

**Current knowledge of the status of**  
**Cetaceans in Manx waters**

by Tom Felce (Manx Whale and Dolphin Watch)

## **Introduction**

Both historical and more recent scientific opinion suggests the Irish Sea can only really be noted for resident Bottlenose dolphins in Cardigan Bay and for mixed species, predominantly Common Dolphins and Minke Whales, in St Georges channel in the south. Of the 20 or so species seen with some regularity in the British Isles and Ireland, only eight are considered as frequently seen in the Irish Sea (Shaw, 1990). These are Harbour Porpoise (*Phocoena phocoena*), Bottlenose Dolphin (*Tursiops truncatus*), Risso's Dolphin (*Grampus griseus*), Common Dolphin (*Delphinus delphis*), White-sided Dolphin (*Lagenorhynchus acutus*), Long-finned Pilot Whale (*Globicephala melas*), Killer Whale (*Orcinus orca*) and Minke Whale (*Balaenoptera acutorostrata*).

Historically, records of cetaceans around the Isle of Man have been scarce. The first documented mention was in 1587, at the Great Enquest of Rushen, during which a man was fined for "concealing a porpos fish" (Craine, 1942), which at the time was considered a crime as all porpoises were the property of the crown. All of the other historical records come from strandings, for example of a Sei Whale (Sargeant, 1925), of a Risso's Dolphin (Bruce, 1939) and of a Bottlenose Dolphin (Bruce, 1940).

However, as far back as 1917, in a pamphlet written by PMC Kermode (Sargeant, 1925), the presence of cetaceans in Manx waters was recognised. It was noted that the porpoise is seen close to shore every year, the common rorqual (Minke Whale) was seen often and that the Grampus or common killer (Risso's dolphin) and the lesser killer (dolphin species) were well known to fishermen.

Furthermore, it was appreciated that the presence or absence of cetaceans was a good indicator of the abundance of fish and other marine life. The same author also noted that most cetacean knowledge had come from strandings and that all cetacean sightings should be reported (Bruce, 1939). However, as it remained for more than half a century, there was no means to actually report any cetacean sightings.

More recently, with increasing anthropogenic pressures and the realisation of the effects such pressures could be having on the marine environment, scientific studies on the Irish Sea have been carried out. The majority of studies looking into cetacean status in the Irish Sea concluded that they were at best scarce, with the majority of sightings being in the southern Irish Sea (Evans et al., 1986; Shaw, 1990; The Irish Sea pilot by DEFRA, Vincent 2003).

The first mention of cetaceans and the Isle of Man was made in a paper assessing cetacean presence in Liverpool Bay and adjacent waters in the northern Irish Sea (Evans, 2001). These were not considered rich areas for cetaceans compared to other parts of the United Kingdom. However, Risso's dolphins and Harbour Porpoise were reported to occur all round the island, Bottlenose and Common Dolphins off the south-west coast and Minke Whales offshore.

Both historically and more recently, there is an absence of evidence of cetaceans in Manx waters. However, this does not equate to there being evidence of absence. There is a great deal of anecdotal evidence of cetaceans around the Isle of Man, from both fishermen and casual observers of the sea. The creation of Manx Whale and Dolphin Watch (MWDW) gave people a means to report cetaceans that previously had not existed.

MWDW was set up as a website and went online in June 2005. The predominant aim was to act as a public sightings network to not only allow people to report their own sightings but also to display recent sightings around the island, hence acting as a database of cetacean sightings in Manx waters. The website also contains information about cetacean species that can be seen around the island and a news section, keeping people informed of interesting sightings and public talks or events. In 2007, Manx Cetacean Surveys were started, the first ever systematic boat based surveys of cetaceans in Manx waters.

It is hoped that MWDW, through the creation of a public sightings network and systematic land and boat based surveys, will at last provide evidence of cetacean presence in Manx waters and will be able to provide baseline information about the species that frequent Manx waters and the temporal and spatial distribution of these species.

## **Some notes on species identification**

It is vital that any researcher studying cetaceans is able to make instant and correct decisions on species identification. The window of opportunity for making such decisions is often only half a second, as cetaceans only spend a fraction of their life at the water surface, hence the need for instant recognition of a cetacean species. Two sets of cues can be used for species identification, morphological and behavioural, as is the case for most fauna. Often, it is a combination of these cues that enables a correct identification of a species to be made.

### **Harbour Porpoise**

Harbour porpoise is the smallest cetacean species in Europe, being 1.5 metres in length, significantly smaller than any other cetacean species in Manx waters. Porpoise are dark grey in colour, almost black and have a rounded head with no obvious beak. Morphologically, their unique characteristic is the triangular fin, unlike any other fin of cetacean species.

Porpoise tend to show quite an arched surfacing motion (see below), which again is unique to the species, but rarely leap or create much water disturbance when moving. Porpoise are fairly boat shy and are usually seen in groups of less than five individuals, although groups of up to 30 individuals are occasionally seen.



### **Risso's Dolphin**

Risso's are one of the largest dolphins, at around 4.5 metres in length and are distinguishable from other dolphins in Manx waters by the lack of beak and blunt head. Their colour varies hugely with age, being born light grey, then darkening as juveniles and then getting more light grey as they age (see below). Individuals gain many scars throughout their life, sometimes to the point of being nearly completely white. Behaviourally, Risso's dolphins tend to be slow moving compared to other dolphins exhibiting behaviours such as logging (laying motionless on the sea surface)

more often than other dolphins. Active behaviours such as leaping are occasionally seen and individuals sometimes show bursts of extreme activity. Risso's dolphins are also less gregarious than other dolphins in Manx waters, being seen most often in groups of 2 to 10 individuals.



### **Minke Whale**

These are the smallest of any baleen whale, at eight metres in length and are distinguishable from other whales by the lack of blow when an individual surfaces. Minke whales are dark grey to black in colour, with a unique white band on the flippers. The dorsal fin is sickle shaped and tall relative to other whales and could be confused with a dolphin's fin.

Minke whales are distinguishable from other cetaceans in Manx waters by the rolling action shown when surfacing (see below). Minke whales tend to be seen as individuals or in small groups of less than three individuals. Minke whales are fairly active for a baleen whale and can be seen lunge feeding and occasionally leaping.



### **Common Dolphin**

Common dolphins are the smallest of the Manx dolphin species at around 2-2.5 metres in length. The dorsal fin is relatively tall and slender and they have a unique hourglass pattern on the flank, starting yellow or ochre in colour and ending white (see below). Common dolphins are highly gregarious and are often seen in groups of over fifty individuals. In Manx waters, the average group size is around twenty

individuals. Common dolphins are also highly active, regularly porpoising and leaping and rarely moving at slow speeds.



### **Bottlenose dolphin**

Bottlenose dolphins are similar in size to Risso's dolphins, at around 4 metres in length and have a sickle shaped dorsal fin. Individuals are light grey except on the belly, which is white.

Bottlenose dolphins show a whole spectrum of behaviours, from languid swimming to highly active behaviours such as breaching and tail slapping. Often it is their behaviour that distinguishes them from Risso's dolphins. In Manx waters, Bottlenose dolphins are seen far more often in winter than in summer and are highly gregarious, often seen in groups of 100 or more individuals.



## **Data collection**

Three types of data have been collected by MWDW; opportunistic data, effort based data from land and data derived from boat surveys. Data derived from the technique of photo-identification will also be described, which can be associated with any of the aforementioned data types.

Opportunistic data refers to sightings of cetaceans that have occurred by chance. These may be sightings reported by casual boat owners or sightings from people on the coast who just happened to spot a cetacean. The majority of sightings reported to MWDW are opportunistic.

Sightings are reported either by phone or directly to the website. If a sighting is reported by an experienced observer, no further action is taken. If the sighting is reported by an inexperienced observer, the observer is phoned to check the validity of the sighting. The observer is asked a series of non-leading questions regarding the sighting, mainly to determine the species, behaviour and number of individuals.

The information gained from opportunistic data is purely sightings related: time of sighting, species, number of individuals, location and behaviour.

Effort based data refers to surveys carried out from land dedicated to looking for cetaceans. Two types of data are collected: effort data and sightings data. Effort records time, location of survey, boat numbers and environmental variables throughout the survey. Sightings data records species, number of individuals per group, behaviour and distance and bearing of the sighting from where the observer is positioned.

Effort data is recorded every fifteen minutes, known as an interval, a common standard in cetacean surveys. The information about each sighting is recorded only once per interval of effort. Effort data is recorded whether there are sightings during the survey or not. Relating effort data to sightings data allows direct comparisons to be made between for example sighting rates at different sites or in different months.

For example, from sightings information alone, two sites may appear to have the same frequency of sighting, with 100 sightings per year from site X and 100 sightings per year from site Y. However, effort data has told us 100 hours of watching took place at site X, whereas only 25 hours of watching had taken place at the site Y. Site Y therefore has a four fold higher sightings rate than site X.

All boat surveys carried out by MWDW are effort based ie. effort and sightings are recorded throughout each trip. Effort essentially records time, distance travelled, the set-up of the observers and environmental conditions. Sightings data essentially records the time and position of the sighting, species, number of individuals and behaviour. The forms used to record this information are in Appendix 1 as well as an explanation of what is recorded on the forms.

Effort data is recorded every fifteen minutes or before if, environmental conditions change, effort type changes or when a new leg is started. Sightings data is recorded at the time that the individual or group was first spotted.

When on Effort Type “LT” (See Appendix 1.1), a very specific type of surveying is being carried out, known as Distance Sampling using Line Transects (Buckland et al., 2001). This methodology was designed to allow estimation of abundance of biological populations which were statistically sound, something that had previously not been achieved with cetaceans.

Line-transect surveys follow a series of systematic, pre-designed lines throughout the research area, called transects, which are selected randomly for each survey. For the method to be statistically strong, three assumptions have to be met (Buckland et al., 2001):

- 1) That all objects on the transect line are detected. Statistically this is written as  $g(0)=1$ , where  $g$  is distance and 1 represents a probability of 100%
- 2) Objects are detected before responding to the vessel
- 3) Distances and angles are measured accurately.

The first assumption is met using double platform surveying. This uses two sets of observers, one set at the point of the vessel which is highest, known as the primary observers, the second set on a lower point usually the deck, known as the secondary observers. The two sets of observers must remain independent, so neither knows there has been a sighting until they spot the animals themselves. This allows the proportion of sightings missed by the primary observers to be calculated. If  $g(0) \neq 1$ , the abundance estimates gained from the primary observers sightings data can be recalculated to allow for the missed sightings.

In order to meet the third assumption, two pieces of equipment are used to measure distance and angle of the sighting from the vessel; a distance stick and an angle board (Appendix 2.1 and 2.2). Accurately measuring the distance and angle of a sighting from a vessel allows calculation of the perpendicular distance of the sighting

from the transect being followed. This is calculated using trigonometry ( $D=RSineA$ , where D is the perpendicular distance, R is the distance from the vessel and A is the angle from the vessel).

This in turn allows the third assumption to be tested, whether the animals are responding to the vessel. Perpendicular distance and frequency of sightings when plotted should show a negative sigmoidal relationship, known as the probability detection function, whereby there are more sightings at low perpendicular distances. If this is not the case, it suggests animals are reacting to the vessel, positively or negatively, which will skew the overall number of sightings and hence the abundance estimate gained from these sightings.

The data gained from distance sampling using line transects is statistically analysed using a computer based programme called DISTANCE to produce an abundance estimate. The calculation is based upon two relationships; firstly, the probability detection function, mentioned above and secondly the fact that bigger groups are more detectable at higher distances than smaller groups. Using these two relationships and the distance travelled when on transect, DISTANCE calculates a density of animals for a particular species, which when multiplied by the research area, gives rise to an abundance estimate.

The survey area consisted of all Manx waters up to 12 miles offshore and was split into eight equally sized boxes (Appendix 3.1), each of which could be completely surveyed in a day. Within each box are four separate routes (Appendix 3.2). The box and route for each survey were chosen randomly.

A typical survey would consist of around 100 nautical miles, consisting of 50 nautical miles on transect. Surveys are only carried out in a sea-state of Beaufort scale 3 or less (10mph or less of wind) and when visibility is 2km or more. Boat surveys were carried out in 2007 and 2008, but using different survey vessels.

Some of the data recorded and discussed in this paper were a result of the technique of photo-identification. This is a process which uses photographs of animals and identifies individuals through observed differences in natural markings. Photo-identification by MWDW focuses primarily on markings to dorsal fins of individuals (Appendix 4.1). When a group of animals was sighted, their behaviour was observed, particularly regarding reaction to the vessel, before photo-identification was attempted.

The group of animals were approached slowly, from behind and to the side, so as not to disturb the group. Particular care was taken not to split the group or block it into land. Images are taken of as many animals as possible and of both sides of the animal if possible. A maximum of thirty minutes is allowed under terms of our licence from the Manx government or the group may be left sooner if all animals are photographed.

Other information about the sighting is recorded on the sightings form (Appendix 1.2). When ashore, the images are processed and catalogued (Appendix 4.2), according to the markings seen on each individual.

# Results

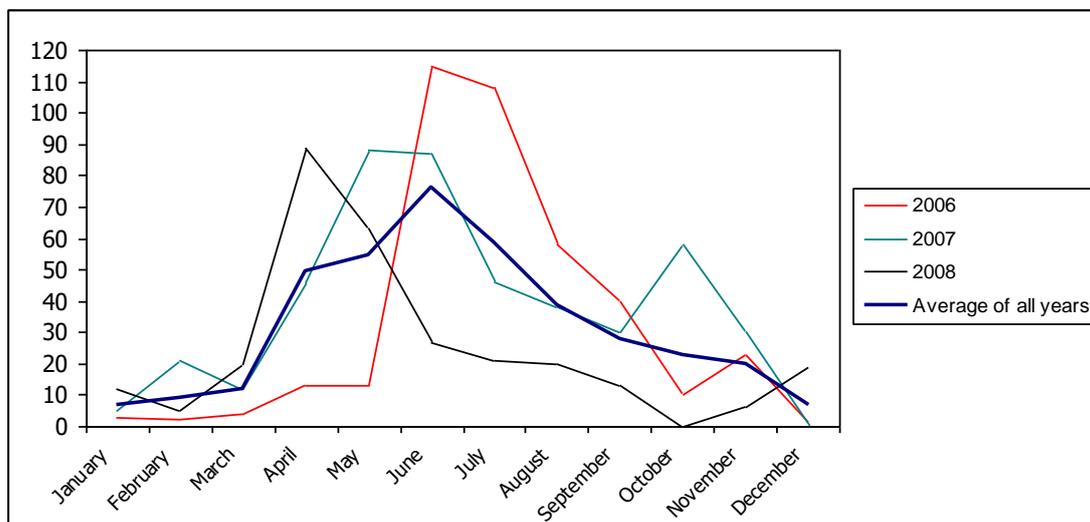
## Opportunistic data

Since its inception in 2006, there have been 1145 sightings reported to MWDW up until the end of 2008; 390 in 2006, 460 in 2007 and 295 in 2008. Table 1 and Figure 1 show the temporal distribution of the sightings.

**Table 1: Sightings per month 2006-2008**

	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>Average</b>
<b>January</b>	3	5	12	7
<b>February</b>	2	21	5	9
<b>March</b>	4	12	20	12
<b>April</b>	13	46	89	49
<b>May</b>	13	88	63	55
<b>June</b>	115	87	27	76
<b>July</b>	108	45	21	58
<b>August</b>	58	38	20	39
<b>September</b>	40	30	13	28
<b>October</b>	10	58	0	23
<b>November</b>	23	30	6	20
<b>December</b>	1	0	19	7
<b>Total</b>	390	460	295	382

**Figure 1: Graph to show sightings per month, 2006-2008 and the average trend over the three years**



Despite very different sightings numbers in each of the three years, the overall trends throughout the year are essentially the same, with a peak in sightings between April and September of 1 to 4 sightings a day. The average of the three years gives the most accurate representation of cetacean numbers around the island, as it evens out monthly anomalies.

A total of 11 species have been reported to MWDW, with five species being reported with some regularity; *Phocoena phocoena* (Harbour Porpoise), *Grampus griseus* (Risso's dolphin), *Balenoptera acutorostrata* (Minke Whale), *Tursiops truncatus* (Bottlenose Dolphin) and *Delphinus delphis* (Common Dolphin). The temporal distribution of sightings of these species can be seen in Table 2. Others in this table refer to rarely seen species such as *Orcinus orca* (Killer Whale).

**Table 2: Temporal distribution throughout the year of all most frequently seen cetaceans**

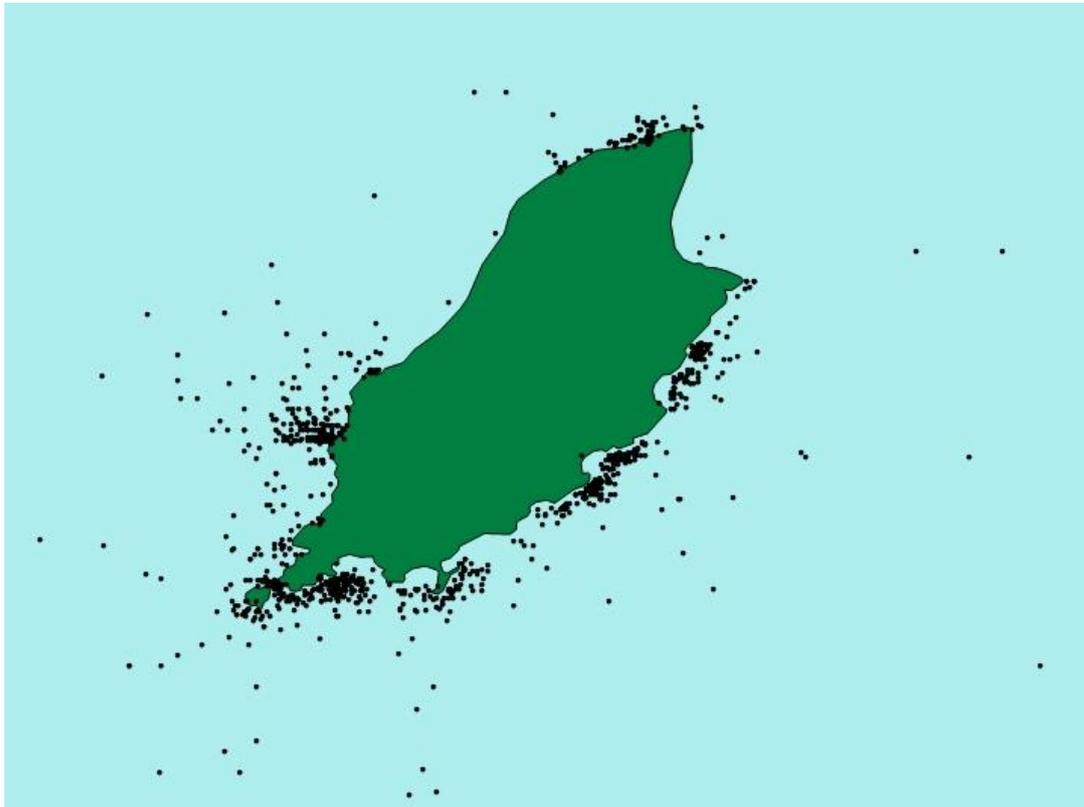
	<b>Harbour Porpoise</b>	<b>Risso's Dolphin</b>	<b>Minke Whale</b>	<b>Bottlenose Dolphin</b>	<b>Common Dolphin</b>	<b>Others</b>
<b>January</b>	4	3	2	11	0	0
<b>February</b>	14	5	0	7	0	2
<b>March</b>	15	16	1	2	0	2
<b>April</b>	81	55	4	2	1	5
<b>May</b>	77	60	8	4	1	13
<b>June</b>	111	44	17	2	37	19
<b>July</b>	106	21	30	0	12	6
<b>August</b>	47	19	29	5	6	10
<b>September</b>	32	10	31	0	2	7
<b>October</b>	20	5	37	0	0	6
<b>November</b>	21	1	29	5	0	3
<b>December</b>	7	0	0	12	0	1
<b>Total</b>	535	239	188	50	59	74

Harbour porpoise is the most commonly seen cetacean, with more than twice the number of sightings than any other. Both Harbour Porpoise and Common Dolphin have a peak sightings rate in June and July. The peak sightings rate for Risso's dolphin is slightly earlier in the year in April and May, mirroring the peak sightings rate for Minke whales, in September and October. Conversely, Bottlenose dolphin sighting rates are highest during the winter months in December and January.

Sightings of cetaceans are reported from all round the island with the most sightings being reported from the south west corner of the island between Port St Mary and the Calf of Man. There are two areas in particular where there have been

very few sightings, firstly in the north west of the island between Peel and the Ayres and also in Ramsey Bay on the north east of the island (Figure 2)

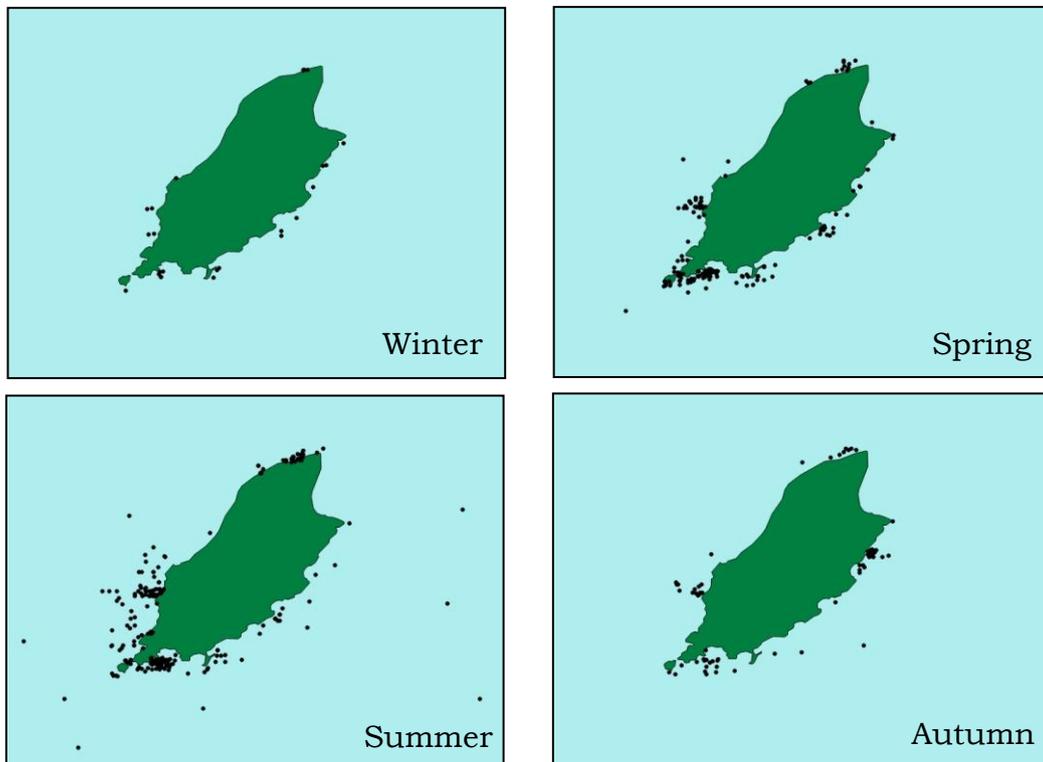
**Figure 2: Plot to show spatial distribution of all sightings reported between 2006 and 2008**



Figures 3, 4 and 5 show the seasonal distribution of sightings of the three most frequently seen species, Harbour Porpoise, Risso's Dolphin and Minke Whale, reported to MWDW. There are four plots for each species representing the seasons. Winter represents December to February, Spring represents March to May, Summer represents June to August and Autumn represents September to November.

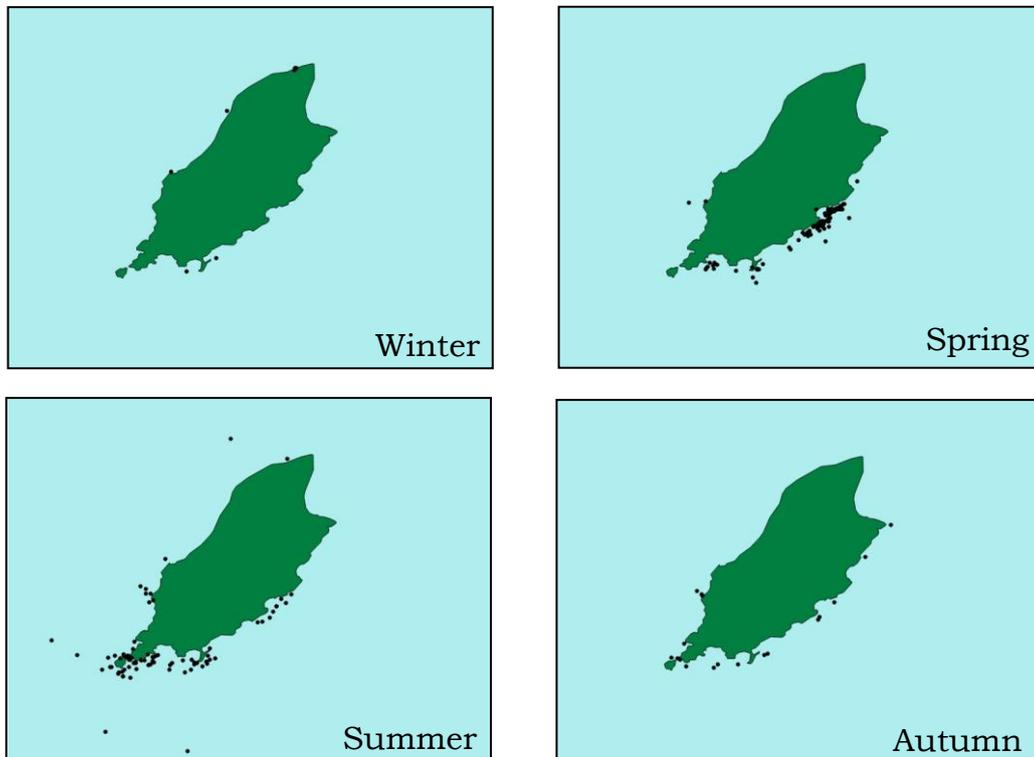
Harbour Porpoise show no pattern in terms of changes in distribution between the seasons. The majority of the sightings reported in all of the seasons are in the south and on the west coast, although there are sightings reported from all round the island (Figure 3).

**Figure 3: Seasonal distribution of Harbour Porpoise sightings reported to MWDW, 2006-2008**



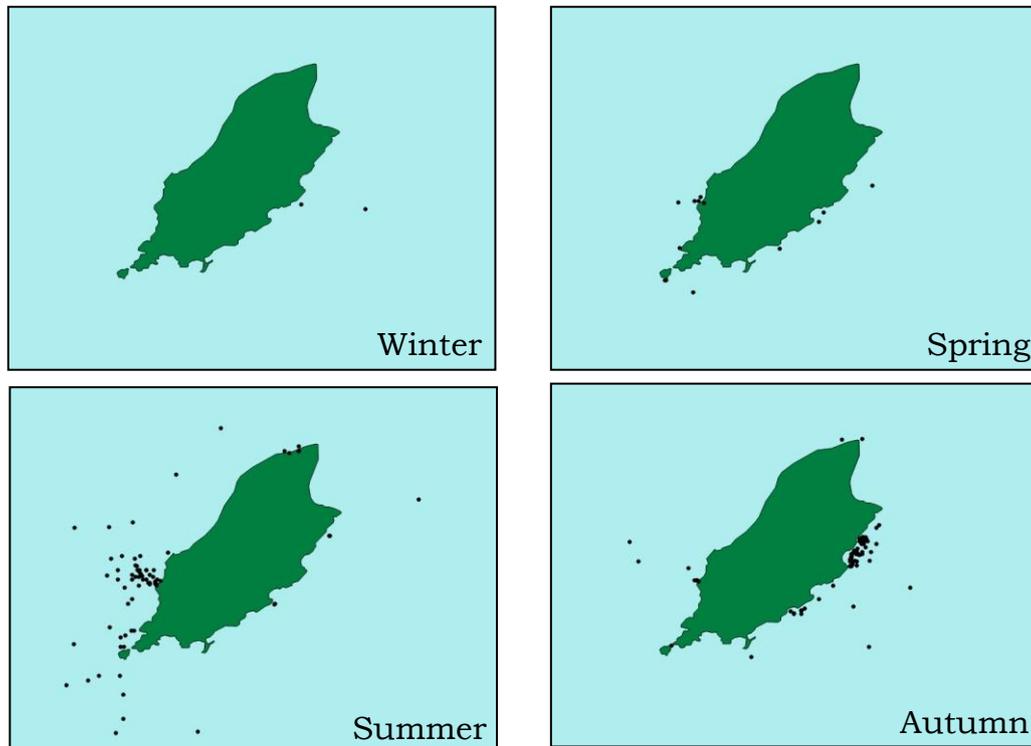
Risso's dolphins on the other hand show two clear patterns regarding the spatial distribution of sightings. Firstly, the majority of sightings in all seasons are on the east coast. There also appears to be a southerly shift in distribution of sightings between spring and summer, with most spring sightings being around Onchan and Douglas heads and most summer sightings being between Langness and the Calf (Figure 4). There is also a temporal aspect to sightings of Risso's with very few sightings reported in autumn and winter ( $n=5$  and  $n=5$  respectively) compared to spring and summer ( $n=60$  and  $n=76$  respectively)

**Figure 4: Seasonal distribution of Risso's Dolphin sightings reported to MWDW, 2006-2008**



Minke Whales also show both a spatial and temporal aspect regarding the distribution of sightings. There is a clear change in distribution between the seasons. In winter and spring, the sightings show no obvious pattern in distribution, being scattered all around the island. In the summer, the sightings are almost exclusively on the west coast of the island, whereas in the autumn, virtually all sightings reported to MWDW are on the east coast of the island, particularly between Laxey and Dhoon bays (Figure 5).

**Figure 5: Seasonal distribution of Minke Whale sightings reported to MWDW, 2006-2008**



Although there may be spatial and temporal aspects to the distribution of Bottlenose and Common Dolphin, the sample sizes are too small ( $n=50$  and  $n=59$  respectively) to be able to draw any worthwhile conclusions. It does appear however, that Bottlenose Dolphin sightings are far more common in winter than in summer whereas conversely, sightings of Common Dolphin appear to be almost exclusively in summer and almost non-existent in the other seasons.

**Data from effort based watches from land**

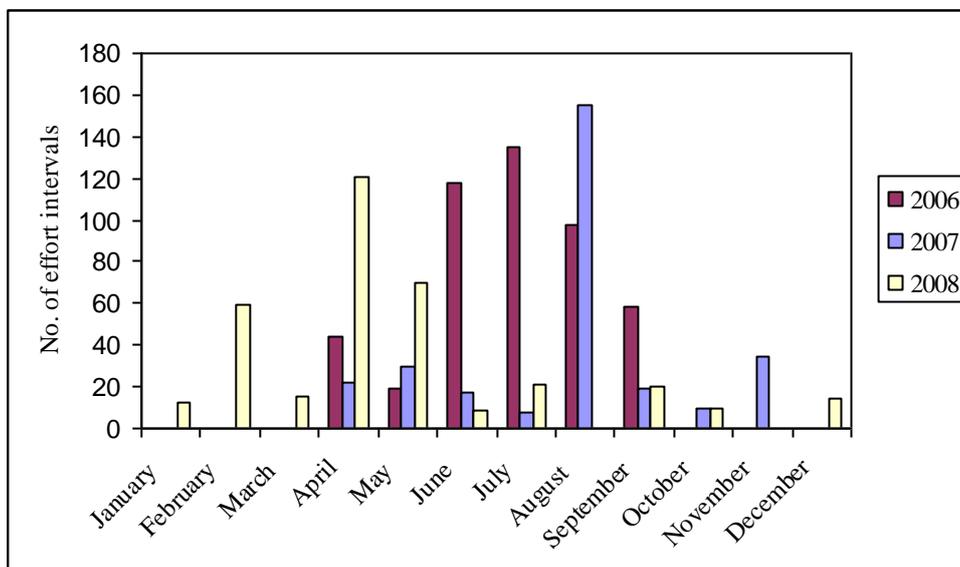
Since 2006, there have been a total of 278.5 hours of effort based watches from land representing 1114 effort intervals (an interval lasting 15minutes). During these watches, there have been a total of 315 sightings of cetaceans and other marine megafauna (Table 3). These represent sightings of different groups of animals not repeat sightings of the same animals.

**Table 3: Total effort and sightings from effort based watches from all sites, 2006-2008**

Year	Effort (hours)	Sightings
2006	118	174
2007	72.75	86
2008	87.75	55

The distribution of effort throughout the year can be seen in Figure 6. Effort has been carried out throughout the year, although there are differences in the spread of effort within each of the years. All effort in 2006 was carried out in the summer, whereas in 2007 and 2008, effort was distributed throughout the year, with peaks in August and the spring in the respective years.

**Figure 6: Distribution of effort at all sites throughout the year, 2006-2008**



The species composition and number of individuals of effort based sightings from land can be seen in Table 4. “Other” refers to grey seals, basking sharks and cetaceans of an unknown species.

**Table 4: Species composition of sightings, 2006-2008**

<b>Species</b>	<b>Number of Sightings</b>	<b>Number of individuals</b>	<b>Number of intervals present</b>
Harbour Porpoise	140	329	242
Risso's Dolphin	11	36	29
Minke Whale	31	38	53
Common Dolphin	14	36	24
Bottlenose Dolphin	2	2	2
Fin Whale	1	3	3
Others	116	242	307
<b>Total</b>	<b>315</b>	<b>686</b>	<b>660</b>

Harbour Porpoise are the most frequently seen cetacean, both in terms of number of different sightings and the number of effort intervals in which they are present (21.7% of all effort intervals). Cetaceans as a whole are present in 31.8% of all effort intervals ie. There would be a cetacean sighting in 1 in every 3 effort intervals. The average number of individuals per sighting of all cetaceans is 2.18, the biggest group recorded being 13 Harbour Porpoise.

Effort based watches can also be used to compare sightings rates between different sites, using cetacean positive intervals ie, the number/percentage of intervals in which at least one cetacean was seen (Table 5)

**Table 5: Sightings rates per area**

<b>Site</b>	<b>Intervals watched</b>	<b>% Cetacean +ve intervals</b>
<b>Calf</b>	105	9.5
<b>Douglas</b>	76	10.5
<b>Dhoon</b>	44	15.9
<b>Maughold</b>	92	3.3
<b>Niarbyl</b>	376	44.1
<b>Port St Mary</b>	157	53.5

Port St Mary has the highest percentage of cetacean positive intervals, with over half the intervals containing at least one sighting of a cetacean.. This contrasts with Maughold Head, where only 3% of intervals contain a cetacean.

#### **Data from boat based surveys**

Since boat surveys started in May 2007, a total of 3473km have been travelled on all trips combined, 2588km in 2007 and 885km in 2008. This was comprised of the following effort types:

**Table 6: Breakdown of effort types during Manx Cetacean Surveys**

<b>Effort Type</b>	<b>Distance (km) 2008</b>	<b>Distance (km) 2007</b>
<b>Casual Watch</b> (no dedicated observers)	23.7	35.3
<b>Dedicated Search</b> (2 dedicated observers on fly-bridge, no independent observer)	623.5	956.1
<b>Line Transect</b> (2 dedicated observers on fly-bridge, 1 independent observer)	223.7	938.7
<b>Photo Identification</b>	14.0	7.6

There have been a total of 266 sightings of cetaceans, seals and basking sharks on all trips, of which 165 are of cetaceans. This equates to a sightings rate of 0.076/km or 13km travelled between every sighting.

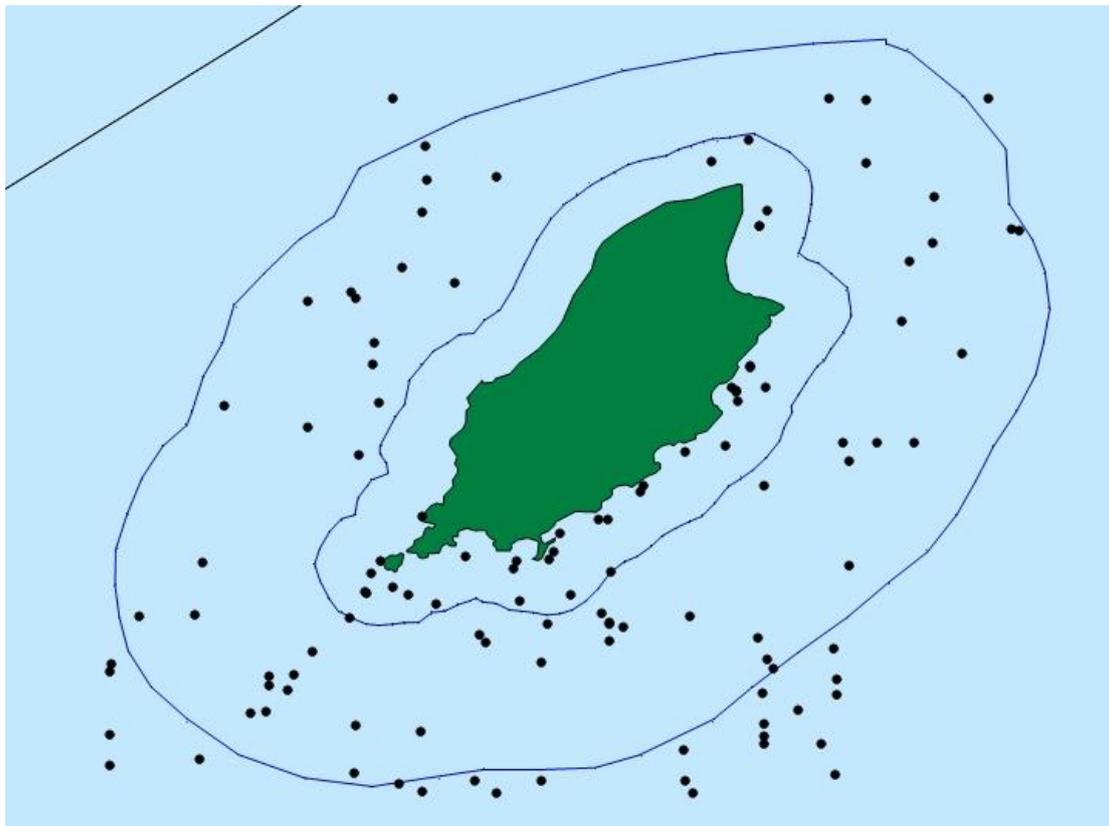
**Table 7: Sightings on Manx Cetacean Surveys, 2007-2008**

<b>Species</b>	<b>Number of sightings</b>	<b>Number of individuals</b>
<b>Basking Shark</b>	53	68
<b>Common Dolphin</b>	2	31
<b>Grey Seal</b>	48	123
<b>Harbour Porpoise</b>	136	284
<b>Minke Whale</b>	12	16
<b>Risso's Dolphin</b>	14	52
<b>Unknown</b>	2	2

As would be expected from the opportunistic and effort based land data, Harbour Porpoise are by far the most frequently seen cetacean or otherwise, comprising 51% of all sightings and 82% of all cetacean sightings. The average group size for cetaceans is 2.33, with the highest group size being in the dolphin species.

The spatial distribution of all sightings on boat surveys can be seen in Figure 7.

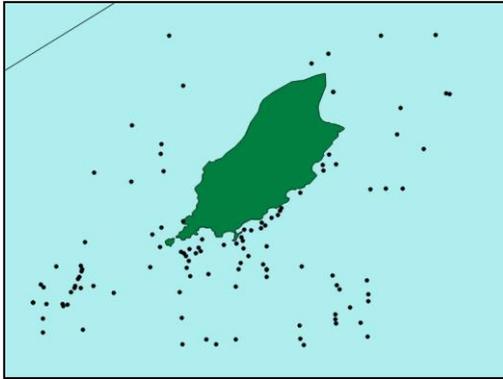
**Figure 7 :All cetacean sightings from Manx Cetacean Surveys 2007 and 2008 and 3 mile and 12 mile offshore boundary**



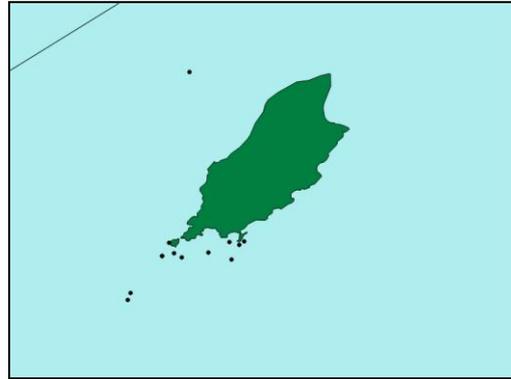
Sightings of cetaceans were made throughout Manx waters, although as would be expected from opportunistic and effort based data, the majority of sightings are in the south of the island. The area containing the lowest number of sightings is in the far north of the island.

The plots for the three main cetacean species seen, Harbour Porpoise, Risso's Dolphin and Minke Whale can be seen in Figures 8, 9 and 10.

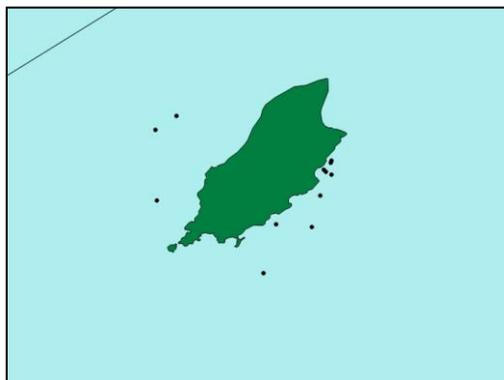
**Figure 8 Harbour Porpoise**



**Figure 9 Risso's Dolphin**



**Figure 10 Minke Whale**



Harbour Porpoise are seen throughout Manx waters, both inshore and offshore, with the majority of the sightings being seen in the south of the island. Risso's Dolphin sightings, with the exception of one sighting, are seen between Langness and the Calf of Man, the majority of them being inshore. Minke Whale sightings are fairly scattered throughout Manx waters, with no obvious areas of high sightings activity. These results mirror the spatial distribution shown by these three species from opportunistic sightings.

Due to a lack of sightings of Risso's Dolphin and Minke Whale, an abundance estimate was only applicable for Harbour Porpoise. Based on data derived from line transect sampling in 2007, it was estimated by DISTANCE that the density of Harbour Porpoise throughout Manx waters (an area of 4492km<sup>2</sup>) was 0.18 per km<sup>2</sup> (Coefficient of Variance = 24.5, 95% intervals = 0.11-0.29). This means that there is

an average density of 0.18 porpoise per km<sup>2</sup>, which statistically, may vary by 24.5%, to a confidence level of 95%. This density therefore equates to an estimated abundance of 814 animals (95% intervals 501-1322). Therefore, there are between 501 and 1322 harbour porpoise within Manx waters.

Photo-identification catalogues have been created for four species by MWDW; Risso's Dolphin, Minke Whale, Common Dolphin and Bottlenose Dolphin. The catalogues use both images taken by MWDW on dedicated surveys as well as images that have been kindly donated to MWDW from other individuals.

There have been a total of 19 encounters with Risso's Dolphins, although two of these encounters did not yield any useful images. From these encounters, 21 well marked individuals have been identified, animals that have markings big enough that can be identified from images of either side of the individual. The catalogue also contains 6 "Left" individuals (those that can only be identified from images of the left hand side) and 8 "Right" individuals (those that can only be identified from the right hand side). The catalogue hence contains a minimum of 29 individuals, as some of the "Lefts" and "Rights" could be the same animal.

From encounters thus far, an average of 42% of all individuals photographed are well-marked. If 21 individuals (the number of individuals in the well-marked catalogue) represent 42% of the population, it can be said that the population of Risso's based on our current catalogue numbers 50 individuals. Although this is only a very basic inference, it does give a general idea of the size of the population of Risso's Dolphins in Manx waters.

The Minke Whale catalogue is based on three separate encounters and currently numbers three well-marked individuals. The Common Dolphin catalogue is based on one encounter and currently numbers 6 well-marked individuals. The Bottlenose Dolphin catalogue is based on one encounter and numbers 12 well-marked individuals, 3 "Left" individuals and 4 "Right" individuals.

## **Discussion**

For the first time, Manx Whale and Dolphin Watch, through both a public sightings network and through dedicated surveys, is able to provide evidence of a significant cetacean presence in Manx waters. Since 2006, an average of 382 sightings are reported to the website each year. The peak for numbers of opportunistic sightings is between May and September, although there are sightings reported throughout the year.

Cetacean sightings around the island are fairly typical in terms of temporal distribution, for a country in northern Europe. Marine ecosystems are driven by primary production, which in northern temperate seas peaks in April or May, when the phytoplankton bloom occurs. This bloom provides food for the entire ecosystem and hence most animals are most numerous in the months consecutive to the phytoplankton bloom. This temporal distribution for cetacean sightings is confirmed by effort based watches from land. (Appendix 6)

In terms of spatial distribution, cetaceans are seen all round the island, with the highest number of sightings off the south and south-west coasts (Figures 2 and 7). There are two factors that may be causative of this apparent spatial distribution. This part of the island is closest to the Irish Sea front, where nutrient-rich mixed water combines with stratified water, resulting in enhanced primary production. Several studies have shown that cetaceans, particularly Harbour Porpoise, associate with this frontal system (Jones, 1984; Weir and O'Brien, 2000).

The second potential factor is anthropogenic. The north of the island is far less accessible in terms of the coast and hence less time is spent in areas where cetaceans may be seen. Furthermore, this area was only visited once on Manx Cetacean Surveys, less frequently than other areas in Manx waters. However, when effort (ie. Time present and distance travelled) is taken into account, the north of the island has a lower sightings rate than elsewhere (0.091 sightings/km; 0.14/km respectively).

As both historical records (Sargeant, 1925) and modern scientific studies (Shaw, 1990) suggested, Harbour Porpoise is the most frequently seen cetacean in Manx waters, making up more than 50% of opportunistic sightings, 70% of cetacean sightings from land-based watches and 82% of cetacean sightings from boat-based surveys.

Temporally, peak sighting frequencies of Harbour Porpoise occur between May and October, with far fewer sightings being reported during the winter months. Although seasonal migration has been suggested for Harbour Porpoise in both north-west Scotland (Evans et al., 1993) and elsewhere in temperate Europe, too few surveys have taken place in British waters during winter months to know whether this is a true effect or due to the difficulty of surveying in the winter.

Despite certain hotspots, for example near Port St Mary and off the south west of the island, Harbour Porpoise are seen throughout Manx waters, both inshore and offshore and show no obvious signs of a change in distribution between the seasons. Harbour Porpoise show high variability in their diet, allowing the species to survive in and exploit a number of marine habitat types, from relatively featureless sandy areas, such as the north west of the island, to topographically complex areas such as Port St Mary or Niarbyl.

Several studies have suggested that the Irish Sea, as a whole, probably has a lower density of cetaceans, including Harbour Porpoise, than other areas in the UK (Shaw, 1990; Evans, 2001). From boat surveys, a density of 0.18 individuals/km<sup>2</sup> was estimated using distance sampling techniques. This compares favourably with studies on porpoise density in the Hebrides (Boran et al., 1999), an area of high productivity, which found porpoise density over a seven year period to be 0.33/km<sup>2</sup> on average. A density of around 0.2/km<sup>2</sup> was also found in Cardigan Bay (Barnes et al., 2002). The northern Irish Sea therefore seems to have a relatively standard abundance of Harbour Porpoise.

The Isle of Man clearly represents an important area for Harbour Porpoise in the north-west Atlantic and it appears that despite possible seasonal migration at either end of the summer, they may show some form of residency to the island, as sightings are reported throughout the year.

Both historical records (Sargeant, 1925) and some recent scientific reports (Evans, 2001) had suggested that Risso's dolphins were present in Manx waters. However, whether their presence was seasonal, their distribution and whether Risso's dolphins show a degree of residency to Manx waters was not known. Risso's dolphins are the second most frequently reported cetacean to MWDW, comprising 20% of all sightings and were also the second most frequently seen cetacean from Manx Cetacean surveys.

Temporally, the peak for Risso's dolphin sightings is slightly earlier than for Harbour Porpoise, occurring between April and June. Between October and February (inclusive), sightings are sparse suggesting some degree of seasonal movement. Very little is known about Risso's dolphins in British waters, so this seasonal movement cannot be confirmed from elsewhere.

The spatial distribution of Risso's dolphin sightings is almost exclusively on the east coast of the island, with more than 90% of all sightings, from both opportunistic and boat based data, occurring on the east coast. The Risso's dolphins also show a more southerly distribution in the summer months compared to the spring. The most likely cause of these two spatial patterns is the distribution of prey, namely Cephalopoda, particularly squid. One squid species, known to be found in the Irish Sea, *Loligo forbesi*, is known from stomach content analysis, to be a prey item of Risso's dolphins elsewhere in British waters. It is likely therefore that Risso's dolphin distribution closely follows that of *L.forbesi* and other squid species in Manx waters.

Photo identification and the data derived from it enable conclusions to be drawn about the life-history of individuals and about the population as a whole. Although the Risso's dolphin catalogue currently numbers 21 well-marked individuals, new individuals are still being recognised (Appendix 5), suggesting the catalogue is incomplete.

Of the 21 well-marked individuals, 7 have been seen more than once and four have been seen in consecutive seasons (2007 and 2008). This suggests a degree of site fidelity by certain individuals to Manx waters.

Risso's dolphins have been shown to live in complex societies, in which some individuals, particularly adult males, show very strong associations, whereas others have pair only or no associations, particularly juveniles (Hartman et al., 2008). Even with the limited sample size of this study, certain individuals do seem to be showing a degree of social association, being seen together on 60% of encounters in which they were seen. However, far more encounters are needed to make any strong inferences about the social structure of Risso's dolphins in Manx waters.

Recent scientific studies suggest that Minke whales are seen very rarely in the northern Irish Sea and certainly would not be described as common (Shaw, 1990; Evans, 2001). Historical records however describe the Minke whale or common rorqual as it was then known, as being seen often (Sargeant, 1925). The Minke whale

is the third most frequently seen cetacean in Manx waters, comprising 16% of all cetacean sightings. The peak months for Minke whale sightings are between July and November, with only fifteen (8%) of sightings occurring outside these months.

There is also a very clear temporal aspect to the distribution of Minke whale sightings. In the summer (June to August), virtually all sightings are on the west coast of the island, whereas in the autumn (September to November), most sightings are on the east coast. The driving factor behind both temporal and spatial patterns appears to be the distribution of herring, a recognised food source of Minke whales, in Manx waters.

There are two known herring stocks in the Irish Sea, known as the Mourne stock, near the east coast of Northern Ireland and the Manx stock. The Manx herring stock are known to spawn on the east coast of the island, in September to October (Bowers, 1969), hence the presence of Minke whales on the east coast during these months. During the summer months, the Manx stock and Mourne stock are found together off the west coast of the island (Bowers, 1980), hence the presence of Minke whales in this area between these months. Both temporally and spatially, Minke whales seem to mirror the Irish Sea herring in Manx waters. It is hoped that the Minke whale photo-identification catalogue will prove a useful tool in determining whether the same individuals frequent Manx waters and will be able to give rise to an estimate of how many Minke whales take advantage of the Manx herring stock.

Neither Bottlenose nor Common Dolphins show any clear pattern in terms of spatial distribution in Manx waters (Appendices 7 and 8). However both species do show a very clear temporal pattern; Bottlenose dolphins are seen more often, 68% of sightings, in the winter, whereas Common dolphins are seen only between May and September.

Bottlenose dolphins in British waters are seen most frequently between April and September, although this does vary between areas (Evans et al., 2003). Early indications from a comparison of images of Bottlenose dolphins taken in Manx waters with images taken in Cardigan Bay suggest that there is movement of individuals between these two areas (Felce, Pers. Obs).

It is possible that some of the individuals from Cardigan Bay, where dolphins are mainly seen between April and September (Bristow and Rees, 2001), move out of Cardigan Bay in the winter months to areas such as the Isle of Man. Group sizes of

approximately 200 individuals have been reported in Manx waters to MWDW, which suggests an abundant food source for Bottlenose dolphins in winter in Manx waters.

The temporal pattern of Common dolphin sightings in Manx waters matches that of Common dolphins in other areas around Britain. In the Celtic Sea and the Hebrides, the species moves onto continental shelf waters in the summer and then back offshore in the winter (Evans et al., 2003)

The use of photo identification on Common dolphins is uncommon, as they are very hard to photograph and highly gregarious, making photographing all individuals in a group, or even most individuals, highly difficult. However, there have been many incidents of mass mortalities of Common dolphins due to being bycaught in fisheries (for example Tregenza and Collet, 1998). Mass strandings have also become common, for example 26 individuals in June 2008 in Cornwall. It is therefore important to gain as much knowledge about Common dolphin numbers and population biology as possible, which can be achieved through photo identification.

In summary, the data gained from opportunistic sightings, land based surveys and Manx Cetacean surveys have provided the first ever information on cetaceans in Manx waters. It appears that Manx waters are important for five cetacean species; Harbour Porpoise, Risso's dolphin, Minke whale, Bottlenose dolphin and Common dolphin. The presence of calves in sightings of all three dolphin species and Harbour Porpoise further highlights the importance of the area for these species. Through further work in Manx waters and through collaboration with other research organisations, more information about the abundance, status and life history of cetaceans in Manx waters will be defined.

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