Mapping Recreational Anchoring, Mooring and Launching in Wales

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Casglwyd data ar gyfer y gweithgareddau didrwydded yma mewn un geo-gronfa ddata gyda'r pedwar dosbarth nodwedd canlynol: safleoedd Angori, Mwrio, Lansio a Dim Angori. Cynhaliwyd y casglu data sylfaenol hyd at 12 morfilltir o'r arfordir, a chrynhowyd data o'r ffynonellau data wedi'u digido canlynol:

- Ystâd y Goron (TCE)
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- Atlas Arfordirol Hwylio Hamdden Fersiwn 2 Cymdeithas Iotio Frenhinol (RYA) y DU yn cynnwys data System Adnabod Awtomatig (AIS)

Unwaith i'r data gael eu casglu, anfonwyd allbwn yn dangos lleoliad pob set ddata i nifer o randdeiliaid morol er mwyn ymgynghori. Gofynnwyd i'r ymgyngoreion am sylwadau ar leoliad a dwyster y defnydd ar gyfer yr holl bolygonau a phwyntiau sy'n gysylltiedig â'r setiau data Angori, Mwrio, Lansio a Dim Angori, yn ogystal â darparu gwybodaeth am gywirdeb data neu nodi unrhyw ddata ychwanegol. Cyfrifwyd ystod o fetrigau dwyster defnydd gan ddefnyddio data AIS, agosrwydd at leoliadau poblogaidd ac ymgynghori â rhanddeiliaid. Ymhellach, cyfrifwyd metrigau hyder hefyd i gyfrif am amrywioldeb disgwyliedig cywirdeb data a gasglwyd a'r wybodaeth a ddeilliodd o ymgynghori.

Mae cynhyrchu'r set ddata hon wedi tynnu sylw at gyfleoedd gwaith yn y dyfodol i fireinio'r set ddata gyfredol. Mae argymhellion yn cynnwys caniatáu cyfnod ymgysylltu rhanddeiliaid hirach a chanolbwyntio ymdrechion ar fisoedd yr haf, pan mae Angori, Mwrio a Lansio ar eu prysuraf. Byddai hyn yn caniatáu i ystod ehangach o ddefnyddwyr morol gyfranogi a chyfrannu i'r prosiect, a hynny yn ystod y cyfnod pan maen nhw'n ymgymryd â'r gweithgareddau dan sylw. Ymhellach, mae'n bosibl y byddai cynnwys cyfryngau cymdeithasol neu apiau symudol yn hwyluso'r prosesau casglu data a gellid defnyddio adnoddau arolwg newydd fel dronau i hysbysu allbynnau'r prosiect.

2. Executive Summary

Recreational vessel Anchoring, Mooring and Launching has the potential to damage benthic marine habitats. The impact and significance of these activities depend on a number of factors including the intensity of the activity and the sensitivity of underlying habitats. As such, defining the locations in which these activities occur is integral to determining the potential for interactions with sensitive features. This project has provided a robust dataset from a wide range of sources on the location and intensity of Anchoring, Mooring and Launching sites in Wales. This data set will provide an important resource for future management of these non-licensable marine activities.

Data for these non-licensable activities were collated in one geodatabase with the following four feature classes: Anchoring, Mooring, Launching and No Anchoring sites. Primary data collection was conducted for up to 12 nautical miles from the coast and data were collated from the following digitised data sources:

- The Crown Estate (TCE)
- Large scale hydrographic charts
- NRW datasets
- Defra (Lee, *in prep*)
- OceanWise: Marine Vector Charts (UK Hydrographic Office s-57)
- United Kingdom Hydrographic Office (UKHO)
- Marine Management Organisation (MMO)
- Boatlaunch website
- The RYA UK Coastal Atlas of Recreational Boating Version 2 including associated (Automatic Identification System (AIS) data)

Once data were collected, outputs showing the location of each dataset were sent to a range of marine stakeholders for consultation. Consultees were asked to comment on the location and intensity of use for all polygons and points associated with the Anchoring, Mooring, Launching and No anchoring datasets, as well as provide information on data accuracy or indicate any additional data. A range of intensity of use metrics were calculated using AIS data, the proximity to popular locations and consultation with stakeholders. Furthermore, confidence metrics were also calculated to account for the anticipated variability of collected data accuracy and the information derived from consultation.

The production of this dataset has highlighted opportunities for future work to refine this existing dataset. Recommendations include allowing for a longer stakeholder engagement period and focussing efforts on the summer months during which Mooring, Anchoring and Launching activity is at its greatest. This would allow a wider range of marine users to participate and contribute to the project, during the period when they are actively participating in these activities. Furthermore, the incorporation of social media or mobile apps could potentially be used to streamline the data collection processes and novel survey resources such as drones could be utilised to provide additional information to inform project outputs.

3.   Introduction

3.1. Project background

Recreational vessel Anchoring, Mooring and Launching has the potential to damage benthic marine habitats mainly through abrasion and penetration of benthic substrates (Griffiths et al., 2017). Mooring blocks can also cause a change in seabed habitat by altering flow and sediment transport dynamics. The impact and significance of this abrasion, penetration and change in habitat type depend on a number of factors including the size and type of anchors or moorings, the intensity of the activity, the sensitivity of habitats and whether the specific location of the activity overlaps with sensitive features. Where there is likely to be a significant impact and potential risk to the marine environment or conservation objectives of Marine Protected Areas (MPAs), further management options to help mitigate any impacts may be required. In this report, MPA refers to the marine components of SACs and SPAs, or MCZs.

This project provides robust datasets from a number of sources concerning the location and intensity of Anchoring, Mooring and Launching sites in Wales to provide a clearer and more detailed indication of the spatial pattern of these non-licensable activities. It will allow future work to identify the overlaps of this activity with sensitive habitats and help improve our understanding of potential future management requirements for these activities.

3.2. Project aims

This project has gathered information on the location and intensity of Anchoring, Mooring and Launching sites used recreationally within Welsh waters. As such, the project incorporated as many sources of information as possible, to ensure the accuracy of the data provided and build the most complete picture available at the time of report production. As such, data have been collected from a variety of digital sources described in full in Section 5, such as digital charts, Automatic Identification System (AIS) outputs and geodatabases from various data licence holders. Furthermore, data were collected via extensive input from stakeholders across Wales which were used to refine the locations of Anchoring, Mooring and Launching sites, their spatial resolution and estimates of usage. This stakeholder engagement increased understanding and confidence in the data, and helped inform consideration of the likely risk to the Welsh marine environment from these activities. This dataset is intended to inform any management decisions required relating to these non -licensable activities as well as identifying geographical areas where further investigation may be needed.

The projects aims, format and objectives were designed to be consistent, where possible, with work conducted by Lee (*in prep*) on the location of Anchoring and Mooring sites thought the UK MPA network, to allow this project to build on the results of Lee (*in prep*) but for the whole of Wales.

4.   Report structure

This report is divided into four main Sections:

- Data resources;
  - describes the data used and the source of each dataset.

- Stakeholder engagement;
  - describes the stakeholder process and how it generated data.

- Data processing
  - indicates the individual steps taken to produce each attribute with the data layers; and

- Conclusions
  - summarises the limitations of the data and suggestions for how to improve future datasets.

5.   Data resources

5.1. Moorings

To ensure full spatial coverage of Welsh waters a large variety of data sources were utilised to populate the recreational Moorings data. Data were gathered from a combination of digital datasets and the interpretation of aerial imagery and were refined via stakeholder consultation. Furthermore, estimation of usage was assigned to all Moorings within Wales by combining AIS data from the Royal Yachting Association (RYA) coastal atlas, stakeholder consultation and counts from aerial imagery.

The datasets were broken down in to spatial (describing the location of the data with a polygon) and temporal (describing the frequency of use) datasets as follows. All overlapping polygons from different sources were generally kept instead of trying to make one new 'master, to help identify the individual sources.

5.1.1.   Spatial datasets
  - Digital datasets
    - The Crown Estate (TCE)
      - (GIS_2018_2023_v1_DJH_MooringsSlipwaysMarinasPorts_Wales) available on request from TCE
    - Large scale Admiralty charts:
      - OceanWise Raster charts
    - NRW datasets (compiled by NRW staff)
      - Coastal_featuresV1_ellipse
      - Coastal_featuresV1_point
      - Coastal_featuresV1_region
      - MC_Harbour_Moorings_poly

- MC_Single_Moorings_ellipse
  - DEFRA
  - OceanWise: Marine Vector Charts (UK Hydrographic Office s-57 (UKHO))
  - MMO datasets
    - Recreational_Anchoring_Areas
    - Recreational_Mooring_Areas

- Aerial imagery datasets
  - Sri,
  - DigitalGlobe,
  - GeoEye,
  - Earthstar Geographics,
  - CNES/Airbus DS,
  - USDA,
  - USGS,
  - AeroGRID,
  - IGN,
  - GIS User Community
  - Google Earth

- Stakeholder consultation
  - NRW Staff
  - SAC officers
  - Harbour authorities
  - Local authorities
  - RYA
  - Public

5.1.2. Temporal datasets

- Digital datasets
  - The RYA UK Coastal Atlas of Recreational Boating Version 2

- Stakeholder consultation
  - NRW Staff
  - SAC officers
  - Harbour authorities
  - Local authorities
  - RYA

Throughout the UK, Mooring sites are closely regulated by harbour authorities, local councils, private landowners and The Crown Estate (TCE). Owing to the nature of regulation, data pertaining to the location of Moorings are well documented. Within Wales, the establishment of any Mooring requires permission from TCE for all areas of TCE-owned seabed; however, the placement and regulation of Moorings are often controlled by the local harbour or council authority. In the case of privately owned seabed Moorings, the TCE has no jurisdiction and does not keep records of the Moorings in that area. In

addition, the TCE dataset cannot account for illegal Moorings or the changing number of Moorings within a licenced area.

Data for Welsh waters was supplied by TCE for this project. Some records in the TCE data were omitted from this study due to concerns over accuracy, however, a total of 69 individual records were used. Two key areas omitted from TCE data were the Menai Strait and two Sections in Milford Haven, which were removed as a large area of the seabed was described as having Moorings in these data sets which did not correspond with other datasets. In addition to the licenced Mooring data held by TCE, further digital datasets were used to identify private Moorings and refine the TCE data. NRW supplied an in-house dataset comprised of records taken from a combination of digital imagery and charts. These data from the "coastal features" datasets were collated, processed and added to the Moorings databases.

Defra supplied data from the Lee, *in prep*) report which encompassed elements of the existing Defra 'Marine Reference' (S-57) dataset supplied to the project. This dataset provided some information on Moorings (in point and polygon data layers named "ShorelineConstructions" and with the feature attribute "Mooring/warping facility") and was collated by the Joint Nature Conservation Committee (JNCC) in July 2011 from data supplied by the UK Hydrographic Office (UKHO). Furthermore, the OceanWise: Marine vector Charts (UKHO) were also used which contain an updated version of the s-57 (UKHO) dataset. These data duplicated some of the data provided in the TCE database but had a lot of additional information relating to commercial (rather than recreational) activity (Lee, *in prep*).

To check for any errors caused by deriving smaller scale maps from larger scale data (known as cartographic generalisation), aerial imagery was used to check the location of all the component data layers. There were often slight differences in the extent or shape of the feature but as the imagery generally covered a range of time frames, it was not possible to provide a judgement in relation to the accuracy of each of the different datasets, and all data were retained. This was considered to be more robust than removing data based on non-quantitative methods.

5.2. Anchoring information

As indicated in Section 5.1, full spatial coverage of Welsh waters (Welsh waters referred to are up to 12 nautical miles from the coast) was achieved by using a large variety of data sources. Data were gathered from a combination of digital datasets, the interpretation of aerial imagery and other sources recommended during stakeholder consultation. Furthermore, estimation of usage was assigned to all Anchoring sites within Wales by combining AIS data from the Royal Yachting Association (RYA) coastal atlas and stakeholder engagement input.

The datasets were broken down into spatial (describing the location of the feature) and temporal (describing the frequency of use) datasets as indicated below.

5.2.1. Spatial datasets

The spatial datasets used for Anchoring are the same as Section 5.1.1 apart from additional data from:

- Digital datasets
  - Coastal sailing forums and websites

5.2.2. Temporal datasets

The Temporal datasets used for Anchoring are the same as those indicated in Section 5.1.2.

The locations of Anchoring within Welsh waters were determined in a stepwise fashion from a range of datasets. Initially, the position of Anchoring sites was determined using the OceanWise: Marine Vector Charts (UK Hydrographic Office s-57) feature with the term "Anchoring" in the description. Further data were added from the existing Defra 'Marine Vector' dataset (in point and polygon data layers named "TransportationAndRoutes" and with a feature attribute of "Anchorage area").

To check for any errors in cartographic generalisation, aerial imagery was used to check the location of all the component data layers. There were often slight differences in the extent or shape of the polygons present but as the imagery generally covered a range of time frames, it was not possible to provide a judgement in relation to accuracy of each of the different datasets. Consequently, all data were retained and this was considered to be a more robust approach than removing data based on non-quantitative methods.

Anchoring is an ephemeral activity and to ensure the greatest coverage of Anchoring activities the position of Anchoring locations were double-checked against a range of sources including online cruising guides, Digital Raster Admiralty charts, Vector charts, pilot books and Aerial imagery. Aerial imagery from various sources was also reviewed to identify the extent of regular Anchoring and more occasional occurrences by reviewing the data and creating a polygon around anchored boats in the images. The digitised aerial imagery was then overlayed onto the Anchoring layer to check the size and shape. Imagery sources included the following: The Channel Coastal Observatory, the Environment Agency, Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, Getmapping, swisstopo, google aerial imagery and the GIS User Community. The aerial imagery cross-check process identified a number of new anchoring sites and redefined the shape and size of existing sites. The aerial imagery data were retained with the Anchoring dataset and identified within the primary source field.

5.3. Launching Information

Full spatial coverage within Welsh waters, was achieved using the same methods described in Section 5.1 and 5.2. Estimation of usage was calculated for all Launching sites within Wales by combining AIS data from the RYA coastal atlas and stakeholder consultation to remain consistent with other Mooring and Anchoring datasets, however, as AIS coverage was minimal for Launching sites, other metrics such as proximity to sailing clubs and centres were also utilised.

5.3.1. Spatial datasets

The spatial datasets used for Launching are the same as those indicated in Section 5.1.1 but included additional data from the following:

- o Digital datasets
    - ▪ http://www.boatlaunch.co.uk

5.3.2. Temporal datasets

The temporal datasets used for Launching are the same as those indicated in Section 5.1.2.

5.3.3. Launching Description

Limited information was available in a digital format for Launching activities; however, where datasets were available they were comprehensive and covered a range of Launching sites. The term Launching refers to any activity wherein a boat is launched into the sea and includes specific features such as slipways. The data layers used were comprised of data from the OceanWise: Marine Vector Charts based on feature-matching the description of "slipway" (as well as other attributes) with the term "shoreline construction". In addition, features from the NRW "coastal features" dataset were also used to populate this dataset.

Additional data were also provided by the company Boatlaunch, this provided information relating to the type and usage of a variety of popular slipways.

5.4. Stakeholder engagement

Stakeholder engagement was primarily used to gather additional information in terms of the location and frequency of Anchoring, Mooring and Launching sites and to provide quality assurance for the data collation process to ensure the data resources used were as accurate as possible. This aspect of the project was conducted after the primary data collection phase was completed and this approach was adopted to focus the engagement process and reduce the amount of input required from the stakeholders. Where possible the

consultation aimed to gather any missing data not included in the digital datasets (such as any missing locations of Anchoring sites, Moorings or Launching areas).

A range of marine stakeholders were consulted but the priority was given to professional bodies such as county marine officers, Harbour Masters, Special Area of Conservation Officers and NRW staff. It was considered that a good response rate could likely be achieved during the consultation window, due to for the availability of the consulted governing bodies. In addition, a range of private stakeholders was also contacted to give a wider breadth of knowledge from a range of marine users.

Stakeholder engagement was conducted using a pre-agreed list of contacts contacted in both English and Welsh. After initial contact, consultees were asked to specify a preference for future contact. All initial emails were followed up by a phone call during which engagement requirements and language preferences were discussed.

After the level of involvement was ascertained, area-specific PDF outputs of Moorings, Launching and Anchoring sites, were sent out to corresponding regional experts. The outputs were discussed face-to-face or by phone depending on individual preferences and contributions from stakeholders included provision of annotated PDF maps, indicating required changes on maps presented to them or providing additional information. The consultation with NRW staff was primarily e-mail based and a series of suggestions were made by NRW staff after assessing the Geodatabase in ArcGIS.

6. Data processing

This section of the report describes the processes and steps taken to produce each data layer and the corresponding data fields. For consistency, each data layer was produced using the same table structure to allow for comparison or merging between data layers. The order of column headings in the tables was as follows:

- "OBJECT ID"
- "Primary_Source"
- "Secondary_Source"
- "Source_Confidence"
- "Location"
- "Description"
- "Intensity_H_M_L"
- "Intensity_AIS"
- "Intensity_SE"
- "Consulted"
- "Consolation_Confidence"
- "Notes"
- "Additional_Notes"
- "Last_Updated"
- "Shape_Length"
- "Shape_Area"

The information provided for each column is described in detail below including the steps taken to produce the data for each data layer. Where any activity-specific fields were created they were added at the end of the table and are described in activity-specific Sections.

6.1. Preparation of Shapefiles

A stepwise approach was taken to data collection. Firstly, all digital layers (including digitised charts) were integrated and then checked against aerial imagery to confirm the position of each polygon was not partly or fully on land. If a polygon was found on land the projection was transformed and if this did not resolve the issue the polygon was removed. Furthermore, comparisons between each primary dataset were made to check their validity and to determine if there was any excessive overlap or direct replication of information provided in the different datasets. Once compiled, any ad hoc data from aerial imagery datasets, vector and raster charts were used to identify smaller or occasionally utilised sites not included in the primary base datasets. Further checks were made using pilot books, paper charts and almanacks; however, because of licencing considerations these data could not be digitised for this project and were therefore only used for reference purposes.

The creation of each data layer required various approaches depending on the original data source, the type of data used and the end use of the data. All

data layers described in Section 5 were transformed into a common projection of GCS_WGS_1984 prior to merging.

Shapefiles produced for the Defra report (Lee*, in prep*) were used as a template for merging the primary data layers, with additional data subsequently being merged into this dataset. This data layer was used initially to ensure comparability between the Defra report (Lee, *in prep*) and this report, however, as the requirements for the current project developed additional fields were added and the table structure subsequently changed. After the initial creation of the shapefile and the merging of datasets, the original shapefiles were converted to a geodatabase to ensure no fields were clipped, appended or lost.

The Arc catalogue plugin X-ray was used to rearrange the table structure to match the table column categories indicated in Section 6 above. This table structure is consistent throughout all the datasets with the exception of an "Additional_Notes" column which was added to the Moorings and Launching datasets. Once all the data layers were finished any missing data <null> fields were replaced with N/A with the exception of any number fields which were indicated to be '0'.

6.2. Data fields

All data fields described in Section 5 above were consistent across all datasets and were created in the same way. As such, each attribute is discussed here, with any layer-specific details discussed in Sections 5.3-5.6.

6.2.1. "Primary_Source"

The 'Primary source' field identifies the original source of the data prior to merging and relates to a shapefile supplied in the raw data (Section 5).

6.2.2. "Secondary_Source"

This field provides any additional detail about the source of the original data. This field was primarily created to retain source information from the Defra (Lee, *in prep*) shapefiles, which itself contains data about where it originated. However, additional source of information have been provided for some datasets (Section 5) where two sources were used. In some cases, it is used to reduce the replication of data, such as for the Launching dataset.

6.2.3. "Source Confidence"

The source confidence field was calculated using professional judgment and gives a level of confidence associated with each primary data source, based on how accurate the data was perceived to be. As such, confidence was determined using a three-tier classification system agreed following consultation between APEM and NRW staff (Table 1).

For example, the UK HO S57 layer was given a high confidence because of the perceived accuracy whilst using the data because minimally or no errors were found during usage and as such the entire dataset was given a value of high.

Table 1: Source Confidence

Value	Intensity
Very confident with the accuracy of the dataset, as the data contained minimal mistakes or erroneous points.	High
Original data layer contained a small number of erroneous data points or was flagged during consultation for having inconsistencies	Medium
Original data layer contained numerous erroneous data or was flagged more than once in consultation.	Low

6.2.4. "location"

This field gives an approximate location of the associated data, calculated from the original UKHO s-57 layer. Location was calculated using the spatial selection tool and any feature within 500 m of an UKHO s-57 coastal features polygon was given the same location value. For those polygons that didn't have any location data, and that weren't in the proximity to a polygon with a location, the name of either the waterway it was in or the town it was located close to were taken from Google Maps. All location names were double checked against locations of nearby polygons across all the datasets to ensure consistency.

6.2.5. "Description"

The description field was also retained from the original UKHO s-57 dataset or populated using data from other layers. This was conducted by directly merging the "description" fields where present (e.g. "Shoreline construction, slipway" in "mtf_industrial_areas") or by copying data from another relevant field (e.g. a "category" from "mtf_administrative_areas" such as "small craft mooring area" or "notes" from the Defra dataset). Where no information was

available, professional judgement was applied where possible to determine the feature, or the field was given a Null value of N/A.

6.2.6. Intensity

Intensity was calculated from AIS values, stakeholder engagement or by using a buffer around popular boating locations. As such, Intensity is given in the following three different forms:

- Intensity from AIS (displayed as High, Medium and Low);
- Intensity from AIS displayed as a log transformed occurrence value (the number of vessels passing through a polygon during one year);
- Intensity from stakeholder consultation.

6.2.7. Intensity_from AIS (High, Medium_Low (H_M_L)) (Intensity_H_M_L)

The Intensity value for the "Intensity H_M_L": field was calculated using intensity from the "Intensity AIS" field. For this dataset, the total count of AIS intersections over the three summer periods (May to September of 2011, 2012 and 2013) were used. Zero values were eliminated and then a log10 taken of the relative density counts to provide a value for intensity (RYA, 2016). Polygons were given a value of High, Medium or Low using frequency bins (Table 2).

Table 2: Intensity derived from AIS data

AIS Value	Intensity
0 - <1	Low
1 - <3	Medium
3>	High

The scale used was chosen to reduce the disproportionate skew towards the high-intensity areas of Milford Haven and Holyhead.

6.2.8. Intensity from AIS (calculated value) (Intensity_AIS)

This field was calculated using The RYA UK Coastal Atlas of Recreational Boating Version 2. Data were extracted from the original *.LKP Arc layer package file into its constituent Shapefiles. The AIS_intensity shapefile was used to calculate the AIS intensity of features within each polygon. Initially, AIS values were calculated using the 'select by attributes' feature and any Anchoring data within the polygon was given the intensity value of the overlapping AIS polygon (1 x 1 nautical mile cells). However, this method was time intensive and later AIS values were added using the spatial join feature with ArcGIS 10.6, joining the attributes of features by their location.

6.2.9. Intensity from stakeholder engagement (Intensity_SE)

The intensity values were calculated in two ways. After consultation with NRW, it was agreed that the intensity value for sites within close proximity of popular sailing clubs should be marked as high intensity. Consequently, a 500 m buffer zone for Mooring and Anchoring and a 250 m buffer for Launching was created around the "The RYA UK Coastal Atlas of Recreational Boating Version 2" features of sailing clubs and RYA centres. Using the 500 m buffer zone as a selection tool, any Anchoring site within the buffer zone was allocated a high-intensity value. Further launching and mooring specific intensity values are described in Section 6.5.1 and 6.4.2, respectively.

The second method of calculating stakeholder intensity was through direct stakeholder engagement and determination of a value based on professional judgement. Values were either defined as High, Medium or low intensity based on the consultee's personal opinion and as such the values are only indicative of use relative to the consultation area. If the value was recorded in this way it was recorded in the notes Section.

6.2.10.   "Consulted"

The "Consulted" field describes who reviewed, refined or added the polygon during the consultation. If a polygon has been reviewed it means that the reviewer is satisfied with the location and/or shape of the polygon. In most cases, the reviewer did not suggest any edits to the corresponding polygon. If the reviewer was not satisfied, then changes to polygon shape or location were made as required.

6.2.11.   "Consultation_Confidence"

As a rough indication of confidence, this field is based on the number of people that reviewed each polygon. A confidence score of 'low' was given to any data that had not been review by any stakeholders regardless of its source. Any polygon that had been reviewed by one individual was given a confidence score of 'medium', unless it was a particularly detailed consultation, then it was given a score of "High", this exception was supported with comments in "additional notes" section. Any polygon that had been reviewed by two or more people was scored as having 'high' confidence. The high confidence value was also given to harbour trusts or teams of people that reviewed the data through a single contact.

6.2.12.   "Notes"

The "notes" field was used to capture any additional information recorded during the consultation.

6.2.13. "Last_Updated"

The "Last Updated" field was added to record the date of any modification to the dataset. It does not contain information about the original data for the underlying data fields.

6.2.14. Automated fields

The attribute fields of OBJECTID, Shape_Length and Shape_Area were created by ArcGIS by default and as such are not discussed further in relation to the attributes of each dataset.

6.3. Anchorage dataset

This dataset was initially created using the Defra Anchoring shapefile (Lee, *in prep*), the UKHO S-57-MTF-Administrative and Aerial Imagery datasets were then projection-matched and added. Additional data were also added from stakeholder consultation, web resources, pilot books, cruising guides and websites.

Any point data was converted to a polygon by using a 10 m buffer around the point data before it was merged.

6.4. Moorings dataset

This dataset was initially created using the Defra Moorings shapefile as a template. The NRW (Coastal Features V1 - Harbour Moorings, Coastal Features V1 – Moorings, Coastal Features V1 – Region and Coastal Features V1 Ellipse – Moorings), The Crown Estate (GIS_2018_2023_v1_DJH_MooringsSlipwaysMarinasPorts) and the UKHO S-57 MTF_ administrate and MTF_Industrial layers, datasets were then projection-matched and added to the dataset. Each layer was added by using the merge feature appending and matching the table structure to remove or retain data. Additional data were also added from stakeholder consultation and web resources.

Any point data were converted to polygons by using a 10 m buffer around the point data before it was merged. A number of additional steps were taken to process the data and create the Moorings attribute fields, as such the individual data column and processes required to create them, are described in Section 5.4.1 and 5.4.2.

6.4.1. "Number of Moorings"

The number of Moorings field was calculated using "Aerial imagery" polygons within the primary source field. The total number of Moorings within the "Aerial imagery" polygon was counted using the ESRI satellite imagery basemap. Counts were then applied to other polygons using a spatial merge. Any Moorings polygon covered by the "Aerial imagery" polygon received the same

value. If several "Aerial imagery" polygons covered the polygon and were not fully spatially overlapping the values were added together. If an estimate could not be made from the "Aerial imagery" data layers, then it was given a value of zero.

6.5. Launching dataset

The Launching dataset was created using the Defra Anchoring shapefile as a structure template. However, all the existing data was removed and data from the UKHO S-57-MTF-Administrative, Boatlaunch, NRW and Aerial Imagery datasets were added. All data points were projection-matched prior to adding data layers. Additional data were also added from stakeholder consultation and web resources.

Boatlaunch data was converted from a javascript file used for web design, into a CVS file using spaces and commas to delimit the columns. Once the data was in a CSV format it was imported into ArcGIS as point data using the coordinates provided in the original data. The XYZ point data were then converted into a shapefile using the method previously described. The Boatlaunch Shape file was then spatially merged with any Launching site with 50m. As such, any Launching site that was merged with Boatlaunch data was recorded within the "secondary source" field.

A number of additional steps were taken to processes the data and create the Launching dataset attribute fields. As such, individual data columns were created, and processes required to produce them are described above in Section 5.5.1 .

6.5.1. "Launching_Intensity"

After further consultation with NRW staff another Launching intensity metric was added. This data layer focused on the popular web-based Launching resource 'www.Boatlaunch.co.uk' and used the occurrence of a slipway on this website as a classification metric. Any Launching location not on Boatlaunch was allocated a low intensity value, and any location on Boatlaunch was allocated a Medium intensity. An Intensity value of High was given to a Launching site defined by Boatlaunch as popular or busy (or any similar terms), or if the site was within 250 m of a RYA centre or club.

6.6. No Anchoring

The 'No Anchoring' data layer was created after the consultation period to address several specific comments with regards to voluntary no Anchoring zones throughout Wales, as such this datalayer is not as refined as the other feature classes with the geodatabase and contains some overlap with the Anchoring feature class. The layer was created using the "Anchoring" dataset as a template and additional 'No Anchoring' data were added using data from the OceanWise s-57 database in the "mtf_obstruction_areas" feature class

(any feature matching "no anchoring" or similar was extracted from the "Description" field and merged in the feature class). Additional sites were also added from stakeholder engagement. Intensity values were not calculated for this dataset as the sites are specified as no Anchoring zones and, as such, should not receive any traffic.

7. Conclusions

7.1. Data use, assumptions, and limitations

Where possible, data have been captured at the highest resolution available regarding the location and usage of a range of Mooring, Anchoring and Luanching sites. Where possible any limitations have been factored into the GIS and steps have been taken to give a confidence level where possible. There are still a number of factors, however, that should be considered when assessing this dataset.

7.1.1. General

- The location and intensity of the activities could have changed since data acquisition.

- The delineation of an anchorage or Mooring area from aerial photography is not 100% accurate, neither is the delineation between the two activities in the same area. Consequently, delineation can only be made by professional judgment. For example, it can only be assumed that Anchoring takes place outside marinas and harbours and that Mooring is more likely within harbours and marinas. However, this delineation is not consistent and seasonal illegal and legal single boat moorings can easily be confused with anchoring. This issue is particularly hard to define on areas of private seabed where no records are kept. Conversely, Anchoring can and does occur within areas designated as Mooring sites particularly at busy times, when all moorings are full. As such, no definitive method can be outlined and professional judgment must be used.

- Different anchorage types have been specified where possible and details have been included in the dataset. However, it is very difficult to distinguish the type of Anchoring used if it was not specified with the original dataset.

- Large scale charts are considered to be generally accurate over a larger spatial scale and are not always accurate on smaller scales. However, because of cartographic generalisation, it is possible that some areas can be misidentified as the wrong feature class.

- A range of different Mooring types has been considered and specified where possible. The type of Mooring has been included in the description where it is available in the original data layer; however, it is very difficult to distinguish the type of Mooring used if it was not specified with the original dataset.

- The Moorings dataset includes both pontoons and swinging Mooring locations for some ports. This was retained from original NRW datasets and should be considered when conducting future analysis.

7.1.2.   Intensity

- Intensity values from AIS have been interpolated across a 1x1 nautical mile area by applying values from the RYA coastal atlas AIS dataset and are as such, only indicative of usage, not quantative values. The AIS data describes the presence of a boat within a polygon, not the activity it is partcitpating in. However, it is accepted that with increased traffic to an area it is likely that the amount of anchoing and mooring would increase proportionally with the increased traffic . Although, no value can be given to this correlation it is logical to assume that increased traffic to an area will increace the activity to an area.

- It should be noted that AIS intensity increases in proximity to ports and harbours as boats come back to ports on set approaches and routes. It is reasonable to assume that this will capture boats anchoring prior to entering port or going to a mooring once in port. However, because of the 1x1 nautical mile buffer, use of AIS data could also misidentify areas of high intensity near ports.

- It should also be noted that parts of Cardigan Bay are within an AIS data blind spot and as such, do not contain any data. The absence of data within the blind spot is not representative of the amount of boat traffic, just the lack of data for that area.

- Intensity values discussed during stakeholder engagement have been highly variable and are extremely knowledge dependent. Therefore any stakeholder-derived intensity value should be considered in the context of the provider's expertise. In addition, intensity values based on stakeholder consultation should be used in conjunction with the confidence value assigned to that polygon.

- Overall intensity values are derived from an average intensity based on a combination of historic area-averaged AIS data and stakeholder-derived intensity values. Given the temporal variability associated with these activities, these values are indicative of historic data.

- Slipway usage data was not collected using data from slipway owners or regulators for all locations. Instead values were calculated using other metrics described in section 6.5.1. As such, they are only indicative values based on regional historical data, not the actual number of boat launches at a site.

7.1.3.   Seasonality

- No patterns of seasonality or temporal variation have been accounted for within the data layers for this Geodatabase. As such, data are an amalgamation of different years and seasons and where possible seasonal and temporal attributes have been included. Layers do not account for the "boating season" (April to September) or changes in usage due to socioeconomics.

- Time series of aerial images were used where possible; however, no full coverage image could be found for any given years. Consequently, a mosaic of images was used to inform the database.

- Any attempts to capture 'seasonality' would imply a level of accuracy within the data that cannot be achieved for an activity such as Anchoring.

- Channel markers have been included in the Moorings layers. However, in areas of high flux like the Caernarfon Bar, markers are frequently moved.

- The lifting, servicing, and re-setting of Moorings, channel marker, pontoon supports and other features have not been considered within the dataset

Consequently, consideration should be given to the limitations of each dataset when querying, analysing or interpreting the GIS layers. Steps should be taken to handle the data appropriately and factor in any limitations.

7.2. Further data collection

Data collection utilised a range of different sources to create an up-to-date dataset for Anchoring sites, Mooring locations and slipways in Wales. However, a range of novel or emergent methods could be used to gather data from social media as outlined below. As such, it is proposed that future data collection methods could fall into two main categories: Social interaction and Data partnerships, using some of the approaches outlined below.

7.2.1.   Methods to consider:

- The integration of data collection into existing Android or IOS app platforms such as www.navily.com, FishAngler or the RYA's online sailing logbook, could streamline the consultation process and the increased population size generated from app-based consultation would also reduce user bias.

- Alternatively, the data could be purchased directly from applications producers.

- The development of mobile 'apps' could make it easier for participants to record their data and facilitate ease of data collation and analysis.

- Social media was not utilised during the consultation phase of this project. This form of data collection has enormous potential for:
  - Hosting consultation maps and surveys.
  - Uploading georeferenced images using a hashtag to identify Mooring or Anchoring locations.
  - Searching uploaded hash tagged images for Anchoring and Mooring locations.
  - Identifying popular Mooring, Anchoring and Launching sites using social media polls.

- Previous work by Lee (*in prep*) suggested field surveys could be implemented to quality control data. This is an expensive option when aeroplane or boat-based survey is deployed. As an alternative, drone imagery from a fixed height and direction could give a useful perspective and time series for a range of sites. This would be particularly useful if the site is visited at regular intervals across one (or more) seasons and the location and numbers of boats at anchor is recorded.

- Time series aerial images from drones or satellites could be analysed to determine consistency in Mooring and anchorage extent over time. It is likely that the number of Moorings will fluctuate between off peak and peak season.

For further development of these data layers the timing of stakeholder engagement should be considered and it is recommended that consultation is conducted during the "boating season" when the boating community is more active.

In addition, a longer consultation period would provide a better opportunity for engagement with relevant stakeholders. For example:

- Marina owners could hand out questionnaires and request log books from a member;
- Clubs could encourage members to share and log their activities across a single data platform;
- Organisations like the RYA could be used to reach a wider platform and persuade members to share usage
- The coastguard and The Royal National Lifeboat Institution (RNLI) could also be approached for the records they currently keep.

7.3. Summary

This dataset has provided an up-to-date source of information for the location and intensity of Mooring, Anchoring/no Anchoring and Launching sites within Welsh waters, up to 12 nautical miles from the coast.

It is considered this dataset could provide a valuable resource to inform future potential management decisions relating to the intensity of Mooring, Anchoring and Launching activity and the potential effects these activities have on marine species and habitats.

The production of this dataset has highlighted opportunities for future work to refine the existing dataset. Recommendations include allowing for a longer stakeholder engagement period and focussing efforts on the summer months during which Mooring, Anchoring and Launching activity is at its greatest. This would allow a wider range of marine users to participate and contribute, during the period when they are actively participating in these activities. Furthermore, the incorporation of social media or mobile apps could also be used to streamline the data collection processes along with the use of other novel survey resources such as drones.

8. References

Griffiths, C.A., Langmead, O.A., Readman, J.A.J., Tillin, H.M. 2017 Anchoring and Mooring Impacts in English and Welsh Marine Protected Areas: Reviewing sensitivity, activity, risk and management. A report to Defra Impacts Evidence Group.

Lee, J. *in prep.* Recreational anchoring and mooring in Marine Protected Areas (MPAs): Activity data collection, Defra.

RYA UK Coastal Atlas of Recreational Boating, version 2.0. 2016. Supplied under licence by the RYA.

9. Appendices

Acronyms

AIS	Automatic Identification System
Defra	Department for Environment, Food and Rural Affairs
JNCC	Joint Nature Conservation Committee
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MPA	Marine Protected Area
NRW	Natural Resources Wales
RYA	Royal Yachting Association
SAC	Special Area of Conservation
TCE	The Crown Estate
UKHO	United Kingdom Hydrographic Office

10. Data Archive Appendix

Data outputs associated with this project are archived on the NRW Document Management System and Server based storage (for GIS layers).

The data archive contains:

[A]   The final report in Microsoft Word and Adobe PDF formats.

[B]   A series of GIS layers on which the report is based

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue

https://libcat.naturalresources.wales (English Version) and
https://catllyfr.cyfoethnaturiol.cymru (Welsh Version)

by searching 'Dataset Titles'. The metadata is held as record no 124695.

If you would like to access the GIS files that accompany this report then please contact the NRW Data Distribution Team datadistribution@cyfoethnaturiolcymru.gov.uk. Some of this data may be able to be supplied to you.