

Dolphin and Porpoise Watch:  
Bottlenose Dolphins and Water Users  
on the Ceredigion Coast, West Wales  
2018

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## Introduction

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. 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). 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 2018 the project was expanded to also include and promote the recording of harbour porpoise sightings in Cardigan Bay.

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 1000km<sup>2</sup> 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 five years of data collection. This is our eleventh Dolphin Watch survey report (Pierpoint and Allan 2000, 2001; 2002; 2004; 2006; Allan et al 2010; Sampson et al 2015, Perry 2016, Heath and Vaughan 2018, Heath and Vaughan 2019). 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

In 2018 bottlenose dolphin and harbour porpoise 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). Ceredigion County Council are very grateful for the staff and volunteer time dedicated to this research by the CBMWC without which this report would not be possible.

**This year's report covers field data collected from 1<sup>st</sup> March to 31<sup>st</sup> October 2018, the same parameters used in both the 2016 and 2017 Dolphin Watch reports. The data from March to October was analysed 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.**

### Site use by bottlenose dolphins

Watches of two hours each were scheduled with set start times of 09:00, 11:00, 13:00, 15:00, 17:00 and 19:00. 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 at 07:00. The two hour watches were divided into eight 15 minute intervals. At the beginning 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 each season to address any misconceptions and to update survey skills and data collection methodology. Volunteers are 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 is considered as 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 beginning 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.
- 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, and compliance/non-compliance with the Ceredigion Commercial Marine Code for wildlife trip boat operators, and the Ceredigion Water Users Marine Code for recreational water users; 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 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 2018 a total of 1306 observation periods (watches) were carried out between March and October (Table 1). Since the first season's field work in 1994 a total of 15,194 watches have been completed.

When the project began observations were carried out at three sites; Aberporth, New Quay Bird's Rock and Ynys Lochtyn. Watches at Ynys Lochtyn have not taken place in recent years; however during 2017 some watches were completed at Ynys Lochtyn by the Cardigan Bay Special Area of Conservation officer, due to lack of capacity this was not possible in 2018. 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 2018**

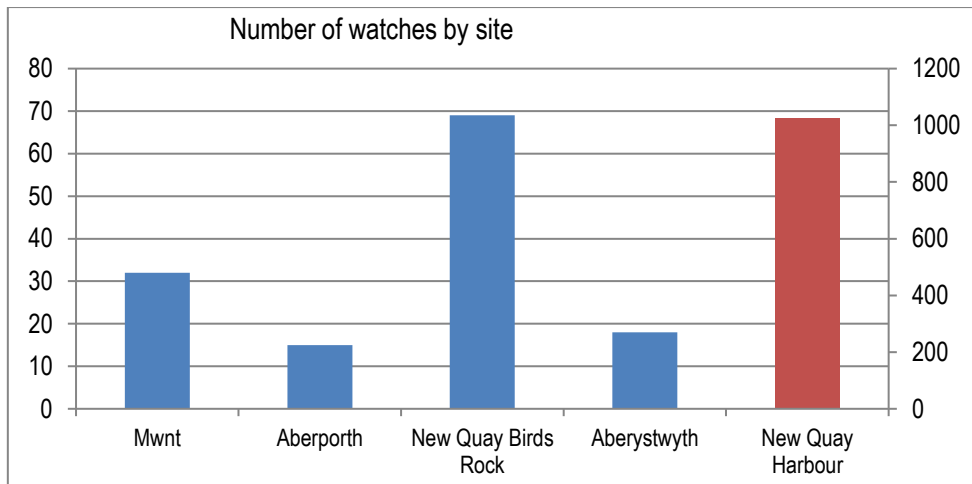
	All sites	Mwnt	Aberporth	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
No of watches	1306	33	17	0	70	1168	18
Hours of effort	2612	66	34	0	140	2336	36

### Survey conditions

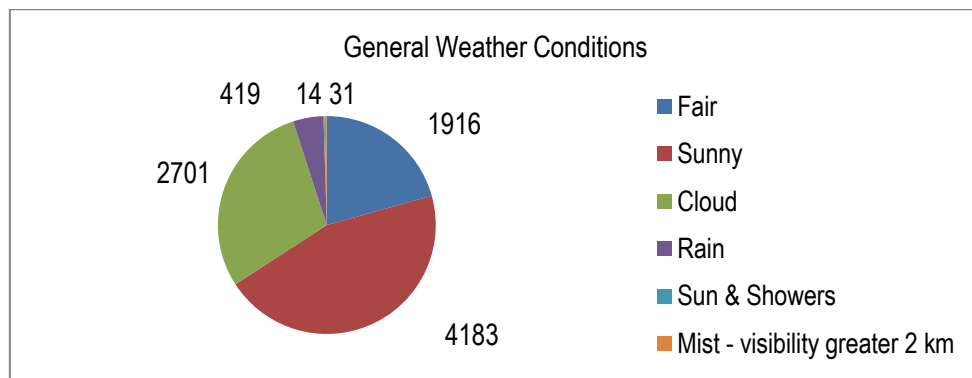
Between 1st March and the 31st October 2018, 1306 watches, 2612 hours of effort were completed in good conditions for observing marine mammals (Table 2). Watches conducted when conditions were not suitable were removed from the dataset. Only watches where data was available for the full two hour survey (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 (Figures 1 & 2).

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

	All sites	Mwnt	Aberporth	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
Number of watches in good conditions	1158	32	15	0	69	1024	18
Hours of effort in good conditions	2316	64	30	0	138	2048	36



**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 1024.*



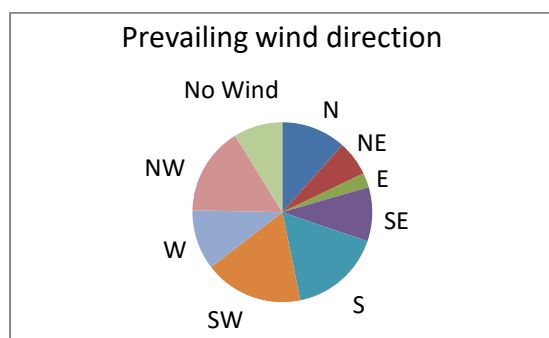
**Figure 2: Weather conditions (number of intervals)**

The median sea state across all sites was sea state 1 (calm, rippled surface). The median sea state for individual sites was sea state 1 for New Quay Harbour, New Quay Bird's Rock and Aberystwyth, while Mwnt and Aberporth had a median sea state of 2 (wavelets; glassy crests do not break).

The wind directions that were the most frequently recorded were south-westerly, westerly, north-westerly and southerly over all sites (Table 3 & Figure 3).

**Table 3: Prevailing wind during watches**

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
Wind direction	W	NW	W	S	SW



**Figure 3: Prevailing wind – frequency of wind direction recorded during all surveys 2018**

## Sightings rates

Sightings rates for bottlenose dolphins were calculated from 1158 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 2018.

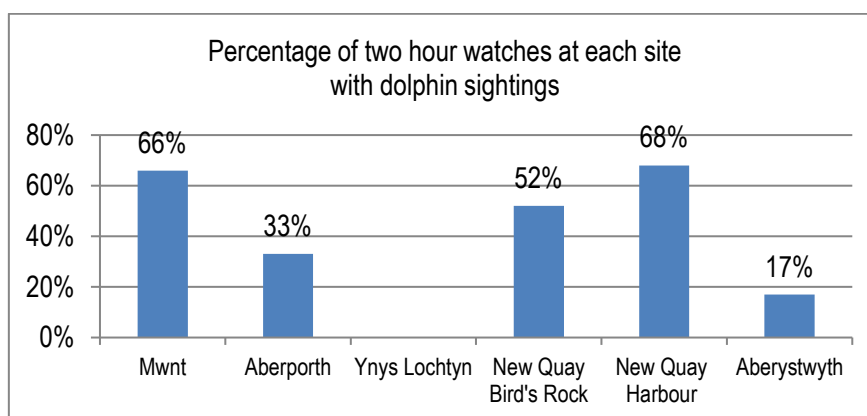
**Table 4: Percentage of two hour watches at each site with dolphin sightings**

Year	Mwnt	Aberporth	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2018	66%	33%	No watches	52%	68%	17%

New Quay harbour had the highest sightings rating of all the sites. Sightings rates for New Quay Harbour had previously been dropping year on year since 2013; however the 2017 sightings rate of 73% was significantly higher than the 2016 figure of 58%, dropping slightly in 2018 to 68%.

The sightings rate at Mwnt had decreased from 77% in 2016 to 52% in 2017; but in 2018 increased to 66%. Aberporth had remained constant at 23% in 2016 and 2017, with sightings increasing by a third to 33% in 2018. New Quay Bird's Rock showed only a small fluctuation over the last few years, from the 2016 figure of 49% to 54% in 2017, dropping slightly to 52% in 2018. No watches took place at Ynys Lochtyn in 2018. The sightings rate in Aberystwyth has decreased significantly from 50% sightings rate in 2016 to just 16% in 2017, and 17% in 2018 where a total of fifteen watches took place (Table 4 & Figure 4).

(Figures for 2016 and 2017 were taken from Heath, M and Vaughan, A (2019) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2016, 2017'.)



*N.B. No watches took place at Ynys Lochtyn in 2018.*

**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**

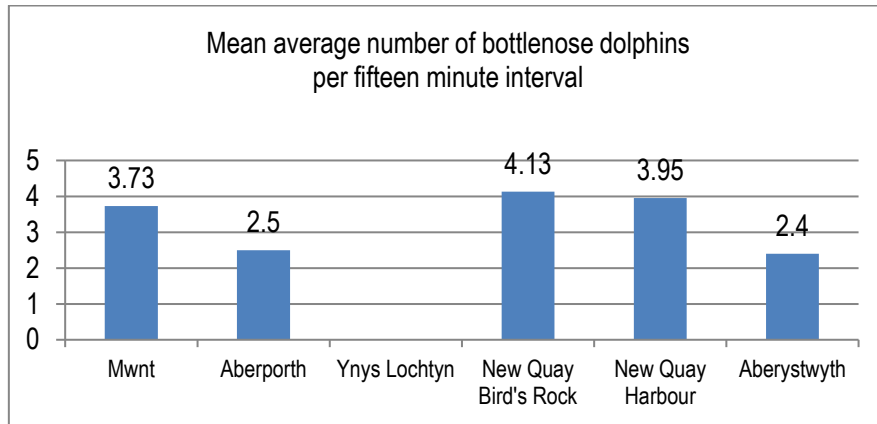
Year	Mwnt	Aberporth	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2018	3.73	2.5	No watches	4.13	3.95	2.4
2017	3.1	2.0	3.7	3.0	2.4	2.8
2016	3.2	1.75	No watches	3.4	3.14	1.9

Watches at New Quay Bird's Rock and New Quay Harbour recorded the highest average number of dolphins in 2018 (Table 5 & Figure 5). New Quay Harbour and New Quay Bird's Rock had shown a decrease in the number of sightings in the previous five year period, however both sights showed an increase in 2018; New Quay Bird's Rock increased from 3.0 to 4.13 while New Quay Harbour increased significantly from 2.4 to 3.95.

Both Mwnt and Aberporth recorded a slight increase in dolphin sightings in 2018.



At Aberystwyth the average number of dolphins has decreased slightly from 2.8 in 2017 to 2.4 in 2018. No watches took place at Ynys Lochtyn in 2018. Figures for 2016 and 2017 are taken from Heath, M and Vaughan, A (2019) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2016, 2017').



N.B. No watches took place at Ynys Lochtyn in 2018.

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

### Group size

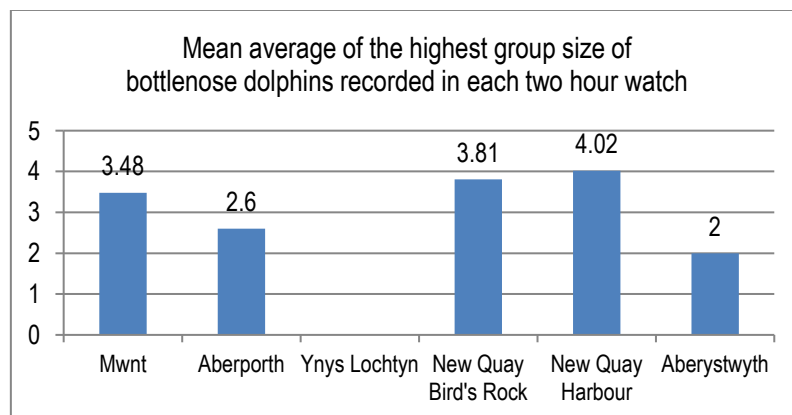
The mean average of the highest group size of dolphins recorded per interval in each two hour watch when sightings occurred was used as a measure of group size (Table 6 & Figure 6). The greatest mean group size occurred at New Quay Harbour and New Quay Bird's Rock.

Figures for 2016 and 2017 are taken from Heath, M and Vaughan, A (2019) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2016, 2017').

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

Year	Mwnt	Aberporth	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2018	3.5	2.6	No watches	3.81	4.02	2
2017	3.29	2*	4.6	3.51	3.7	2.75*
2016	3.65	1.67*	No watches	4.15	4.03	2.4

\* Fewer than 5 watches recorded with sightings



N.B. No watches took place at Ynys Lochtyn in 2018.

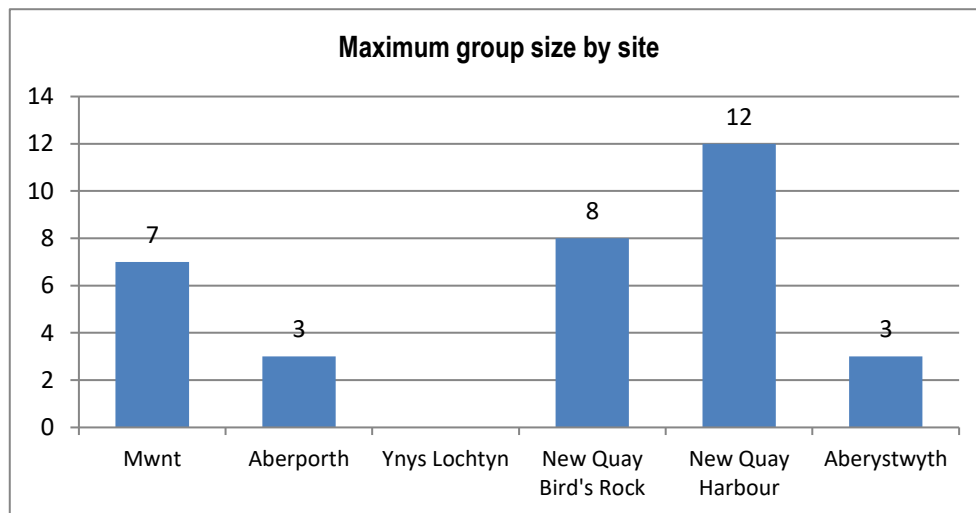
**Figure 6: Mean average of the highest group size of bottlenose dolphins recorded in each two hour watch**

## 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 were observed at New Quay Harbour (12 animals) New Quay Bird's Rock (8 animals) and Mwnt (7 animals). The Mwnt, New Quay Bird's Rock and New Quay Harbour 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	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2018	7	3	0	8	12	3



**Figure 7: Maximum group size of bottlenose dolphins by site**

## Sightings of young bottlenose dolphins

Young dolphins were sighted at New Quay Harbour in 68% of the watches during 2018; an increase from the previous year's figure of 50%. New Quay Bird's Rock had a similarly high percentage, at 44% of watches with young dolphins present, an increase on previous years. The number of young bottlenose dolphins recorded at New Quay Bird's Rock has fluctuated widely in recent years and was down to 23% in 2017, a slight drop from the 24% recorded in 2016, but a significant drop from the 2011, 2012 and 2015 totals of 48.8%, 34.5% and 37.1% respectively. Young dolphins were sighted at Mwnt in more than 43% of the watches during 2018; a decrease from the previous year figure of 53%. No young dolphins were recorded at Aberporth in 2018. No watches took place at Ynys Lochtyn in 2018. In Aberystwyth there was a significant increase from no sightings of young animals the previous two years to 33% in 2018. However at both Aberporth and Aberystwyth relatively few watches take place therefore this data needs to be interpreted with caution.

Figures for 2016 and 2017 are taken from Heath, M and Vaughan, A (2019) *'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2016, 2017.'*

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

Year	Mwnt	Aberporth	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2018	43%	0%	No watches	44%	68%	33%
2017	53%	0%	40%	23%	50%	0%
2016	41%	33%	No watches	24%	50%	0%

## 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).

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

Year	Mwnt	Aberporth	Ynys Lochtyn	New Quay Bird's Rock	New Quay Harbour	Aberystwyth
2018	4.76	1.2	No watches	3.42	5.01	5
2017	3.4	1	6	3.8	5.3	2.8

Figures for 2017 are taken from Heath, M and Vaughan, A (2019) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2017'.

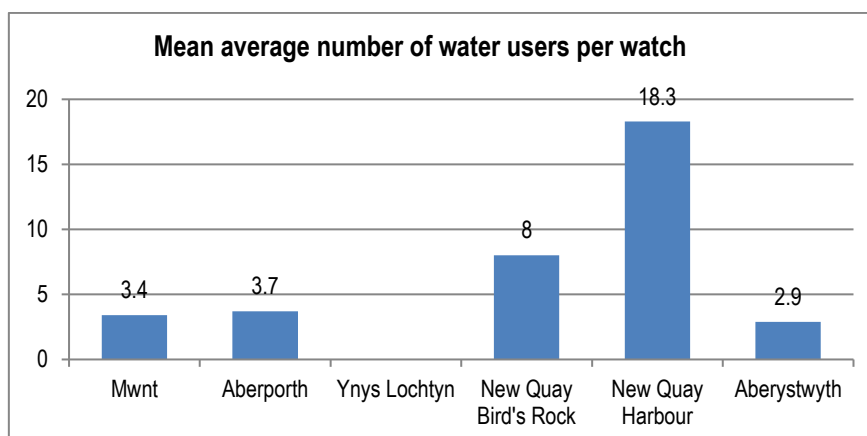
## Water User Encounters

### Levels of boat traffic by site

Water user traffic was monitored by tally counts of water users over each two hour observation period. New Quay Harbour was the busiest site for water user traffic, next was New Quay Bird's Rock, then Aberporth, followed by Mwnt; with the lowest water user count at Aberystwyth. (Table 10 & Figure 8).

**Table 10: Mean water user counts per two hour watch 2018**

	Mwnt	Aberporth	Ynys Lochtyn	New Quay Birds Rock	New Quay Harbour	Aberystwyth
2018	3.4	3.7	No watches	8	18.3	2.9



**Figure 8: Mean average water user counts per two hour watch for each site**

*No watches took place at Ynys Lochtyn in 2018.*

The most frequently recorded water user types in New Quay Harbour in 2018 were visitor passenger boats, with 5,399 recorded during the season in 2018. The next highest category were canoes, kayaks and paddleboards at 5,255; which for the second consecutive year have overtaken motorboats as the second most frequently recorded type of water craft. These were followed by motor boats at 3520, speed boats/RIB at 1743, and sail boats at 1763.

At New Quay Bird's Rock visitor passenger boats were again the most frequent, with 315 visitor passenger boats recorded. The next most frequently recorded type of vessel at this site were canoes, kayaks and stand up

paddle-boards, with 55 recorded; therefore the number of visitor passenger boats at Bird's Rock is significantly higher than any other type of water user. At Mwnt visitor passenger boats were again the most frequently recorded water user type in 2018. At Aberystwyth, fishing boats were the most frequently recorded water user type. At the Aberporth site, the number of canoes, kayaks and SUPs recorded is significantly higher than other types of water user. At Aberporth in 2018, 36 canoes were recorded. (Table 11 & 12).

**Table 11: Total count of different types of water user on each site in 2018 in good weather watches**

	motor boat	speed boat (RIB)	sail boat	commercial fishing boat	visitor passenger boat	canoe/kayak/SUP	jet-ski	Number of watches
Mwnt	27	13	13	13	25	15	2	32
Aberporth	5	4	9	0	1	36	1	15
Ynys Lochtyn	No watches							
New Quay Bird's Rock	61	49	26	43	316	45	2	69
New Quay Harbour	3520	1743	1763	994	5406	5255	29	1024
Aberystwyth	15	2	2	26	0	7	0	18

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

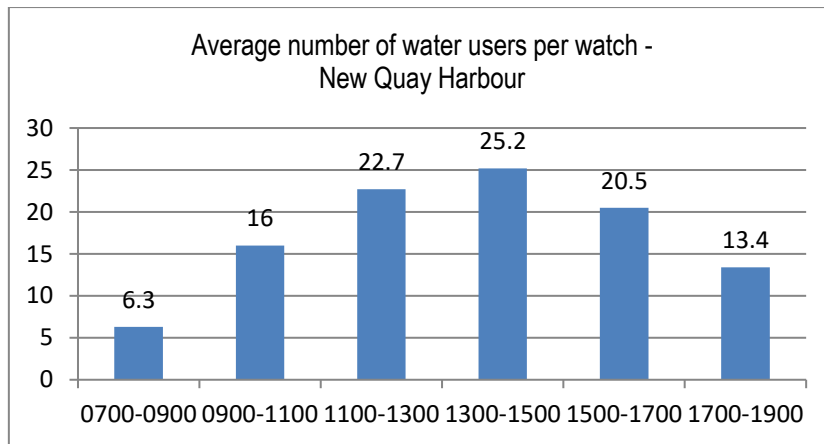
	motor boat	speed boat (RIB)	sail boat	commercial fishing boat	visitor passenger boat	canoe/kayak/SUP	jet-ski	Number of watches
Mwnt	0.84	0.4	0.4	0.4	0.8	0.5	0.06	32
Aberporth	0.3	0.3	0.6	0.0	0.06	2.4	0.07	15
Ynys Lochtyn	No watches							
New Quay Bird's Rock	0.9	0.7	0.4	0.6	4.6	0.7	0.02	69
New Quay Harbour	3.4	1.7	1.7	1.0	5.3	5.1	0.03	1024
Aberystwyth	0.8	0.1	0.1	1.4	0.0	0.4	0.0	18

### **New Quay Harbour**

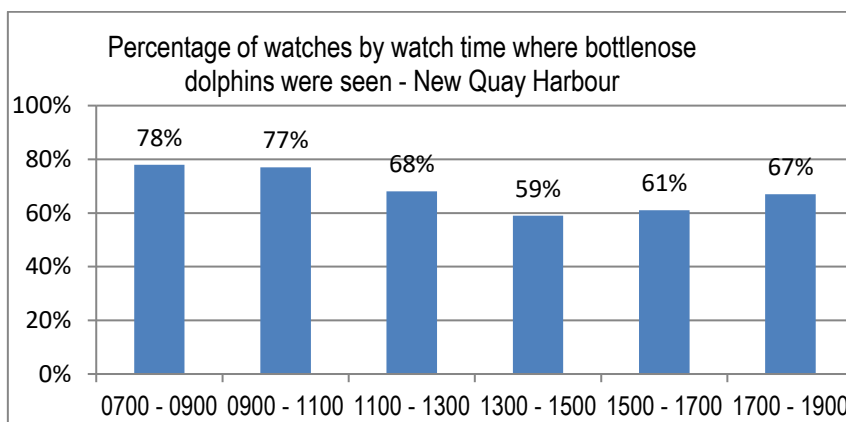
Due to the high volume of water users in the New Quay Harbour area, a factor unique to this site; water user counts per watch time and dolphin occupancy per watch time were also investigated to examine whether there is a correlation between the number of water users and site use by bottlenose dolphins.

The watch between the hours of 1300 – 1500 has the greatest average number of water users recorded per watch at 25.2 and the smallest percentage of bottlenose dolphin sightings per watch at 59%.

The greatest percentage of bottlenose dolphin sightings occurred in the mornings up to 1100 when the water user traffic is quietest; the average number of water users per watch between 0700 – 0900 was just 6.3, with a bottlenose dolphin sightings rate of 78%. (Figures 9 & 10).

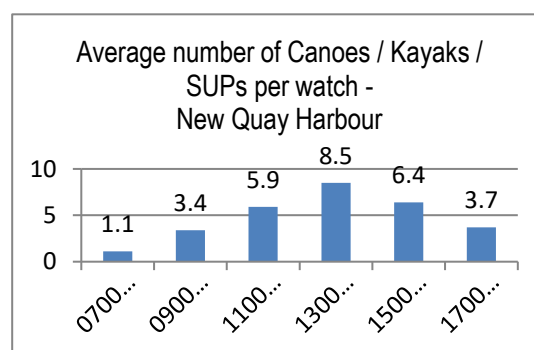
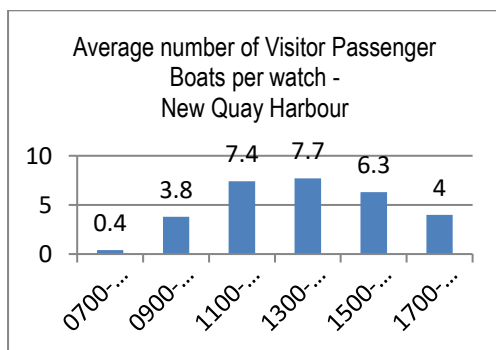


**Figure 9: Average number of water users recorded by time of watch at New Quay Harbour 2018**



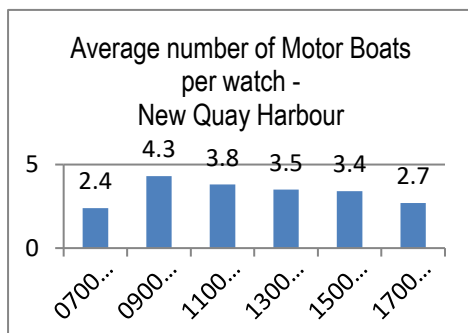
**Figure 10: Percentage of watches by time of day where dolphins were seen at New Quay Harbour 2018**

The graphs below show the number of water users by watch for the three most frequent types of water craft recorded from the New Quay Harbour monitoring site.



**(Above left) Figure 11: Average number of visitor passenger boats recorded per watch at New Quay Harbour 2018**

**(Above right) Figure 12: Average number of canoes / kayaks / SUPs per watch at New Quay Harbour 2018**



**(Left) Figure 13: Average number of motor boats recorded per watch at New Quay Harbour 2018**

## Encounters between dolphins and water users

The protocol followed during a Dolphin Watch survey defines a water user encounter as occurring when a water craft travels within 300m of an individual dolphin or a group of dolphins. A total of 1595 encounters between bottlenose dolphins and water users were recorded in 2018. The highest observed encounter rates were at New Quay Harbour; New Quay Bird's Rock had the second highest encounter rate. Encounters with visitor passenger boats were most frequently recorded across the survey sites.

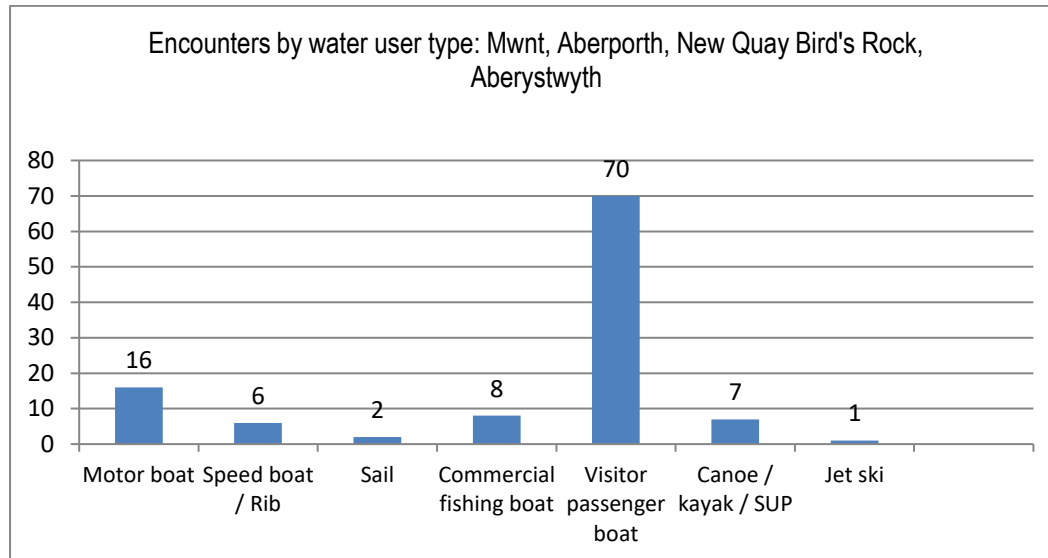


Figure 14: Encounters by water user type: Mwnt, Aberporth, New Quay Bird's Rock, Aberystwyth 2018

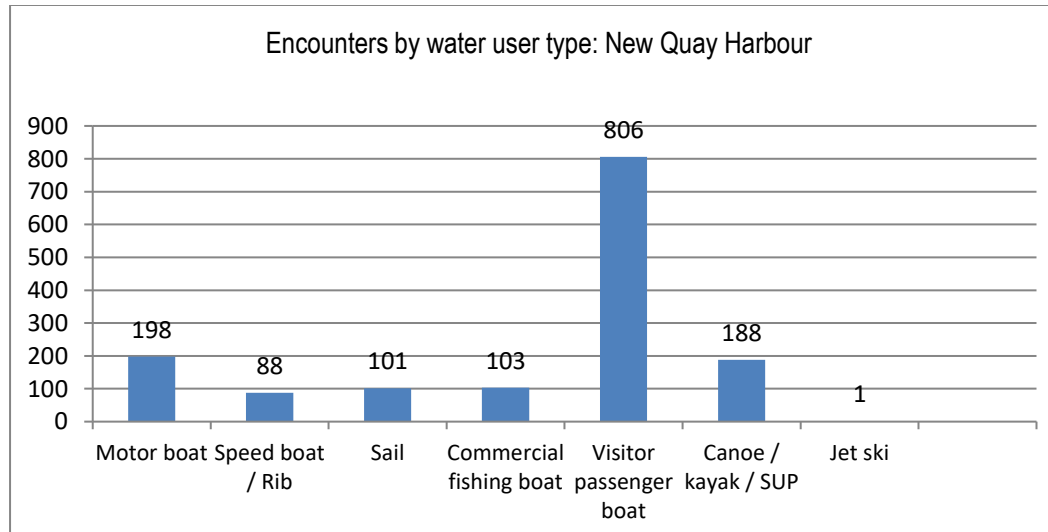


Figure 15: Encounters by water user type: New Quay Harbour 2018

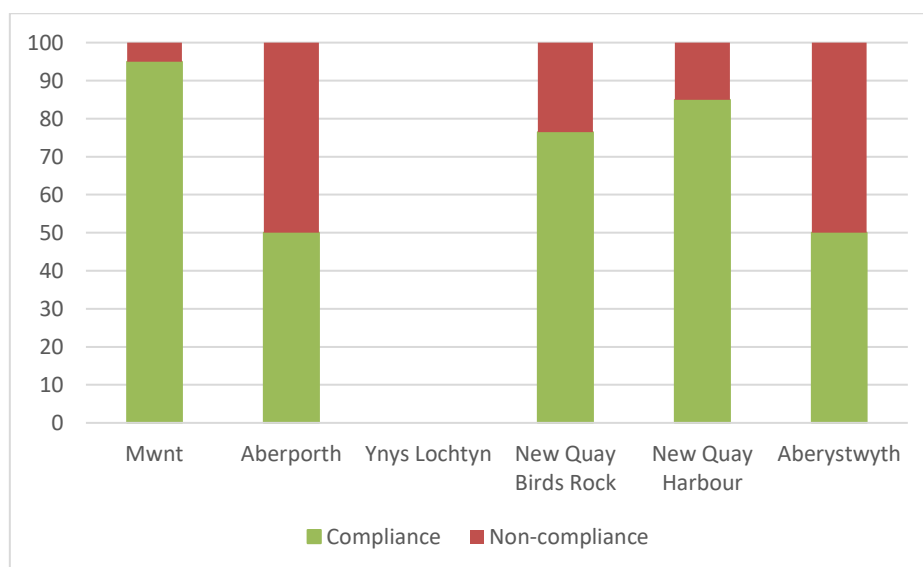
## Compliance with the Ceredigion Marine Codes by water users during encounters with dolphins

There were 1595 encounters recorded between water users and dolphins during the 2018 survey period. In 1342 (84%) of the encounters the observer recorded that the water user followed the relevant Marine Code; these Marine Codes are the guidelines for recreational water users and for commercial passenger boats. There were (253) 16% of encounters in which water users did not follow the appropriate Marine Code (Table 13).

The rate of compliance with the Ceredigion Marine Codes varied by location: Aberystwyth, and Aberporth both recorded less than five water user encounters; therefore this data cannot provide an accurate or fair indication of compliance at these sites. At the three remaining sites water users in the New Quay Bird's Rock area had the highest rate of compliance at 96%, followed by New Quay Harbour at 88% and Mwnt at 75% (Figure 16).

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

Site	Total number of water user encounters	Number of water user encounters following the Marine Codes	Percentage compliance with the Marine Codes	Number of water user encounters not following the Marine Codes	Percentage non-compliance with Marine Codes
Mwnt	19	18	95%	1	5%
Aberporth	2	1	50%	1	50%
Ynys Lochtyn	No watches				
New Quay Bird's Rock	85	65	76.5%	20	23.5%
New Quay Harbour	1485	1256	85%	229	15%
Aberystwyth	4	2	50%	2	50%
All sites	1595	1342	84%	253	16%



*N.B. Aberporth and Aberystwyth recorded less than 5 encounters in 2018. No watches took place at Ynys Lochtyn in 2018.*

**Figure 16: Percentage of compliance/non-compliance with the Ceredigion Marine Codes during dolphin encounters (as a percentage of all recorded encounters per site)**

### Proportions of different types of non-compliance with the Ceredigion Marine Codes

The majority of cases of non-compliance with the marine codes involved water users: manoeuvring to either approach or follow the dolphins (62%) or vessels travelling too fast within 300 metres of a group of dolphins (37%) (Table 14).

**Table 14: Relative proportions of types of water user non-compliance with the Ceredigion Marine Codes**

Water user activity (when not complying with codes of conduct)	Number of encounters	Percentage of non-compliance
N1: Too fast, wake speed within 300m of dolphins	89	37%
N2: Erratic course to follow dolphins	150	62%
N3: Attempted to touch, feed or swim with dolphins	1	0.5%
N4: Speed over 8 knots within New Quay zoned area	1	0.5%

### The incidence of non-compliance for different water user types

Where more than five encounters took place by water craft type, speedboats had the highest rate of non-compliance: in 43% of all encounters with a speedboat the vessel did not follow the Ceredigion Marine Code. Canoes/kayaks/SUPs had the second highest rate of non-compliance at 34% of encounters. 2018 is the first year that the rate of non-compliance for canoes, kayaks and SUPs is higher than for motor boats; motor boats had a non-compliance rate of 31% (Table 15).

**Table 15: Non-compliance of different types of water user**

Water user type	Number of non-compliant water users by type	Total number of encounters by type	Percentage of non-compliance by type
Speedboat (rib)	41	96	43%
Motor boat	65	213	31%
Canoe/kayak/SUP	66	193	34%
Commercial fishing boat	10	111	9%
Sailing boat	12	103	12%
Visitor passenger boat	57	870	7%
Jet-ski	1	2	50%
Other (RNLI & research)	3	7	43%
Total	255	1595	16%

NB only 2 jet ski encounters were recorded in 2018

### Percentage of non-compliance during encounters by water user type by site (where more than five encounters took place)

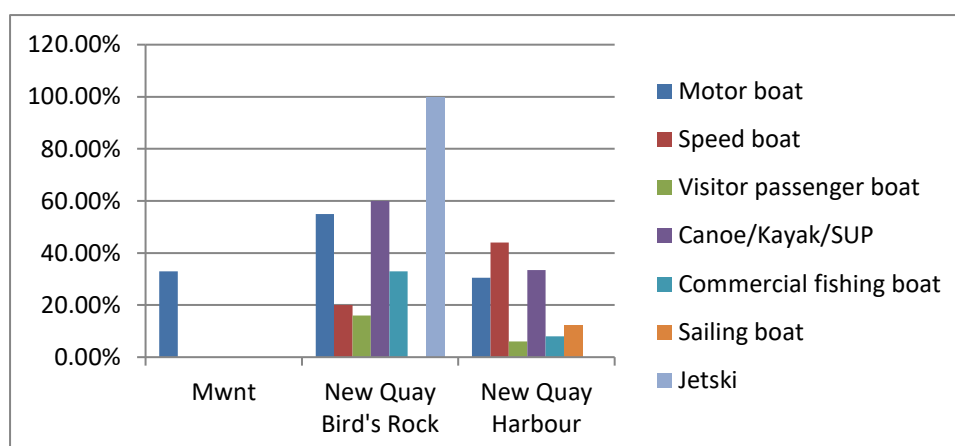
The three sites where more than five encounters were recorded are Mwnt, New Quay Bird's Rock and New Quay Harbour. At Mwnt only motor boats were observed not complying with the marine codes.

At New Quay Bird's Rock although the table and graph show jet skis as having the highest rate of non-compliance at 100% this was the only jet ski encounter to be recorded from Bird's Rock, so this should be treated with caution. Canoes, Kayaks and SUPs had a percentage non-compliance rate of 60%, motor boats were the third highest group, where non-compliant behaviour was recorded at 55%. At New Quay Harbour speed boats/ribs had the highest rate of non-compliance at 44%; canoes/kayaks/SUPs had a non-compliance rate of 33.5%, followed by motor boats at 30.5% (Table 16 & Figure 17).



**Table 16: Percentage of non-compliance during encounters by water user type by site**  
**N.B. Aberporth and Aberystwyth recorded less than five encounters in 2018 so are not included in the table below.**

		Motor boat	Speed boat (rib)	Commercial fishing boat	Sail boat	Visitor passenger boat	Canoe/kayak/SUP	Jet ski	other	Total
Mwnt	Number of non-compliant boats by type	1	0	0	0	0	0	0	0	1
	Total number of encounters by type	3	0	4	0	12	0	0	0	19
	Percentage non-compliance by type	33%	0%	0%	0%	0%	0%	0%	0%	5%
New Quay Bird's Rock	Number of non-compliant boats by type	6	1	1	0	9	3	1	0	21
	Total number of encounters by type	11	5	3	2	58	5	1	0	85
	Percentage non-compliance by type	55%	20%	33%	0%	16%	60%	100%	0%	25%
New Quay Harbour	Number of non-compliant boats by type	60	39	8	12	45	63	0	3	230
	Total number of encounters by type	197	88	103	101	800	188	1	7	1485
	Percentage non-compliance by type	30.5%	44%	8%	12%	6%	33.5%	0%	43%	15.5%

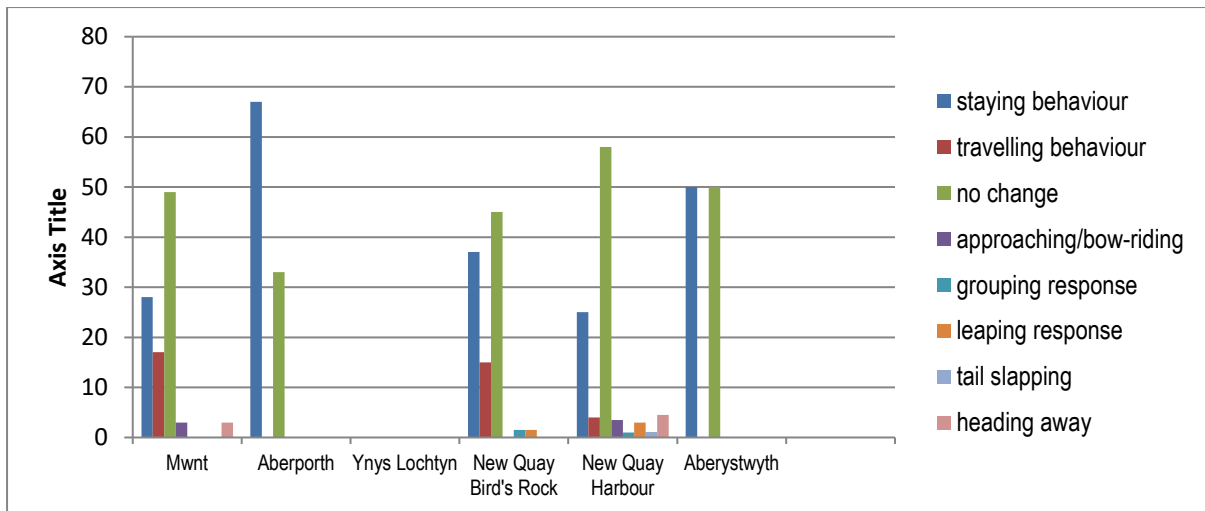


*N.B. Aberporth and Aberystwyth recorded less than five encounters in 2018 so are therefore not included in the chart above. No watches took place at Ynys Lochtyn in 2018.*

**Figure 17: Percentage of non-compliance during encounters by water user type by site**

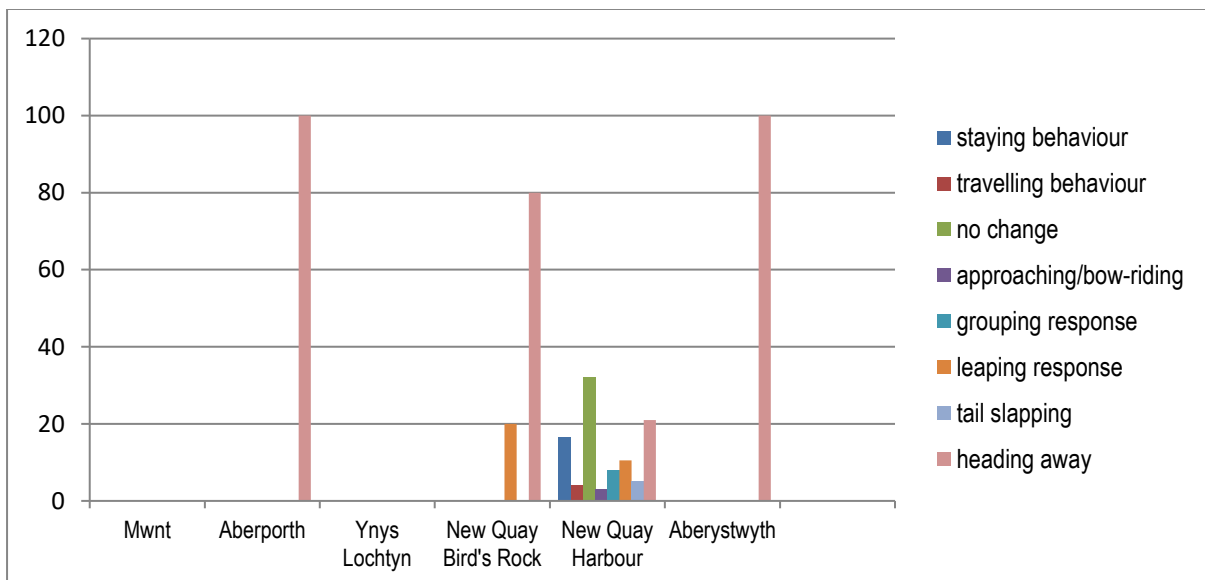
### Effects of water user encounters on bottlenose dolphin behaviour

How dolphins responded to positive and negative encounters with water users (whether water users followed the Ceredigion Marine Codes) 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 water user). 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 watches took place at Ynys Lochtyn in 2018.

**Figure 18: Dolphin behavioural responses to positive water encounters (water users following the Ceredigion Marine Codes).**



N.B. No watches took place at Ynys Lochtyn in 2018.

**Figure 19: Dolphin behavioural responses to negative water user encounters (water users not following the Ceredigion Marine Codes).**

All sites showed that when the Ceredigion Marine Codes were followed, ‘no change’ and ‘staying’ behaviours were the most frequently recorded response (Figure 18).

No negative encounters were recorded at Mwnt during 2018. At Aberporth, New Quay Bird’s Rock and Aberystwyth, during encounters where the Ceredigion Marine Codes were not complied with, ‘heading away’ was the most frequently recorded response. No watches took place at Ynys Lochtyn during 2018. At New Quay Harbour, even when vessels did not follow the codes, ‘no change’ was still the most frequently recorded behaviour, followed by ‘heading away’ (Figure 19).

This data supports the findings of the 2016 and 2017 reports Heath, M and Vaughan, A (2019) ‘*Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2016*’ which suggests that both constant low levels of disturbance from the volume of water craft at the New Quay Harbour site (figures 12 and 13) along with individual incidents of non-compliance with the Ceredigion Marine Codes influence site usage by the bottlenose dolphin population in southern Cardigan Bay.

## Acknowledgements

Thank you to all the hundreds of people that have contributed to the Dolphin Watch data collection over the last twenty four years. More than 80 people contributed observations in 2018. Observers' names are listed below, with apologies for any errors or omissions.

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## Appendix

### Site use by harbour porpoise and Atlantic grey seal

#### Atlantic grey seal

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth	Ynys Lochtyn
Number of watches with seals recorded	33	1	13	74	15	3
Mean average number per watch	1.24	2	1.38	3.46	1.06	1.67

#### Harbour porpoise

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth	Ynys Lochtyn
Number of watches with harbour porpoise recorded	3	0	9	1	0	0
Mean average number per watch	1	-	4	5	-	-