

Cetacean research in Manx

waters 2007-2014

By Tom Felce (Manx Whale and Dolphin Watch)

Boat based surveys

Boat surveys have been carried out in Manx waters by Manx Whale and Dolphin Watch (MWDW) since 2007. This is the first time that systematic boat surveys, for cetaceans, have been carried out in Manx waters. Due to unforeseen circumstances, three different boats have had to be used to carry out surveys.

In 2007, MWDW chartered a motor boat moored in Douglas, called Hot Totty, which had a fly-bridge, therefore allowing line transect surveys to be carried out (as the transect line has to be able to be seen at all times during these surveys). Due to illness to the skipper, a different motor boat, called Grampus, was used to survey between 2008 and 2012. This also had a fly-bridge and was of similar height to Hot Totty, therefore making the data collected from the two vessels comparable, as eye height affects the distance away that it is possible to spot cetaceans. For practical and financial reasons, MWDW was forced, in 2013, to change vessel again, to a smaller and therefore cheaper vessel, which regrettably did not have a fly-bridge. This meant that line transect sampling was not possible on this vessel, which in turn meant surveys were predominantly for the purpose of carrying out photo-identification and being able to calculate relative abundance of species in areas that had been surveyed.

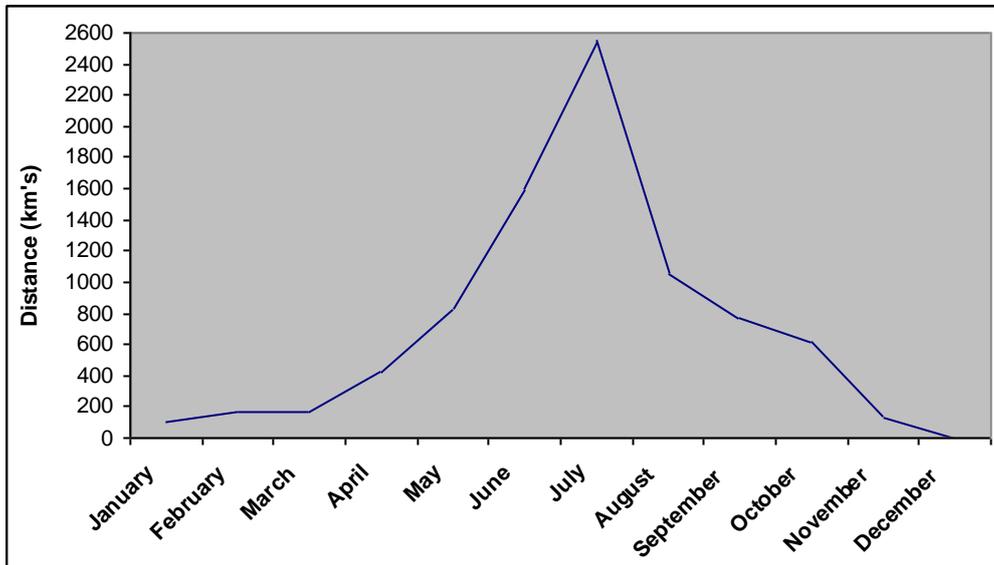
The number of trips carried out per year and therefore the number of kilometres surveyed, varied hugely between years, mainly due to unpredictable weather and unavailability of the charter vessel due to damage.

Table 1: Survey coverage per annum

Year	No. of trips	Km's surveyed
2007	18	2566
2008	9	837
2009	10	973
2010	4	358
2011	5	435
2012	10	925
2013	17	1895
2014	4	404
Total	77	8393

The temporal coverage of the boat surveys, in terms of the amount of kilometres surveyed per month, also shows huge variation (Figure 1) as would be expected in a temperate climate. The majority of effort (71.9%) has been carried out

Figure 1: Temporal spread of effort from boat surveys



between May and September. It is hoped, however, that it will be possible to carry out more surveys during the winter months, as very little boat surveying is carried out throughout Britain during these months, particularly offshore (>3 miles from land).

There have been a total of 696 sightings of cetaceans since 2007, as well as 104 sightings of basking sharks and 55 grey seal sightings. The number of sightings per year and cetacean sighting frequency per year is as follows:

Table 2: Cetacean sighting frequency per year

Year	No. of sightings	Sightings/km
2007	96	0.037
2008	47	0.056
2009	70	0.072
2010	22	0.061
2011	43	0.100
2012	71	0.077
2013	297	0.157
2014	50	0.124
Total	696	0.083

The sighting frequency does appear to be generally increasing in recent years, to a maximum of 0.157 sightings per kilometre in 2013. However, this is most likely to be a result of where surveying was carried out in 2013 and 2014 in particular, when line transect surveying was no longer an option.

For the purposes of line transect surveying, Manx territorial waters were split into eight boxes, each of which could be surveyed within one day. Box 1 covers the north eastern part of Manx waters, out to 12 miles and the boxes continue to increase numerically moving clockwise around the island, so that Box 5 covers the south western corner of the island and Box 8 covers the north western area of Manx waters, adjacent to Box 1. The spatial coverage and sighting frequency within each box, whilst under surveying conditions, is as follows:

Table 3: Distance surveyed and sighting frequency per box

Box	Distance (kms)	Sightings	Sightings/km
1 (north east corner)	287	24	0.083
2 (Ramsey Bay to Douglas Bay)	140	5	0.035
3 (Douglas Bay to Scarlett)	392	15	0.038
4 (south east corner)	438	43	0.098
5 (south west corner)	725	86	0.119
6 (Scarlett to Niarbyl)	318	35	0.110
7 (Niarbyl to Jurby)	214	36	0.168
8 (Jurby to the Ayres)	226	7	0.031

The highest sighting frequencies were found to be in Boxes 4 to 7. Therefore, once line transect surveys could not be carried out and trips were orientated towards photo-identification, it made practical and financial sense to mainly survey in areas that cetaceans were most likely to be, in boxes 4, 5, 6 and 7. This is likely to be causative of the much higher sighting frequencies seen in 2013 and 2014.

Five different cetacean species were seen from the boat surveys, as well as several sightings which could not be identified down to a species level. The known species seen are the Harbour porpoise (*Phocoena phocoena*), the Risso's dolphin (*Grampus griseus*), the Minke whale (*Balenoptera acutorostrata*), the Short-beaked common dolphin (*Delphinus delphis*) and the Bottlenose dolphin (*Tursiops truncatus*). The species composition of all boat sightings since 2007 is as follows:

Table 4: Species composition of cetacean sightings from boat surveys

Species	No. of sightings	% of total sightings
Bottlenose dolphin	3	0.4
Common dolphin	10	1.4
Harbour porpoise	566	81.3
Minke whale	59	8.5
Risso's dolphin	45	6.5
Unidentified sp.	13	1.9

Photo-identification was also able to be carried out during boat surveys. This is the process of recognising one individual from another through natural markings and pigmentation patterns, which in the case of most cetaceans, including all species frequenting Manx waters, uses the dorsal fin for identification purposes.

Photo-identification was carried out on all species, all of which now have catalogues of recognisable individuals seen in Manx waters. The exception is the Harbour porpoise, as the species is very shy of boats and therefore it is almost impossible to capture images of good enough quality for photo-identification. The number of encounters (each attempt made at taking images for the purpose of identification) and average duration per species is as follows:

Table 5: The number and average duration of photo-identification encounters

Species	No. of encounters	Average duration (mins)
Bottlenose dolphin	2	19
Common dolphin	7	12
Harbour porpoise	20	8
Minke whale	45	16
Risso's dolphin	41	22

Effort based surveys from land

Land based surveys have been carried out systematically on the Isle of Man since 2006. The surveys have taken place at a number of sites around the island, but at only 5 sites has there been enough sightings data collected for reliable data analysis; Marine Drive (54° 8.416N, -4° 28.282W), Port St Mary (54° 4.072 N, -4° 44.202W), Calf East (54° 3.768N, -4° 47.578W), Calf West (54° 3.877N, -4° 47.623W) and Niarbyl (54° 9.830N, -4° 44.408W).

There has been a total of 1344 hours and 15 minutes of land based surveying carried out since 2006, equating to 5377 intervals of fifteen minutes.

Table 6: Land based effort per location

Location	Time surveyed (hours)	No. of intervals
The Ayres	1.50	6
Calf East	247.00	988
Calf West	151.00	604
Langness	8.00	32
Lynague	35.75	143
Marine Drive	228.00	912
Niarbyl	315.25	1261
Peel Castle	65.75	263
Port Erin	6.00	24
Port St Mary	286.00	1144
Total	1344.25	5377

Over 90% of all land based surveying took place at the five aforementioned sites. Although there was enough effort carried out at Peel Castle and Lynague, there were too few cetacean sightings at these two sites for them to be included in any analysis of sightings data. Of the 5377 fifteen minute intervals surveyed, 1184 (22.0%) were cetacean positive (containing at least one cetacean sighting within the 15 minute interval).

The frequency of sightings is by no means equal across sites however (Table 7). Port St Mary for example has a significantly higher sighting frequency ($X^2=27.82$ to 129.62; $p \leq 0.001$) than any of the other sites which have a big enough sample size.

Table 7: The frequency of cetacean sightings per location

Location	No. of cetacean +ve intervals	% of cetacean +ve intervals
The Ayres	2	33.3
Calf East	201	20.3
Calf West	104	17.2
Langness	15	46.9
Lynague	0	0.0
Marine Drive	128	14.0
Niarbyl	262	20.8
Peel Castle	1	0.4
Port Erin	0	0.0
Port St Mary	471	41.2
Total	1184	22.0

The species composition of cetacean sightings from land based surveys was similar to the composition of cetacean sightings from boat surveys. As expected, the same five species seen during boat surveys were the only species seen from land based surveys, those being the Bottlenose dolphin, Harbour porpoise, Minke whale, Risso's dolphin and Short-beaked common dolphin, as well as some sightings that were not identified to species level. Harbour porpoise was by far the most frequently

Table 8: Species composition of sightings from land based surveys

Species	No. of +ve intervals	% of total cetacean +ve intervals
Bottlenose dolphin	26	2.2
Common dolphin	39	3.3
Harbour porpoise	875	75.1
Minke whale	113	9.7
Risso's dolphin	154	13.2
Unidentified species	12	1.0

Note: The %'s of cetacean +ve intervals column totals more than 100% as more than one species were seen in some 15 minute intervals

seen cetacean species, accounting for 75% of all cetacean positive intervals. Interestingly, for a species that typically frequents deep, offshore waters, Risso's dolphins are seen much more frequently from land (13.2%), as a percentage of total sightings, than from boat surveys (6.5%).

Systematic land based surveys provide the most reliable means of understanding inshore site usage by cetacean species. The data can also be used to assess fine scale

habitat use and temporal use of inshore areas by cetacean species. Due primarily to lack of resources, land based surveying is currently limited to five sites in the southern half of the island, leading to a lack of knowledge about habitat use of inshore sites in the north of the island. In 2014, for the first time, workshops were carried out by MWDW to teach local people how to firstly recognise one species from another, but also to be able to carry out land based surveys without our assistance. It is hoped that in future years, this will not only increase the amount of data collected by this survey method, but will also help address the problems with spatial coverage that are currently being experienced.

Land based surveys are also going to become a vital monitoring tool once the construction and operation of inshore tidal energy technology commences in Manx waters. All but one of the sites being proposed for tidal energy development are in areas which land based surveys are already being carried out and this dataset will allow assessment of whether there are any detrimental effects of tidal energy development on cetaceans and if there are any, how severe these effects are.

Opportunistic sightings

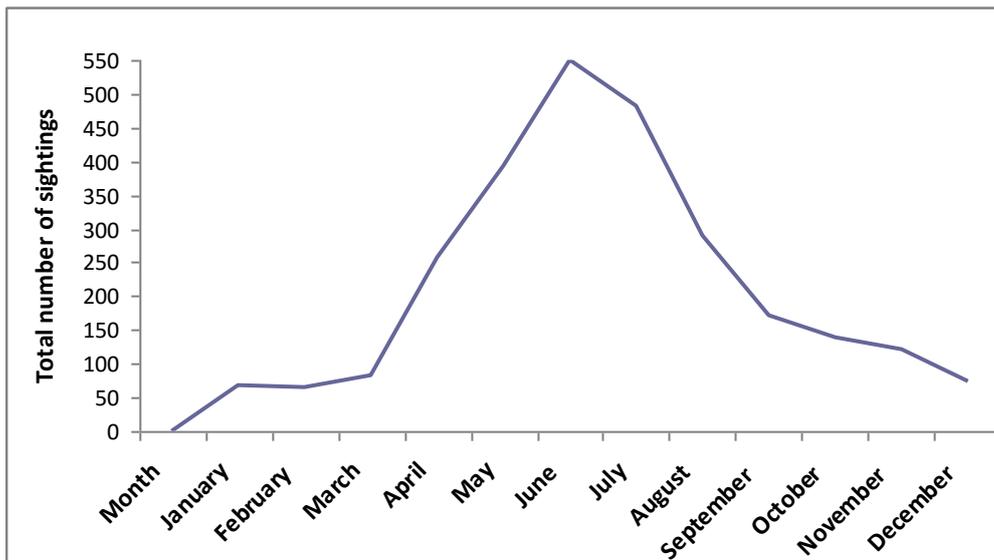
Opportunistic sightings refer to those sightings that occur by chance, by people that are not in the process of carrying out surveys specifically for cetaceans. In this context, this refers predominantly to sightings from land, but also includes sightings from people using the sea, either on recreational or commercial vessels. All these sightings are collated on the MWDW website, which was started in 2006, to give local people a site, previously unavailable to them, on which they could record cetacean sightings.

Table 9: Number of opportunistic sightings per year

Year	Total number of sightings
2006	357
2007	460
2008	295
2009	280
2010	285
2011	264
2012	280
2013	227
2014	243

Since 2006, there have been a total of 2691 sightings reported to MWDW, an average of 299 sightings per year. There has been considerable variation in the number of sightings reported per year, with many more sightings reported in 2006 and 2007 than in later years. This is unlikely to be due to there simply being more cetaceans, particularly inshore from where the majority of opportunistic sightings are reported, in these years than in later years. Weather, particularly wind speed, has a big influence on the number of opportunistic sightings seen, with 2006 and 2007 having especially calm springs and summers. Furthermore, three or more of the people who reported the majority of sightings in the first two years of the website running, for various reasons stopped reporting sightings after 2007/2008, which would have resulted in a massive decrease in the number of sightings reported.

Figure 2: Temporal distribution of opportunistic sightings



Nearly 80% of opportunistic sightings are reported between April and September, a temporal pattern in sightings that is repeated throughout the British Isles. This is predominantly due to the highly increased primary productivity in marine ecosystems during these months compared to the winter.

As expected from boat based and land based surveys, the species composition of opportunistic sightings is dominated by five species, these five species comprising over 95% of all sightings reported to the website (not including those of unidentified species, which accounts for 98.5% of all sightings). The other 1.5% of sightings comprise Atlantic white-sided dolphin, *Lagenorhynchus acutus* (n=1), Fin whale

Balenoptera physalus (n=5), Humpback whale *Megaptera novaeangliae* (n=4), Long-finned pilot whale *Globicephala melas* (n=1), Orca *Orcinus orca* (n=24), Sei whale *Balenoptera borealis* (n=1) and White-beaked dolphin *Lagenorhynchus albirostris* (n=1).

Table 10: Species composition of opportunistic sightings

Species	No. of sightings	% of total sightings
Bottlenose dolphin	228	8.47
Harbour porpoise	1373	51.02
Minke whale	381	14.16
Risso's dolphin	497	18.47
Short-beaked common dolphin	89	3.31
Unidentifiable to species level	86	3.20
Others	37	1.37

A new website was created by the start of 2014 for MWDW, which is far more user-friendly and far more aesthetically pleasing. Active usage of social media has also proven a useful tool for people to report sightings, either for those not registered on the website or those not confident enough to use it. It is hoped that these two changes will help to increase the number of opportunistic sightings reported to MWDW.

One group that is grossly under-represented in terms of reporting opportunistic sightings is boat users, especially commercial boat users, both commercial fishers and tourist trip boats. It is hoped that the development of a new App. for tablet phones, which will significantly reduce the time it takes to report a cetacean sighting, may help to increase the level of reporting from this group.

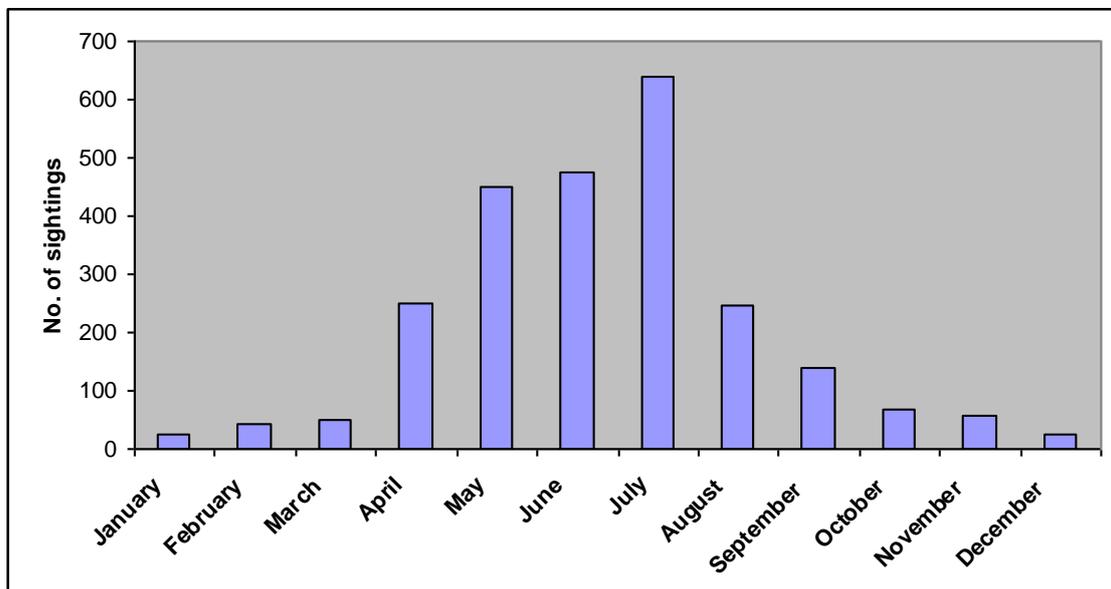
Harbour porpoise (*Phocoena phocoena*)

The Harbour porpoise is by far the most frequently seen cetacean in Manx waters, comprising 81.3% of boat sightings, 75.1% of land based survey sightings and 51% of opportunistic sightings. Since surveys began in 2006, there have been a total of 2466 sightings of the species, comprising 6037 individuals. This equates to an average group size of 2.45 individuals, which is a fairly typical average group size for this species. Although the group size ranges up to 60 individuals, the majority of groups reported/seen (84.5%) contain three individuals or less.

Based on data derived from boat based line transect surveys, it has been estimated that the density of Harbour porpoise throughout Manx waters is 0.207/km² (0.137-0.312/km², CV=21.09%). This equates to an abundance of around 928 porpoises in Manx waters concurrently.

Unlike other cetacean species that frequent Manx waters, which tend to be highly seasonal, Harbour porpoise can be found in Manx waters throughout the year, although there is still a clear increase in sightings between April and September.

Figure 3: Total number of Harbour porpoise sightings per month



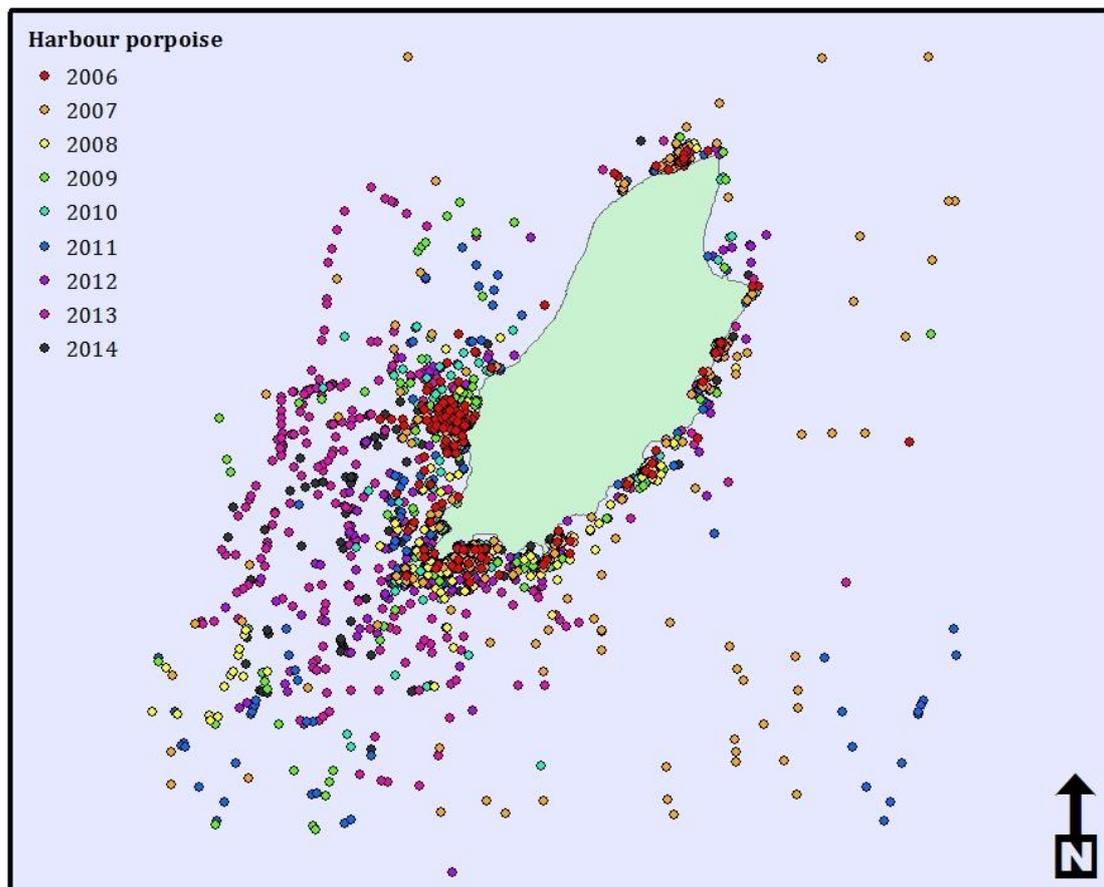
Harbour porpoise are found throughout Manx waters, both inshore and offshore, although there are certain hotspots. Inshore, land based surveys have shown that Port St Mary is a hotspot for the species, containing almost twice as many sightings and twice the sighting frequency of any other land based survey site. This is likely to be

Table 11: Sighting frequency of Harbour porpoise from land based surveys

Location	No. of HP +ve intervals	% of HP +ve intervals
Calf East	152	15.4
Calf West	61	10.1
Marine Drive	76	8.3
Niarbyl	191	15.1
Port St Mary	390	34.1

due to the high level of habitat complexity found around the Ledges in Port St Mary, providing a variety of niches for a variety of fish considered prey for the Harbour porpoise. Offshore, there are areas of high density along two high gradient slopes

Figure 4: All sightings of Harbour porpoise in Manx waters 2006 to 2014



running parallel to the west coast, approximately 6 miles offshore and 10 miles offshore and along the Irish sea frontal region, which runs from the Calf of Man in a south-westerly direction to Dublin.

It is important to note that this map is not effort related (takes into account the amount of time spent looking for cetaceans), so apparent hotspots, such as the area off Niarbyl on the west coast are as much a result of high amounts of effort as actual high densities of porpoises.

Similarly, areas where there appears to be a very low density of porpoises, such as offshore on the east coast or the north west of Manx waters, simply reflect the lack of effort carried out in these areas, as opposed to a true lack of porpoises. Future survey work must try and address these currently “unknown” areas, thus giving a much clearer picture of the true spatial distribution and geographical variations in density, of Harbour porpoise in Manx waters.

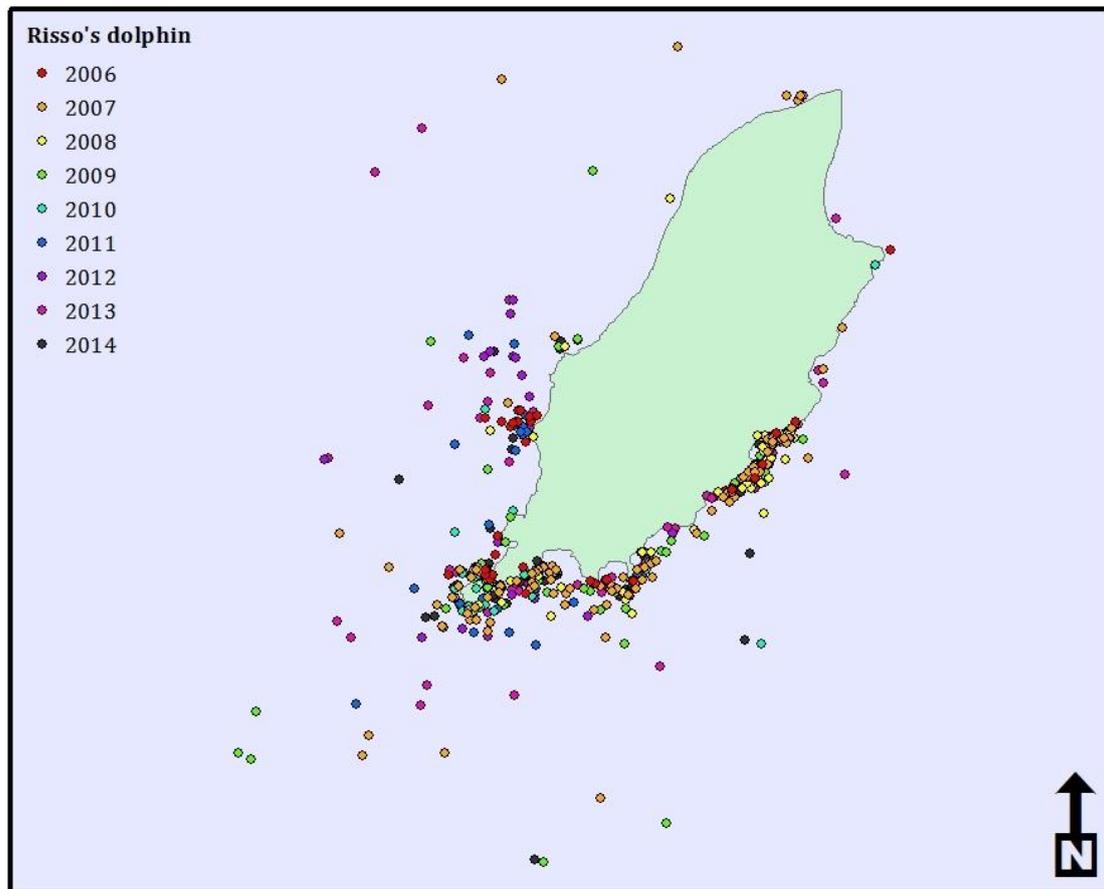
Risso's dolphin (*Grampus griseus*)

Risso's dolphins are the most commonly seen dolphin species in Manx waters, comprising 6.5% of sightings from boat surveys, 13.2% from land based surveys and 18.5% of opportunistic sightings. Since MWDW began in 2006, there have been a total of 599 sightings of the species, comprising 2681 individuals. This equates to an average group size of 4.5 individuals. This is a relatively small average group size for the species, which typically has a group size of between 6 and 12 individuals. The average group size is likely to have been negatively skewed by the unusually high number of sightings of single individuals (n=166, 27.7%). While single individuals do occur, it is likely that in most cases this was just an under-estimation of group size.

Risso's dolphins are highly seasonal to Manx waters, with 96% of sightings being reported between March and September. Risso's dolphins are almost exclusively found on the east and southern coasts of Manx waters and seem to favour inshore waters over offshore waters. There is one particular hotspot in the south of the island, between 54° 0.0 N and 54° 5.0 N and -4° 35.0 W and -5° 0.0 W (between Langness and just north of the Calf). 19.6% of effort during boat surveys (1646.0kms out of 8393.0kms of effort overall) was carried out in this area, but over 53.5% of boat based Risso's sightings were in this apparent hotspot.

This is further supported by opportunistic data. The area only equates to 5.8% of Manx territorial waters, but has had 43.9% of opportunistic Risso's dolphin sightings.

Figure 5: All sightings of Risso's dolphins in Manx waters 2006-2014



The majority of photo-identification work on cetaceans in Manx waters has been carried out on Risso's dolphins. Since 2007, there have been a total of 69 encounters with Risso's dolphins, resulting in 285 positively identified dolphins. The catalogue currently consists of 51 well-marked individuals (recognisable from an image of either side of the dorsal fin), 45 individuals recognisable from the left hand side only and 54 individuals recognisable from the RHS only, giving a minimum catalogue size of 105 individuals (assuming all LHS individuals are the same as RHS individuals).

Of the 105 well-marked and RHS only individuals, 33 have been re-sighted (31.4%). Of these individuals, 12 have been re-sighted on 5 or more occasions (11.4%), suggesting a high level of site fidelity to Manx waters and perhaps even seasonal residency. Consistent and prolonged seasonal occupancy is one of the two factors that define whether an area can be considered as critical habitat for a species, with the other being whether an area is necessary for the survival or recovery of a species.

Of the 599 Risso's dolphin sightings in Manx waters, 129 (21.5%) contained at least one calf, with some groups containing 5 or more calves. Since many of these sightings were from land, this percentage is likely to be an under estimation, as it is difficult to differentiate between calves and adults at a distance. The presence of calves and possibly nursery groups, containing multiple calves, suggests that Manx waters are crucial for the survival of this particular sub-population of Risso's dolphins.

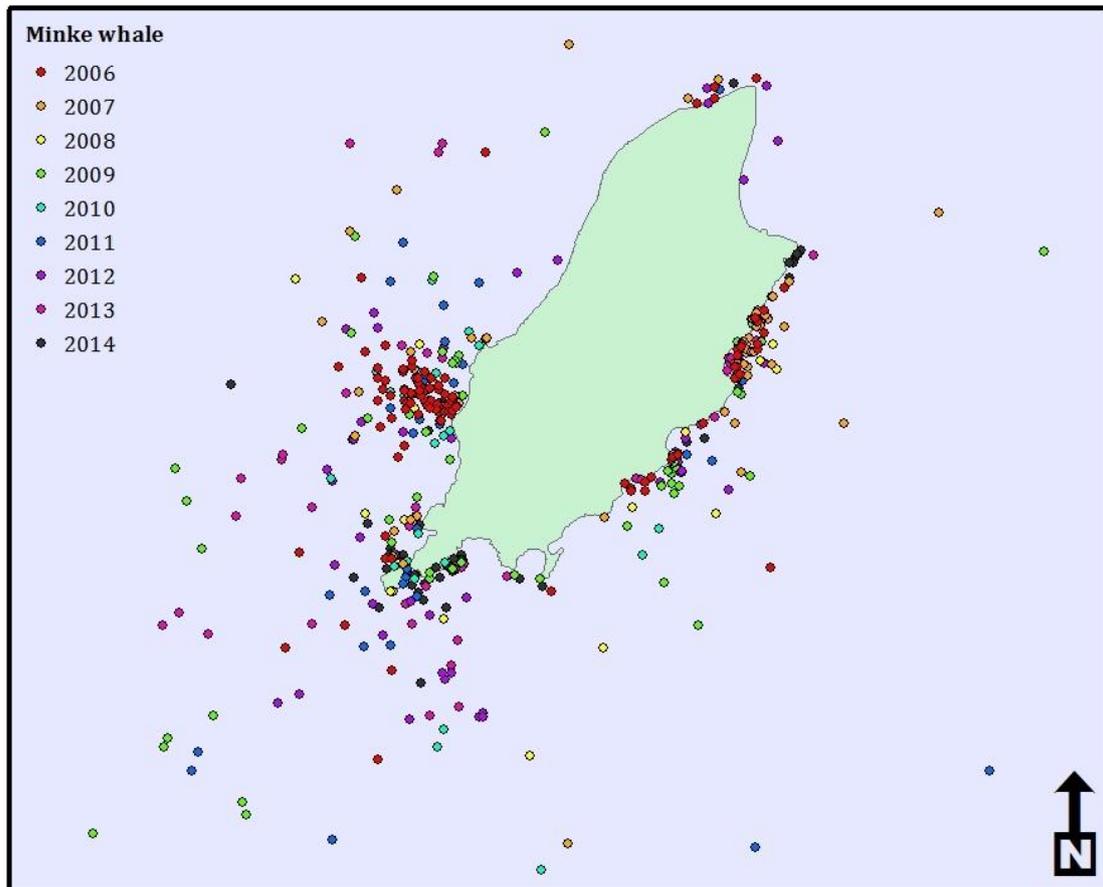
Furthermore, Manx waters usually have the highest number of Risso's dolphin sightings of any region in the British Isles in a year. In 2013 for example, there were 71 sightings in Manx waters, compared to 74 in the rest of the British Isles and Ireland combined. It has been found that Risso's dolphins in the British Isles are genetically very distinct from other populations of the species in Europe and that they are possibly genetically isolated. If this is the case, then Manx waters are vitally important for the survival of this sub-population of Risso's dolphins and every effort must be made to ensure that the current abundance and range of Risso's dolphins in Manx waters is at the very least maintained.

Minke whale (*Balenoptera acutorostrata*)

The Minke whale is the only whale species seen with any regularity in Manx waters, comprising 8.5% of boat based sightings, 9.7% of sightings from land based surveys and 14.2% of opportunistic sightings. Since the collation of sightings data began in 2006, there have been a total of 502 sightings of Minke whales, comprising 778 individuals.

Minke whales also show seasonality to Manx waters with 488 of 502 sightings (97.2%) being reported between May and November. This seasonality is thought to reflect the seasonality of the pre-dominant prey item of the species in Manx waters, the Atlantic herring (*Clupea harengus*). The distribution of Minke whales in Manx waters also reflects the distribution of the Irish and Mourne herring stocks on which they feed. There are effectively three clusters of sightings around the island, off the west coast, around the Calf of Man and between Douglas and Dhooon on the north-east coast. These reflect the movement of the herring around the island, from feeding grounds on the west coast, to a more southerly feeding ground around the Calf to the north-east of the island, where the herring congregate before spawning.

Figure 5: All sightings of Minke whales in Manx waters 2006 to 2014



The abundance of Minke whales in Manx waters at any one time is currently unknown, as there have not been enough sightings during line transect surveys to be able to derive an accurate estimate of density. Photo identification has been carried out however on Minke whales in Manx waters, with the current catalogue containing 17 well marked individuals. As has been found with other catalogues of the species, there have been no re-sightings of the same individual.

It is likely that Minke whales used to be far more abundant in Manx waters and the Irish Sea as a whole, before the crash of the herring population in the mid to late 1900's. With the herring fishery in Manx waters being effectively closed (one set of pair-trawlers has the only herring quota in Manx waters), it is likely that the herring population will recover, if left undisturbed. If this is the case, then it seems likely that the Minke whale population in Manx waters will also increase.

Bottlenose dolphin (*Tursiops truncatus*)

Compared to more southerly areas of the Irish sea, in particular Cardigan Bay, there are few sightings of Bottlenose dolphin in Manx waters, the species making up 0.2% of boat based sightings, 2.2% of land based sightings and 8.5% of opportunistic sightings. Since 2006, there have been a total of 239 sightings of Bottlenose dolphin, comprising a surprisingly high 6600 individuals. This equates to an average group size of 27.6 individuals, by far the highest group size of any cetacean species in Manx waters.

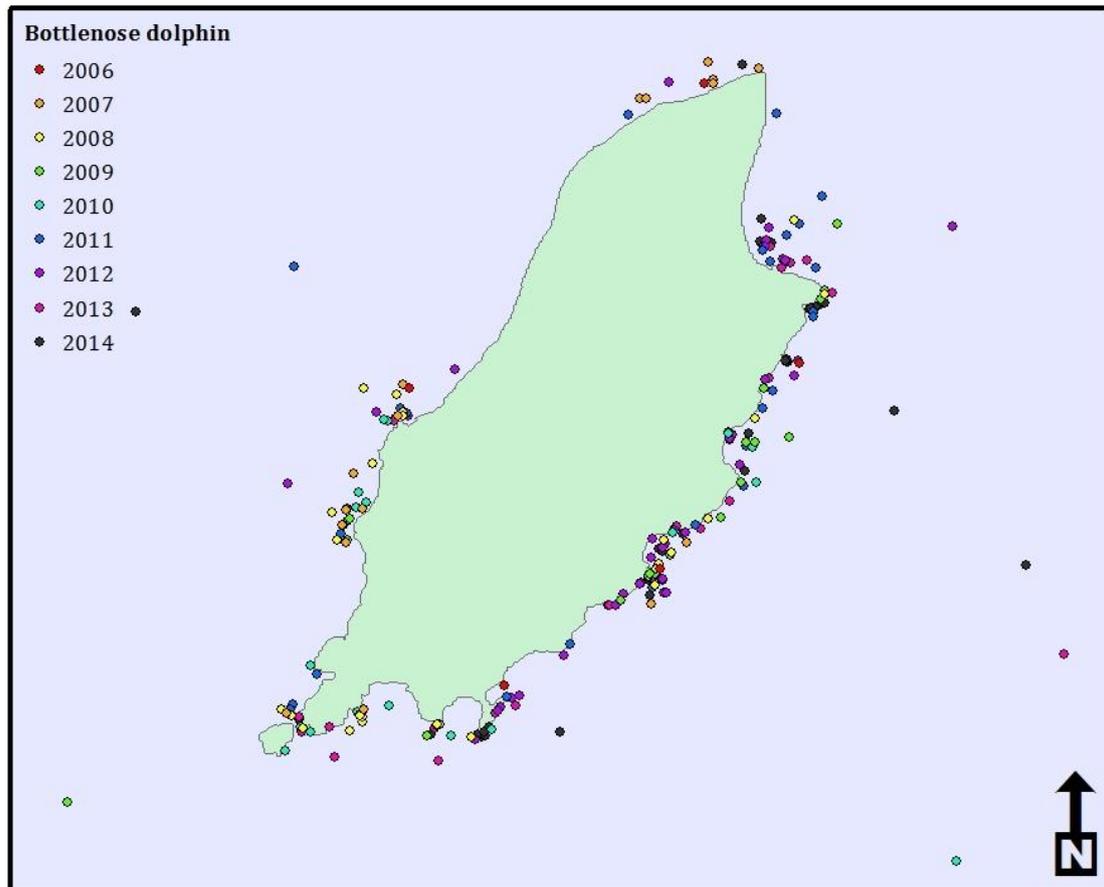
Group sizes of over fifty individuals are fairly common (n=49, 20.5% of all sightings) and groups as large as 100 or more individuals have also been seen with some regularity (n=22, 9.2% of all sightings). Such large group sizes are unusual for Bottlenose dolphins in the British Isles, with typical group sizes in Cardigan Bay or the Hebrides, for example, containing between 5 and 15 individuals.

Bottlenose dolphins do not share quite the level of seasonality to Manx waters as other cetacean species, but do tend to be seen much more frequently between November and February (n=145, 60.1% of sightings) than at any other time of year. This frequency of sightings during winter is again unusual for the species, as in other areas of the British Isles, sightings are far more common between April and October, with very few, if any, sightings during the winter months. The number of sightings of Bottlenose dolphins does seem to be increasing, but this could simply be due to raised awareness of such large groups of dolphins being seen in Manx waters, causing more people to look for and report the species.

The distribution of Bottlenose dolphins in Manx waters is widespread, although the species does show a preference for the east coast of the island, particularly between just south of Douglas and Ramsey Bay. Photo-identification of Bottlenose dolphins in Manx waters has been hindered by a lack of encounters. Bottlenose dolphins being winter specialists in Manx waters decreases the likelihood that the sea state will be good enough to allow boat surveys to be carried out. Therefore, MWDW have only had one encounter with the species at sea since 2007, with the rest of the encounters being either from land or by members of the public at sea.

The Bottlenose dolphin catalogue currently contains 55 well marked individuals, 7 recognisable from the left hand side only and 6 recognisable from the right had side

Figure 6: All sightings of Bottlenose dolphins in Manx waters 2006 to 2014



only. The majority of individuals in the catalogue have also been photographed in Cardigan Bay, where the individuals are seasonally resident between April and October. It seems likely therefore that the population of Bottlenose dolphins that inhabit Cardigan Bay in the summer, come together during the winter months in huge numbers and are seen much further north in the Irish Sea, presumably due to limited feeding opportunities in Cardigan Bay in the winter.

Short-beaked common dolphin (*Delphinus delphis*)

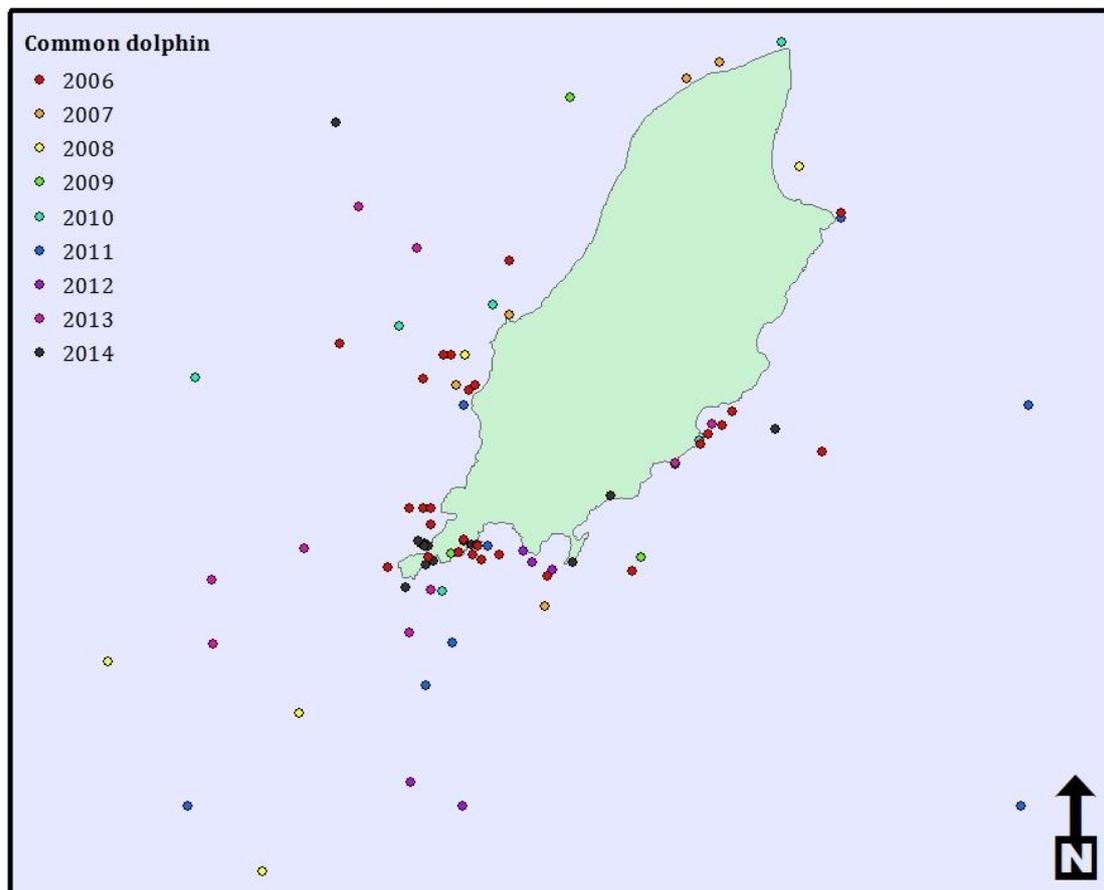
Short-beaked common dolphins are the least frequently seen of the cetacean species seen with some regularity in Manx waters, comprising 1.4% of boat based sightings, 3.3% of sightings from land based surveys and 3.3% of opportunistic sightings. Since 2006, there have been 122 sightings of Common dolphins comprising 768 individuals, an average group size of 6.3 individuals. This is a much lower

average group size than is found in other areas of the British Isles, where group sizes of 100 individuals are common.

Common dolphins are highly seasonal to Manx waters, with no sightings between October and March and 84% of sightings being in June, July and August. This seasonality is matched elsewhere in the British Isles and it is thought that the species may make yearly migrations into and out from inshore waters.

The distribution of Common dolphins in Manx waters shows no real pattern, although the species seems to prefer offshore waters, with the exception of the south west corner of the island. The photo identification catalogue for Common dolphins

Figure 7: All sightings of Common dolphins in Manx waters 2006 to 2014



currently contains 23 individuals, none of which have been re-sighted. It is likely that the number of Common dolphins in Manx waters has declined in recent years, as it has all over the British Isles. It is important therefore that Manx waters are managed carefully to prevent further decline of this species.