritage Service**

[www.ehsni.gov.uk](http://www.ehsni.gov.uk)



*Marine Institute*  
Foras na Mara

**May 2006**

## **Acknowledgements**

This project (ISCOPE) and the work of the Irish Whale and Dolphin Group would not be possible without the support of a wide range of agencies, organizations and people. We would particularly like to thank our funders, Environment and Heritage Service (Northern Ireland), Heritage Council, Marine Institute and the National Parks and Wildlife Service and their representatives involved in helping us deliver this contract (see Appendix I). We have also received great support from the Naval Services and the Maritime Squadron, the Geological Survey of Ireland and the crew of RV Celtic Explorer. We would also like to thank the support of Inis Cologne, West Cork Marine Tours and Whalewatch West Cork.

### *Contributors to the Sighting Scheme 2003 – 2005*

The following have contributed to our constant effort sightings scheme during 2003-2005:

Jim Allen, Simon Berrow, Frances Bermingham, Dinah Boyne, Katie Boyne, Gary Burrows, Margaret Cahill, Fidelma Carroll, Nick Channon, Miriam Crowley, Paschal Dower, Tommy Doyle, Ian Enlander, Kieran Grace, Patrick Graham, Clare Heardman, Emmett Johnston, James Kilroy, Emer Magee, Andrew Malcolm, Nick Massett, Louise McAlavey, Louise McCullagh, B. McInerney, Owen McManus, Tony Murray, John O'Boyle, Joanne O'Brien, Mick O'Connell, Niamh O'Neill, Tim Roderick, Conor Ryan, Phyllis Ryan, Andrew Speer, Ann Trimble, Dave Wall, Helen White, Pádraig Whooley, David Williams, Faith Wilson.

The following have contributed significantly to our casual sighting scheme:

Nick Addey, Sandy Alcorn, Joe Aston, Colin Barnes, Colin Barton, Anthony Beese, Cliff Benson, Frances Bermingham, Pádraic de Bhaldrathe, Shane Bisgood, Sarah Buckley, Brian Caffrey, Chips Chipperfield, Alistair Church, Cian Clarke, Declan Clarke, Paul Commiskey, Frank Conroy, Dick Coombes, Eileen & Tim Cooper, Don Cotton, John Coveney, Jacquie Cozens, Ciaran Cronin, Kevin Cronin, Jill Crosher, Philip Daly, Bryan Deegan, Anita Donaghy, Derry Doyle, Karin Dubskey, Jean Dunleavy, Dr. Peter Evans, Grace Fanning, Wilton Farrelly, Tim Feen, Shay Fennelly, Iain Fisher, Dara Fitzpatrick, David Galbraith, Frances Gallagher, Mark Gannon, Karl Grabe, Mike Hallahan, Greg Hamilton, Seamus Hasset, Janet Howley, Malcolm Houston, Kate Hutchinson, Trisha Hyde, Vinny Hyland, Justin Ivory, John Jefferies, Graham Johnston, Alan Jones, Pauliina Kauppila, Charlie Kavanagh, Richard Kaye, Niall T. Keogh, Noel Keogh, Oonagh Kelleher, Tom Kennedy, Peter Kinsella, John Lally, Lt John F.M. Leech, Noel Linehan, Richard Lowe, Frances Lynch, Patrick Lyne, David Lyons, Mac, John and Tilly Malings, Ian Mannix, Ferdia Marnell, Suzanne Massett, Ronan MacGiollapharaic, Louise McCullagh, Peter McGroary, Coilin MacLochlainn, Derek McLoughlin, Ivor McMahan, Liam McNamara, Mark Mellett, Oscar Merne, Des Mills, Killian Mullarney, Audrey Murphy, John Murphy, Colin Murray, Richard Nairn, Ivor Neill, Helena Ni Chonchuir, Colin Nugent, Fiacc O'Brolchain, Bernie O'Brien, Miriam O'Connell, Stephen O'Connor, Patrick O'Doherty, Ian O'Driscoil, Conal O'Flanagan, Ciarán O'Keefe, Tom O'Leary, Brian O'Rourke, John O'Shea, Richard O'Shea, Brendan O'Sullivan, Christian Osthoff, Geoff Oliver, Claire Pollock, John Petch, Tom Power, Lt. Cathal Power, Dermot Quirke, Conor Rafferty, Glenn Rankine, Sue Redican, Brad Robson, Paddy Roche, Derek Scott, Rory Sheehan, Ian Slevin, Nic Slocum, Pat Smiddy, Gerry Spain, Colin Speedie, Peter Steele, Gareth Thomas, Mathew Tickner, David Tierney, Willem Van Dijk, Micheal Viney, Paul Walsh, Richard Weyl, Tony Whelan, Steve Wing, Johnny Woodlock, Jim Wilson, Louise Wilson, Peter Wilson.

### **Contributors to Stranding Scheme 2003 - 2005**

The following have provided stranding records:

Sandy Alcorn, Alan Barrett, Chris Barron, Therese Barron, Bob Bates, Len Bell, Frances Bermingham, Simon Berrow, Christian Brene, John Brophy, Delia Burt, Billy Butler, Tony Canavan, E. Carabine, L. Carabine, Nick Channon, David Chippendale, Chips Chipperfield, Katie Clifford, Ralph Collier, Dick Coombes, Ken Cotter, Don Cotton, Randall Counihan, Raymond Cowman, John Cronin, Jill Crosher, Julie Dean, Pádraig de Bhaldrathe, Tommy Doyle, Brian Duffy, Helen Duggan, Pat Dunleavy, Ian Enlander, John Falvey, Daniel Farrell, Wilton Farrelly, Kevin Flannery, Pat Gallagher, Martin Gill, Peter Green, Eithne Griffin, Niall Hanley,

William Heap, Clare Heardman, Robert Holloway, Brian Honan, Jim Hurley, Michael Hussey, Sinead Hussey, Irish Seal Sanctuary, Robin Jay, Emmett Johnston, Jiri Karbus, Andrew Kelly, Roisin Kelly, James Larkin, Peter Larkin, Carol Loftus, Ciaran Loughnane, Robert Lundy, Jill Lynch, Lucy Bingham McAndrew, Bernard MacBradaigh, James McCartan, Kevin McCormick, Rob McDonnell, Ronan MacGiollapharaic, Eoin McGreal, Melina McMullan, David McNamara, Chris MacNulty, Aoife MacNulty, Emer Magee, Geoff Magee, Andrew Malcolm, Breffni Martin, Nick Massett, Padraic Moran, Patrick Mulcahy, Mary Mulvany, George Munday, Eamon Murphy, Noel Murray, Tony Murray, Richard Nairn, Eileen Noonan, John O'Boyle, Irene O'Brien, Joanne O'Brien, Mick O'Clery, Mick O'Connell, Marianne Odendahl, Ger O'Donnell, Tim O'Donoghue, Terri O'Neill, Liz O'Regan, Pat O'Suilleabhain, Sean Pierce, Gabriela Pinto, Derek Polley, Gianni Ponzi, Joe Quilty, Chris Randolph, Glen Rankine, Cillian Roden, Steve Roffe, Emer Rogan, Nollaig Ruddy, Billy Ryan, Thomas Ryan, Harold Schieber, Lorcan Scott, Maurice Sheehy, Lorraine Shelley, Nic Slocum, Pat Smiddy, Susan Steele, Alan Stoney, Jamie Storer, Leo Sullivan, Ann Trimble, Betty Twomey, E. Usher, Michael Viney, Dave Wall, Nicky Walsh, Brendan Ward, Roger White, Ger Whooley, Pádraig Whooley, Johnny Woodlock

## Introduction

ISCOPE is an Irish Whale and Dolphin Group (IWDG) initiative, which aimed to promote better awareness and knowledge of cetaceans (whales, dolphins and porpoises) in Irish waters, by encouraging public participation in cetacean recording.

Despite their importance, the ecology, status and habitat requirements of most cetacean species in Irish waters are poorly understood. Two cetacean species, which are abundant in Ireland (harbour porpoise *Phocoena phocoena* and bottlenose dolphin *Tursiops truncatus*), are listed under Annex II of the EU Habitats Directive and are priority species for Natura 2000. All cetacean species (baleen whales, dolphins, harbour porpoise and toothed whales) are listed as priority species for conservation in Northern Ireland. Management of these and other cetacean species and site designation is constrained by lack of reliable data on their distribution and relative abundance.

Monitoring these highly mobile and largely inaccessible animals and identifying critical habitats is difficult and stranding and sighting schemes have been developed for this purpose. The IWDG stranding and sighting schemes, which have been operating since 1991, provide a baseline for a national cetacean recording scheme throughout the island of Ireland and enable agencies and government departments to fulfil obligations under international agreements, including ASCOBANS, Natura 2000, Northern Ireland Biodiversity Strategy and the recently published National Biodiversity Plan.

The objectives of ISCOPE were to:

- 1) increase awareness of cetaceans in Irish waters and participation in biological recording,
- 2) encourage greater participation in cetacean recording schemes in Ireland,
- 3) organize training workshops to improve cetacean identification and recording skills,
- 4) carry out quantified effort watches at selected sites,
- 5) exploit “ships of opportunity” to increase seasonal and geographic coverage,
- 6) improve reporting and identification of stranded animals,
- 7) maintain cetacean database and develop indices for monitoring status

## **Administration**

Deliverance of the objectives of ISCOPE was overseen by a Steering Committee. Each funding body and the IWDG was represented on the Committee (see Appendix I for members and dates of meetings). The Committee met six times over the period February 2003 - January 2006. In addition, two separate meetings were conducted with the Marine Institute in Galway.

Simon Berrow of the IWDG was responsible for overall co-ordination and reporting to the ISCOPE Committee. The ISCOPE budget was managed by Phyllis Ryan of the IWDG and full accounts are presented in Appendix II. Interim and Annual Reports were produced and circulated each year (2003-2005). This final report covers the period 1 February 2003 to 31 March 2006 inclusive.

## **Workpackages**

There were four work packages in ISCOPE. Each is presented separately but there was considerable overlap between them. Although for reporting purposes, one person was allocated responsibility for each work package, in reality there were joint responsibilities for their delivery. In general, Pádraig Whooley was responsible for WP1 and WP2, Dave Wall for Ships of Opportunity Surveys (ShOps) in WP3 and Simon Berrow for land-based effort watches in WP3 and WP4.

The Work packages largely followed that proposed with one or two additional items. Additional items to be included:

- i) Preparation of sighting validation guidelines
- ii) Preparation of relevant guidelines for local Biodiversity Plans for Local authorities
- iii) Assess the influence of tidal and diel cycles on sightings
- iv) Gap Analysis of ShOpS survey effort
- v) Marine SAC monitoring during 2005

These additional items are reported within the relevant work package. Specific guidelines for local Biodiversity Plans for local authorities have not been produced, rather the IWDG have responded, where relevant, to local plans.

## Work package 1

### ***Increase awareness of, and participation in, cetacean recording schemes in Irish waters***

#### Tasks:

- 1.1 increase awareness of cetaceans in Irish waters,
- 1.2 encourage greater public participation in recording schemes,
- 1.3 encourage greater participation from government agencies and professional staff who are regularly at sea, including; National Parks and Wildlife Service, Marine Institute, Department of the Marine, Irish Navy and Coastguard,
- 1.4 make cetacean recording a routine part of all surveys carried out by government agencies,
- 1.5 avail of opportunities from Irish Observer Scheme on foreign vessels to increase coverage,

#### Achievements:

##### *1. Produce resources (Tasks 1.1 and 1.2):*

The first task was to develop resources for introducing the scheme to the public and standardising recording forms. Although it took longer to produce ISCOPE publications and recording forms than expected, the standard of design and production was very high and they were well received once distributed. An A3 (folded) publication “Introduction to ISCOPE” was produced (10,000 copies) to encourage participation in cetacean recording in an attractive and informative manner and also to provide a useful document to help improve field skills (thus extending its shelf life).

#### Resources produced include:

- a. The IWDG standardised recording forms (colour coded to aid administration) have been revised and printed (1,000 x stranding, 10,000 x casual sighting and 5,000 x effort related land-based watching form and 5,000 boat-based effort forms).
- b. An A1 sized poster has been produced (1,000 copies) to display at coastal locations and in prime sites to solicit involvement in ISCOPE.
- c. Two sets of four A0 sized ISCOPE panels were printed, one set on hard backing, one set laminated for display at conferences.
- d. Whalewatching Map of Ireland was produced in collaboration with Inis perfume. A print run of 10,000 was produced and distributed (2,000 at WhaleWatch Ireland 2004 and 2005).
- e. A4 laminate Boat Users Guide (2000 copies, with additional funding from BIM).

These publications have been distributed to and presented at:

- a. All IWDG members (currently at 770)
- b. All those who have contributed to the stranding and sighting schemes by submitting records to the IWDG.
- c. All agencies that have contributed to the sighting schemes (Air Corps, Irish Navy, Marine Institute, Geological Survey of Ireland, Heritage Officers, National Parks and Wildlife Service Conservation Rangers, Environment and Heritage Service Conservation Staff, Northern Ireland Coastguard, Regional Fisheries Boards, Bord Ischaigh Mhara, Sea Fishery Officers)
- d. Yachting, sea angling and dive boat skippers.
- e. Serious enquiries from the public about involvement in cetacean recording (c400)
- f. Irish Environmental Colloquim in Limerick (31 January, 2004)
- g. EurOcean conference in Galway (10-13 May, 2004)
- h. Irish Environmental Colloquim in Sligo (29-30 January 2005)
- i. Blasket Island Commemoration, Dunquin, Co Kerry (8 October, 2005) 50 people (SB)
- j. Marine Institute Lecture Series, Castlebar, Co Mayo (12 October, 2005) 200 people (SB)

2. *Articles (Tasks 1.1 and 1.2):*

A number of promotional articles on ISCOPE have been written for a range of publications e.g. Irish Wildlife Trust Newsletter, Wings (BWI), Subsea (Dive Magazine), Fáilte (Irish Ferries on board publication), Countryman, British Wildlife, Whale and Dolphin Magazine, Northern Ireland Birdwatchers report, Marine Times and the IWDG Newsletter (IWDG News). Interviews on cetaceans and ISCOPE have been delivered on national and local radio including national RTE news.

3. *Exhibitions (Tasks 1.1 and 1.2):*

ISCOPE was promoted at three major exhibitions, including an ongoing All-Ireland touring exhibition in collaboration with the government's Environmental Information Centre (ENFO).

- a. An ISCOPE exhibition was organised by Faith Wilson on behalf of the IWDG at the ENFO Centre in St Andrews Street, Dublin during July, 2004. In total 70 schools and over 1,000 students attended workshops in association with the exhibition, which were delivered by IWDG personnel. ENFO produced a massive 80,000 print run of posters and postcards for this exhibition including 10,000 copies of an IWDG/ENFO illustrated poster of the 24 cetacean species found in Irish waters. The exhibition then toured the country appearing in libraries and public places from Rosscarbery, Co Cork to Ennis, Co Clare and EXPLORIS in Co Down. Such was the demand, the panels were duplicated by ENFO. This provided major exposure to ISCOPE.
- b. Boat Show at the RDS, Dublin (23-27 February, 2005). During the five days around 1000 people visited the stand and around 300 ISCOPE packs distributed.

- c. Irish Outdoor Adventure Show, RDS Dublin (4-6 March, 2005). During the three days around 1000 people visited the stand.

4. *Government agencies and surveys (Tasks 1.3 and 1.4)*

See Work Package 2.

5. *Irish Foreign Research Vessel Observer Scheme (Task 1.5)*

The Irish Foreign Research Vessel Observer Scheme provides opportunities to accompany foreign research vessels conducting surveys in Irish waters. Though the Irish Foreign Research Vessel Observer Scheme provides an allowance for observers on such vessels it is insufficient to constitute a salary for an observer. Funding constraints meant that the IWDG did not take up any observer places under this scheme in 2005, however the scheme remains an important opportunity for conducting cetacean surveys in areas of interest in the future and will be used over the next three years under ISCOPE II.

One volunteer (Kate Bradbury) was provided with IWDG cetacean survey record forms during a six day cruise on board the Dutch fisheries vessel R.V. Tridens from in March 2005. Records of five sightings of three cetacean species (common dolphin, unidentified large whale and pilot whale) and one shark species (basking shark) were made and details submitted to the IWDG.



## Workpackage 2

### *Training and public presentations*

#### Tasks:

- 2.1 Organise public talks and training workshops throughout the island of Ireland which will include slide shows and video presentations on key identification features and field visits to carry out practical training,
- 2.2 Produce a training DVD for cetacean identification and recording in Irish waters.

#### Achievements:

It was decided that rather than organise public talks and training workshops remotely from the IWDG offices a better long-term strategy would be to encourage local interested parties (IWDG members, Local Authorities etc) to organise talks on behalf of ISCOPE. This policy has been a great success.

##### *1. Public talks (Task 2.1):*

Under ISCOPE, 41 public talks on cetaceans were delivered in 12 counties with around 1800 people attending (see Appendix III for full list).

##### *2. Training courses (Task 2.1):*

The delivery of training courses was delayed during late 2003 until resources were produced and printed. However, 26 training courses, including field trips, were delivered in 10 counties (see Appendix III for full list). Those courses targeted at funding agencies included:

- a. An introduction to cetacean identification and recording training course for Marine Institute Fisheries Assessment Technicians (FATS) was delivered in February 2004.
- b. NPWS Staff in the NW, SW and SE Regions. Many rangers are now attempting to carry out effort watches (1 per month) as part of their work programme.
- c. Commander Mark Mellet of the Irish Navy has appointed cetacean watch officers onboard LE Eithne to formalise their recording effort and relationship with the IWDG. A course was delivered onboard LE Eithne on 11 March 2005 in Galway Docks. At a meeting on 15 December 2005, Cdr Hugh Tully has requested that this scheme is extended to all Irish Navy vessels and a service level agreement has been agreed.

3. *Slide packs (Task 2.1):*

Four slide packs, which include 68 images of cetaceans and how to identify and look for them have been produced. These are available to members of the IWDG who might like to present a talk locally. These packs are presently kept in Cork, Kerry, Dublin and Antrim. In addition a CD with each image scanned at high resolution has been produced for Powerpoint presentations and for use by the media. Requests for these slide packs have been made by NPWS staff in the NW and SE Regions.

4. *Training DVD (Task 2.2):*

It was decided to produce an interactive DVD (instead of a video) covering not just species identification but also whale watching field skills and live strandings. Additional support from the Heritage Council and EHS was provided for this DVD. An interactive DVD provides a very useful educational resource as well as for supporting training. Production of the DVD was carried out by Jim Wilson and Stephen O'Connell on contract to the IWDG. 1000 copies were produced and circulated to NPWS and EHS offices, Heritage officers, research ships and information/interpretation centres. Every secondary school in Northern Ireland was sent a copy as part of the Heritage Fund from EHS. The DVD was also presented at the European Cetacean Society Conference in Sweden, .

5. *Additional achievements:*

Such was the success of the DVD a field guide based on the DVD was proposed by the Committee. The IWDG contracted Stephen O'Connell and Jim Wilson to produce a draft ready for printing for publication in June 2006.

### Work package 3

#### *Carry out quantified effort watches at selected sites and ship transects*

##### Tasks:

- 3.1 expand the number of constant effort recording sites,
- 3.2 Use ships of opportunity (ShOps) as platforms for quantified effort data including consolidate present ferry surveys and develop routes across the Irish and Celtic Sea.

##### Achievements:

1. *Effort related sites (Task 3.1):*

It was decided that specific sites for effort related watches would not be targeted but observers were encouraged to watch from their choice of sites. This would give more extensive coverage. People who have effort recorded in field notebooks were identified and sent effort forms in an attempt to recover historical data.

The total number of watches carried out during ISCOPE is shown in Table 1 and from all sites in the IWDG database is shown in Table 2. The distribution of watch sites is shown in Figure 1.

**Table 1. Summary of effort watches by month during ISCOPE**

Year	Month												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
<b>2003</b>	6	9	9	3	7	11	7	16	10	27	6	15	<b>126</b>
<b>2004</b>	7	9	18	20	31	10	23	49	18	22	16	17	<b>240</b>
<b>2005</b>	21	35	41	42	40	49	51	60	44	31	36	24	<b>474</b>
<b>2006</b>	30	18	15	-	-	-	-	-	-	-	-	-	<b>63</b>
<b>Total</b>	<b>64</b>	<b>71</b>	<b>83</b>	<b>63</b>	<b>78</b>	<b>70</b>	<b>81</b>	<b>125</b>	<b>72</b>	<b>80</b>	<b>58</b>	<b>56</b>	<b>903</b>

During ISCOPE, a total of 903 watches have been carried out at 78 sites (Table 1) distributed (dots scaled relative to the number of watches) throughout the island of Ireland (Figure 1). The IWDG Sightings database already had details of 619 watches from 36 sites that were carried up to 2001 and a number carried out in 2002. Thus in total the IWDG have data from 1817 watches from 93 sites. The total number of hours watched now exceeds 2794. All effort data have been uploaded onto web server for on-line interrogation.



Fig 1. Distribution of all sites with effort watches

**Table 2. List of effort watch sites and total time watched**

County	Total number of sites watched	Total number of watches carried out	Total time (hours)
Derry	1	20	33.3
Antrim	18	114	186.6
Down	7	85	156.9
Dublin	7	109	147.7
Wicklow	3	27	51.5
Wexford	1	6	10.6
Waterford	3	122	204.1
Cork	10	443	749.5
Kerry	8	351	447.0
Clare	8	341	486.9
Galway	8	59	87.9
Mayo	7	28	45.7
Sligo	4	41	88.3
Donegal	8	72	99.2
<b>TOTAL</b>	<b>93</b>	<b>1817</b>	<b>2794.1</b>

Some watch sites are close together, and in effect overlook the same water. These have been amalgamated into a single site (e.g. Sleah Head includes watches from Dunmore Head and Coomenole in Co Kerry) but can be loaded separately on the database and data extracted from each site if required.

At present, 29 sites have greater than 10 watches carried out. These could be considered as the sites with the best coverage. They are:

- i) Four sites >100 watches:  
Fanore, Co Clare, Galley Head: Old Head of Kinsale, Co Cork: Ardmore Head, Co Waterford
- ii) Three sites 50-100 watches:  
Howth Head, Co Dublin, Ballybunion: Sleah Head, Co Kerry
- iii) Four sites 30-50 watches:  
Loop Head and Black Head, Co Clare: Ramore Head, Co Antrim: Tawney, County Donegal
- iv) Seventeen sites 10-30 watches:  
Black Head and Portmuck, Co Antrim: Finavarra, Co Clare: Sherkin Island, Co Cork: Belfast Lough: Newcastle, Long Rock and Bloody Bridge, Co Down: Killiney Bay Co Dublin: Beal strand, Co Kerry: Toberpatrick, Co Sligo: Bray Head, Co Wicklow: Portstewart, Co Derry: Malinbeg, Co Donegal, Galway city, Lettermullen and Spiddle: Co Galway.

2. *Ships of opportunity (ShoPS) (Task 3.2):*

2.1 Ferry Surveys

Although this project started before ISCOPE the data from the ferry surveys has been brought into ISCOPE and routes have been expanded. Monthly surveys are being conducted with Irish Ferries on the Dublin – Holyhead and Rosslare - Pembroke routes. From December 2005 a new survey route commenced across the north Irish Sea, using P&O vessels sailing between Larne and Cairnryan.

Data entry from the ferry surveys program, dating back to 2001, has been completed and currently the data is being reviewed to produce seasonal distribution and relative abundance maps using data from 2001 – 2005.

Examples of maps generated are shown in Figure 2.

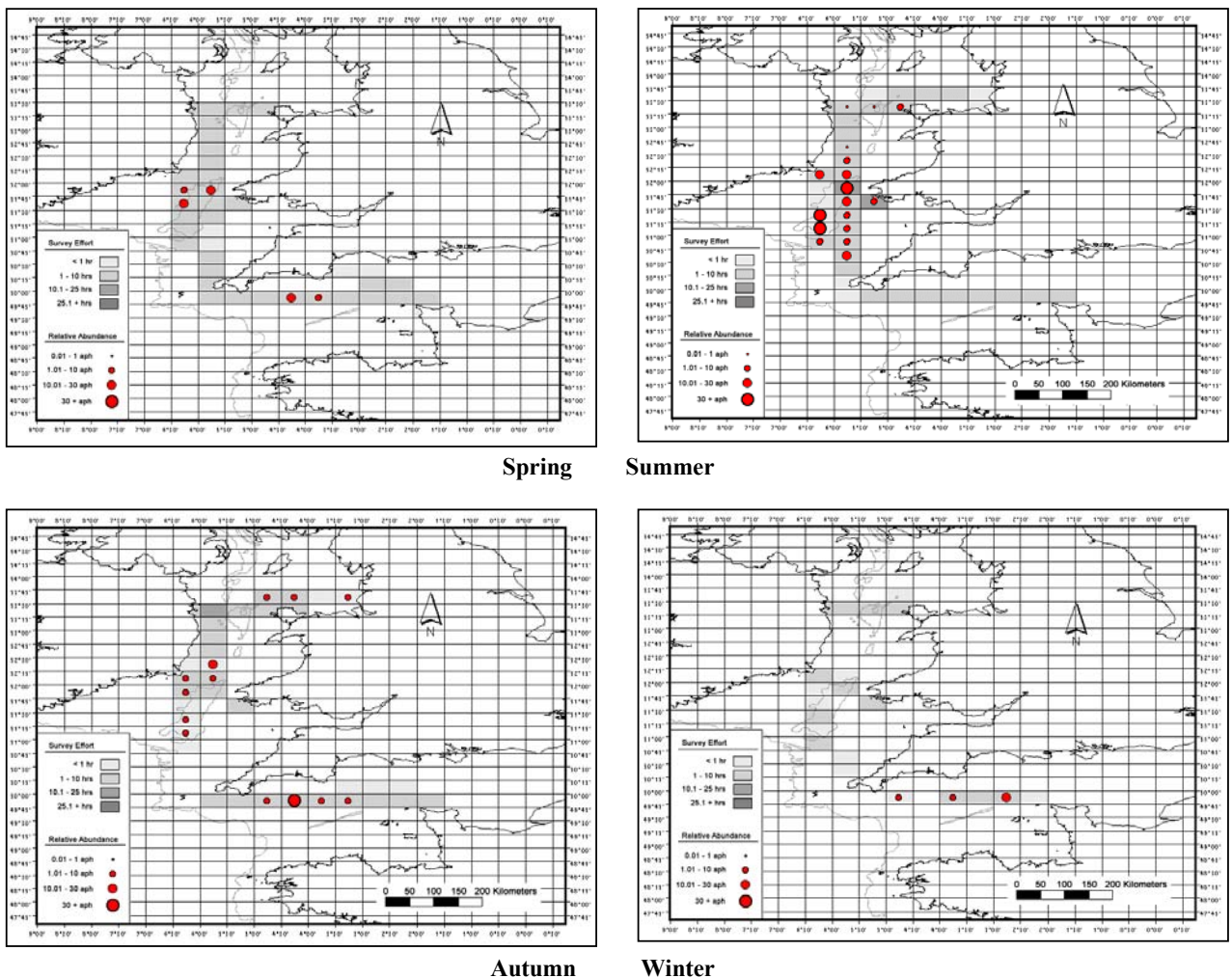


Fig. 2. Seasonal survey effort (sea state 3 or less), distribution and relative abundance of common dolphin (*Delphinus delphis*) recorded during IWDG Ferry Surveys from 2001- September 2005.

## 2.2 Celtic Explorer Surveys

During ISCOPE, the IWDG conducted surveys on ten cruises onboard the Marine Institute research vessel, RV Celtic Explorer (Table 2.) These included six cruises during the 2004 Seabed Survey and two surveys during the 2004 and 2005 Herring Acoustic Surveys. Some of these surveys were made possible through additional funding from the Heritage Council Wildlife Grants Scheme 2004 and the Marine Institute. Copies of cruise reports can be downloaded from [www.iwdg.ie/ShipSurveys/](http://www.iwdg.ie/ShipSurveys/).

Table 2: Dates and location of cruises onboard RV Celtic Explorer

<b>Cruise</b>	<b>Date</b>	<b>Location</b>	<b>Observer</b>
Herring Acoustic Survey	8-21 Jan 2004	Northwest Coast	Joanne O'Brien
Blue Whiting Survey	21 Mar - 7 Apr 2004	All Coasts	Joanne O'Brien
<i>Blackrock Seismic Survey*</i>	<i>12-18 May 2004</i>	South Coast	Dave Wall
Seabed Survey Leg 1	19 May - 2 Jun 2004	Shannon Approaches	Dave Wall
Seabed Survey Leg 2	3 June - 28 Jun 2004	North Coast	Joanne O'Brien
Seabed Survey Leg 3	2 July - 28 Jul 2004	Rockall Bank	Dave Wall
Seabed Survey Leg 4	30 July - 26 Aug 2004	North coast	John Meade/Brendan Allen
Seabed Survey Leg 5	27 Aug - 23 Sep 2004	West Cork / Kerry	Dave Wall
Herring Acoustic Survey	25 Nov-15 Dec 2004	South Coast	Dave Wall
Seabed Survey	26 Aug - 1 Sep 2005	West of Kerry	Dave Wall
Herring Acoustic Survey	2 - 22 Oct 2005	South Coast	Dave Wall

*\* Marine Mammal Observer on 2D Seismic Survey over Blackrock Prospect*

## 2.3 Gap Analysis

A GAP analysis of cetacean survey effort within the Irish EEZ was prepared to identify current gaps in seasonal survey effort off the Irish coast. The most noticeable gaps were over the Hatton Bank and southern Celtic Sea in summer and in all offshore areas in autumn and winter (see Appendix III).

## 2.4 Additional platforms of opportunity

We have collaborated with Department of Zoology, University College, Cork who were carrying out aerial surveys for turtles (along the south coast and in the Irish Sea) and sunfish (during ferry surveys between Cork and Swansea and Northern France). An IWDG observer joined the turtle survey during one survey (4 September, 2003) 15 cetacean sightings were recorded. Additional casual sightings were sent to the IWDG from additional aerial surveys and around 60-80 sightings from collected during the sunfish surveys.

### 3. *Additional achievements*

#### 3.1. Marine SAC monitoring

The IWDG were requested to initiate a trial-monitoring programme of the two Special Areas of Conservation designated for Harbour porpoise (Roaringwater Bay, Co Cork and Blasket Islands, Co Kerry). A monitoring protocol was drafted and agreed by NPWS (both research and regional management) and monitoring commenced in January 2005 with Mick O'Connell being appointed by IWDG to co-ordinate the monitoring of the Blasket Islands and Pádraig Whooley for Roaringwater Bay.

##### *Roaringwater Bay cSAC*

Twelve watches were carried out from Castle Point overlooking Roaringwater Bay cSAC with cetaceans observed on five (42%). Only harbour porpoise were observed at a mean rate of 0.63 sightings per hour. Seven watches were carried out by the NPWS Ranger, Patrick Graham, three by the IWDG (Pádraig Whooley) and two together during training of the NPWS ranger. A summary of watches can be obtained in Appendix IV.

##### *Blasket Islands cSAC*

Of the 27 watches carried out, cetaceans were observed on 23 (85%). Most watches (22: 81%) were carried out by Mick O'Connell of the IWDG with four by the local NPWS Ranger, Pascal Dower. A total of 44 sightings were made during 3455 minutes (57.6 hours) of watching: a rate of 0.82 sightings per hour. Both Annex II species (harbour porpoise and bottlenose dolphins) have been observed as well as common dolphins and minke whales. A summary of watches can be obtained in Appendix IV.

#### 3.2. Sources of variability of ability to detect cetaceans

An additional task suggested by the ISCOPE Committee was to explore sources of variability in sighting efficiency for cetaceans from land-based watching. As this potentially could require significant resources the IWDG are collaborating in an MSC project based at the Galway-Mayo Institute of Technology in Galway. Joanne O'Brien, with funding from the NPWS, is carrying out effort watches in Galway and Mayo and is exploring the effects of observer experience as well as other factors on sighting rates. It is hoped that results from this project can be used to improve the design of the IWDG Cetacean Sighting Schemes in the future.

## Work package 4

### *Maintain cetacean database and develop indices for monitoring purposes*

#### Tasks

- 4.1. Develop database in real time (website management)
- 4.2. Obtain training in Access database management
- 4.3. Develop indices based on effort related data for monitoring
- 4.4. Source historical sighting records from published and unpublished reports and overseas
- 4.5. Publish a review of data in 2005

#### Achievements:

##### 1. *Database Development (Task 4.1):*

There have been two major upgrades of the website ([www.iwdg.ie](http://www.iwdg.ie)) during ISCOPE, both were carried out by Padraic Moran under contract to the IWDG. The main objectives for phase 1 were:

- a. To rebuild the sightings database, addressing shortcomings and providing a solid platform on which future developments can take place.
- b. To improve the way sightings data is retrieved, with better quality maps, more search options, and improvements to the interface.

With these objectives met, phase 2 was designed to build on this platform by incorporating the following datasets:

- a. Sightings data from the Ships of Opportunity (ShOp) surveys.
- b. Strandings data (with improved sightings search facilities).
- c. Effort recording on sightings watches.

At the end of phase 2 the full set of IWDG's monitoring data can now be managed in an efficient, flexible database system, with advanced on-line search and retrieval.

##### 2. *Develop Monitoring Indices (Task 4.3)*

Cetacean stranding and sighting schemes are acknowledged as environmental monitoring indices (Boelens et al. 2004). Deriving monitoring indices from sightings and strandings data is a new use of the data and there is no tested methodology available. To date indices of relative abundance have been generated using "number of sightings per hour" as a standard measure. This makes comparisons between sites and seasons easy and can easily be stratified by environmental variables such as sea-state. If we compare the mean number of sightings



per hour, there is variation throughout the year (peak in July and August around the Blasket Islands) and between sites. In the six examples shown in Table 3, the highest sighting rates were recorded in Roaringwater Bay in the winter which also showed the highest mean rate overall. However sample size is still very low for this site (n=12) and if comparisons are to be made they should be restricted to sites with more watches spread over the year e.g. Blaskets compared to Howth Head. This shows consistently higher sighting rates throughout the year with a mean of 0.43 sightings per hour compared to 0.31 in the Blaskets. Thus the sighting rate of harbour porpoises is relatively greater off Howth Head compared to the Blaskets.

Other indices that might be useful include “number of animals per hour” (using best estimate), which could give relative abundance and “species diversity”.

To fully develop robust monitoring indices requires more data collected throughout the year and at a number of key sites. It is proposed to develop these more fully in ISCOPE II.

Table 3. Sighting rate (number of sightings per hour) of harbour porpoise from six sites, including two cSAC for harbour porpoise.

	Site				
	Roaringwater Bay *	Blasket Islands *	Fanore, Co Clare	Black Head, Co Antrim	Howth Head, Co Dublin
<i>Sample size</i>	12	76	236	22	72
<i>Hours watched</i>	13.2	167	329.8	36.8	94.7
January	1.5	0.4	0	0.8	0.8
February	0.7	0.4	0	0	0.6
March	1.8	0.1	0	0	0.1
April	0	0.2	0.1	0	0.3
May	1.0	0.2	0	0	0.5
June	0	0.3	0	Nd	0.6
July	0	0.7	0.1	0.1	0.6
August	1.0	0.5	0.1	0	0.4
September	0	0.2	0	0.2	0
October	Nd	0.3	0	0.5	0.5
November	Nd	0.2	0	0.5	0.5
December	Nd	0.4	0	0.2	0.2
<b>Mean</b>	<b>0.78</b>	<b>0.31</b>	<b>0.025</b>	<b>0.21</b>	<b>0.43</b>

\* cSpecial Areas of Conservation for harbour porpoise, nd = No Data

### 3. *Historical records (Task 4.4)*

An attempt to identify sources of historical sightings data, which might be of good enough quality to include in the sightings and strandings database, was made. Sources included field naturalists notebooks, published sources (Irish Naturalists Journal) grey literature (JNCC, Seawatch Foundation reports). It was also noted that the two main Bird Observatories (Cape Clear, Co Cork and Copelands, Co Down) might provide two point sources, at either end of island, with time series data for cetacean sightings. A number of historical records were sourced and this task will be ongoing.

#### 3.1 Bird Observatory records:

Geoff Oliver was contracted to carry out a review of cetacean sighting records from Clear Island, Co Cork as part of ISCOPE. Copeland bird observatory was approached in order to try and encourage a similar review of cetacean records but the number of records was considered too small for detailed analysis and most had been obtained during effort watches which are already in the database.

A total of 43,967 individual cetaceans were sighted off Cape Clear. Most of these were harbour porpoise (27,444), common dolphin (6698), unidentified dolphin (6596) and Risso's dolphin (1174). There were only 241 large whales sighted including 5 humpback and 17 fin whales.

This work will be published as a review paper in the Irish Naturalists' Journal when completed.

## Deliverables and Targets

The project deliverables include:

1. Greater public awareness of cetaceans in Irish waters. Target 100 website hits per week and 150-200 additional members per annum with a target of 1000 by the end of 2005.
2. Expansion of biological recording in Ireland. Target 50-100 recorded strandings per annum and 100 casual recorders and 50 regular recorders by 2005.
3. Greater recording effort of cetaceans in Irish waters. More extensive geographical and seasonal sightings effort. Increased coverage off northwest coast and offshore.
4. Indices of relative abundance at 12 sites around the coast.

### *Impact Indicators*

In order to assess the impact of ISCOPE on cetacean recording we have identified impact indicators. Three impact indicators are used for ongoing monitoring within the project. These are: Stranding records, Sighting records and Website hits.

#### *1. Public awareness (Impact Indicator 1):*

##### *1.1 Website hits*

Assessing public awareness of cetaceans in Ireland was to be achieved by quantifying the use of the website [www.iwdg.ie](http://www.iwdg.ie) and the number of people becoming members of the IWDG. Website traffic continued to grow steadily at more or less the same rate over the ISCOPE period (Figure 3). In October 2005 the number of requests per month exceeded 20,000 for the first time. Over the last three months the average successful requests for pages each day was 705 with 16,910 distinct hosts served. We have far exceeded our target of 400 requests per month.

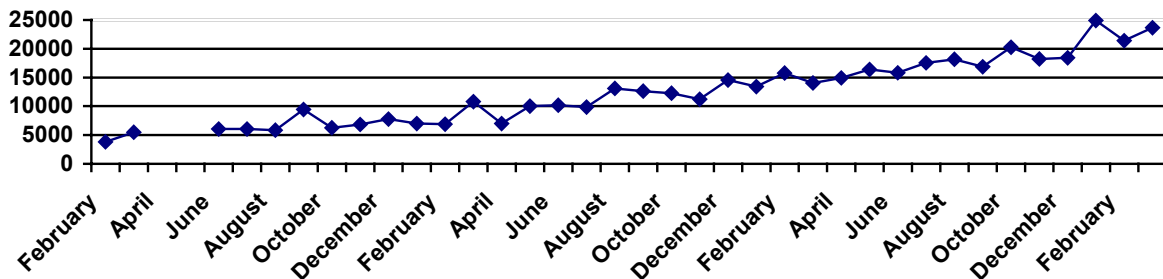


Fig. 3. Number of page requests per month from February 2003 - March 2006

Further details on website use during 2005 include:

1. Where possible to determine, most requests are from within Ireland followed by the UK, Netherlands, Germany and the US.
2. Most queries are for IWDG, which shows people are familiar with the initials and are actually searching for the site.
3. The home page is the most used page followed by species profiles and news. The ISCOPE pages score quite highly with ShOp surveys the most popular.

## 1.2 Membership of the IWDG

Figure 4 shows the increase in IWDG membership between 2000-2005. From an initial membership of around 300 we have grown at an average of 100 new members per annum. Membership of the IWDG was at 770 by December 2005, which is short of the target of the 1000. IWDG was at 770 by December 2005, which is short of the target of the 1000.

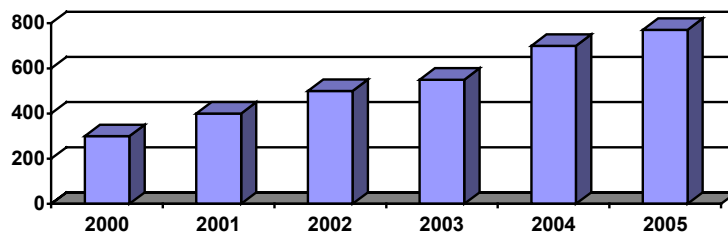


Fig. 4. Number of IWDG members 2000-2005

## 2. *Stranding Records (Impact Indicator 2):*

The number of stranding records in the IWDG Stranding database is shown in Figure 5. These are not all published or validated and additional records will be received for 2005. Records have been steadily increasing throughout the present decade and ISCOPE has helped to maintain this trend. We have achieved our target of 50-100 stranding records per annum.

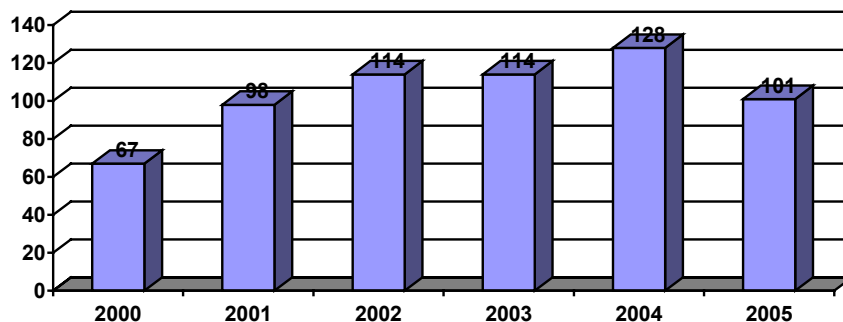


Fig. 5. Number of stranding records received 2000-2005

### 3. Sighting records (Impact Indicator 3):

The total number of sightings received (both casual and effort related records combined) each year from 2000 to 2005 is shown in Figure 6. There were a greater number of records received in 2001 than data from 2000 and 2002 would have expected but we can see that the rate of increase during the ISCOPE period (2003-2005) is consistent and increasing at around 8.5% per annum.

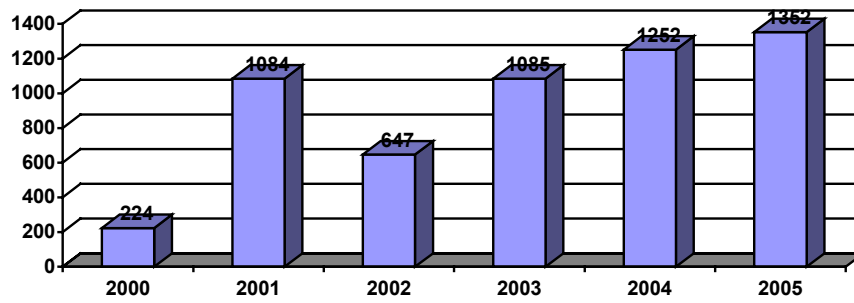


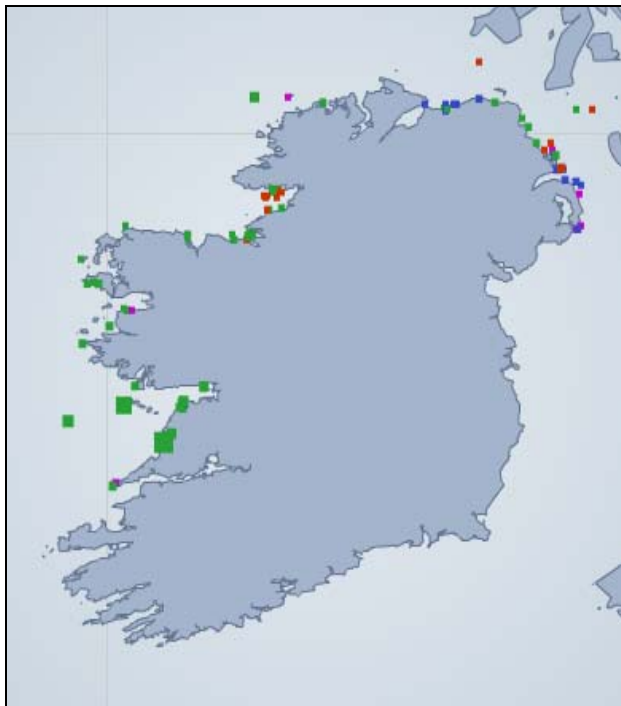
Fig. 6. Number of sighting records received 2000-2005

An objective of ISCOPE was to improve seasonal and geographical coverage. There has been a general increase in the proportion of sightings in January, March, April, August and a decline in May, June, September and December with little change in February, October and November (Table 4).

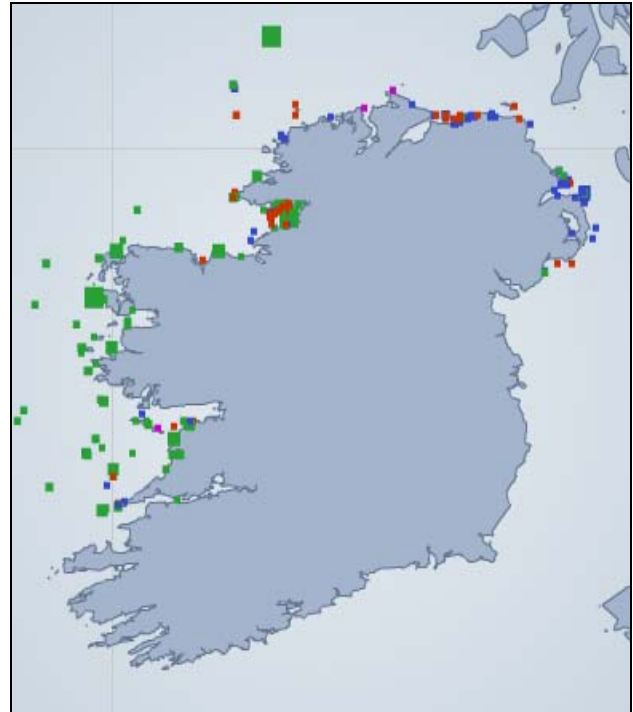
**Table 4. Cetacean sighting records reported to the IWDG from 2000 to 2005**

Month	2000	2001	2002	2003	2004	2005
January	28 (12.5%)	33 (3%)	22 (3.6%)	55 (5.1%)	33 (2.6%)	69 (5.1%)
February	13 (5.8%)	28 (2.6%)	14 (2.3%)	31 (2.9%)	37 (3%)	41 (3%)
March	16 (7.1%)	22 (2%)	29 (4.7%)	27 (2.5%)	62 (5%)	59 (4.4%)
April	12 (5.4%)	26 (2.4%)	24 (3.9%)	44 (4.1%)	58 (4.6%)	58 (4.3%)
May	12 (5.4%)	85 (7.8%)	25 (4.1%)	68 (6.3%)	189 (15.1%)	76 (5.6%)
June	32 (14.3%)	116 (10.7%)	39 (6.3%)	119 (11%)	131 (10.5%)	123 (9.1%)
July	15 (6.7%)	180 (16.6%)	112 (18.2%)	120 (11.1%)	246 (19.6%)	240 (17.8%)
August	10 (4.5%)	197 (18.2%)	108 (17.5%)	206 (19%)	183 (14.6%)	304 (22.5%)
September	44 (19.6%)	157 (14.5%)	73 (11.9%)	199 (18.3%)	103 (8.2%)	137 (10.1%)
October	22 (9.8%)	83 (7.7%)	62 (10.1%)	133 (12.3%)	88 (7%)	102 (7.5%)
November	14 (6.2%)	83 (7.7%)	49 (8%)	36 (3.3%)	73 (5.8%)	85 (6.3%)
December	6 (2.7%)	74 (6.8%)	59 (9.6%)	47 (4.3%)	49 (3.9%)	58 (4.3%)
<b>Totals</b>	<b>224</b>	<b>1084</b>	<b>616</b>	<b>1085</b>	<b>1252</b>	<b>1352</b>

The seasonal distribution of sighting records is strongly influenced by sea-state caused by prevailing weather conditions as well as observer coverage but these data do suggest a slight improvement in the proportion of winter records.



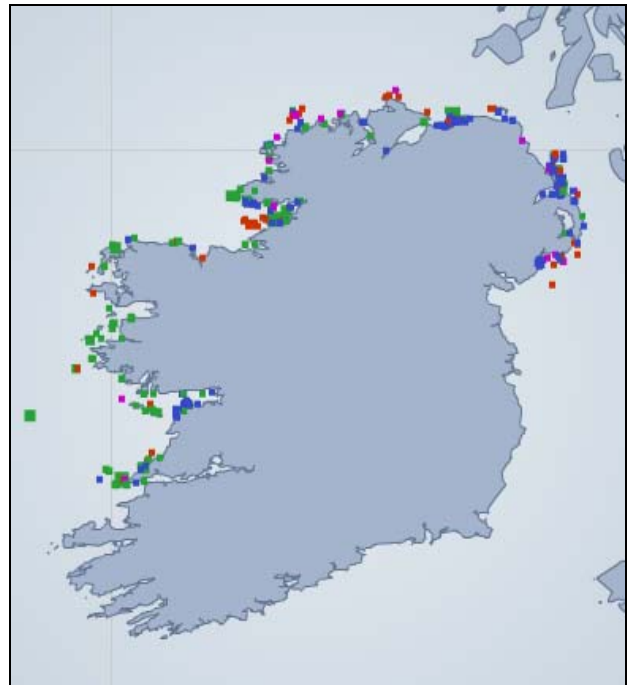
**2002 (n=141)**



**2003 (n=264)**



**2004 (n=376)**



**2005 (n=389)**

**Fig. 7 Distribution of sighting records from Counties Clare to Down from 2002-2005**

Geographical coverage shows a stronger improvement in the proportion of sighting records from the west and northwest coasts (Counties Clare to Down) (Fig 7). This shows the number of records has increased as has the proportion from these areas from 22.8% (2002), 24.3 (2003), 30.0% (2004) to 28.8% (2005) of total records, an increase of around 26% over three years.

1. *Relative abundance index from 12 sites (Impact Indicator 4):*

There are eleven sites (Loop Head and Black Head, Co Clare, Ramore Head, Co Antrim, Kilcar, Co Donegal) have between 30 and 50 watches) with at least 30 watches in total. Three of these sites (Howth Head, Co Dublin, Ballybunion and Sleah Head, Co Kerry) have between 50 and 100 watches and four sites (Fanore, Co Clare, Galley Head and Old Head of Kinsale, Co Cork, Ardmore, Co Waterford) have more than 100 watches. Effort statistics for these sites may provide indices of relative abundance as effort is distributed throughout the year (Table 5).

Table 5. Summary of results of watches, from sites with more than 30 recorded watches.

Site	No watches	No sightings	No species	Sighting rate (sightings per hour)
Fanore, Co Clare	236	39	2	0.1
Old Head of Kinsale, Co Cork	273	311	8	0.6
Galley Head, Co Cork	114	197	8	1.5
Ardmore Head, Co Waterford	108	86	6	0.5
Ballybunion, Co Kerry	87	53	1	0.3
Sleah Head, Co Kerry	75	110	5	0.7
Howth Head, Co Dublin	72	43	1	0.5
Black Head, Co Clare	43	35	3	0.6
Kilcar, Co Donegal	35	23	5	0.5
Loop Head, Co Clare	33	22	5	0.4
Ramore Head, Co Antrim	33	12	2	0.2

Sighting rate varies between 0.1 sightings per hour at Fanore, Co Clare to 1.5 sightings per hour from Galley Head, Co Cork. The species diversity also varies considerably from only one species off Howth Head (harbour porpoise) and Ballybunion, Co Kerry (bottlenose dolphin) to eight (bottlenose dolphin, common dolphin, fin whale, harbour porpoise, minke whale, sei whale, humpback whale, Risso's dolphin) off Galley Head and the Old Head of Kinsale, Co Cork.

## **Additional Impact Indicators**

A number of presentations have been made on the ISCOPE work at conferences and seminars in addition to some and publications in peer reviewed journals.

### Conferences and Seminars

1. National Biological Records Roundtable, Waterford Institute of Technology. 5-6 May 2006
2. Irish National Seabed Survey (INSS) Seminar, University College Cork. 18 November 2005
3. CeDaR Conference on Biological Recording. Ulster Museum, Belfast. 1-2 October 2005.
4. European Cetacean Society, 19th Annual Conference, La Rochelle, France, 2-7 April, 2005
5. Environ2005, Institute of Technology, Sligo. 29-30 January 2005.
6. Irish National Seabed Survey (INSS) Seminar at Hydro 4, Galway. November 2004.
7. IWDG Míol Mór International Whale Conference, Rosscarbery, Co. Cork 24-25 September, 2004.
8. 5th Annual Symposium on the Flora and Fauna of Atlantic Islands, University College Dublin, 20-25 August, 2004.

### Peer reviewed Publications

- Wall, D., O'Brien, J., Meade, J. and Allen, J. (2006) Summer distribution and relative abundance of cetaceans off the west coast of Ireland. *Biology and Environment (in press)*.
- Berrow, S.D., Wall, D. and Rogan, E. (in press) Recording stranded cetaceans in Ireland. European Cetacean Society Special Edition. *Proceedings of the Stranding Workshop. La Rochelle, April 2005*.
- Santos, M.B., Berrow, S.D. and Pierce, G.J. (in press) Stomach contents of a sperm whale *Physeter macrocephalus* calf in Co Clare (Ireland). *Irish Naturalists' Journal*.
- Wall, D., O'Brien, J., Meade, J. and Allen, J. (2005). Basking shark *Cetorhinus maximus* (Gunnerus) off Cos Clare, Down and Donegal. *Irish Naturalists' Journal* 28(3), 131.
- Berrow, S.D., O'Brien, J. (2005). Sperm whale *Physeter macrocephalus* L. calf, live stranded in Co. Clare. *Irish Naturalists' Journal* 28 (10) 40-41.

### Contributions to International studies

Tissue samples were collected from stranded animals as part of international projects. Merel Dalebout, University of New South Wales, Australia) has established an genetic database of beaked whales and has already analysed tissue samples from Cuvier's beaked whale from Ireland. She is looking at sub-species of this species around the world. Rus Hoebel (University of Durham, England) is interested in sperm and Susan Chivers (SWFS, La Jolla, California, US) in pygmy sperm and Per Palsboll (University of Berkeley, California) in humpback and fin whale genetics.



Bone tissue from beaked whales were sent to Colin McLeod who has recently published a study of isotopes which included the Irish samples. (MacLeod, C.D., Herman, J., Sabin, R., Berrow, S.D., Bloch, D. and Newton, J. Lopez, A., Debrot, A & Pierce, G.J. 2006. Evidence of niche partitioning between beaked whale species (Family Ziphiidae) in the North Atlantic from stable isotope analysis).

Table 6. List of tissue samples obtained during ISCOPE contributed to international projects

Species	Location	Supplied by	Stranding	Sample	Sent to
Bottlenose dolphin	Allihies, Co Cork	Clare Heardman	7/1/2005	skin	Simon Ingram
Bottlenose dolphin	Tarbert, Co Kerry	Simon Berrow	25/07/2005	skin	Simon Ingram
Bottlenose dolphin	Aughleam, Mullet, Co Mayo	Marianne Odendahl	21/02/2005	skin	Simon Ingram
Common dolphin	Salthill, Co Galway	Simon Berrow	30/12/2003	parasites	-
Bottlenosed whale	Loop Head, Co Clare	Michael Viney	1950	bone	Merel Dalebout
Cuviers beaked whale	Ballydonegan, Co Cork (V575 435)	Clare Heardman	6/1/2005	skin	Merel Dalebout
Cuviers beaked whale	Ballydonegan, Co Cork (V575 435)	Clare Heardman	7/1/2005	skin	Merel Dalebout
Cuviers beaked whale	Fanad Head, Co Donegal	Emmet Johnston	20/08/2005	skin	Merel Dalebout
Fin whale	Oysterhaven, Co Cork	Padraig Whooley	15/07/2005	skin	Per Palsboll
Fin whale ?	Sydney Parade, Co Dublin	Nick Channon	c1850	bone	Per Palsboll
Fin whale ?	Belderg, Co Mayo	Seamus Caulfield	c1980	bone	Per Palsboll
Fin whale ?	Spiddle, Co Galway	John Falvey	9/1/2005	skin	Per Palsboll
Humpback whale	Greencastle, Co Donegal	Andrew Speer	13/09/2004	skin	Per Palsboll
Humpback whale	Fair Head, Co Donegal	Gary Burrows	as above ?	skin	Per Palsboll
Pilot whale	Oranmore, Co Galway	Simon Berrow	23/01/2004	teeth	-
Pilot whale (neonate)	Inch, Co Kerry	Mick O'Connell	10/1/2005	skin	-
Risso's dolphin	Doonbeg, Co. Clare	Simon Berrow	2/5/2004	teeth	-
Sowerby's Beaked Whale	Courtown, Co Wexford	Kevin McCormick	20/8/2004	skin	Merel Dalebout
Sperm whale	Castlefreke, Co Cork	Padraig Whooley	17/01/2005	skin	Rus Hoebel
Sperm whale ?	Belgooley, Co Cork	Padraig Whooley	6/3/2005	skin	Rus Hoebel
True's beaked whale ?	Lettermullan, Co Galway	Padraic de Blaidraithe	1975	bone	Merel Dalebout
Unident Ziiphidae	Rossbeigh, Co Kerry	Mick O'Connell	Jun-04	skin	Merel Dalebout
Pygmy Sperm whale	Ballyheigue, Co Kerry	Simon Berrow	22/11/2005	skin	Susan Chivers
Pygmy Sperm whale	Ballyheigue, Co Kerry	Simon Berrow	22/11/2005	Prey items	Colin MacLeod

## Appendix I: ISCOPE Steering Committee

### Members

Environment and Heritage Service (Northern Ireland):

Joe Breen (to November, 2003)

Gary Burrows (since November, 2003)

Irish Whale and Dolphin Group:

Shay Fennelly (to November, 2003)

David Wall (since November, 2003)

Heritage Council:

Liam Lysaght

Marine Institute:

Michael O’Cinneide

Martina Hennissey (10 November, 2003)

Terry McMahan (March, 2004)

National Parks and Wildlife Service:

Ciaran O’Keeffe

David Lyons (since November, 2003)

### Meetings

#### Full Committee

24 February, 2003

NPWS offices, Ely Place, Dublin

25 November, 2003

NPWS offices, Ely Place, Dublin

8 March, 2004

NPWS offices, Ely Place, Dublin

4 November, 2004

NPWS offices, Ely Place, Dublin

18 April, 2005

Marine Institute, Parkmore, Galway

9 January, 2006

NPWS offices, Ely Place, Dublin

#### Marine Institute only

21 March, 2003

Marine Institute, Parkmore, Galway

10 November, 2003

Marine Institute, Parkmore, Galway

## Appendix II: List of public talks and training courses

### *Public talks (Task 2.1):*

- a. Rosslare, Co Wexford: (22 February, 2003), Attended by 70 people (SB).
- b. Fota Wildlife Park, Co. Cork: Series of 3 workshops delivered throughout July (PW).
- c. Dingle Aquarium, Co Kerry, (21 July 2003) (PW)
- d. Dublin Zoo, Co Dublin. Attended by 20 people (DW)
- e. Natural History Museum, Dublin. Attended by 20 people (DW)
- f. Heritage Week (7-14 September) events: Skibereen, Co. Cork (PW) Dunquin, Co. Kerry (Mick O'Connell) and Kilrush, Co. Clare (SB)
- g. Galley Head, Co Cork, (13 September 2003), through the Landmark Trust (PW)
- h. Wexford environmental day, New Ross, Co Wexford, (21 September 2003) (KM)
- i. Letterfrack, Co. Galway (26 Oct. 03) organised by CEEC. Attendance 80 people (SB)
- j. Corofin, Co Clare (26 November), organised by NPW. Attended by 40 people (SB)
- k. Munster Dive Centre, Cork. (11 December, 2003), Attended by 30 people (PW),
- l. Kenmare, Co Kerry (13 December, 2003) Attended by 20 people (MO'C),
- m. Nenagh, Co Tipperary (14-16 January, 2004) organised by Tipperary CC. Attended by 150 people (SB),
- n. NUI Galway, 18 February. Attended by 75 people (PW),
- o. Carrickfergus Castle, Co Antrim, (20 February, 2004). Organised by EHS and attended by 55 people (PW),
- p. Trinity College Dublin, (26 February, 2004). Attended by 25 people (DW)
- q. Baltimore Traditional Boat Festival, Co. Cork (29 May 2004) 60 people (PW)
- r. Castletownbere, Co. Cork, talk (6 June, 2004) 80 people (PW)
- s. World Ocean's Day, Tramore, Co. Wexford, (12 June, 2004) 100 people (PW)
- t. Cape Clear Island, Co. Cork, (7 July, 2004) 50 people (PW)
- u. Natural History Museum, Dublin, (8 August, 2004) 30 people (DW)
- v. Cape Clear Island, Co. Cork (12 October, 2004) 60 people (PW)
- w. Millipore B.V., Cork (22 October, 2004) 20 people (PW)
- x. GMIT, Galway, (5 November, 2004) 40 people (SB)
- y. Roscarbery Historical Society, Public talk (20 January, 2005) 50 people (PW)
- z. Hook Head, Co. Wexford, Public Talk (21 January, 2005) 30 people (PW)
- aa. IMF Boat Show RDS seminar program, (26 February, 2005) 60 people (PW)
- bb. Irish Outdoor Adventure Show, RDS, (5 March, 2005) 30 people (PW)
- cc. Rosses Point, Sligo, (2 May 2005) 80 people (PW)
- dd. Ceide Fields Centre, Co Mayo (5 May 2005) 20 people (SB)
- ee. World Ocean's Day Festival, Tramore, Waterford (11 &12 June) (PW)
- ff. Cape Clear Island, Public talk during Ecology course, c40 people (7 July 05) (PW)
- gg. County Nature Trust, Cork AGM, open to public c35 people (PW)

- hh. Blasket Island Commemoration, Dunquin, Co Kerry, (8 October, 2005) 50 people (SB)
- ii. Marine Institute Lecture Series, Castlebar, Co Mayo (12 October, 2005) 200 people (SB)

*Training courses (Task 2.1):*

- b. T-Bay Surf and Wildlife Centre, Tramore, Co Waterford (24 May, 2003). Organised by T-Bay Surf and Wildlife Visitor Centre). Attended by 20 people. ISCOPE material is now been displayed at their interpretive Centre (PW)
- c. Marine Institute FATS, Marine Institute, Galway (5 December, 2003) (SB)
- d. T-Bay Surf and Wildlife Centre, Tramore, Co Waterford (8 January, 2004) Attended by 15 transition year students (PW)
- e. Marine Institute FATS, Galway: (5 February, 2004) 8 persons (SB)
- f. Portrush, Co Antrim (23 February, 2004), organised by EHS. Attended by 50 people (PW & SB)
- g. Cardonagh, Inishowen Peninsula, Co Donegal. (24 February, 2004) Organised by the Inishowen Wildlife Club. Attended by 35 people (PW)
- h. Sligo IT. (25 February, 2004) Organised by Sligo IT. Attended by 40 people (PW)
- i. T-Bay Surf and Wildlife Centre Tramore, Co Waterford (12- 13 March, 2004) (PW).
- j. Salthill, Galway, in collaboration with Atlantiquarium, Galway (20 March, 2004) (SB).
- k. Augleam, Mullet peninsula, Co Mayo (21 May, 2004) 18 people attended (SB)
- l. Westport, Co Mayo (22 May, 2004) 65 people attended (SB)
- m. Wexford Wildfowl Reserve, Wexford Slobs, (22 May, 2004) 15 attended (PW),
- n. Tory Island, Co Donegal (18-20 June, 2004) 25 people attended (SB),
- o. Kilrush, Co Clare (3 July, 2004) 18 people attended (SB)
- p. EPA staff field trip to Old Head Kinsale, Cork (8 July, 2004) 10 people (PW)
- q. Conamara Sea Week, Letterfrack, Co Galway (23 October, 2004) (SB)
- r. Letterfrack, Co Galway: (23 October, 2004): 60 people attended (SB)
- s. NPWS NW Regional staff: Donegal (3 February, 2005)
- t. Tramore, Co. Waterford, T-Bay Surf and Wildlife Centre, 5 February: 15 People (PW)
- u. T-Bay Surf and Wildlife Ctr, Tramore, Waterford, (5 February, 2005) 15 people (PW)
- v. Course onboard LE Eithne in Galway Docks (11 March 2005)
- w. Portrush Countryside Centre, Antrim, (30 April, 2005) 20 persons (PW)
- x. Donegal Bay SAC, Donegal, Evening workshop, (3 May, 2005) 20 people, (PW)
- y. Tory Island, Co Donegal, (20-22 May 2005) 25 persons (SB)
- z. NPWS SE Regional staff, Wexford Wildfowl Reserve 15 people (SB)
- aa. NPWS SW Regional staff, Killarney National Park 25 people (SB)

(SB = Simon Berrow, PW = Pádraig Whooley, DW = Dave Wall, MO'C = Mick O'Connell)

## **Appendix III: GAP Analysis of ShOp surveys**

### **Introduction**

The waters of Ireland's Exclusive Economic Zone (EEZ) are thought to represent one of the most important cetacean (whales, dolphins and porpoise) habitats in Europe. To date 24 species of cetacean have been recorded in Irish waters, seven of these have been confirmed as calving within the Irish EEZ while a number of other species are possibly calving (e.g. minke whale and northern bottlenose whale) (Berrow 2001). In recognition of their importance for cetaceans, the Irish government declared all Irish waters (within the EEZ) to be a whale and dolphin sanctuary in 1991 (Rogan and Berrow 1995).

Despite this recognition, information on the distribution and relative abundance of cetaceans within the Irish EEZ, especially in offshore waters, is very limited. There still exist many gaps in coverage particularly off the northwest coast and in most other waters outside of the spring and summer months. Published distribution maps are therefore only indicative. There is an urgent need for more accurate data on the distribution and abundance of cetaceans in Irish waters in order to comply with a number of EU and International Directives (e.g. Habitats Directive, 1992; OSPAR Convention, 1992; EU Council Reg. 812/2004 Concerning Small Cetacean Bycatch) and national conservation initiatives (e.g. National Biodiversity Plan).

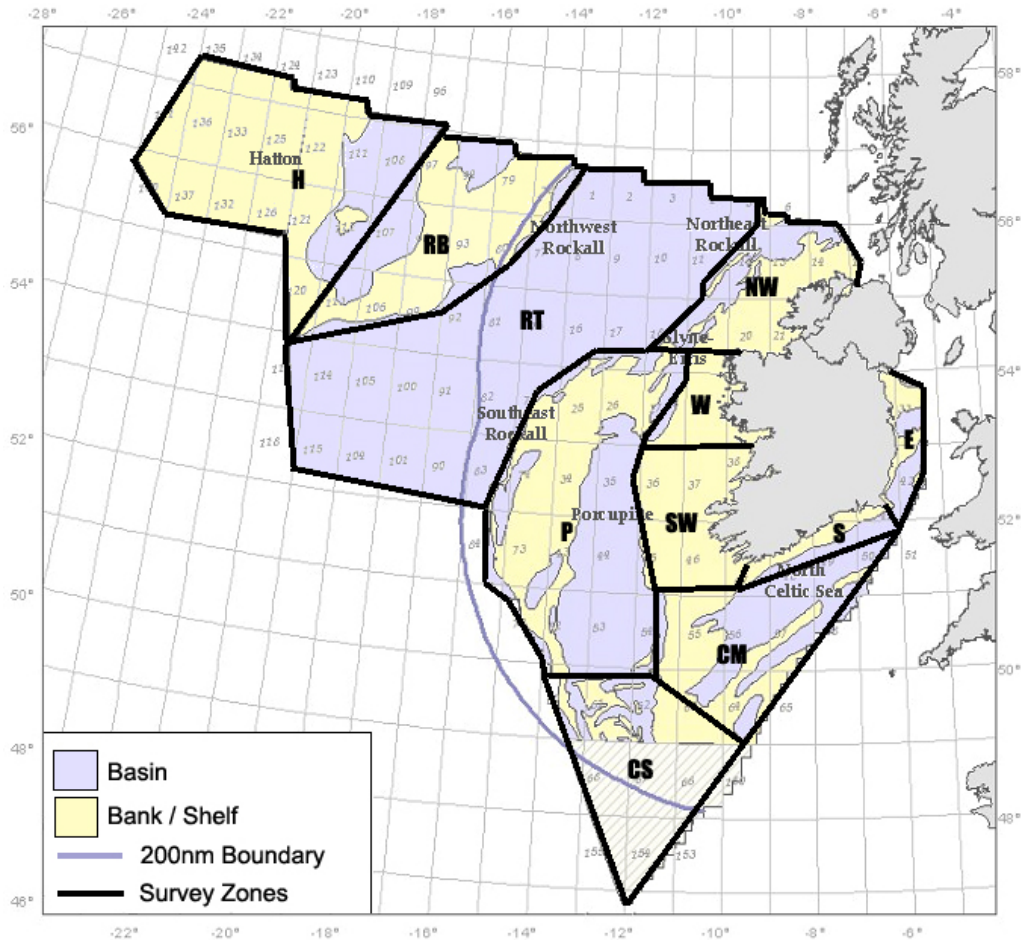
### **Survey effort, past and present in Irish waters**

The Irish Whale and Dolphin Group (IWDG) has been collecting data on the distribution and relative abundance of cetaceans in Irish waters (including Northern Ireland) since 1991. The IWDG casual and constant effort sightings schemes record data mainly from land-based sightings and surveys (Berrow *et al.* 2002). Similar schemes organised in the UK by the Sea Watch Foundation, Organisation Cetacea and others (Sea Watch 2003; ORCA 2005; WDCS 2005) over the past two decades have also recorded cetaceans in Irish waters. These sightings schemes also collect casual sightings from seafarers. In general such surveys only allow for mapping of cetacean distribution within a few kilometres of the coastline. Land based constant effort surveys are less common but allow for estimation of relative abundance within the areas covered (Reid *et al.* 2003). For large scale offshore mapping of cetacean distribution and abundance, boat based surveys are required.

Dedicated surveys which aimed to derive abundance estimates are limited to the SCANS survey of the Celtic Sea in 1994 (Hammond *et al.*, 1995) and an area covering the Irish shelf edge, Rockall Trough and Porcupine Bank in 2000 (O'Cadhla *et al.* 2004). Leopold *et al.* (1992) derived an abundance estimate for harbour porpoise on a 'ship of opportunity' during a fisheries cruise along the south-west coast of Ireland. Gordon *et al.* (1999) carried out a dedicated visual and acoustic survey off the northwest coast in 1993, however abundance estimates were not calculated. During 2005 an absolute abundance survey (SCANS II) is planned, which will be a repetition of the 1994 SCANS survey but will also survey waters to the west of Ireland and the Irish Sea. A number of studies on board 'ships of opportunity' have presented maps of the distribution and/or relative abundance of cetaceans in Irish waters (see Appendix I). The Joint Nature Conservation Committee (JNCC) has

collected incidental cetacean sightings from vessels of opportunity in UK and Irish waters since 1979, with many of these surveys based on board seismic survey vessels. The Coastal and Marine Resources Centre in University College Cork have also conducted JNCC-type surveys on board ships of opportunity.

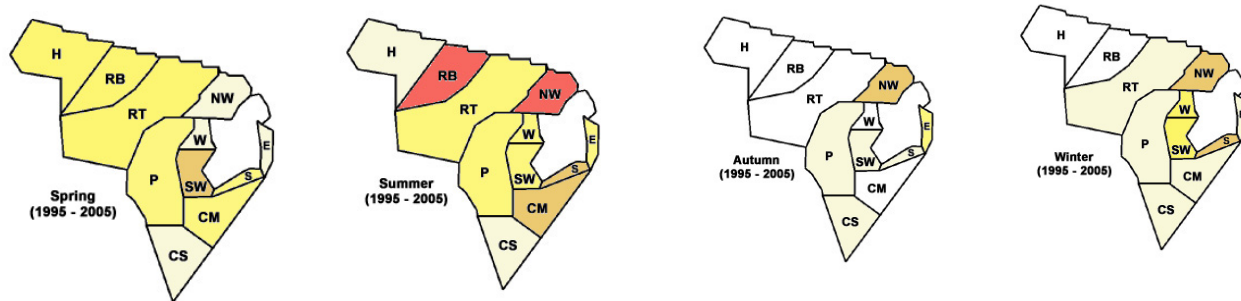
### Cetacean Surveys Gap Analysis



**Fig. 1** Map of Irish EEZ with the area broken down into **survey zones** suitable for the planning of surveys of cetacean relative abundance and distribution. [NW=North West (<200m); W=West Coast (<200m); SW=South West Coast (<200m); S=South Coast; E=East Coast; CM=Mid Celtic Sea; CS=South Celtic Sea; P=Porcupine Bank & Basin; RT=Rockall Trough; RB=Rockall Bank; H=Hatton Bank & Basin].

The IWDG has conducted dedicated cetacean distribution and relative abundance surveys on board commercial ferries since 2001 and are also part of the Atlantic Research Coalition (ARC), a network of researchers who conduct similar surveys on board commercial ferries in Ireland, England, Scotland, Wales and Spain (Breton *et al.* 2004). Since 2003 the IWDG have conducted relative abundance and distribution surveys on board the state offshore research vessel *R.V. Celtic Explorer*.

An analysis of survey effort thus far was conducted using three parameters (Geographical area; Season and Survey Method) to assess gaps in survey effort within the Irish EEZ. Casual sightings schemes and land-based constant effort schemes were excluded from the analysis as the results of such schemes generally only apply to a narrow area along the coastline. In addition, surveys which focused purely on a single bay or estuary (for a single species) were excluded as were purely acoustic surveys (as relative abundance estimates cannot be accurately deduced from such surveys).



**Fig. 2** Survey effort within survey zones, according to **season**.  = partial (non representative of whole area) non-dedicated cetacean survey conducted.  = At least one non-dedicated cetacean survey (JNCC type) conducted of area.  = Single dedicated cetacean survey conducted in area since 1995 in addition to any non dedicated cetacean surveys (if any).  = Two or more dedicated cetacean surveys conducted in area since 1995 (or to be conducted during SCANS II). White = areas with little or no survey effort during that season. Additional JNCC seabird at sea surveys may have been conducted in some areas since 1995, however seasonal effort data was not available for JNCC seabird at sea surveys at the time of writing.

**References:** **Spring:** Wall *et al.* 2004; O’Brien J. 2004a; Reid *et al.* 2003; Brereton *et al.* 2001; Ó Cadhla *et al.* 2004. **Summer:** Wall *et al.* 2004; Reid *et al.* 2003; Brereton *et al.* 2001; Ó Cadhla *et al.* 2004; Hammond *et al.* 1995; Gordon *et al.* 1999; Leopold *et al.* 1992. **Autumn:** Wall D. 2003; Reid *et al.* 2003; Brereton *et al.* 2001; Ó Cadhla *et al.* 2004. **Winter:** Wall D. 2004; O’Brien J. 2004b; Reid *et al.* 2003; Brereton *et al.* 2001; Ó Cadhla *et al.* 2004.

Much of the cetacean survey work in Ireland has thus far been conducted as part of the JNCC Seabirds at Sea programme or by marine mammal observers on board seismic vessels. Most surveys (including dedicated cetacean research surveys) have been conducted during spring and summer months, when weather conditions are most likely to be favourable. The result is that knowledge of cetacean distribution and abundance, during autumn and winter, in Irish waters is severely limited.

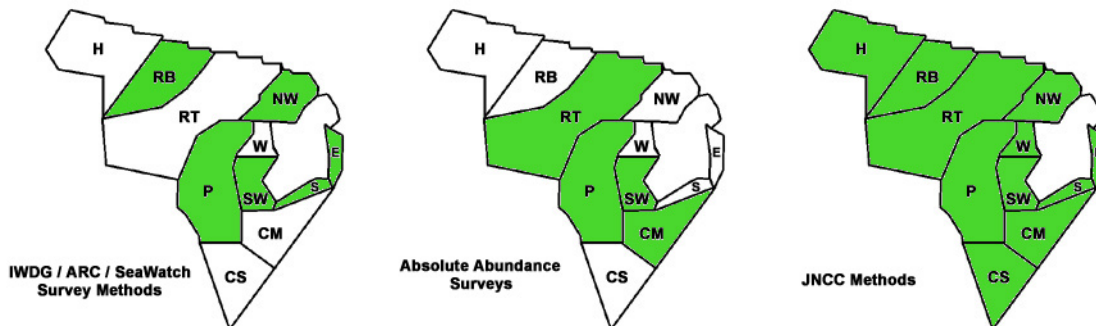
The majority of survey effort thus far has focused on inshore waters and along the continental shelf (and shelf edge) off the west coast. In offshore waters, petroleum exploration and associated surveys have enabled good coverage of the Rockall and Porcupine banks during spring and summer. Little effort has been conducted on the banks in autumn and winter and data gathered from surveys conducted on board seismic vessels may be of

limited value (see ‘survey methods and limitations’). Less effort has focused on the Rockall Trough and Porcupine Basin and in waters over the Hatton Bank and Basin.

In waters over the continental shelf, further survey effort is required off the north coast of Ireland, where initial results show a very low relative abundance of cetaceans (Wall *et al.* 2004). Further effort is also required in central and southern areas of the Celtic Sea. Survey effort in the Irish Sea has historically focused along the lines of the ferry routes between Ireland and Wales. Increased survey effort is required in other areas of the Irish Sea and St. George’s Channel.

### Survey Methods and Limitations

JNCC survey methods are designed for the collection of incidental cetacean sightings recorded during surveys for seabirds at sea. The survey methodology restricts survey effort to a 300m strip on one side of the survey vessel (Pollock *et al.* 1997). This method significantly reduces the surveyor’s likelihood of detecting cetaceans outside of this narrow field of view (Ó Cadhla *et al.* 2004). It is the view of the IWDG that dedicated cetacean surveys are required to obtain an accurate estimate of cetacean distribution and relative abundance when conducting single observer, visual surveys from ships of opportunity.



**Fig. 3** Survey effort within survey zones, according to survey method. JNCC Surveys include seabird at sea and modified seabird at sea survey methods.

*References:* **IWDG / ARC / SeaWatch:** Wall D. 2004; Wall *et al.* 2004; O’Brien J. 2004a&b; Wall D. 2003; Brereton *et al.* 2001; Gordon *et al.* 1999. **Absolute Abundance:** Ó Cadhla *et al.* 2004; Hammond *et al.* 1995; Leopold *et al.* 1992. **JNCC Methods:** Reid *et al.* 2003; Ó Cadhla *et al.* 2004.

The use of air guns or air gun arrays (on vessels conducting 2D or 3D surveys) may deter many cetacean species from approaching the survey vessel (Wall D. 2004a and Stone, C.J., 2003) and will therefore reduce the likelihood of surveyors detecting cetaceans in the survey area. Therefore it is unlikely that surveys conducted from vessels towing air guns will allow for accurate estimation of cetacean distribution and relative abundance. The deterrent effect of multi-beam arrays on cetaceans appears to be less of an issue, however some species may be affected to a greater extent than others (e.g. harbour porpoise were rarely detected from the R.V. Celtic explorer during multi-beam surveys in 2004) (Wall *et al.* 2004; O’Brien and Berrow 2005).



## **Cetacean Abundance and Distribution Surveys: Why use ShOps?**

Using 'ships of opportunity' provides a cost effective tool for the collection of data on cetacean distribution and abundance. The costs involved in conducting dedicated surveys of cetaceans on board chartered vessels are prohibitive with daily costs of chartering a suitable vessel running into thousands or tens of thousands of euro (for offshore surveys). Each year, there are a large number of vessels available within the Irish EEZ, which are suitable as platforms for conducting cetacean surveys. Such vessels include:

**State research vessels:** Areas of operation include inshore and offshore waters, with the *R.V. Celtic Explorer* operating in difficult to access offshore habitats and the *R.V. Celtic Voyager* mainly operating in inshore waters.

**Foreign research vessels:** Such vessels operating within Irish waters are obliged to carry an observer from the host nation.

**Naval vessels:** The Irish naval fleet conduct regular patrols around the Irish coast and are particularly active in waters over the Irish shelf and areas where commercial fishing activity (and potential for cetacean-fisheries interactions) is high.

**Commercial ferries:** The IWDG operate two surveys on the Irish Sea with Irish Ferries. Our UK colleagues (Sea Trust) also conduct surveys on board Stena Ferries on the south Irish Sea. Potential to expand such surveys exist in the north Irish Sea (Larne/Belfast – Cairnryan) and in the Celtic Sea (Cork – Swansea, Rosslare – Cherbourg and Cork – Roscoff). Smaller ferries off the west and north coasts also offer potential for surveying inshore waters.

**Other commercial shipping:** Coastal cargo routes operate between Irish Ports on the east and west coasts and between UK and Irish ports.

**Commercial survey vessels:** Vessels chartered for commercial surveys (geohazard, seismic, salvage, drilling rigs and tenders) are often open to carrying marine mammal observers.

**Aerial Surveys:** There may be scope to access air corps fisheries patrol craft and aircraft conducting research and mapping/photography surveys over Irish waters.

Such vessels provide opportunities to survey otherwise inaccessible offshore habitats or provide platforms for long term monitoring of cetacean distribution and relative abundance in areas of interest (Brereton *et al.* 2004). Research vessels are particularly favourable platforms as the simultaneous collection of cetacean data along with environmental and physical oceanographic data (e.g. bathymetric data, benthic samples, fisheries data etc.) enhances interpretation of results and assists in an ecosystem approach to marine habitat management (Wall *et al.* 2006).

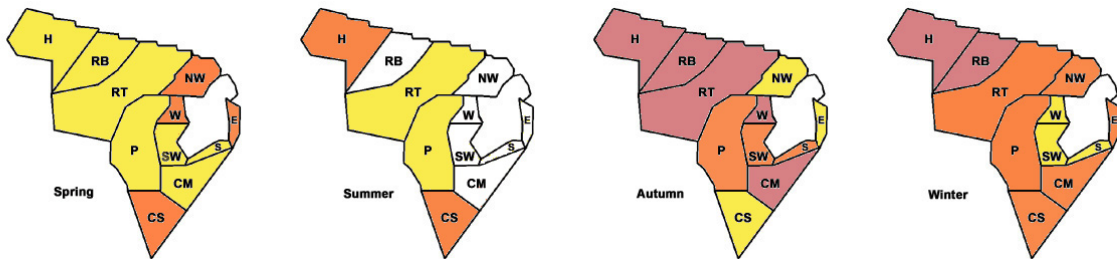
## **Survey Proposal for 2005 – 2008**

The EEZ of the Irish State extends over in excess of 890,000km<sup>2</sup> of ocean. A diversity of marine habitat types occur within this area, including; inshore coastal waters, offshore waters to 200m depth over the continental shelf and shelf edge habitat. Beyond the shelf edge lie offshore banks and abyssal waters in excess of 4000m

deep. The effort required to survey such a vast expanse of marine habitats is immense and cannot be achieved in a single survey or a single year. The costs of systematically surveying such an area for marine mammals in all seasons would be prohibitive. Neither is it feasible to survey a small section of the Irish EEZ and attempt to apply the results to whole area. Initial surveys have already shown that cetacean diversity and relative abundance can vary greatly across relatively small geographical distances and between adjacent marine habitats (Wall *et al.* 2006).

The IWDG therefore proposes to conduct an initial assessment of cetacean distribution and relative abundance within a representative sample of marine habitat types located within the geographical survey zones detailed above (fig. 1). It is proposed that this work will be completed within 3 years and would be followed by a monitoring system focusing on priority conservation areas with occasional assessments of other areas and habitats.

### Priority Areas



**Fig. 4** Priority survey areas 2005 – 2008. ■ = Very high priority areas with little or no previous survey effort. ■ = High priority areas with only partial survey effort during the given season. ■ = Moderate priority areas with previous survey effort but where additional effort is required due to high conservation priority of the area or where all previous effort is likely to have under-recorded cetacean relative abundance. **White** = Low priority areas with at least two dedicated cetacean surveys since 1995 or areas to be covered by SCANS II surveys in 2005.

### References

Berrow, S. 2001 Biological diversity of cetaceans (whales, dolphins and porpoises) in Irish waters. In J. Nunn (ed.), *Marine Biodiversity in Ireland and adjacent waters*, 115-119. Belfast. Ulster Museum.

Berrow, S.D. and Rogan, E. 1995 Cetaceans stranded on the Irish coast, 1901-1995. *Mammal Review* 27(1), 51-76.

Berrow, S.D., Whooley, P. and Ferriss, S. (2002) Irish Whale and Dolphin Group Cetacean Sighting Review (1991-2001). Irish Whale and Dolphin Group. ISBN 0-9540552-1-7. 34 pp.

Berrow, S.D., Holmes, B. and Kiely, O.R. 1996 Distribution and abundance of bottle-nosed dolphins *Tursiops truncatus* in the Shannon Estuary. *Biology and Environment: Proceedings of the Royal Irish Academy* 96B (1): 1-9.

- Brereton, T., Wall, D., Cermeño, P., Vasquez, A., Curtis, C. and Williams, A. 2004 *Cetacean Monitoring in North-west European Waters*. Report, No. 1. Atlantic Research Coalition, Dorset, UK.
- Clark, C.W., and Charif, R.A., 1998 *Acoustic monitoring of large whales to the west of Britain and Ireland using bottom mounted hydrophone arrays, October 1996 – September 1997*. Report No. 281. Joint Nature Conservation Committee, Peterborough.
- European Union 1992 *Council directive on the conservation of natural habitats and of wild fauna and flora*. EU Council Directive, 92/43/EEC.
- European Union 2004 Council Regulation (EC) No 812/2004 of 26.4.2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98. *Official Journal L 150* 30/04/2004, pp. 0012 – 0031.
- Gordon, J., Berrow, S.D., Rogan, E. and Fennelly, S. 1999 Acoustic and visual survey of cetaceans off the Mullet peninsula, Co. Mayo. *Irish Naturalists Journal*, 26, 251-259.
- Hammond, P.S., Benke, H., Berggren, P., Borchers, D.L., Buckland, S.T., Collet, A., Heide-Jørgensen, M.P., Heimlich-Boran, S., Hiby, A.R., Leopold, M.F. and Øien, N. 1995 *Distribution and abundance of the harbour porpoise and other small cetaceans in the North Sea and adjacent waters*. Final report to the European Commission, LIFE contract: 92-2/UK/027, 240 pp.
- Ingram S., Englund A. and Rogan E. 2001 *An extensive survey of bottlenose dolphins (*Tursiops truncatus*) on the west coast of Ireland*. Final report to the Heritage Council. Grant WLD/2001/42. 17pp
- Ingram S.N. 2000 *The ecology and conservation of bottlenose dolphins in the Shannon Estuary, Ireland*. Unpublished PhD thesis, University College Cork. 213pp
- Leopold, M.F., Wolf, P.A. and Van de Meer, J. 1992 The elusive harbour porpoise exposed: strip transect counts off south-western Ireland. *Netherlands Journal of Sea Research*, 29, 395-402.
- O'Brien J. 2004a *Blue Whiting Survey 2004: Cetacean Distribution & Relative Abundance Survey*. Report to the IWDG and Marine Institute.
- O'Brien J. 2004b *North-west Herring Acoustic Survey 2004: Cetacean Distribution & Relative Abundance Survey*. Report to the IWDG and Marine Institute.
- O'Brien J. and Berrow S.D. 2005 *The impact of Multibeam on cetaceans: A Review of Best Practice*. Unpublished report to the National Parks and Wildlife Service.
- Ó Cadhla, O., Mackey, M., Aguilar de Soto, N., Rogan, E. and Connolly, N. 2004 *Cetaceans and Seabirds of Ireland's Atlantic Margin. Volume II – Cetacean distribution and abundance*. Report on research carried out under the Irish Infrastructure Programme (PIP): Rockall Studies Group (RSG) projects 98/6 and 00/13, Porcupine Studies Group project P00/15 and Offshore Support Group (OSG) project 99/38. Coastal and Marine Resources Centre, University College Cork.
- ORCA 2005 Organisation Cetacea. Website: <http://www.orcaweb.org.uk/>
- OSPAR 1998 *Convention for the protection of the marine environment of the north-east Atlantic*. OSPAR Commission, London.
- Pollock, C., Reid, J.B., Webb, A. and Tasker, M.L. 1997 *The distribution of seabirds and cetaceans in the waters around Ireland*. Report, No. 267, Joint Nature Conservation Committee, Peterborough.
- Reid, J.B., Evans, P.G.H. and Northridge, S.P. 2003 *Atlas of Cetacean Distribution in north-west European Waters*. Joint Nature Conservation Committee, Peterborough.

- Sea Watch 2003 The Sea Watch Foundation. *Website: <http://www.seawatchfoundation.org.uk/>*
- SMRU 2004 Scans II Survey. *Website: <http://biology.st-andrews.ac.uk/scans2/index.html>*
- Stone, C.J., 2003 *The effects of seismic activity on marine mammals in UK waters, 1998-2000*. JNCC Report 323, 75 pp
- Wall D. 2004a *Blackrock Prospect Geohazard Survey 2004: Cetacean Distribution, Relative Abundance & Survey Mitigation Procedures*. Unpublished Report to Marine Institute and Providence Resources P.l.c.
- Wall D. 2004b *Herring Acoustic Survey 2004: Cetacean Distribution & Relative Abundance Survey*. Unpublished report to the IWDG and Marine Institute.
- Wall D. 2003 *Ground Fish Survey 2003: Cetacean Distribution & Relative Abundance Survey*. Report to the IWDG and Marine Institute.
- Wall, D., O'Brien J., Meade J. and Allen B.M. 2006 Summer distribution and relative abundance of cetaceans off the west coast of Ireland. *Biology and Environment: Proceedings of the Royal Irish Academy B. (in press)*
- Wall, D., O'Brien J., Meade J. and Allen B.M. 2004 Summer distribution and relative abundance of cetaceans off the west coast of Ireland. Final Report to the Heritage Council, Grant Ref: 13552
- WDCS 2005 Whale and Dolphin Conservation Society. *Website: <http://www.wdcs.org/>*

**Appendix I:** Published Cetacean Surveys in Irish Waters.

<b>Author(s)</b>	<b>Who</b>	<b>Year</b>	<b>Area</b>	<b>Season</b>	<b>Survey Method</b>
Wall D. (2004b)	IWDG	2004	South Coast	Winter	RA/ D
Wall <i>et al.</i> (2004)	IWDG	2004	North Coast, South-west Coast & Rockall Bank	Spring/Summer	RA/ D
O'Brien J. (2004a)	IWDG	2004	Shelf Edge, Porcupine Bank & South Coast	Spring	RA/ D
O'Brien J. (2004b)	IWDG	2004	NW Coast	Winter	RA/ D
Wall D. (2003)	IWDG	2003	NW Coast	Autumn	RA/ D
Reid <i>et al.</i> (2003)	JNCC	1979 - 2003	Irish Shelf, Irish Sea & Rockall Bank	Spring /Summer	JNCC
Reid <i>et al.</i> (2003)	SeaWatch	1960 - 2003	UK	All Seasons	LBC/ER
Brereton <i>et al.</i> (2004)	ARC	2001	NW Europe - Atlantic	All Seasons	RA/ D
Ingram <i>et al.</i> (2001)	UCC	2001	West Coast Bays	Summer	Photo ID
Ingram S.N. (2000)	UCC	1994 -1999	Shannon Estuary	All Seasons	Photo-ID
O'Cadhla <i>et al.</i> (2004)	CMRC	1999 - 2001	Irish Shelf, Porcupine Bank, Hatton Bank, Rockall Trough & Bank.	Spring & Summer	JNCC & Trial Methods
Berrow <i>et al.</i> (2002)	IWDG	1991 - 2001	Ireland	All Seasons	LBC/ER
O'Cadhla <i>et al.</i> (2004)	CMRC	2000	Porcupine Bank & Rockall Trough	Summer	AAS
Clark & Charif (1998)	Cornell / JNCC	1996 - 1997	Deep Waters off West Coast	All Seasons	D/A
Hammond <i>et al.</i> (1995)	SCANS	1994	Celtic Sea	Summer	AAS
Berrow <i>et al.</i> (1996)	IWDG / UCC	1993 - 1994	Shannon Estuary	Spring to Autumn	AS & Photo-ID
Gordon <i>et al.</i> (1999)	IFAW / IWDG	1993	NW of Belmullet	Summer	RA/V&A
Leopold <i>et al.</i> (1992)	NIS	1992	SW Coast	Summer (Single Day)	AAS

Organisations: IWDG = Irish Whale and Dolphin Group, ARC = Atlantic Research Coalition, JNCC = Joint Nature Conservancy Council, UCC = University College, Cork, CMRC = Coastal and Marine Research Centre, IFAW = International Fund for Animal Welfare, NIS = Netherland Institute for Sea Research

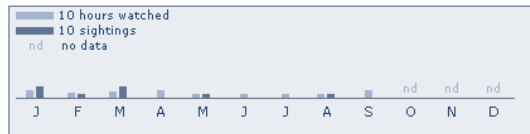
Survey techniques: RA/ D = Relative Abundance and distribution, RA/V&A = Relative Abundance and Visual & Acoustic, LBC/ER = Land Based Casual & Effort Related, S = Absolute Abundance Survey

## Appendix IV: Marine SAC monitoring watch data

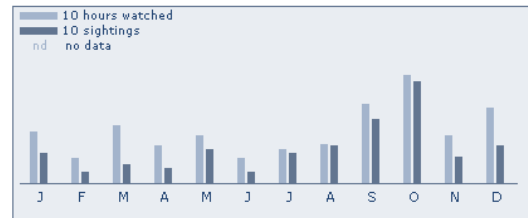
Effort watches from Castle Point, Roaringwater Bay, County Cork

Date	Start Time	Sea State	Duration	No of Sightings	Species and Numbers	Sightings rate (per hr)	Observer
28-01-05	9:45	1	120	3	10+ HP	1.50	Padraig Whooley, Patrick Graham
14-02-05	10:35	2	90	1	3 HP	0.67	Padraig Whooley, Patrick Graham
10-03-05	12:35	1	70	4	6-9 HP	3.42	Padraig Whooley
31-03-05	10:30	3	30	0	0	0	Padraig Whooley
14-04-05	19:00	0	65	0	0	0	Padraig Whooley
29-04-05	10.00	2	60	0	0	0	Patrick Graham
17-05-05	15.00	2	60	1	2 HP	1	Patrick Graham
09-06-05	10.00	1-2	60	0	0	0	Patrick Graham
29-07-05	10.00	2-3	60	0	0	0	Patrick Graham
12-08-05	10.00	1-2	60	1	3 HP	1	Patrick Graham
05-09-05	18.00	2	60	0	0	0	Patrick Graham
29-09-05	10.00	3	60	0	0	0	Patrick Graham

Species: HP = Harbour Porpoise



Month	Hours	Sghts	Avg/hr
January	2	3	1.5
February	1.5	1	0.7
March	1.7	3	1.8
April	2.1	0	0
May	1	1	1
June	1	0	0
July	1	0	0
August	1	1	1
September	2	0	0
October	[no data]		
November	[no data]		
December	[no data]		



Month	Hours	Sghts	Avg/hr
January	13.7	8	0.6
February	6.8	3	0.4
March	15.4	5	0.3
April	10.2	4	0.4
May	12.6	9	0.7
June	6.5	3	0.5
July	8.9	8	0.9
August	10.3	10	1
September	21	17	0.8
October	28.8	27	0.9
November	12.7	7	0.6
December	20.2	10	0.5

Effort watches from Slea Head, Co Kerry

Date	Start Time	Sea State	Duration	No of Sightings	Sightings	Sightings rate (per hr)	Observer
26-01-05	10:40	2	180	4	6HP, 10-12BND	1.33	Mick O'Connell
05-02-05	15:30	2-3	100	2	c. 5 HP	1.2	Mick O'Connell
16-02-05	11:20	2	130	2	6-8 HP	0.92	Mick O'Connell
06-03-05	16:00	1-2	120	2	1 MW, 5BND	1.00	Mick O'Connell
21-03-05	10:00	2	180	1	1 MW	0.33	Mick O'Connell
29-03-05	12:30	2	100	0	0	0	Pascal Dower
03-04-05	12:00	2	100	0	0	0	Pascal Dower
16-04-05	14:00	3	150	0	(2 Basking sharks)	0	Mick O'Connell
20-04-05	11.10	2	180	3	2MW, 1HP (2 Basking sharks)	1.0	Mick O'Connell
20-04-05	15.30	1	100	3	1 HP, 1MW, 5 Do	1.8	Mick O'Connell
10-05-05	11.40	2	110	3	1MW, 3HP	1.64	Mick O'Connell
30-05-05	9.30	2	150	1	1HP	0.40	Mick O'Connell & Pascal Dower
10-06-05	16.30	3	120	1	1MW	0.5	Mick O'Connell
28-06-05	11.20	1	180	2	6HP (1 Sunfish)	0.67	Mick O'Connell
11-07-05	19.40	2	120	2	5HP, 1 Do	1.0	Mick O'Connell
21-07-05	17.30	1	45	1	8HP	1.33	Mick O'Connell
28-07-05	19.30	1	100	1	19HP (1 Sunfish)	0.60	Mick O'Connell
03-08-05	20.00	3	50	2	9HP	2.4	Mick O'Connell
07-08-05	13.50	1	160	2	15HP, 2MW	0.75	Mick O'Connell
27-08-05	16.25	2	180	3	12HP, 2MW, 40CD	1.0	Mick O'Connell
23-09-05	15.30	3	180	1	1MW	0.33	Mick O'Connell
11-10-05	11.55	2	180	3	8HP, 1MW	1.0	Mick O'Connell
28-10-05	14.20	4	120	1	3HP	0.5	Mick O'Connell
15-11-05	12.00	3	100	1	2HP	0.6	Pascal Dower
17-11-05	11.40	2	120	0	0	0	Mick O'Connell
5-12-05	11.45	3	80	1	2HP	0.75	Pascal Dower
6-12-05	11.50	2	120	2	8HP, 1MW	1.0	Mick O'Connell

Species: HP = Harbour Porpoise, BND = Bottlenose Dolphin, MW = Minke Whale, CD=Common Dolphin,

Do=Dolphins