Dolphin and Porpoise Watch:

Effects of Water User Encounters on Bottlenose dolphin behaviour and site use

on the Ceredigion Coast, West Wales

2023

Melanie Heath and Ian Hughes

Contents

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^2 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 nine years of data collection. This is the fifteenth 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, Heath and Vaughan 2020, Heath and Vaughan 2022, Heath and Hughes 2025, Heath and Hughes 2026). 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).
Pease note: *The year 2020 is the only year in the project's twenty-nine year history to have an incomplete data set; this is due to the Covid 2019 pandemic and the measures put in place through lockdowns and activity restrictions until August 2020, so data was only collected in 2020 in a limited form. This data was used to inform site management; but did not provide a comparable data set to produce a report for the year 2020.*

The key aims of the DPW project are:

•To monitor the presence of bottlenose dolphins and harbour porpoise to improve our understanding of bottlenose dolphin and porpoise site usage and to monitor trends in dolphin and porpoise occurrence

•To monitor levels of water user traffic to aid coastal zone management and to assess the effectiveness of the Cardigan Bay Marine Codes

•To Investigate interactions between bottlenose dolphins/ harbour porpoise and water users, and how these interactions affect dolphin and porpoise behaviour

•To increase public awareness and appreciation of the marine wildlife in Cardigan Bay

Method

In 2023 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 Borth.
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 1st March to 31st October 2023, the same parameters used in the 2016, 2017, 2018, 2019, 2021 and 2022 Dolphin and Porpoise Watch reports. The data from March to October was analysed in 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 and Porpoise Watch volunteers receive 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 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 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 water users

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

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

For each 'encounter' the observer recorded the type of water user that was closest to a dolphin/group; the total number of water users 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 Marine Code for recreational water users; and all the dolphin behaviours that were observed.

Water users were considered to have complied with the Ceredigion Marine Codes if they either passed the animals at 'no-wake' speed, with no changes of course to approach (code Y1) or slowed down gradually and stopped (Y2). Four codes were used when water users did not comply and these were either because they were travelling too fast within 300 metres of dolphins (N1); they followed a changes of course to approach 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 water users. 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 2023 a total of 1357 observation periods (watches) were carried out between March and October (Table 1). Since the first season's field work in 1994 a total of 20,337 watches have been completed.
When the project began observations were carried out at three sites; Aberporth, New Quay Bird's Rock and Ynys Lochtyn. In recent years however, watches at Ynys Lochtyn have not taken place every year. 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 or 2023.
Borth has also been added as a new site. Mwnt has been included since 1998; New Quay Harbour and Aberystwyth were added to the site list in 2004. No data was collected at Aberystwyth in 2023.
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 2023

	All sites	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Borth
No of watches	1357	65	40	109	1120	23
Hours of effort	2714	130	80	218	2240	46

Survey conditions

Between 1st March and the 31st October 2023, 1301 watches, 2602 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	New Quay Bird's Rock	New Quay Harbour	Borth
Number of watches in good conditions	1304	65	40	109	1067	23
Hours of effort in good conditions	2608	130	80	218	2134	46

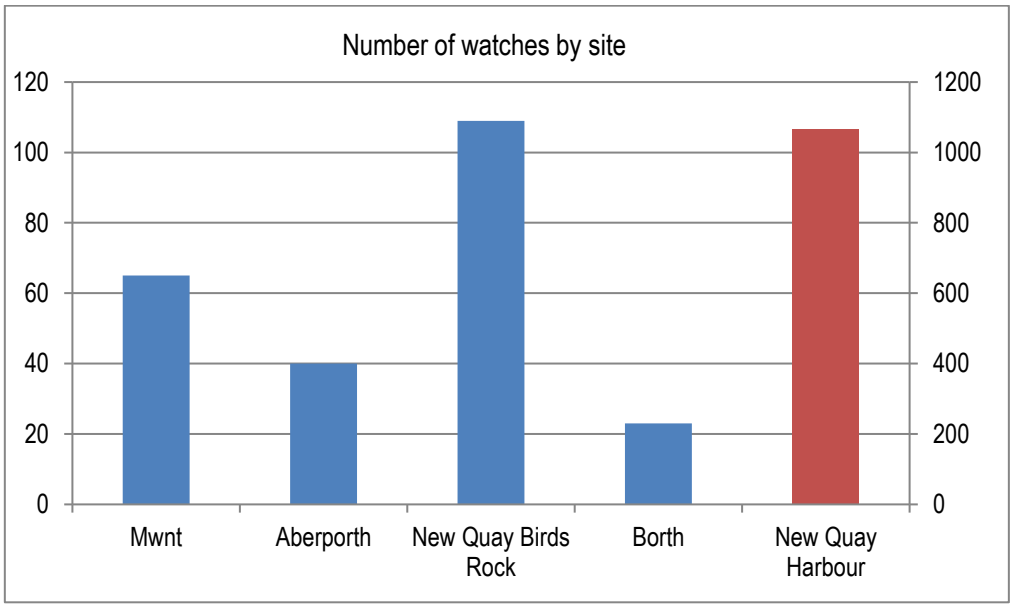

Figure 1: Number of watches conducted in good weather at Dolphin Watch monitoring sites
N.B. New Quay Harbour watches are conducted every day throughout the season from 7am to 7pm by Living Seas' staff and volunteers based at the CBMWC. The number of watches at this site is therefore much higher.

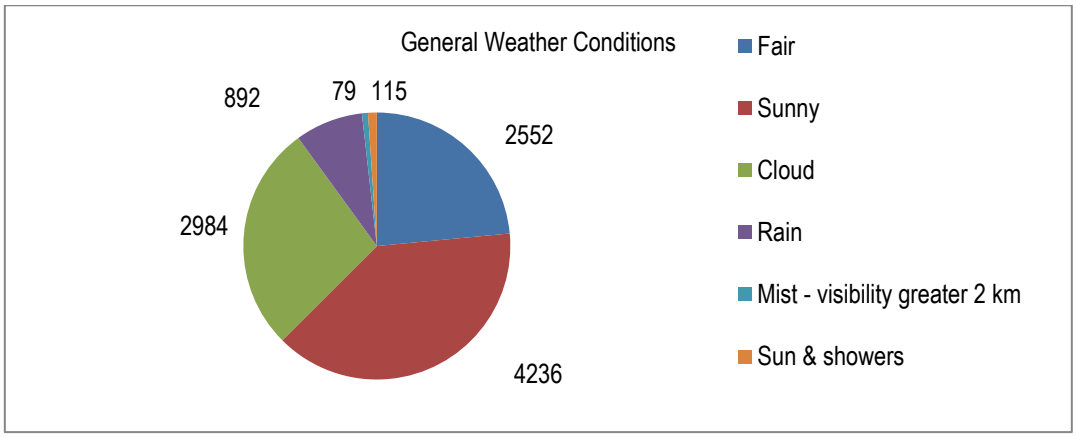

Figure 2: Weather conditions (number of intervals)

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 (calm, rippled surface) for Aberporth, New Quay Bird's Rock and Borth. The median sea state for Mwnt and New Quay Harbour was sea state 2.

Sightings rates

Sightings rates for bottlenose dolphins were calculated from 1301 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 2023.

Table 3: Percentage of two hour watches at each site with dolphin sightings

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Borth
2023	62%	10%	37%	67%	22%

New Quay harbour had the highest sightings rating of all the sites at 67%, a repeat of the 67% sightings rate in 2022. Mwnt also had an identical sightings rate to 2022 at 62%. All other sightings rate down,

Aberporth had remained constant at 23% in 2016 and 2017, with an increase to 33% in 2018, dropping to 17% in 2019; and dropping further in 2021 to 14%. In 2022 there was a significant increase in the sightings rate to 43%. The 2023 sightings rate at Aberporth was just 10%.

New Quay Bird's Rock showed a significant drop in 2023 to 37% from the 49% rate in 2022.

There was no available data for Aberystwyth for 2023.

Borth was a new site for 2019, with a sightings rate of 13%, increasing in 2021 to 24%, and increasing again to 40% in 2022.[1] In 2023 the rate dropped to 22%.

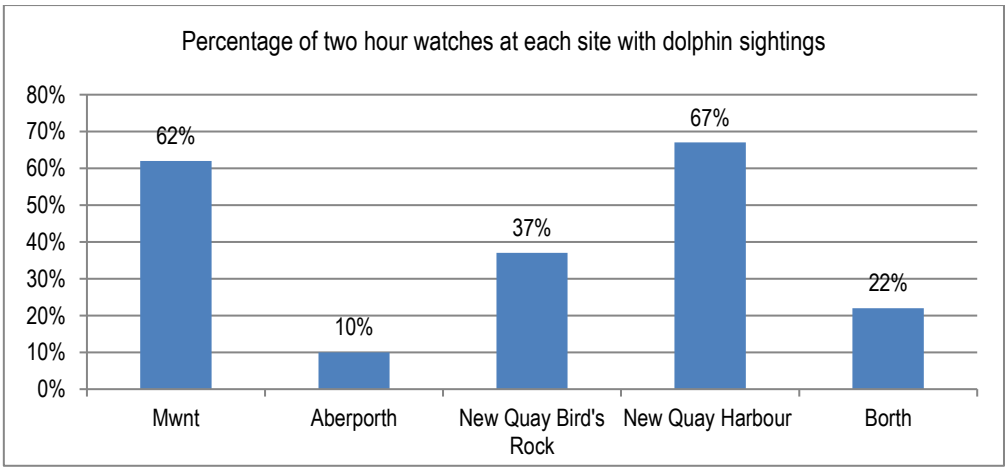

Figure 3: Sightings rates - percentage of two hour watches in which dolphins were recorded

[1] (Figures for 2016 were taken from Heath, M and Vaughan, A (2018) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2016'. Figures for 2017 were taken from Heath, M and Vaughan, A (2019) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2017'. Figures for 2018 were taken from Heath, M and Vaughan, A (2022) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2018'. Figures for 2019 were taken from Heath, M and Vaughan, A (2023) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2019'. Figures for 2021 were taken from Heath, M and Hughes, I (2025) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2021' Figures for 2022 were taken from Heath, M and Hughes, I (2026) 'Dolphin Watch: Bottlenose dolphins and boat traffic on the Ceredigion coast, West Wales 2022'.

Table 4: 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	Borth
2023	4.5	1	4	2.3	No data	2.1
2022	4.6	3	4.6	2.3	2.5	2.4
2021	4.3	3	3.8	3.75	2.2	2.4
2019	3.7	2.7	3.7	3.3	2.1	2
2018	3.7	2.5	4.1	4	2.4	No watches

Mwnt and New Quay Bird's Rock recorded the highest average number of dolphins in 2023 (Table 4 & Figure 4). Aberporth has dropped to just 1, after staying constant with a mean average of between 2.5 and 3 for the site in recent years.
Borth has remained at an average of between 2 and 2.4 since watches began here in 2019.

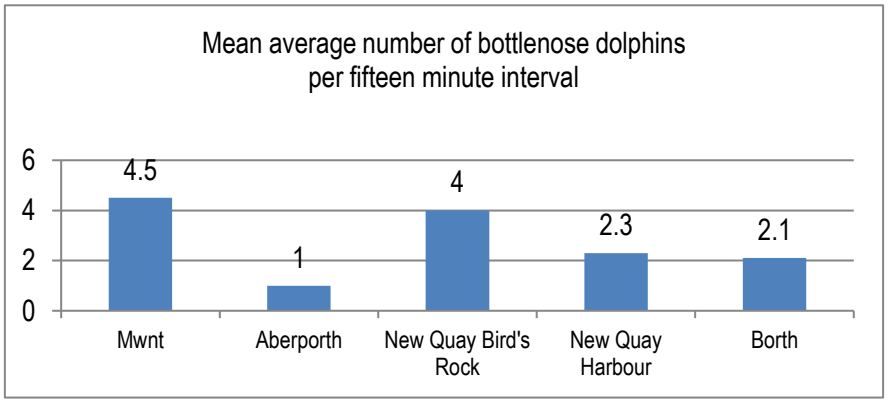

Figure 4: Mean average number of dolphins observed in a fifteen minute interval where dolphins were sighted

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 5 & Figure 5).
The greatest mean group size in 2023 occurred at Mwnt. Mean group size at Mwnt has been increasing steadily over the last five years. In contrast, mean group size at New Quay Harbour has been dropping over the last 5 years.

Table 5: 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	Borth
2023	4.6	1	4	3.4	No data	1.8
2022	4.4	2.9	3.9	3.4	2.6	2.3
2021	4.1	3	3.9	3.6	2.3	2.3
2019	3.2	3	4	4.2	1.9	2
2018	3.5	2.6	3.8	4	2	No watches

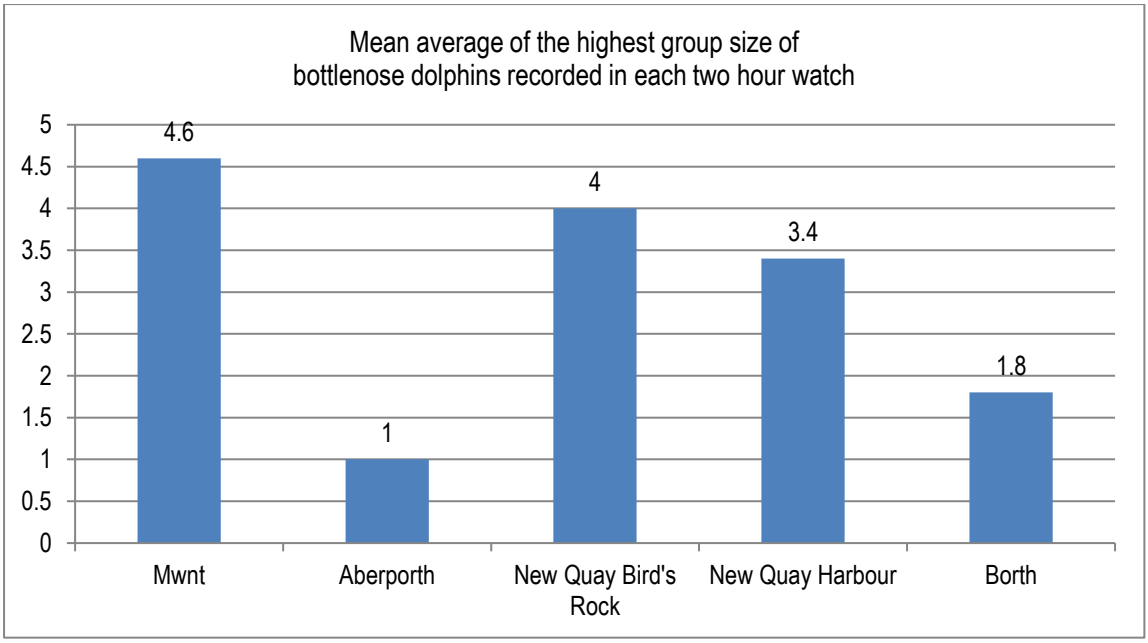

Figure 5: Mean average of the highest group size of bottlenose dolphins recorded in each two hour watch

Maximum recorded group size at each site

The maximum dolphin group size observed at each site was also recorded (Table 6 & Figure 6). The largest group sizes were observed at New Quay Harbour (12 animals) Mwnt (10 animals) and New Quay Bird's Rock (9 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 6: Maximum recorded group size at each site

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Borth
2023	10	1	9	12	3

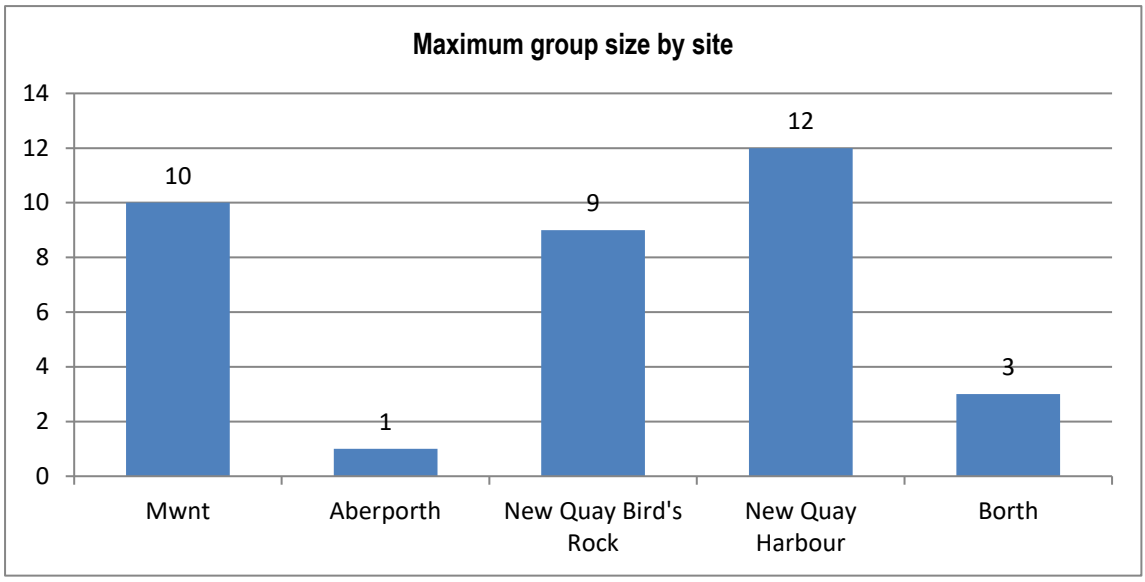

Figure 6: Maximum group size of bottlenose dolphins by site

Sightings of young bottlenose dolphins

New Quay Harbour had the highest sightings rate of animals with calves, seen in 66% of the watches during 2023, the same figure as in 2022 and 2021.
New Quay Bird's Rock has had a significant percentage increase in 2022 to 37% from the 2021 figure of just 19%. Again in 2023 the sightings rate for young animals was 37%. The number of young bottlenose dolphins recorded at New Quay Bird's Rock has fluctuated widely in recent years from 44% of watches with young dolphins present in 2018 to 23% in 2019.
Young dolphins were sighted at Mwnt in 55% of watches, a significant increase from the 2022 figure of 29%.
At Aberporth no young dolphins were seen in 2023.
Borth had a percentage sightings rate of dolphins with calves at 20% in 2023.

Table 7: Young dolphin sightings (percentage of watches when dolphins present with young animals) at sites where more than five watches took place

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth	Borth
2023	55%	0%	37%	66%	No data	20%
2022	29%	24%	37%	66%	23%	18%
2021	31%	0%	19%	66%	39&	30%
2019	15%	20%	23%	61%	14%	67%
2018	43%	0%	44%	68%	33%	No watches

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; i.e. when dolphins were present, how long did they stay.

Table 8: Site occupancy (mean number of fifteen minute intervals per watch when dolphins were present) at sites where more than five watches took place

Year	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Aberystwyth	Borth
2023	4.5	2.5	4	5	No data	3.6
2022	4.6	3.4	3.6	5	3.6	3
2021	4.1	1	4.4	5.2	2.4	3
2019	3.2	3.2	3.7	5	3.7	7
2018	4.8	1.2	3.4	5	5	No watches

Water user encounters

Levels of water user traffic by site

Water user traffic was monitored by tally counts of water-craft over each two hour observation period. A total tally of 20,992.
New Quay Harbour was the busiest site for water user traffic followed by New Quay Bird's Rock, then Aberporth, Borth was fourth, with the lowest water user count at Mwnt (Table 9 & Figure 7).

Table 9: Mean water user counts per two hour watch 2023

	Mwnt	Aberporth	New Quay Birds Rock	New Quay Harbour	Borth
2023	2	3.7	8	19	2.7

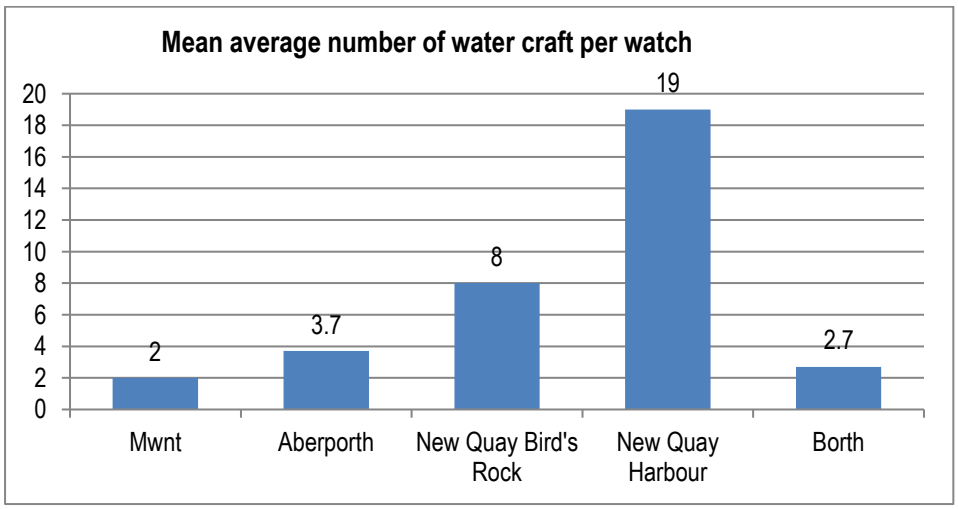

Figure 7: Mean average water user counts per two hour watch for each site

The most frequently recorded water user types in New Quay Harbour in 2023 were Visitor passenger boats with 6499 recorded. Canoes, kayaks and SUPs were the second highest recorded at 5588. The next highest category was motor boats at 3451, sail boats at 1928 and speed boats/RIBs at 1498.

New Quay Bird's Rock, had the second highest water user count; where visitor passenger boats were the most frequent, with 578 recorded. The next most frequently recorded water user at this site were sail boats with a count of 97 recorded. The third most frequently recorded type of water user were motor boats with a count of 95. Commercial fishing boats, speed boats and canoes and stand up paddleboards all had similar coats at this site, with counts of 33, 31 and 29 respectively. Therefore the number of visitor passenger boats at Bird's Rock is significantly higher than any other type of water user.

Table 10: Total count of different water user types on each site in 2023 in good weather watches

Site	motor boat	speed boat/RIB	sail boat	commercial fishing boat	Visitor passenger boat	Canoe/ kayak/ sup	jet-ski	RNLI	Research
Mwnt	27	8	25	13	32	27	0	0	1
Aberporth	18	5	14	13	1	98	0	0	0
New Quay Bird's Rock	95	31	97	33	578	29	2	2	1
New Quay Harbour	3451	1498	1928	729	6499	5588	36	17	12
Borth	12	3	7	5	0	34	1	0	0

Table 11: Mean average counts of different water user types for each site by two hour watch in 2023

Site	motor boat	speed boat/RIB	sail boat	commercial fishing boat	visitor passenger boat	Canoe kayak/SUP	jet-ski	Other research/ RNLI
Mwnt	0.42	0.12	0.4	0.2	0.5	0.42	0	0.01
Aberporth	0.45	0.13	0.35	0.33	0.025	2.5	0	0
New Quay Bird's Rock	0.9	0.3	0.9	0.3	5.3	0.3	0.02	0.03
New Quay Harbour	2.7	1.2	1.5	0.6	5	4.2	0.03	0.02
Borth	0.5	0.13	0.3	0.22	0	1.5	0	0

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 1100 – 1300 has the greatest average number of water users recorded per watch at 23.
The watches from 07:00 – 09:00 hours recorded the highest percentage of dolphins at 69%, this period also had the lowest boat count with a mean average of 5.8.

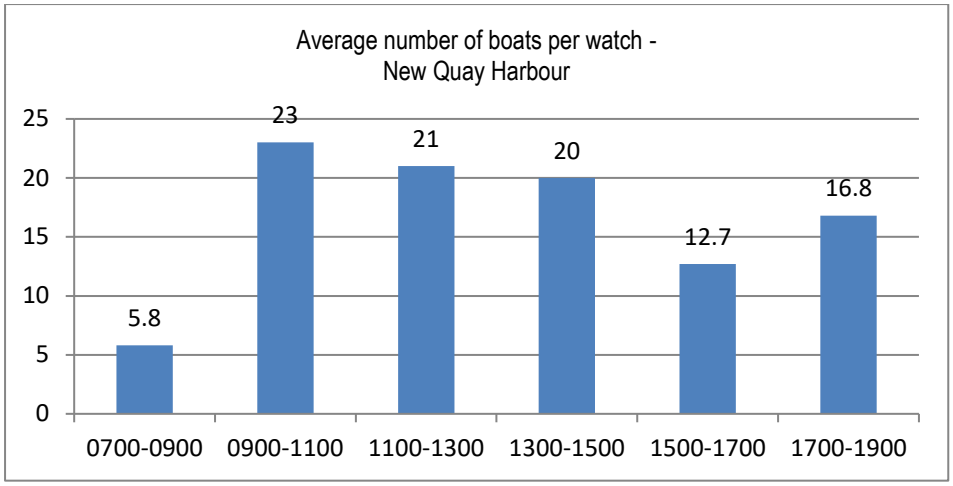

Figure 7: Average number of water users recorded by time of watch at New Quay Harbour 2023

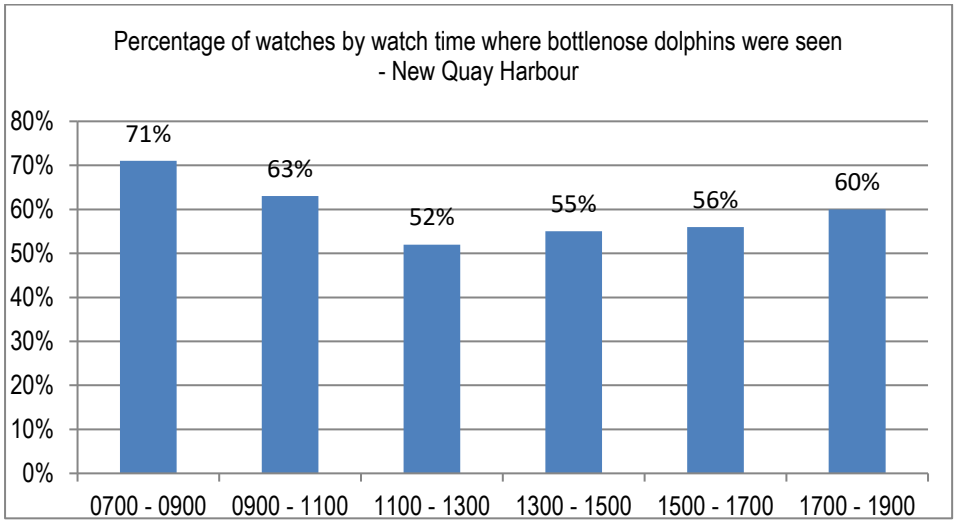

Figure 8: Percentage of watches by time of day where dolphins were seen at New Quay Harbour 2023

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

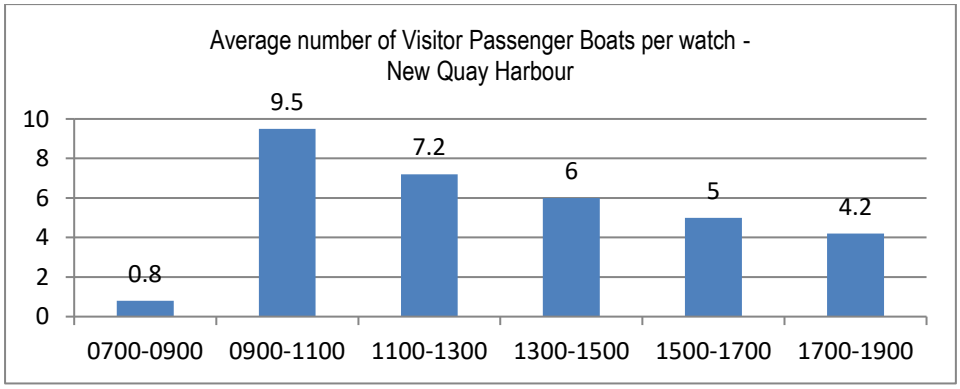

Figure 9: Average number of Visitor Passenger Boats recorded per watch at New Quay Harbour 2023

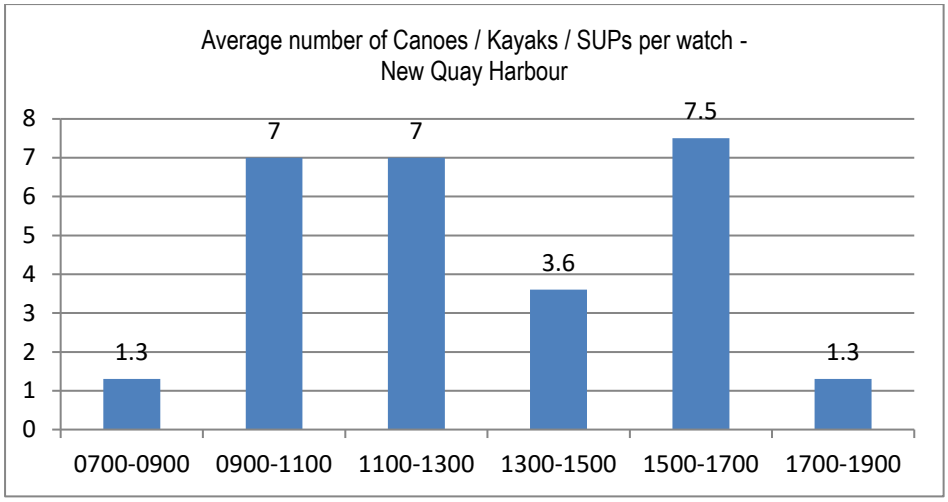

Figure 10: Average number of Canoes / Kayaks / SUPs per watch at New Quay Harbour 2023

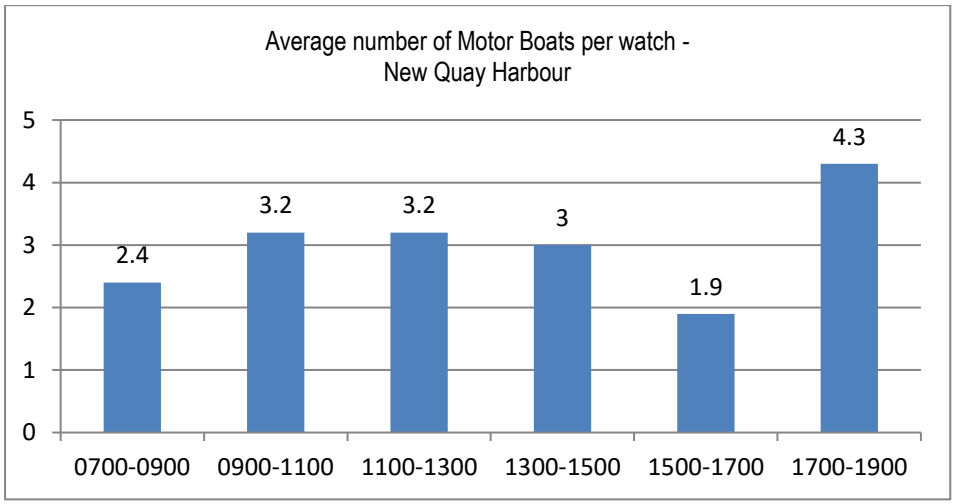

Figure 11: Average number of Motor Boats recorded per watch at New Quay Harbour 2023

Encounters between dolphins and water users

The protocol followed during a Dolphin Watch survey defines an encounter as occurring when any watercraft travels within 300m of an individual dolphin or a group of dolphins. A total of 4028 water-craft users were within 300 meters of dolphins during an encounter in 2023. Because the current protocol only records the behaviour of the first watercraft in an encounter during each Observation Period the total number of encounters recorded between bottlenose dolphins and watercraft in 2023 was 2196. The highest observed encounter rates were at New Quay Harbour; Bird's Rock had the second highest encounter rate, followed by Mwnt. Encounters with visitor passenger boats were the most frequently recorded.

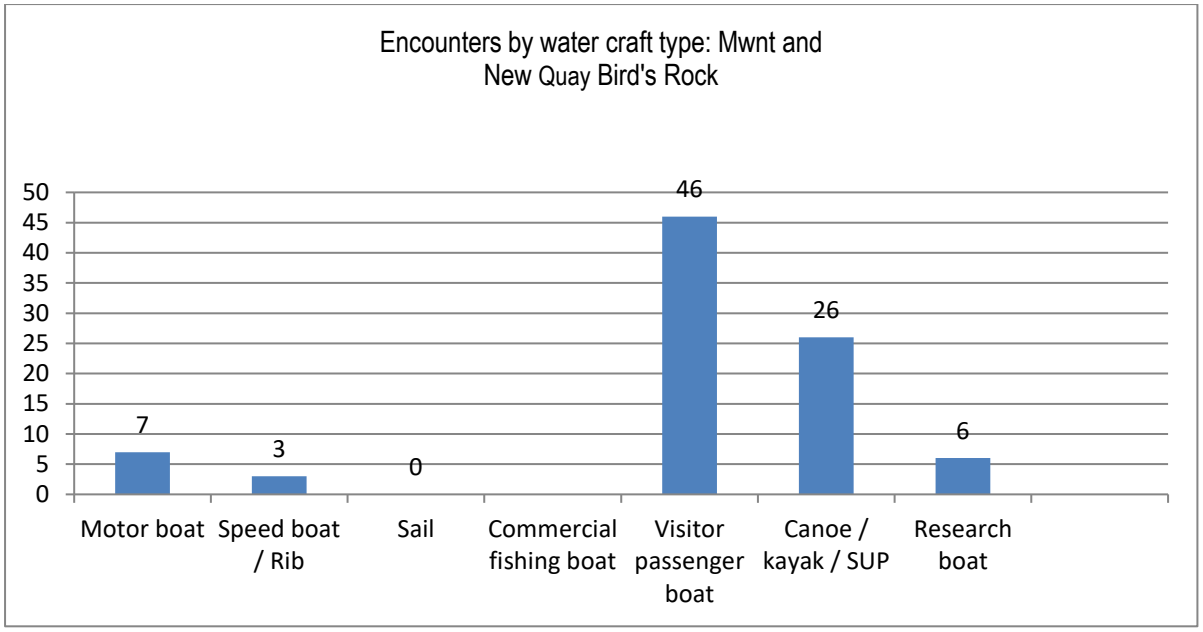

Figure 12: Encounters by water user type: Mwnt and New Quay Bird's Rock, 2023

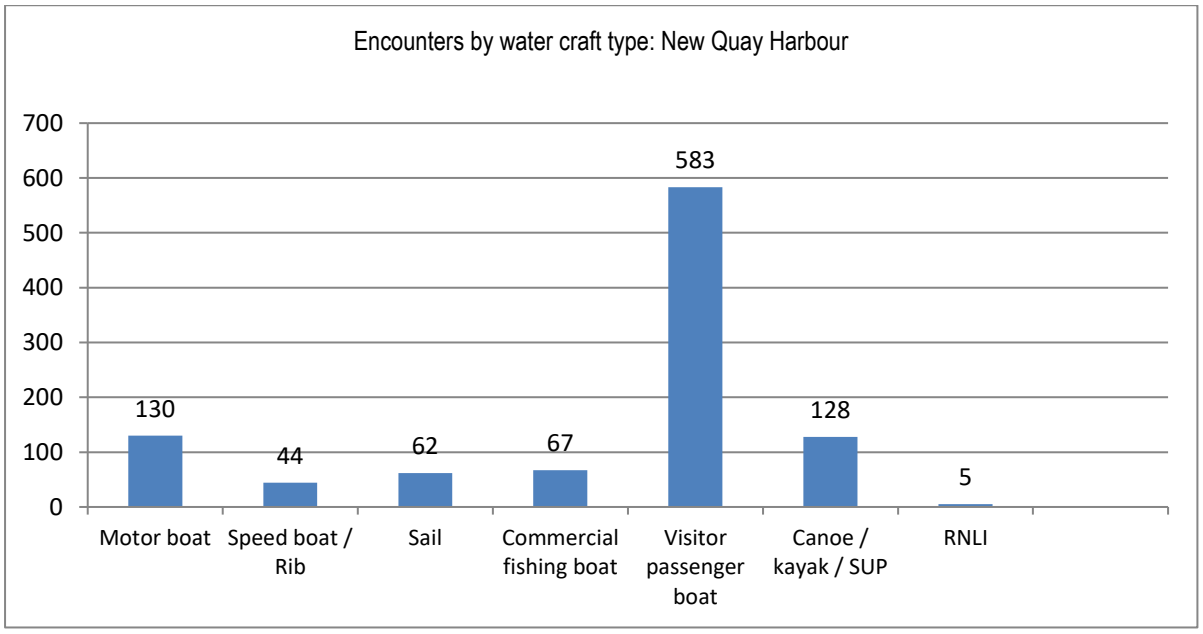

Figure 13: Encounters by water user type: New Quay Harbour 2023

Compliance with the Cardigan Bay Marine Codes by water users during encounters with dolphins

There were 1988 encounters recorded between water users and dolphins during the 2023 survey period. In 1579 (79%) 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 409 (21%) of encounters in which water users did not follow the appropriate Marine Code (Table 12).

The rate of compliance with the Cardigan Bay Marine Codes varied by location; New Quay Harbour had the highest rate of compliance at 81%. New Quay Bird's Rock had a compliance rate of 77% while Mwnt had the lowest compliance rate at just 20%. (Table 12 and Figure 14).

Table 12: Percentage of compliance/non-compliance with the Cardigan Bay Marine Codes 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	40	8	20%	32	80%
New Quay Bird's Rock	48	37	77%	11	23%
New Quay Harbour	1900	1534	81%	366	19%
All sites	1988	1579	79%	409	21%

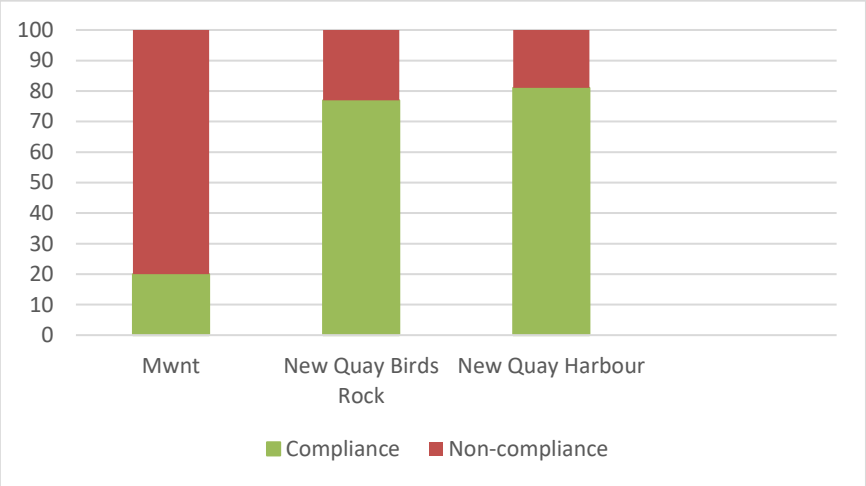

Figure 14: Percentage of compliance/non-compliance with the Cardigan Bay Marine Codes during dolphin encounters

Proportions of different types of non-compliance with the Cardigan Bay Marine Codes

Non-compliance with the Cardigan Bay Marine Codes involved water users manoeuvring to either approach or follow the dolphins (52%) or vessels travelling too fast within 300 metres of a group of dolphins (48%). 104 (53%) out of the 196 incidents of water users exceeding no wake speed within 300 metres of a dolphin or a group of animals across all sites involved a visitor passenger boat in New Quay Harbour area. (Table 13).

Table 13: Relative proportions of types of non-compliance with the Cardigan Bay Marine Codes

Water user activity (when not complying with the Cardigan Bay Marine Codes)	Number of encounters	Percentage of non-compliance
N1: Too fast, wake speed within 300m of dolphins	196	48%
N2: Erratic course to follow dolphins	213	52%

The incidence of non-compliance for different water users

Motor boats had the highest rate of non-compliance: in 33% of all encounters with a motorboat the water user did not follow the Cardigan Bay Marine Codes. (Table 14).

Table 14: 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)	27	85	32%
Motor boat	50	172	29%
Canoe/kayak/SUP	108	283	38%
Commercial fishing boat	19	62	31%
Sailing boat	19	71	27%
Visitor passenger boat	175	1299	13%
Jet-ski	0	0	0%
Other (RNLI & research)	11	16	69%
Total	**409**	**1988**	**21%**

Percentage of non-compliance during encounters by water user type by site

At Mwnt, all water users except sail, research and jet skis, were observed not complying with the Cardigan Bay Marine Codes.
95% of canoes and SUPs within 300 metres of a dolphin or group of animals did not follow the Cardigan Bay Marine Codes.
The RNLI on exercise had a non-compliance rate of 100%. The MPA Officer raised the issue with the RNLI to be more aware of animals in the water when on exercise in the area when the incidents took place.
At New Quay Bird's Rock, motor boats, Visitor Passenger Boats and Research boats were the water user types recorded for non-compliance.
At New Quay Harbour, all water user types, with the exception of jet skis, were recorded not following the Cardigan Bay Marine Codes. Canoes and SUPs at 51% and the RNLI at 50% had the highest non compliance rates.

		Motor boat	Speed boat (rib)	Commercial fishing boat	Sail boat	Visitor passenger boat	Canoe/ kayak/ SUP	Jet ski	research	(RNLI	Total
Mwnt	Number of non-compliant water users by type	4	3	2	0	2	19	0	0	2	32
	Total number of encounters by type	4	3	3	1	6	20	0	2	2	40
	Percentage non-compliance by type	100%	100%	66%	0	33%	95%	0	0	100 %	80%
New Quay	Number of non-compliant water users by type	2	0	0	0	3	0	0	6	0	11

Bird's Rock	Total number of encounters by type	3	0	0	1	38	0	0	6	0	48
	Percentage of non-compliance by type	66%	0	0	0	8%	0	0	100%	0	23%
New Quay Harbour	Number of non-compliant water users by type	44	24	17	19	170	89	0	0	3	366
	Total number of encounters by type	165	58	59	69	1368	174	0	1	6	1900
	Percentage of non-compliance by type	27%	41%	29%	27%	12%	51%	0%	0%	50%	19%

Table 15: Percentage of non-compliance during encounters by water user type by site

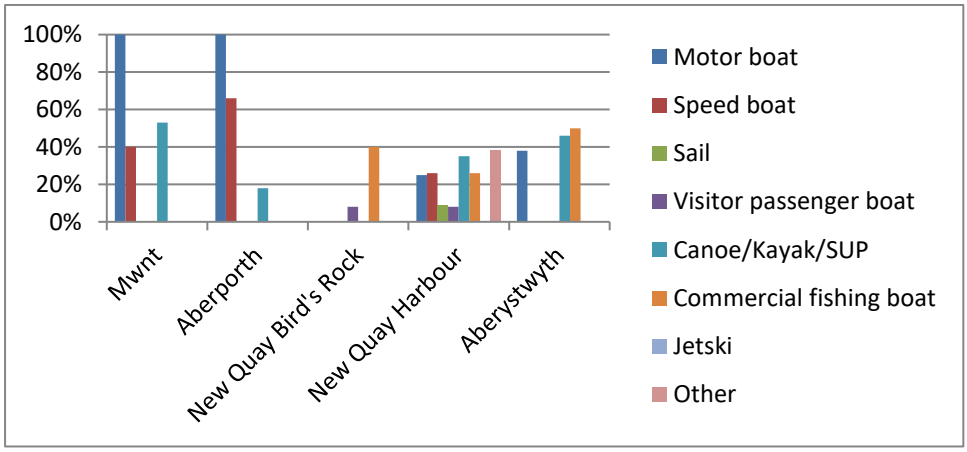

Figure 15: Percentage of non-compliance during encounters by water user type by site

Effects of water user encounters on bottlenose dolphin behaviour

How dolphins responded to positive and negative encounters with water users (whether they followed the relevant Cardigan Bay Marine Code) 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 but classed as negative responses.

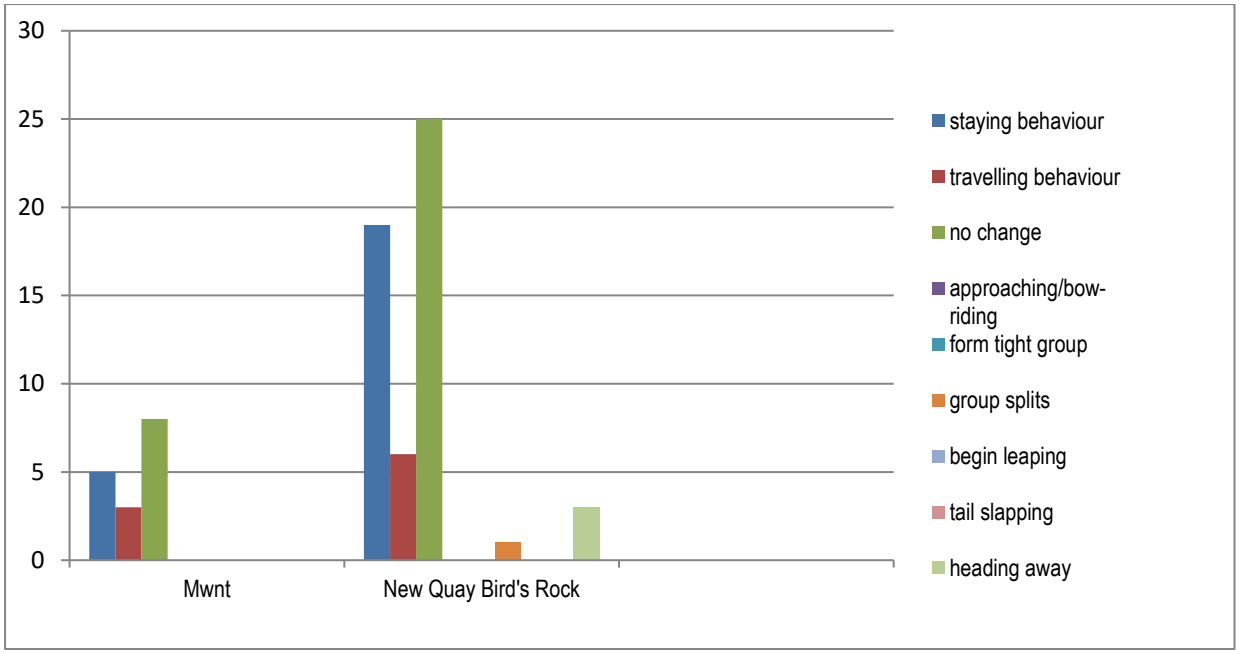

Figure 16: Dolphin behavioural responses to positive water user encounters (water users following the Cardigan Bay Marine Codes) at the Mwnt and New Quay Bird's Rock monitoring sites.

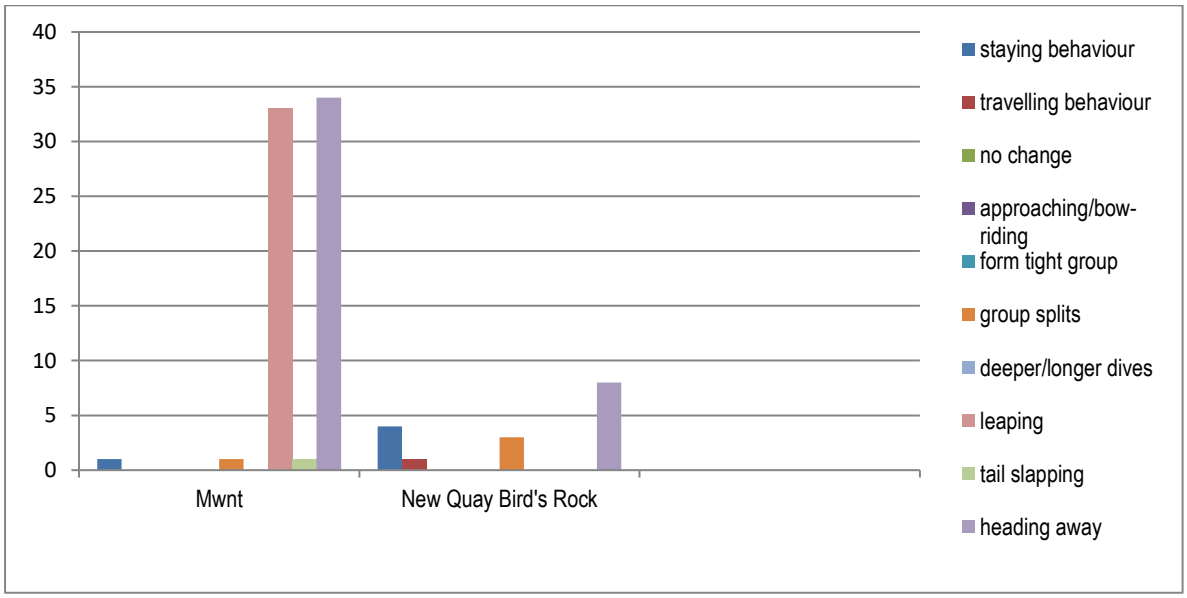

Figure 17: Dolphin behavioural responses to negative water user encounters (water users not following the Cardigan Bay Marine Codes) at the Mwnt and New Quay Bird's Rock monitoring sites.

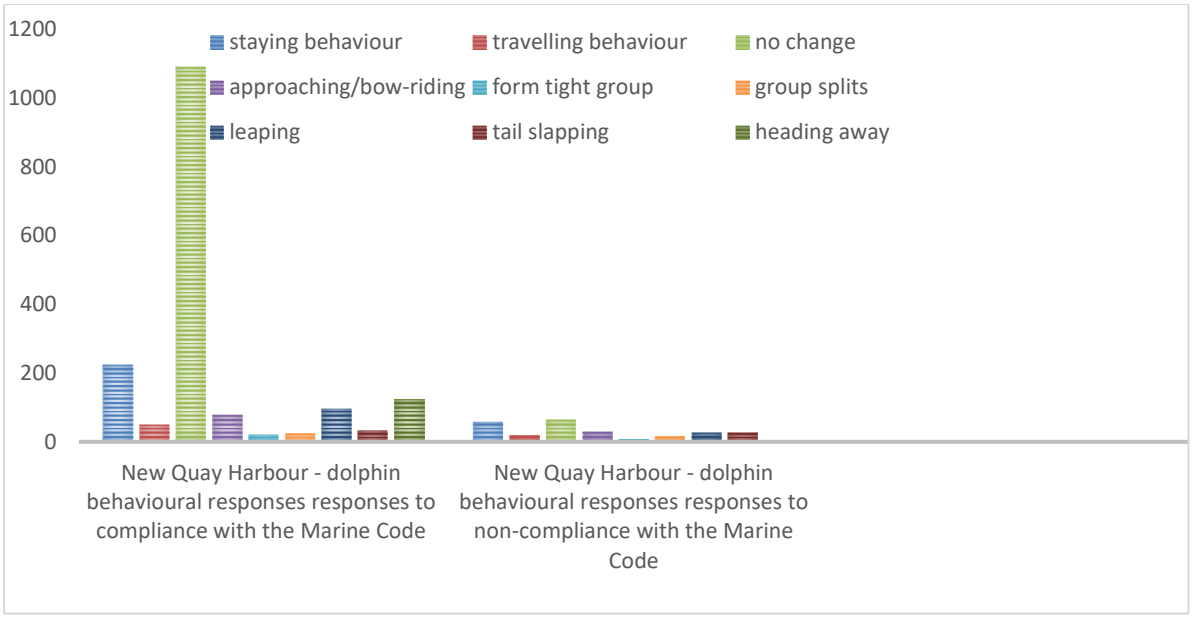

Figure 18: Dolphin behavioural responses to negative and positive water user encounters (water users following the Cardigan Bay Marine Codes) at the New Quay harbour monitoring site.

All sites showed that when the Cardigan Bay Marine Codes were followed, 'no change' was the most frequently recorded response (Figure 16).
During encounters where the water user did not comply with the Cardigan Bay Marine Codes, 'heading away' and 'began leaping' were the most frequently recorded responses at Mwnt. 'Heading away' was also the most frequently recorded response at Bird's Rock when the Cardigan Bay Marine Codes were not complied with.

At New Quay Harbour 'no change' was the most frequently recorded behaviour whether the Cardigan Bay Marine Codes were complied with by water users or not.
This suggests that although the data demonstrates that dolphins occupy the New Quay harbour areas less when the number of water users is greatest; bottlenose dolphin responses to water users encounters are similar whether the water user follows the Cardigan Bay Marine Codes, suggesting that animals may be becoming habituated to water user encounters in this area.
Dolphins within close proximity to water users are potentially at risk both physically and behaviourally from the impact of the interaction, and may lead to potential collisions or vessel strikes between water users and bottlenose dolphins in these areas.

Acknowledgements

Thank you to all the hundreds of people that have contributed to the Dolphin Watch data collection over the last twenty-nine years. More than 80 people contributed observations in 2023. Observers' names are listed below, with apologies for any errors or omissions.

Ceredigion County Council wish to say a sincere thank you to all of the Wildlife Trust of South and West Wales Living Sea's staff and volunteers based at the Cardigan Bay Marine Wildlife Centre for their support for this project, for the time spent training volunteers and their significant contribution to the data collection which makes this report possible.

Aline Denton, Ann Fletcher, Brian and Jane Jones, Carol Robinson, Dave Thomas, Geraint Jones, Gillian Benton, Gordon Orme, Greg Ellis, Hugh Griffiths, Jackie Biggs, Kate Smith, Les Higginbotham, Marion Carlisle, Melanie Heath, Nicky Chambers, Paul Taylor, Steve Potter & Marie duQuesnay
Abby Tannette, Mark Lokier, Cameron Mackenzie, Abigail Stephens, Adelaide Kennedy, Agnes Pautrel, Amy Griffiths, Andrea Kourra, Andy Dilworth, Andy Wise, Aslak Varda, Bridie Austin, Cam Molland, Cameron Mackenzie, Cameron Molland, Elise Skelding, Joe Wilkins, Chelsea Boden, Chelsea Taylor, Chloe Mayne, Clive Hoskins, Cody Ayre Higgins, Grace Cane, Daisy Barnes, David Martin, Deni Wither, Elise Skelding, Ellie Allison, Grace Bint, Grace Balkin, Ellie Jackson, Elise Skelding, Jimmy Medici, Ellie Quin, Emma Holden, Ffion Lloyd, Francesca Pinagli, Myron Westgarth, Gerri Murphy, Grace Balchin, Grace Bint, Grace Cane, Andrea Kourra, Grace Macmillan, Graham Blunden, Heidi Newport, Holly Hamilton, Imogen Gribble, Jackie Hill, Mark Lokier, Dave Martin, Jake Morris, Daisy Barnes, Jane Blank, Juliette Rebow, Joshua Johnson, Jem Randalls, Jane Blank, Jem Randler, Jane Blank, Jem Randles, Jess Lawes, Steve Hyam, Jayne Foxley, Janet Daniels, Luisa Berry, Jeremy Randles, Jane Blank, Jeremy Scott, Nichol Jones, Janet Damet, Rosie Wemsley, Jess Lawes, Jimmy Medici, Joe Wilkins, Joe Williams, Jon Radcliffe, Maddy de Marquis, Joe Willins, Jake Morris, Rosie Hemsley, Joshua Johnson, Laura Evans, Lydia Williams, Lauren Williams, Lauren McMillan-Shaw, Lynda & Clive Hoskins, Madeline De Marchis, Maggie Price, Marie Boyere, Myron Westgarth, Nichol Jones, Olivia Hilton, Orla Ambrose, Paul Wilkinson, Poppy Lane, Rebecca Roslyn, Stephen Hyam, Rhiannon Tate, Rhion Hawkes, Rosie Hemsley, Rhiannon Tate, Sam Murphy, Sam Ryan, Samantha Murphy, Sarah Harraway, Sarah Wilkins, Sarah Williams, Stephen Hyam, Summer England, Stephen Hyam, Lynda and Clive Hoskins.

Appendix

Site use by harbour porpoise and Atlantic grey seal

Atlantic grey seal

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Borth
Number of seals recorded	25	1	301	242	32

Harbour porpoise

	Mwnt	Aberporth	New Quay Bird's Rock	New Quay Harbour	Borth
Number of harbour porpoise recorded	24	0	6	69	0