National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht

HARBOUR SEAL PILOT MONITORING PROJECT, 2011

January 2012

INTRODUCTION

Two species of seal (*Phocidae*) commonly breed in Ireland: the Harbour seal (*Phoca vitulina*) and the Grey seal (*Halichoerus grypus*). Ireland's current minimum population estimate for Harbour seal numbers 2,905 seals, based on a robust baseline assessment carried out in August 2003 (Cronin *et al*., 2004; Cronin *et al*., 2007). Following that study and the assessment of Grey seal population size (Ó Cadhla & Strong, 2007; Ó Cadhla *et al*., 2008), a scientific evaluation of ongoing monitoring methods for populations of seal species (Cronin & Ó Cadhla, 2008) was commissioned by the Scientific Unit of the National Parks & Wildlife Service (NPWS). This report outlined monitoring options for Ireland's seal populations based on data and experience obtained during the national seal population assessments and other scientific considerations. This information, together with the results of seal monitoring work carried out by regional staff since 2003 and the potential operational capacity for annual seal monitoring were also considered by NPWS in the development of monitoring strategies for Harbour seal and Grey seal by mid-2009. With regard to monitoring Ireland's Harbour seal population, it was decided to pursue a twin-track strategy targeting the annual moult season (August-September approximately) when the highest numbers of Harbour seals gather ashore. It consists of the following two components:

1. A national aerial survey using thermal imaging within the 6-year Habitats Directive Article 17 reporting cycle, in order to produce an updated minimum estimate of the national population size.
2. Annual monitoring on the ground by NPWS regional staff at key regional haul-out sites in order to deliver recurrent data on approximately 40-50% of the national population.

Both components are designed to complement each other, permitting the two-way 'truthing' of aerial and ground-count data in years when both survey elements coincide and placing the data gathered by either monitoring component into an appropriate context. It is envisaged that annual monitoring data from selected sites may be pooled to investigate ongoing regional or local population status & trends.

Upon finalisation of coherent NPWS seal monitoring strategies in 2009, the first surveys to reassess regional populations of Harbour seal commenced in August-September 2009 and reported out in 2010 (NPWS, 2010). Results of the second round of surveys in August-September 2010 subsequently reported out in 2011 (NPWS, 2011). Initially the project undertook to test monitoring survey feasibility and data collection methods for the species at a range of well established haul-out sites and to resolve any logistical or methodological problems encountered. Survey effort is now being pursued annually on a pilot basis to 2012 after which the project and its results will be subject to further review.

This report presents findings from the third year of the Harbour seal pilot project in which annual monitoring counts are carried out by regional staff at a selection of moult haul-out sites in southern and western Ireland. Support was given by members of the Scientific Unit. Under the monitoring programme developed and first tested in 2009, it was intended that:

i. Each selected regional Harbour seal site would be surveyed on three separate sample dates during the moult season (August-September);
ii. Where possible, a series of hourly counts of seals at each site would occur within two hours of Low Water (i.e., LW ± 2hr), to include a count at the time of Low Water;
iii. Counts of Harbour seals at all haul-out sites would occur in the afternoon where possible.

This work aims to be co-ordinated in its approach via a standard survey protocol (NPWS, 2011), accounting for environmental (e.g., weather, tides) and behavioural variability which greatly affect Harbour seal site-use and haul-out group size.

In August 2011 a repeat national aerial survey using thermal imaging commenced in Co. Donegal and covered the entire coastline to Galway Bay. Simultaneous aerial and ground-counts were performed at

seven sites of variable habitat type that are regularly monitored as part of the Harbour seal pilot project. The results of this effort and the two-way 'truthing' of aerial and ground-count data will report out in 2012.

METHODS

Survey guidelines and the standardised datasheet used in 2011 were based on those developed over the 2009-2010 period (NPWS, 2011). The study area also remained consistent with previous survey effort, being limited to a maximum of fourteen coastal locations (Fig. 1) in order to deliver data on key colonies containing different seal habitats and haul-out group sizes. Harbour seals were again the main survey target. Additional data on the prevailing environmental conditions, group composition, seals in the water, Grey seals and any disturbance events encountered were also sought from recorders.

In 2011, NPWS personnel (Appendix I) set out to visit selected monitoring sites three times between the 14th August and 17th September while allowing for suitable weather conditions and tidal requirements. Where possible, surveys were carried out from an established shore-based vantage point giving a clear unrestricted view of all animals in the haul-out group using suitable optical equipment (i.e., telescope and binoculars). However, in the case of larger bays in Counties Cork and Kerry (e.g., Bantry Bay, Kenmare River) which contain numerous small haul-out sites not easily accessed or viewed from land, provision was made to conduct surveys by boat. This has been the preferred method of population monitoring at these important locations for a number of years (Heardman *et al*., 2006; NPWS, 2010; NPWS, 2011). Considering the complex expansive area to be covered in such cases, individual haul-out sites are normally surveyed once within the optimal Low Water ± 2hr period, as close to the time of Low Water as possible.

Based on data gathered in 2009-10 and given their importance on regional and national scales (Cronin *et al*., 2004; Heardman *et al*., 2006; Cronin, 2007), Bantry Bay and Kenmare River were prioritised for full survey coverage (i.e., n=3 replicate surveys) in 2011 if necessary ahead of adjacent survey sites in Roaringwater Bay and Dunmanus Bay, Co. Cork which hold comparatively smaller numbers of Harbour seals (Cronin *et al*., 2004; NPWS, 2010; NPWS, 2011). Similarly, Westport Bay which contains the principal accessible moult haul-out aggregations within Clew Bay was prioritised for full coverage if necessary ahead of Roonagh, Co. Mayo.

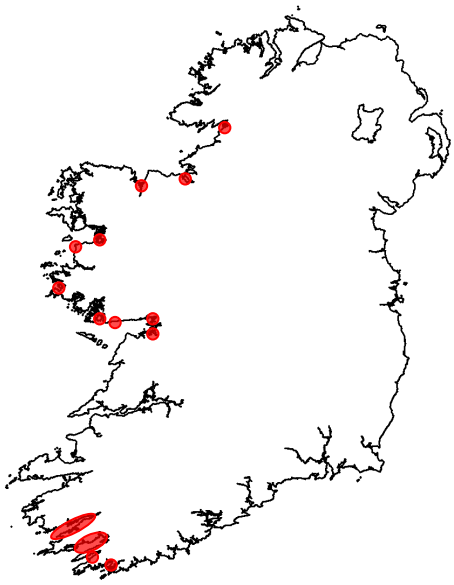

Figure 1. Map of coastal locations (in red) surveyed for Harbour seals during August-September 2009, 2010 and 2011.

RESULTS

Overall data collection methods were implemented satisfactorily in the field by the various participants involved (Appendix I) and the specific Tide and Time of Day guidelines established for the pilot project (NPWS, 2011) were possible to implement in most cases. An exception is made for the broader boat-based surveys of locations in Co. Kerry and Co. Cork which are conducted in a standardised manner around the

hours of Low Water (NPWS, 2010; NPWS, 2011). In general the weather conditions recorded by surveyors were quite favourable for conducting counts of Harbour seals (i.e., no precipitation, wind strength ≤ Beaufort Force 3-4). Two individual surveys in mid-September, however, occurred partly in wind strengths ≥Beaufort Force 5, one of which ended at Force 6 by the Low Water +2hr mark. Care should be taken in the interpretation of data collected at the sites concerned in such conditions, due to the potential influence of such weather on the distribution and numbers of Harbour seals hauled out ashore.

As in 2009 and 2010, a total of 14 coastal locations in southern and western Ireland were surveyed (Fig. 1), many of which contain multiple sites at which moulting Harbour seals have been shown to haul out ashore (Cronin *et al*., 2004). In addition to boat-based surveys of inner Bantry Bay and Kenmare River, opportunistic land-based sampling was successfully carried out at Adrigole Harbour, Co. Cork (n=3 surveys), Illaunsillagh, Co. Kerry (n=3 surveys) and Cove Harbour (West Cove), Co. Kerry (n=3 surveys). Two additional opportunistic surveys were also performed at Ballycrovane Harbour in the outer (southern) part of Kenmare River, one of which recorded the presence of Harbour seals ashore on Illaunnameanla (n=7). These more remote sites, which tend to contain smaller numbers of Harbour seals, fall outside the area normally possible for boat-based coverage in Bantry Bay and Kenmare River respectively within the available c.4.5-hour survey period but the additional data are nevertheless useful when such recording effort is possible.

A total of 46 surveys were carried out across a range of Harbour seal habitats within the 14th August-17th September period (i.e., seven surveys more than in 2010). Two more surveys took place shortly afterwards in the month of September and these are included in the data presented below (Table 1). Six monitoring sites (i.e., Roaringwater Bay, Adrigole Harbour, Illaunsillagh, Cove Harbour/West Cove, Loughaunbeg, Roonagh) saw increased survey effort over the moult period compared with 2010. The surveys at Adrigole, Illaunsillagh, West Cove and Roonagh were all carried out opportunistically and for comparatively short tidal durations due to prioritisation of effort towards key adjacent locations (e.g., Kenmare River, Clew Bay). A total of 38 surveys were carried out from vantage points on land. Wherever possible boat-based surveys were timed to concentrate recording effort around the critical 2-hour period either side of Low Water and thereby deliver the maximum numbers of Harbour seals ashore.

Table 1. Locations surveyed for Harbour seals during August-September 2011 and summary count data associated with each location. [n/a = not applicable, i.e., where full recounting of seals at individual haul-out sites within the 2-hour period either side of Low Water (LW) was not possible]

County	**Location name**	**2011** No. of surveys carried out	**Re-sampling** within tidal cycle (i.e., LW ± 2hr)	**2011** Max. count of Harbour seals	**Tidal state** during maximum count
Cork	Roaringwater Bay	3*	n/a	66	LW-2hr to -1hr
	Dunmanus Bay	1**	n/a	29	LW to +1hr
	Adrigole Harbour[1]	3	n/a	20	LW+1hr
	Bantry Bay (inner)	3	n/a	365	LW-1.25hr to +2hr
Kerry	Kenmare River	3	n/a	309	LW-2hr to +0.5hr
	Illaunsillagh[2]	3	n/a	37	LW-0.25hr
	Cove Harbour/West Cove[2]	3	n/a	50	LW-0.25hr
Galway	Kinvara Bay	3	✓, ✓, ✓	130	LW-1hr
	Oranmore Bay	3	✓, ✓, ✓	159	LW
	Loughaunbeg, Inverin	3	✓, ✓, ✓	30	LW-2hr, LW+1hr
	Cashla Bay (inner)	2	✓, ✓	77	LW+2hr
	Mannin Bay	3	✓, ✓, ✓	64	LW
Mayo	Roonagh	3	n/a, n/a, n/a	29	LW+1hr, LW+1hr
	Westport Bay	3	✓, ✓, n/a	116	LW-1hr
	Moy estuary	3	✓, ✓, ✓	128	LW
Sligo	Ballysadare Bay	3	✓, ✓, ✓	270[r]	LW+2hr
Donegal	Donegal Bay (inner)	3	✓, ✓, ✓	194[r]	LW+1hr

[1] This site lies in outer Bantry Bay. [2] This site lies in the outer Kenmare River.

* The third survey of this site took place on 20th September, just outside the main survey period.

** The survey of this site took place on 26th September, nine days outside the main survey period.

[r] = restricted visibility may have led to underestimation for one or more scheduled counts.

Maximum numbers of Harbour seals recorded during the 14th August-17th September survey period are shown in Table 1 and Figure 2. In the southwest, sites in Roaringwater Bay, inner Bantry Bay and Kenmare River maintained their importance on both regional and national scales (Cronin *et al*., 2004; Heardman *et al.,* 2006; NPWS, 2010; NPWS, 2011). In the western region higher maximum figures were again recorded in Kinvara Bay, Oranmore Bay and the Moy estuary, although the maximum count of Harbour seals in Westport Bay was lower than in the preceding two years of survey (Fig. 2). The notable peak count recorded at Cashla Bay, Co. Galway in 2009 was again not recorded in the field in 2011. In the northwest, Harbour seal count data obtained from Ballysadare Bay and inner Donegal Bay continued to demonstrate these sites' importance on both regional and national scales. In both cases recorded maximum counts were lower in 2011 than in previous years of the pilot study. In inner Donegal Bay this picture may be compounded to an extent by restricted visibility of haul-out groups in the survey area in 2010 (NPWS, 2011).

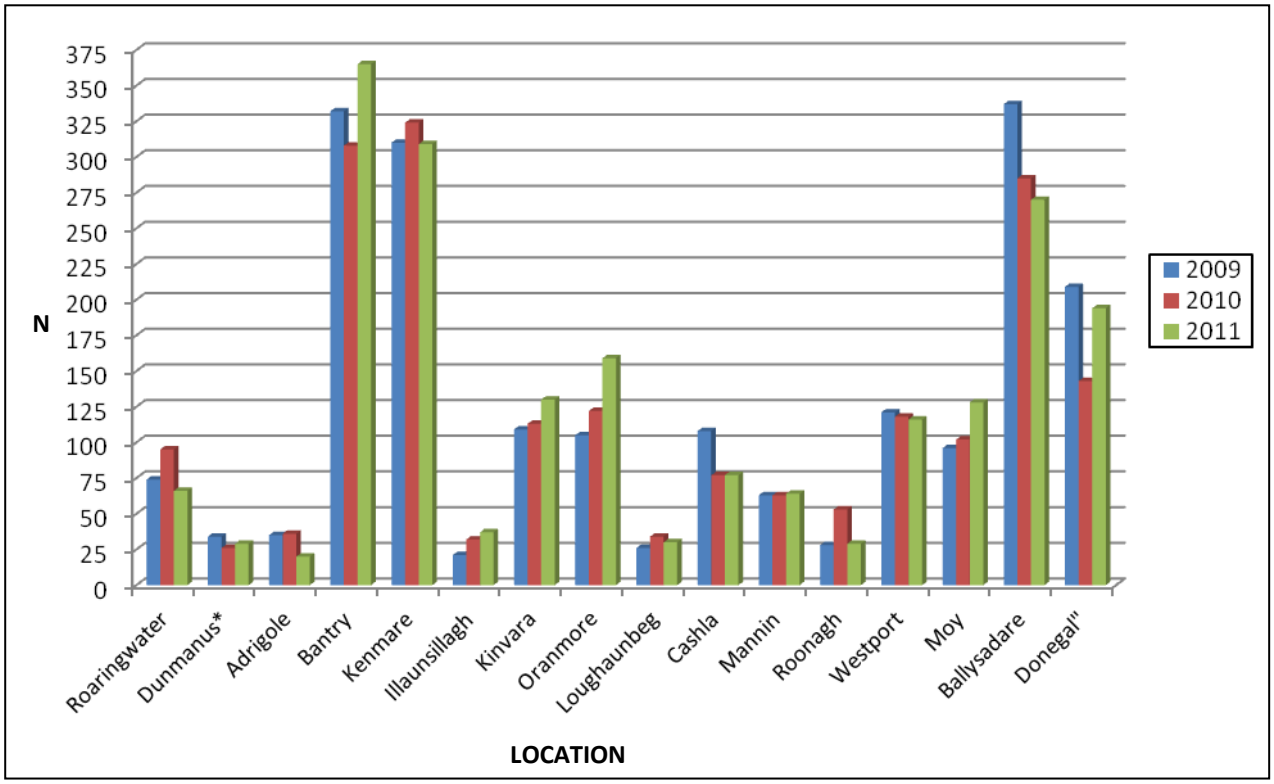

Figure 2. Harbour seal count data recorded at pilot study locations during the annual moult in 2009, 2010 and 2011. The maximum count (N) in each year recorded for each of the 14 principal monitoring locations is shown, along with data from two additional sites within Bantry Bay (Adrigole) and Kenmare River (Illaunsillagh) respectively. [*The 2011 survey of Dunmanus Bay took place on 26th Sept, outside the principal monitoring period. ''Restricted visibility in inner Donegal Bay in 2010 may have resulted in underestimation].

Dates in 2011 on which the maximum numbers of Harbour seals were recorded at each location continued to be variable within the survey period (Fig. 3) and the date of the maximum Harbour seal count in 2009, 2010 and 2011 was weeks apart at a number of sites (e.g., Bantry Bay, Kenmare River, Oranmore Bay, Mannin Bay, Moy estuary; Fig.3). While the data thus continue to rule out a clear geographic (i.e., region/location) or temporal pattern (i.e., date) of association there are indications of a potential cluster in moult count maxima within the second and third weeks of August (Fig. 3). The sample sizes in these cases remain comparatively small, however, and the data may be susceptible to the influence of covariates such as weather conditions, disturbance or changes in seal behaviour, for example. The continuation of survey effort into 2012 may permit a more robust statistical analysis on the monitoring dataset to be performed.

Similar to that observed in 2009 and 2010 (NPWS, 2010; NPWS, 2011), a preliminary examination of the prevailing tidal state at each location during which the maximum number of Harbour seals was recorded indicates no strong pattern of association between the two variables and the highest numbers of seals at a site could be found at any stage of the target LW ± 2hr period (Table 1; Fig. 4). In general, numbers of

Harbour seals at locations that were monitored consistently through the two-hour period either side of Low Water (n=25 surveys across nine locations; Table 1) tended to increase from the figure recorded two hours before Low Water (i.e., LW-2hr). However, the outcome of repeated counting thereafter until two hours after Low Water (i.e., LW+2hr) continued to be variable in 2011 between (a) individual sites and (b) individual survey dates. So far only Ballysadare Bay has demonstrated consistency across all three survey years in the state of tide during which the maximum number of Harbour seals was recorded (Fig. 4).

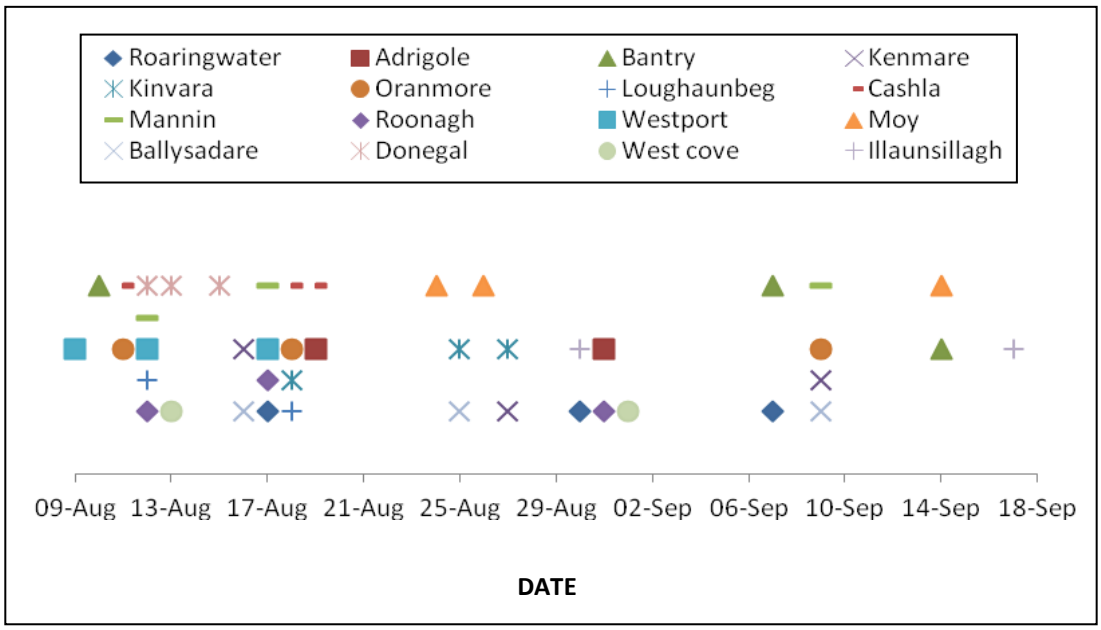

Figure 3. Distribution of dates in August-September 2009-2011 during which the maximum counts of Harbour seal were recorded at selected pilot study locations. Only sites at which two or more counts were performed in either year are included.

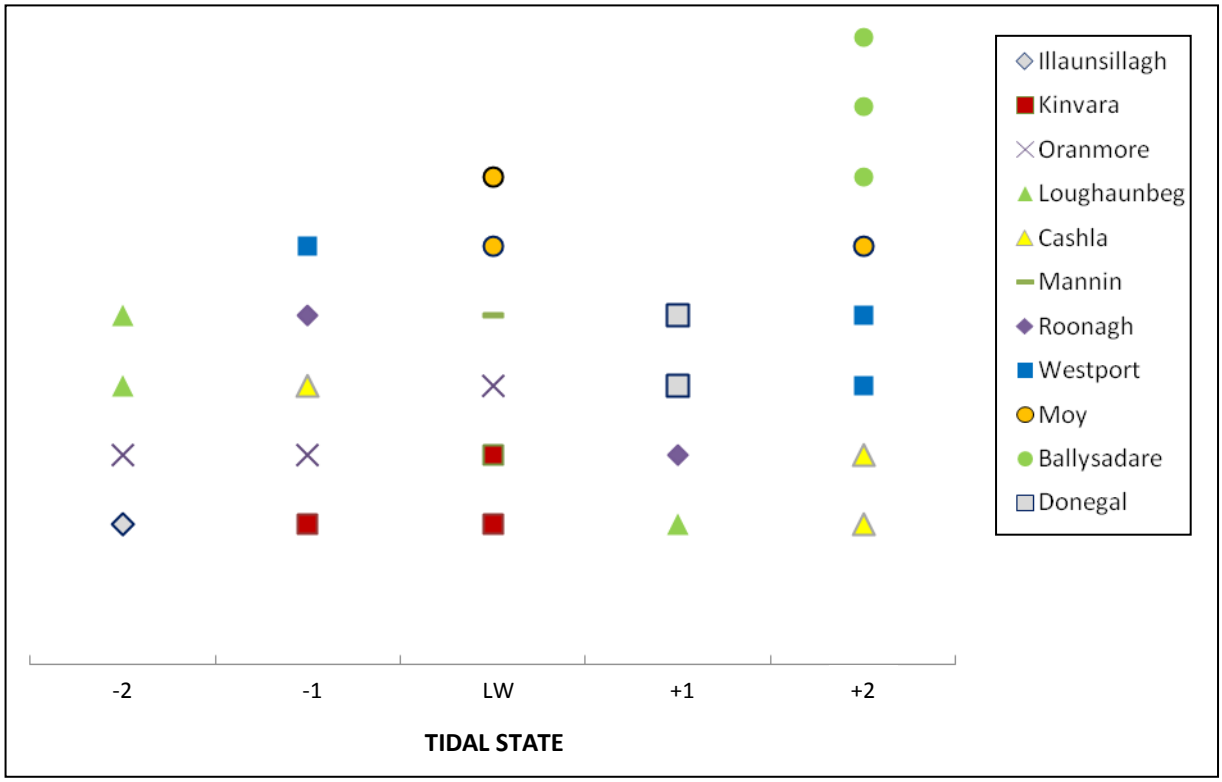

Figure 4. The distribution of Harbour seal maximum count data at 11 pilot study sites in August-September 2009-2011, shown according to the prevailing tidal state. Only those sites for which a full set of five counts occurred within the prescribed Low Water±2hr period are included.

As reported from survey data collected in 2009 and 2010 (NPWS, 2009; NPWS, 2010), a number of locations showed declines in the numbers of Harbour seals ashore as a result of local disturbances via human activity which were recorded by members of the survey team (*see details below*). Participants in the monitoring surveys also noted any apparent weather-related anomalies in distribution and count data, issues with regard to the visibility of hauled out seals, and other noteworthy features.

Roaringwater Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	-	-	-
# of boat-based surveys	3	1[a]	3[b]
Max. Harbour seal count	74	95	66
Date of maximum count	7th Sept	30th Aug	17th Aug
Disturbance	None observed	Leisure industry	None observed
Discussion	Harbour seal count data for the 2011 moult period delivered a lower maximum than has been recorded in this bay since the pilot project began in 2009. The second survey of this location (29th Aug) recorded a total of 65 Harbour seals. The local importance of haul-out sites on Aghillaun - a small island adjacent to the mouth of the Ilen river and the Creeveens - skerries within Ballydehob Bay, were again evident in 2011. Each site held more than 40% of the total number of seals recorded on 17th August.		

Dunmanus Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	-	-	-
# of boat-based surveys	1	1	1[c]
Max. Harbour seal count	34	26	29
Date of maximum count	25th Aug	31st Aug	26th Sept
Disturbance	Not recorded	None observed	None observed
Discussion	In spite of the 2011 survey being conducted more than a week later than the prescribed survey window, the total number of seals recorded within the bay was quite similar to data obtained in 2009 and 2010. In recent years, surveys by regional staff also recorded 27 and 29 Harbour seals on 15th Sept 2007 and 18th Sept 2008, respectively. The principal sites for Harbour seals were again found at Carrigphillip and Mucklagh Rocks on the south side of the bay, although 12 Harbour seals were also recorded at Carrigeenarontia, a small skerry east of Twopoint Island.		

Adrigole Harbour, Bantry Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	1	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	35	36	20
Date of maximum count	19th Aug	26th Aug	31st Aug
Disturbance	Fishing activity Leisure/Recreation	Not recorded	Leisure/Recreation
Discussion	The maximum number of Harbour seals recorded across three surveys in 2011 was below figures recorded in 2009 and 2010. In recent years 23 and 27 Harbour seals have been recorded on 28th Aug 2007 and 10th Sept 2007, respectively during surveys by regional staff. Human disturbance of seals hauled out in the harbour was recorded during two of the surveys in 2011. In both cases, all seals ashore entered the water as a result of local kayak activity. Harbour seals have been reported internationally to be vulnerable to disturbance via close approaches by kayaks, canoes and small boats.		

[a] A second survey took place on 11th October, significantly outside the main survey period.

[b] The third survey took place on 20th September, just outside the main survey period.

[c] This single survey took place on 26th September, nine days outside the main survey period.

Bantry Bay (inner)

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	-	-	-
# of boat-based surveys	2[d]	3	3
Max. Harbour seal count	332	308	365
Date of maximum count	10th Aug	7th Sept	14th Sept
Disturbance	Survey team	Leisure/Recreation	Recreation activity Fishing activity
Discussion	The maximum count recorded in the inner bay in 2011 was considerably higher than that recorded in 2010 using the same standardised methods. Summary data gathered within Bantry Bay since 2000 suggest that the numbers of seals ashore during the moult may fluctuate considerably between years. Prior to this project, regular surveys by regional staff recorded 303, 268 and 329 Harbour seals on 7th Sept 2006, 10th Sept 2007 and 15th Sept 2008, respectively. A peak exceeding 400 animals in the bay as a whole was recorded in 2003. Local disturbance of Harbour seals (i.e., evacuation of haul-out sites) was again recorded in inner Glengarriff Harbour in 2011. This was due to people walking ashore on sites normally occupied by seals while fishing activity adjacent to Coulagh Rocks also led to seals entering the water. A notable increase in Harbour seal numbers was observed within Glengarriff Harbour for the third survey (14th Sept). While this coincided with significantly reduced recreational activity in the area, it may also have been a natural phenomenon linked to prevailing weather conditions or other biological or environmental factors.		

Kenmare River

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	-	-	-
# of boat-based surveys	2	3	3
Max. Harbour seal count	310	324	309
Date of maximum count	9th Sept	27th Aug	16th Aug
Disturbance	None observed	Fishing activity Survey team	Leisure/Recreation Fishing activity Survey team
Discussion	The maximum counts recorded in the 2009-2011 continue to represent the highest numbers of Harbour seals recorded by NPWS personnel at this survey location. In previous years 239 and 285 Harbour seals were recorded by regional staff on 12th Sept 2007 and 16th Aug 2008, respectively. Disturbance to five haul-out groups within Kenmare River was recorded during the monitoring period. These events were attributed to the close presence of small inshore fishing vessels (n=3 sites), kayak activity (n=1 site) and, on one occasion, to the survey team itself which was an unusual scenario and possibly due to previous agitation of the haul-out group concerned.		

Illaunsillagh, outer Kenmare River

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	1	2	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	21	32	37
Date of maximum count	11th Sept	30th Aug	17th Sept
Disturbance	Not recorded	None observed	None observed
Discussion	The maximum count of Harbour seals recorded in August-September 2011 within this sheltered haul-out area represents the highest count since the monitoring project began. Background site-specific data remain limited for this site although figures gathered since 2009 have been similar to those recorded in August-September 2003, 2004 and 2005 by Cronin (2007).		

[d] A third survey took place on 9th October, significantly outside the main survey period.

Cove Harbour (West Cove), outer Kenmare River

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	-	2	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	-	31	50
Date of maximum count	-	13th Aug	1st Sept
Disturbance	-	None observed	None observed
Discussion	The maximum count of Harbour seals recorded on 1st September represents the highest count since the monitoring project began covering this haul-out site in 2010. Background data are limited for this haul-out site, the westernmost site used by Harbour seals within Kenmare River. Given the result obtained in 2011 at this location, if feasible additional surveys during the moult season would be worthwhile.		

Kinvara Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	3	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	109	113	130
Date of maximum count	25th Aug	27th Aug	18th Aug
Disturbance	Recreation activity	Survey team	Survey team Shellfish boat activity
Discussion	The maximum figure recorded in 2011 is the highest Harbour seal count recorded from this bay so far. The area continues to require co-ordinated surveying from both the east and west sides of the bay in order to obtain an accurate estimate of all seals occurring there. The bay was also flown by the 2011 aerial survey (using thermal imaging) and a simultaneous aerial/ground-count was obtained. On 18th August disturbance, due to the second observer accessing a vantage point and passing in sight of some seals hauled out nearby, resulted in a small number of seals entering the water and relocating to the principal haul-out site on Goormeen Rock. A second more significant disturbance event was recorded on 30th August when the approach of a small shellfish tender vessel broadly towards this larger haul-out site resulted in its evacuation by many hauled out seals. Weather conditions during the third monitoring survey in mid-September were partly outside the prescribed limits due to a strengthening wind.		

Oranmore Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	3	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	105	122	159
Date of maximum count	9th Sept	11th Aug	18th Aug
Disturbance	None observed	None observed	None observed
Discussion	Data recorded at this location on 18th August also delivered a higher count of Harbour seals than has previously been recorded in the bay. The site is comparatively complex in its layout and topography and requires surveying from both the north and southeast sides of the bay in order to confirm full coverage and ensure an accurate estimate of all Harbour seals occurring in the bay. Oranmore Bay was also flown by the 2011 aerial survey (using thermal imaging) and a simultaneous aerial/ground-count was obtained. Weather conditions during the third monitoring survey in mid-September were partly outside the prescribed limits due to a strengthening wind. Winds above Beaufort Force 3-4 can be problematic in monitoring Oranmore Bay due to its comparative exposure to a range of wind directions and distance of the primary vantage point from available haul-out sites in the centre of the bay.		

Loughaunbeg, Inverin

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	2	2	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	26	34	30
Date of maximum count	18th Aug	12th Aug	18th Aug
Disturbance	None observed	None observed	None observed
Discussion	The maximum Harbour seal count recorded across three monitoring surveys in 2011 was broadly similar to previous results obtained in 2009 and 2010. Background site-specific data are limited for this comparatively exposed haul-out site situated in outer Galway Bay (north shore).		

Cashla Bay (inner)

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	2	2	2
# of boat-based surveys	-	-	-
Max. Harbour seal count	108	77	77
Date of maximum count	19th Aug	11th Aug	18th Aug
Disturbance	None observed	None observed	Recreation/Leisure
Discussion	While a considerably lower maximum count of Harbour seals was recorded for this site than in 2009, the 2011 total was identical to that recorded in 2010 and it continued to exceed previous known data for the site. Some minor disturbance of hauled out seals was recorded on the 18th August due to people landing ashore from a dinghy on a group of rocks within the site. Most of the animals remained hauled out, however.		

Mannin Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	3	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	63	63	64
Date of maximum count	9th Sept	12th Aug	17th Aug
Disturbance	None observed	Unknown source	Recreation activity
Discussion	This area requires access for counting from more than one side of the bay in order to obtain an accurate estimate of all Harbour seals occurring there throughout the prescribed tidal period. In 2011 the use of two co-ordinating observers facilitated more comprehensive data collection at this location. Maximum count data obtained were very similar to figures recorded so far by the monitoring project while a maximum total of 63 Harbour seals was also recorded on 1st September. Disturbance of hauled out seals was recorded on one occasion in the western part of the site. This was due to people walking nearby.		

Roonagh

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	1	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	28	53	29
Date of maximum count	12th Aug	11th Aug	17th Aug, 31st Aug
Disturbance	Recreation activity	Recreation activity	None observed
Discussion	Data were recorded more opportunistically at this location in 2011 and coverage of the full c.4.5 hour tidal period was not possible, although the second survey did comprise four haul-out counts, one short of the overall objective. The 2010 maximum count was not repeated. Total numbers of Harbour seals were identical on two surveys however and were similar to those recorded in 2009. The site was also flown by the 2011 aerial survey (using thermal imaging) and a near-simultaneous aerial/ground-count was obtained.		

Westport Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	3	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	121	118	116
Date of maximum count	12th Aug	9th Aug	17th Aug
Disturbance	None observed	None observed	Leisure/Recreation
Discussion	The maximum number of Harbour seals recorded at this location in 2011 was similar to previous data obtained in the pilot project and continued to exceed that recorded during the 2003 national aerial survey in August of that year. The bay was also flown by the 2011 aerial survey (using thermal imaging) and a simultaneous aerial/ground-count was obtained. If seals are distributing themselves on the west side of islets as the tide ebbs, obtaining an exact count of Harbour seals can be difficult from even the best vantage point (i.e., Pigeon Point). On one survey date, disturbance due to the presence of up to five canoeists may have caused the temporary displacement of seals from some haul-out sites in the bay.		

Moy estuary

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	3	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	96	102	128
Date of maximum count	24th Aug	26th Aug	14th Sept
Disturbance	Fishing activity Leisure industry	Fishing activity	Fishing activity Leisure/Recreation Research activity
Discussion	The maximum count of Harbour seals obtained at this location in 2011 was higher than in previous NPWS data from the site. The estuary was also flown by the 2011 aerial survey (using thermal imaging) and a simultaneous aerial/ground-count was obtained. As in 2009 and 2010 human disturbance resulting in Harbour seals entering the water was recorded on two survey dates. This was due (i) to the close approach of passing small fishing/angling and leisure boats and (ii) to the landing ashore of a research team via dinghy in order to collect scat samples from the haul-out site.		

Ballysadare Bay

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	3	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	337	285	270
Date of maximum count	25th Aug	9th Sept	16th Aug
Disturbance	Recreation activity	Recreation activity	None observed
Discussion	An elevated vantage point on the east side of this large bay is commonly used to survey the bay using a high magnification telescope. However if significant numbers of seals are distributing themselves on the west side of more distant sandbanks as the tide ebbs, obtaining an exact count of seals of both species can be difficult from the eastern side of the bay alone. Winds above Beaufort Force 3-4 may also be problematic in monitoring Ballysadare Bay due to its comparative exposure to a range of wind directions and distance of the primary vantage point from available haul-out sites in the centre of the bay. As in 2010, when possible the use of two co-ordinating observers in 2011 facilitated more accurate data collection whereby a second observer covered the west side of the bay and liaised with the main observer. Maximum count data collected at this location across three surveys in 2011 were lower than in 2009 and 2010. The bay was also flown by the 2011 aerial survey (using thermal imaging) and a simultaneous aerial/ground-count was obtained. Numbers of grey seals utilising this haul-out location during the August-September monitoring period (n_{peak}= 71, 82, 40) continue to be noteworthy.		

Donegal Bay (inner)

	Year - 2009	Year - 2010	Year - 2011
# of land-based surveys	3	3	3
# of boat-based surveys	-	-	-
Max. Harbour seal count	209	143	194
Date of maximum count	12th Aug	13th Aug	15th Aug
Disturbance	Shellfish aquaculture	Shellfish harvesting Recreation activity Aircraft	Recreation activity
Discussion	The use of two observers in 2011 facilitated the gathering of accurate data from this location since Harbour seals at this site appear to move readily between sandbank areas and may not always be observed fully from one vantage point alone. The maximum count of Harbour seals obtained during monitoring in 2011 was somewhat lower than that recorded in 2009 but significantly exceeded the 2010 maximum which was likely to have been an underestimate (NPWS, 2011). The bay was also flown by the 2011 aerial survey (using thermal imaging) and a simultaneous aerial/ground-count was obtained. Disturbance events, resulting in significant numbers of Harbour seals entering the water, were recorded on two occasions. These were due to people walking with dogs adjacent to the haul-out sites concerned.		

DISCUSSION

The aim of this ongoing initiative is to explore an effective regional monitoring programme that could deliver monitoring data for a modest proportion of the Irish Harbour seal population and its protected sites while being logistically and safely achievable using established best practice. Such monitoring would be expected to deliver sufficiently robust data to complement full national assessments of population status in accordance with the 6-year reporting cycle for the European Commission. The first segment of a repeated national assessment of Harbour seal population size, which covered the entire coastline from Co. Donegal to Galway Bay, was performed in August 2011 using aerial thermal imaging. Its results will provide essential up to date information concerning Harbour seal distribution and abundance during the moult season in Ireland, while the simultaneous ground-truthing exercises performed by NPWS personnel at several monitoring locations will assist in the evaluation of ongoing population monitoring data and methodologies.

Ireland's national survey during the 2003 moult season showed that Harbour seals were widely scattered among more than 200 distinct haul-out sites (Cronin *et al*., 2004). The vast majority of these sites contained fewer than 50 seals. Many sites can only be surveyed effectively by aerial or boat-based means since they are not easily viewed from land. The locations surveyed repeatedly by boat- or land-based methods in 2009, 2010 and 2011, many of which are designated as Natura 2000 sites (i.e., Special Areas of Conservation) for Harbour seal, were selected carefully due to their accessibility and importance based on local population estimates.

Framed against the observed distribution and minimum population estimate from August 2003 (Cronin *et al*., 2004) and the results of the first two years of monitoring (NPWS, 2010; NPWS, 2011), the data gathered in 2011 again delivered information on a significant proportion of Ireland's Harbour seal population. Several sites recorded higher maximum numbers of Harbour seals than in 2009 and/or 2010 but there were also reduced maxima at several survey locations (*see* Figure 2). The information generated so far by the pilot study should not be over-interpreted, however. There are many critical factors which may influence the number of seals recorded ashore at a particular location, including the visibility of animals in the haul-out group at different tidal states, human disturbance and various other key explanatory variables (e.g., tidal state, tidal amplitude/height range, the proportion of the population available for counting ashore, habitat preferences of individual seals).

While efforts have been made to minimise any observer-linked effect by the production of survey guidelines, the use of experienced observers and standardised recording practices, it should be remembered that the number of seals recorded by an observer at a particular moult haul-out site is always a minimum estimate since these animals are mobile and the entire Harbour seal population inhabiting an

area does not haul out ashore consistently or at the same time. Future analysis and cross referencing with aerial thermal imaging surveys (e.g., August 2011) will enable some of these issues to be examined further including at the locations where simultaneous Harbour seal counts have been conducted from the air and from the ground.

Based on application of the survey guidelines in 2011, there appear to be few difficulties with the field recording methodology. Quality control of the dataset generated indicated some recording discrepancies, however. This would suggest that future Harbour seal monitoring data might be better entered into a standardised digital format (e.g., mobile data recorder or coded Excel data form whose fields match those in the survey form). This possibility is being explored at the moment.

Apart from survey locations in Co. Kerry and Co. Cork that continue to be surveyed extensively by boat, monitoring of the full period two hours either side of Low Water was achieved with considerable success in 2011, resulting in greater effort coverage (i.e., a higher number of haul-out counts) overall than was the case either in 2009 or 2010. As demonstrated above and in previous reporting (NPWS, 2010; NPWS, 2011), variation in the state of tide during which the maximum Harbour seal count may be obtained from a site is commonplace. In addition, it cannot be assumed that the peak count for a particular location will occur at the same date/time each year. While there may be situations where some loss of coverage is unavoidable due to limited time or human resources available, the absence of full standardised coverage at particular locations may confound the survey results with respect to natural variability in the number of seals hauling out ashore and explanatory environmental covariates (e.g., date, time of day, weather, disturbance events). In this way the intrinsic variability in count data may be augmented further and the potential for investigation of count-covariate relationships obscured.

The total of forty-six surveys conducted between 14th August and 17th September is the highest yet recorded and comprises an excellent result given the ongoing pilot nature of the study and unsettled weather conditions during the summer of 2011. Weather conditions during surveys and the maximum counts of Harbour seals recorded in 2011 were both favourable in many cases, including when they are framed against survey efforts in 2009 and 2010. Some locations, however, recorded lower maximum counts of Harbour seals than had been documented by the project thus far. In contrast, locations such as inner Bantry Bay and Oranmore Bay, for example, saw higher maxima than have been recorded in recent years. As explained above, care should be taken not to over-interpret such results at this stage of the project.

There were also a few locations in 2011 where restricted visibility from the vantage point used or the reliance on a single observer on particular dates may have introduced a level of uncertainty into the estimation process. While the particular position, group density and behaviour of Harbour seals at an individual site on a specific date cannot be controlled, it is expected that the results of combined aerial and ground-counting exercises performed in 2011 and ongoing site-specific measures proposed above will inform and help to resolve such potential difficulties into the future.

It is envisaged that continued replication of standardised site monitoring effort into 2012 will assist in the understanding of current Harbour seal population size and distribution in the southwest/west of Ireland. It will also permit investigation of the various explanatory variables influencing the recorded data, and also improve estimates of local and regional population size into the future. From a site management point of view, the incidence of disturbance to Harbour seals continues to be an important feature at some locations where seals commonly haul out ashore in proximity to human activity (e.g., recreational walkers, marine leisure activities, commercial fishing). The monitoring surveys conducted in 2011 were again an effective means of logging the incidence and observed causes of such events.

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Appendix I - Participants in the Pilot Study, 2011

Northwest	*West*	*Southwest*
Tim Roderick	Raymond Stephens	Clare Heardman
Fiona Farrell	Helen Carty	Declan O'Donnell
Oliver Ó Cadhla	Oliver Ó Cadhla	Patrick Graham
Lee McDaid	Jacinta Murphy	Danny O'Keeffe
Carl Byrne	Gerry Higgins	Barry O'Donoghue
	Aonghus O'Donaill	Michael O'Sullivan
	Dermot Breen	Pascal Dower
	Ger O'Donnell	Pat Dawson
	Eoin McGreal	
	Irene O'Brien	
	James Kilroy	