

Ireland. Progress report on cetacean research, May 2008 to May 2009, with statistical data for the *calendar year* 2008

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This report summarises information obtained from:

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1. SPECIES AND STOCKS STUDIED

IWC common name	IWC recommended scientific name	Area/stock(s)	Items referred to
Humpback whale	<i>Megaptera novaeangliae</i>	NE Atlantic	2.1.2, 3.1.1, 4.1
Fin whale	<i>Balaenoptera physalus</i>	NE Atlantic	2.1.2, 3.1.1, 4.1, 4.3, 8
Minke whale	<i>Balaenoptera acutorostrata</i>	NE Atlantic	2.1.1, 4.3, 8
Harbour porpoise	<i>Phocoena phocoena</i>	NE Atlantic	2.1.1, 2.1.2, 4.3, 8
Common dolphin	<i>Delphinus delphis</i>	NE Atlantic	2.1.2, 4.3, 8, 9
Striped dolphin	<i>Stenella coeruleoalba</i>	NE Atlantic	4.3, 8
Bottlenose dolphin	<i>Tursiops truncatus</i>	NE Atlantic	2.1.1, 2.1.2, 3.1.1, 4.1, 4.3, 8, 9
Atl. white-sided dolphin	<i>Lagenorhynchus acutus</i>	NE Atlantic	4.3, 8
White-beaked dolphin	<i>L. albirostris</i>	NE Atlantic	2.1.1
Long-finned pilot whale	<i>Globicephala melas</i>	NE Atlantic	4.3, 8
Risso's dolphin	<i>Grampus griseus</i>	NE Atlantic	2.1.1, 3.1, 4.3, 8
Killer whale	<i>Orcinus orca</i>	NE Atlantic	2.1.1
Pygmy sperm whale	<i>Kogia breviceps</i>	NE Atlantic	4.3, 8
True's beaked whale	<i>Mesoplodon mirus</i>	NE Atlantic	4.3, 8
Sperm whale	<i>Physeter macrocephalus</i>	NE Atlantic	8

2. SIGHTINGS DATA

2.1 Field work

2.1.1 Systematic

Target species	Date	Area	No. of sightings	Contact person/institute and references
Harbour porpoise	July-Sept/08	5 sites (North County Dublin, Dublin Bay, Cork Coast, Roaringwater Bay, Galway Bay)	269 13 CD, 8 MW, 1 BND	Simon Berrow (IWDG)

Harbour porpoise	July-Sept/08	3 sites (Donegal Bay, Blasket Islands)	63 HP 4MW, 2BND, 2CD	Simon Berrow (IWDG)
Bottlenose dolphin	July-Sept/08	3 sites (Donegal Bay, Blasket Islands)	5 BND	Simon Berrow (IWDG)
Bottlenose dolphin	Jan-Dec	Shannon Estuary	8 BND	Simon Berrow (SDWF)
Bottlenose dolphin	June-Sept 08	NE Atlantic/ West coast of Co. Mayo	8	M. Oudejans (DNT)
Common dolphin	June-Sept 08	NE Atlantic/ West coast of Co. Mayo	6	M. Oudejans (DNT)
Risso's dolphin	June-Sept 08	NE Atlantic/ West coast of Co. Mayo	4	M. Oudejans (DNT)
Harbour porpoise	June-Sept 08	NE Atlantic/ West coast of Co. Mayo	15	M. Oudejans (DNT)
Minke whale	June-Sept 08	NE Atlantic/ West coast of Co. Mayo	2	M. Oudejans (DNT)
White beaked dolphin	June-Sept 08	NE Atlantic/ West coast of Co. Mayo	1	M. Oudejans (DNT)
Unidentified dolphin	June-Sept 08	NE Atlantic/ West coast of Co. Mayo	4	M. Oudejans (DNT)
Harbour porpoise	Sept 08	Connemara	2	E. Rogan/A. Englund (ZEPS/UCC)
Bottlenose dolphin	June-Sept 08	Cork Harbour	5	E. Rogan/A. Englund (ZEPS/UCC)
Bottlenose dolphin	June-Sept 08	Shannon Estuary	22	E. Rogan/ A. Englund (ZEPS/UCC)
Bottlenose dolphin	Sept 08	Connemara	0	E. Rogan/ A. Englund (ZEPS/UCC)
Risso's dolphin	Sept 08	Connemara	1	E. Rogan/ A. Englund (ZEPS/UCC)

During 2008, eight coastal sites around the entire Irish coast were surveyed by IWDG to determine the density of harbour porpoises in order to identify potential sites for designation as Special Areas of Conservation (SAC) (see Berrow et al., 2008 a; 2008b). These sites ranged from 104 to 547 km². During 37 days at sea, 475 track-lines totalling 20,662km of effort were surveyed in sea-state ≤ 2 using distance sampling. From the total of 332 sightings, 618 individual porpoises were observed. Overall densities ranged from 2.03 to 0.53 porpoise per km²; mean group size ranged from 1.19 to 2.67 animals. The proportion of young was typically 6-8% but 14 and 18% were recorded at two sites. Abundance estimates ranged from 87 to 402 porpoises depending on the density estimate and area of the site. The occurrence of bottlenose dolphins in Donegal Bay was reviewed and its suitability as a Special Area of Conservation for bottlenose dolphins assessed (Berrow, 2008). Eight dedicated boat-based surveys were carried out in Donegal Bay between July and September 2008. A total of 637km were surveyed. Over 90% of the entire survey time was carried out in sea-state ≤ 2 . Bottlenose dolphins were recorded during three visits to this site. A total of five groups were recorded. Dedicated surveys (n = 8) were also carried out in the coastal waters of County Mayo (NW Ireland) to determine population size, habitat use and site fidelity of bottlenose dolphins (Oudejans, 2008) and in Connemara, Cork and in the Shannon estuary (UCC). Standardised boat surveys and photo-identification of individual bottlenose dolphins were used to estimate the abundance of bottlenose dolphins using the Lower River Shannon SAC (Englund et al., 2008). A total of 11 surveys were conducted between June 14 and September 28 resulting in 22 encounters with bottlenose dolphin groups.

2.1.2 Opportunistic, platforms of opportunity

Primary species	Area	Data type/method	Collected by	Platform	Location of archive (if applicable)	Contact person/institute and refs
Bottlenose dolphin	Shannon estuary	Photo-ID	Research scientists	whalewatching vessel	SDWF	Simon Berrow (SDWF)
Fin whale	Ireland Celtic Sea	Photo-ID	Researcher	whalewatching vessel	IWDG	Padraig Whooley (IWDG)
Humpback whale	Ireland Celtic Sea	Photo-ID	Researcher	whalewatching vessel	IWDG	Padraig Whooley (IWDG)
All Species	Irish EEZ & Adjacent	Line Transect Survey	Research Scientists	Research Vessels, Naval Vessels, Commercial Ferries.	IWDG	Dave Wall (IWDG)

	Waters					
Bottlenose dolphin	NE Atlantic/ Co. Mayo	Photo-ID; sightings	crew / dedicated observer	marine-based tourism vessel	National biodiversity data centre Ireland	M. Oudejans (DNT)
Harbour porpoise	NE Atlantic/ Co. Mayo	sightings	crew / dedicated observer	marine-based tourism vessel	National biodiversity data centre Ireland	M. Oudejans (DNT)
Common dolphin	NE Atlantic/ Co. Mayo	sightings	crew	marine-based tourism vessel	National biodiversity data centre Ireland	M. Oudejans (DNT)
Risso's dolphin	NE Atlantic/ Co. Mayo	sightings	crew / dedicated observer	marine-based tourism vessel	National biodiversity data centre Ireland	M. Oudejans (DNT)
Killer whale	NE Atlantic/ Co. Mayo	sightings	fishermen	fishing vessel	National biodiversity data centre Ireland	M. Oudejans (DNT)
Unidentified dolphin	NE Atlantic/ Co. Mayo	sightings	crew / dedicated observer	marine-based tourism vessel	National biodiversity data centre Ireland	M. Oudejans (DNT)

As part of the ongoing monitoring of dolphin tour boats in the Lower River Shannon cSAC the SDWF carried out 30 trips on whale-watching vessels. A total of 40 individual dolphins were identified of which 38 had been recorded previously. Of the 40 dolphins 25% had been recorded from tour boats in 1999 and 43% in 2007. A review of the SDWF tour boat monitoring data was carried out by Miller (2008). She suggested the data showed no strong relationships between the cumulative exposure of dolphins (using nine years data) to tour boats and four variables which were chosen as indicators. The distribution of tour boat trips appears to have shifted from one primary concentration, to two separate areas of concentration, which may be a reflection of changes in dolphin distribution. In addition, three opportunistic surveys were carried out on a nature tour boat in Mayo (DNT).

2.2 Analyses/development of techniques

Target species	Date	Area	Methods/effort	Parameters/ factors measured	Contact person/institute; refs
Fin whale	Sept-Dec/08	Celtic Sea	Whale Watch Vessel	Distribution; sighting frequency, Photo-ID	Padraig Whooley (IWDG)
Bottlenose dolphin	July-Sept/08	3 sites (Donegal Bay, Blasket Islands)	Line transect survey to estimate densities using distance sampling	Distribution, density estimates, photo-ID	Simon Berrow (IWDG)
Harbour porpoise	July-Sept/08	3 sites (Donegal Bay, Blasket Islands)	Line transect survey to estimate densities using distance sampling	Distribution, density estimates	Simon Berrow (IWDG)
Harbour porpoise	July-Sept/08	5 sites (North County Dublin, Dublin Bay, Cork Coast, Roaringwater Bay, Galway Bay)	Line transect survey to estimate densities using distance sampling	Distribution, density estimates	Simon Berrow (IWDG)

Single platform line-transect surveys were carried out on six days at eight sites between July and September 2008. Density estimates of harbour porpoises were calculated using DISTANCE (Version 5, University of St Andrews, Scotland), calculated using the track-line as the sample and the sighting as the observation. In this survey we assumed that all animals on the track-line were observed ie. $g(0) = 1$.

Summary table from Berrow *et al.* (2008 a; 2008b)

Location	Area (km ²)	Mean group size	% young	Density (per km ²)	Abundance ± SE (95% Confidence Intervals)	CV	Reference
North County Dublin	104	1.41	8	2.03	211±47.1 (137-327)	0.23	Berrow <i>et al.</i> (2008a)
Dublin Bay	116	1.19	6	1.19	138±33.2 (86-221)	0.24	Berrow <i>et al.</i> (2008a)
Cork coast	326	2.67	0	0.53	173±56.6 (92-326)	0.33	Berrow <i>et al.</i> (2008a)
Roaringwater Bay	128	2.21	7	1.24	159±42 (95-689)	0.27	Berrow <i>et al.</i> (2008a)
Galway Bay	547	2.15	7	0.73	402±84.1 (267-605)	0.21	Berrow <i>et al.</i> (2008a)
Carnsore Point	151	1.91	14	0.58	87±36.3 (39-196)	0.42	Berrow <i>et al.</i> (2008b)
Blasket Islands	227	1.76	18	1.65	372±105.3 (216-647)	0.28	Berrow <i>et al.</i> (2008b)
Donegal bay	281	2.40	8	0.88	249±111.5 (106-586)	0.45	Berrow <i>et al.</i> (2008b)

3. MARKING DATA

3.1 Field work

3.1.1 Natural marking data

Species	Feature	Area/stock	No. photo- ID'd	Catalogue (Y/N)	Catalogue total	Contact person/institute; refs
Humpback whale	Fluke	N.E. Atlantic	3	Y	10	P. Whooley (IWDG)
Humpback whale	Dorsal fin	N.E. Atlantic	3	Y	10	P. Whooley (IWDG)
Fin whale	Dorsal Fin, Chevron, Natural Scarring etc.	N.E. Atlantic	20	Y	62	P. Whooley (IWDG)
Bottlenose dolphin	Dorsal fin	Shannon estuary	40	Y	180	S. Berrow (SDWF)
Bottlenose dolphin	Dorsal fin	Donegal Bay	44	Y	44	S. Berrow (IWDG)
Bottlenose dolphin	Dorsal fin	Coastal Ireland	25	Y	25	S. Berrow (IWDG)
Bottlenose dolphin	Dorsal fin	Galway Bay	37	Y	37	J. O'Brien (GMIT)
Bottlenose dolphin	Dorsal fin	Clew Bay	11	Y	11	J. O'Brien (GMIT)
Bottlenose dolphin	Dorsal fin	Shannon Estuary	196	Y	410	E. Rogan/A.Englund (UCC)
Bottlenose dolphin	Dorsal fin	West and south coast of Ireland	6	Y	123	E. Rogan/A.Englund (UCC)
Bottlenose dolphin	Dorsal fin	Broadhaven Bay	17	N		M.Coleman (UCC)
Bottlenose dolphin	Dorsal fin	NE Atlantic/ West coast of Co. Mayo	85	Y	85	M. Oudejans (DNT)
Risso's dolphin	Dorsal fin	NE Atlantic/ West coast of Co. Mayo	16	Y	16	M. Oudejans (DNT)

Bottlenose dolphin photo-id catalogues were compiled by GMIT and IWDG in 2008 for Galway Bay, Clew Bay, Donegal Bay and coastal Ireland (n=116), and between each of these catalogues a total of 16 individual dolphins were re-sighted ranging over distances of 130-650km (O'Brien *et al.* 2008a). Dorsal fin photos are used for individual recognition and occasionally the occurrence of scoliosis (see Berrow and O'Brien, 2006). Using photo-identification mark-recapture (UCC), the number of bottlenose dolphins using the Shannon SAC during June to September 2008 was 14 ± 16.9 (SE) (CV= 0.15, 95% CI 85-152). Lasermetrics were also used during this study to examine sexual dimorphism in bottlenose dolphins (Englund *et al.*, 2008a).

4. TISSUE/BIOLOGICAL SAMPLES COLLECTED

4.1 Biopsy samples (summary only)

Species	Area/stock	Calendar year/ season - no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Bottlenose dolphins	NE Atlantic	2008/4	Y	50	50	Emer Rogan (UCC)
Fin whale	NE Atlantic	Nov 2008 n=11	Y	11	11	Simon Berrow (IWDG)
Humpback whale	NE Atlantic	Nov 2008 n=1	Y	1	2	Simon Berrow (IWDG)

4.2 Samples from directed catches (commercial, aboriginal and scientific permits) or bycatches

No samples were collected from bycatches in this calendar year.

4.3 Samples from stranded animals

Species	Area/stock	Tissue type(s)*	No. collected	Archived (Y/N)	No. analysed	Contact person/institute
Fin whale	NE Atlantic	Skin, blubber, liver	1	Y		UCC, IWDG
Atlantic white-sided dolphin	NE Atlantic	Skin	3	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Common dolphin	NE Atlantic	Skin	11	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Harbour porpoise	NE Atlantic	Skin	5	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Bottlenose dolphin	NE Atlantic	Skin	3	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Striped dolphin	NE Atlantic	Skin	5	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Long-finned pilot whale	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Minke whale	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Pygmy sperm whale	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Risso's dolphin	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Fin whale	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
True's beaked whale	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Baleen whale species	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Beaked whale species	NE Atlantic	Skin	1	Y		Dr. Ruth Carden (NMI-NH / IWDG)
Unknown cetacean	NE Atlantic	Skin	2	Y		Dr. Ruth Carden (NMI-NH / IWDG)

4.4 Analyses/development of techniques

Gender of fin and humpback whales from which tissue samples were obtained was determined using PCR amplification of ZFX and SRY genes. Specimens of known gender were used as blind controls to validate the technique. The results showed that all the fin whales sampled were male. This suggests these whales might be showing sex based spatial or temporal segregation on feeding grounds off the south coast of Ireland (Ian O'Connor, GMIT).

5. POLLUTION STUDIES

There are no on-going studies to examine contaminant levels.

6. STATISTICS FOR LARGE CETACEANS

6.1 Corrections to earlier years' statistics for large whales

Not applicable

6.2 Direct catches of large whales (commercial, aboriginal and scientific permits) for the calendar year 2008

Not Applicable

6.3 Anthropogenic mortality of large whales for the calendar year 2008

6.3.1 Observed or reported ship strikes of large whales (including non-fatal events)

No ships strikes were observed or reported

6.3.2 Fishery bycatch of large whales

No bycatch of large whales was reported during this period. However, it should be noted that post-mortem examination of stranded animals are not currently been carried out and dedicated observer programmes operate at a very low level of coverage.

7. STATISTICS FOR SMALL CETACEANS

7.1 Corrections to earlier years' statistics for small cetaceans

Not applicable

7.3 Anthropogenic mortality of small cetaceans for the calendar year 2008

7.3.1 Observed or reported ship strikes of small cetaceans (including non fatal events)

No ships strikes were observed or reported

7.3.2 Fishery bycatch of small cetaceans

No bycatch of large whales was reported during this period. However, it should be noted that post-mortem examination of stranded animals are not currently been carried out and dedicated observer programmes operate at a very low level of coverage. Of 14 hauls observed in a pelagic fishery for albacore tuna, no cetacean bycatch was observed (BIM).

8. STRANDINGS

Species	No. strandings	No. post mortems	Contact person(s)/ Institute(s)	Contact email address(es)
Harbour porpoise	31	1	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Common dolphin	24	1	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Pilot whale	17	1	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Striped dolphin	11	1	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Atlantic white-sided dolphin	9	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Bottlenose dolphin	5	2	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Minke whale	4	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Cuvier's beaked whale	4	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
White-beaked dolphin	2	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Fin whale	2	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Risso's dolphin	1	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Sowerby's beaked whale	1	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Sperm whale	1	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Dolphin/porpoise sp.	15	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Beaked whale sp.	3	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Whale sp.	2	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie
Cetacean sp.	2	0	Mick O'Connell (IWDG)	mick.oconnell@iwdg.ie

A total of 134 stranding records were reported during 2008, down slightly on 2007 when 144 records were received (O'Connell and Berrow in press). At least 13 species were identified with harbour porpoise and

common dolphin being the two most frequently stranded species, accounting for 23.1% and 17.9% respectively. The relatively high number of striped dolphin strandings has continued with 11 records in 2008 compared to 7 in 2007 and 17 in 2006. Results from 2008 showed a marked increase in strandings of some deep-diving species (beaked and pilot whales), especially from February to April. A similar trend was noted for the same species in the UK and France and are considered atypical and an unprecedented event (Dolman *et al.*, in press). A total of eight beaked whales (including four Cuvier's beaked whale were reported, which is the highest annual total reported. Pilot whales were the third most frequently recorded species stranding during 2008 with 17 recorded incidents (12.7% of stranding records. All records are validated by the IWDG and published in the Irish Naturalists' Journal (O'Connell and Berrow in press).

9. OTHER STUDIES AND ANALYSES

Nuclear and mitochondrial genetic analyses of mainly bycaught common dolphins revealed the presence of at least two distinct populations on either side of the North Atlantic Ocean (Mirimin *et al.* 2009). This study suggested that potentially large populations exist on either side of the North Atlantic, where gene flow appears to be strong at a regional scale (i.e. within east and west North Atlantic). No evidence of recent reduction of effective population size (bottleneck) was detected using a panel of 14 microsatellite loci.

Systematic marine mammal observations have been conducted in Broadhaven Bay, Co. Mayo in relation to the construction of a gas pipeline. A total of 336 hours of dedicated observation (cliff and boat based) were carried out between May and October 2008. A total of 73 sightings of 6 species of cetaceans were observed during this period. Observations included: minke whale, killer whale, Risso's dolphin, bottlenose dolphin, common dolphin and harbour porpoise. Risso's and bottlenose dolphin calves were also regularly sighted. Acoustic monitoring using T-PODs were also used in order to monitor dolphin and porpoise presence close to the construction site between June 12th and December 6th resulting in a total of 7853 hours. Regular occurrence of dolphin species and harbour porpoises was detected (Coleman *et al.*, 2008).

Acoustic recordings using a single element hydrophone and a solid state recorder were made during photo-identification surveys for bottlenose dolphins, resulting in 15 hours of recordings collected in the Shannon Estuary and Cork Harbour. A total of 710 whistle contours has so far been extracted and will be used to compare the whistle repertoire between different communities of bottlenose dolphins in Irish waters as part of a PhD (Englund *et al.*, 2008b).

A total of 58 bottlenose dolphin skin samples were collected using biopsy sampling from the Shannon estuary putative population (n = 46), Cork Harbour (n = 4) and from 14 individuals that stranded along the west and north coast of Ireland. Genetic variability was surveyed using a panel of 15 nuclear microsatellite loci and 544 base pairs of the mitochondrial (mt) DNA control region. No evidence of inbreeding or bottleneck was found in the Shannon sample, although mitochondrial haplotype diversity was low (0.335 ± 0.077). There was strong evidence using both classes of markers that the four dolphins that stranded more than 100 Km from the Shannon estuary were genetically differentiated from the Shannon and Cork samples. Further sampling this year will elucidate if additional population structure exists along the west coast of Ireland (UCC).

10. LITERATURE CITED

Include all references cited in the text here. Please follow the official IWC style guide for references (<http://www.iwcoffice.org/publications/styleguide.htm>).

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O'Brien, J., Berrow, S., Ryan, C., Whooley, P., McGrath, D. and O'Connor, I. (2008a) Evidence for long-distance movements of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photo-identification. Report to the National Parks and Wildlife Service.

O'Connell, M. and Berrow, S. (2008) Records from the Irish Whale and Dolphin Group. *Irish Naturalists' Journal* 29(1), 40-4

11. PUBLICATIONS

11.1 Published or 'In Press' papers only

Berrow, S.D., Cosgrove, R., Leeney R.H., O'Brien, J., McGrath, D., Dalgard, J. and Le Gall, Y. (in press) Effect of acoustic deterrents on the behaviour of Common dolphins (*Delphinus delphis*). *Journal of Cetacean Research and Management*.

Berrow, S.D. (in press) Winter distribution of Bottle-nosed Dolphins *Tursiops truncatus* (Montagu) in the inner Shannon Estuary. *Irish Naturalists' Journal*.

Berrow, S.D., O'Brien, J., O'Connor, I. and McGrath, D. (2009) Abundance Estimate and Acoustic Monitoring of Harbour Porpoise *Phocoena phocoena* in The Blasket Islands Candidate Special Area of Conservation. *Biology and Environment: Proceedings of the Royal Irish Academy* 109B(1), 35-46.

Hickey, R., Berrow, S.D., and Goold, J. (in press) Towards a bottlenose dolphin whistle ethogram from the Shannon Estuary, Ireland. *Biology and Environment*

Ingram, S. Rendell, L., and Rogan, E. Prioritising estimate precision when designing monitoring surveys of bottlenose dolphins (*Tursiops truncatus*) in a coastal marine protected area. *Biological Conservation*

Luque, P.L., Pierce G.J., Learmonth J.A., Santos M.B., Ieno E., López A., Reid R.J., Rogan, E., González, A.F., Boon, J., Law, R.J. and Lockyer, C.H. (in press) Dentinal anomalies in teeth of harbour porpoises (*Phocoena phocoena*) from Scottish waters: are they linked to sexual maturation and environmental events? *JMBA* doi:10.1017/S0025315409001866

Mirimin, L., Westgate, A., Rogan, E., Rosel, P., Read, A., Coughlan, J. and Cross, T. 2009. Population structure of short-beaked common dolphins (*Delphinus delphis*) in the North Atlantic Ocean as revealed by mitochondrial and nuclear genetic markers. *Mar. Biol.* 156: 821-34

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11.2 Unpublished literature

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