

# Shannon Dolphin Tour Boat Monitoring Report – 2009

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## **Introduction**

The Shannon Estuary is a candidate Special Area of Conservation (cSAC) for bottlenose dolphins *Tursiops truncatus*. Commercial dolphin-watching is carried out within the estuary and is listed as a Notifiable Activity by the National Parks and Wildlife Service (NPWS). Consent is therefore required from the NPWS for those operators wishing to dolphin-watch within the cSAC. All operators receiving consent are required to “provide monitoring data for each trip in the prescribed form as outlined in the data sheet Tour Boat Monitoring Protocol 2000”.

The Shannon Dolphin and Wildlife Foundation (SDWF) were contracted by National Parks and Wildlife Service to implement this monitoring protocol in compliance with requirements under the EU Habitats Directive during the 2009 season.

## **Methodology**

Operators were required to fill out a log-sheet for each dolphin-watching trip they carried out. A list of accredited operators for the 2009 season was forwarded by NPWS to SDWF (Appendix I) and each operator was forwarded log-sheets to record details of each dolphin trip. The log-sheet prompts for information on trip length, time to locate dolphins, number of groups and dolphins observed, presence and estimated number of calves, location of dolphins and the time for which each group was watched. The SDWF have produced a log-sheet for the inner and the outer estuary to ensure operators can accurately plot their route and the location of dolphins watched.

Photo-identification is carried out on a sample of trips (target 10% of total trips) to determine which dolphins were being watched from tour boats. This also provided an opportunity to cross reference the operator’s records with SDWF records to assess their interpretation of the monitoring indices that they are required to record.

## **Results**

Of the 241 log-sheets received during 2009, there were data fields missing on 16 (6.6%) of log-sheets. The 12 missing fields from Carrigaholt were mostly related to sea and weather conditions, with one relating to time to locate dolphins. The number of log-sheets missing data from Kilrush was 12, down

50% on 2008. Of the 19 missing fields, nine related to weather and sea conditions, four to trip length and just two to time spent with dolphins. During 2009, SDWF accompanied 36 trips (17 from Kilrush and 19 from Carrigaholt), which was 14.9% of the total carried out, almost 5% above the target for the season. Data for eight monitoring indices, which were collected during 2009, are presented below.

1. *Number of operators and trips*

Only two companies, with one dolphin-watching vessel each, carried out dolphin-watching in the Shannon Estuary cSAC during 2009 (Appendix I). The total reported number of trips (241) were 80 (22%) less than reported in 2008 with trips from Carrigaholt down by 10% and Kilrush by 33 %. Similarly to 2008, most trips were carried out in July, and not August due to bad weather during that month. Of the total number of trips, 106 (44%) departed from Kilrush and 135 (56%) departed from Carrigaholt in County Clare. Monthly distribution of trips was consistent with previous years with most (53%) trips carried out in July and August (Table 1).

**Table 1. Number of dolphin-watching trips carried out from two ports in County Clare in the Shannon Estuary during 2009**

Month	Port		Total	% Total
	Carrigaholt	Kilrush		
April	9	5	14	5.8%
May	14	11	25	10.4%
June	25	26	51	21.2%
July	37	29	66	27.3%
August	34	28	62	25.7%
September	10	4	14	5.8%
October	6	3	9	3.7%
<b>Total</b>	<b>135</b>	<b>106</b>	<b>241</b>	

2. *Length of trip*

The mean length of each dolphin-watching trip is shown in Table 2 together with the same data from previous years. The mean length was greater from Carrigaholt than from Kilrush which is consistent with 2008. This was the longest mean trip length (10.9 minutes longer than the nine-year average) reported from Carrigaholt since monitoring began, however as fewer trips were carried out each day due to poor weather, the operator from Carrigaholt could increase trip length to include other aspects of interest to his customers, thus providing more value for money. Carrigaholt unlike Kilrush is not restricted by the opening times of lock gates which allowed considerably more flexibility in trip length. Trip length from Kilrush was the second highest recorded (Table 2), which might reflect a seaward shift in the distribution of dolphins (see page 8) with dolphins occurring farther from Kilrush and thus

increasing searching time. Trip length is influenced by weather conditions, increasing in poor weather as it takes longer to locate dolphins, as well as dolphin distribution.

**Table 2. Mean length (minutes) of dolphin-watching trips from 2000 – 2009**

Port	Year								
	2000	2001	2002	2003	2005	2006	2007	2008	2009
Carrigaholt	119.6	124.9	123.6	117.8	118.6	119.1	124.7	132.3	145.0
Kilrush	133.1	129.7	125.6	115.2	110.6	119.7	127	113.2	132.1

### 3. Time to locate dolphins

Dolphins were located on 91.2% of trips overall with nine trips from Carrigaholt and 12 from Kilrush failing to locate dolphins. There were no other cetacean species seen during the trips. The mean time to locate dolphins from Carrigaholt (41.2 minutes) was nine minutes greater than in 2008, and 11 minutes greater than in 2007.

The time to locate dolphins can be strongly influenced by weather conditions as well as dolphin distribution. Consistent with the past three years, the time to locate dolphins from Kilrush was greater than 2008 by nine minutes. The time to locate dolphins from Kilrush generally increased through the summer which was consistent with previous years. Interestingly, the time to locate dolphins from Carrigaholt decreased and was lowest in July and August, suggesting greater numbers of dolphins there, despite the inclement weather. A higher proportion of trips were carried out from Carrigaholt in September and October than in most years due to the poor weather earlier in the season. Trips during Sept/Oct tend to be longer and take longer to locate dolphins which tend to be further west than during July and August.

**Table 3. Mean time (minutes) to locate dolphins from the two ports during the 2009 season (only those trips which observed dolphins are included)**

Month	Carrigaholt	Kilrush
April	48.1	31.3
May	59.2	50.1
June	47.2	48.3
July	22.0	50.1
August	39.4	55.7
September	43.8	110*
October	76.2	53.3
<b>Mean</b>	<b>41.2</b>	<b>52.2</b>

\* note only four trips carried out with two failing to locate dolphins

#### 4. Location of dolphin groups

The tour boat operating from Carrigaholt located most dolphins in Zones 1 (58.5%) and 2 (21.5%) (Table 4), which were similar to previous years (see Appendix II for location of Zones). Following an increase by 6% of trips to zone 3 in 2008, there was a decrease (3%) observed in 2009. An increase in trips to Zone 2 of around 4% was observed this year. Dolphin trips from Carrigaholt also include other aspects of wildlife and geological/cultural interest, which are more accessible in Zone 2, thus the motivation to visit Zone 2 is not purely for watching dolphins.

The tour boat from Kilrush tended to watch dolphins in Zones 7 (34%) and Zone 6 (25%), which was consistent with previous years but the number of trips to these zones were 8% and 5% down on 2008. Following an 8% increase in the location of dolphins in Zone 5 in 2008, a decrease of 13% was recorded this year. While no dolphins were watched in Zones 1 and 2 last year, 4% of trips were to these zones in 2009. The biggest change was in Zone 3 where 27% of trips were carried out in 2009 compared to only 7% in 2008. These changes reflect a decrease in the accessibility of dolphins upriver, especially around Scatterry Island and Carrig Buoy. Increased rainfall may have affected prey distribution by decreasing salinity in the estuary.

**Table 4: Zones in which tour boats watched dolphins from each port during 2009**

Zone	Carrigaholt	Kilrush	Total
	No. (%)	No. (%)	No. (%)
1	76 (58.5%)	4 (4%)	80 (34.9%)
2	28 (21.5%)	0 (0%)	28 (12.2%)
3	26 (20.0%)	27 (27%)	53 (23.1%)
4	-	6 (6%)	6 (2.6%)
5	-	4 (4%)	4 (1.7%)
6	-	25 (25%)	25 (10.9%)
7	-	33 (33%)	33 (14.4%)
<b>Total</b>	<b>130</b>	<b>99</b>	<b>229</b>

#### 5. Time on dolphins

The total time on dolphins for all vessels during 2009 was calculated as 6,809 minutes or 113.5 hours (Table 5). This is an overall decrease of 35% on 2008, which followed a 17% decrease in 2007 and 4% in 2006. The Carrigaholt boat reported an 14% decrease in overall time on dolphins, following an 18% decrease in 2008. Strikingly, a 51.8% decrease was recorded by the Kilrush boat.

**Table 5. Total time (minutes) on dolphins from the two ports during 2009 season (different groups observed within a trip are indicated)**

Month	Carrigaholt					Kilrush			
	G1	G2	G3	G4	Total	G1	G2	Total	<b>Total</b>
April	173	75	7	0	0	100	30	130	<b>130</b>
May	273	116	0	0	375	284	30	314	<b>689</b>
June	602	220	220	10	326	753	0	753	<b>1079</b>
July	761	269	52	9	1983	667	80	747	<b>2730</b>
August	745	151	49	4	949	592	125	717	<b>1666</b>
September	146	81	3	0	230	85	0	85	<b>263</b>
October	140	0	0	0	140	60	0	60	<b>200</b>
<b>Total</b>									
-minutes	2840	912	331	23	4003	2541	265	2806	<b>6809</b>
-hours	47.3	15.2	5.5	0.4	66.7	42.4	4.4	46.8	<b>113.5</b>

The requirement to spend only 30 minutes per group per trip was exceeded on three occasions from Carrigaholt, but only by an average of two minutes. The time a dolphin encounter starts and ends, is not always determined by the operator as dolphins may follow the boat on its departure from the group. The 30 minute time limit was exceeded on 5 occasions from Kilrush (compared to 21 occasions in 2008), with a maximum of 40 minutes on one group of dolphins but with an overall mean of only 6 minutes.

A total of 224 dolphin groups were watched from Carrigaholt and 107 from Kilrush resulting in a mean (standard deviation) of 18 (9) minutes spent with dolphins per group per trip from Carrigaholt and 26 (6.5) minutes from Kilrush. This corresponds to an overall average decrease of one minute spent per group across both ports compared to last year. The overall time per group per trip from both ports combined was 20.5 minutes, well within the recommended 30 minutes.

#### 6. *Number of dolphins and groups*

As shown in previous seasons, the tour boat from Carrigaholt tended to watch more groups of dolphins with a greater mean group size on each trip compared to Kilrush. The mean number of groups watched per trip from each port was consistent with previous years.

There was a consistent general trend for the numbers of groups per trip to decrease from Carrigaholt during September and October as mean group size increases. This trend has again occurred during September and October 2009, but this time it was observed from boats working out of both ports. From

previous years, the expected trend from Kilrush is for the number of groups per trip to increase through the season and the mean group size to remain fairly consistent. This trend may be due to the small sample size of just seven trips in September and October.

**Table 6. Mean number of dolphin groups and group size encountered during 2009**

Month	Carrigaholt		Kilrush	
	Group	Group size	Group	Group size
April	1.4	12.6	1.0	7.5
May	1.4	7.3	1.1	6.9
June	2.0	8.2	1.9	6.5
July	2.0	9.8	0.9	6.0
August	1.6	7.5	1.0	7.0
September	1.7	7.2	0.8	13.7
October	0.8	20.4	1.3	16.5
<b>Mean</b>	<b>1.7</b>	<b>9.2</b>	<b>1.0</b>	<b>7.9</b>

#### 7. *Number of groups with calves*

Of the 126 trips from Carrigaholt with sightings, calves were present on 81 (60.5%), which a little higher (5%) than previous years. From Kilrush, calves were present on 62 (58.1%) of the 106 trips where dolphins were observed, which is a 3% increase on 2008. The number of groups with calves increased this year, after a decrease in 2008. These data show that breeding groups are subjected to dolphin-watching in the Shannon Estuary.

#### 8. *Individual dolphins watched from tour boats*

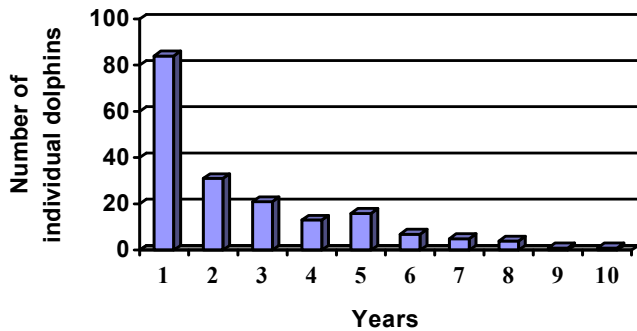
Whenever possible, the individual dolphins watched from tour boats were recorded using photo-identification. During 2009, 36 trips (17 from Kilrush and 19 from Carrigaholt) were sampled which was 15.7% of the total carried out (Table 7). Dolphins were observed on 35 (97.2%) of trips sampled.

The SDWF catalogue contains images from 187 individually recognisable bottlenose dolphins (Appendix III). A total of 47 individual dolphins were identified from tour boats during 2009 and of these, 43 (91.5%) had been previously recorded and 4 had not (Appendix III). The proportion watched in the previous two years increased from 33-43% to 43-45%. Interestingly 40-43% of dolphins recorded in 2008 had also been recorded in 2000 to 2003 and 78% in 2004. This suggests that the same dolphins have been watched for a large number of years and that they are not avoiding the tour boats, nor have they died or left the estuary.

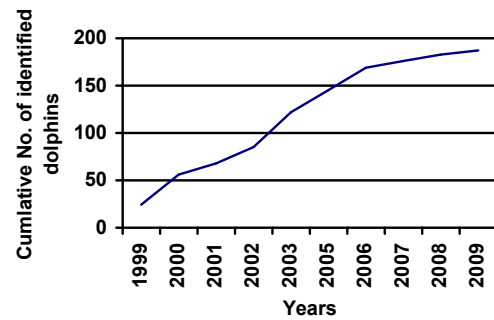
**Table 7: Number of identifiable dolphins recorded from tour boats, 1999-2009**

Year	No. of trips	No. of identified dolphins	Number (%) of dolphins recorded from tour boats in previous years										
			1999	2000	2001	2002	2003	2005	2006	2007	2008		
1999	11	22	-	-	-	-	-	-	-	-	-	-	-
2000	25	35	13 (37%)	-	-	-	-	-	-	-	-	-	-
2001	27	33	10 (30%)	19 (58%)	-	-	-	-	-	-	-	-	-
2002	31	42	11(31%)	18 (50%)	24 (67%)	-	-	-	-	-	-	-	-
2003	57	86	13 (15%)	31 (38%)	39 (45%)	32 (37%)	-	-	-	-	-	-	-
2005	43	68	13 (19%)	21 (31%)	20 (30%)	22 (32%)	39 (57%)	-	-	-	-	-	-
2006	43	61	6 (10%)	15 (24%)	19 (31%)	18 (30%)	30 (49%)	35 (57%)	-	-	-	-	-
2007	47	32	5 (16%)	12 (38%)	7 (21%)	10 (31%)	19 (59%)	17 (53%)	18 (56%)	-	-	-	-
2008	29	40	10 (25%)	16 (40%)	17 (43%)	16 (40%)	31 (78%)	19 (48%)	18 (45%)	17 (43%)	-	-	-
2009	36	47	4 (10%)	14 (33%)	9 (21%)	14 (33%)	26 (62%)	18 (43%)	23 (55%)	14 (33%)	19 (45%)	-	-

The proportion of dolphins re-sighted each year is shown in Figure 1, which shows that most dolphins are recorded only once with a corresponding decrease with time. Only one individual dolphin has been recorded each of the nine years of monitoring since 1999 (Appendix III). In Figure 2 a cumulative plot of newly identified dolphins being recorded each year is shown. The curve is starting to plateau out suggesting most of the dolphins in the estuary have been observed from tour boats.

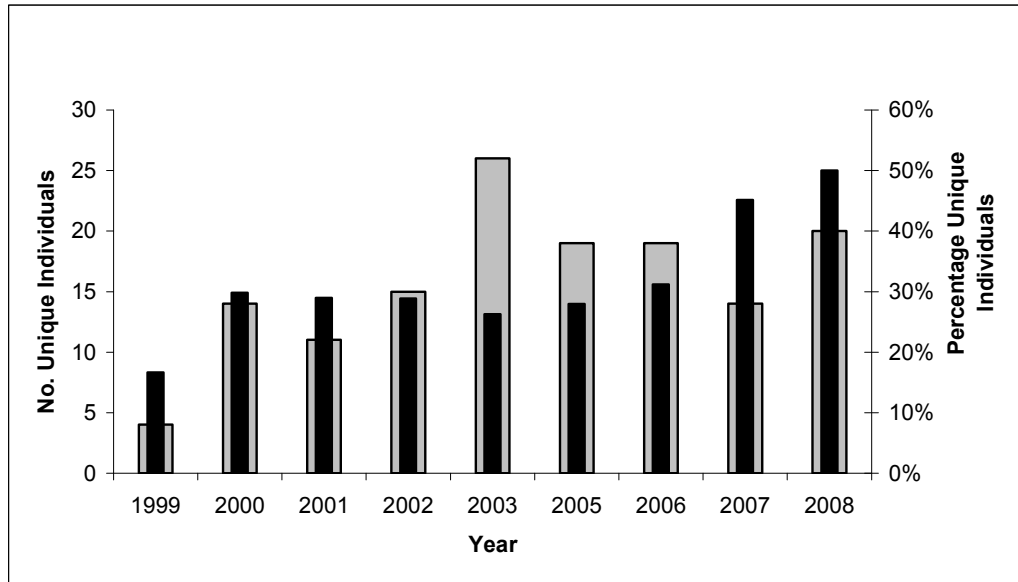


**Figure 1. Frequency of re-sightings of individual dolphins over a 10 year period (1999-2009)**



**Figure 2. Discovery curve for newly identified dolphins (1999-2009)**

Figure 3 shows the number (and as a percentage of the total identified in each year) of dolphins recorded in 2009 that were also recorded at least once since 1999. A total of 14 individual dolphins thus showed long-term (but not necessarily annual) site fidelity over the course of 10 years in the Shannon Estuary.



**Figure 3. Number of Individual dolphins identified during 2009 that were also identified in other years using photo-identification**

**Comparison between SDWF data and operators logbooks**

Data from monitoring forms received from each operator were compared with data recorded by the SDWF for the same trip. This enabled a comparison to be made between the operators interpretation of the monitoring data with that made by the SDWF researchers.

On the vessel from Carrigaholt (*Draíocht*), the observer is on the main deck and has little contact with the skipper who is in an elevated wheelhouse, thus there is limited possibility of one passing on information to the other. This is not the case on the Kilrush boat (*Dolphin Discovery*) where observer and skipper/deck hand are in close proximity. A summary of this comparison is shown in Table 8. Only differences in the most important monitoring indices are shown.

**Table 8: Mean (range) differences in data collected by operators and the SDWF on the same trip**

Monitoring Index	<i>Dolphin Discovery</i> (n=16)	<i>Draíocht</i> (n=19)	Mean (n=35)
Time to locate dolphins (mins)	-1.94	-0.11	-1.02
Number of groups	0.00	0.21	0.11
Group size	1.20	3.43	2.32
Time on dolphins (mins)	-1.47	0.39	-0.54



In contrast to 2008, the operator from Kilrush tended on average to underestimate the time to locate dolphins. In keeping with previous years however, group size was overestimated but the time spent with dolphins was under-estimated. Consistent with previous years, the operator from Carrigaholt also tended to under-estimate the time to locate dolphins but over-estimated group size and the time on dolphins (Table 8). However, the time a dolphin trip starts may differ between the operator and the SDWF as the operator considers a dolphin trip has started once the vessel rounds the pier head and not once it leaves the berth. The underestimation of times to locate and spent with dolphins is consistent and differs by less than one minute for both operators. Therefore on average, the disparity between those indices collected by the operators and the tour boat operators is almost negligible.

These data should be treated with caution and a better way of comparing monitoring indices is required. The tour boat operators have considerable experience of the bottlenose dolphins in the Shannon Estuary compared to the SDWF research assistants. It can be difficult to decide in the field when an encounter has started; often the Carrigaholt tour boat will steam past a group of dolphins early in a trip and thus the operator might not record this as an encounter, whereas the researcher might. Estimating group size for bottlenose dolphins is inherently difficult by virtue of their fission-fusion social structure; where individuals may continually join and leave groups. Also the operator has considerable height advantage over the SDWF as he is situated in the wheel-house, this facilitates a more accurate estimation of group size. The overall mean differences in monitoring indices between the operators and SDWF are small and thus would not significantly affect the overall results.

### **Insights into the Home Range of Shannon Dolphins**

The SDWF carried out a basking shark *Cetorhinus maximus* project in the summer of 2009 which was funded by the Heritage Council. The study involved searching large areas of inshore waters of counties Kerry, Donegal and Cork for sharks. While most of our effort in Co. Kerry was carried out in Dingle Bay, one day was spent searching the area from Kerry Head to Brandon Point, adjacent to the Shannon Estuary. On 22 June at 12:20pm, a group of 20 bottlenose dolphins was encountered 1.5km west of Brandon Point (N52 17.159, W10 8.079W). While heading in a southwesterly direction, the group increased in size and by three hours later comprised *circa* 30 individuals including three calves. The encounter was ended west of Sauce Creek (N52 16.889, W10 13.848). Photo-identification was carried out using the same methodology as for the tour-boat monitoring.

Of the 30 dolphins recorded, there were twelve well-marked individuals and all were matched with those recorded in the Lower River Shannon SAC. Notably, none were matched to the Irish Coastal Bottlenose Dolphin Catalogue (O'Brien *et al.*, in press). This large group represents 26% of the Shannon putative population, according to the most recent abundance estimate of 140 individuals (Englund *et al.*, 2008). This has been the third case of an incidental encounter with Shannon dolphins in the Tralee and Brandon Bays area, confirmed using photo-identification (Ryan and Berrow, in press). This however is the largest such group and the furthest from the Lower Shannon SAC at

approximately 24km from the SAC boundary. Four dolphins that have been recorded six years or more in the Shannon Estuary during tour-boat monitoring were observed in this group but were not recorded inside the estuary during this year's monitoring work. This is suggestive of a seaward shift in the range of individuals, which previously showed strong site fidelity to the Lower Shannon during summer months. However, one dolphin was photographed inside the Shannon SAC from a dolphin tour boat both before and after this encounter, suggesting that such movements are not necessarily permanent nor are they necessarily migratory in nature.

We propose that dedicated fieldwork be carried out in the Shannon approaches/Brandon and Tralee Bays area in order to assess the home range of the Shannon dolphins. This would provide a more complete understanding of their ecology, conservational requirements and the mechanisms pertaining to their genetic isolation from the putative coastal bottlenose dolphin population (Mirimin *et al.*, 2009). We also propose that the SAC boundary be extended to include other known areas which the Shannon dolphins frequent, which may indeed include critical habitat.

### **Summary and Conclusions**

This is the tenth season of monitoring dolphin tour boats in the Shannon Estuary. Trip records were received from 235 dolphin-watching trips, which was 22% less than in 2008, following a similar decrease of 24% between 2007 and 2008. The ongoing trend is towards a decline in tour boat activity driven by poor weather during peak months (July and August) and a decline in tourism to west Clare.

Mean trip length increased from both Carrigaholt and Kilrush during 2009 to the highest recorded since monitoring began. It was particularly elevated (16.7%) from Kilrush. Mean time to locate dolphins also increased significantly, up 27% from Carrigaholt and 20% from Kilrush. The proportion of trips with no dolphins observed was also greater than in previous years. This resulted in the total time on dolphins being down 32% overall and a huge 52% by the Kilrush dolphin-watching boat.

There was a change in zones in which dolphins were located and watched, with an increase again observed in Zone 2 (south side of outer estuary). Following a decrease in 2008, there was an increase in trips to Zone 3 (Beal bar). A decrease was recorded in Zone 5 (south side of the estuary) with a corresponding increase to Zone 1 by the Kilrush operator (following a similar decrease to Zone 1 by the Carrigaholt operator).

The results from monitoring during 2009 show large changes in the monitoring indices. This reflects a very poor season by dolphin-watching operators in the Lower River Shannon cSAC, who not only had to operate in a poor tourism season and poor weather, especially in August, but also struggled to find dolphins when conditions were good. This is evident from the increase in time to locate dolphins and length of dolphin trip. Changes in zones reflected boats, especially from Kilrush, having to search for

dolphins outside of the areas they watched dolphins in recent years. It is not possible to identify the reasons why dolphins' distribution was different during 2009 but there are indications that dolphins may be exploring different areas in the Shannon Estuary and adjacent waters presumably in which to forage. Bottlenose dolphins are now observed very frequently off Loop Head at the mouth of the Shannon (IWDG unpublished data) and were also recorded off Tralee and Brandon Bays during the summer of 2009 (Ryan and Berrow, in press). One explanation is changes in the numbers and timing of salmon in the estuary. Shannon Regional Fisheries Board reported a 50-60% decline in salmon entering spawning rivers during 2009 compared to 2008 which was down 50% from 2007. This equates to a decline of around 75% between 2007 and 2009: this decline in salmon numbers in the estuary may be forcing the dolphins to forage further afield (Loop Head, Tralee Bay) to obtain their daily food requirements. As 2007 was a good year for salmon returning to spawning rivers it is hoped that 2010 is a good year as most fish return after three years (SRFB *pers. comm.*). Monitoring dolphin prey such as salmon is essential if we are to understand changes in the distribution and behaviour of the Shannon dolphins.

This monitoring does provide a good reflection of changes in the dolphins' distribution and also relative abundance. Small or subtle long-term changes to dolphin behaviour or distribution are hard to record as these signals are difficult to distinguish against inter-annual variations. A catastrophic event such as major changes to the population within the Shannon Estuary or the dolphins' sensitivity to dolphin-watching boats will be identified. Bottlenose dolphins are long-lived animals with a generation time of around 20 years. Ten percent of those individual dolphins observed from dolphin-watching vessels during 2009 were also recorded from dolphin boats ten years earlier in 1999, demonstrating the importance of long-term monitoring. This monitoring also ensures the continued sustainable development of the dolphin-watching industry in a marine candidate Special Area of Conservation.

Increasingly, the SDWF photo-identification catalogue is being used for a variety of additional uses including contributing to an Irish Coastal Bottlenose Dolphin Catalogue which aims to record the movement of bottlenose dolphins around Ireland (O'Brien *et al.*, in press). The catalogue was also used to determine if stranded bottlenose dolphins are from the Shannon Estuary population. There was an unprecedented mass stranding of 17 dolphins in Tralee Bay in July 2009, and the catalogue was instrumental in determining that they were not Shannon dolphins. Clearly, a stranding of this scale would be of great concern considering the small size of the Shannon putative population (Englund *et al.*, 2008). It is increasingly becoming apparent that the Shannon dolphins are quite a unique population. To date no Shannon dolphin has been recorded outside of the Shannon Estuary/Tralee Bay area and there is strong evidence of some genetic discreteness (Mirimin *et al.*, 2009). Continued annual monitoring is essential if we are to ensure favourable conservation status for this species in the Lower River Shannon cSAC or detect changes at an early stage to enable mitigation measures to be implemented.

## References

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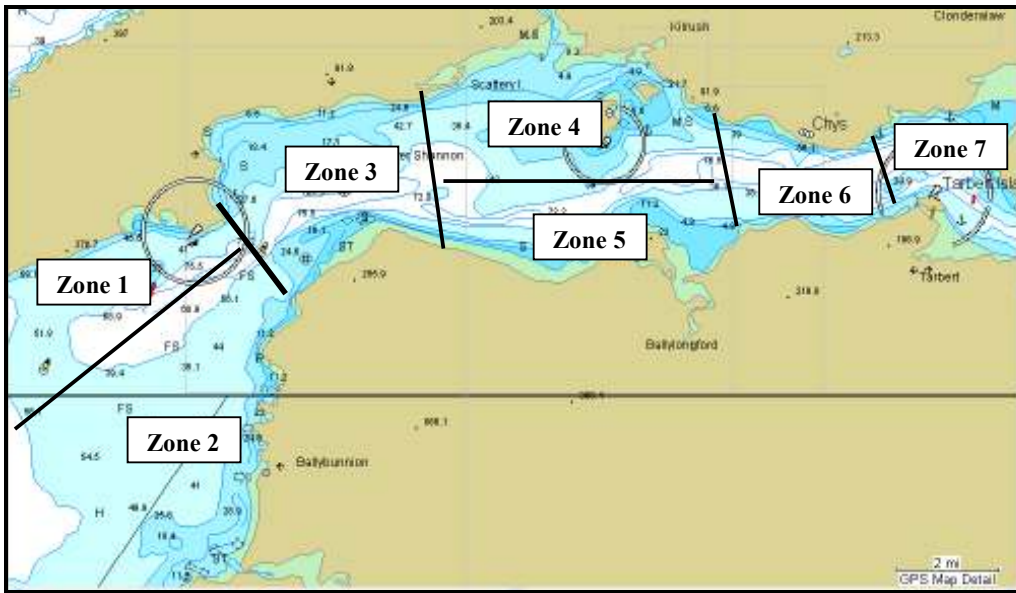
Mirimin, L., Miller, R., Berrow, S., Ingram, S., Cross, T. and Rogan, E. (2009) Genetic variability and isolation of a resident population of bottlenose dolphins *Tursiops truncatus* in the Shannon Estuary, west of Ireland. 18<sup>th</sup> Biennial Conference of the Society of Marine Mammalogy

Ryan, C. and Berrow, S. (in press). An extension to the known home range of Shannon Estuary Bottlenose Dolphins (*Tursiops truncatus* (Montagu 1821)). *Irish Naturalists' Journal*.

**Appendix I: Number of vessels and trips carried out by all operators given permission to carry out dolphin-watching trips in the Shannon Estuary during 2009.**

<b>Company</b>	<b>Port</b>	<b>Vessel</b>	<b>Number of trips</b>
Dolphinwatch	Carrigaholt	Draíocht	135
Michael Fennell	Kilbaha	Deva	0
Lisroe Marine Services	Kilrush	Rouge Trader	0
Scattery Island Ferries	Kilrush	Dolphin Discovery	106
Robert Stack	Ballybunnion	Lady Eilish	0

**Appendix II: Tour boat monitoring form, showing zones in which dolphins were watched**



- Zone 1:** line from Kilcredaun to Kilconly Point and north of line down middle of estuary
- Zone 2:** line from Kilcredaun to Kilconly Point and south of line down middle of estuary
- Zone 3:** between line from Kilcredaun to Kilconly Point and from Corlis Point to Littor House
- Zone 4:** north of line down middle of estuary and between line from Corlis Point to Littor House and from Moyne to Knockinglas Point
- Zone 5:** south of line down middle of estuary and between line from Corlis Point to Littor House and from Moyne to Knockinglas Point
- Zone 6:** between line from from Moyne to Knockinglas Point to a line between Besborough and Hassey's Hill
- Zone 7:** upriver of a line between Besborough and Hassey's Hill

## Appendix III: Individual dolphins recorded from tour boats 1999-2008

Identification No	Year										Total years sighted
	1999	2000	2001	2002	2003	2005	2006	2007	2008	2009	
1		*			1	*	*	*	*		5
2			*	*	*	*	*	*		*	7
4	*	*			*						3
5						*					1
6		*			*		*			*	4
7			*	*		*					3
8	*	*	*	*	*	*	*		*		8
9							*				1
10				*	*						2
11	*	*	*	*	*	*	*	*	*	*	10
13						*					1
14				*	*						2
15						*					1
16				*	*				*		3
18		*	*	*	*	*	*	*			7
19	*	*	*	*	*	*	*		*		8
20		*		*	*	*		*	*	*	7
21				*	*	*	*				4
23			*		*						2
24		*	*		*	*	*				5
27	*			*	*	*					4
28	*	*	*	*	*	*		*			7
30		*									1
31					*	*	*				3
33		*	*		*					*	4
34	*	*	*	*	*	*	*		*	*	9
35		*	*	*	*						4
36		*	*		*						3
38	*		*		*						3
40		*		*							2
41		*	*		*					*	4
42		*				*	*	*			4
43				*							1
44	*		*	*					*		4
45				*	*	*	*	*		*	6
46						*					1
47	*	*	*	*							4
49			*	*	*					*	4





95			*			*				2
96			*	*	*	*		*	*	6
97	*		*	*	*	*				5
98		*	*	*	*	*		*		6
99					*	*	*	*	*	5
100				*	*					2
101			*							1
102	*	*		*	*		*	*	*	7
103					*					1
104				*	*				*	3
105					*					1
106					*	*	*	*	*	5
107				*	*					2
108			*		*			*		3
109					*					1
110					*					1
111					*					1
112					*					1
113					*	*			*	3
114					*					1
115					*					1
116					*				*	2
117					*	*	*		*	4
118					*					1
119					*					1
120					*					1
121					*			*		2
122					*					1
123					*					1
124					*					1
125					*		*	*	*	4
126					*	*	*	*	*	6
128		*								1
129	*									1
131					*					1
133					*					1
137					*			*	*	3
138					*					1
139					*					1
141		*								1
142		*			*					2
143		*								1
144		*	*		*	*	*	*	*	8
145					*					1

146	*	*				2
147	*	*		*		3
148		*	*	*	*	4
149		*				1
150		*				1
151		*	*			2
152		*	*			2
155		*				1
156		*				1
157		*				1
158		*		*	*	3
159		*	*		*	3
161		*				1
162				*		1
163		*	*		*	3
164		*	*			2
165		*				1
166		*				1
167		*		*	*	3
168		*				1
169		*				1
171			*			1
172			*			1
174		*				1
175		*				1
177			*	*		2
178			*		*	2
179			*		*	2
180			*			1
181			*		*	2
182			*			1
183			*			1
184			*			1
185			*		*	2
186			*			1
187			*			1
188			*			1
189			*			1
191			*			1
192			*			1
193			*	*	*	3
194			*			1
195			*			1
196			*		*	2

197							*				1
198							*				1
200							*				1
201								*			1
202								*			1
203							*	*			2
204							*				1
205							*				1
206							*	*	*		3
207							*	*			2
208								*	*		2
209								*	*		2
210									*		1
211									*		1
212									*		1
213									*		1
214									*		1
<b>TOTAL</b>	<b>24</b>	<b>47</b>	<b>38</b>	<b>52</b>	<b>99</b>	<b>68</b>	<b>61</b>	<b>31</b>	<b>40</b>	<b>47</b>	
<b>CUMULATIVE TOTAL</b>	<b>24</b>	<b>56</b>	<b>68</b>	<b>85</b>	<b>122</b>	<b>145</b>	<b>169</b>	<b>176</b>	<b>180</b>	<b>183</b>	

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