



## Pen Llŷn a'r Sarnau Special Area of Conservation

Dolphin Watch

Data analysis 2016-17

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Adroddiad wedi darparu ar gyfer ACA Pen Llŷn a'r Sarnau / A report prepared for the Pen Llŷn a'r Sarnau SAC



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## 1.0 INTRODUCTION

Dolphin Watch has been running in Ceredigion since 1994, and in 2016 the scheme was brought to Pen Llŷn a’r Sarnau SAC. In 2016, Dolphin Watch was piloted in Abersoch along a popular stretch of the Wales coast path (Figure 1), and is now in its second year of running. The need for Dolphin Watch in this area was highlighted by the community, who explained their concerns over increases in powered craft activity and its potential adverse effect on the local bottlenose dolphin population. Bottlenose dolphins are also a feature of the Pen Llŷn a’r Sarnau Special Area of Conservation (SAC). The aim of Dolphin Watch is to obtain further information on cetacean site use and boating traffic that would help guide future management. The study was designed to encourage local people to take part and it was hoped that in doing so it would raise public awareness of the issue of boat disturbance. Dolphin Watch in Pen Llŷn a’r Sarnau SAC is led by the Pen Llŷn a’r Sarnau SAC Officer.



***Figure 1: View point from the survey site in Abersoch, overlooking the St. Tudwals islands***

The principle aims of the project are:

- a) To monitor the presence of bottlenose dolphins at a chosen pilot site along the coast; and
- b) To gather data on boat traffic to aid the management of the Pen Llŷn a'r Sarnau SAC.

Other aims and outcomes of the project include:

- To improve understanding of bottlenose dolphin site usage
- To monitor trends in dolphin occurrence
- To monitor levels of boat traffic
- To Investigate interactions between bottlenose dolphins and boats
- To assess the effectiveness of the Gwynedd Marine Code
- To increase public awareness and appreciation of the marine wildlife in Pen Llŷn a'r Sarnau SAC

## 2.0 METHODS

In 2016, a site in Abersoch was chosen as the location to pilot Dolphin Watch in Pen Llŷn a'r Sarnau. Abersoch is located on the south coast of the Llŷn Peninsular. In March 2016, a report was produced outlining the location, the methodology and purpose of Dolphin Watch. A full risk assessment was also produced for the Abersoch site.

The methods for the Pen Llŷn a'r Sarnau Dolphin Watch scheme follows the same methodology as the Ceredigion Dolphin Watch that has been running since 1994.

Bottlenose dolphin observations were recorded at Abersoch from July to September in 2016 and 2017. The data was collected by teams of volunteers, a number of which had taken part in similar studies. All volunteers were invited to attend a training day at Abersoch Golf Club, followed by a visit to the watch site so that volunteers were familiar with the site and to ensure they were appropriately educated before commencing the study (Figures 2 and 3).





**Figure 2: Volunteers attend a training day held at Abersoch Golf Club before the survey period commences**



**Figure 3: Volunteers practice their observations at the site during training**

## 2.1 Habitat use by bottlenose dolphins

Three watches of two hours each were scheduled daily at each site beginning at 11:00, 13:00 and 15:00. The two hour watches were divided into eight 15 minute intervals. At the beginning of each interval the start time and information on environmental conditions (general weather, visibility, wind direction and sea state) were recorded on the data sheet.

This information was later used to extract a subset of observations made in good conditions (visibility at least 2km, sea state 3 or less) for which sighting rates of bottlenose dolphins were calculated.

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 (school) was considered to be animals of the same species in close proximity (within approximately 10 body lengths of another animal) and behaving in a similar manner. Abbreviated codes were written against each group location giving species name, group size, number of small calves and activity state at the beginning of the 15 minute interval or when first seen.

From these systematic counts sightings rates for bottlenose dolphins were derived. Two indices were used to make comparisons with previous field seasons:

- a) the proportion of two hour watches in which dolphins were recorded; and
- b) the average count of dolphins in a 15 minute interval per two hour watch.

For watches in which dolphins were recorded at least once a further three 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. By using these maximum counts the total number of dolphins seen in each two hours was not estimated, as we could not determine this from the data collected.
- d) **Occurrence of young bottlenose dolphins** (juveniles or calves). The proportion of watches in which small calves were seen was examined. Bottlenose dolphins were recorded as young animals if they were distinctly paler than the accompanying adult and approximately two-thirds of the adult length or less. Calves are identifiable by their smaller size and foetal folds may still be visible.
- e) **Site occupancy** – to examine the amount of time that dolphins occupy sites, the average number of 15 minute intervals with bottlenose dolphins present per watch was calculated, for watches in which dolphins were recorded at least once.

Observers are asked to assign an activity code to each dolphin group at the beginning of every 15 minute interval or when first sighted. This allowed us to describe the relative frequency with which different dolphin behaviours occurred. Although some observers also

recorded changes in activity during the 15 minute intervals, only the first activity is used as this was considered to be a systematic sample of dolphin activity state at each site.

## 2.2 Encounters between bottlenose dolphins and boats

Additional information was recorded on the data sheet when boats came within 300m of a group of dolphins; this is classed as a “boat encounter”. Only one boat encounter in each 15 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 encounter the observer recorded the type of boat that was closest to a dolphin, the total number of boats within 300m of the group of dolphins, whether the boat complied with the Gwynedd Marine Code, and recorded all the dolphin behaviours that were observed. Boat operators were considered to have complied with the Gwynedd Marine Code 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, 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); or they attempted to touch, feed or swim with dolphins (N3). Finally, a special 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 which they must fly when they are invoking their licence.

Whether following the Gwynedd Marine Code affected how dolphins responded to encounters with boats was also examined. Observers recorded different dolphin responses during encounters. In the analyses some behaviours were grouped together, for example 'heading away fast swimming' and 'heading away steadily' (HS or HF), were grouped as a negative response (i.e. a change in dolphin behaviour to move away from a boat). Similarly, 'approaching' (AP), 'bow-riding' (B or BR) and 'following boat' were grouped as a positive response. Leaping or begin leaping (L or BL), tail-slap (TS) and grouping (GS or GF) were examined as separate categories'.



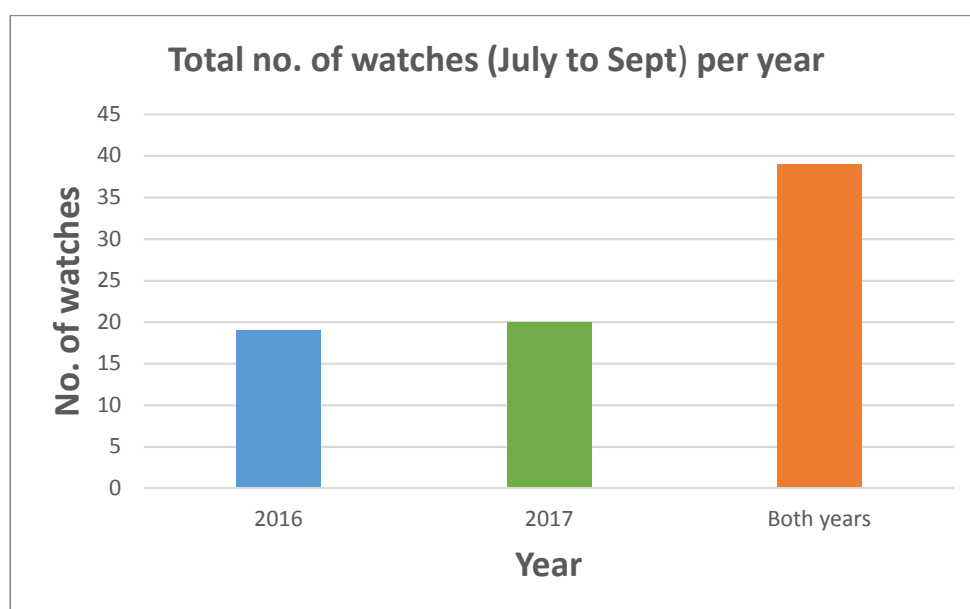
## 3.0 RESULTS

### 3.1 Observer Effort

During 2016 and 2017 a total of 39 watches and 78 hours of recording effort were carried out between July and September. Table 1 and figure 4 show that in 2017 there was a small increase in watches (19 to 20) and hours of effort (38 to 40) compared to 2016.

**Table 1: Watch totals for July to the end of September 2016-17**

	Abersoch (July to Sept)
No. of watches in 2016	19
No. of watches in 2017	20
<b>No. of watches June-Sept both years</b>	<b>39</b>
Hours of effort 2016	38
Hours of effort 2017	40
<b>Hours of effort June-Sept both years</b>	<b>78</b>



**Figure 4: Total number of watches at Abersoch per year**

### 3.2 Survey conditions

In 2016 and 2017, the majority of two hour watches in each year were completed in good conditions (Beaufort sea state 3 or less) for observing marine mammals (63% in 2016 and 85% in 2017).

**Table 2: Number of watches conducted in good conditions**

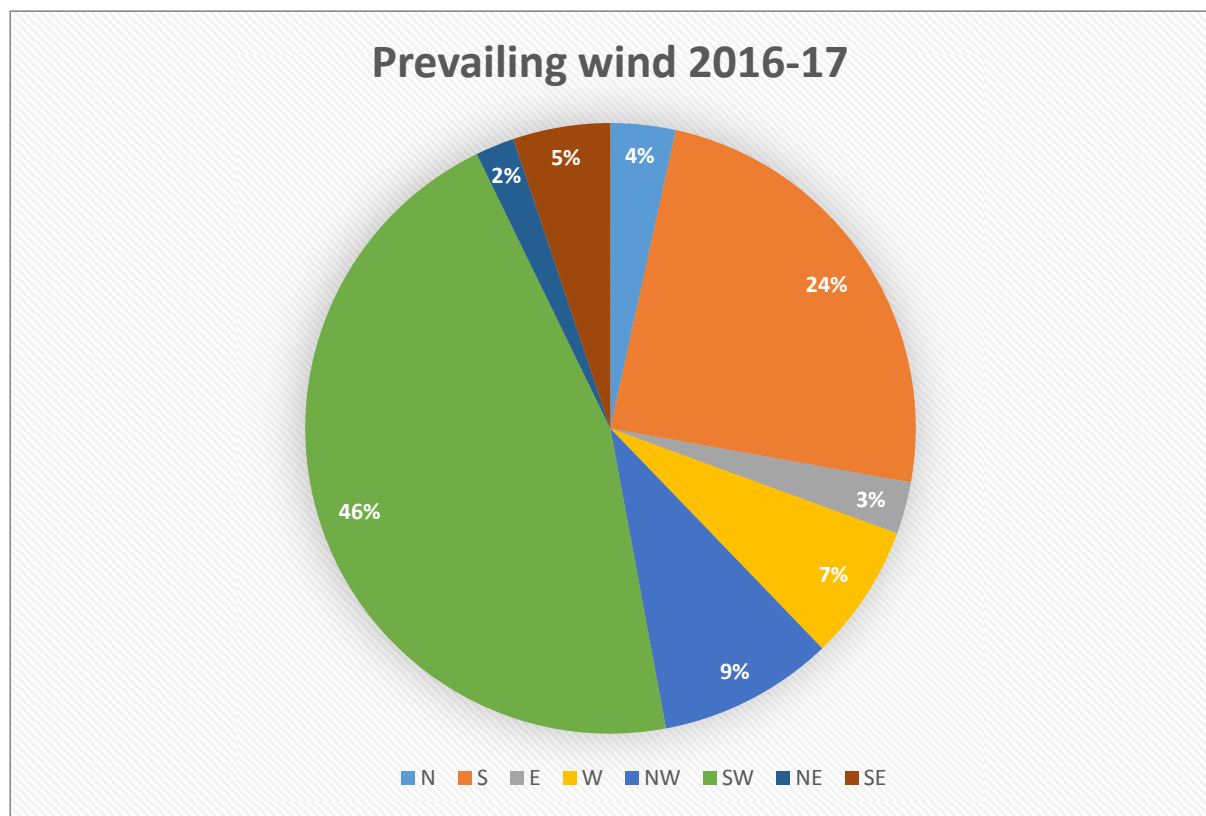
Year	Number of watches in good conditions	% of watches in good conditions
<b>2016</b>	12	63%
<b>2017</b>	17	85%

The median recorded sea state for both years was sea state 2 (wavelets; glassy crests do not break).

The most frequently recorded wind direction during watches was south west for both years (Figure 5).

**Table 3: Prevailing wind during watches**

	2016	2017	Both years
<b>Abersoch</b>	SW	SW	SW



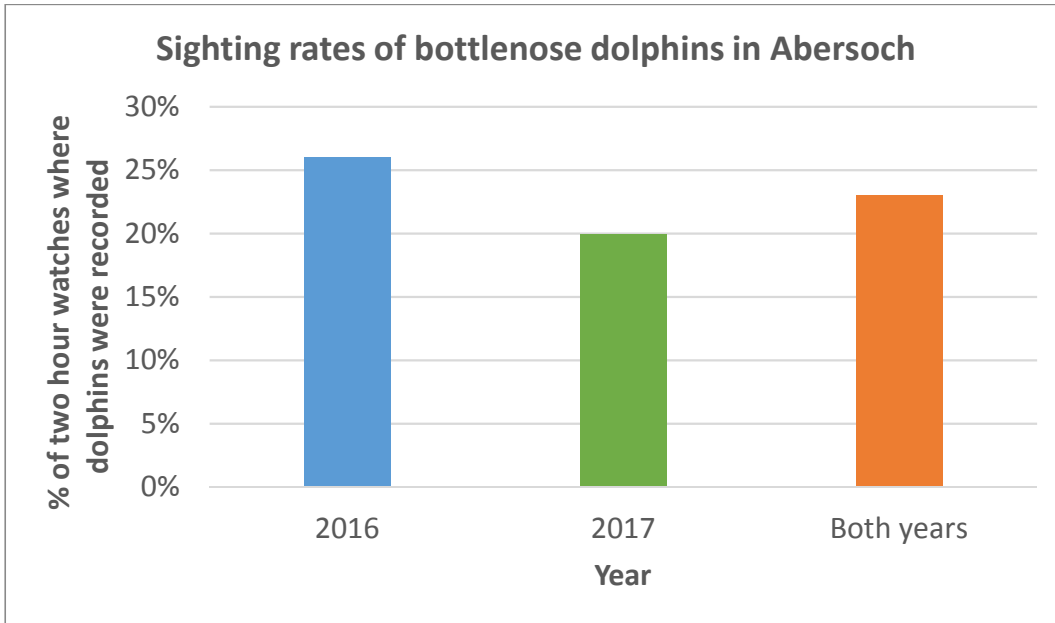
**Figure 5: Prevailing wind - Frequency of wind direction recorded during all surveys 2016-2017**

### 3.3 Sightings

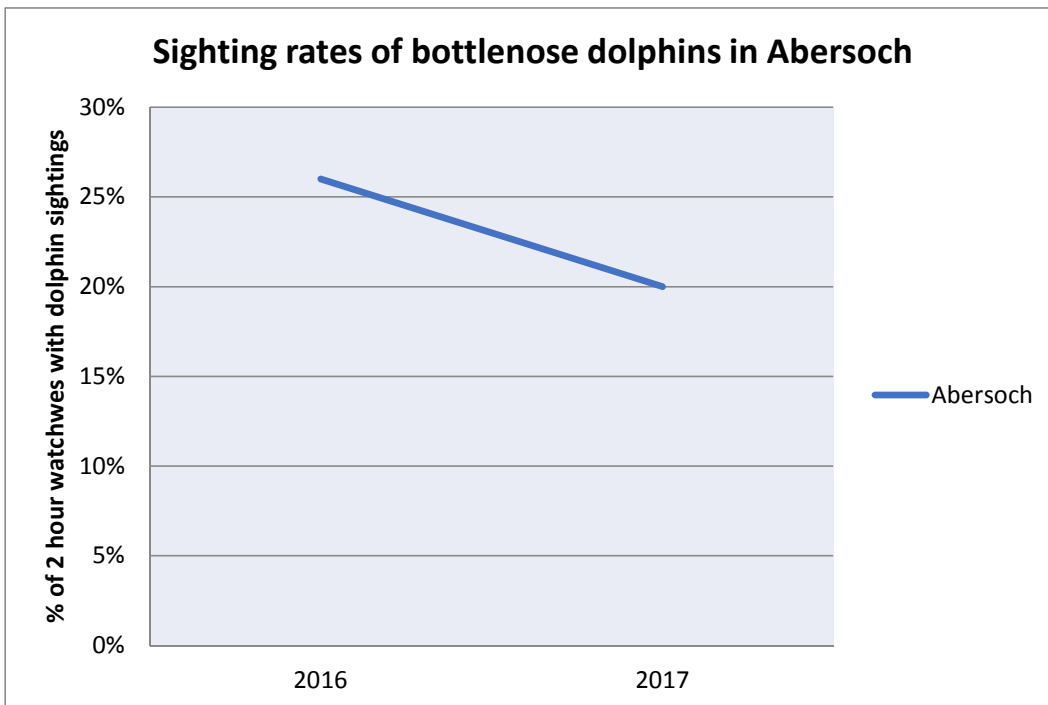
Sightings rates for bottlenose dolphins were calculated from 39 watches: 19 in 2016 and 20 in 2017. The year with the highest sighting rates was 2016 (26%). 2017 saw 4 out of 20 watches with sightings (20%). This demonstrates a decrease in the number of sightings of bottlenose dolphins from 2016 to 2017 (Table 4, Figure 6 and Figure7).

**Table 4: Sighting rates of bottlenose dolphins**

	Abersoch
<b>2016</b>	26%
<b>2017</b>	20%
<b>Both years</b>	23%



**Figure 6: Sighting rates - Percentage of two hour watches in which bottlenose dolphins were recorded**



**Figure 7: Sighting rates - Percentage of two hour watches in which bottlenose dolphins were recorded 2016-2017**



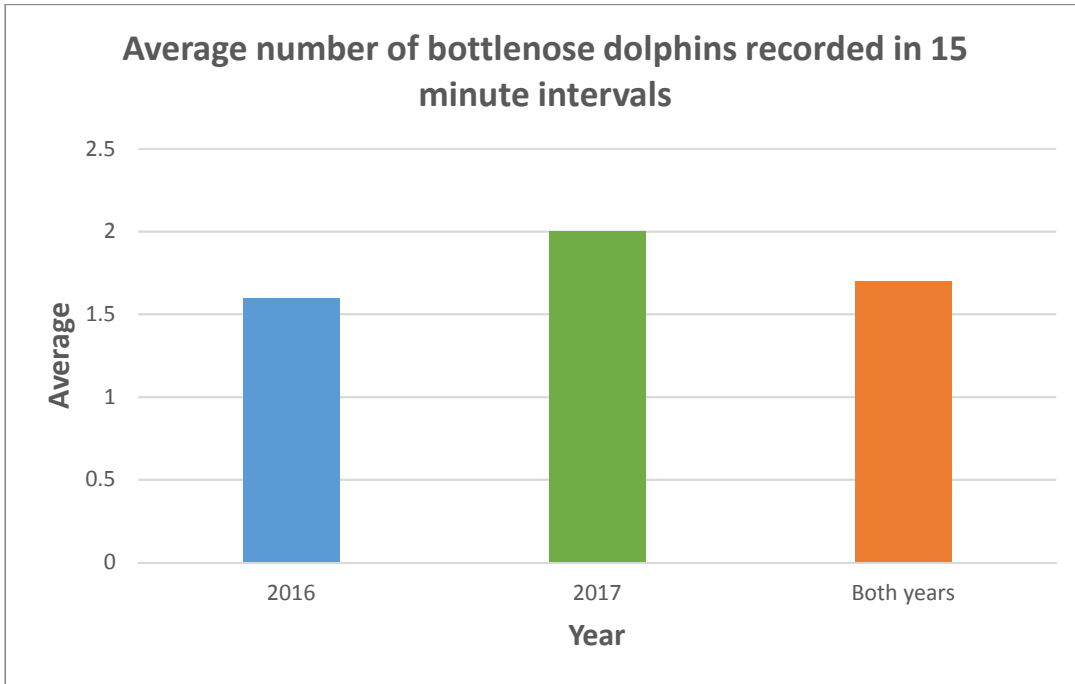
**Figure 8: Dolphins sighted during a survey**

### **3.4 Group Size**

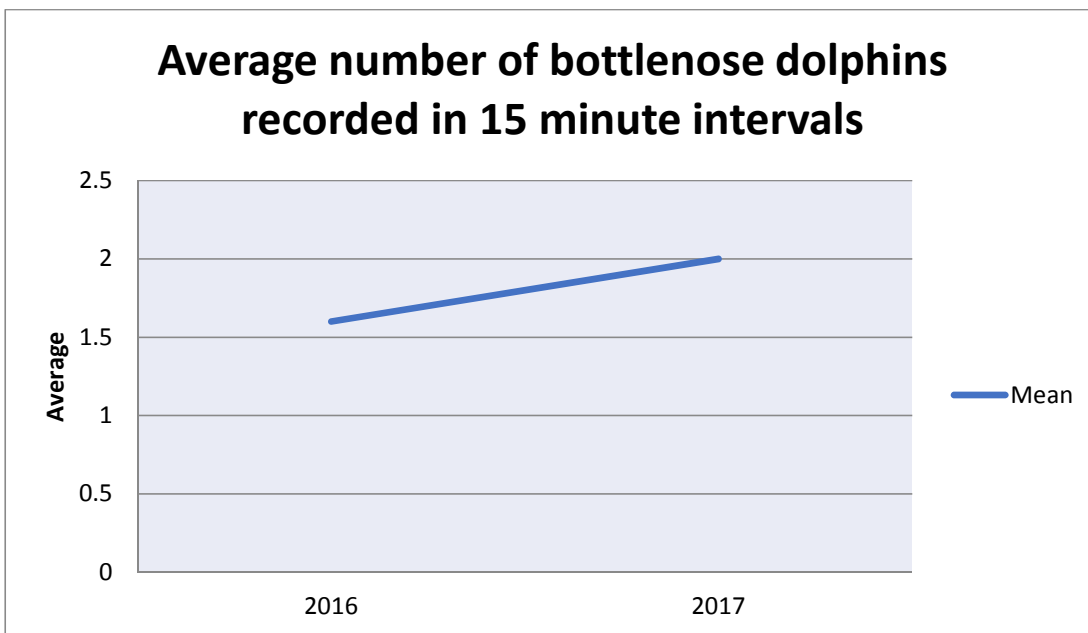
When bottlenose dolphins were spotted the average number observed was similar between 2016 and 2017 (Table 5, Figure 9 and Figure 10). The highest numbers were observed in 2017 with an average of 2 compared to an average of 1.6 in 2016. This shows a small increase in the average number of bottlenose dolphins observed in a 15 minute interval when dolphins were sighted.

**Table 5: Average number of bottlenose dolphins observed in a 15 minute interval, when dolphins were sighted**

<b>Year</b>	<b>Average</b>
<b>2016</b>	1.6
<b>2017</b>	2
<b>Both years</b>	1.7



**Figure 9: Average number of bottlenose dolphins observed in 15 minutes (when dolphins were sighted)**



**Figure 10: Average number of bottlenose dolphins per 15 minutes per two hour watch (when dolphins were sighted)**



The maximum dolphin group size observed in each year was investigated. Table 6 shows that the maximum group size of dolphins observed was 3 for both years.

**Table 6: Maximum recorded group size in each year**

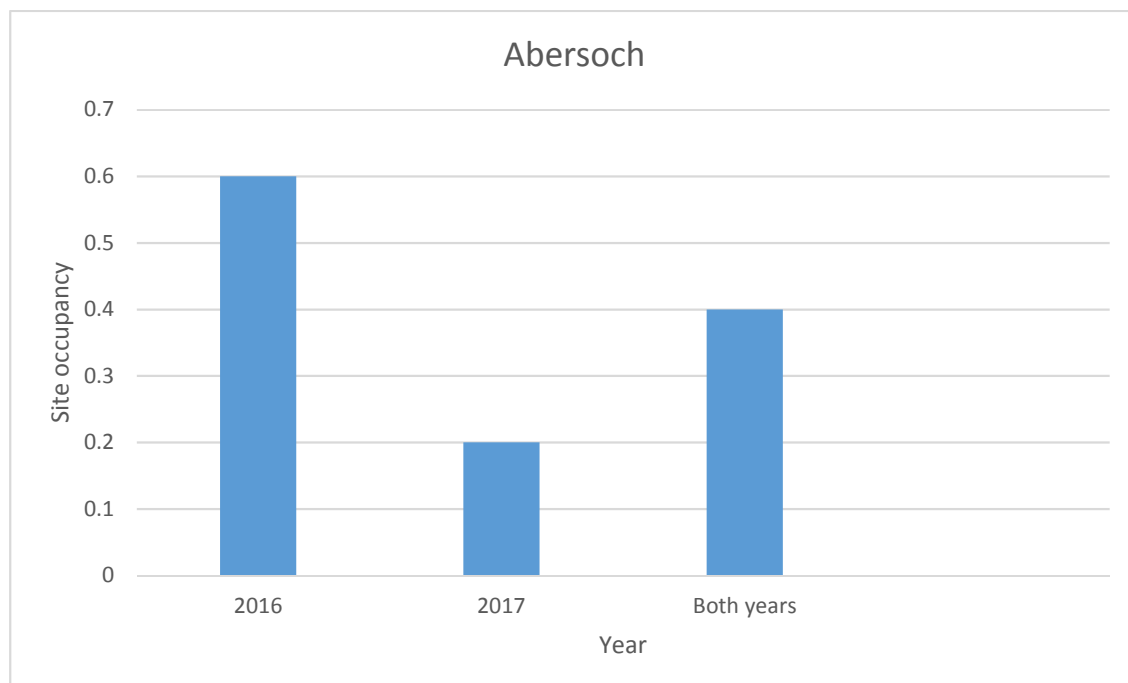
	Abersoch
<b>2016</b>	3
<b>2017</b>	3
<b>Both years</b>	3

### 3.5 Site Occupancy

Site occupancy is defined as the amount of time that bottlenose dolphins were present at the site. It is measured as the average number of 15 minute intervals that dolphins were recorded, per two hour watch. 2016 had the highest occupancy rates, with a site occupancy of 0.6 compared to 0.2 in 2017 (Table 7 and figure 11).

**Table 7: Site occupancy**

	Abersoch
<b>2016</b>	0.6
<b>2017</b>	0.2
<b>Both years</b>	0.4



**Figure 11: Site occupancy (average number of intervals per watch that dolphins were present)**

### 3.6 Sightings of young bottlenose dolphins

No sightings of young bottlenose dolphins were recorded in 2016 or 2017.

### 3.7 Levels of Boat traffic

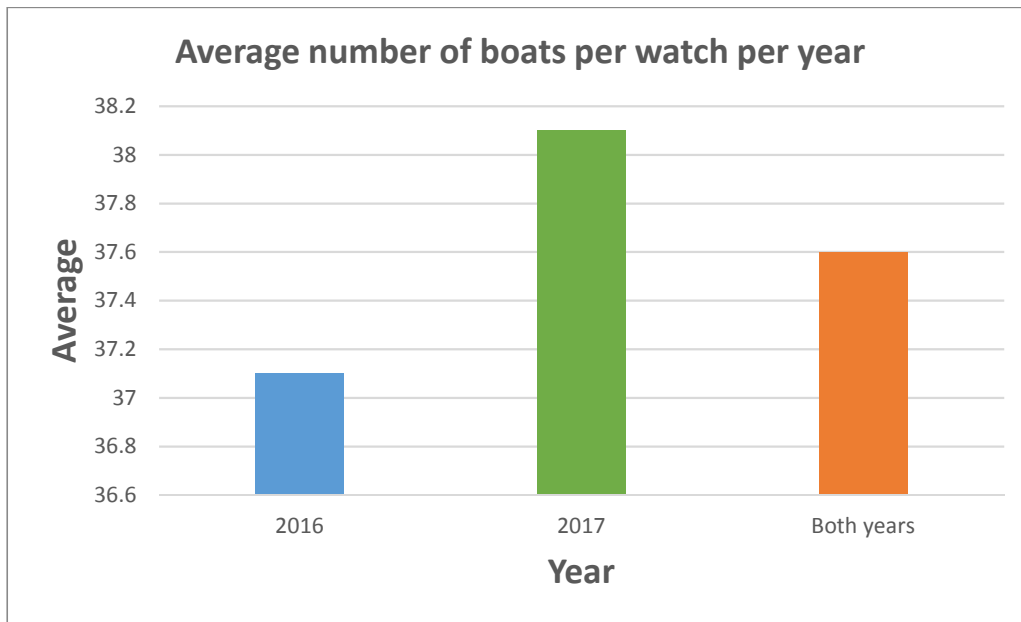
Levels of boat traffic were recorded during every watch using tally counts of different boat types. Average boat counts are compared between years (Table 8 and Figure 13). Both years were extremely busy with boat traffic, but 2017 had a marginally larger amount of average boat traffic per watch (38.1) compared to 2016 (37.1). Across both years, the average number of boats was 37.6 per watch. Recorded boat traffic included motor boats, speedboats, water-skiers, sailing boats, commercial fishing boats (Figure 12), visitor passenger boats, canoe/kayak/paddle-boarders (Figure 15) and jet-skis.



*Figure 12: A commercial fishing boat observed during a survey*

*Table 8: Average boat counts per watch for each year*

	<b>Average</b>
<b>2016</b>	37.1
<b>2017</b>	38.1
<b>Both years</b>	<b>37.6</b>

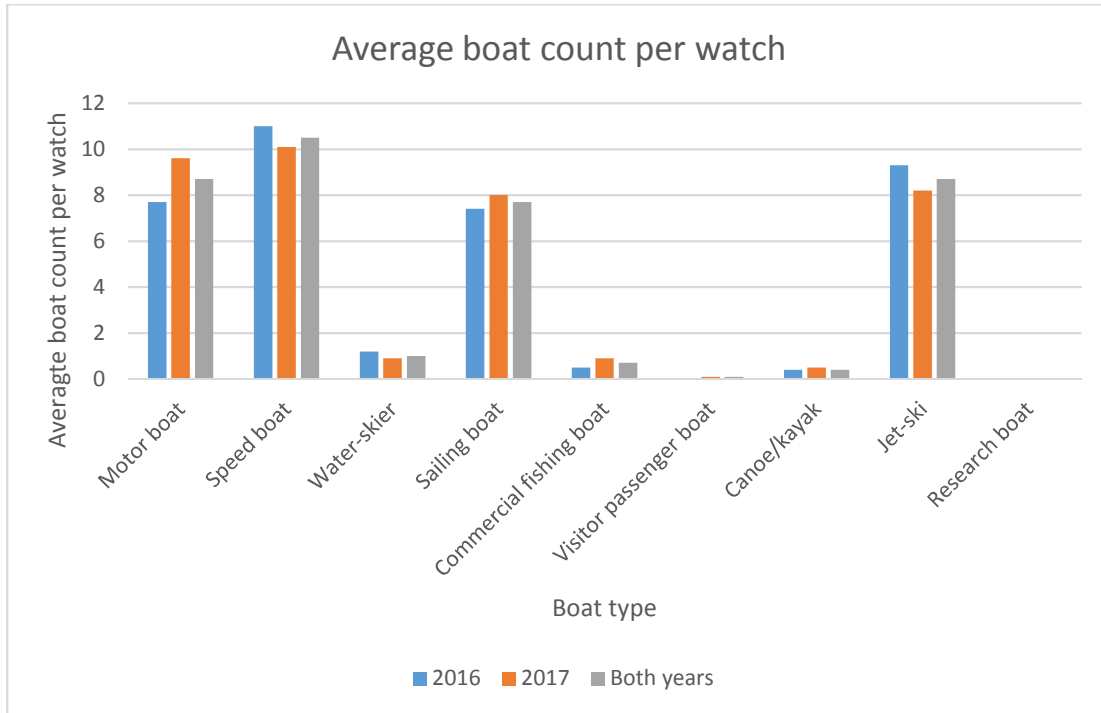


**Figure 13: Average boat counts per watch per year**

The most frequently recorded boat type were speedboats for both years (Table 9 and Figure 14), followed by jet skis and motor boats. There was a decrease in the average number of jet skis from 2016 to 2017, whereas the average number of motor boats and sailing boats increased between 2016 and 2017. The average number of water-skiers, commercial fishing boats, and canoes/kayaks remained relatively constant. No cetacean research boats were observed in 2016 or 2017.

**Table 9: Average counts of different boat types in 2016 and 2017**

	Motor boat	Speed boat	Water-skier	Sailing boat	Commercial fishing boat	Visitor passenger boat	Canoe/kayak	Jet-ski	Research boat
<b>2016</b>	7.7	11	1.2	7.4	0.5	0.0	0.4	9.3	0
<b>2017</b>	9.6	10.1	0.9	8.0	0.9	0.1	0.5	8.2	0
<b>Both years</b>	8.7	10.5	1	7.7	0.7	0.1	0.4	8.7	0



**Figure 14: Annual average count of different boat types for 2016 and 2017**



**Figure 15: Paddle-boarder**

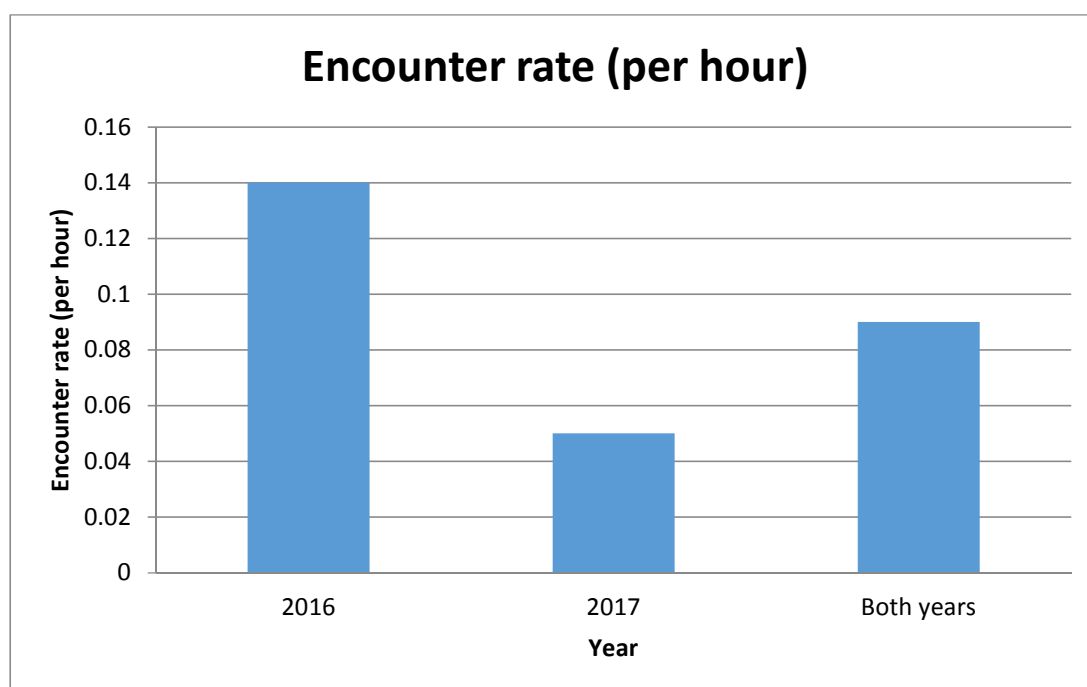
### 3.8 Encounters between dolphins and boats

During dolphin watch surveys a boat encounter occurs when a vessel approaches within 300m of a dolphin or a group of dolphins.

A total of 7 encounters between dolphins and sea going vessels were recorded between 2016 and 2017 with the highest number of encounters, 5, recorded in 2016, compared to 2 in 2017 (Table 10 and Figure 16).

**Table 10: Encounter rate between dolphins and boats (average number per hour) for each year**

	Number of encounters	Encounter rate (per hour)
2016	5	0.14
2017	2	0.05
Both years	7	0.09



**Figure 16: Encounter rate between dolphins and boats (average number per hour) for each year**

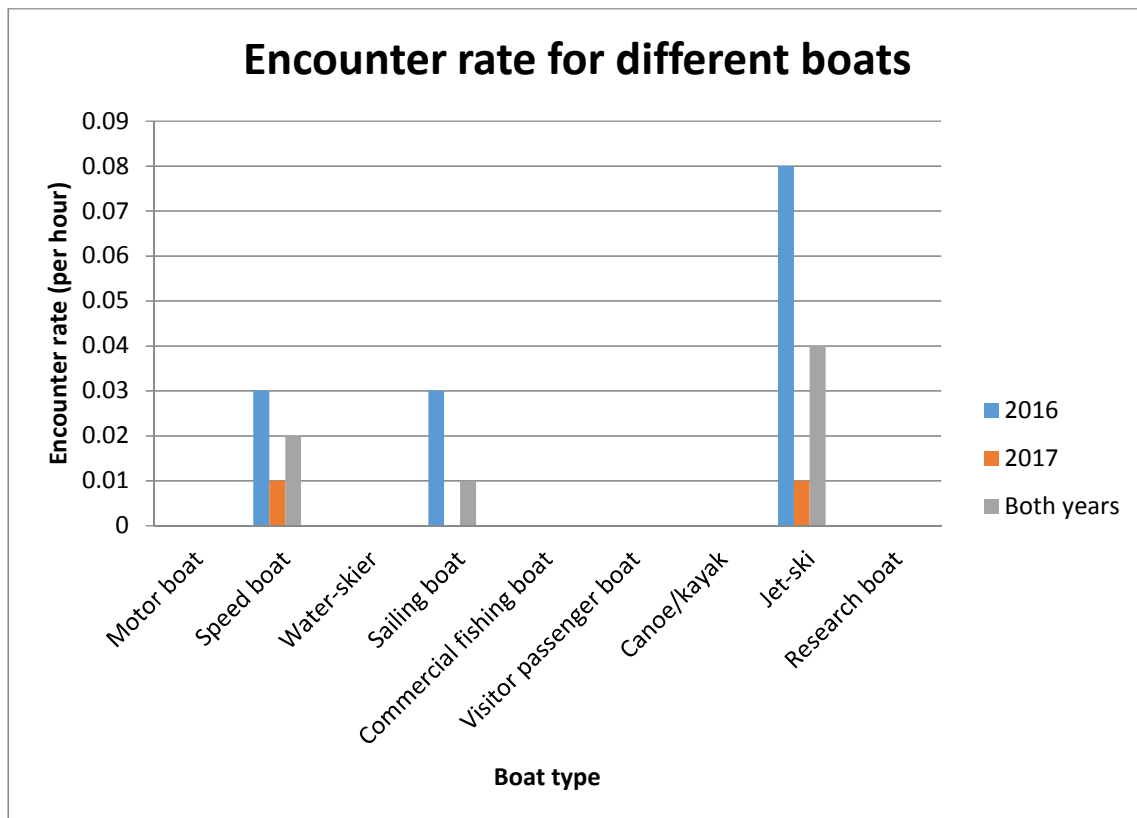
The different types of boats involved in encounters with bottlenose dolphins were examined for each year (Table 11 and Figure 17).

Encounters with jet-skis were the most frequently recorded in 2016 (3) followed by speedboats (1) and sailing boats (1). In 2017, there was one encounter between dolphins and a speedboat, and one with a jet ski. This shows there have been encounters with jet-skis and speedboats in both years, which may be due to the fact that jet-skis and speed boats were the most frequently counted boats on average between 2016 and 2017. There were no encounters between dolphins and any other sea vessels.



**Table 11: Encounter rate (per hour) for different boat types**

	Motor boat	Speed boat	Water-skier	Sailing boat	Commercial fishing boat	Visitor passenger boat	Canoe/kayak	Jet-ski	Research boat
<b>2016</b>	0	0.03	0	0.03	0	0	0	0.08	0
<b>2017</b>	0	0.01	0	0	0	0	0	0.01	0
<b>Both years</b>	0	0.02	0	0.01	0	0	0	0.04	0



**Figure 17: Encounter rates for different boat types**

## 4.0 COMPLIANCE WITH THE GWYNEDD MARINE CODE BY BOAT USERS DURING ENCOUNTERS WITH DOLPHINS

### 4.1 Proportion of compliance/non compliance

There were seven recorded boat encounters with dolphins where the observer noted the boating activity in relation to the Gwynedd Marine Code (Table 12) across both years. The Gwynedd Marine Code is a set of guidelines given to boat users and is promoted widely in the area (Figure 18). Across both years, boat users followed the Gwynedd Marine Code in 28% of the encounters with dolphins (20% in 2016 and 50% in 2017). There were 5 encounters recorded between 2016 and 2017 where the boat users did not appear to follow the Gwynedd Marine Code, compared to two where compliance with the Gwynedd Marine Code was observed.

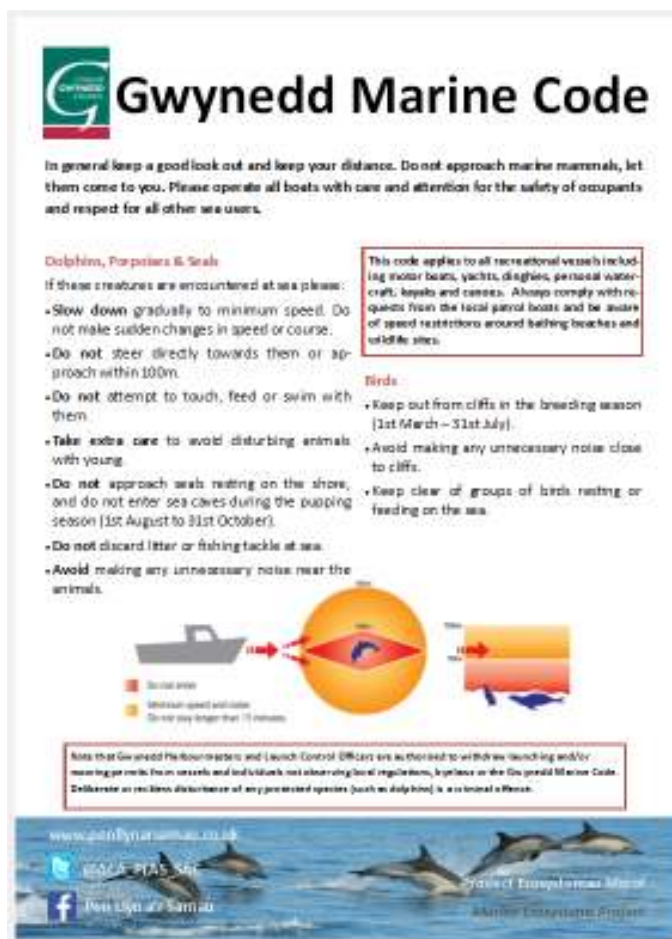


Figure 18: The Gwynedd Marine Code and sticker

**Table 12: Percentage compliance with the Gwynedd Marine Code during dolphin encounters**

	2016	2017	Both years
<b>Number of boat encounters</b>	5	2	7
<b>Number of encounters where the boat followed the Gwynedd Marine Code</b>	1	1	2
<b>% compliance with the Gwynedd Marine Code</b>	20%	50%	28%
<b>Number of encounters where the boat did not follow the Gwynedd Marine Code</b>	4	1	5
<b>% non-compliance with the Gwynedd Marine Code</b>	80%	50%	71%

The percentage of non-compliance with the Gwynedd Marine Code (Table 12) shows that non-compliance appears to be most prevalent during 2016 (80%), although this may be due to the larger number of boat encounters. 2017 saw 50% of non-compliance with the Gwynedd Marine Code.

#### 4.2 Proportions of different types of non-compliance to Gwynedd Marine Code

All of the cases of non-compliance with the Gwynedd Marine Code involved boats manoeuvring erratically to either approach, avoid or follow the dolphins or boats travelling too fast within 300 metres of a group of dolphins (Table 13).

**Table 13: Percentage of type of non-compliance with code of conduct during dolphin encounters**

<b>Boat activity (during non-compliance)</b>	<b>Number of encounters</b>	<b>Percentage of non-compliance</b>
<b>N1: Too fast, wake speed within 300m of dolphins</b>	0 – 2016 0 – 2017	0 – 2016 0 – 2017
<b>N2: Erratic course to approach, avoid or follow dolphins</b>	4 – 2016 1 – 2017	100% - 2016 100% - 2017
<b>N3: Attempted to touch, feed or swim with dolphins</b>	0 – 2016 0 – 2017	0 – 2016 0 – 2017

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

Jet-skis had the highest levels of non-compliance with the Gwynedd Marine Code for both years (Table 14). Sailing boats and speedboats were also found to not comply with the Gwynedd Marine Code in the recorded encounters. The only vessel type to encounter dolphins and comply with the Gwynedd Marine Code was speedboats. Throughout both survey years there were very few encounters between boats and dolphins, although the majority of encounters that did occur led to non-compliance of the Gwynedd Marine Code.

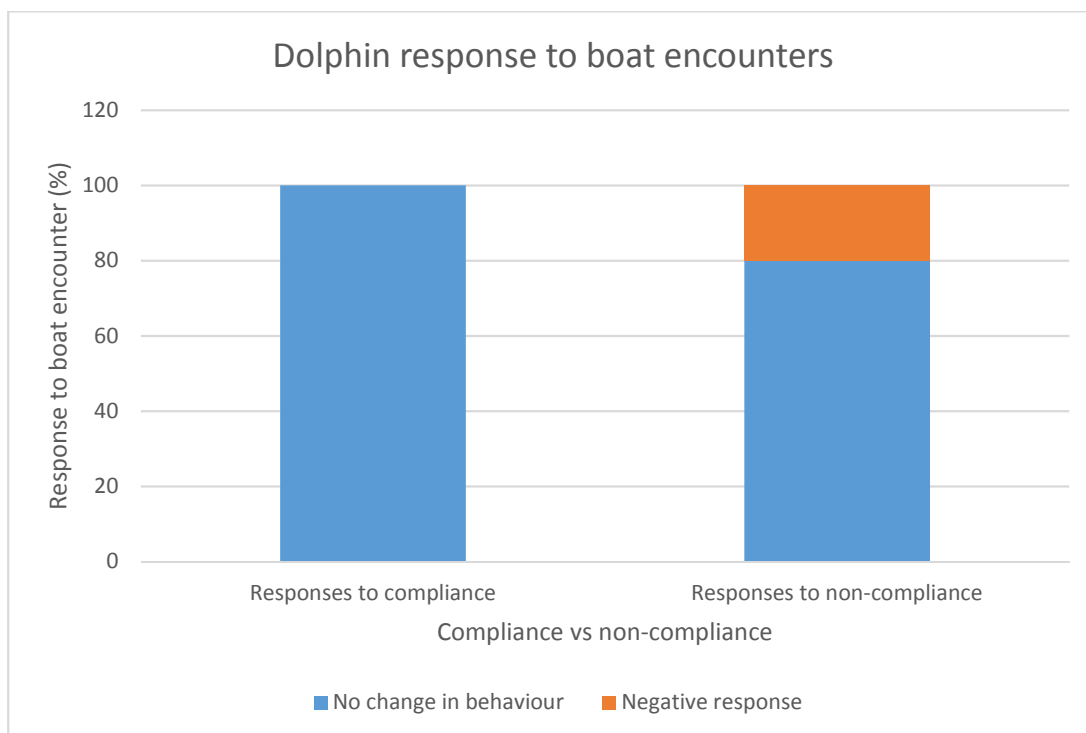
**Table 14: Percentage of non-compliance with Gwynedd Marine Code for different boat types**

	Number of non-compliant boats		Percentage of non-compliance to Gwynedd Marine Code (%)		Proportion of non-compliance
	2016	2017	2016	2017	Both years
<b>Motor boat (MB)</b>	-	-	-	-	-
<b>Speed boat (SB)</b>	-	-	-	-	-
<b>Water-skier (SS)</b>	-	-	-	-	-
<b>Sailing boat (SAIL)</b>	1	-	25%	-	20%
<b>Commercial fishing boat (CF)</b>	-	-	-	-	-
<b>Canoe/kayak/paddleboard (C)</b>	-	-	-	-	-
<b>Jet-ski (J)</b>	3	1	75%	100%	80%
<b>Research Vessel (R)</b>	-	-	-	-	-
<b>Other (O)</b>	-	-	-	-	-
<b>All boat types</b>	4	1	100%	100%	100%

### 4.4 Effects of boat encounters on bottlenose dolphin behaviour

The effect of boat encounters on bottlenose dolphin behaviour was not examined in detail, however, whether dolphins responded differently to boats when boat users followed the Gwynedd Marine Code was investigated.

The effect of non-compliance on dolphin behaviour is of concern, in particular any negative responses from boat encounters, for example dolphins changing their behaviours or moving away. Changes in group structure, tail slapping and leaping were examined as well as positive responses such as dolphins including bow riding or heading towards the boat. No change in dolphin behaviour observed during an encounter was also examined separately as this could be considered a neutral response and could indicate that the dolphins were unaffected by the encounter.



**Figure 19: Dolphin behavioural responses to boat encounters, comparison of percentage occurrence between compliance and non-compliance**

The data shows that there was no change in dolphin behaviour following encounters with boats that followed the Gwynedd Marine Code. It also showed that there was no change in behaviour 80% of the time following encounters with boats that did not follow the Gwynedd Marine Code. Dolphins demonstrated a negative response 20% of the time following encounters with boats that did not follow the Gwynedd Marine Code.

## 5.0 CONCLUSIONS

Dolphin Watch was piloted in Pen Llŷn a’r Sarnau SAC for the first time in 2016 and run for a second year in 2017.

In 2016, 19 watches were carried out, amounting to 38 hours of survey time and 152 survey intervals. In 2017, 20 watches were undertaken, amounting to 40 hours of survey time and 160 survey intervals. There was a slight increase in the amount of surveys undertaken in 2017 due to more volunteers taking part in the project.

Most of the surveys took place in good conditions, 63% in 2016 and 85% in 2017. The median recorded sea state was two and the most frequently recorded wind direction was southwest. As most surveys took place in good conditions we have confidence in the data collected.

A number of dolphins were spotted during the surveys. Volunteers recorded dolphins in 26% of watches in 2016 and 20% of watches in 2017. The average number of dolphins recorded in an interval (when they were spotted) was 1.6 for 2016 and 2 for 2017.



Suggesting that the average group size was slightly larger in 2017. No young dolphins were recorded during the surveys.

A large number of boats were recorded across both years, an average of 37.1 per watch in 2016 and 38.1 in 2017. Speedboats were the most frequently recorded both years followed by jet-skis, motorboats and sailboats. The number of speedboats and jet-skis decreased slightly from 2016 to 2017 whilst the number of motorboats and sailboats increased. The large number of vessels recorded demonstrates that the area is popular with many different types of vessels.

Seven encounters between dolphins and boats were recorded, five in 2016 and 2 in 2017. The boat types involved in the recorded encounters were speedboats, jet-skies and sailboats. In 2016, 80% did not comply with the Gwynedd Marine Code, this fell to 50% in 2017. This could indicate that boats users are becoming more aware of the Gwynedd Marine Code but the sample size is too small to say this conclusively. Across both years, 100% of recorded speedboat encounters complied with the Gwynedd Marine Code whereas 100% of recorded jet-ski and sail boat encounters did not comply with the Gwynedd Marine Code. 100% of non-compliance with the Gwynedd Marine Code was due to vessels following an erratic course to either approach, follow or avoid dolphins. When boats followed the Gwynedd Marine Code, dolphins didn't change their behaviour. When boats didn't follow the code it resulted in behaviour change 20% of the time.

As Dolphin Watch has only been running in Pen Llŷn a'r Sarnau for two years the data set is still small and it would be difficult to determine any changes or trends in the data. It is unclear at this time if there are more dolphins present at other times of the year at this site. It would be useful to survey at other times of year and at other sites to compare site occupation and boat encounters.

## 6.0 RECOMMENDATIONS FOR THE DOLPHIN WATCH PROJECT

**Listed below are a summary of the author's recommendations for the Dolphin Watch project data collection:**

- As the project is in its infancy, the scheme does not currently have a large pool of volunteers to participate in data collection. The project would benefit from an increase in additional participation and survey effort to ensure more time slots are filled with the potential to increase the survey period.
- To extend the surveys outside of the current core survey times (Friday – Sunday) to gather a wider pool of data.
- Explore the possibility of recording more than one boat encounter per 15 minutes.

- Ensure that consistent behaviour is recorded by updating the behaviour categories and providing a more detailed key, volunteers will be able to better understand the complex behaviour of dolphins. A new category could also facilitate unknown behaviours.
- Update the Gwynedd Marine Code categories to provide volunteers with a more detailed key to ensure consistent encounter information is recorded.
- Co-ordinators should check survey sheets on a regular basis to ensure consistency in data collection.
- In 2016 and 2017, Dolphin Watch has been trialled in Abersoch. It would be useful to roll out Dolphin Watch across the SAC in order to provide a larger pool of data, from which valuable comparisons can be made.
- It is recommended that at least two volunteers are be assigned to a two hour time slot to enable accurate counting of boats, and reduces the risk of missing dolphin sightings.

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