

Dolphin Watch:
Bottlenose Dolphins and Boat Traffic
on the Ceredigion Coast, West Wales
2016

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Introduction

In 1994, when the Dolphin Watch study first began, the aim was to obtain further information on the relationship between cetacean site use and boat traffic; this data would then help to guide future management of the then recently designated voluntary Marine Heritage Coast (MHC). Dolphin Watch was established in response to a community led initiative which raised concerns that perceived increases in powered craft activity may have potential adverse effects on the local bottlenose dolphin population. The project was designed with the aim of encouraging local people to participate in monitoring the dolphins, to both build support for the MHC and to raise public awareness of the issue of boat disturbance.

In 1996 an area in the south of Cardigan Bay was put forward as a candidate Special Area of Conservation (cSAC) under the EU Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, 1992) because of its importance for the bottlenose dolphin population in Cardigan Bay.

In 2004 the Cardigan Bay Special Area of Conservation (SAC) was officially designated as an SAC. Stretching from Ceibwr Bay in Pembrokeshire to Aberarth in Ceredigion and extending almost 20km from the coast, Cardigan Bay Special Area of Conservation (SAC) protects the wildlife found in around 1000km² of sea. Cardigan Bay SAC forms part of a network of protected sites known as the Natura 2000 (N2K) network.

Dolphin Watch has now completed twenty three years of data collection. This is our ninth Dolphin Watch survey report (Pierpoint and Allan 2000, 2001; 2002; 2004; 2006; Allan et al. 2010; Sampson et al. 2015, Perry, S. 2016). A peer reviewed paper has also been published Pierpoint, C., Allan, L., Arnold, H., Evans, P., Perry, S., Wilberforce, L. and Baxter, J (2009) Monitoring important coastal sites for bottlenose dolphin in Cardigan Bay, *Journal of the Marine Biological Association of the United Kingdom*. 89 (5): 1033-1043).

The key aims of the project are:

- ❖ To monitor the presence of bottlenose dolphins to improve our understanding of bottlenose dolphin site usage and to monitor trends in dolphin occurrence
- ❖ To monitor levels of boat traffic to aid coastal zone management and to assess the effectiveness of the local codes of conduct
- ❖ To Investigate interactions between bottlenose dolphins and boats
- ❖ To increase public awareness and appreciation of the marine wildlife in Cardigan Bay

Method

Bottlenose dolphin monitoring was completed at five study sites in Cardigan Bay, West Wales. The data was collected by a team of volunteers, some of whom had already taken part in the project in previous years, but also working alongside volunteers new to the project. The study sites were located at Mwnt, Aberporth, New Quay Bird's Rock, New Quay Harbour and Aberystwyth.

Records from New Quay Harbour were collected and contributed to the database by the Wildlife Trust of South and West Wales Living Seas' staff and volunteers from the Cardigan Bay Marine Wildlife Centre (CBMWC).

This year's report covers field data collected over a longer period of time than in previous years; March to October rather than June to September. The data from March to October was analysed in order to include the full length of the field season covered by volunteers at many of the sites, and to ensure that sufficient data collected in suitable conditions (visibility at least 2 km, sea state 3 or less) was available for analysis. This time frame will now be used in all subsequent reports.

Site use by bottlenose dolphins

Watches of two hours each were scheduled with set start times of 09:00, 11:00, 13:00 and 15:00.

At New Quay Harbour, The Wildlife Trust of South and West Wales Living Seas' staff and volunteers from the Cardigan Bay Marine Wildlife Centre carried out additional watches throughout the field season (07:00 and 17:00).

The two hour watches were divided into eight 15 minute intervals. At the start of each interval the start time and information on sighting conditions (general weather and visibility, wind direction and sea state) were recorded on a data sheet. This information was later used to extract a subset of observations made in good conditions (visibility at least 2 km, sea state 3 or less) for which sighting rates of bottlenose dolphins were calculated and comparisons made between study sites.

Dolphin Watch volunteers received training at the start of the season to address any misconceptions and to update survey skills and data collection methodology. Volunteers were provided with a range of keys, guidance notes and a comprehensive photographic guide detailing cetacean behaviours that may be observed.

When marine mammals were present at the site their locations were marked on a map. Locations were estimated by eye within a grid of guidelines to landmarks. A group of bottlenose dolphins was considered to be animals in close proximity (within about ten body lengths of another animal) and behaving in a similar manner. Abbreviated codes were written against each individual animal or group location giving species name, group size, number of calves and behaviour at the start of the fifteen minute interval or when first seen.

From these systematic counts sighting rates for bottlenose dolphins were derived. Two indices were used to make comparisons between sites and with previous field seasons. These indices were:

- a) The proportion of two hour watches in which dolphins were recorded
- b) The average count of dolphins in a fifteen minute interval per two hour observation period.

For those watches in which dolphins were recorded at least once, three further indices were calculated:

- c) Group size: as a measure of the average group size or number of dolphins aggregated at each site, the mean of the highest count recorded in each watch was used. The total number of dolphins seen in each two hours was not estimated, as we cannot determine this from the data collected. The aim of the study is not to identify individual animals; therefore we are unable to establish whether the same animal/s moved through the site more than once in a watch.

- d) Occurrence of young bottlenose dolphins (juveniles or calves): bottlenose dolphins were recorded as calves if they were distinctly paler than the accompanying adult and approximately two-thirds of the adult length or less. Foetal folds may also still be visible on very young calves.
- e) Site occupancy: to examine the amount of time that dolphins tended to occupy sites, the average number of fifteen minute intervals with bottlenose dolphins present per watch was calculated for watches in which dolphins were recorded at least once.

Encounters between bottlenose dolphins and boats

Additional information was recorded on the data sheet when a vessel/s came within 300 metres of a group of bottlenose dolphins. This was classed as a 'boat encounter'.

Only the first boat encounter in each fifteen minute interval was recorded. This reduced the likelihood of bias towards particular types of boat that observers may have considered to have a greater impact on dolphin behaviour.

For each 'boat encounter' the observer recorded the type of boat that was closest to a dolphin/group, the total number of vessels within a 300 metre radius of an individual dolphin/group; compliance/non-compliance with the Ceredigion Marine Recreational or Commercial Code of Conduct and all the dolphin behaviours that were observed.

Boat operators were considered to have complied with the code of conduct if they either passed the animals at 'no-wake' speed and with no erratic alterations of course (code Y1) or slowed down gradually and stopped (Y2). Four codes were used when operators did not comply and these were either because they were travelling too fast within 300 metres of dolphins (N1); they followed an erratic course to approach, avoid or follow dolphins (N2); they attempted to touch, feed or swim with dolphins (N3), or they were clearly exceeding 8 knots within a buoyed, low speed zone at New Quay (N4). A code (R) was used when the boat involved was a vessel permitted under licence from Natural Resources Wales to approach bottlenose dolphins for research purposes. These vessels carry a flag that they must fly when they are invoking their licence.

We then examined whether compliance or non-compliance with the Ceredigion Marine Codes of Conduct affected the dolphins' behaviour and how the dolphins responded to encounters with boats. Observers recorded dolphin behaviour for each fifteen minute interval throughout the two hour observation period and the dolphins' behavioural responses during encounters.

Results

Observer effort

During 2016 a total of 1360 observation periods (watches) were carried out between March and October (Table 1). Since the first season's field work in 1994 a total of 12,630 watches have been completed.

When the project began observations were carried out at three sites; Aberporth, New Quay Bird's Rock and Ynys Lochtyn; but in recent years watches at Ynys Lochtyn have not taken place. Mwnt has also been included since 1998; New Quay Harbour and Aberystwyth were added to the site list in 2004. The New Quay Harbour data is contributed to the database by The Wildlife Trust of South and West Wales. This data is collected by Living Seas' staff and volunteers based at the Cardigan Bay Marine Wildlife Centre, following the same survey protocols but surveys are conducted over the full calendar year.

Table 1: Observation period (watch) totals in the period 1st March – 31st October 2016

	All sites	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
No of watches	1360	57	13	115	1162	13
Hours of effort	2716.5	112.25	26	229.5	2323	25.75

Survey conditions

Between 1st March and 31st October 2016, 2396 hours of effort were completed in good conditions for observing marine mammals (Table 2). Watches conducted when conditions were not suitable were removed from the dataset. Only watches where data was available for the full two hour survey (eight successive fifteen minute intervals) conducted in Beaufort sea state 3 or less and where visibility was greater than 2 km were used for further analysis (Figure 1 & Figure 2).

Table 2: Number of watches conducted in good conditions (used for further analysis)

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
Number of watches in good conditions	48	13	110	1017	10
Hours of effort in good conditions	96	26	220	2034	20

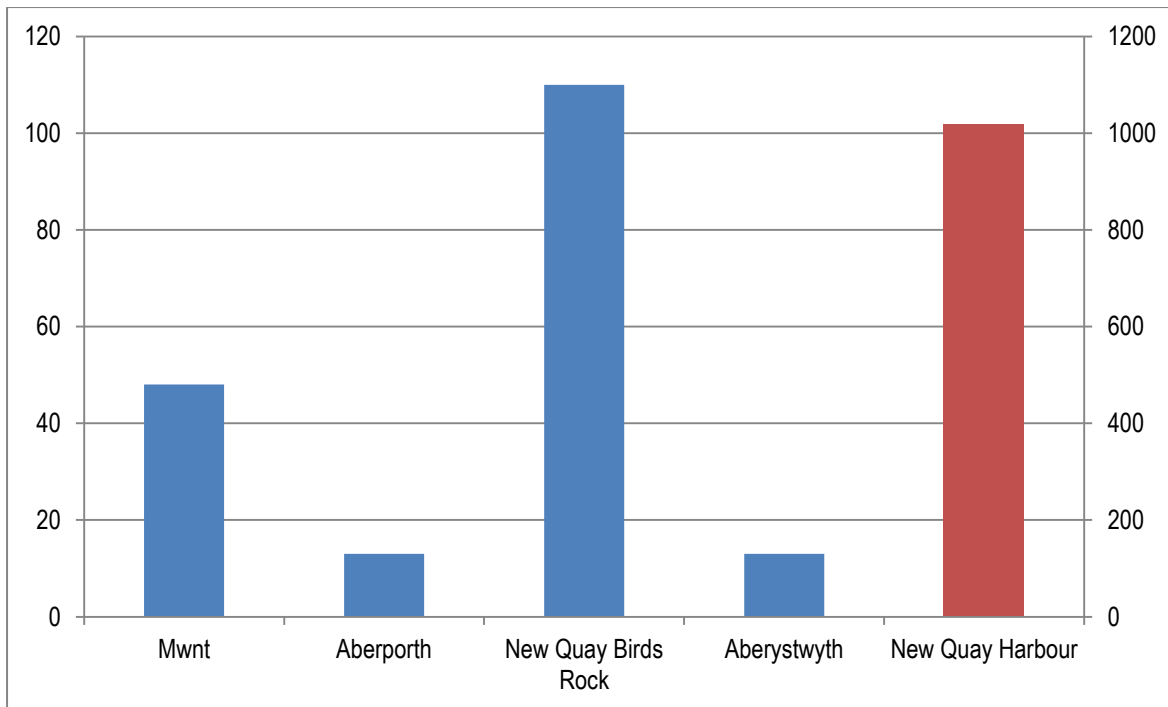


Figure 1: Number of watches conducted in good weather at Dolphin Watch monitoring sites

N.B. New Quay Harbour watches are conducted every day throughout the season from 7am to 7pm by Living Seas' staff and volunteers based at the CBMWC therefore the number of watches at this site is much higher at 1017.

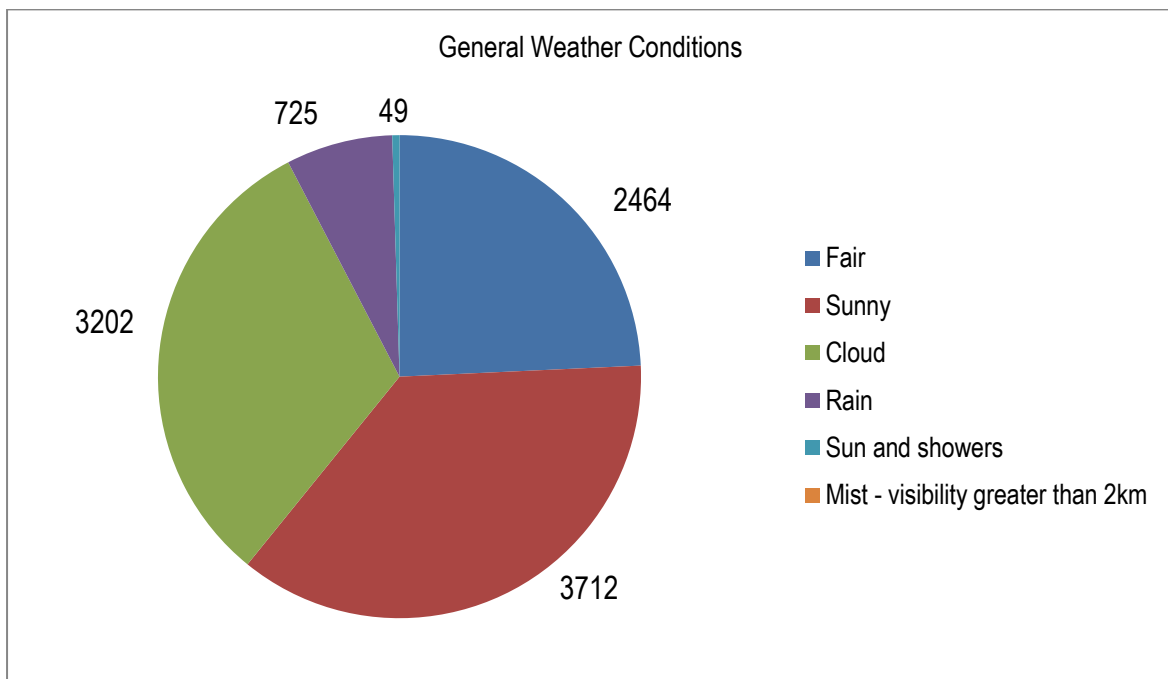


Figure 2: Weather conditions (number of intervals)

The median sea state recorded across all sites was sea state 2 (wavelets; glassy crests do not break). The median sea state for individual sites was also sea state 2 with the exception of New Quay Bird's Rock where the median sea state was 1 (calm, rippled surface).

The wind directions that were most frequently recorded were south-westerly, north-westerly and southerly over all sites, with the exception of Aberystwyth where south-easterly winds were the most frequently recorded (Table 3 & Figure 3).

Table 3: Prevailing wind during watches

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
Wind direction	SW	SW	SW	SW	SE

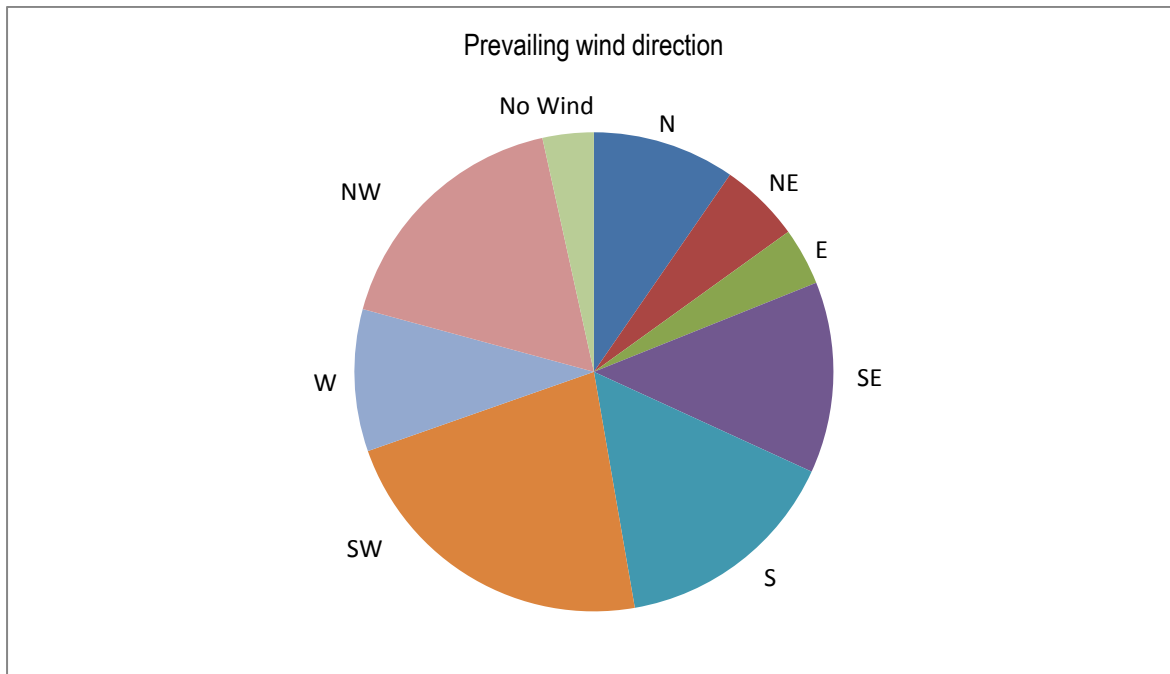


Figure 3: Prevailing wind – frequency of wind direction recorded during all surveys

Sightings rates

Sightings rates for bottlenose dolphins were calculated from 1198 watches. These were watches with eight intervals recorded in good conditions (sea state 3 or less and visibility >2km) between the beginning of March and the end of October 2016.

Table 4: Percentage of two hour watches at each site with dolphin sightings

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2016	77%	23%	49%	58%	50%

Mwnt had higher sightings ratings than the other sites (Table 4 & Figure 4). Sightings rates for New Quay Harbour have been dropping year on year since 2013: 2013 - 82%; 2014 - 70%; 2015 - 62%.

Sightings rates at all other sites were consistent with past sightings ratings.

(Figures for the period 2013-15 were taken from Perry, S (2016) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2013-2015'.)

N.B. This year's report refers to a longer period of time than in previous years; March to October rather than June to September.

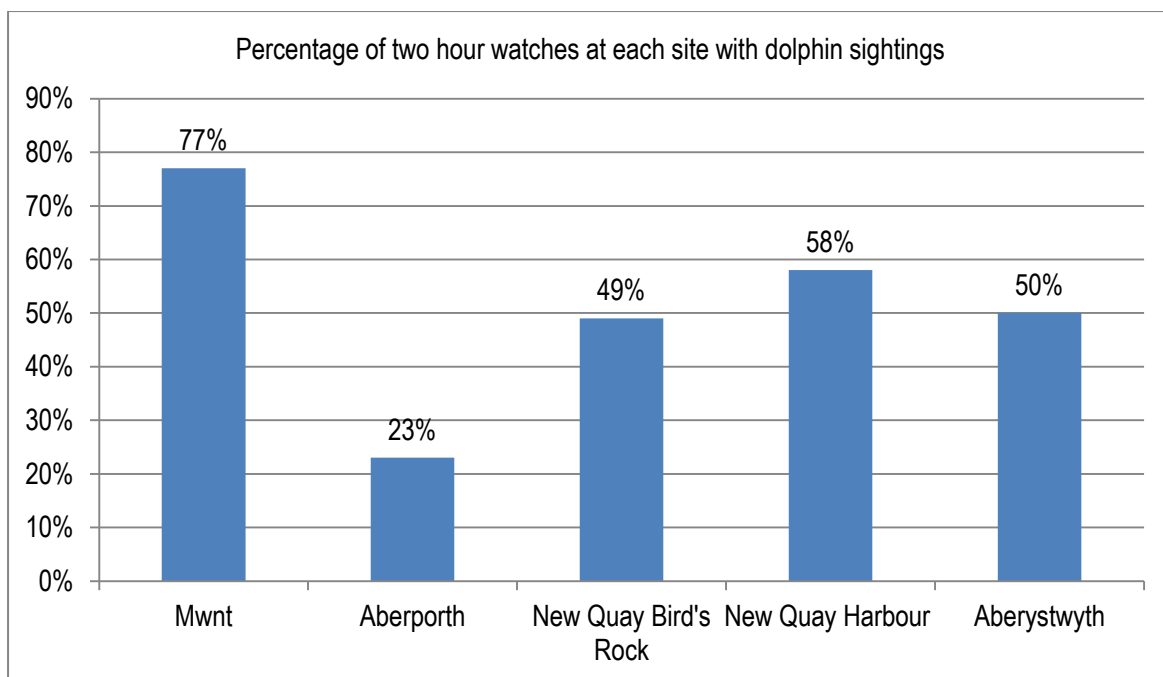


Figure 4: Sightings rates - percentage of two hour watches in which dolphins were recorded

Table 5: Mean average number of dolphins observed in a fifteen minute interval where dolphins were sighted

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2016	3.2	1.75	3.4	3.14	1.9
2013-15	3.5	1.75	3.12	3.1	1.9

Watches at Mwnt, New Quay Bird's Rock and New Quay Harbour recorded the highest average number of dolphins. The average number of dolphins at Mwnt has decreased slightly from previous years (Table 5 & Figure 5). The 2013-15 Dolphin Watch report showed that the mean average number of dolphins observed in a fifteen minute interval at Mwnt was 3.5; while in 2016 this figure had decreased slightly to 3.2.

There has been a slight increase at New Quay Bird's Rock from 3.12 in 2013-15 to 3.4 in 2016. Although lower numbers were observed in Aberporth and Aberystwyth; the mean average numbers of dolphins observed in a fifteen minute interval were consistent in 2016 with data collected in previous years for both sites.

(Figures for the period 2013-15 were taken from Perry, S (2016) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2013-2015'.)

N.B. This year's report refers to a longer period of time than in previous years; March to October rather than June to September.

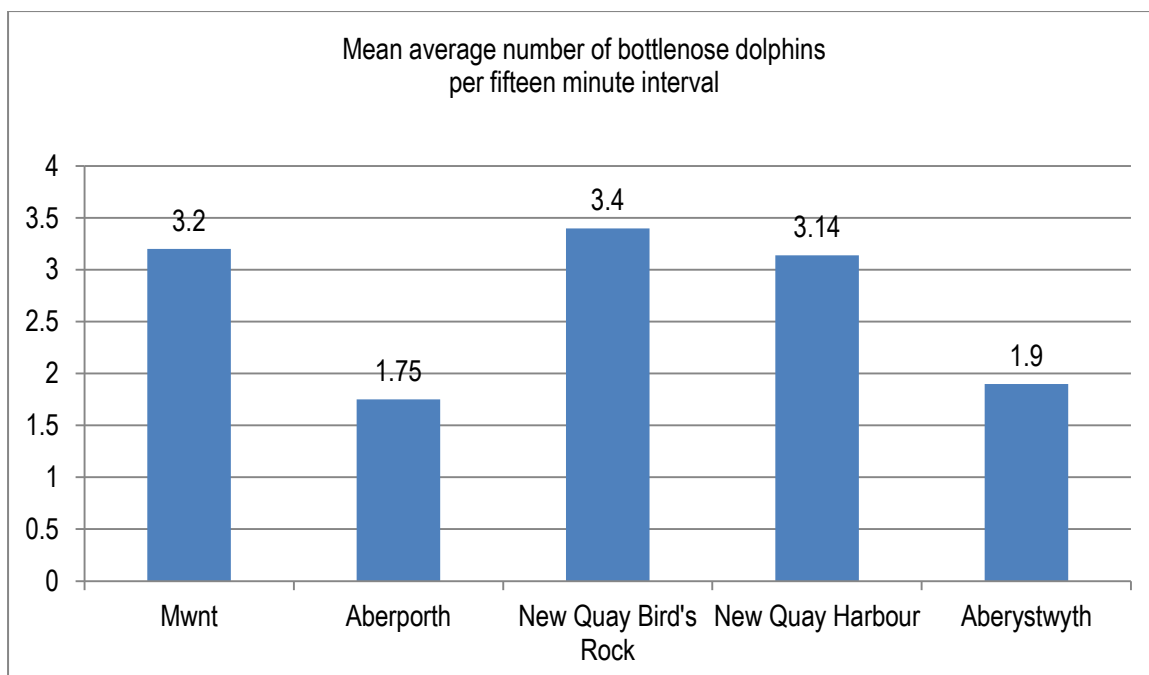


Figure 5: Mean average number of dolphins observed in a fifteen minute interval where dolphins were sighted

Group size

The mean average of the highest group size of dolphins recorded per interval in each two hour watch where sightings occurred was used as a measure of group size (Table 6 & Figure 6). Group size has decreased at Mwnt over the last three monitoring seasons from 4.3 in 2014 and 3.8 in 2015 to 3.65 in 2016. The group size in New Quay Harbour and New Quay Bird's Rock have increased this year; while group size at Aberporth and Aberystwyth have been variable over the last four years; however fewer watches have taken place at these two sites (less than 25 per season).

(Figures for the period 2013-15 were taken from Perry, S (2016) *'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2013-2015'*.)

N.B. This year's report refers to a longer period of time than in previous years; March to October rather than June to September.

Table 6: Mean average of the highest group size of bottlenose dolphins recorded in each two hour watch

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2016	3.65	1.67*	4.15	4.03	2.4

* Fewer than 5 watches recorded with sightings

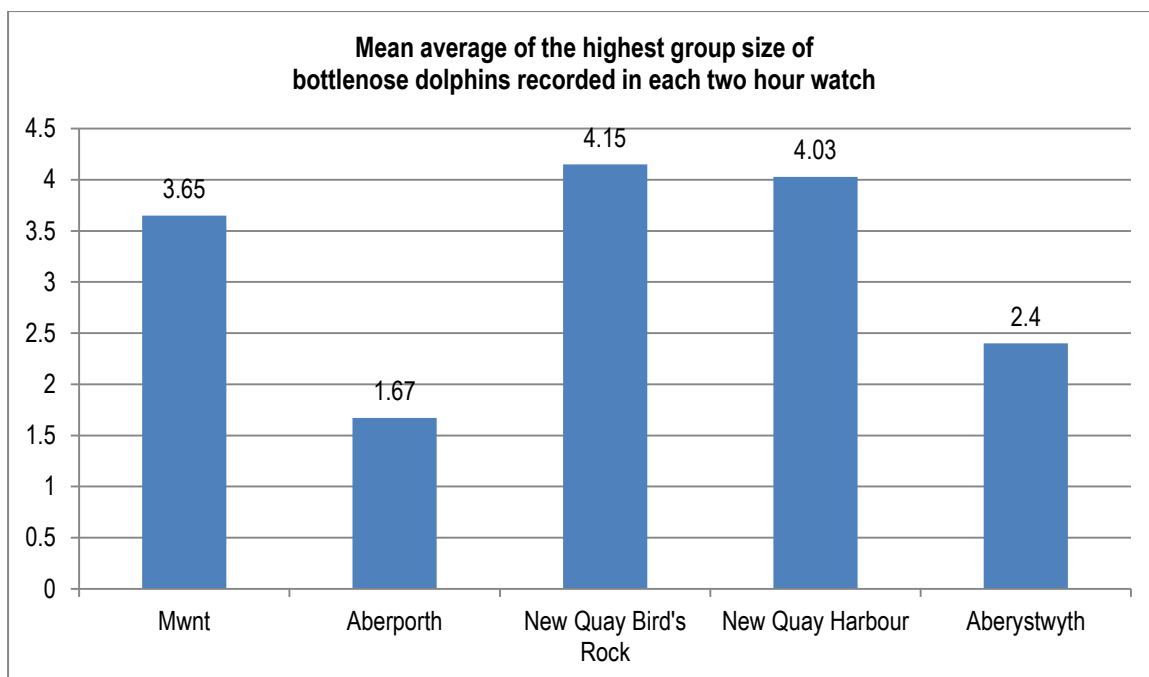


Figure 6: Mean average of the highest group size of bottlenose dolphins recorded in each two hour watch

Maximum recorded group size at each site

The maximum dolphin group size observed at each site was also recorded (Table 7 & Figure 7). The largest group sizes recorded were at New Quay Harbour (11 animals), Mwnt (11 animals) and New Quay Bird's Rock (10 animals). These three sites show consistently larger groups of animals in all years since group size was first included in the 2008 report.

Table 7: Maximum recorded group size at each site

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2016	11	2	10	11	3

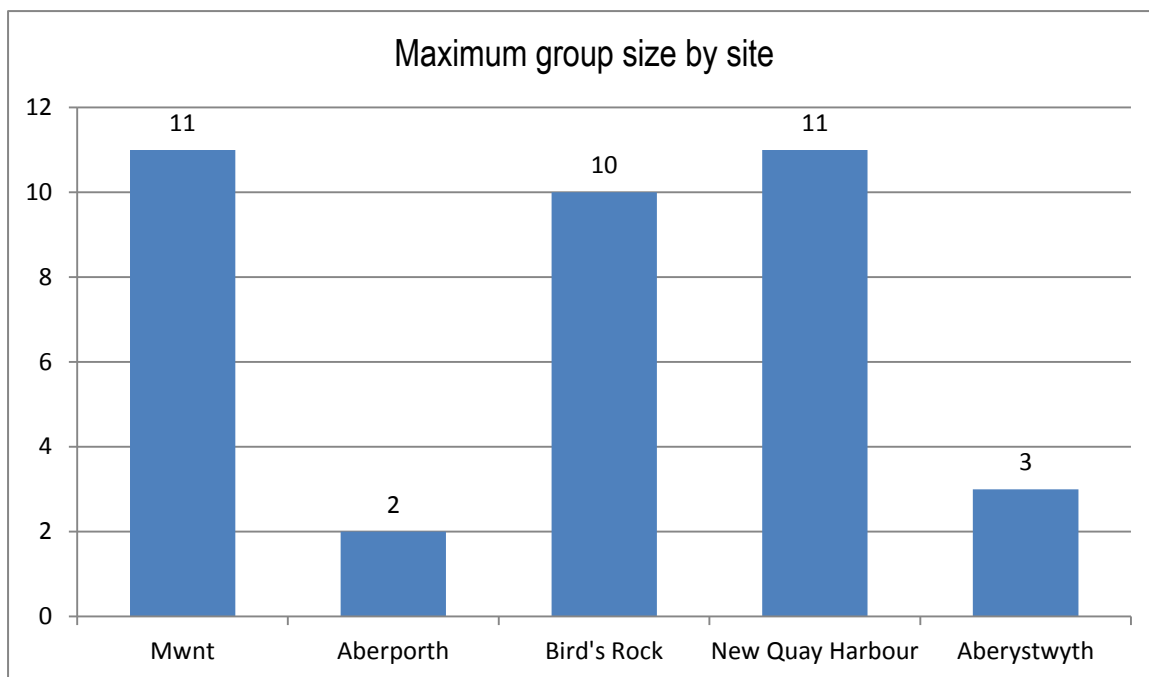


Figure 7: Maximum group size of bottlenose dolphins by site

Sightings of young bottlenose dolphins

Young bottlenose dolphins were recorded most frequently in New Quay Harbour, where they were observed in 50% of the watches in 2016. Young dolphins were sighted at Mwnt in more than 40% of the watches during 2016. Figures for both sites are consistent with previous years. At Aberporth the number of watches where young bottlenose dolphins were recorded has increased from 18.2% in 2010 to 33% in 2016. However at this site relatively few watches take place therefore this data needs to be interpreted with caution. No young dolphins were recorded at Aberystwyth in 2016 (Table 8).

The number of watches with young bottlenose dolphins recorded at New Quay Bird's Rock has fluctuated widely in recent years (Figure 8).

(Figures for 2010 were taken from Sampson, B., Green, M. and Kelsall, J (2014) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2010-2012'.)

Table 8: Young dolphin sightings (percentage of watches when dolphins present with young animals)

	Mwnt	Aberporth	New Quay Bird's Rock	Aberystwyth	New Quay Harbour
2016	41%	33%	24%	0%	50%

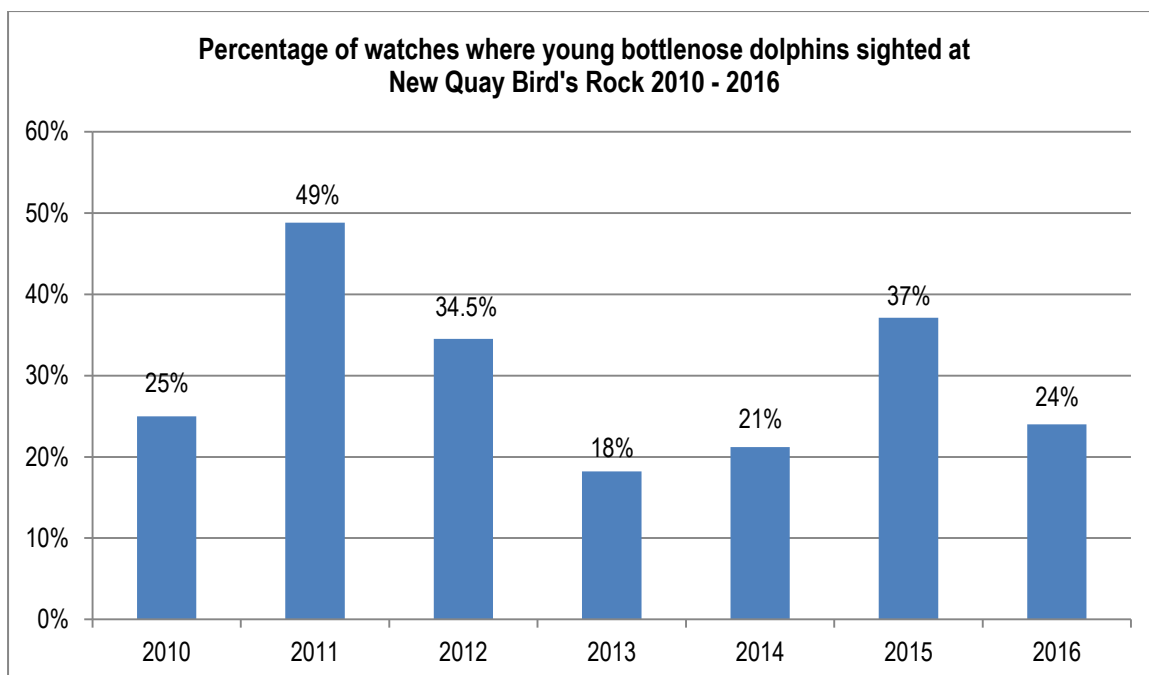


Figure 8: Percentage of watches where young bottlenose dolphins sighted at New Quay Bird's Rock 2010 – 2016

Site occupancy

Site occupancy is defined as the amount of time that bottlenose dolphins were present at each site. It is measured as the mean average number of fifteen minute intervals that dolphins were recorded per two hour watch.

New Quay Harbour had the highest occupancy rates, with dolphins present for more than four intervals out of eight (one hour) on average (Table 9). Site occupancy rates for all sites were consistent with previous years. N.B. This year's report refers to a longer period of time than in previous years; March to October rather than June to September.

Table 9: Site occupancy (mean number of fifteen minute intervals per watch when dolphins were present)

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2016	3.05	1.33	3.46	4.78	3

Direction of travel by bottlenose dolphins

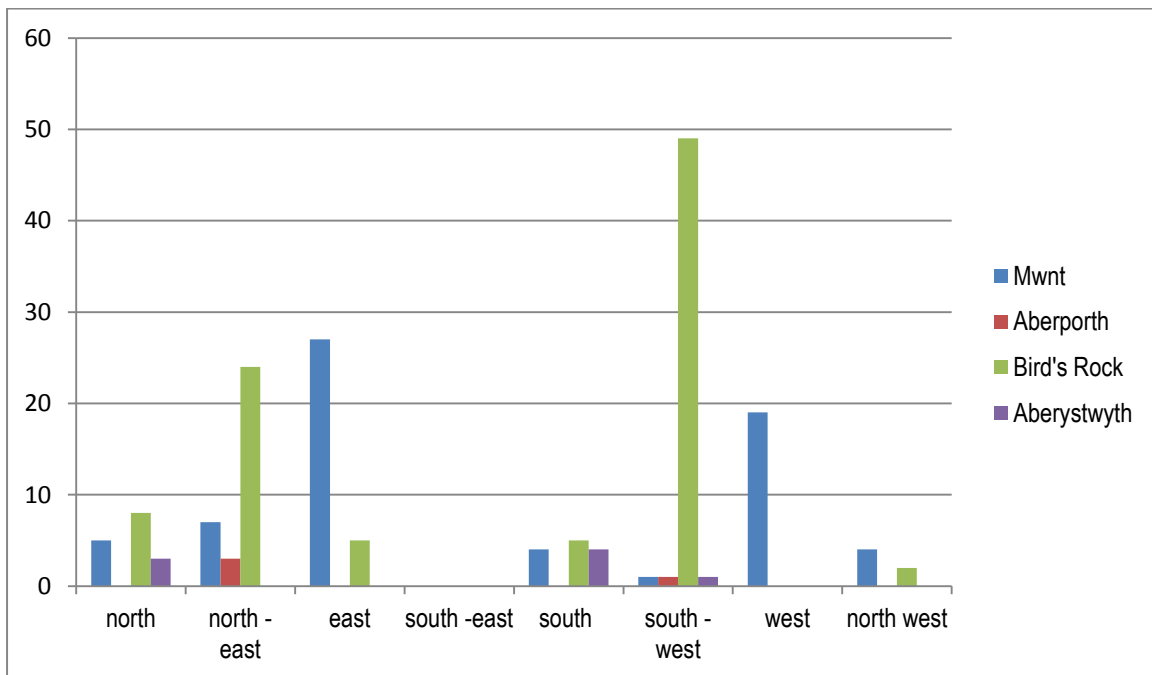


Figure 9: Direction of travel by bottlenose dolphins, excluding New Quay Harbour

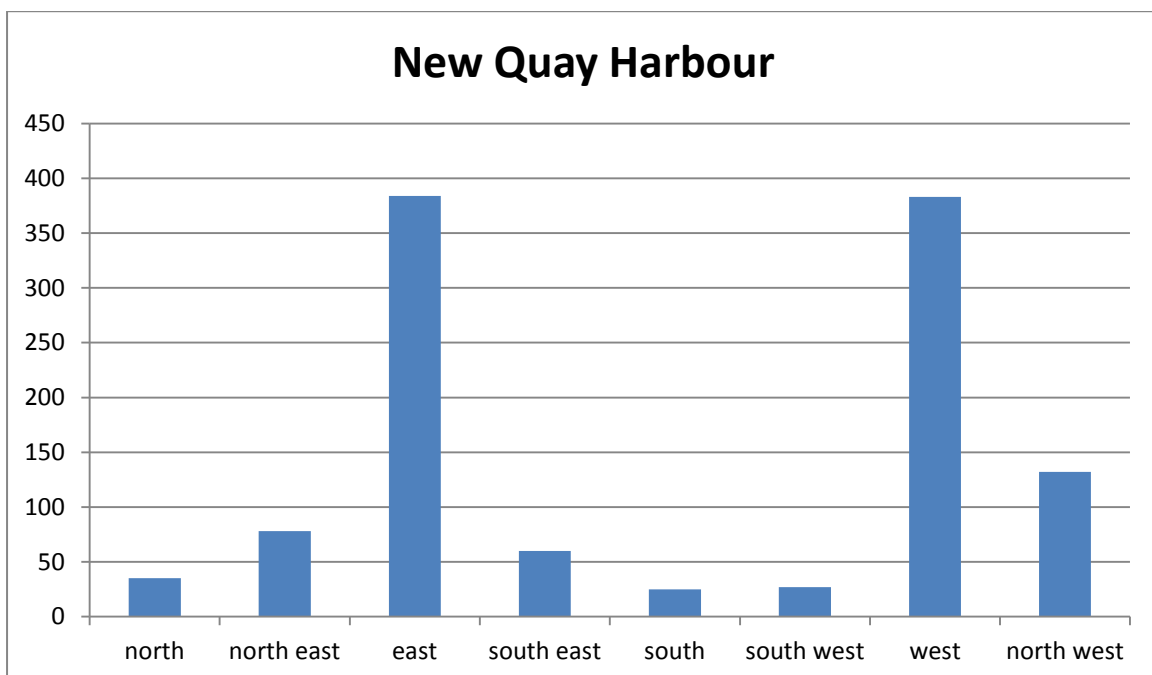


Figure 10: Direction of travel of bottlenose dolphins in New Quay Harbour

Figures 9 and 10 above show that the most frequently recorded direction of travel for bottlenose dolphins is movement up and down the Ceredigion coast; travel directly out to sea is much less frequently recorded at all sites.

Levels of boat traffic by site

Boat traffic was monitored by tally counts of vessels over each two hour observation period. New Quay Harbour was the busiest site for boat traffic, followed by Bird's Rock and then Aberystwyth; with the lowest boat counts at Mwnt (Table 10 & Figure 11).

N.B. This year's report refers to a longer period of time than in previous years; March to October rather than June to September.

Table 10: Mean boat counts per two hour watch 2016

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2016	3.94	5.31	9.93	20.27	7.1

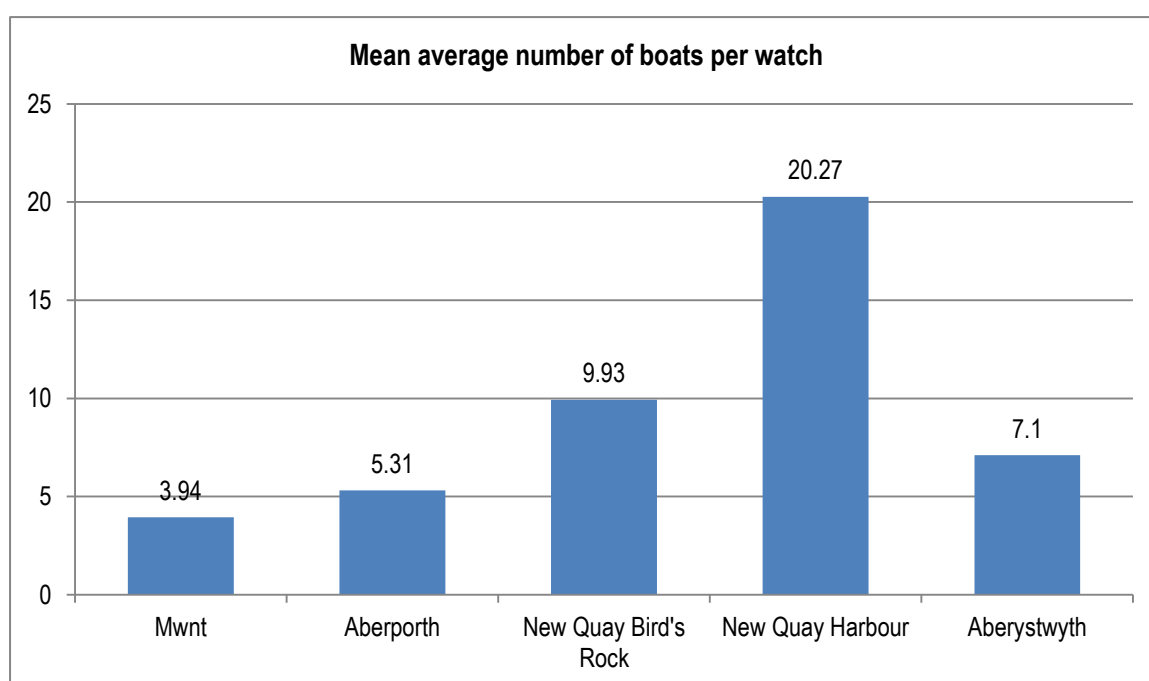


Figure 11: Mean average boat counts per two hour watch for each site

The most frequently recorded boat types in New Quay Harbour were visitor passenger boats, with 5,704 recorded during the season in 2016. The next highest category were motor boats at 4,604 and canoes/kayaks/stand up paddleboards (SUP) closely followed as the third most frequent type of vessel with a count of 4,295.

At New Quay Bird's Rock visitor passenger boats were seen most frequently, with 643 visitor passenger boats recorded. The next most frequently recorded type of vessel at this site were motor boats, with 169 recorded. Therefore the number of visitor passenger boats at Bird's Rock is significantly higher than any other type of vessel.

At the Mwnt monitoring site visitor passenger boats and motor boats were the most frequently recorded boat types, with 53 of each boat type recorded during observation periods in 2016.

At the Aberporth site the number of canoes, kayaks and SUPs recorded is significantly higher than any other types of vessel. The number was also high given the small number of watches that took place here. Over the 13

watches (twenty six hours) that took place at Aberporth in 2016, 40 canoes were recorded, compared to the 63 canoes/SUPs counted at Birds Rock over 115 watches (229.5 hours) demonstrating that Aberporth is a significant launch site for canoes/kayaks/SUPs.

At the Aberystwyth monitoring site motor boats were the most frequently recorded (Table 11 & 12).

Table 11: Total count of different types of boat at each site during good weather watches

Site	motor boat	speed boat (RIB)	sail boat	commercial fishing boat	visitor passenger boat	canoe/ kayak/ SUP	jet-ski	research boat
Mwnt	53	9	12	44	53	14	3	0
Aberporth	16	5	3	5	0	40	0	0
New Quay Bird's Rock	169	61	84	66	643	63	2	2
New Quay Harbour	4604	1846	2018	1034	5704	4295	21	5
Aberystwyth	39	0	6	15	0	9	0	1

Table 12: Mean average counts of different boat types for each site by two hour watch

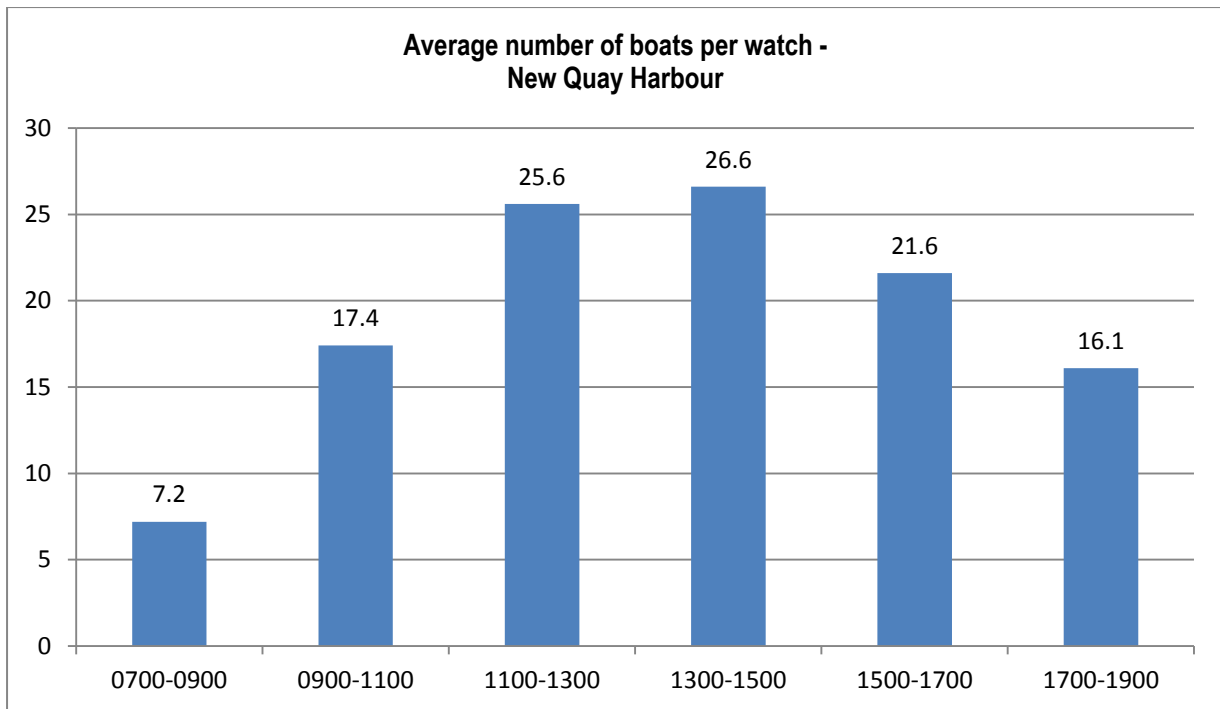
Site	motor boat	speed boat (RIB)	sail boat	commercial fishing boat	visitor passenger boat	canoe/ kayak/ SUP	jet-ski	research boat
Mwnt	1.13	0.19	0.26	0.94	1.13	0.3	0.0	0.0
Aberporth	1.23	0.38	0.23	0.38	0.0	3.8	0.0	0.0
New Quay Bird's Rock	1.61	0.59	0.8	0.63	6.12	0.61	0.0 2	0.02
New Quay Harbour	4.78	1.92	2.09	1.07	5.92	4.46	0.0 2	0.0
Aberystwyth	3.9	0.0	0.6	1.5	0.0	0.9	0.0	0.1

New Quay Harbour

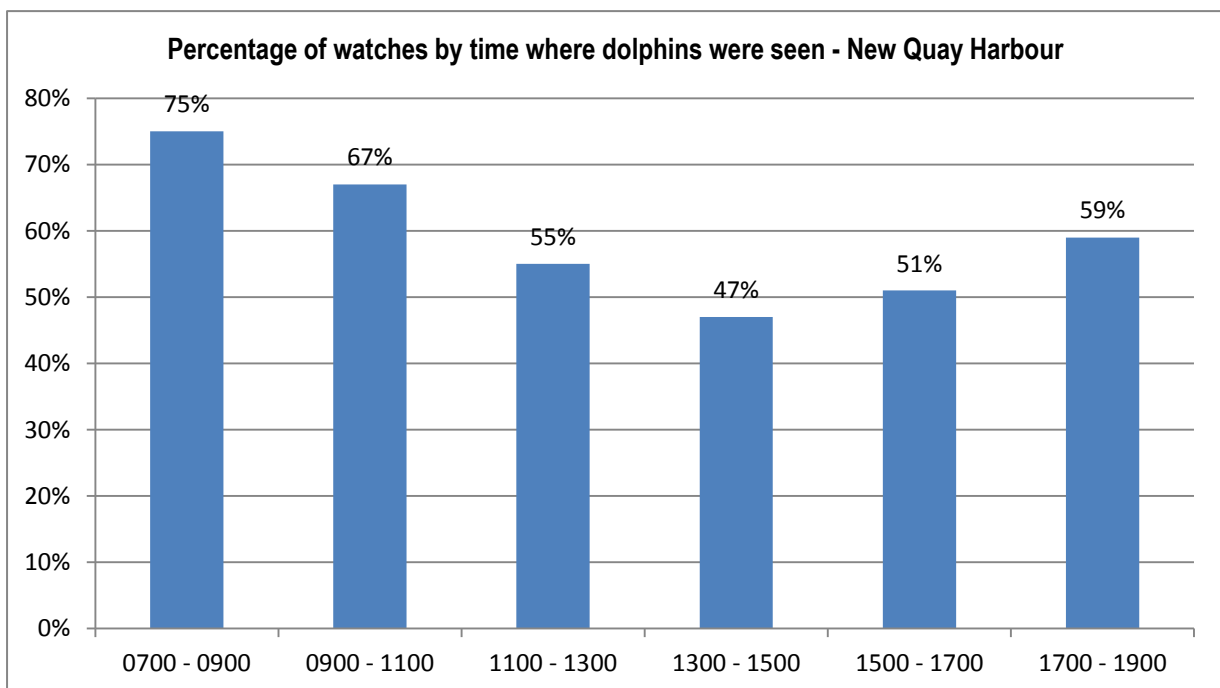
Due to the high volume of boats in the New Quay Harbour area, a factor unique to this site; boat counts per watch time and dolphin occupancy per watch time were also investigated to examine whether there is a correlation between the number of boats and site use by bottlenose dolphins.

The watch between the hours of 1300 – 1500 has the greatest average number of boats per watch at 25.4 and the smallest percentage of bottlenose dolphin sightings per watch at 47%.

The greatest percentage of sightings by watch time (75%) occurred in the mornings between 0700 – 0900 hours when the boat traffic is quietest with an average boat count per watch of 7.2 (Figures 12 & 13).



Figures 12: Average number of boats recorded by time of watch at New Quay Harbour



Figures 13: Percentage of watches by time of day where dolphins were seen at New Quay Harbour

Encounters between dolphins and boats

The protocol followed during a Dolphin Watch survey defines a boat encounter as occurring when a vessel travels within 300m of an individual dolphin or a group of dolphins. A total of 1143 encounters between bottlenose dolphins and boats were recorded in 2016.

The highest observed encounter rates were at New Quay Harbour; New Quay Bird's Rock had the second highest encounter rate. No encounters between dolphins and boats were recorded at Aberporth. Visitor

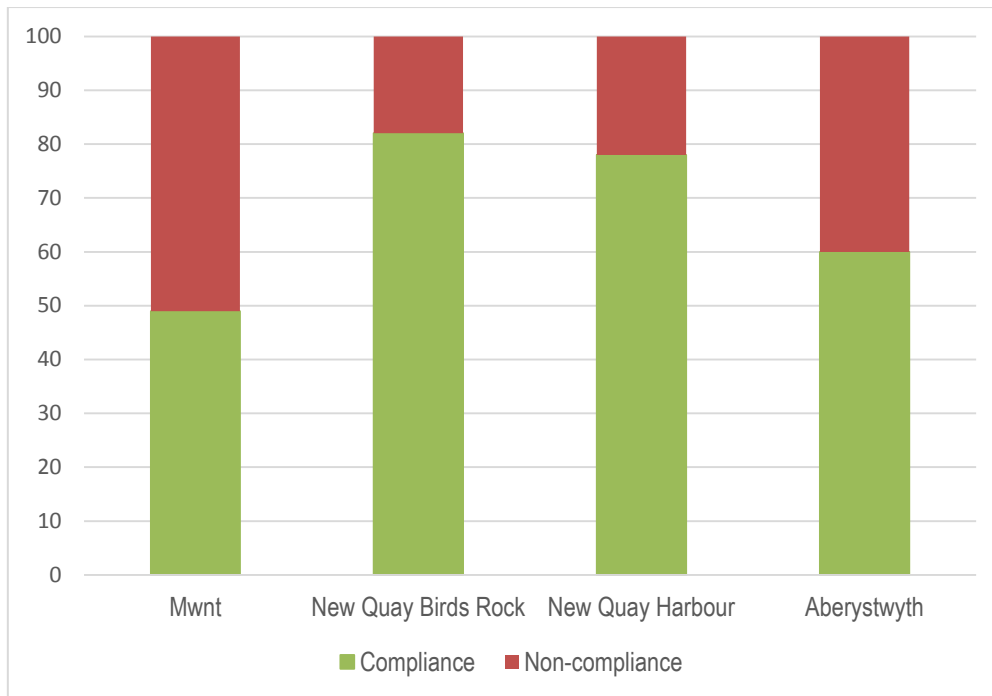
passenger boats were the most frequently recorded encounter, followed by motor boats and then canoes/kayaks/SUPs.

Compliance with the Ceredigion marine codes of conduct by boat users during encounters with dolphins

In 2016 there were 1143 encounters recorded between boats and dolphins. In 881 cases (77% of the total) the observer recorded that the boat user followed the relevant code of conduct; these codes of conduct were the guidelines for either recreational boat users and for commercial passenger boats. There were 262 cases (23% of encounters) in which boat users did not follow the appropriate code of conduct (Table 13). The rate of compliance with the Ceredigion Marine Codes varied by location: boat users in the New Quay Bird's Rock area had the highest rate at 82%, followed by New Quay Harbour at 78%. Only 60% followed the code of conduct at Aberystwyth but this represents three encounters from a total of only five. The lowest compliance rate of just 49% was recorded at Mwnt (Figure 14).

Table 13: Percentage of compliance/non-compliance with the Ceredigion Marine Codes of Conduct during dolphin encounters

Site	Total number of boat encounters	Number of boat encounters following the code of conduct	Percentage compliance with codes of conduct	Number of boat encounters not following the code of conduct	Percentage non-compliance with codes of conduct
Mwnt	35	17	49%	18	51%
Aberporth	No encounters recorded				
New Quay Bird's Rock	106	87	82%	19	18%
New Quay Harbour	997	774	78%	223	22%
Aberystwyth	5	3	60%	2	40%
All sites	1143	881	77%	262	23%



N.B. Aberporth did not record any type of encounter in 2016

Figure 14: Percentage of compliance/non-compliance with the Ceredigion Marine Codes of Conduct during dolphin encounters (as a percentage of all recorded encounters per site)

Proportions of different types of non-compliance with the codes of conduct

The majority of cases of non-compliance with the code of conduct involved boats manoeuvring erratically to either approach or follow the dolphins (62%) or boats travelling too fast within 300 metres of a group of dolphins (35.9%) (Table14).

Table 14: Relative proportions of types of boat non-compliance with the codes of conduct

Boat activity (when not complying with codes of conduct)	Number of encounters	Percentage of non-compliance
N1: Too fast, wake speed within 300m of dolphins	94	35.9%
N2: Erratic course to follow dolphins	164	62.6%
N3: Attempted to touch, feed or swim with dolphins	3	1.1%
N4: Speed over 8 knots within New Quay zoned area	1	0.4%

The incidence of non-compliance for users of different boat types

Speedboats had the highest rate of non-compliance with the code of conduct; in 50% of all encounters with a speedboat the vessel did not follow the Ceredigion marine code of conduct. Canoes/kayaks/SUPs also had a high level of non-compliance at 45.7% of encounters. Motor boats were the third highest group observed not

following the code of conduct during encounters, with a non-compliance rate of 35% (Table 15).

Table 15: Non-compliance of different types of boat

Boat type	Number of non-compliant boats by type	Total number of encounters by type	Percentage non-compliance by type
Speedboat (rib)	41	82	50%
Canoe/kayak/SUP	42	92	45.7%
Motor boat	61	174	35.1%
Commercial fishing boat	25	80	31.3%
Sailing boat	15	75	20%
Visitor passenger boat	78	636	12.3%
Jet-ski	0	1	0%
Other	0	3	0%
Total	262	1143	23%

Percentage of non-compliance during encounters by vessel type by site

At the Mwnt and New Quay Bird's Rock monitoring sites, motor boats had the highest rate of non-compliance of all the encounters recorded; visitor passenger boats had the second highest rate of non-compliance. No other vessel types were recorded as non-compliant at Mwnt or Bird's Rock. The total percentage of non-compliance at Mwnt was 51.4% and at New Quay Bird's Rock was 18%.

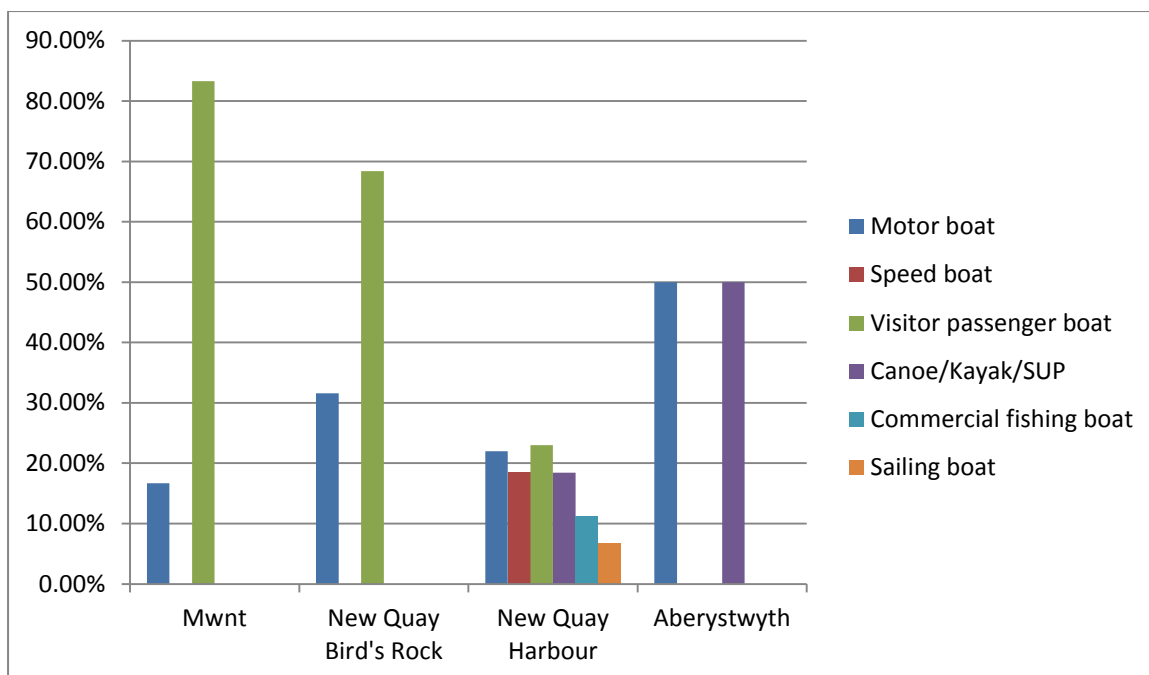
At the New Quay Harbour site speed boats had the highest rate of non-compliance followed by Canoes/Kayaks/SUPs and thirdly, motor boats. Commercial fishing boats and sail boats had the lowest rates of non-compliance. The total percentage of non-compliant vessels at New Quay Harbour was 22.4%.

At the Aberystwyth site, less than 5 encounters took place; while at Aberporth no encounters were recorded (Table 16 & Figure 15).

Table 16: Percentage of non-compliance during encounters by vessel type by site

		Motor boat	Speed boat (rib)	Commercial fishing boat	Sailing boat	Visitor passenger boat	Canoe/kayak/SUP	Jet ski	Other	Total
Mwnt	Number of non-compliant boats by type	3	0	0	0	15	0	0	0	18
	Total number of encounters by type	3	0	1	0	32	0	0	0	35
	Percentage non-compliance by type	100%	0	0	0	47%	0	0	0	51.4%
New Quay Bird's Rock	Number of non-compliant boats by type	6	0	0	0	13	0	0	0	19
	Total number of encounters by type	7	3	2	1	93	0	0	0	106
	Percentage non-compliance by type	85.7%	0%	0%	0%	14%	0	0	0	18%
New Quay Harbour	Number of non-compliant boats by type	50	41	25	15	51	41	0	0	223
	Total number of encounters by type	158	83	75	75	513	91	1	1	997
	Percentage non-compliance by type	31.6%	49.4%	33.3%	20%	10%	45%	0%	0%	22.4%
Aberystwyth (5 or less encounters took place)	Number of non-compliant boats by type	1	0	0	0	0	1	0	0	2
	Total number of encounters by type	2	0	2	0	0	1	0	0	5
	Percentage non-compliance by type	50%	0	0	0	0	100%	0	0	40%

N.B. Aberporth did not record any type of encounter in 2016

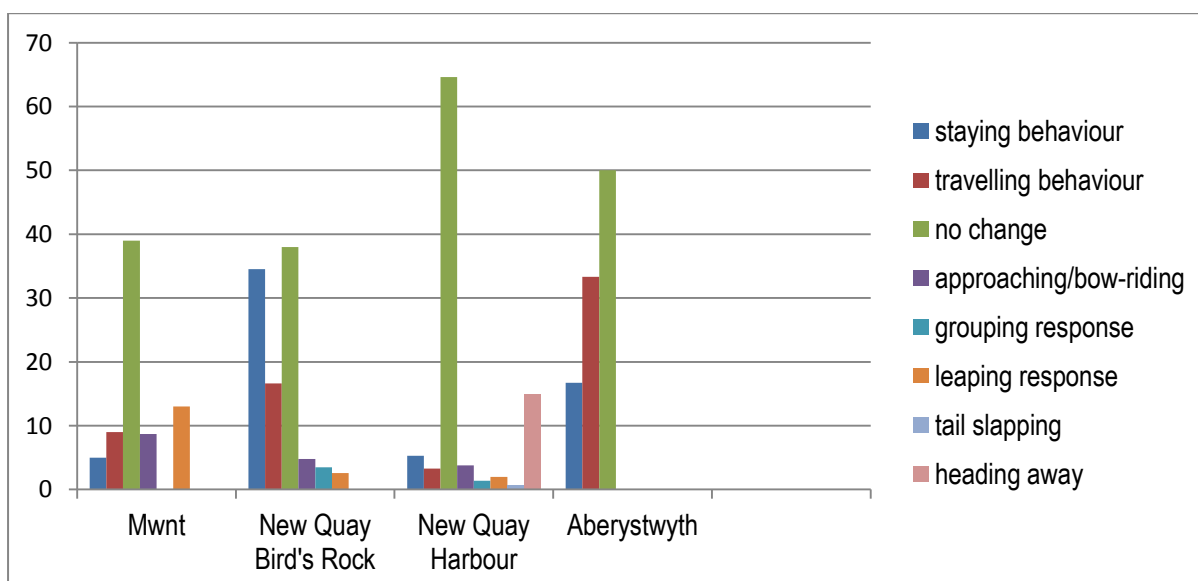


N.B. No encounters were recorded at Aberporth

Figure 15: Percentage of non-compliance during encounters by vessel type by site

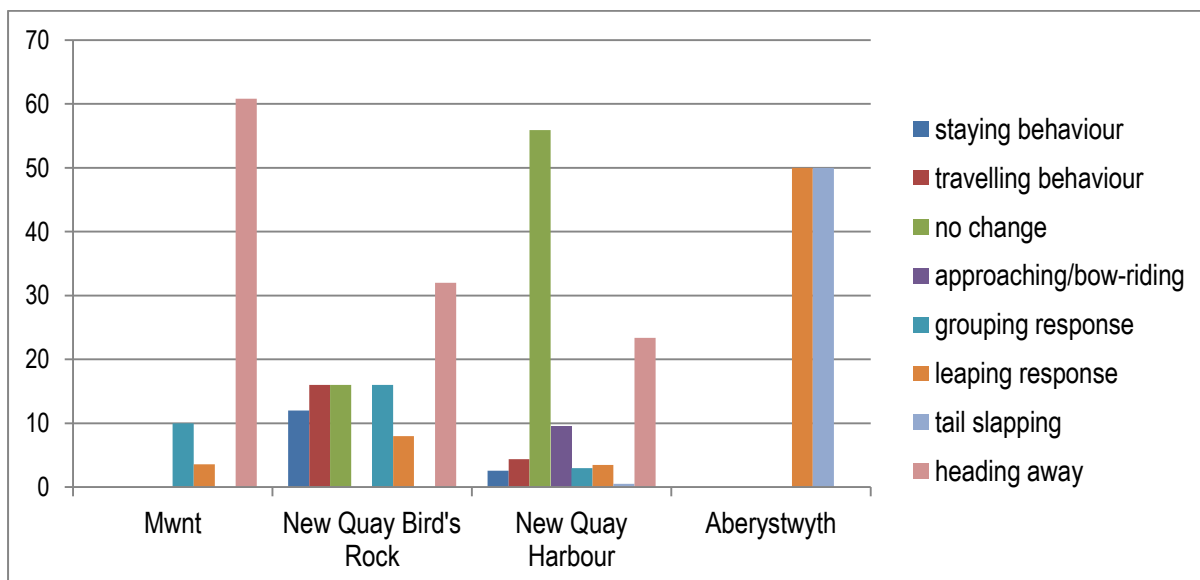
Effects of boat encounters on bottlenose dolphin behaviour

How dolphins responded to positive and negative encounters with boats (whether vessels followed the codes of conduct) was also examined. Observers recorded the different dolphin responses during encounters. In the analyses certain behaviours are grouped together; for example 'heading away fast swimming' and 'heading away steadily' (HS or HF) are grouped together as a negative response (i.e. a change in dolphin behaviour to move away from a boat). Likewise 'approaching' (AP) and 'bow-riding' (B) are grouped together as positive responses. 'Leaping' or 'begin leaping' (L or BL), 'tail-slap' (TS) and 'grouping' (GS or GF) are listed as separate categories.



N.B. No encounters were recorded at Aberporth

Figure 16: Dolphin behavioural responses to positive boat encounters (vessels following the Ceredigion Marine Codes of Conduct)



N.B. No encounters were recorded at Aberporth

Figure 17: Dolphin behavioural responses to negative boat encounters (vessels not following the Ceredigion Marine Codes of Conduct)

All sites showed that when the Ceredigion Marine Codes of Conduct were followed, 'no change' in behaviour was the most frequently recorded response, suggesting that the boats' presence did not impact or disturb the animals (Figure 16).

During encounters where the marine codes were not complied with; at Mwnt and Birds Rock 'heading away' was the most frequently recorded response. In Aberystwyth 'tail slapping' and 'leaping' were the only behaviours recorded. In Aberystwyth a total of only five boat encounters were recorded however.

At New Quay Harbour, even when vessels did not follow the codes, 'no change' was still the most frequently recorded behaviour, this was followed by 'heading away' (Figure 17).

In conclusion, the data suggests that constant low levels of disturbance as a result of the sheer volume of water craft in an area (see figures 12 and 13) has a significant influence on dolphin site usage, pushing them off preferred feeding sites. At the New Quay Harbour site this constant low level disturbance appears to have a more significant impact on site usage by bottlenose dolphins than individual incidents of disturbance by water craft; demonstrated by 'heading away' being the second most frequently recorded behaviour in New Quay Harbour irrespective of whether the vessel complied or failed to comply with the codes of conduct. This suggests that although dolphins may initially appear not to change their behaviour during encounters, the behaviour perceived to be exhibited may actually change following the encounter; therefore these findings indicate that a more thorough investigation of responses to encounters is needed.

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Appendix

Site use by harbour porpoise and grey seal

Atlantic grey seal

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
Number of watches with seals recorded	25	0	26	261	1
Mean average number per watch	1.04	0	1.14	1.03	1

Harbour porpoise

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
Number of watches with harbour porpoise recorded	0	0	3	7	0
Mean average number per watch	0	0	1.83	1.5	0