IDENTIFYING WHALE WATCHING HOTSPOTS IN THE ACCOBAMS AREA
FINAL REPORT

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Dolphin watching vessel off mainland Portugal. Photo courtesy of ICNF/RNES.

November, 2022

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Under contract No. 08/2020, Gianna Minton was engaged to support the implementation of activities as part of the 2020-2022 ACCOBAMS Program of Work related to Cetacean watching (CA2d). Part of her contract entailed a study aimed at identifying hotspots of Whale Watching activities in the ACCOBAMS area. This study was based on questionnaires distributed to identified whale watching data collection partners in every country of the ACCOBAMS Area. The questionnaires were developed by the contractor and refined in consultation with members of the ACCOBAMS Whale Watching Working Group (WWWG), many of whom also acted as data collection partners. The author and the ACCOBAMS Secretariat are very grateful for the support they provided in the implementation of this study.

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Disclaimer

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Introduction

When conducted responsibly, whale watching (used here to include any form of commercial activity to observe whales, dolphins or porpoises in their natural habitats), can provide many benefits. These can include education and awareness raising for participating customers, who may become more aware of threats to cetaceans and more motivated to contribute to conservation efforts (e.g. Schuler and Pearson, 2019; Cisneros-Montemayor et al., 2020); economic benefits to coastal communities and increased incentives to protect local cetaceans (e.g. Silva, 2015; Ryan et al., 2017; Cisneros-Montemayor et al., 2020), and, where tour operators engage in citizen science, an increased understanding of cetacean distribution and density (e.g. Bruce et al., 2014; Pacheco et al., 2019). However, unregulated or irresponsible whale watching activities can also have multiple negative impacts resulting from the cumulative impacts of disrupted socialising, foraging, and resting behaviour (e.g. Parsons, 2012; Christiansen et al., 2013; Machernis et al., 2018).

For this reason, it is important that managers and decision makers are able to maintain an overview of the scope and scale of whale watching in a particular area, and to understand whether activities are sustainable in relation to the populations of cetaceans in the area. While data on the frequency and intensity of whale watching effort exists for some well-studied regions within the ACCOBAMS area, including the Straits of Gibraltar and parts of the French coast of the Pelagos Sanctuary (e.g. Mayol et al., 2007; Cazalla et al., 2016; Gimenez, 2019), these are often not comparable and an ACCOBAMS regional overview on these activities is still lacking.

The study aims to map potential pressure on the cetacean populations that are targeted for whale watching activities throughout the ACCOBAMS area. Numerous studies on the impacts of whale watching showed that the number of vessels (Williams and Ashe, 2007; Schuler et al., 2019), engine noise (Sprogis et al., 2020), and cumulative temporal exposure to these (Pérez-Jorge et al., 2017) are important factors in determining whether or not whale watching activities can be considered sustainable or potentially harmful over time.

As such, this study does not aim to obtain information on specific whale watching tour operators but rather to collect data that can be used to generate comparable rough measures of whale watching pressure, throughout the ACCOBAMS region.

Methodology

Data collection

This study applied a standardised approach to gather basic information on the scope and scale of whale watching activity (WW) within the ACCOBAMS area through two main approaches: (1) a Questionnaire-based approach and (2) a Desk-based analysis and ground-truthing approach.

- The **Questionnaire-based data gathering** approach relied on the distribution of a questionnaire to identify voluntary whale watching 'data collection partners' in each ACCOBAMS country, most of whom are members of the Whale Watching Working Group of the ACCOBAMS Scientific Committee. These data collection partners have been responsible for the completion of questionnaires at a country-, province-, or port- level.

  Data gathering was conducted in two phases:

  Phase I: a more general country-level questionnaire that assessed very roughly how many WW operators there were in the ACCOBAMS countries that replied, the locations from which WW took place, and what kinds of guidelines or regulations were in place for WW in each country. This was completed in mid-2021, although data provided was supposed to reflect pre-pandemic levels of whale watching (e.g. 2019).

Phase II: a detailed and standardised questionnaire designed to allow a broad assessment of the level of pressure from whale watching vessels on whale and dolphin populations in areas where data collection partners were able to gather such data. This questionnaire aimed to characterise and generate a standardised method to measure whale watching activity in each region through: (a) the number of vessels operating tours and (b) the duration and (c) frequency of tours offered in high and low seasons. The full questionnaire template is available online here and a sample of the questionnaire template for a single location is included as Annex 1. For both questionnaires, respondents were asked to provide *meta-data*, as opposed to details of particular operators. Data on particular operators was provided by some respondents and can be used as additional information to aid in the ground-truthing of responses (see below), but this detailed listing is not the main aim of either questionnaire. Note that this exercise focused on *commercial* whale watching only, as defined by Hoyt in his landmark study of whale watching worldwide (Hoyt, 2001). Several categories of commercial whale watching activity were defined for use in the questionnaire, as follows:

Whale watching: For the purpose of this study, we use the definition of whale watching used for the landmark study by Erich Hoyt - 2001*: "Whale watching" is thus defined as tours by boat, air or from land, formal or informal, with at least some commercial aspect, to see, swim with, and/or listen to any of the some 83 species of whales, dolphins and porpoises.' Following Hoyt 2001, as well as tours that are strictly whale- or dolphin-oriented, we would also like to measure the contribution from general nature tours and cruises which feature whales and dolphins as a prominent aspect. Research tourism, which takes monetary contributions from participants is also included as a separate category of Whale watching tour operators. But recreational whale watch tourism conducted by individuals with private recreational vessels is NOT included in the scope of this study.
Dedicated WW operators offering day/half-day trips: These are tour operators that market themselves entirely on the basis of dedicated whale and/or dolphin watching tours. All of their daily/half-day trips should be included in the responses related to the number of tours and hours dedicated to WW.
Dedicated WW operators that offer multi-day liveaboard trips: These are tour operators that market themselves entirely on the basis of dedicated whale and/or dolphin watching tours. Unless there is reason to do otherwise, 8 hours per day should be included in the responses related to the number of tours and hours dedicated to WW.
Marine tourism operators that also offer dedicated WW tours: These are operators that offer marine or coastal nature tours and cruises that include cruises explicitly dedicated to whale or dolphin watching. Please include ONLY their dedicated whale and dolphin watching tours in the totals that you report.
Marine tourism operators that offer fishing, wildlife or leisure tours that also regularly encounter cetaceans: These are operators that offer marine or coastal nature tours and cruises that regularly include an element of whale or dolphin watching. Please use your best judgement to estimate the number of trips or hours of each trip that are dedicated to WW.
Research tourism operators: These are research groups that solicit monetary contributions from participants to join research cruises and assist with data collection for whales and dolphins. Although we can assume that they adhere to good practices, it is useful to consider their contribution to vessel traffic around cetaceans in the target area.

A virtual online 'training' or orientation session was held for data collection partners in April 2021 to ensure that they understood how to use the "**Phase II** questionnaire", and to provide them the opportunity to ask for clarifications.

- A **desk-based analysis and ground-truthing** approach included the collection of additional information and ground truthing of questionnaire responses from the following sources:
  - The 2009 study of global whale watching funded by IFAW (O'Connor et al., 2009) and specific studies commissioned by ACCOBAMS and other partners (e.g. Mayol et al., 2007; Cazalla et al., 2016; Gimenez, 2019); and recently published guides to whale watching in Britain and Europe (Carwardine, 2016).
  - Discussions with the ACCOBAMS WW Working Group, High Quality WW label partners, and other targeted experts and partners.
  - A desk-top review of published reports and peer-reviewed literature on the key species and populations present in the ACCOBAMS region and their conservation status at ocean-basin level, as well as local level if applicable.

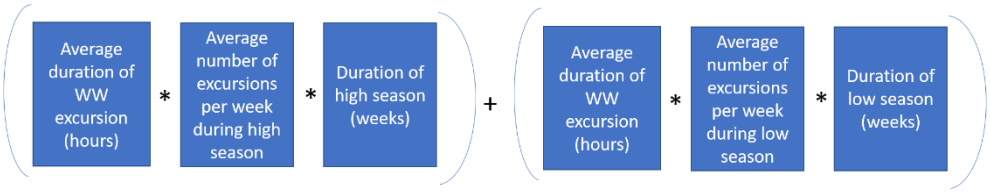
It should be noted that the ACCOBAMS Data collection partners were responsible of the data collection effort in each of their respective countries. They were requested to do so using their own official records in cases where dolphin watching is a licensed activity, and/or using internet searches (using the appropriate local languages), and local information networks, ground-truthed through phone calls emails where necessary, to obtain the most up-to-date and accurate information available. It was beyond the scope of this study to verify or ground truth the data they collected, or to find alternative sources of information for those countries that did not participate in the second phase questionnaire (see below). For example, typing in a country name and 'dolphin watching' as search terms in Google maps often reveals dozens of 'matches', some of which appear to be operators that offer marine tours without any specific mention of dolphin watching, and others that specifically advertise dolphin watching tours. Some have websites that appear to be recently updated, but others have not been updated for many years, and some can only be reached by telephone or instant messaging to confirm what their actual activities are. The voluntary nature of the data collection process may have limited the cross-referencing of data sources. As such, this study does not claim to be exhaustive and readers may keep in mind that the results presented in this report likely represent an underestimate of the total volume of whale watching activity in the ACCOBAMS area.

Data analysis and mapping

The responses to the first phase questionnaire were compiled to create a very simple table of the countries in the ACCOBAMS region that allowed comparison of the rough estimates of WW operators, numbers of WW ports/harbours, and the status of voluntary or legally enforceable regulations/guidelines in each country. Data gathering for the second phase occurred between 2021 and 2022. Although initially data were supposed to reflect pre-pandemic levels of whale watching activities (e.g., up through 2019), some of the data collected in late 2021 and 2022 reflects more current operations in the surveyed areas (especially true for Italy and Spain).

Results second questionnaire were compiled into a spreadsheet that was used for the following analyses and visualisations of the data:

- National-level analysis: data compiled for each country was used to provide an overview of the total number of operators in the country falling under different categories, the types of vessels used, the focal species targeted by whale watching operations, and the cumulative intensity of whale watching effort as measured by 'total number of whale watching hours per year'. This total was derived as follows:



- Mapping of 'hotspots' based on total annual vessel-hours per town/harbour. This was done by using QGIS® (Version 3.22.9) to assign different-sized shaded symbols for each town/port for which data was provided, based on the calculated number of vessel hours, binned into categories of 0-500 hours, 500-1000 hours, 1500-2000 hours or over 2000 hours per year.
- Mapping of the *relative* geographical range of whale watching operations in each port and harbour by assigning different sized symbols to each location based on either the reported offshore range, or alongshore range of operations, depending on which was more extensive. Symbols were created in 'bins' representing 0-20km, 20-40km, 40-60km, 60-80km, or 80-100km. These were roughly calibrated to each country map's scale bar so that the symbol for the location with the furthest range was in proportion to that range category.
- Further analysis and representation of results through tables, graphs and text that explain the results in more detail and highlight findings of particular interest, especially where particular (vulnerable) species or populations may be experiencing high levels of (seasonal) pressure from whale watching, or where reported practices may cause additional pressure on populations (e.g., use of aircraft to locate cetaceans, offering in-water encounters, etc.).

Results: A regional overview

Phase I

Phase I questionnaires, providing a general overview of whale watching, were completed by data collection partners of 24 ACCOBAMS range countries. Of these countries, 50% (n=12) reported that there was no commercial cetacean watching currently taking place (although two reported plans to develop this category of tourism). Six countries reported that only 1-10 commercial operators offered WW tours, two reported 11-20 operators, three reported 20-50 operators, and only one country reported more than 50 commercial operators, with Portugal, France, Italy, and Spain being the countries that appear to host the highest numbers of commercial whale watching operators (see Table 1 below).

Interestingly, three of these four countries (France, Portugal and Spain) also appear to have the highest levels of legally enforceable regulations and licencing requirements for commercial whale watching operations. Notably only Spain and Portugal (8% of all respondents) have specific licensing requirements in place for commercial whale-watching operators, and only Portugal, France, Spain, Croatia and Bulgaria have legally enforceable whale watching regulations in place (20% of all respondents).

Several different categories of whale watching operations were reported among those countries that have some form of commercial whale watching, with seven countries (29%) reporting the presence of dedicated whale-watching tour operators, six countries (25%) reporting general marine tourism operators that also offer dedicated whale watching tours, five countries (21%) hosting general marine tourism operators that regularly encounter cetaceans, nine countries (38%) hosting research organisations that also involve paying clients in their boat-based work, and only three countries (13%) reporting the presence of marine tour operators that also offer dedicated multi-day whale watching tours.

Table 1: Countries with the highest levels of reported commercial whale watching activity, and the legal status of WW in those countries as reported in Phase I questionnaires completed by voluntary data collection partners. Note that countries are listed in descending order of the number of reported commercial WW operators.

Country	Number of reported commercial operators	Number of harbours from which WW takes place	Whale watching legally defined?	Specific licensing required for WW?	Legally Enforceable WW regulations?	Voluntary WW Guidelines?
Portugal (ACCOBAMS area only)	>50	10	Yes	Yes	Yes	Yes
France (Mediterranean coast)	20-50	30	No	No	Yes	Yes
Italy	20-50	20	No	No	No	Yes
Spain (Mediterranean coast)	20-50	12	Yes	Yes	Yes	Yes
Croatia	11-20	5-10	No	No	Yes	Yes
Russia	11-20	5	No	No	No	Yes
Cyprus	1-10	2	Yes	No	No	No
Greece	1-10	5	No	No	No	Yes
Israel	1-10	3	No	No	No	Yes
Malta	1-10	5	No	No	No	No
Slovenia	1-10	1	No	No	No	Yes
Türkiye	1-10	1	No	No	No	No
Albania, Algeria, Bulgaria, Egypt (Mediterranean coast), Georgia, Lebanon, Libya, Monaco, Morocco, Romania, Syria, Tunisia, Ukraine	0	0	9 countries do have a legal definition of WW despite no commercial operations in place	No countries require licensing	Only Bulgaria has legally enforceable WW guidelines – which are part of general wildlife viewing guidelines	Only Bulgaria reports voluntary WW guidelines
Totals and percentages		**Approx. 100**	**50%**	**8%**	**20%**	**41%**

Phase II

Based on the results of the first questionnaire, a total of twelve countries reporting commercial operations were expected to complete the Phase II questionnaire. However, phase II questionnaires were received from data collection partners of only seven ACCOBAMS Contracting countries (France, Greece, Italy, Malta, Portugal, Spain and Türkiye). Data was compiled for a total of 87 ports and harbours in these seven countries, and transcribed into a master spreadsheet to be used in analysis and mapping of results.

Region-wide data and trends

Table 2 provides an overview of the basic statistics compiled for each of the 7 participating countries. Countries are listed in alphabetical order.

Table 2: Overview of whale watching activity represented in the data compiled for this report.

Country	Total number of dedicated WW operators (incl. research operators)	Total number of vessels dedicated only to WW	Total number of marine tourism operators also offering WW	Cumulative number of WW hours	Average estimated number of WW passengers per year	Average vessel length for WW tours	Most common type of engine/power used for WW	Most commonly targeted WW species
France*	10	7	23	16,363	53,551	15.0	Inboard diesel, sailing, limited outboard petrol and electric	Fin whales, sperm whales, bottlenose dolphins, striped dolphins
Greece***	1	1	1	3,202	2,542	12.3	Inboard diesel	Bottlenose, common and striped dolphins
Italy*	5	9	31	10,707	54,634	13.6	Inboard Diesel and sailing, some outboard petrol	Fin whales, sperm whales, bottlenose dolphins, pilot whales, Risso's Dolphins, Striped dolphins, Cuvier's beaked whales
Malta	0	0	1	40	260	14.0	Inboard diesel	Bottlenose and striped dolphins
Portugal*	55	143	0	10,212	73,580	8.9	Outboard petrol, Inboard diesel	Bottlenose dolphins, common dolphins
Spain*	12	19	24	50,167	396,614	12.8	Inboard diesel, outboard petrol, some sailing	Fin whales, bottlenose dolphins, common dolphins, striped dolphins
Türkiye***	0	0	0	384	768	25.5	Inboard diesel	Bottlenose and common dolphins, Black Sea harbour porpoises

* Note that for several countries the values represented only include whale watching operations in the ACCOBAMS area, and thus exclude their Atlantic coasts and/or any overseas territories.

** Note that the data collated for Italy only represents a few regions on the Mediterranean/Ligurian/Tyrrhenian coast and not the Adriatic coast.

*** Note that a significant portion of the whale watching effort in Greece, and all the whale watching effort in Türkiye is conducted through research-based tourism operators.

Table 2 should be viewed in conjunction with Figures 1a and 1b, which provide an indication of the areas for which data was collected (1a) and the density of whale watching effort in each area. While the entire Mediterranean coasts of Spain and France are represented, the data collated for Italy only represents a few portions of its Western

Mediterranean coasts and not the Ionian nor Adriatic coasts. The data for Portugal only represents the southern coast of Portugal and not the west-facing Atlantic coast, which is not part of the ACCOBAMS region. As such, it is important to note that the Phase II portion of this study has provided only a preliminary overview of whale watching activities and resulting pressure, with the only exception for the Western Mediterranean region, for which a full overview was completed.

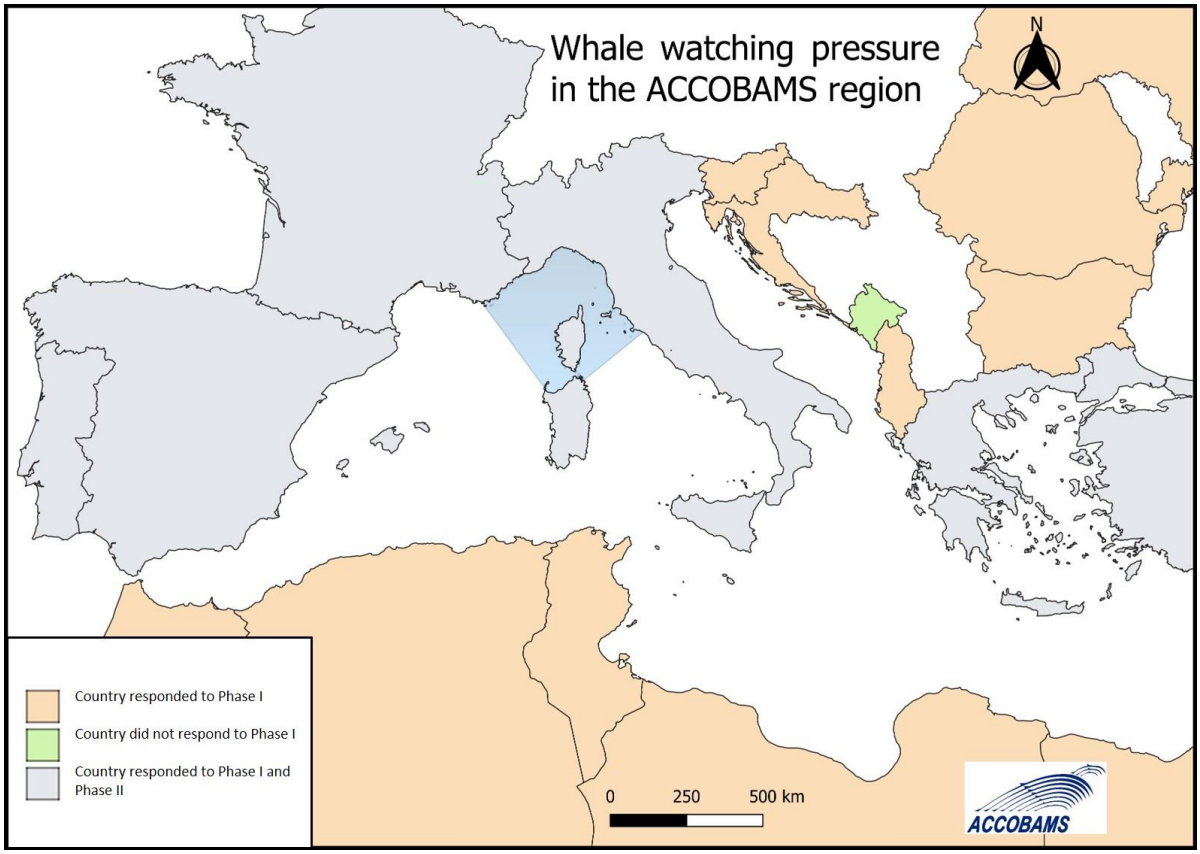


Figure 1a: An overview of the ACCOBAMS countries that participated in the whale watching hotspot Phase I and Phase II questionnaires.

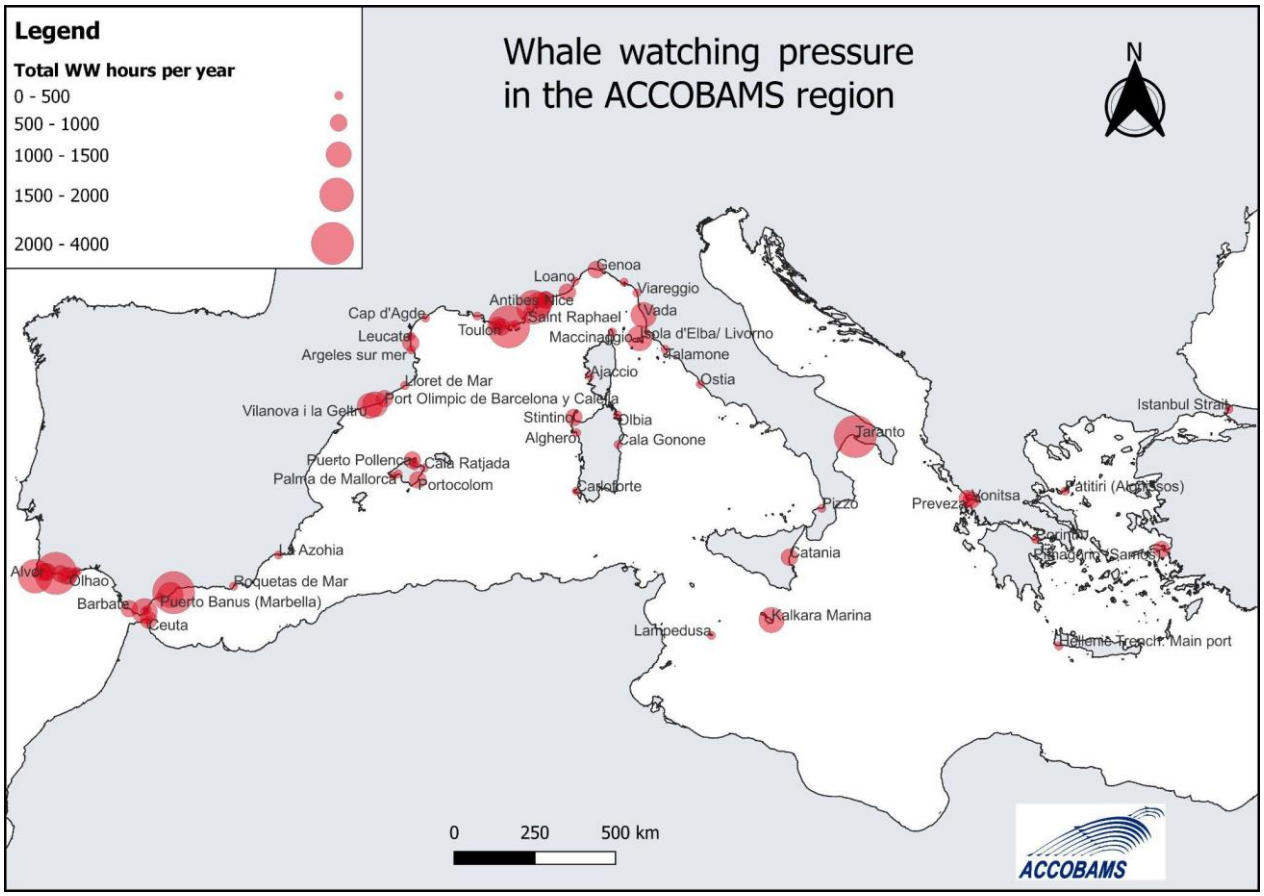
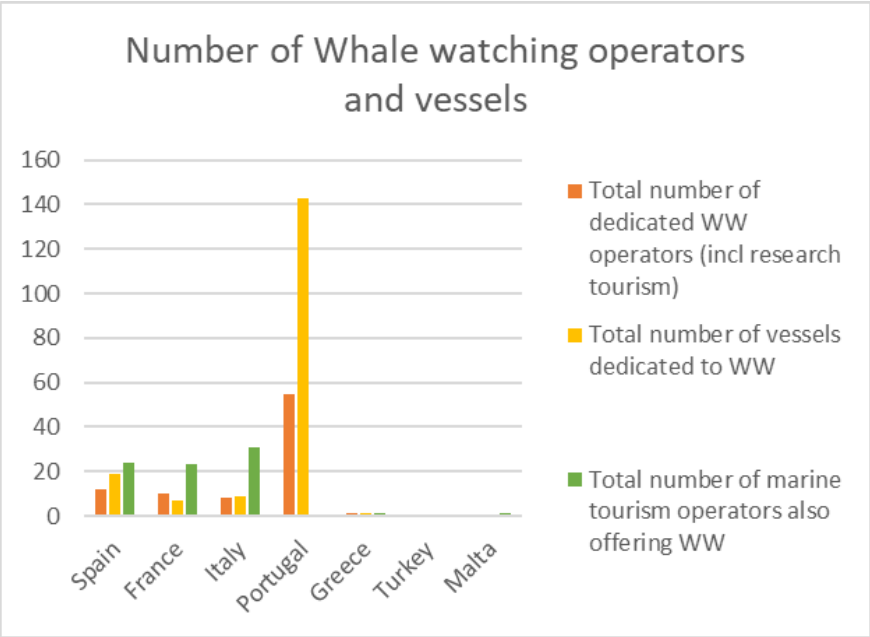


Figure 1b: A preliminary overview of whale watching 'hotspots' in the seven countries of the ACCOBAMS area that participated in Phase II of the data collection effort. Data provided on the duration and frequency of tours in high and low seasons was used to provide a rough estimate of the total number of whale watching hours conducted annually from each of the ports and harbours included in the study. The size of the red/pink circles reflect the number of cumulative whale watching hours, *not* the radius of operations.

The data presented in Table 1 was also used to generate graphs comparing the number of whale watching operators and vessels in the ACCOBAMS area as reported for the seven countries participating in the Phase II study versus the estimated cumulative annual whale watching hours and passengers (Figures 2a and 2b).



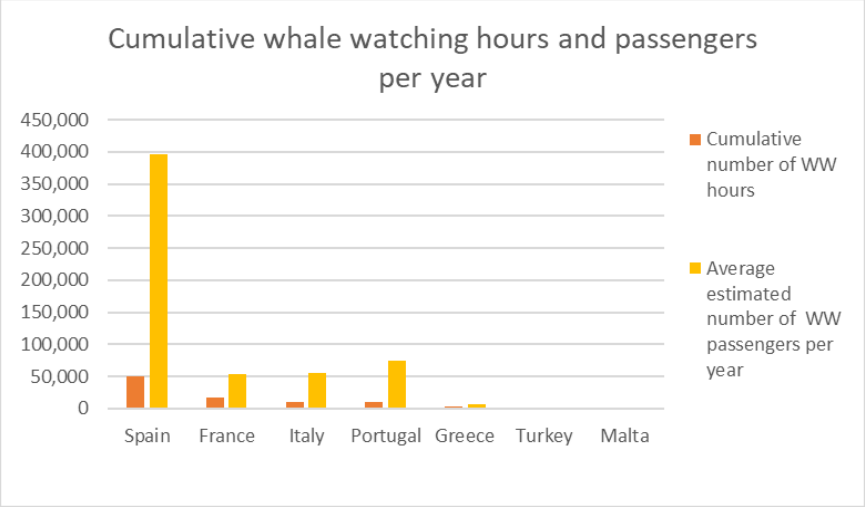
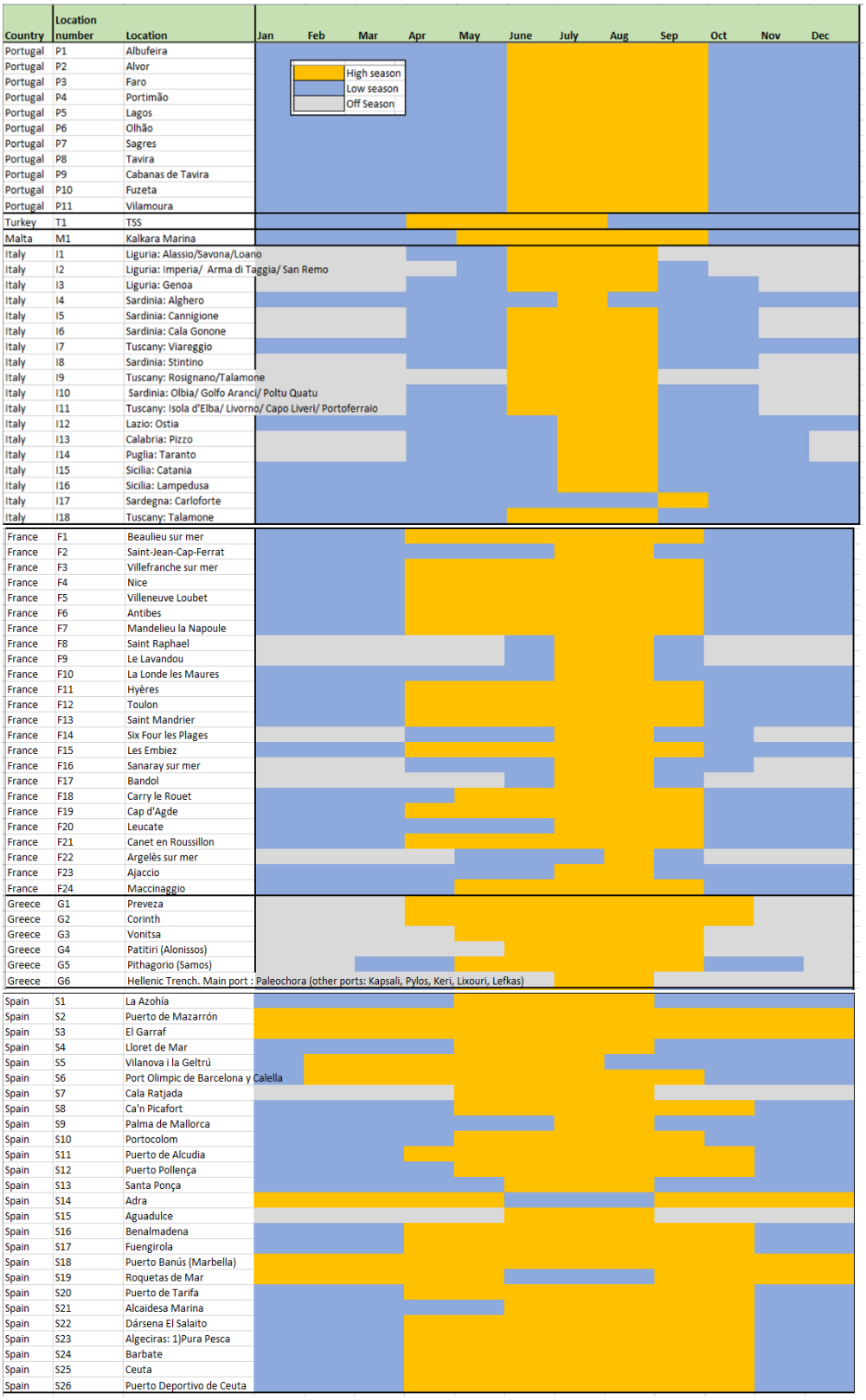


Figure 2a (top) depicts the total number of tour operators exclusively dedicated to whale watching (red), and the cumulative number of vessels that they operate (purple), versus the combined number of Marine tourism operators that also offer whale watching, or regularly include whale watching in their tours (orange). **Figure 2b** (bottom) portrays the cumulative number of whale watching hours (red) versus the cumulative estimated average number of passengers that engage in whale watching in the seven countries that participated in Phase II of the study. Note that the data for Portugal only represents the South-facing coast that is part of the ACCOBAMS area, and the data for Italy only represents selected parts of the coastline.

Figures 2a and 2b demonstrate that while Portugal has the highest number of registered dedicated whale watching operators and vessels dedicated to whale watching, Spain has by far the highest number of average estimated passengers and cumulative hours of whale watching activity, which is probably linked to the fact that a few ports in Spain operate tours from vessels with a capacity for up to 200 or more passengers per tour, while other ports in other countries typically have much lower capacity vessels of 25 or fewer passengers.

Phase II results were also used to map peak seasons (Fig. 3) and provide insight into the times of year at which cetaceans are most likely to be exposed to pressure from whale watching activities.



Country	Location number	Location
Portugal	P1	Albufeira
Portugal	P2	Alvor
Portugal	P3	Faro
Portugal	P4	Portimão
Portugal	P5	Lagos
Portugal	P6	Olhão
Portugal	P7	Sagres
Portugal	P8	Tavira
Portugal	P9	Cabanas de Tavira
Portugal	P10	Fuzeta
Portugal	P11	Vilamoura
Turkey	T1	TSS
Malta	M1	Kalkara Marina
Italy	I1	Liguria: Alassio/Savona/Loano
Italy	I2	Liguria: Imperia/ Arma di Taggia/ San Remo
Italy	I3	Liguria: Genoa
Italy	I4	Sardinia: Alghero
Italy	I5	Sardinia: Cannigione
Italy	I6	Sardinia: Cala Gonone
Italy	I7	Tuscany: Viareggio
Italy	I8	Sardinia: Stintino
Italy	I9	Tuscany: Rosignano/Talamone
Italy	I10	Sardinia: Olbia/ Golfo Aranci/ Poltu Quatu
Italy	I11	Tuscany: Isola d'Elba/ Livorno/ Capo Liveri/ Portoferraio
Italy	I12	Lazio: Ostia
Italy	I13	Calabria: Pizzo
Italy	I14	Puglia: Taranto
Italy	I15	Sicilia: Catania
Italy	I16	Sicilia: Lampedusa
Italy	I17	Sardegna: Carloforte
Italy	I18	Tuscany: Talamone
France	F1	Beaulieu sur mer
France	F2	Saint-Jean-Cap-Ferrat
France	F3	Villefranche sur mer
France	F4	Nice
France	F5	Villeneuve Loubet
France	F6	Antibes
France	F7	Mandelieu la Napoule
France	F8	Saint Raphael
France	F9	Le Lavandou
France	F10	La Londe les Maures
France	F11	Hyères
France	F12	Toulon
France	F13	Saint Mandrier
France	F14	Six Four les Plages
France	F15	Les Embiez
France	F16	Sanaray sur mer
France	F17	Bandol
France	F18	Carry le Rouet
France	F19	Cap d'Agde
France	F20	Leucate
France	F21	Canet en Roussillon
France	F22	Argelès sur mer
France	F23	Ajaccio
France	F24	Maccinaggio
Greece	G1	Preveza
Greece	G2	Corinth
Greece	G3	Vonitsa
Greece	G4	Patitiri (Alonissos)
Greece	G5	Pithagorio (Samos)
Greece	G6	Hellenic Trench. Main port : Paleochora (other ports: Kapsali, Pylos, Keri, Lixouri, Lefkas)
Spain	S1	La Azohía
Spain	S2	Puerto de Mazarrón
Spain	S3	El Garraf
Spain	S4	Lloret de Mar
Spain	S5	Vilanova i la Geltrú
Spain	S6	Port Olimpic de Barcelona y Calella
Spain	S7	Cala Ratjada
Spain	S8	Ca'n Picafort
Spain	S9	Palma de Mallorca
Spain	S10	Portocolom
Spain	S11	Puerto de Alcudia
Spain	S12	Puerto Pollença
Spain	S13	Santa Ponça
Spain	S14	Adra
Spain	S15	Aguadulce
Spain	S16	Benalmadena
Spain	S17	Fuengirola
Spain	S18	Puerto Banús (Marbella)
Spain	S19	Roquetas de Mar
Spain	S20	Puerto de Tarifa
Spain	S21	Alcaidesa Marina
Spain	S22	Dársena El Salaito
Spain	S23	Algeciras: 1)Pura Pesca
Spain	S24	Barbate
Spain	S25	Ceuta
Spain	S26	Puerto Deportivo de Ceuta

Figure 3: Indication of high, low seasons for whale watching in the ACCOBAMS region. Note that not all respondents indicated the possible 'off seasons'.

Not surprisingly, in general Figure 3 demonstrates that the vast majority of whale watching in the ACOBAMS region takes place in the spring and summer months, between April and September. Only in a two locations in the south of Spain is this trend reversed, with low season occurring during the months of July and August.

Country-specific data and trends

While the data above provide a broad-scale overview of whale watching in the ACCOBAMS area, examining data more closely at a country-by country level provides more detailed insight into trends. It is also at this scale that we are able to look more closely at the species that are targeted for whale watching in different areas and the resulting potential vulnerabilities, and to compare the data collected for this report with data available from previously published sources. More details on scope, scale and characteristics of whale watching operations in all 87 that were included in this study can be found in the Supplementary Material to this report, which is available on request from the ACCOBAMS Secretariat.

France

Data overview

Data was compiled by Miraceti for the entire Mediterranean coast of France. Whale watching activities were quantified for a total of 24 ports and harbours, including two in Corsica. The cumulative whale watching hours are portrayed in Figure 4 below.

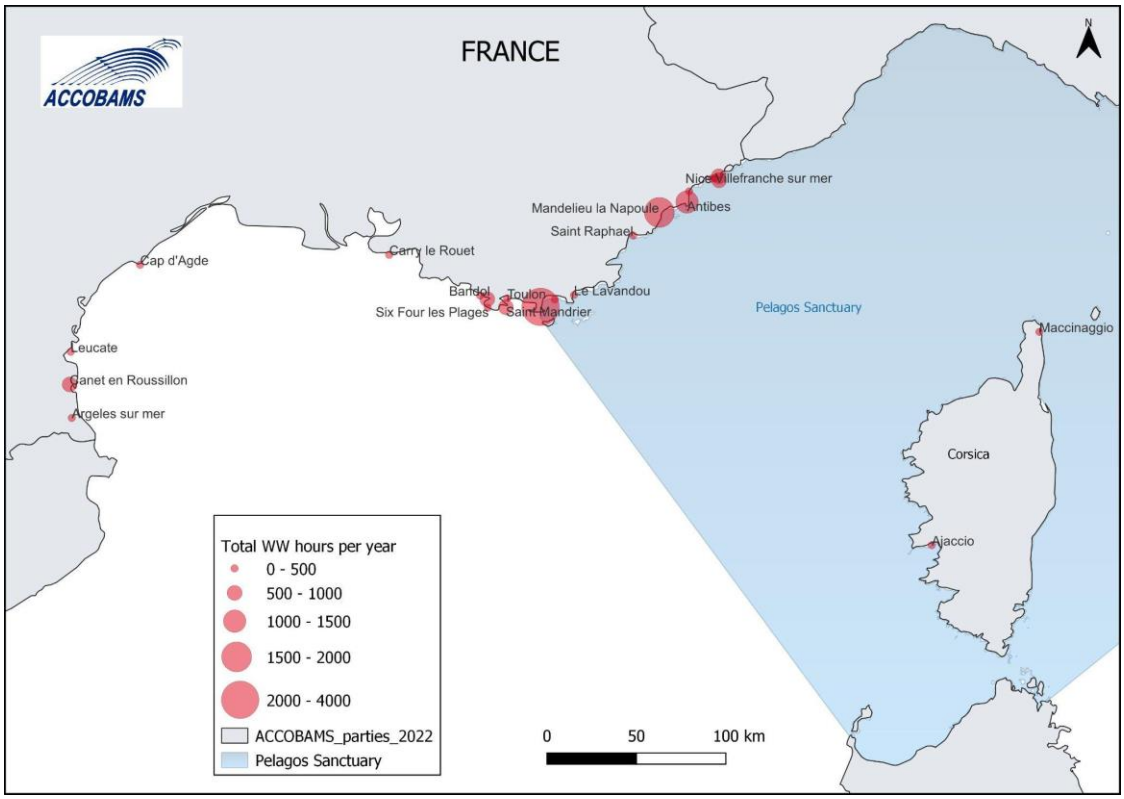


Figure 4: Depiction of the intensity of whale watching activities conducted from 24 ports on the Mediterranean coast of the French mainland, as well as two locations on Corsica, represented by estimated cumulative annual hours of whale watching activities conducted from each port. Note that the size of the pink symbols does *not* reflect the geographical range of whale watching tours, which is represented in figure 5.

Commercial whale watching tours from the 24 ports and harbours that were analysed in the study are conducted from a variety of platforms, ranging from a minimum vessel length of 6m (from the port of Villeneuve-Loubet), to a maximum length of 27.5m (from Le Lavandou). The most common type of engines used are inboard diesel engines ranging from 20hp to 3000hp, although 10 of the 24 ports also include vessels that are powered by wind (sails) or electric motors. Tour operators from 11 of the 24 harbours do not use any auxiliary means to locate cetaceans, while VHF radio contact with other vessels is used to help locate cetaceans in 6 locations, aerial spotting planes are used in four locations (Villefranche-sur-Mer, Antibes, Mandelieu-la-Napoule, and Carry-le-Rouet), and hydrophones are used in three locations.

The target species of whale watching operations for the 24 locations included in this study included (in order of frequency that they were listed for each location) common bottlenose dolphins (*Tursiops truncatus*, Tt), fin whales (*Balaenoptera physalus*, Bp), striped dolphins (*Stenella coeruleoalba*, Sc), sperm whales (*Physeter macrocephalus*, Pm), long-finned pilot whales (*Globicephala melas*, Gm), Risso's dolphins (*Grampus griseus*, Gg), and Cuvier's beaked whales (*Ziphius cavirostris*, Zc). Figure 5 below indicates which species are targeted in each location.

There was wide variation in the distance typically covered by tours. Ranges were estimated based on the data compilers knowledge of specific operators with whom they had collaborated, data from surveys mapping the presence of whale watching vessels in 2017 (Gimenez et al., 20189), and testimonies from whale watching tour operators about their own, and competitors' practices. Ranges along shore varied from 0 to 70 kilometres, while offshore distances ranged from 10-100km. Figure 5 provides an indication of the relative ranges of whale watching operations in the ports and harbours included in this study.

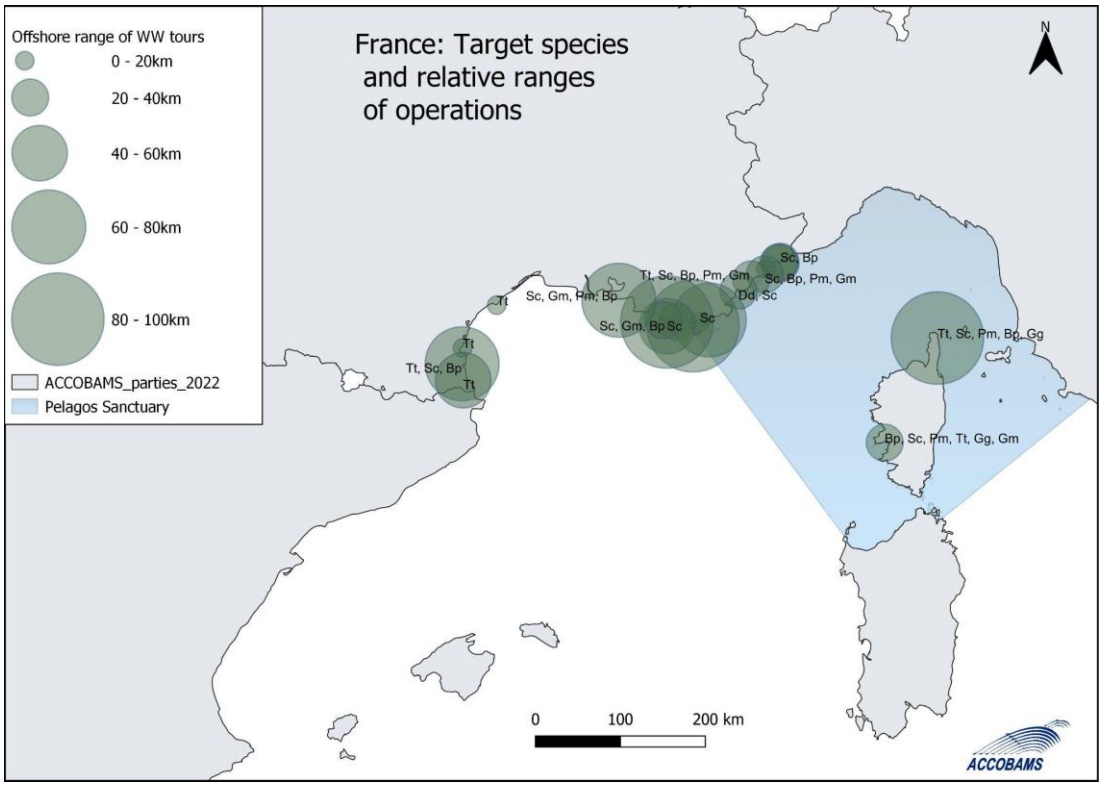


Figure 5: Target cetacean species (represented by the initials of their scientific names) and relative ranges (represented by green circles) of whale watching operations from each port or harbour included in this study. Note that the size of the green circles is based on reported ranges *offshore*, and are proportional to, but not exactly aligned with the estimated offshore ranges of tours. Note also that the species are presented in the order that data collectors reported them.

Comparison with previous studies and information sources

The data presented here align with the information presented on whale watching operations in Carwardine's 2016 review of whale watching on the Mediterranean coast of France and the Pelagos Sanctuary (Carwardine, 2016), both in terms of locations from which whale watching tours depart and the target species that are seen in the coastal and shelf waters of the Gulf of Lion on the western portion of the Mediterranean and the more varied habitats in the Pelagos Sanctuary. These findings also echo those of Mayol et al. (2007; 2014), in terms of locations where whale watching takes place, and the nature of whale watching tours, many of which occur in combination with other marine wildlife tours, and are difficult to classify exclusively as whale watching. The low proportion of dedicated whale watching tour operators (6) recorded in this study compared to marine tourism operators that also offer whale watching, or for which whale watching features as part of broader tours (22) echoes the findings of Mayol et al. (2007). The overall number of operators (33) is also slightly higher than those recorded by Mayol et al., who recorded sharp increases in whale watching tours from 1970-2007. A later study (Chazot et al., 2020) documented a total of 38 operators involved in whale watching tours in 2019. However, some of these operators were not included in this study as their activities did not meet the definition of 'commercial' whale watching. Data compilers familiar with whale watching activity on the French coastline believe that the overall level of whale watching activity has remained stable and/or possibly increased slightly since 2019.

Off the coasts of Corsica and the Gulf of Lion, the most frequently targeted species, also the species most likely to be observed, is the common bottlenose dolphin. This species' overlapping distribution with a range of human activities, including trawl fishing and private leisure boats (both motorised and sailing boats), as well as whale watching formed the focus of a study conducted in 2019 (Gimenez et al., 2019). This study, based on nearly 35,000kms of survey effort throughout Gulf of Lion and along the Ligurian coast, identified areas of high relative abundance of bottlenose dolphins on the western portion of the Gulf of Lion, which coincide with the locations where the species is often the only target species for whale watching, especially in areas where tours do not range further offshore (see Fig. 5).

Gimenez et al. also highlighted a number of areas where bottlenose dolphin distribution overlaps with a range of observed human activities, including whale watching, that could disrupt important life cycle activities such as foraging, resting and nursing (Figure 6). These areas overlap with the areas highlighted as whale watching hotspots in this study, including Toulon, (Cap d')Agde, and Porte-Vendres/Argeles sur Mer.

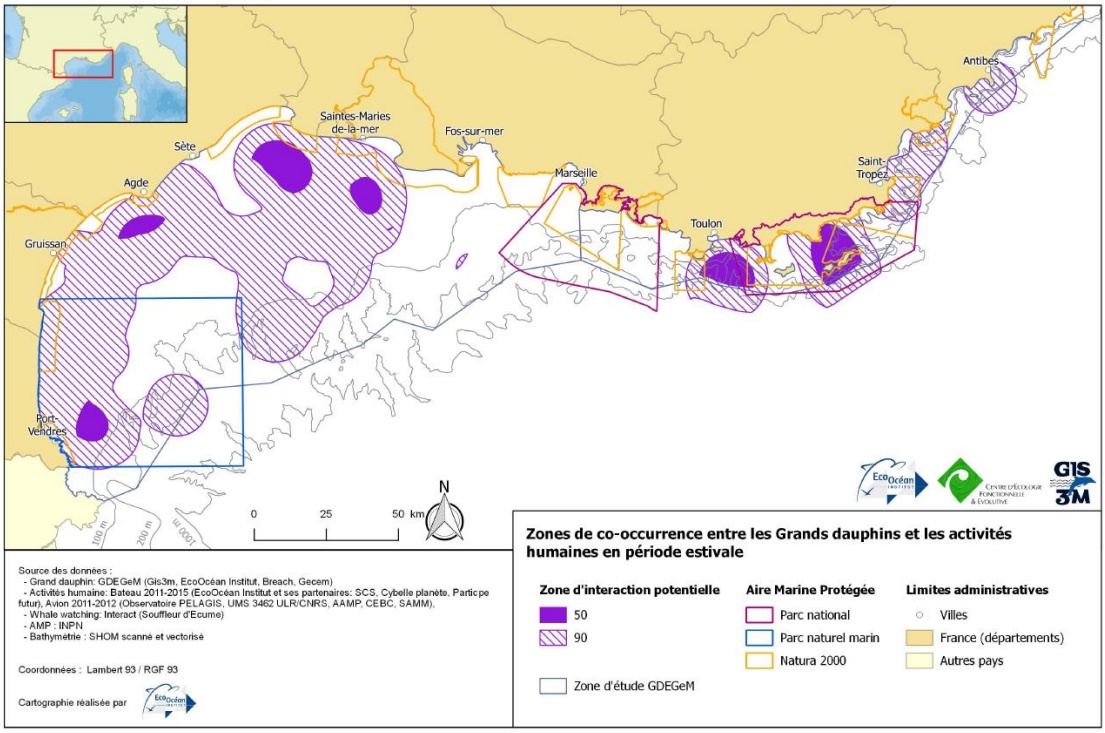


Figure 6. Reproduced from Gimenez et al., 2019. Littoral et Mer Programme de recherche participative Les futurs des mondes du littoral et de la mer. Rapport final, Centre d'Écologie Fonctionnelle et Évolutive (CEFE). Hotspots for interaction between bottlenose dolphins (Tursiops truncatus) and human activities, denoted by the solid purple polygons, which represent 50% of the potential interactions, and the striped purple polygons, which represent the zones where 90% of interactions are likely to take place.

The species targeted by whale watching operations on the Provence coast, on the other hand, are more varied. Here the bathymetry is more varied, and whale watching operations more frequently target striped dolphins (*Stenella coeruleoalba*), fin whales (*Balaenoptera physalus*) and sperm whales (*Physeter macrocephalus*). While the Mediterranean population of striped dolphins is considered Least Concern on the IUCN Red List of Threatened Species (Lauriano, 2022), the Mediterranean subpopulations of fin whales and sperm whales are both considered Endangered (Panigada et al, 2021; Pirotta et al., 2021). While the threats of ship strikes and underwater noise from ferries and large vessel traffic are considered the main threats to these populations, whale watching activities on this part of the French coastline, and particularly in the Pelagos Sanctuary should be carefully monitored to ensure that they are not introducing additional pressure on these threatened populations.

Greece

Data overview

Data on whale watching activities in Greek waters was compiled by the Pelagos Cetacean Research Institute. Whale watching activities were quantified for six ports and harbours. The cumulative whale watching hours for these six locations are portrayed in Figure 7 below.

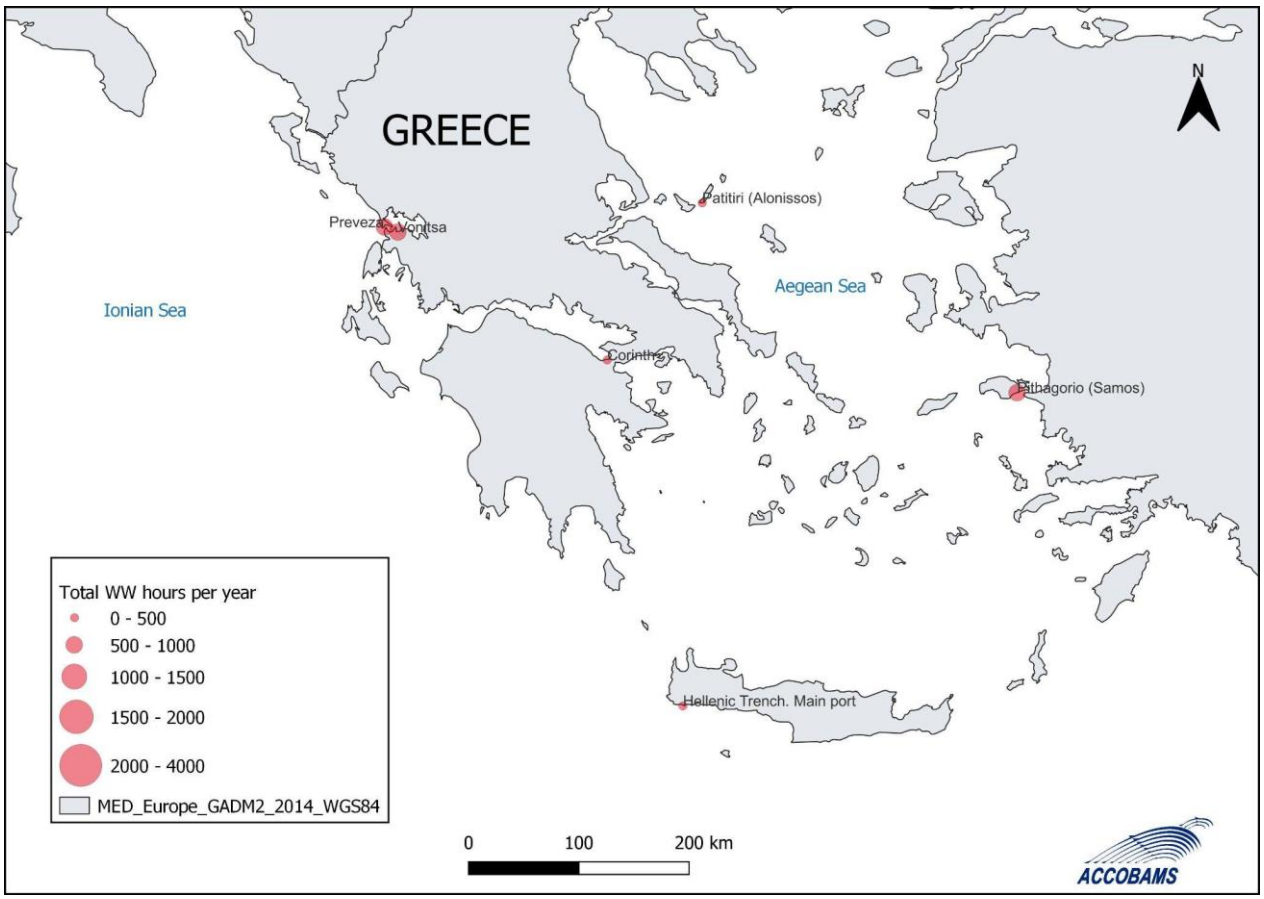


Figure 7: Depiction of the intensity of whale watching activities conducted from six locations in Greece, represented by estimated cumulative annual hours of whale watching activities conducted form each port. Note that the size of the pink symbols does not reflect the geographical range of whale watching tours, which is represented in figure 8.

Whale watching tours from the six ports and harbours that were analysed in the study are conducted from a variety of platforms, ranging from a minimum vessel length of 7m to a maximum length of 22m. The most common type of engines used are inboard diesel engines ranging from 110hp to 450hp. Only two ports report (also) using outboard diesel motors, and only one port includes sailing in combination with inboard diesel. Interestingly, operations from 4 of the 6 ports in this study are conducted as research ecotourism activities, and only one port (Corinth) offers dedicated commercial whale watching tours, while another (Preveza) includes a marine tour operator who also offers commercial whale watching.

Tours from four of the six ports do not use any auxiliary means to locate cetaceans, while two ports from which sperm whales are target species (Pithagorio on Samos, and the Hellenic Trench) also use hydrophones to help locate cetaceans. The target species of whale watching operations for the six locations included in this study included (in order of frequency) common bottlenose dolphins (*Tursiops truncatus*, Tt), striped dolphins (*Stenella coeruleoalba*, Sc), short-beaked common dolphins (*Delphinus delphis*), sperm whales (*Physeter macrocephalus*, Pm), Risso's

dolphins (*Grampus griseus*, Gg), and Cuvier's beaked whales (*Ziphius cavirostris*, Zc). Figure 8 below indicates which species are targeted in each location.

There was wide variation in the distance typically covered by tours. The reported ranges are generally small, with no tours reported to range more than 28km offshore. Tours tended to range further *alongshore* with a minimum reported distance of 30km and a maximum of 52km (mean 42km).

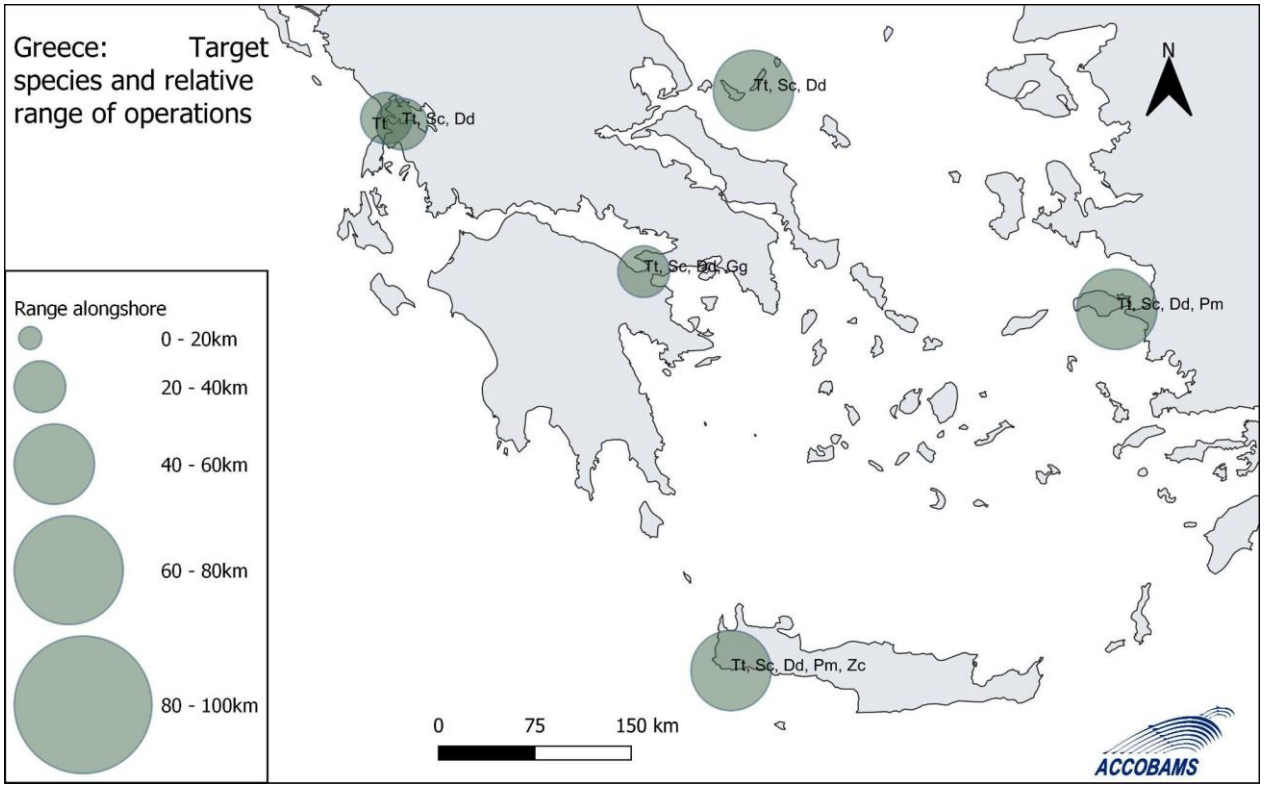


Figure 8: Target cetacean species (represented by the initials of their scientific names) and relative ranges of whale watching operations (represented by green circles) from each port or harbour included in this study. Note 1: the size of the green circles is based on reported ranges *alongshore*, and are proportional to, but not exactly aligned with the estimated alongshore ranges of tours. Note 2: the southernmost symbol, located in the southwest corner of Crete represents research-based whale watching activities that occur throughout the wider research area of the Hellenic Trench, which actually includes up to six separate ports: Paleochora, Kapsali, Pylos, Keri, Lixouri, Lefkas, and different species are encountered in different sections of this wider area.

Comparison with previous studies and information sources

The data presented here align with the information presented on whale watching operations in Carwardine's 2016 review of whale watching in Greece (Carwardine, 2016), both in terms of locations from which whale watching tours depart and the target species that are seen around the Greek Islands. One notable difference, however, is that Carwardine indicates that fin whales and harbour porpoises are seen regularly in the area, while these species were not indicated as a focal species for whale watching operations evaluated in this study.

The density of commercial whale watching effort around the Greek islands appears to be low and limited geographically in comparison with other parts of the Mediterranean/ACCOBAMS region, and as such is unlikely to be contributing to other human pressures on cetacean populations. The sperm whales of the Hellenic trench are of great conservation concern, particularly in relation to vessel traffic and the risk of ship strikes (Frantzis et al., 2014; Cates et al., 2017; Frantzis et al., 2019; Oceanmind, 2020). However, the whale watching activities reported in this study would not appear to be placing any additional pressure on this population, given the low density of annual whale

watching effort (<500 hours, see Table 2 and Fig. 7), and the fact that tours in and around the Hellenic Trench are conducted under the auspices of research groups, who use boats powered by wind/sails whenever possible and take great care not to disturb the animals' natural behaviour.

Italy

Data overview

Data for Mediterranean coast of Italy and Sardinia was collected by the CIMA Foundation. Whale watching activities were quantified for 18 ports and harbours along the northern and central Tyrrhenian coast of Italy, including Sardinia. Data was not compiled for the southern Tyrrhenian coast (with the exception of Pizzo in Calabria), Adriatic and Ionian coasts, and only one location (Catania) was researched in Sicily. The cumulative whale watching hours for each port/harbour included in this study are portrayed in Figure 9 below.

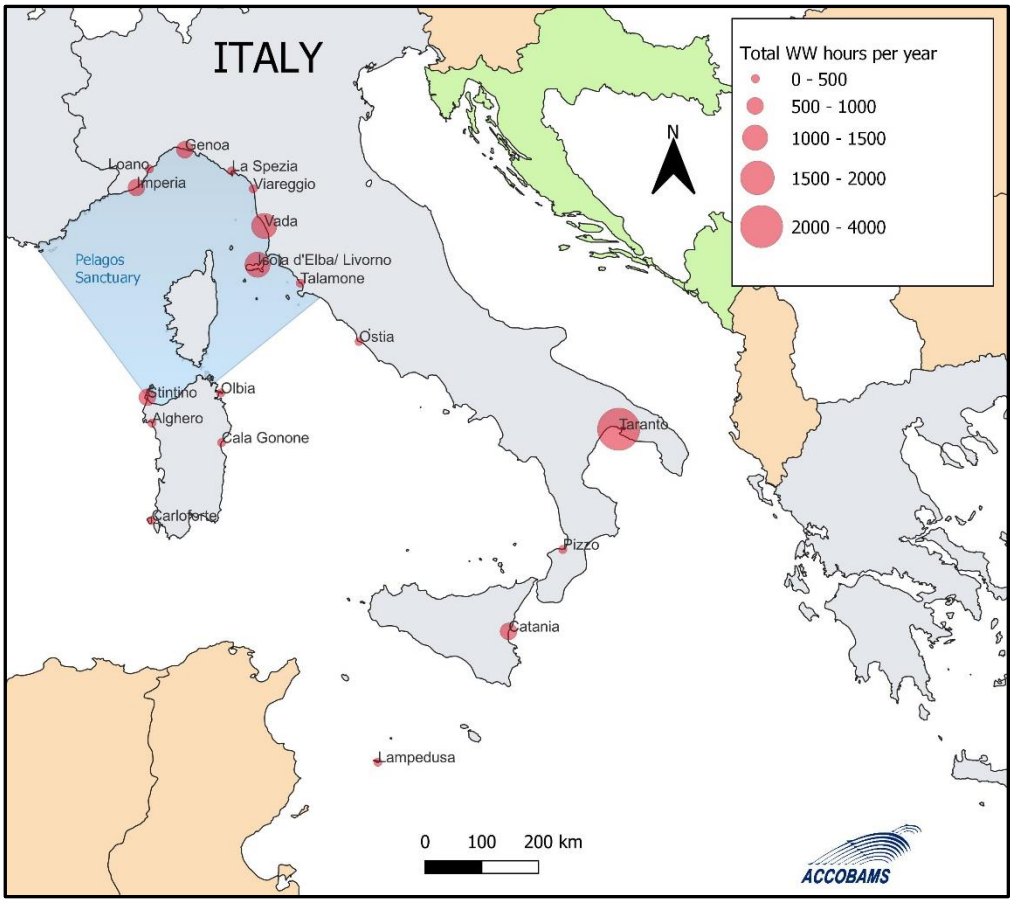


Figure 9: Depiction of the intensity of whale watching activities conducted from 18 locations in Italy and one in Malta, represented by estimated cumulative annual hours of whale watching activities conducted from each port. Note that the size of the pink symbols does not reflect the geographical range of whale watching tours, which is represented in figure 10.

Whale watching tours from the 18 ports and harbours that were analysed in the study are conducted from a variety of platforms, ranging from a minimum vessel length of 6-7m (several locations) to a maximum length of 28.7m (Liguria Alassio). The most common type of engines used were inboard diesel engines ranging from 40hp to 1050hp. Four ports report (also) using outboard petrol motors, and seven include sailing. The ports of Carloforte in Sardinia and Talamone in Tuscany only use sailing boats for whale watching operations.

Auxiliary means to locate cetaceans are used in only three locations where hydrophones are used, usually only by research groups offering ecotourism. The target species of whale watching operations for the 18 locations included in this study included (in order of frequency) common bottlenose dolphins (*Tursiops truncatus*, Tt), striped dolphins (*Stenella coeruleoalba*, Sc), fin whales (*Balaenoptera physalus*, Bp), sperm whales (*Physeter macrocephalus*, Pm), Risso's dolphins (*Grampus griseus*, Gg), long-finned pilot whales (*Globicephala melas*, Gm), and Cuvier's beaked whales (*Ziphius cavirostris*, Zc). Figure 10 below indicates which species are targeted in each location.

There was wide variation in the distance typically covered by tours. Ranges along shore varied from 6 to 100 kilometres, while offshore distances ranged from 4 to 100km. Figure 10 provides an indication of the relative ranges of whale watching operations in the ports and harbours included in this study.

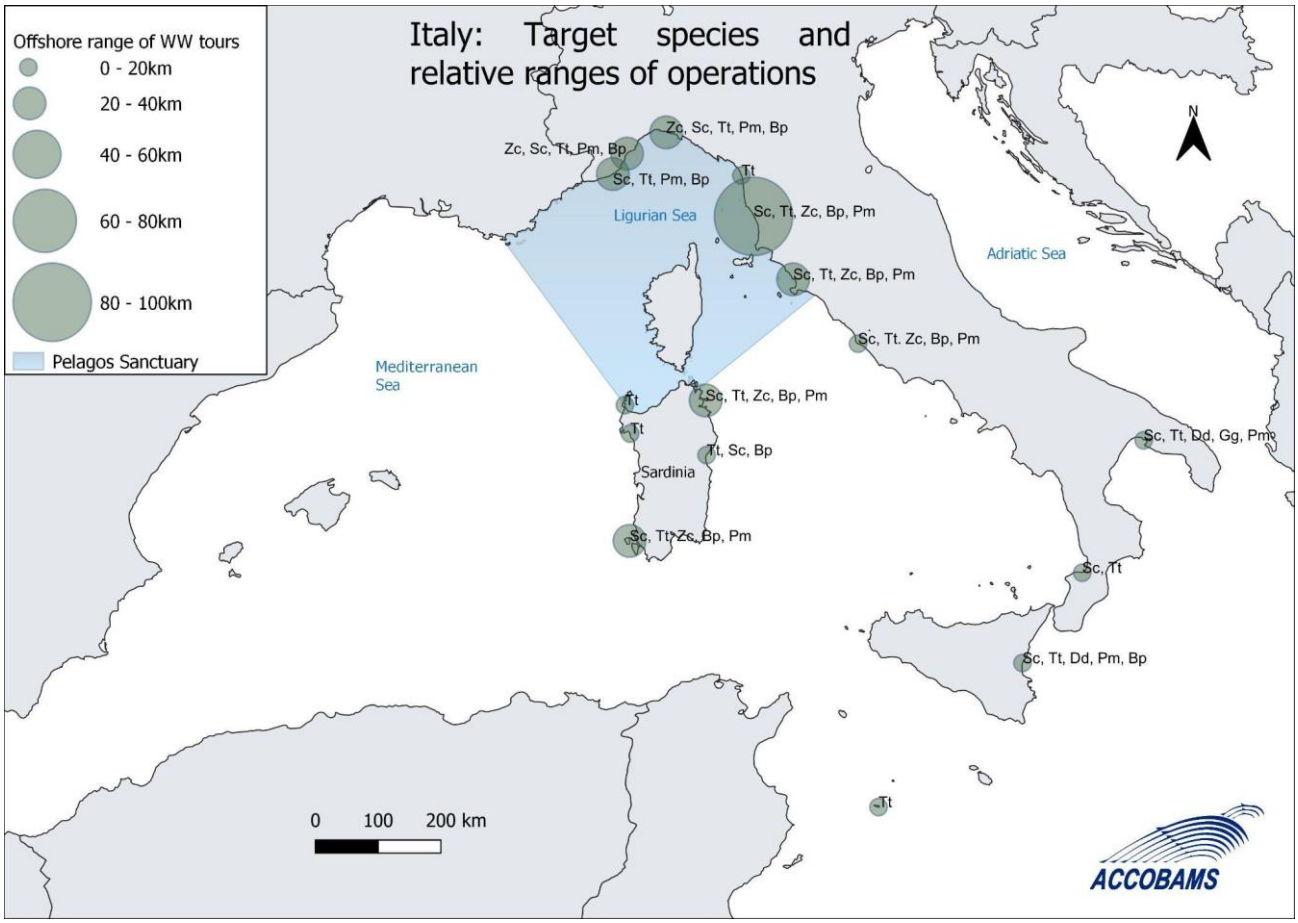


Figure 10: Target cetacean species (represented by the initials of their scientific names) and relative ranges (represented by green circles) of whale watching operations from each port or harbour included in this study. Note that the size of the green circles is based on reported ranges *offshore*, and are proportional to, but not exactly aligned with the estimated offshore ranges of tours. Note also that the species are presented in the order that data collectors reported them.

Comparison with previous studies and information sources

The data presented here align with the information presented on whale watching operations in Carwardine's 2016 review of whale watching in Italy (Carwardine, 2016), both in terms of locations from which whale watching tours depart and the target species that are seen on the Ligurian and Tyrrhenian coasts of Italy. Carwardine places emphasis on the occurrence of fin whales, particularly within the Pelagos Sanctuary, as well as the fairly intense cross-border

marine tourism/whale watching operations that take place between Nice (France) and San Remo/Imperia (Italy). The results of this study reflect a significant increase in whale watching activity in Italy, particularly along the Ligurian coastline and within the Pelagos Sanctuary, as documented by Tepisch et al. (2020), who surveyed whale watching customers in the summers of 2016 and 2017. They documented a growing industry that contrasted with the low number of operators documented by Fortuna et al. in 2004 (Fortuna et al., 2004), when only four truly commercial operators were offering whale watching in the Italian waters of the Ligurian Sea. In 2004, Fortuna et al. documented a higher number of marine tour operators who also engaged in dolphin watching, and this trend has continued, with the current study documenting 17 marine tour operators that also offer whale watching tours and 14 marine tour operators that frequently encounter cetaceans during their tours, and only 6 operators that exclusively specialise in whale watching.

While the intensity (as measured by total annual whale watching hours) and the range of whale watching effort on the Italian coastline of the Pelagos Sanctuary is significantly less than on the French side of the border, care should be taken to ensure that whale watching operations do not place additional pressure on the regionally endangered and declining fin whale population (Notarbartolo di Sciara et al., 2016; Panigada et al., 2017; Panigada et al., 2021; David et al., 2022).

Malta

Data overview

Data on whale watching operations in Malta were collected by EcoMarine Malta. Whale watching tours leave from a single port. Tours range up to 24 km offshore, and 10 km alongshore on a vessel that is 14m long and has a capacity for 12 passengers. The vessel uses 95 hp inboard diesel engines, and the two species targeted by operations are common bottlenose dolphins (*Tursiops truncatus*) and striped dolphins (*Stenella coeruleoalba).*

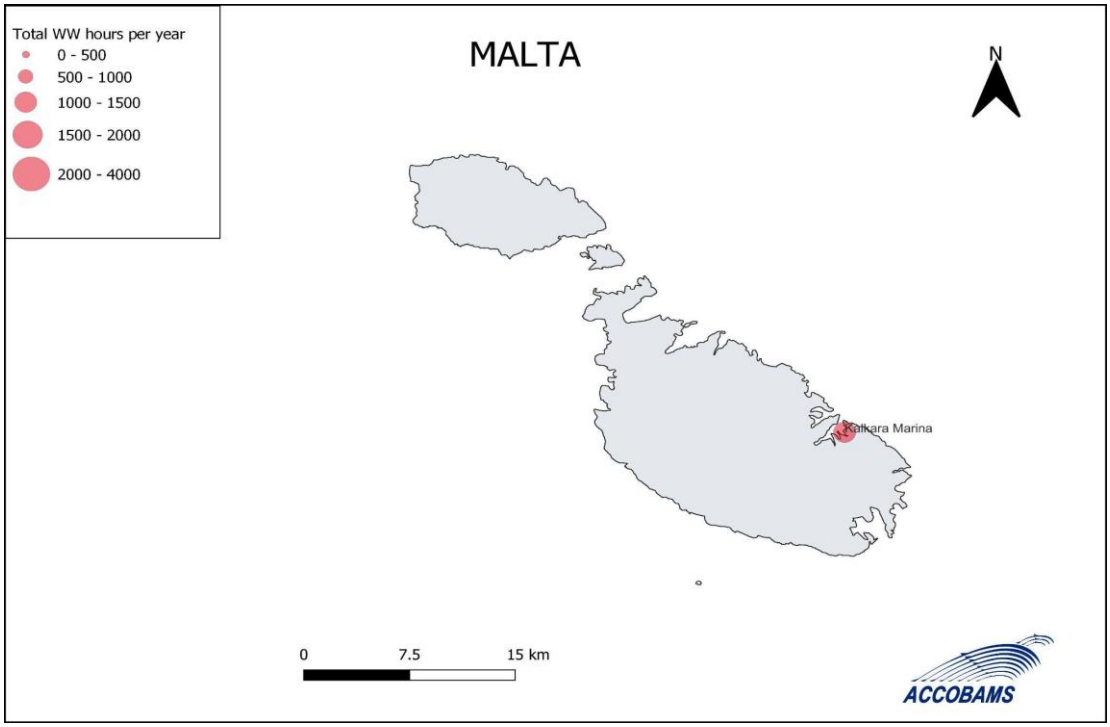


Figure 11: Depiction of the intensity of whale watching activities conducted from a single port in Malta, represented by estimated cumulative annual hours of whale watching activities conducted from this port. Note that the size of the pink symbols does not reflect the geographical range of whale watching tours, which is represented in figure 10.

Comparison with previous studies and information sources

Carwardine (2016) does not address whale watching in Malta, and there appear to be no peer-reviewed publications on cetacean watching activities in Malta.

Portugal

Data overview

Data for the south-facing coast of Portugal (corresponding to the portion of Portugal's coastline included in the ACCOBAMS area), was collected by the Instituto da Conservação da Natureza e das Florestas. Whale watching activities were quantified for 11 ports and harbours. The cumulative whale watching hours for each port/harbour in this study are portrayed in Figure 12 below.

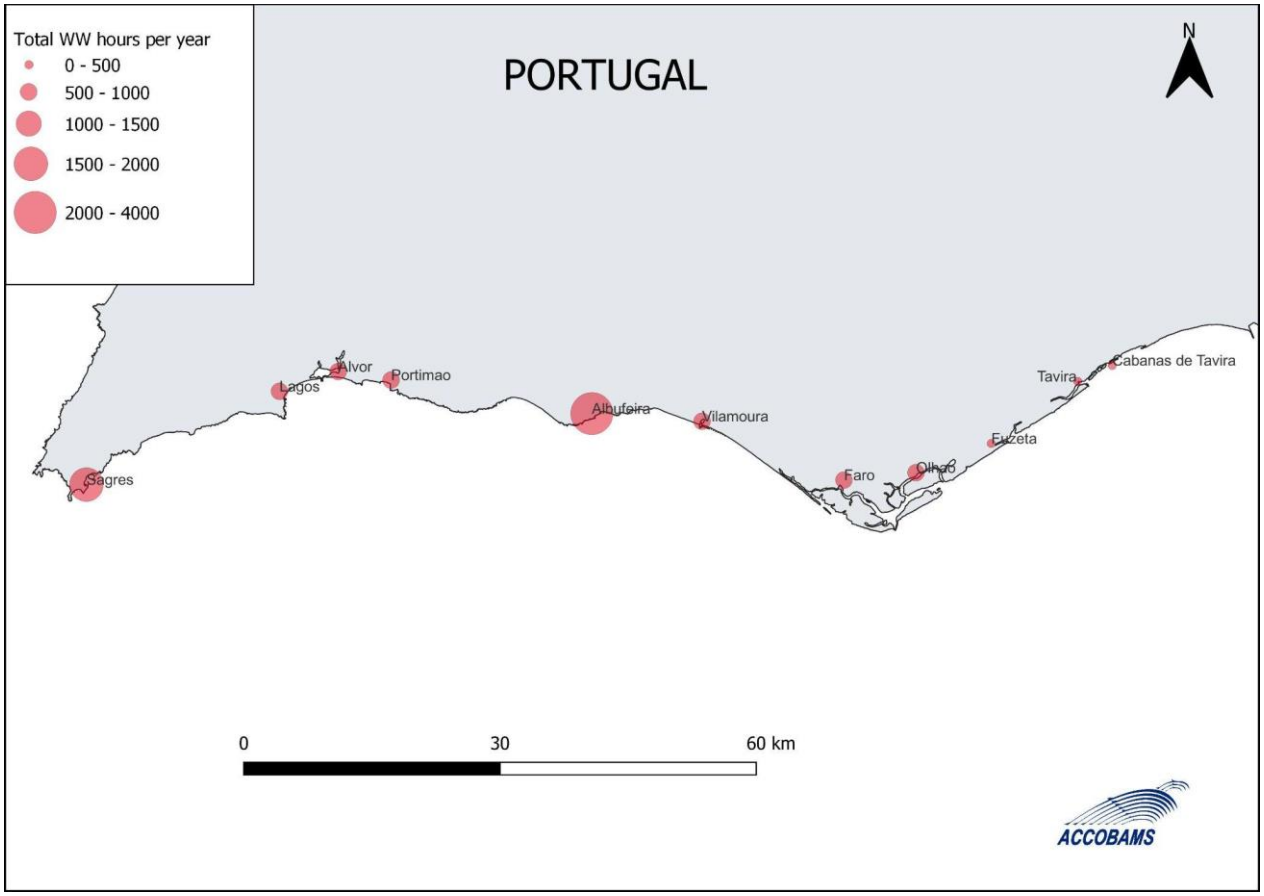


Figure 12: Depiction of the intensity of whale watching activities conducted from 11 locations in the ACCOBAMS portion of Portugal's coastline, represented by estimated cumulative annual hours of whale watching activities conducted form each port. Note that the size of the pink symbols does not reflect the geographical range of whale watching tours, which is represented in figure 13.

Whale watching tours from the 11 ports and harbours that were analysed in the study are conducted from a variety of platforms, ranging from a minimum vessel length of 5m to a maximum length of 17.7m. A combination of outboard petrol and inboard diesel engines are used in all 11 ports, ranging from 40hp to 1410hp.

Auxiliary means to locate cetaceans are not used in any of the 11 locations. More details on scope, scale and characteristics of whale watching operations in all 11 ports can be found in the Supplementary Material to this report, which is available on request from the ACCOBAMS Secretariat.

Common dolphins (*Delphinus delphis*, Dd), and common bottlenose dolphins (*Tursiops truncatus*, Tt), are the two main species regularly targeted by whale watching operations in these areas of Portugal. Nevertheless fin whales (*Balaenoptera physalus*, Bp), minke whales (*Balaenoptera acutorostrata*, Ba) and killer whales (*Orcinus orca*, Oo) can also be seen during the summer season when these species (particularly Bp and Oo) migrate into the Mediterranean sea. Figure 13 below indicates which species are targeted in each location, as well as the maximum distance typically covered by tours in each area. Almost all operations typically range roughly 14km offshore and 18km alongshore, with the exception of tours from Alvor, which can range up to 50km alongshore.

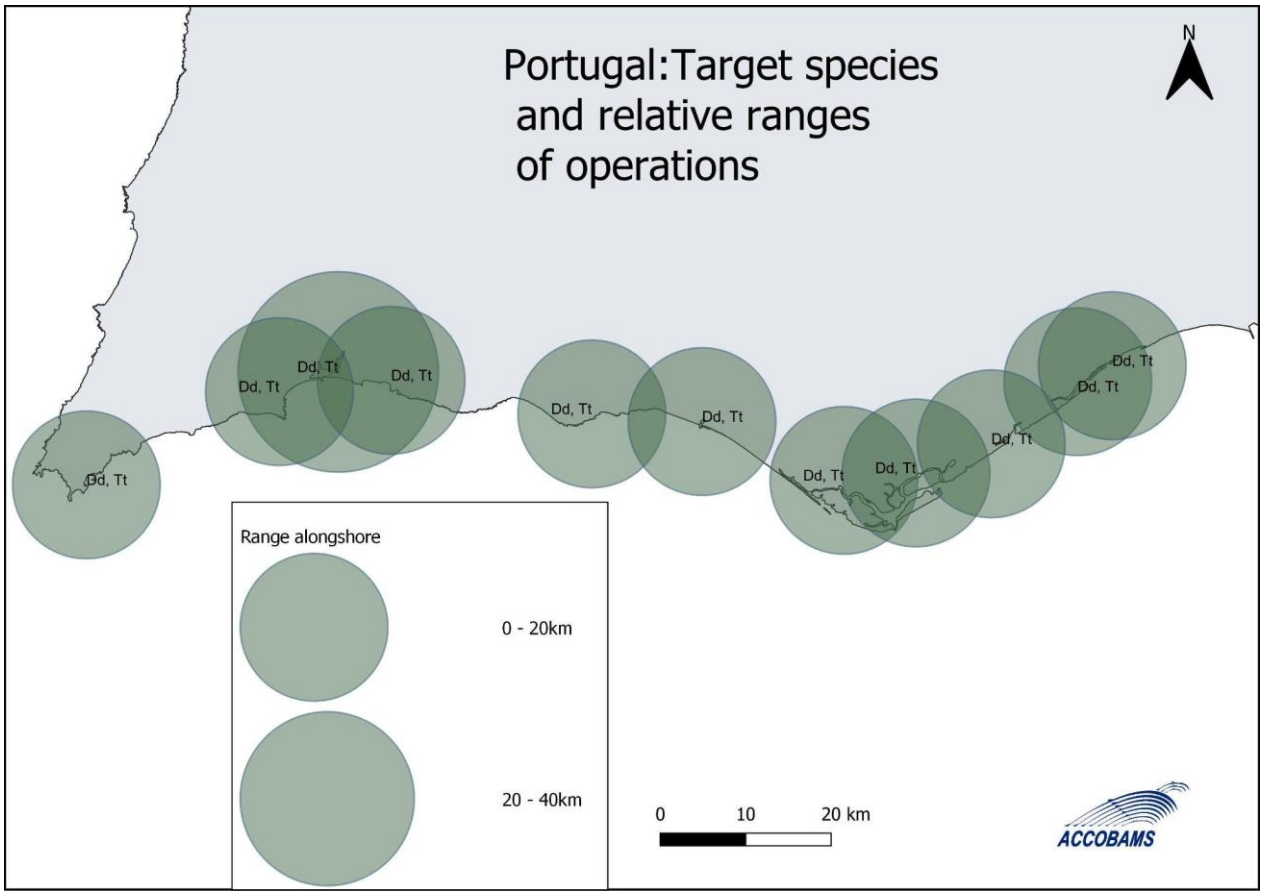


Figure 13: Target cetacean species (represented by the initials of their scientific names) and relative ranges of whale watching operations (represented by green circles) from each port or harbour included in this study. Note that the size of the green circles is based on reported ranges *alongshore*, and are proportional to, but not exactly aligned with the estimated alongshore ranges of tours. Note also that the species are presented in the order that data collectors reported them.

Comparison with previous studies and information sources

The data presented here align with the information presented on whale watching operations in Carwardine's 2016 review of whale watching in Portugal (Carwardine, 2016), both in terms of locations from which whale watching tours depart and the target species that are seen south-facing coast of Portugal. Unlike the other countries included in this study, all of the Portuguese operations included here are registered as dedicated whale watching tour operators.

Figures 11 and 12 demonstrate that whale watching operations are evenly disturbed along the coastline, with relatively little overlap in their ranges. Neither the bottlenose dolphins or common dolphins most regularly targeted by whale watching operations is considered threatened on a global or regional scale. However, the fin whales and killer whales that are sometimes observed during tours both represent Endangered subpopulations (Panigada et al., 2021; Esteban et al., 2021).

Spain

Data overview

Data for the Mediterranean coast of Spain, including the area around the island of Mallorca and the Strait of Gibraltar, was collected by the S.G. Biodiversidad Terrestre y Marina, Ministerio para la Transición Ecológica y el Reto Demográfico. Whale watching activities were quantified for 26 ports and harbours. The cumulative whale watching hours for each port/harbour in this study are portrayed in Figure 14 below.

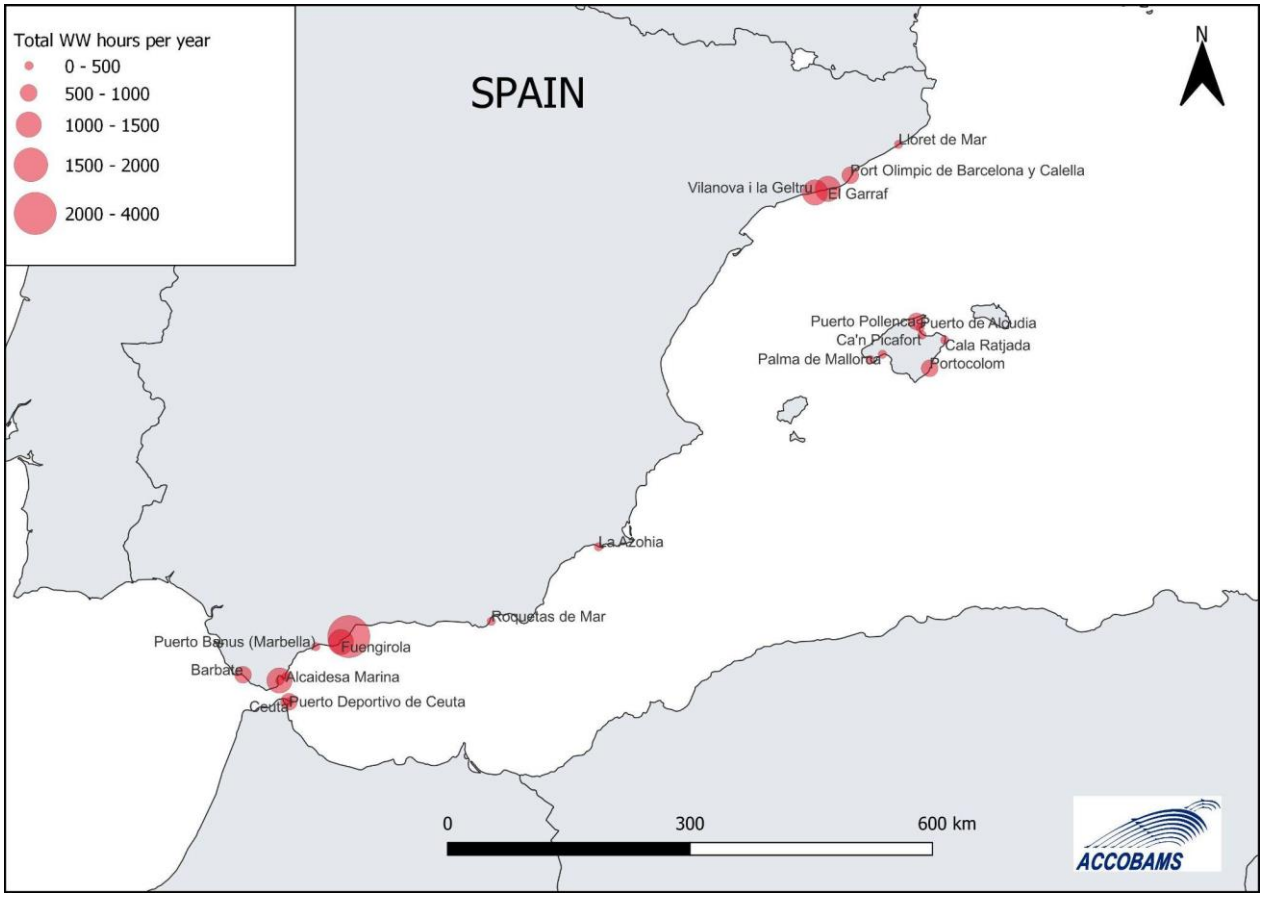


Figure 14: Depiction of the intensity of whale watching activities conducted from 26 locations in the ACCOBAMS portion of Spain's coastline, represented by estimated cumulative annual hours of whale watching activities conducted from each port. Note that the size of the pink symbols does not reflect the geographical range of whale watching tours, which is represented in figure 15.

Whale watching tours from the 26 ports and harbours that were analysed in the study are conducted from a variety of platforms, ranging from a minimum vessel length of 5m to a maximum length of 22.7m. The most common type of engines used are inboard diesel engines (15 of 26 locations) and Outboard petrol engines (8/26 locations) ranging

from 15hp to 1000hp. Four ports report that whale watching is conducted from sailing vessels, and only one port includes the use of electric motors.

Auxiliary means to locate cetaceans are used in only one location where research-based tours use hydrophones to assist in the location of cetaceans. More details on scope, scale and characteristics of whale watching operations in all 26 locations can be found in the Supplementary Material to this report, which is available on request from the ACCOBAMS Secretariat.

The target species of whale watching operations for the 26 locations included in this study included (in order of frequency) common bottlenose dolphins (*Tursiops truncatus*, Tt), striped dolphins (*Stenella coeruleoalba*, Sc), fin whales (*Balaenoptera physalus*, Bp), long-finned pilot whales (*Globicephala melas*, Gm), sperm whales (*Physeter macrocephalus*, Pm), Risso's dolphins (*Grampus griseus*, Gg), killer whales (*Orcinus orca*, Oo), and Cuvier's beaked whales (*Ziphius cavirostris*, Zc). Figure 10 below indicates which species are targeted in each location.

There was wide variation in the distance typically covered by tours. Ranges along shore varied from 6 to 100 kilometres, while offshore distances ranged from 4 to 100km. Figure 14 provides an indication of the relative ranges of whale watching operations in the ports and harbours included in this study.

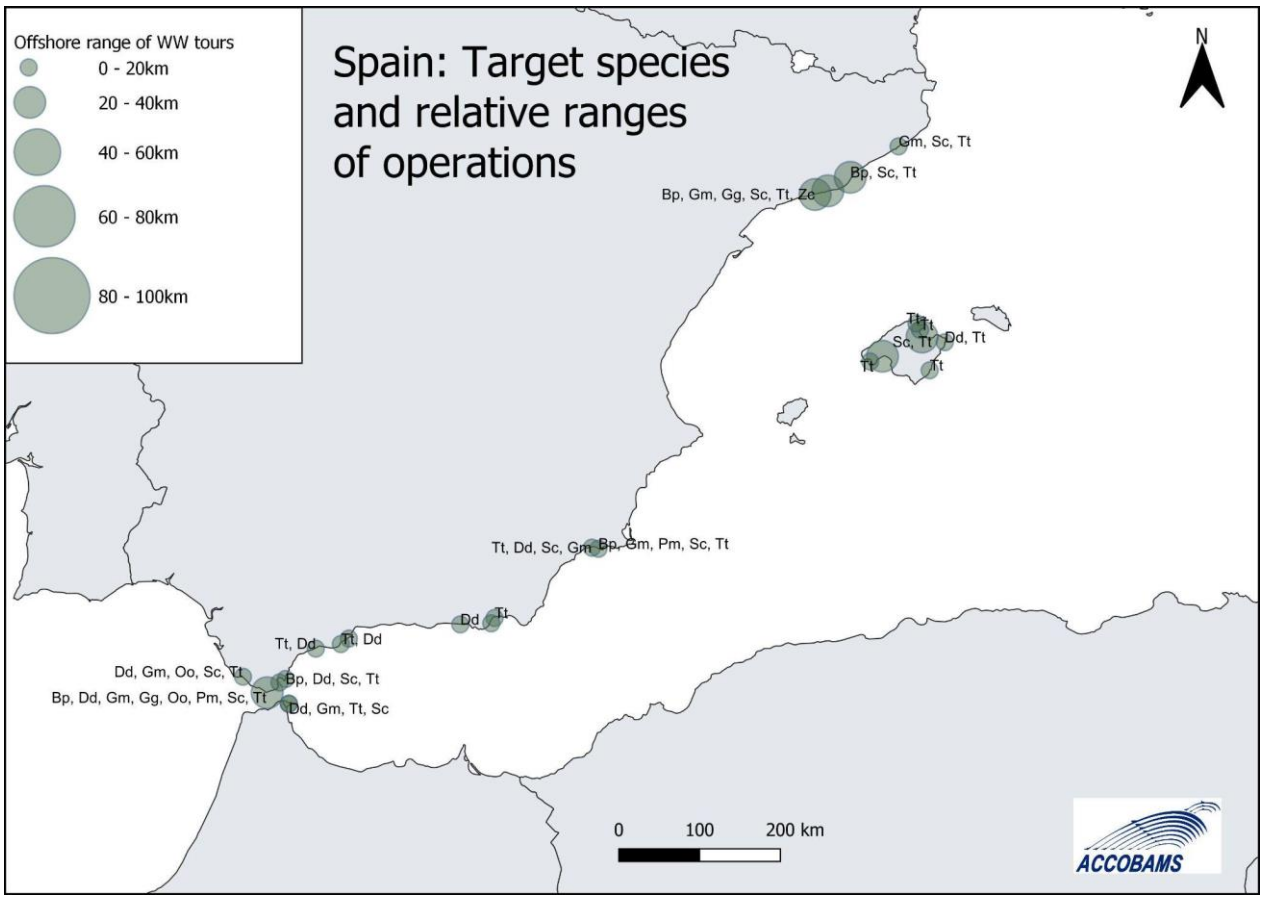


Figure 15: Target cetacean species (represented by the initials of their scientific names) and relative ranges of whale watching operations (represented by green circles) from each port or harbour included in this study. Note that the size of the green circles is based on reported ranges *offshore*, and are proportional to, but not exactly aligned with the estimated offshore ranges of tours. Note also that the species are presented in the order that data collectors reported them.

Comparison with previous studies and information sources

The data presented here align with the information presented on whale watching operations in Carwardine's 2016 review of whale watching in the Spanish waters in the western Mediterranean (Carwardine, 2016), both in terms of locations from which whale watching tours depart and the target species that are seen in the Balearic Sea, the Alboran Sea and the areas around the Strait of Gibraltar.

The Strait of Gibraltar is an area of interest and of conservation concern for several reasons. This area, as well as the Alboran Sea just to the east of it is known to support a high density of cetaceans including a resident and Endangered population of killer whales (de Stephanis et al., 2008; Esteban et al., 2016; Tenan et al., 2020; Esteban et al., 2022), an Endangered Mediterranean population of sperm whales (Rendell and Frantzis, 2016), and Vulnerable Cuvier's beaked whales (Panigada et al., 2017; Cañadas et al., 2018) Figures 13 and 14 indicate that it is an area with a relatively high density of whale watching effort, which was the focus of a 2016 study commissioned by ACCOBAMS to assess the nature, scope, scale, and sustainability of whale watching operations in the area (Cazalla et al., 2016). This study documented an increasing trend in the number of whale watching operators and passengers participating in tours from the ports of Chiclana, Ceuta, Gibraltar and Tarifa between 2000 and 2015 with a shift from dedicated whale watching to more varied marine/adventure tourism that also includes an element of whale watching. The study indicates that Pilot whales, Sperm whales and Killer whales are the species most affected by whale watching in an area already affected by high levels of fishing pressure and maritime traffic (Cazalla et al., 2016). A 2020 study examining the density of shipping in Important Marine Mammal Areas (IMMAs) identified the Alboran Deep IMMA, the area just to the East of the Straits of Gibraltar as the area in the top 5% of ship strike risk of all 173 IMMAs identified at that time (Oceanmind, 2020). Although the level of underwater noise and ship strike risk from whale watching activities is much less likely to present a threat to cetaceans in the area than commercial shipping, the potential cumulative impacts of human activities in this heavily used part of the Mediterranean should be taken into account.

Türkiye

Data overview

Data on commercial whale watching in Turkish waters was collected by the Turkish Marine Research Foundation (TUDAV). Whale watching activities were quantified for only one location in the Istanbul Strait (part of the Turkish Straits System which does not belong ACCOBAMS area), as it was judged that no commercial whale watching activities were currently being conducted in the Black Sea, Aegean, or Mediterranean portions of Türkiye's coastline. The cumulative whale watching hours for this port/harbour is portrayed in Figure 16 below.

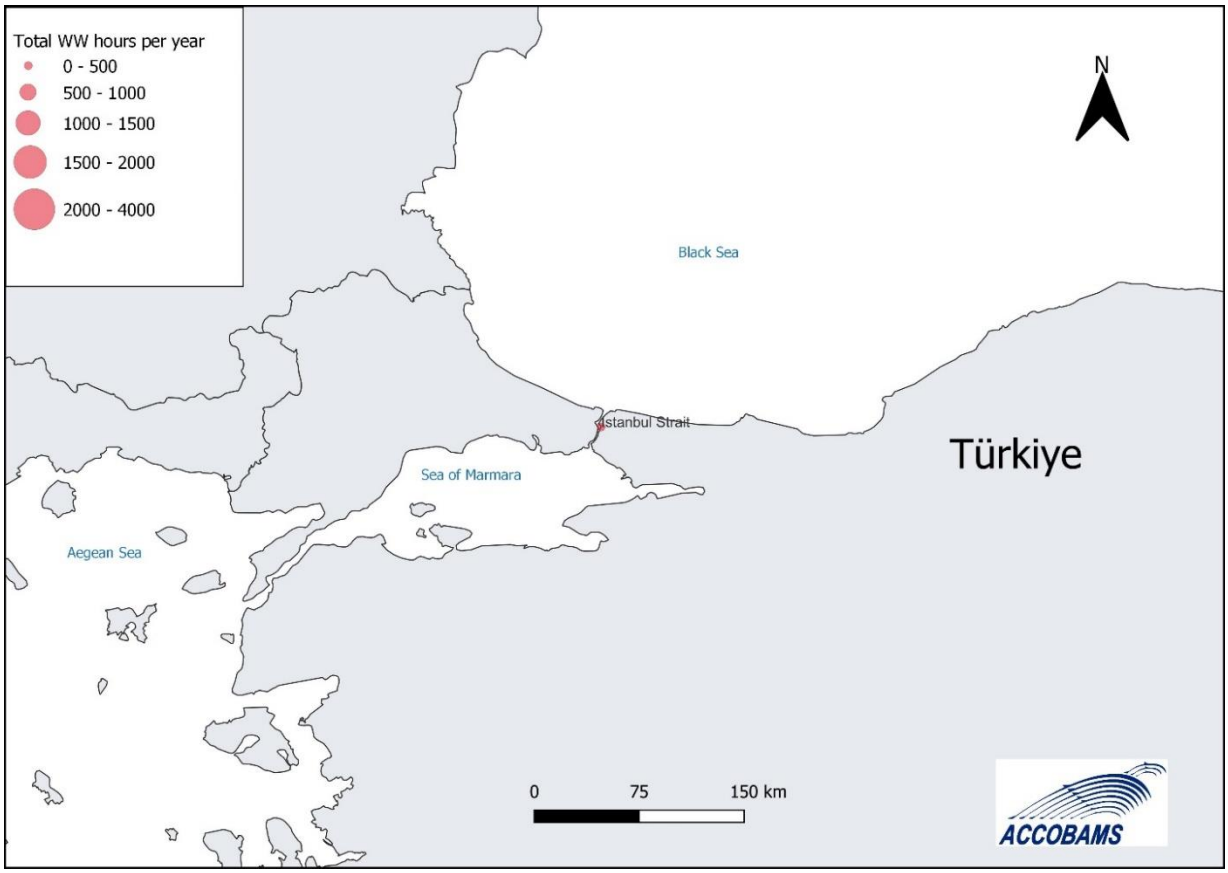


Figure 16: Depiction of the intensity of whale watching activities conducted from the only location on Türkiye's coastline with commercial whale watching activities, represented by estimated cumulative annual hours of whale watching activities conducted from each port. Note that the size of the pink symbol does not reflect the geographical range of whale watching tours.

Whale watching tours from this port are conducted as a research tourism venture and use vessels ranging from 18-33m in length, with a passenger capacity of 5-60 people. The vessels are powered by inboard diesel engines ranging from 270-1300 hp. No auxiliary means are used to locate cetaceans. More details on scope, scale and characteristics of whale watching operations in this location can be found in the Supplementary Material to this report, which is available on request from the ACCOBAMS Secretariat. The whale watching tours in Istanbul Strait have so far aimed to raise public awareness on cetaceans and wildlife in the area while onboard observations were carried out by the experts, and not to profit commercially.

The target species of whale watching operations fin this location are common bottlenose dolphins (*Tursiops truncatus*, Tt), common bottlenose dolphins (*Delphinus delphis*, Dd) and Black Sea harbour porpoises (*Phocoena phocoena relicta*, Ppr). No data was provided on the typical range of the whale watching/research tours.

Comparison with previous studies and information sources

The data presented here align with the information presented on whale watching operations in Carwardine's 2016 review of whale watching in Turkish waters (Carwardine, 2016), both in terms of locations from which whale watching tours depart and the target species that are seen. Carwardine presented whale watching in this area as a nascent industry in 2016, one which may not have had the opportunity to develop as it may have in recent years due to the pandemic.

Discussion and recommendations

This is the first study designed to assess Whale watching pressure at a regional scale within the ACCOBAMS area. While the information provided in the Phase II questionnaire responses was fairly complete for the Western Mediterranean sub-region, the eastern portion of the Mediterranean and Black Sea was only partially assessed. For this reason, the information presented here should be considered as providing only preliminary insight into the distribution and characteristics of ongoing whale watching activities. In the Western Mediterranean region it also provides some indications of potential 'hotspots' where further study and/or management measures may be required.

Possible sources of bias

The methods used to ensure that comparable metrics on whale watching pressure were collected across countries required data collectors to extrapolate required information, in some cases through educated guesses (e.g., on length of tours, number of weekly tours, differences between high and low season, etc.). As such, the numbers represented in Table 2 and the values generated for cumulative annual whale watching hours from each port should be interpreted with caution.

Furthermore, the definitions of commercial whale watching used to guide data collectors in this study, will have excluded the documentation of any additional pressure that may originate from recreational vessels that engage in whale watching activities without being registered as commercial enterprises. This may include private boat rentals or non-profit associations that do not charge for tours, but accept 'membership fees' for clients participating in their activities.

Furthermore, it should also be noted that it was not within the scope of this study to evaluate the behaviour of vessels around cetaceans. Vessels that adhere to approach guidelines, such as maintaining a minimum distance and respecting speed restrictions are much less likely to disturb cetaceans' natural behaviours or negatively impact target populations (e.g. Currie et al., 2021; Puszka et al., 2021). Approach guidelines can be mandated by law (e.g. Royal Decree 1727/2007 in Spain), or by certification systems such as the ACCOBAMS High Quality Whale Watching Label. As such, not all whale watching 'hours' counted in this study are equal, and high levels of whale watching effort conducted by conscientious operators in one area may cause less disturbance than relatively low levels of activity by unscrupulous operators in another area.

Another possible source of bias it that which may have resulted from the reliance on data collectors in each ACCOBAMS country. While those data collectors participating in the Phase II questionnaire will have been well placed to conduct internet searches in each country's appropriate target language and/or to use local networks and knowledge to collect the most accurate data possible on whale watching operations, only 7 of the 24 member countries that responded to the Phase I questionnaire participated in the Phase II questionnaire. Five countries indicated that commercial whale watching is conducted in their waters, but did not participate in the second phase of the study, and many others reported that no commercial whale watching takes place in their waters. Unfortunately it was outside of the scope of this study to ground truth these responses, as internet searches could not be conducted in every target country's appropriate language, and determining whether information on the internet was up-to-date and accurate, especially following the pandemic years, would have been difficult without local knowledge and connections.

While these sources of bias may have resulted in some inaccuracies, because definitions were applied consistently across all regions, they are likely to provide a good indication of relative levels of whale watching pressure. The maps and data presented here are useful to highlight both areas of concern where high levels of whale watching activity may be combined with other sources of anthropogenic stress to put target cetacean populations at risk, as well as areas where whale watching pressure appears to be low, and where the industry could continue safely at its current

levels and/or be further developed in a responsible manner to help promoting cetacean awareness and conservation within the ACCOBAMS region.

Potential areas of concern

Because of an uneven distribution of study effort (i.e., Phase II was carried out only in seven countries, two of which with partial data), Figure 1 provides a preliminary visual overview of whale watching 'hotspots' throughout the ACCOBAMS area. However, at least in the Western Mediterranean and adjacent south Portuguese Atlantic coast, the coverage was complete. Here three areas stand out as areas where a relatively high number of whale watching hours are generated from multiple locations within a fairly small geographical area. These are (in clockwise direction): 1) The Southwestern tip of Portugal between Sagres and Albufeira; 2) The Straits of Gibraltar and adjoining Spanish coast of the Alboran Sea, including the area between Barbate, Ceuta and Benalmadena; 3) The French coast encompassing the areas between Bandol, Hyeres, and Nice.

These areas are discussed in greater detail under relevant sections on Portugal, Spain and France. In the case of Portugal, the relatively high density of whale watching activity appears to be carefully managed, through a system underpinned by legal definitions of whale watching, a requirement for licensing of whale watching vessels and operators. A concern about the density of whale watching activities in this region has led to a decision to suspend the issuing of any new licenses until a thorough study of the carrying capacity of the region can be conducted.

Concerns have already been expressed about whale watching pressure in and around the Straits of Gibraltar and the Alboran Sea (Cazalla et al., 2016). Cazalla et al. (2016) revealed a number of whale watching operations and/or vessels that had not been licensed for whale watching activities and did not adhere to Spanish national cetacean approach guidelines. While measures have been taken to address this in recent years, this area should continue to be monitored closely to ensure that tourism activities do not combine with fishing and shipping pressure to cause further declines in the Endangered killer whale and sperm whale populations that use this area. Furthermore, recent concerns about aggressive and unpredictable behaviour towards boats from the resident killer whales in the area merit continued careful monitoring (Esteban et al., 2016; Esteban et al., 2022).

The third area of concern is an area of the French coastline that has also been the focus of previous studies, particularly those that focus on bottlenose dolphins (Gimenez, 2019; Labach et al., 2019), which are the target of whale watching operations closer to shore throughout the area.

Not surprisingly, two of these three 'hot spots' (highlighted in Figure 17) overlap with multiple IUCN Important Marine Mammal Areas (IMMAs) (Hoyt and Notarbartolo di Sciara, 2021; Tetley et al., 2022), which recognized their importance for different cetacean species and different aspects of their life cycle functions. This highlights that ecologically important areas displaying a variety of species in relatively good numbers encourage the natural development of whale watching activities (Note that the Portuguese 'hotspot' could also qualify as a IMMA, however this section of coastline has not yet been assessed in the IMMA process, and will only be under review in early 2023 when the IMMA process covers the Northeast Atlantic).

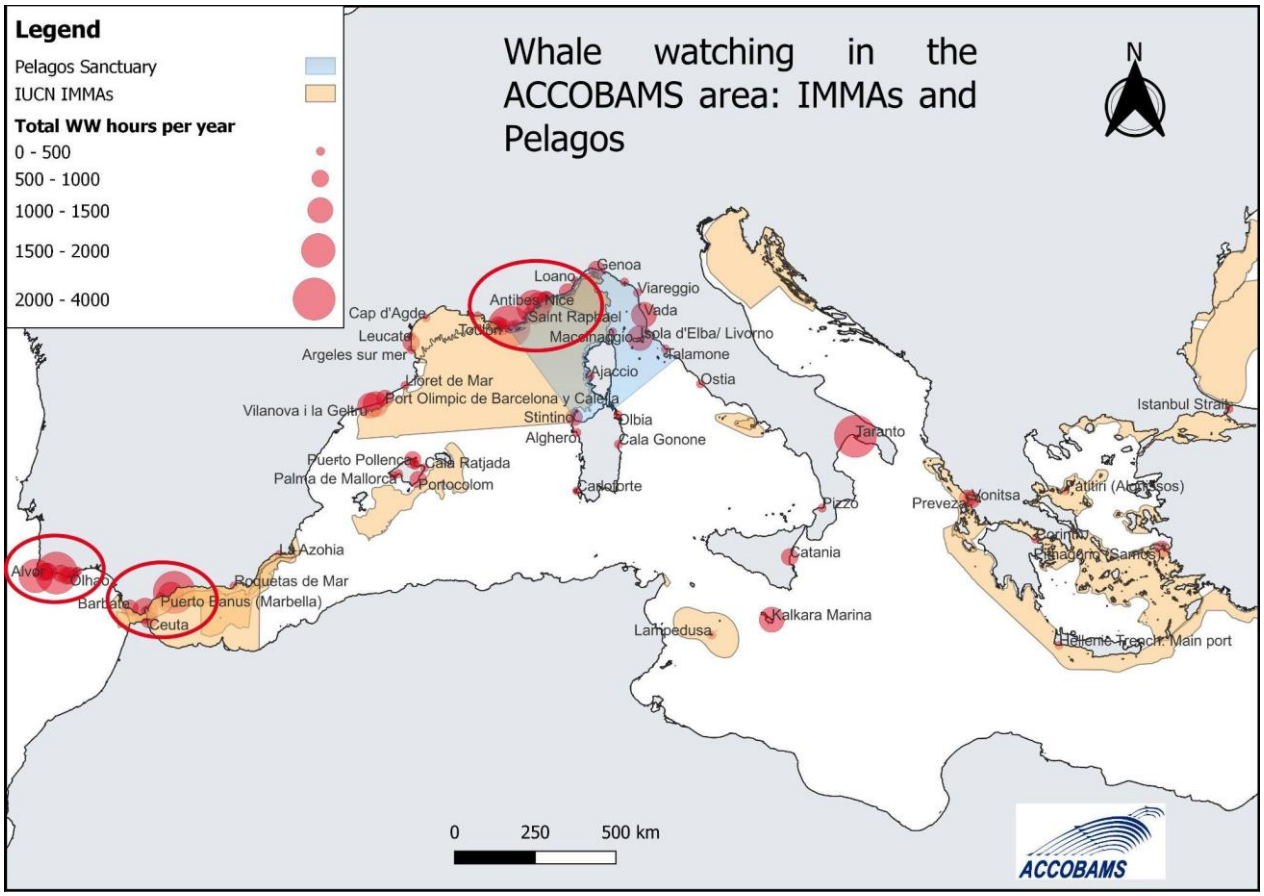


Figure 17: Depiction of the intensity of whale watching activities conducted throughout the ACCOBAMS area, represented by estimated cumulative annual hours of whale watching activities conducted form each port, overlayed with the boundaries of IUCN Important Marine Mammal Areas (IMMAs). Red ellipses indicate areas where relatively high levels of whale watching activity are occurring in relatively restricted geographical habitats, two of which are also recognised as Important Marine Mammal Areas. Note that the size of the pink symbol does not reflect the geographical range of whale watching tours.

Recommendations

This report highlights some useful points that merit further consideration for follow-up action:

Management recommendations:

- **Licensing**: Countries like Portugal and Spain that have clear licensing systems in place for whale watching tour operators, were most easily able to compile the data requested for this study. Licensing systems allow administrators and managers to maintain databases of tour operators and to monitor increases or decreases in whale watching effort. In other countries, where there are not yet formal legal definitions of whale watching, and no licensing systems in place, research teams worked extremely hard to use their professional networks and internet and telephone searches to compile whale watching data. Countries in the ACCOBAMS region should be encouraged to implement licensing frameworks that will allow them to more effectively monitor whale watching activities and the cumulative pressure they may be exerting on target populations (see also the *Guidelines for the management of cetacean watching activities in the ACCOBAMS Area included in draft Resolution 8.19 that will be presented for adoption by ACCOBAMS Parties at MOP8*).
- **Formal whale watching regulations:** In addition to licensing systems, governments that don't already have formal whale watching regulations in place should consider encoding approach guidelines into enforceable

legal measures. A wide variety of examples of effective approach guidelines can be found in the IWC/CMS Online Whale Watching Handbook (https://wwhandbook.iwc.int/en/downloadable-resources/guidelines-and-regulations). Legally enforceable guidelines are considered by many to be much more effective in preventing negative impacts to cetaceans than voluntary codes of conduct (e.g. Higham et al., 2014).

- **Certification schemes**: Where licensing and/or legal regulations are not yet in place, or where additional incentives can be used to ensure that whale watching operators are adhering to the best standards possible, certification schemes can be effective. The ACCOBAMS HQWW label involves a rigorous training scheme for participating tour operators, and participating tour operators are held to a high standard, not only with respect to approach guidelines, but also with respect to education of clients and collection of sightings data to contribute to science (for more details see: https://wwhandbook.iwc.int/en/case-studies/the-accobams-high-quality-whale-watching-certificate).
- **Quieter, and more eco-friendly vessels:** The vast majority of whale watching operations documented in this study use inboard diesel, or outboard petrol engines of various powers. These engines are likely to generate a significant amount of underwater noise. Recent research indicates that it is the noise from whale watching vessels' engines that are most likely to disturb cetaceans, leading to the recommendation that electric engines or sailing power are used whenever possible for whale watching operations (Sprogis et al., 2020; Arranz et al., 2021a; Arranz et al., 2021b) that electric engines (as well as sailing power). The use of electric engines and/or sailing power is also an attractive option.

Further research:

- **More complete coverage of the ACCOBAMS area**: This report contains a great deal of data on the scope and scale of whale watching effort from 87 ports in 7 countries. However, some countries (i.e. Italy) are incompletely represented, and other countries in the ACCOBAMS area that reported commercial whale watching activity in the first questionnaire did not complete the second questionnaire. A follow up study should be conducted to obtain more complete coverage of the entire ACCOBAMS area.
- **More in-depth co-occurrence studies:** The first level of analysis conducted for this report only briefly touches on the implications of this whale watching effort in relation to what is known about cetacean distribution at a finer scale. We recommend that the data compiled for this study is used to conduct further co-occurrence analyses by merging the data and spatial layers generated in this study with spatial layers held by different research groups throughout the ACCOBAMS region on cetacean occurrence. At the ACCOBAMS level, this data layer can feed into the Cetacean Critical Habitat (CCH) process. The data collected for this survey on the geographical range and scale of whale-watching operations will be combined with distribution and density maps of the different cetacean species, in order to provide a global view on co-occurrence. This process will use data generated through the ACCOBAMS Survey Initiative (ASI). The CCH will also analyse data on cetacean co-occurrence with other human pressures, such as shipping traffic, recreational activities and fisheries, helping to determine where multiple human activities may be overlapping with the potential to have negative impacts on cetaceans and their habitat.
- **Focus on hotspots and Endangered populations**: Co-occurrence studies should initially focus on the hotspots identified in this study, as well as areas that host Endangered (sub-)populations of cetaceans. These include all areas used by Endangered Mediterranean sperm whales (Pirotta et al., 2021) fin whales (Panigada et al., 2021), and killer whales (Esteban et al., 2016; Esteban and Foote, 2021; Esteban et al., 2022).

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ANNEX 1

ACCOBAMS Whale Watching hotspot study: Questionnaire to facilitate regional mapping of whale watching activity

Introduction: This questionnaire has been designed to facilitate the collection of data on a town/harbour by town/harbour basis to determine the number of commercial whale watching operators and tours that are run in a 'normal' year (e.g. pre- and hopefully post- COVID 19). Thank you for agreeing to be a national or local level focal point and agreeing to help collect this data. Please enter your details below, and use whatever resources you can to provide the most complete answers possible to the questions that follow. Note that we are not trying to compile an inventory of individual operators or their contact details, but rather meta-data on the number of operators and the quantity and nature of the tours they run. Our ultimate goal is to derive a standard unit of effort for whale watching activity to be able to compare across towns and ports throughout the ACCOBAMS region. If you would like to provide details of individual operators, please feel free to do so in the WW Operators tab of this questionnaire - but this is NOT mandatory. Please feel free also to submit additional reports, maps or other materials with your questionnaire if you think it will contribute to the aims of our study. If you have any questions, or would like clarification, please contact Gianna Minton: gianna.minton@gmail.com

Focal point/Data compiler details	
Data compiler name:	
Data compiler email address:	
Data compiler region or country remit: Please list the country or region for which you are compiling data and the number of towns/harbours that fall into this region	
Location Details	
Name of location for which you are compiling data (note that if you are compiling data at country-wide level, we would ask you to complete different sheets for each port/town/harbour from which commercial whale watching tours are offered. Please use the extra tabs on this sheet- Location 2 and Location 3 are already provided, but these can be copied if you require more sheets for multiple locations:	
Latitude/longitude coordinates for the location for which you are compiling data (please use decimal degrees and please choose one point that can represent the town/port/harbour from which tours depart):	

Number of operators and tours (Please base your answers on 2019 BEFORE the impact of COVID-19)											
Num.	**Question**	**Dedicated WW operators offering day/half-day trips**	**Dedicated WW operators that offer multi-day liveaboard trips**	**Marine tourism operators that also offer dedicated WW tours**	**Marine tourism operators that offer fishing or wildife tours that also regularly include WW**	**Research tourism operators**	**Define high season (e.g. May-September)**	**Number of weeks of high season**	**Define low season (e.g. Otober-April)**	**Number of weeks of low season**	**Comments**
1	How many whale watching tour operators in the following categories offer vessel-based commercial whale watching tours from this location? (please feel free to include details/lists with operator names and websites in the annex)										
2	Per category, how many vessels do these operators collectively operate (e.g. one operator may run multiple vessels from the same port/harbour)?										
3	*On average* – how many hours does a tour last from this town/harbour for each of the categories listed?										
4	*On average* – how many tours per week do these operators *collectively* offer from this town/harbour for each of the categories listed during high season?										
5	*On average* – how many tours per week do these operators *collectively* offer from this town/harbour for each of the categories listed during low season?										

6	*On average* – how many kms offshore/away from land do these operators range from GPS location provided for the town/harbour?										
7	*On average* – how many kms alongshore/parallel to land do these operators range from GPS location provided for the town/harbour?										
Nature of tours and vessels used (Please base your answers on 2019 BEFORE the impact of COVID-19)											
8	What is the range (in meters) of the length of vessels used for WW in this location for each of the following categories? (e.g. 6-24 would indicate a range of vessels from 6m to 24m in length).										
9	What is the range in passenger capacity for the vessels used to offer WW in this location for each of the following categories? (e.g. 6-30 would indicate the smallest vessels can take 6 passengers and the largest can take 30).										
10	Please indicate what types of motors are used for WW activities by the different categories of operators in this location. Please choose from the following categories: outboard diesel, outboard petrol, inboard diesel, inboard petrol, electric, sailing/wind powered, kayaks (you may indicate multiple answers separated by commas)										

11	What is the range (in hp) of the motors used by vessels involved in WW in this location for each of the following categories? (e.g. If vessels have two engines - report their combined power - e.g. 150-300 would indicate a range of motors that have a (combined) power ranging from 150-300hp).										
12	Which species of whale or dolphin are most frequently encountered by WW tours operating from this location? (please use Scientific names, and list multiple species if appropriate - but do not include those species that are only very rarely observed)										
13	Are any auxiliary means used to locate cetaceans for these tours? If so please indicate which (e.g. drones, aircraft, hydrophones) and use the comments to indicate whether their use is regular or not.										
14	How many operators permit or promote in-water interactions ('swim-with') with cetaceans for each of the categories listed here?										
15	If in-water interactions are offered, *on average* how many tours per week offer this option during high season?										
16	If in-water interactions are offered, *on average* how many tours per week offer										

	this option during low season?										