



# EXPEDITION REPORT

Expedition dates: 29 March – 18 April 2019

Report published: March 2020

**Photo-identification and surveys of  
cetaceans in the central group of the  
Azores islands**







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**Expedition dates:  
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**Report published:  
March 2020**

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Biosphere Expeditions**

\*no part of this report to be published without the main author's written permission

# Abstract

In 2019 Biosphere Expeditions concluded its 15<sup>th</sup> year of cetacean photo-identification and distribution studies in the Azores. The expedition was based in Horta on the island of Faial and work was conducted around the three islands of Faial, Pico and São Jorge. The expedition ran from 29 March to 18 April and concentrated on six main projects.

Sightings of all cetacean species were recorded. 26 sightings of five different species of cetacean and one species of turtle were recorded during the expedition period. In 2019 a beta version of a data collection app was trialed.

**Baleen whales:** Fin whale: The expedition saw 3 fin whales in 1 encounter. Preliminary matching of individuals has begun, and photos have been sent to catalogues in Spain, Iceland and the US.

**Humpback whale:** There were no humpback whales observed during the expedition, although one was seen just before the expedition started. A humpback whale was heard singing on the hydrophone on one occasion. The North Atlantic Humpback Whale Catalogue is currently approaching 11,000 individuals and plays an important role in discovering long-range matches. Since 2004 the expedition has contributed 21 ID photos. Data collected during the expedition, as well as outside the expedition and by other researchers, suggest that the humpbacks that are seen in the Azores are part of the endangered Cape Verde population, rather than the Caribbean population. Matching movements to populations is important, because little is known about the movements of the eastern Atlantic humpback whales.

No other baleen whales were observed in 2019.

The most likely reason for the lack of baleen whales is that the level of primary (nutrient) productivity has not been very high for the last few years. This meant that there was no food around to bring the migrating whales closer to the coast.

**Sperm whale:** Sperm whale photo-identification, ongoing since 1987 in the Azores, continued, with 4 identifiable individuals photographed from 15 encounters, including 3 animals seen in previous years. Matches now indicate that males migrate to Norway and that females spend their whole lives together, and undertake at least a limited migration. In addition, sperm whale groups observed in the Azores are more stable and associations between individuals last for a much longer period of time than they do in the Pacific. This is most likely due to food availability in the different areas.

**Dolphins:** Dolphin photo-identification, which began in 1987, also continued. One group of Risso's dolphin and a group of orcas were recorded. The Risso's dolphins seen are a known group of females with a few males mixed in, but the orcas had not previously been photographed in the Azores.

**Europhlukes:** Europhlukes was a European-wide project (funded 2002-2005) that brought together different researchers from several countries to share data and photo-identification pictures of various species. Sperm whale fluke shape extractions were made from the photos taken during the expedition and compared with those of sperm whales sighted in previous years and in other areas of the Atlantic. No matches were found to any other regions.

**POPA:** Data collection for the Department of Oceanography and Fisheries (DOP) of the University of the Azores, for the Tuna Boat Observer programme, POPA, was successfully collected for a sixteenth year. The expedition vessel "Physeter" is the only non-fishing vessel in the programme. Information was collected for random cetacean sightings along transects, as well as designated turtle and bird count attempts and marine debris sightings.

**Turtles:** Loggerhead turtle data have been collected and animals tagged in the Azores since 1988 for a joint venture between the University of Florida and the University of the Azores. During this expedition 7 loggerhead turtles were seen; none were caught and tagged.

# Sumário

A “Biosphere Expeditions 2019” concluiu o seu décimo quinto ano de recolha de dados sobre a distribuição de cetáceos nos Açores, com recurso a observações visuais e foto-identificação. A cidade da Horta, na ilha do Faial, foi a base da expedição e o trabalho foi conduzido em redor das três ilhas do Faial, Pico e São Jorge. Esta expedição decorreu entre 29 de Março e 18 de Abril, e concentrou-se em seis projectos principais.

Avistamentos de todas as espécies de cetáceos foram registrados. Foram registados um total de 26 avistamentos de 5 espécies distintas de cetáceos e 1 espécie de tartaruga. Em 2019, uma versão beta de um app de coleta de dados foi testada.

**Baleias de barbas:** Baleias-comuns: A expedição registou 3 baleias-comuns num encontro. Iniciou-se uma análise preliminar dos avistamentos e reavistamentos de baleias-comuns, com o propósito de enviar as identificações para catálogos em Espanha, Islândia e EUA.

**Baleias-de-bossa:** Nesta expedição não foram registados avistamentos de baleias-de-bossa, embora um indivíduo tenha sido observado mesmo antes do início da expedição. O catálogo de baleias-de-bossa do Atlântico Norte está a aproximar-se de 11,000 indivíduos e este desempenha um papel importante na detecção de reavistamentos de longo alcance. Desde 2004 que a expedição contribuiu com 21 fotografias identificativas. Os dados recolhidos durante esta expedição, juntamente com dados recolhidos por outros investigadores, sugerem que as baleias-de-bossa observadas nos Açores fazem parte da população ameaçada de Cabo Verde e não da população das Caraíbas. Estes reavistamentos são importantes, porque actualmente existe pouca informação sobre os movimentos das baleias-de-bossa na costa Este do Atlântico.

Não foram observadas outras baleias de barbas em 2019.

A razão mais provável para a falta de baleias é que o nível de produtividade não tem sido muito alto nos últimos anos. Isso significava que não havia comida por perto para aproximar as baleias migratórias da costa.

**Cachalote:** Desde 1987 que está em curso nos Açores um programa de foto-identificação de cachalotes, com 4 indivíduos identificados e fotografados em 15 encontros, incluindo reavistamentos de 3 animais observados em anos anteriores. Os reavistamentos detectados indicam que os machos migram para as águas da Noruega e as fêmeas passam a sua vida em grupos e efectuam migrações/movimentações mais limitadas. Para além disso, os grupos de cachalotes observados nos Açores são mais estáveis e as associações entre indivíduos permanecem por períodos mais longos do que as que ocorrem no Pacífico. Este facto deve-se, provavelmente, à diferença de disponibilidade de alimento entre ambas as áreas.

**Golfinhos:** A foto-identificação de golfinhos, que iniciou em 1987, tem continuado. Foram observados um grupo de grampos e um grupo de orcas. Os grampos que foram observados são um grupo de fêmeas bem conhecido com alguns machos misturados já fotografadas anteriormente, mas o grupo de orcas nunca tinha sido fotografado nos Açores.

**Europhlukes:** Europhlukes foi um projecto Europeu (2002-2005) que reuniu investigadores de diversos países para partilhar dados de foto-identificação de várias espécies. As extracções das caudas dos cachalotes fotografados durante a expedição serão comparadas com fotografias obtidas em anos anteriores e noutras áreas do Atlântico. Nenhum dos cachalotes fotografados nos Açores foi reavistado noutras áreas.

## POPA:

Pelo décimo sexto ano foram recolhidos dados para o Programa de Observação das Pescas nos Açores (POPA) coordenado pelo Centro do Instituto do Mar da Universidade dos Açores. O “Physeter” é a única embarcação que não se dedica à pesca comercial e que contribui para o POPA. A informação foi recolhida aleatoriamente ao longo de transectos de observação de cetáceos. Foram também efectuadas tentativas para contagem de tartarugas, aves marinhas e avistamentos de lixo marinho.

## Tartarugas:

As tartarugas *Caretta caretta* são capturadas e marcadas nos Açores desde 1988, para um projecto conjunto entre a Universidade da Flórida e a Universidade dos Açores. Durante esta expedição, 7 tartarugas-boba foram avistadas, mas nenhuma foi capturada ou marcada.



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Please note: Each expedition report is written as a stand-alone document that can be read without having to refer back to previous reports. As such, much of this section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

# 1. Expedition review

M. Hammer (editor)  
Biosphere Expeditions

## 1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at [www.biosphere-expeditions.org](http://www.biosphere-expeditions.org).

This expedition report deals with an expedition to the Azores that ran from 29 March to 18 April 2019. The expedition was part of a long-term research project to elucidate the life histories and migration patterns of whales, dolphins and turtles across the oceans and assist with the formulation of effective conservation strategies.

The Azores Archipelago, which sits near the middle of the Atlantic Ocean, about 1,400 kilometres off the coast of Portugal, is one of the prime whale and dolphin hotspots in the world and around 30% of the world's known cetacean species have been recorded there. For management purposes the International Whaling Commission (IWC) has included the Azores Archipelago in the East Greenland and Iceland stocks, but there is little evidence to support this.

In 2004 the expedition initiated the first long-term concerted study on baleen whales in the Azores. These animals in particular had not been studied around the Azores. Accurate knowledge of the origins of the baleen whales passing the archipelago on their migration from March to May will help to determine which stocks they come from and assess more accurately their true numbers (which are often inflated in efforts to set hunting quotas).

The expedition also continued with existing sperm whale, bottlenose and Risso's dolphin studies. The sperm whale study is part of a larger migration and social study, and the dolphin study is in the early stages of assessing animal numbers and migratory behaviour around the archipelago. Loggerhead turtles were also studied and tagged as part of an international research project studying their life history and migration around the Atlantic.



## 1.2. Research area

The Azores Archipelago, Europe's westernmost point, is a group of nine distinct islands, lying on the same latitude as New York and Lisbon, around 1,400 kilometres off the coast of Portugal (of which they are part). Lying on the Mid-Atlantic Ridge, the islands display spectacular volcanic scenery, with large blue-green crater lakes, impressive black lava sea cliffs, and, towering above them all, the highest mountain in Portugal on Pico.



**Figure 1.2a.** Map of the Azores.

An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at [Google Maps](#).

The Azores were discovered in 1427 by Portuguese explorers and colonised shortly after by people of mainly Portuguese and Flemish descent. During the 20th century the islands were an important stopover point for undersea communications cables, transatlantic flights and yachtsmen. The islands' main income is from agriculture and fishing; tourism has all but passed by the islands.

## 1.3. Dates

The expedition ran over two ten-day groups.

29 March - 7 April | 9 - 18 April 2019

Team members could join for multiple slots (within the periods specified). Dates were chosen to coincide with the migration of baleen whales past the archipelago.

## **1.4. Local conditions & support**

### **Expedition base**

The expedition team was based on the island of Faial, near the harbour in a guesthouse consisting of modern twin and double rooms. Dinner was eaten at local bistros/restaurants or the expedition base, a breakfast buffet was served by participants on a rota and each participant prepared a lunch pack from the buffet. Vegetarians and some special diets were catered for. Accommodation was on a twin-share basis.

### **Weather**

The climate is mild maritime Mediterranean with daytime temperatures during the expedition months from 10° to 24°C. Extremes are usually buffered by the Gulf Stream passing by, but it could get quite cold, especially on the boat, with the wind chill factor.

### **Field communications**

The boat carried two radios for communication with other boats. Mobile phones did work on the island and within a few kilometres out at sea. There was also (limited) wireless internet access at base via a public server. The expedition leader posted a [diary with multimedia content on Wordpress](#) and excerpts of this were mirrored on [Biosphere Expeditions' social media sites](#).

### **Transport, vehicles & research vessel**

Team members made their own way to the Horta assembly point. From there onwards and back to the assembly point all transport, vehicles and boats were provided for the expedition team for expedition support and emergency evacuations.

Our research vessel, the Physeter (after the Latin name for sperm whale), was a modern offshore motor catamaran with large fore and aft decks and equipped with life raft, lifejackets, emergency beacon, two radios, radar, fish finder and other safety features.

### **Medical support & insurance**

The expedition leader was a trained first aider, and the expedition carried a comprehensive medical kit. The standard of medical care in the Azores is high and further medical support was available at a hospital in town. All team members were required to carry adequate travel insurance covering emergency medical evacuation and repatriation. Emergency procedures were in place, but did not have to be invoked as there were no medical or other emergencies.

## **1.5. Expedition scientist**

Biosphere Expeditions works on this project with Lisa Steiner of Whale Watch Azores. Lisa graduated in Marine Science in 1988 at the University of Miami and joined the IFAW (International Fund for Animal Welfare) cetacean research vessel "Song of the Whale" two weeks later, which at the time was based in the Azores. Since then Lisa has spent all her summers working on cetaceans around the Azores and at other times has also studied them in Alabama, Hawaii, Cape Verdes, Bermuda, Scotland and Madeira. She has published numerous research papers on cetaceans.



## **1.6. Expedition leader**

Craig Turner was born in Oxford, England. He studied biology, ecology and environmental management at Southampton, Aberdeen and London universities. Soon after graduating, he left the UK for expedition life in Tanzania. Since then, he has continued to combine his interest in travel and passion for conservation, working with a wide range of organisations on projects and expedition sites in the Americas, Africa, Asia and the Pacific. He has managed expedition programmes for the Zoological Society of London, and is a frequent contributor to the 'Explore' conference held by the Royal Geographical Society (RGS). He is a Fellow of the RGS and the Linnean Society. Having visited and/or worked in more countries than years have passed, he now runs a small environmental consultancy with his partner, based in Scotland, where he splits his wildlife interests and work between the UK and overseas. He also crews for the Royal National Lifeboat Institution and is casualty care trained. He is ever keen to share his exploits, writing for several magazines, and is a published photographer.

## **1.7. Expedition team**

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of ages, nationalities and backgrounds. They were (with country of residence):

29 March – 7 April 2019

Neil Goodall (UK), Ashley Halligan\* (USA), Joeanne Jackson (UK), Kathleen Livingstone\* (USA), Carsten Riedl\* (Germany), Stefanie Riemer (Germany), Florentine Schwabbauer (Germany), Hans-Juergen Voss (Germany), Shantala Wentink (the Netherlands), Stefan Windhorst (Germany).

9 – 18 April 2019

Julia Burucker (Germany), Martin Etter (Switzerland), Jasmin Huether (Germany), Cris Marshall (UK), Peter Pilbeam (UK), Yvonne Raap (Switzerland), SuEllen Stirling (USA), Mary Storkan (USA), Gerhard Strauhs (Austria), Lisa Wallis (UK).

\*bloggers / members of the media. Carsten Riedl delivered exposure as detailed on the [Azores expedition page](#). Both Ashley Halligan and Kathleen Livingstone failed to deliver any significant exposure and have been banned from taking part in any further expeditions.

## **1.8. Partners**

Our main partner on this project is Whale Watch Azores, a whale watching and research group founded by our local scientists and operating from Faial Island. Other partners include Europhlukes (a European cetacean photo-ID system and research database), the University of the Azores, POPA (the Observer Programme for the Fisheries of the Azores), the University of Florida (for research into turtles), as well as the local community of whale spotters (vigias).

## 1.9. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website [www.biosphere-expeditions.org](http://www.biosphere-expeditions.org).

Enquires should be addressed to Biosphere Expeditions at [info@biosphere-expeditions.org](mailto:info@biosphere-expeditions.org).

## 1.10. Expedition budget

Each team member paid towards expedition costs a contribution of €1,790 per person per 10-day slot. The contribution covered accommodation and meals, supervision and induction, special non-personal equipment, and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses such as telephone bills, souvenirs etc., or visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

<b>Income</b>	€
Expedition contributions	29,846
<b>Expenditure</b>	
Base camp and food includes all board & lodging, base camp equipment	5,243
Research vessel & transport includes fuel, oils, wear & tear for research vessel, taxis on land	5,131
Equipment and hardware includes research materials & gear, etc.	456
Staff includes local and Biosphere Expeditions staff & expenses	4,132
Administration includes registration fees, sundries, etc.	35
Team recruitment Azores as estimated % of PR costs for Biosphere Expeditions	4,981
<b>Income – Expenditure</b>	<b>9,868</b>
<b>Total percentage spent directly on project</b>	<b>67%</b>



### **1.11. Acknowledgements**

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members (listed above) who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff (also mentioned above) were central to making it all work on the ground. Thank you to all of you and the ones we have not managed to mention by name (you know who you are) for making it all happen. Biosphere Expeditions would also like to thank the Friends of Biosphere Expeditions for their sponsorship and/or in-kind support.

We would also like to thank our partners Europhlukes, the University of the Azores, POPA, the University of Florida, and the local community of whale spotters (vigias). A final thanks goes to skippers Gyro & Nuno, as well as James Rosa and Claudia Steube, our excellent hosts at Banana Manor.

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## 2. Whale & dolphin study

Lisa Steiner\*

Whale Watch Azores

\*no part of this report to be published without the main author's written permission

### 2.1. Introduction

The Azores are a group of nine islands located about 900 nautical miles off the coast of Portugal. 28 species of cetacean have been seen in the islands over the last 30 years. Sperm whales were commercially hunted there until 1985. With the cessation of whaling, whale watching was a natural successor, but did not begin in earnest until the late 1990s. Little work has been done around the archipelago before June, which is why the expedition usually takes place in April and May. In 2018, the expedition started earlier than before, in March, to try and take advantage of some of the early migrating whales and in 2019 the expedition began on 29 March.

Baleen whales have been seen fairly regularly migrating past the islands from March to June over the last decade, but it is unknown where they have come from or where they are migrating to. It is thought that they are travelling north to feed in the waters around Iceland, Greenland, Norway or even Nova Scotia for the summer. Photo-identification of the animals passing the Azores enables us to match photos with photos taken elsewhere to hopefully determine some of these migration routes. So far, there have been several matches between blue whales to other areas: several of the animals sighted in Spitzbergen, Norway have also been seen in the Azores. There are two matches between the Azores and Iceland and probably the most interesting match to date is from 2014: a blue whale that had been seen in the Gulf of St. Lawrence, Canada in 1984, was seen off the South coast of Pico, 30 years later. There are now additional matches of blue whales to Northern Spain and Ireland. In addition, several blue whales have now been seen in multiple years in the Azores. Twelve humpback whales have been observed in both the Azores and the Cape Verde Islands and ten have also been re-sighted in Norway. Two individuals have been seen in all three places. A new match of a humpback has also been made to Newfoundland (not by the expedition). There are still no matches with individuals sighted in the Caribbean, despite some satellite tracking showing some movement in this direction.

Although sperm whales were caught in the Azores all year round, it has been thought that there are not many female sperm whales and calves around during the winter months. Working earlier in the year in March and April has given us the opportunity to see that females and calves are present at this time of year as well as during the summer months. In future, we would like to expand the effort to include the winter months, to see if some females and calves are present in the archipelago all year round.

Photo-identification of sperm whales began in the Azores in 1987 and over 3,000 individuals have been identified since then (just over 500 of them by the expedition). The Europhlukes matching program makes matching individuals much faster than when done manually. Work by other researchers has shown that some bottlenose and Risso's dolphin are resident in the islands year round and there are some transient groups, just passing through.

By photographing individuals, we can start to see patterns of habitat use by different groups of dolphin at different times of year and compare ID photos to existing catalogues, to determine what home ranges might exist for these resident individuals. This requires a lot of time spent matching ID photos to identify individuals and their groups. Most of this work will be done in the future by MSc or PhD students.

Not much is known about the orcas that are occasionally observed around the islands. To date, all the orcas have been seen eating fish, rather than marine mammals. One group of individuals has been matched between the central and eastern groups of islands. They were seen in Sao Miguel in 2013 (I. Korpöga Eriksson pers. comm.) and seen again off Faial in 2016.

## **2.2. Summary of expedition work and results 2004-2019**

Over the past 15 years (2004-2019, with the exception of 2017, when no expedition took place), the expedition has spent 1,529 hours at sea looking for cetaceans: 75 hours in March, 971 in April and 483 in May. During that time the expedition has registered a very large number of animals (Fig. 2.2a, which shows the number of sightings for the main species that we see, adjusted for effort).

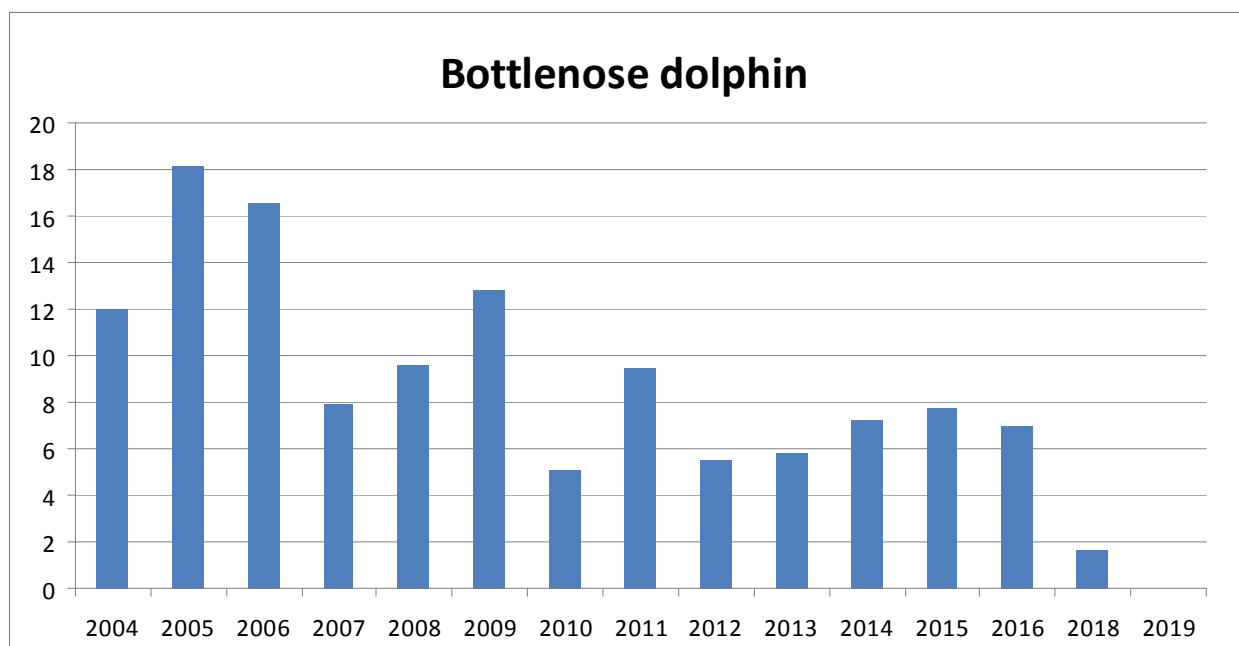
Highlights of the expeditions were:

- 520 new sperm whales were identified, including 178 re-sighted animals. During the 2007 expedition, a record 167 sperm whales were encountered, with another four expeditions yielding over 100 sightings each.
- 125 separate blue whale sightings were made, with 3 individual blue whales being identified in different years. To date, no blue whale identified during an expedition has been identified elsewhere.
- 41 fin whale encounters were recorded in 2016 and 35 in 2006. So far, no fin whales identified during the expedition have been identified elsewhere.
- 27 humpback whale sightings were made, with 2 re-seen in the Cape Verde Islands and 1 over a two-month period in 2016. No other humpbacks sighted during an expedition have been matched to other areas of the Atlantic.
- Thousands of dolphins have been recorded, and the expedition has been fortunate to observe some rare sightings, such as pygmy sperm whales, false killer whales, orcas and a couple of beaked whales.
- Several loggerhead turtles have been caught during the expeditions, but none of them have been recaptured elsewhere.

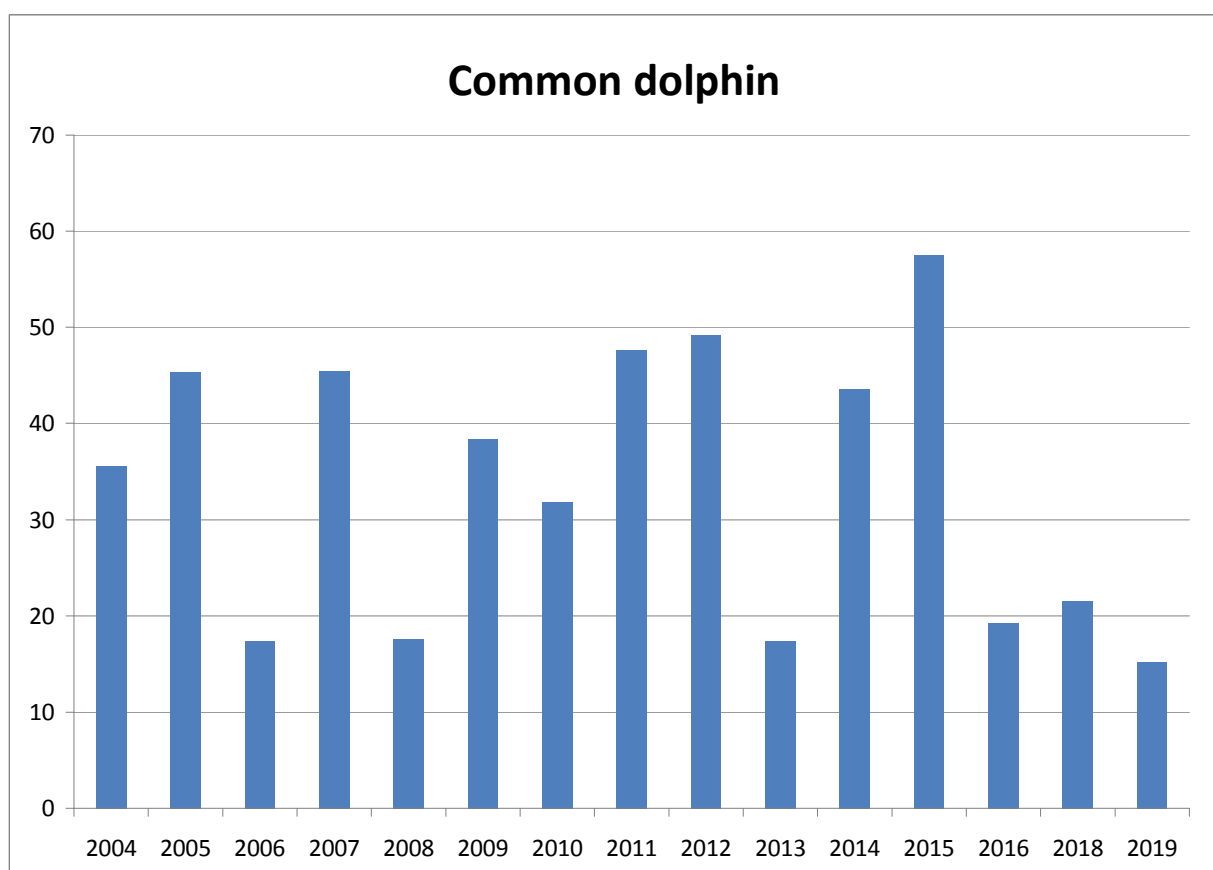
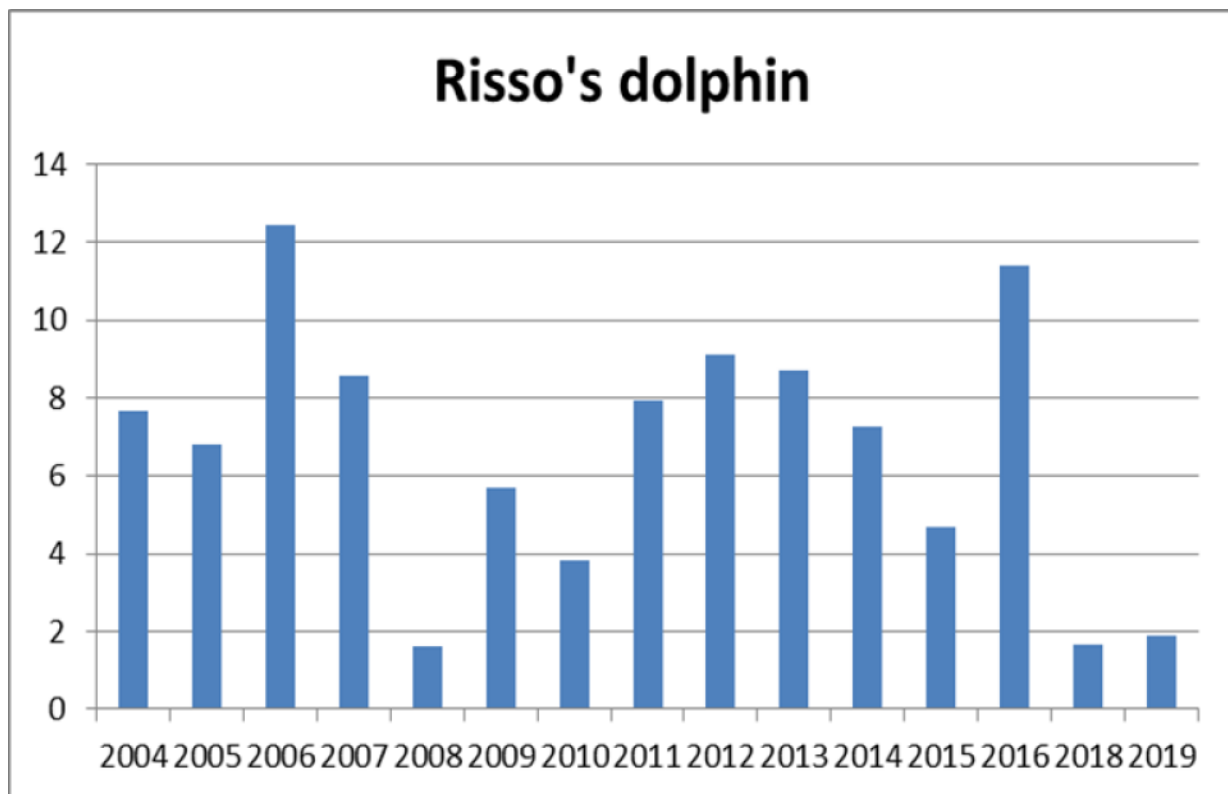


- Since the expeditions began in 2004, the lead author has given multiple presentations. An oral presentation at the European Cetacean Society (ECS) conference in Kolmarden was given in 2004 on site fidelity of sperm whales. She has also been first author on posters at three conferences and co-author on several others: In 2009 the poster was on male sperm whale matches from the Azores to Norway ([Steiner et al. 2009](#)), which has since been published ([Steiner et al. 2012](#)). In 2015, the topics were movements of female sperm whales between the Azores, Madeira and the Canaries ([Steiner et al. 2015](#)), the first blue whale matches from the Azores to Newfoundland and Norway ([Sears et al. 2015](#)) and humpback whales using the Azores as a stopover feeding point ([Cucuzza et al. 2015](#)). In 2016, a poster was presented in Madeira on habitat use of species of baleen whale in the Azores ([Chevallard et al. 2016](#)). In 2019, the poster was about false killer whales in the Azores ([Steiner et al. 2019](#)).
- Other papers published since the start of the expeditions and co-authored by Lisa Steiner have dealt with humpback whale sightings around the Cape Verde and North Atlantic (Wenzel et al. 2009). Other publications comprise a paper on True's beaked whales around the North Atlantic (Aguilar de Soto et al. 2017), movements of pilot whales between the Azores (Alves et al. 2019), Madeira and the Canaries and a paper on abundance of sperm whales in the Azores (Boys et al. 2019). Most of these publications mainly used data not collected during the expedition. Lisa Steiner is currently working on a paper about blue/fin whale hybrids with colleagues from Iceland, the Azores and Ireland (Iverson et al. in preparation) and a note about a match of a sperm whale between the Gulf of Mexico and the Azores.
- For the lead author it continues to be a source of great motivation and inspiration to watch expedition participants arrive with little or no experience and gel into a team that gets the work done, sometimes in very challenging conditions.

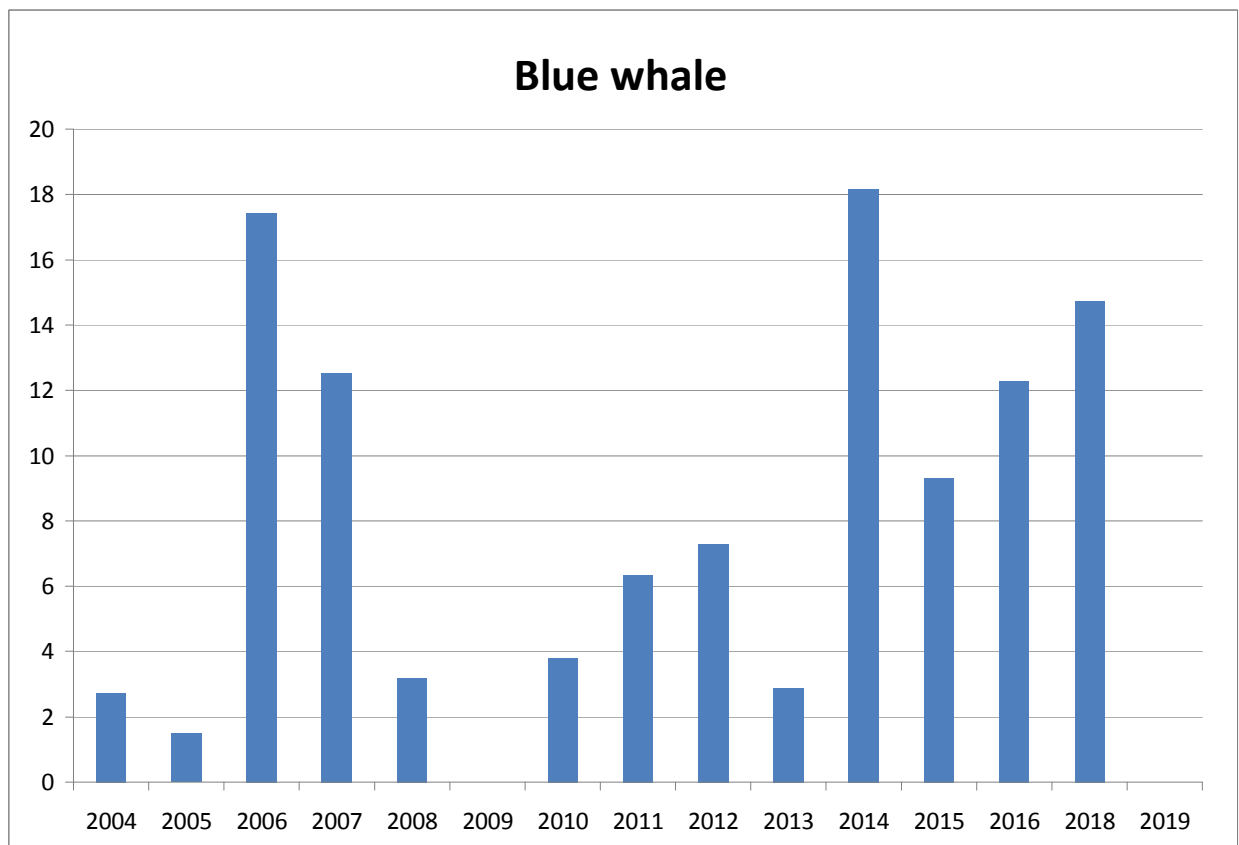
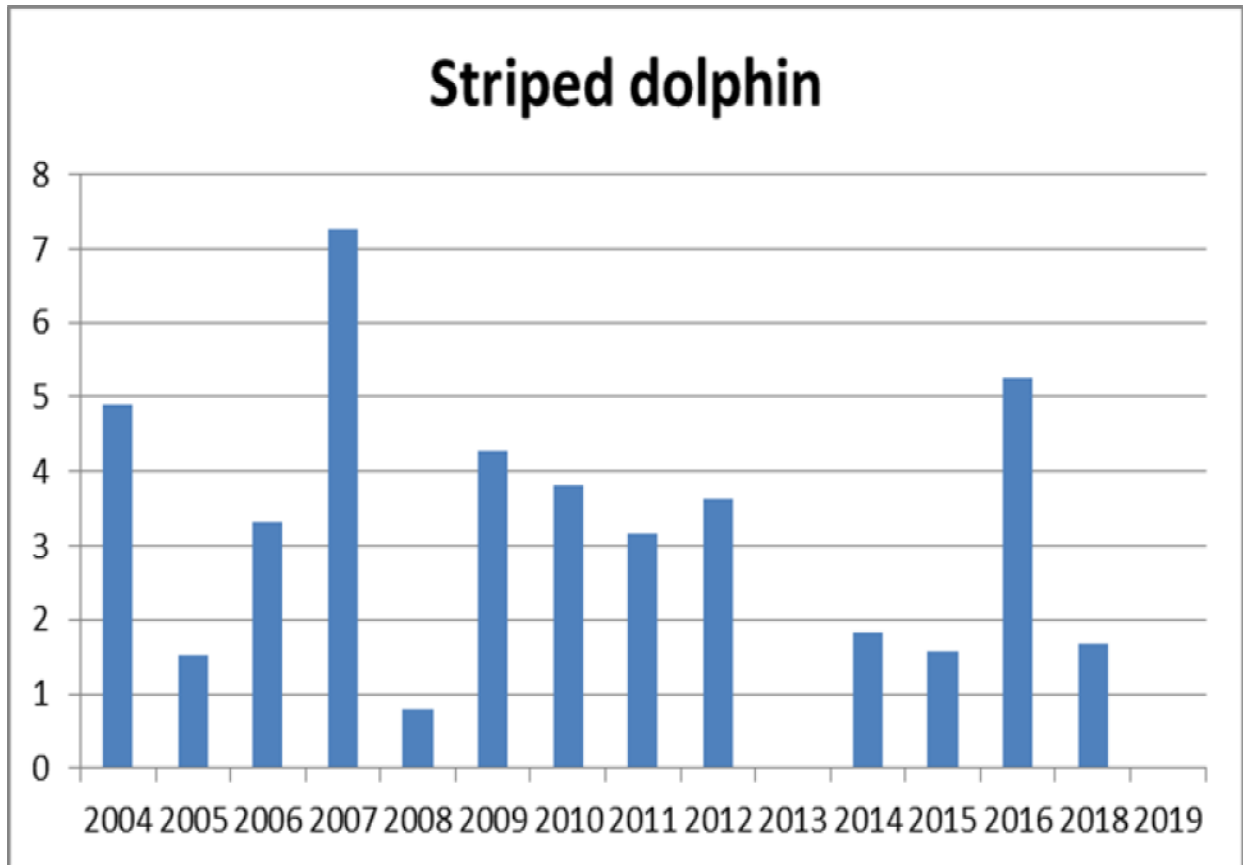
These highlights show how important the work of Biosphere Expeditions is to gathering information on the cetaceans around the Azores. Considering the short duration of the expedition in any given year, the fact that we have collected as many data as we have is an incredible achievement.



**Figure 2.2a (part 1).** Species sightings 2004-2019 adjusted for effort .

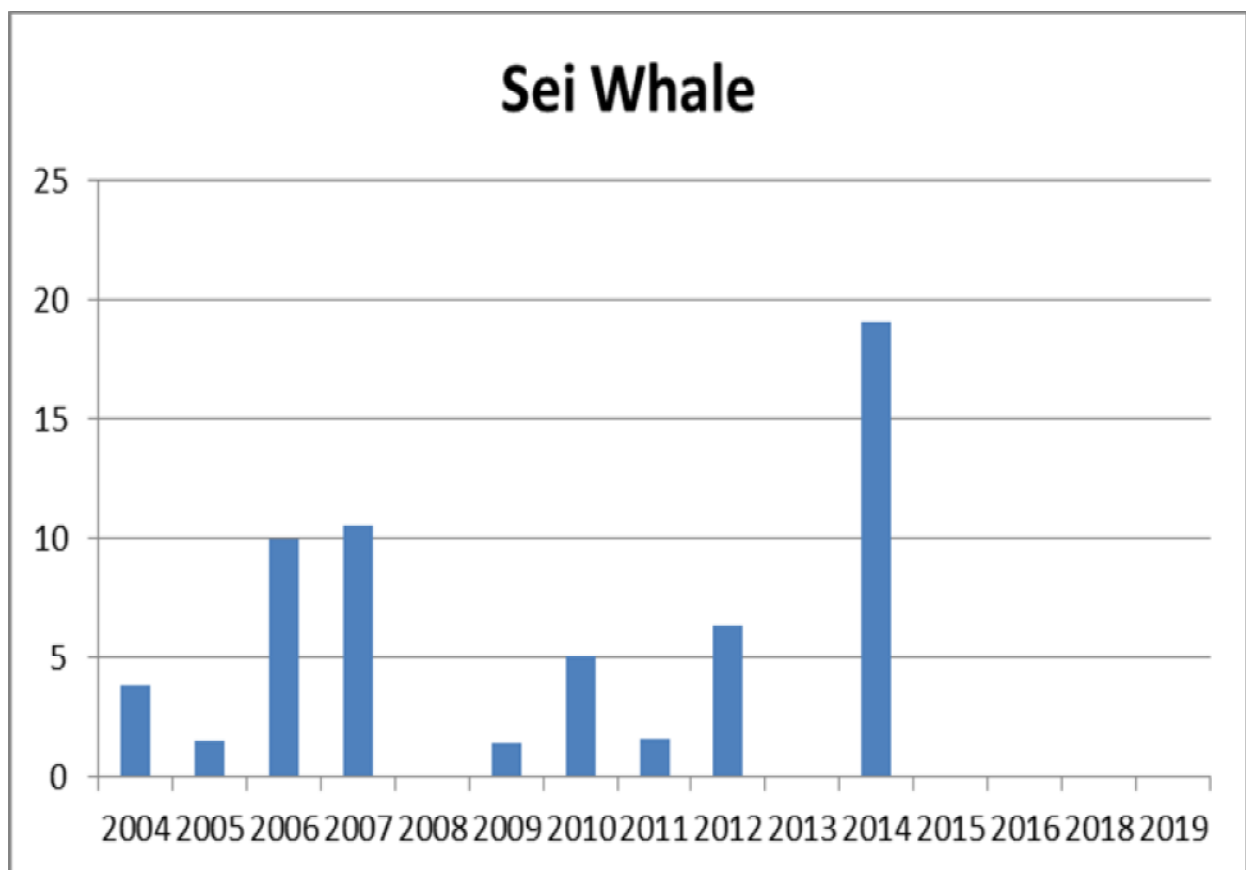
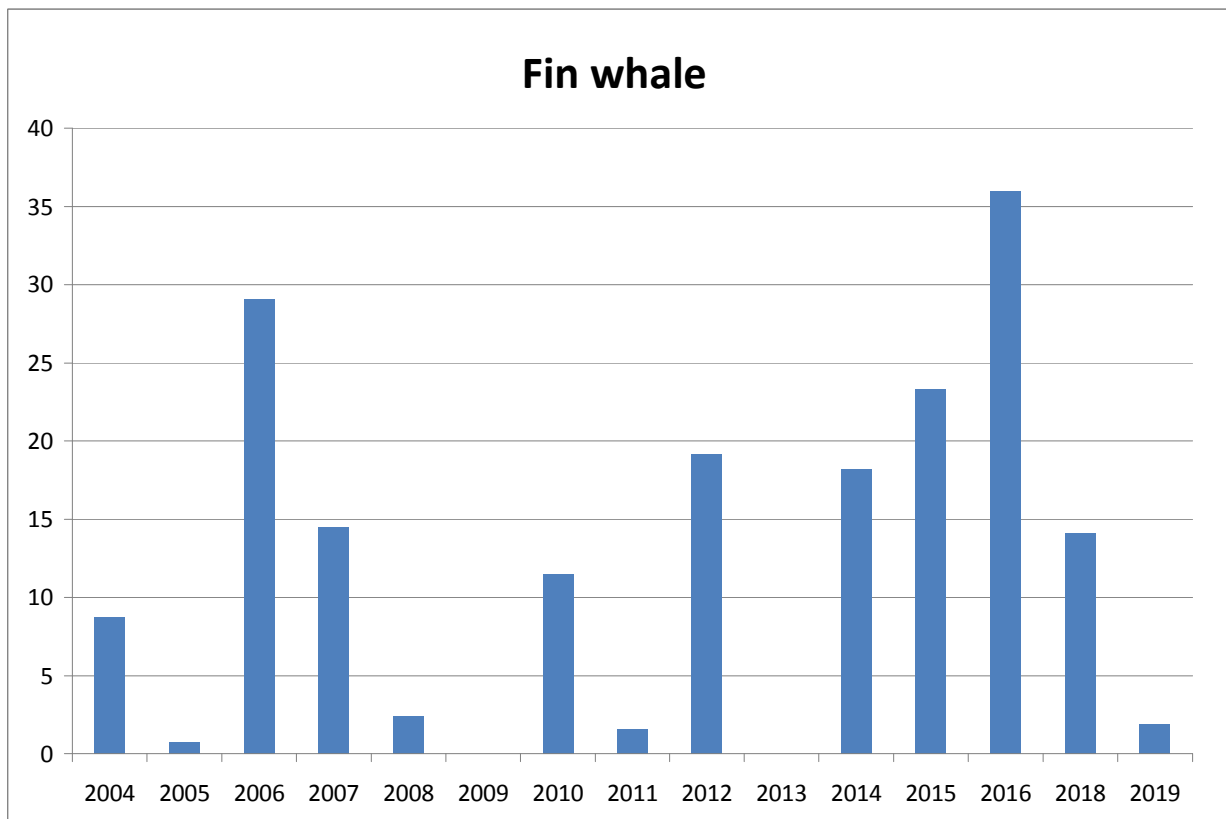


**Figure 2.2a (part 2).** Species sightings 2004-2019 adjusted for effort.

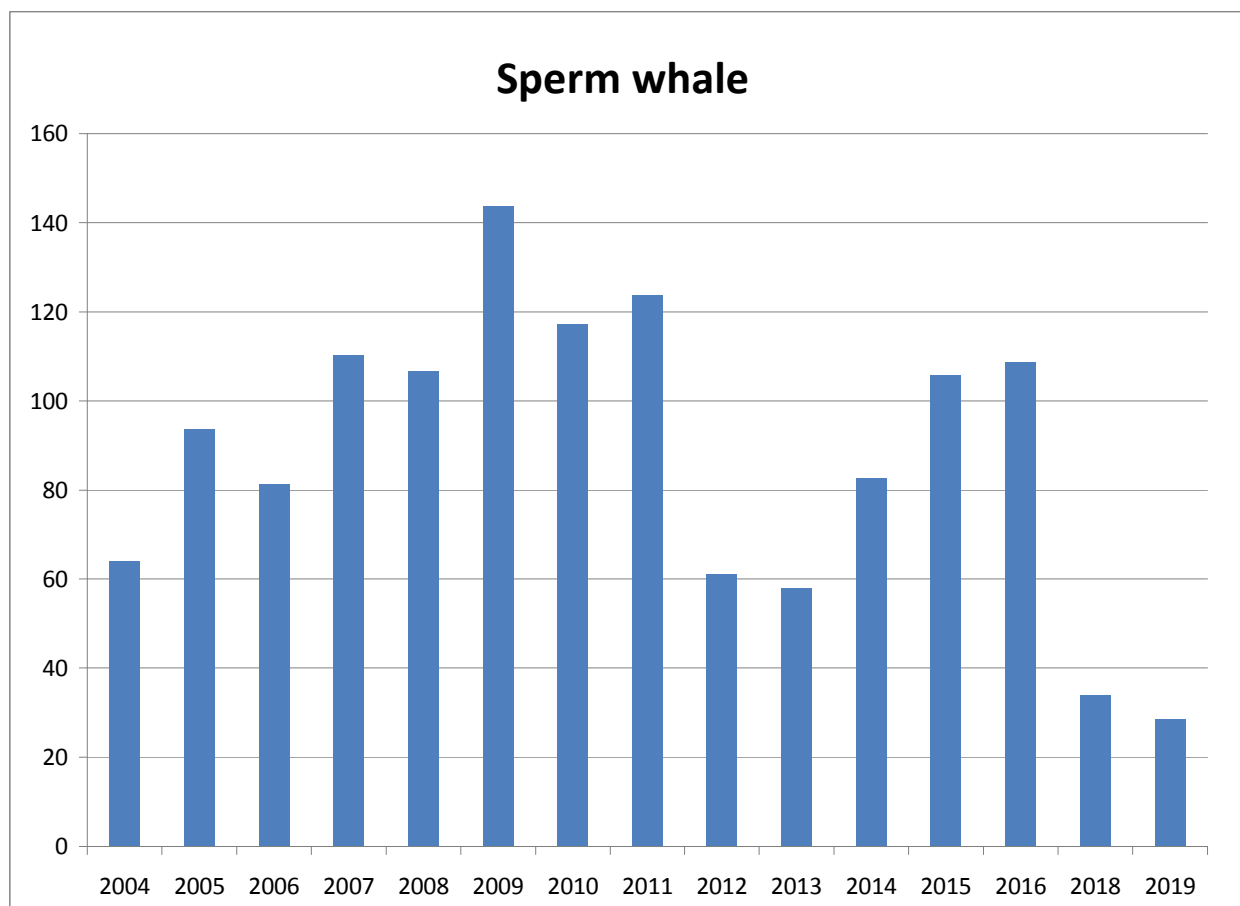
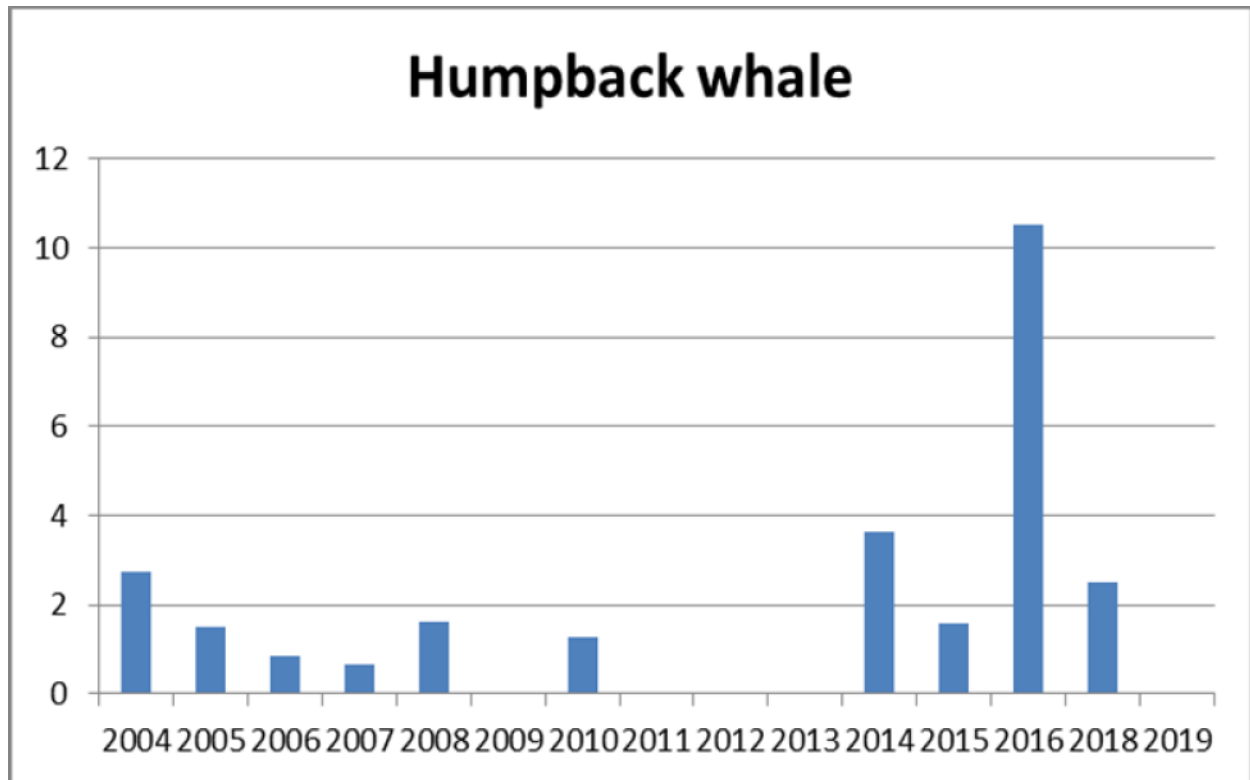


**Figure 2.2a (part 3).** Species sightings 2004-2019 adjusted for effort.





**Figure 2.2a (part 4).** Species sightings 2004-2019 adjusted for effort.



**Figure 2.2a (part 5).** Species sightings 2004-2019 adjusted for effort.

### 2.3. Methods

Physeter (Latin for sperm whale), a 12 m motor catamaran, was used to go to sea on days when weather conditions permitted this. Vigias, local lookouts, were located on the cliffs about 150 m above sea level, where they began to look for whales at around 07:30 to be able to direct the boat, on its departure at 09:00. If the lookouts did not sight any whales, the boat was equipped with a towed hydrophone to attempt to locate sperm whales acoustically. The boat also had up to three additional lookouts onboard, two on the bow (Fig. 2.3a) and one looking aft (behind the boat) searching for cetaceans.



**Figure 2.3a.** Observers on the bow.

Two citizen scientists were tasked with filling in POPA forms (transects and bird, turtle and trash surveys) (Fig. 2.3b). Other citizen scientists were on camera duty, data sheets, hydrophone monitoring (Fig. 2.3c), filling in the log or collecting water temperatures (Fig. 2.3d), when required. In 2019, the aft lookout was also responsible for collecting data on the beta version of the Monicet App (Fig. 2.3e). On occasion, crew members may have had to do more than one job at a time.

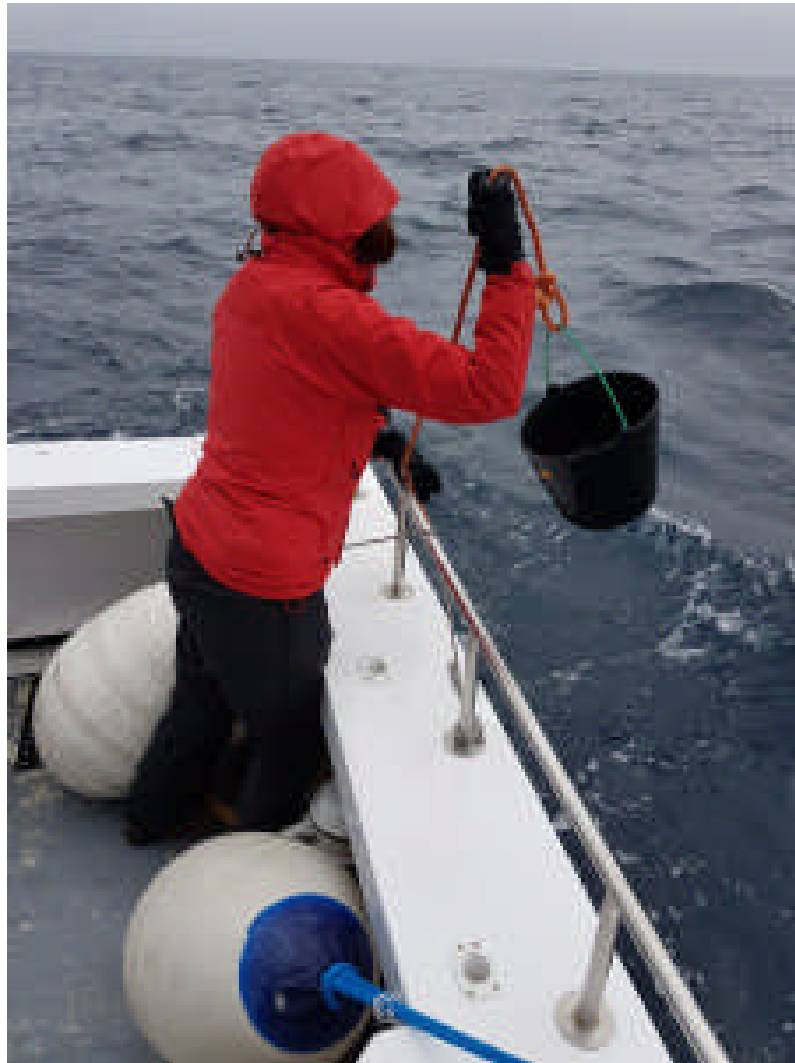


**Figure 2.3b.** POPA sheet duty.



**Figure 2.3c.** Hydrophone deployment and listening.





**Figure 2.3d.** Collecting water for temperature measurement (for POPA).



**Figure 2.3e.** Collecting data using the Monicet app.

When found, sperm whales were approached from behind in order to obtain fluke photographs and in accordance with the whale watching regulations. Baleen whales were also approached from behind, but moving further forward to obtain photographs of dorsal fins as well as chevron patterns of the fin whales (mottling located on the right side of the animal, just behind the blowhole). Risso's dolphin and orcas were also paralleled in order to obtain dorsal fin and saddle patch (orcas) photographs for identification of individuals. Other dolphins sighted were approached for species identification. If the species was not a target species, the boat usually moved on to look for other target animals.

Two cameras were used to obtain the ID photographs: A Canon 7D MK II with a Canon 100-400 mm lens and a Nikon F70 with a 70-300 mm lens.

Data collected for non-sperm whale sightings included: start and end time of the encounter, position of the sighting as well as number of animals, presence or absence of calves and general behavioural state (milling, feeding, bowriding or travelling).

Only four categories of behaviours (milling, travelling, bowriding or feeding) were differentiated, because generally not enough time could be spent with the animals to break behaviours down further. If the animals were travelling, the direction of travel was noted. In addition, environmental information was also recorded including: water temperature, wind speed and direction, sea state (Beaufort scale), and visibility. The number and behaviour of birds associating with the dolphins or whales was also recorded, as was the presence of other whale watching vessels. All sightings were treated as separate encounters, unless more dolphins were seen within two to three minutes of ending the previous encounter, then the maximum number of dolphins and end time were adjusted.

Data collected for sperm whale sightings included: date, start and end time, number of whales, number of calves (the calves also count in the whale column), if the calf was suckling, if there was a visible callous (a growth on the top of the dorsal fin, which indicates that the whale is female) or, if the whale was male, position, fluke heading, defecation and the presence of other whale watching boats.

When loggerhead turtles were sighted, their position was recorded on POPA forms. An attempt to catch the animal was made and, if successful, it was measured and tagged with stainless steel flipper tags for the University of Florida / University of the Azores turtle tagging programme.

When the boat returned to port, there was a debriefing on board to show where the boat had been during the day, using a nautical chart. Later, sperm whale photos taken during the day were matched to the catalogue.

Results were analysed using Excel data analysis tools. Summary statistics obtained thus were used to obtain average group sizes and ranges. Sightings obtained in 2019 were not sufficient to use other statistics.

## 2.4. Results

### 2.4.1. Effort

The research vessel *Physeter* normally left the harbour around 09:00 and returned around 16:00, weather permitting. The boat went to sea for nine days during the expedition and spent between 3 and 8.25 hours (h) per day on the water, the average being 5.5 h. A total of 52.5 h with sea conditions less than sea state 5 were spent at sea. In 2019, there were also 10 h with a sea state of 4, only a fraction less than sea state 5. A comparison of the yearly effort since 2004 is presented in Fig 2.4a. It should be noted that prior to 2009, the expedition duration was 13 days, which has since been reduced to 10 days. Also of note is that in 2009, 2011, 2013 and 2015 there were no expeditions in May. There was no expedition in 2017. In 2018 the expedition began in March for the first time, with no groups in May. There were also no groups in May in 2019 and only one day at sea in March of the same year.

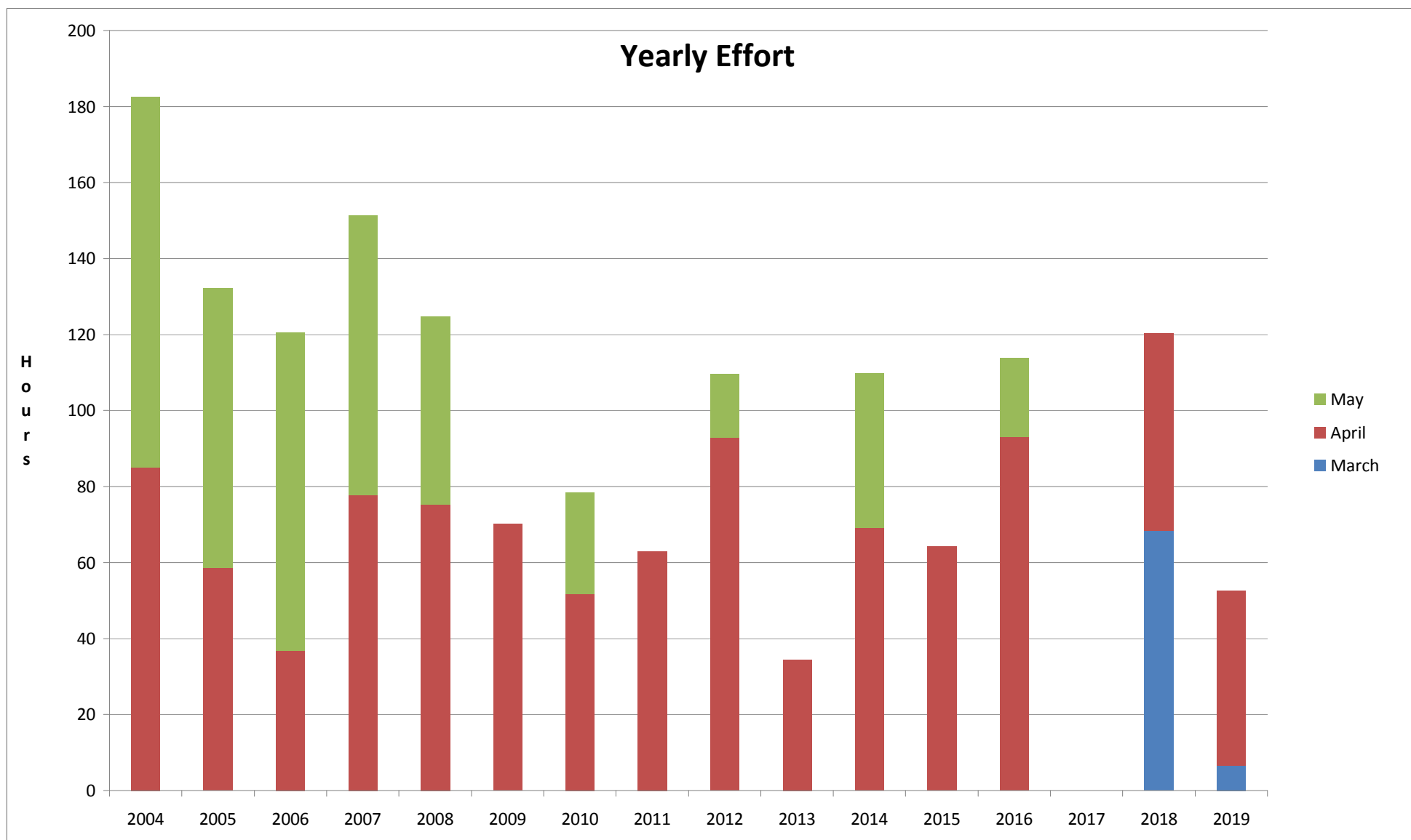
### 2.4.2. Encounters

During the 2019 expedition, eleven groups of non-sperm whales from four different species and 15 sperm whale encounters were recorded (Table 2.4a.).

**Table 2.4a.** Species encountered.

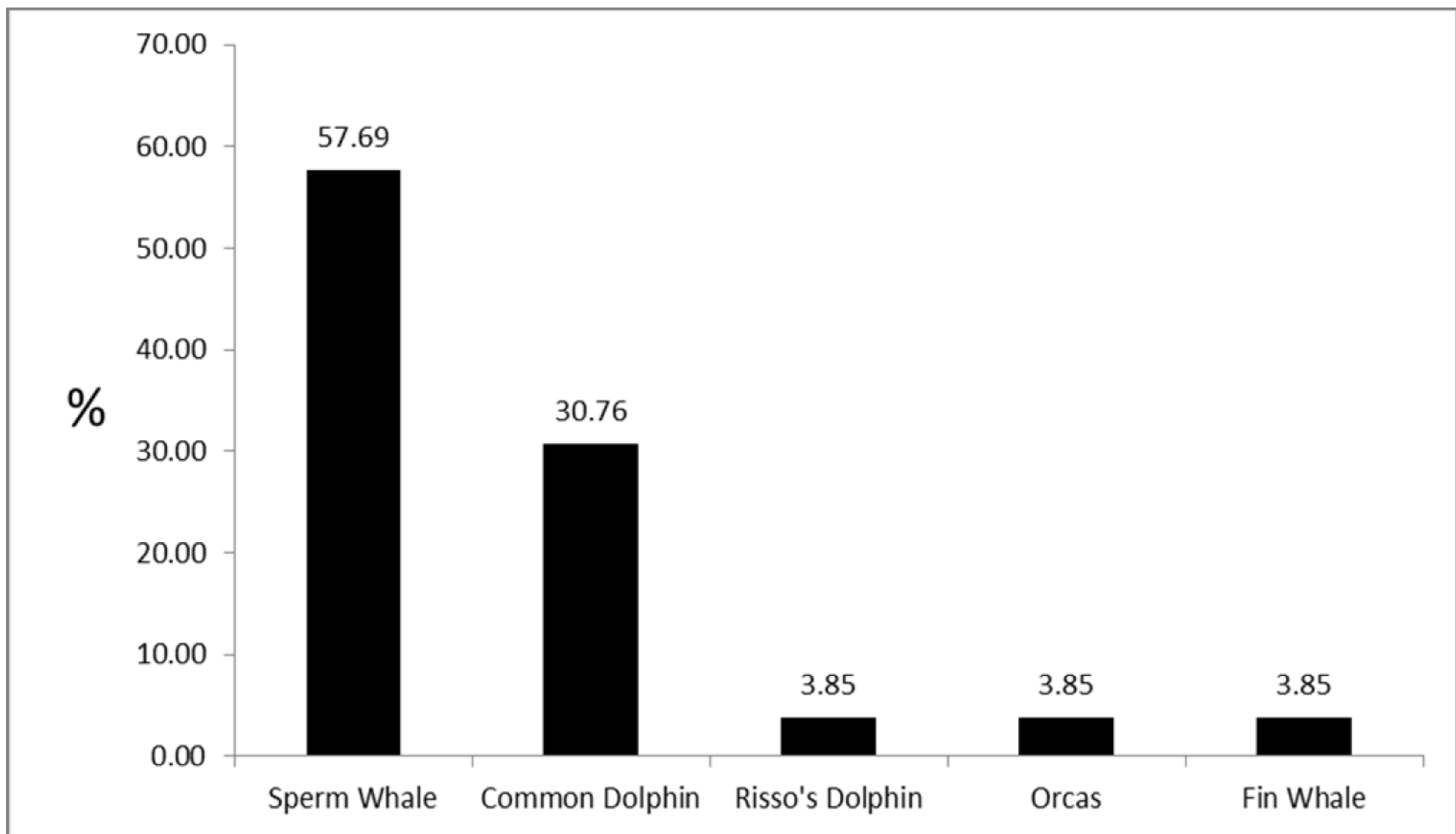
COMMON DOLPHIN, <i>Delphinus delphis</i>	8
RISSO'S DOLPHIN, <i>Grampus griseus</i>	1
ORCAS, <i>Orcinus orca</i>	1
FIN WHALE, <i>Balaenoptera physalus</i>	1
SPERM WHALE, <i>Physeter macrocephalus</i>	15

These encounters resulted in a relative sightings frequency as shown in Fig. 2.4b. Sperm whales were the species encountered most at 57.69% and, along with common dolphin at 30.76%, made up almost 90% of the sightings. Fin whales, orcas and Risso's dolphins comprised the rest of the sightings.



**Figure 2.4a.** Yearly effort 2004 – 2019.





**Figure 2.4b.** Species sightings frequency relative to other species.

### 2.4.3. Species sightings

#### Common dolphin

This species was encountered eight times. Group sizes ranged from 5-30 with an average of 13 (Fig. 2.4c). This group size is lower than we have previously observed. Calves were first observed on 2 April and seen on 50% of sightings during the expedition. There are insufficient data to determine if group sizes were larger with calves than without. It is generally thought that calves are present in larger groups, which provide greater protection for the youngsters (Schaffar-Delaney 2004, Tezanos-Pinto 2009).

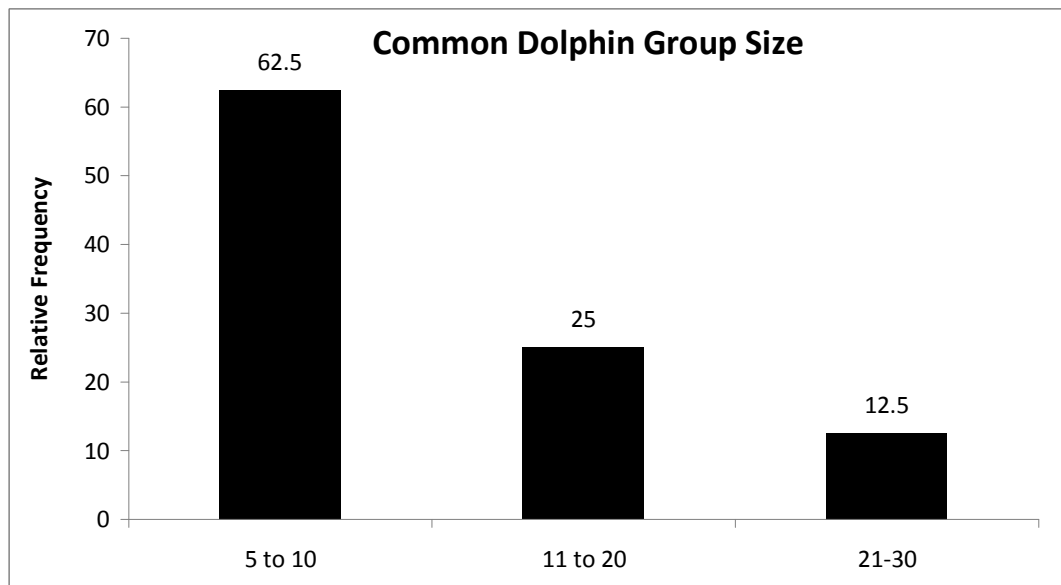


Figure 2.4c. Common dolphin group size classes.

Behaviour of common dolphin was evenly split between milling and travelling. They bowrode on 75% of encounters and were seen feeding once (Fig. 2.4d).

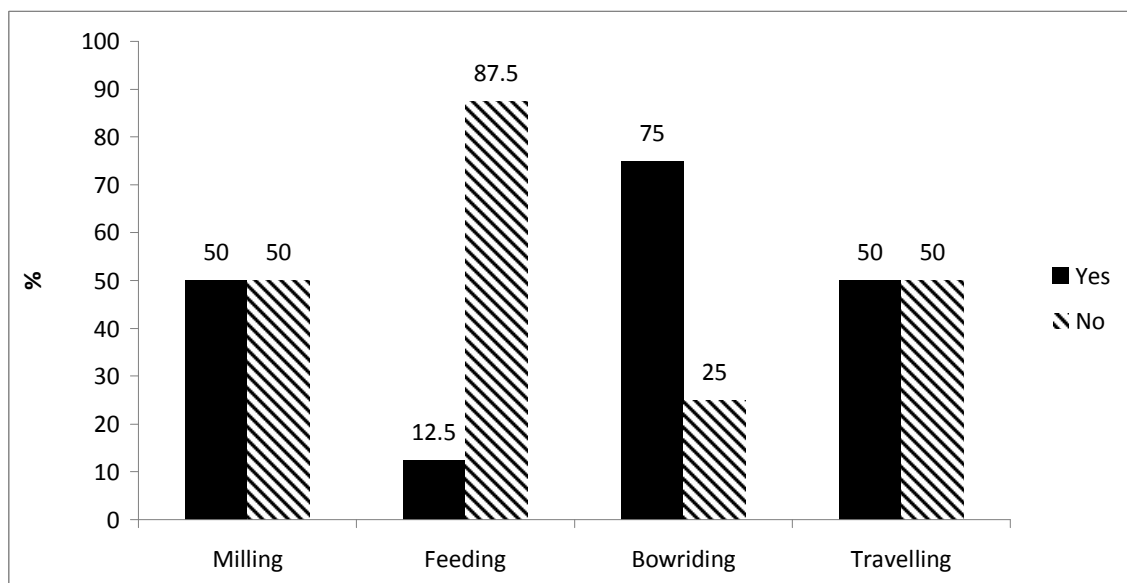


Figure 2.4d. Common dolphin behaviour.

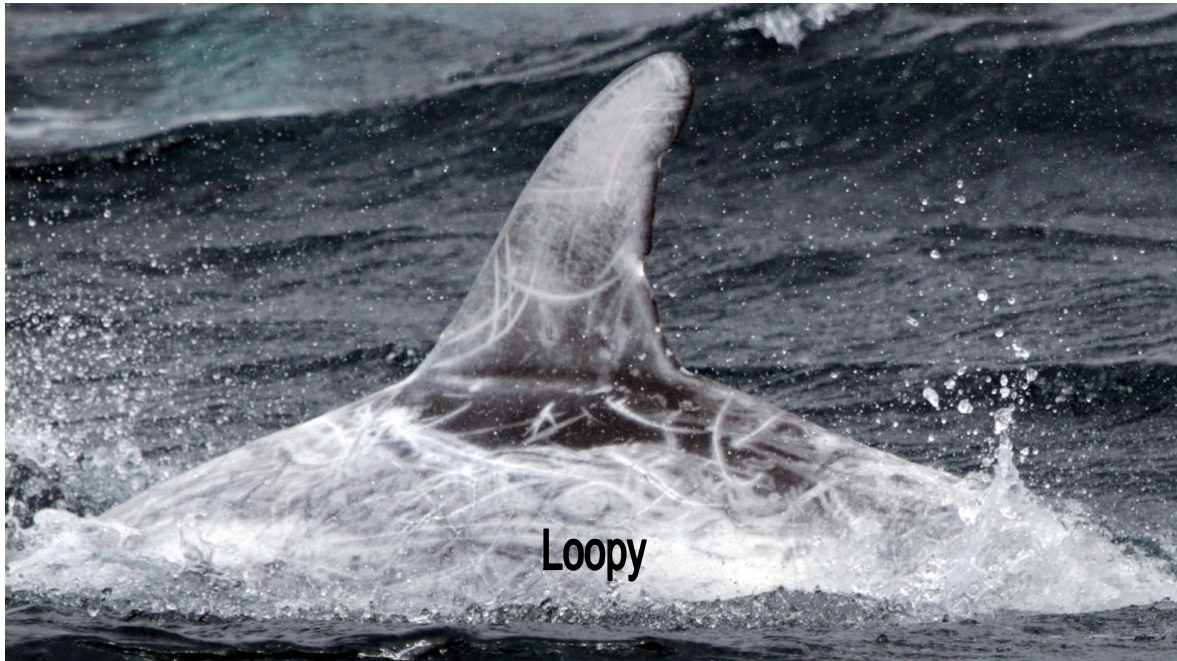
## Risso's dolphin

One group of 25 Risso's dolphin was seen, including males as well as mothers and calves. Photographs were taken of dorsal fins to identify individuals (Fig. 2.4e). This proved to be a mixed group of known individuals. There were several females, including "Resa", first seen in 2004, M3a, first seen in 2006, with her third calf and also M5cc, with a calf. There were a few males mixed in with the group. One of these ("Loopy") used to be part of a large group of older males that has slowly disappeared over the years and now he does not appear to have a stable group. He and S22 had not been seen for several years prior to this encounter (Karin Hartman pers. comm.).



**Figure 2.4e (part 1).** Risso's dolphin dorsal fin photo-ID.





**Figure 2.4e (part 2).** Risso's dolphin dorsal fin ID photos.



## Orcas

A group of eight orcas was observed on 31 March 2019. This group had also been seen a few days prior to the expedition sighting (Sanne Bakkers pers. comm.). They were milling (non-directional movement) and appeared to be feeding, although no prey was seen. ID photos of the dorsal fins and saddle patches were taken to match to other previous sightings of orcas in the Azores (Fig. 2.4f), though no matches were found to the catalogue. This species is not seen very frequently, but can be seen at any time of the year, although there have been more sightings in the spring than at other times of the year.



**Figure 2.4f (part 1).** Orca dorsal fin ID photos.





**Figure 2.4f (part 2).** Orca dorsal fin ID photos.





**Figure 2.4f (part 3).** Orca dorsal fin ID photos.

### Fin whale

One group of three fin whales was seen during the expedition. They were travelling southeast. Photo identification pictures of the chevrons and dorsal fins of two individuals were obtained (Fig 2.4g) and these photos were sent to the College of the Atlantic, University of Virginia and The Bottlenose Dolphin Research Institute (BDRI) in Spain for matching to their Atlantic catalogues. No matches have been found to date.



**Figure 2.4g (part 1).** Fin whale ID photos





**Figure 2.4g (part 2).** Fin whale ID photos.

## Humpback whale

No humpback whales were seen on the 2019 expedition. However, for the first time in over 30 years of research, we heard a humpback whale singing on the hydrophone on 4 April 2019. It is the male humpback whales that usually “sing” on the breeding grounds. Unfortunately, we were unable to locate the animal.

## Sperm whale

Sperm whales are one of the target species of the expedition. They were encountered 15 times on 13 April, comprising 19 animals (not all different individuals). The average group size was 1.27, ranging from 1-2, which is similar to that encountered during other parts of the summer. One large male was seen, and females with calves were observed 4 times. Photographs were taken of all whales that fluked up. Individuals can be recognised by the nicks and scallops formed on the trailing edge of the tail, due mainly to wear and tear as the flukes beat through the water (Fig. 2.4h). Four different individuals were identified in total, from the 15 encounters. One male was observed that had not previously been seen. The others were re-sighted individuals; 2 had been seen during the 2013 expedition and the other individual had also been seen during the 2008 expedition, in addition to 2013.



seen in 2013



seen in 2013



seen in 2008 & 2013



unidentified male

**Figure 2.4h.** Sperm whale ID photos.



## Miscellaneous sightings

Loggerhead turtles were observed seven times during the expedition. None were caught for tagging (Fig. 2.4i).



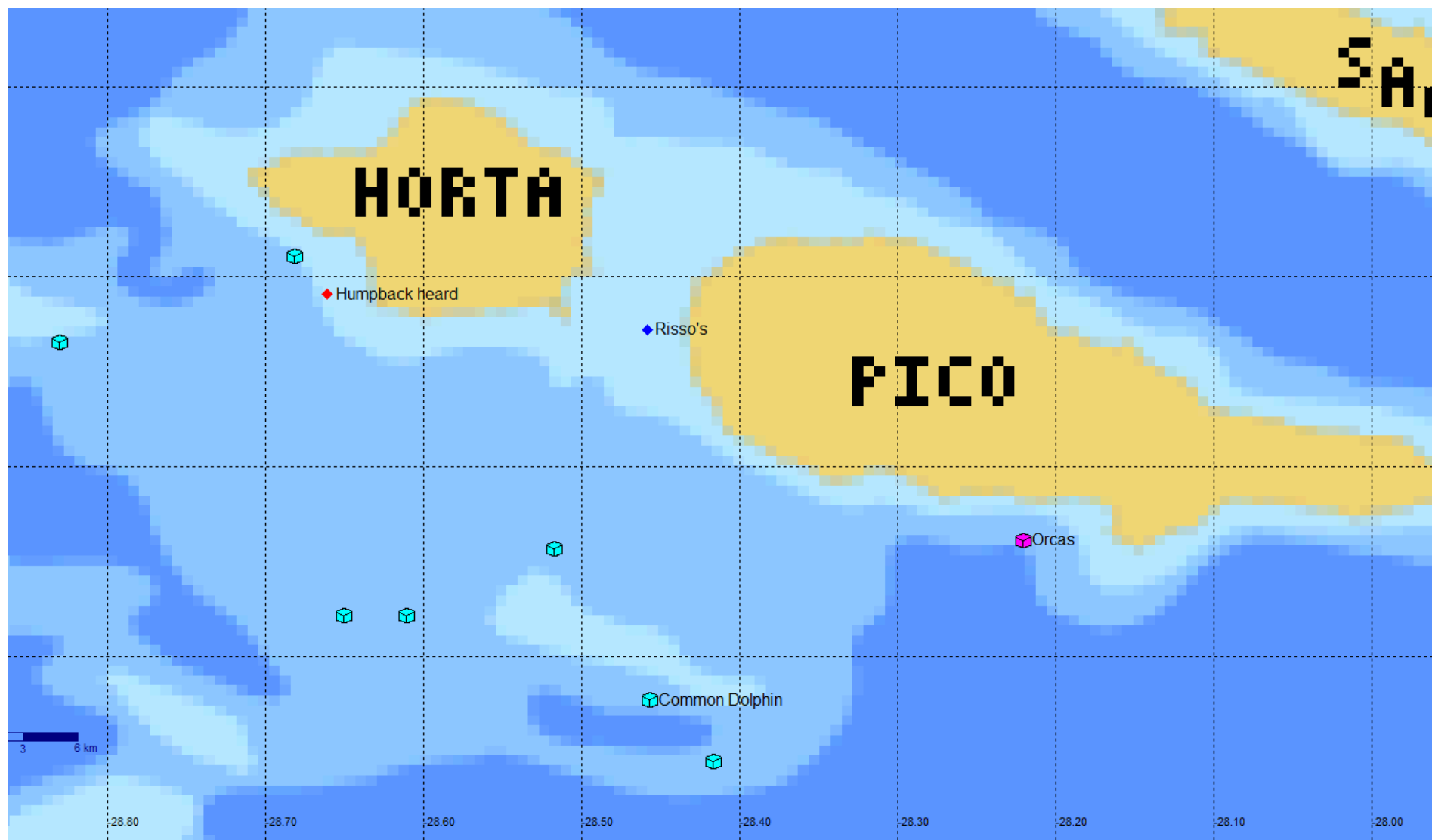
**Figure 2.4i.** Loggerhead turtle.

## Sightings during the expedition

Figs. 2.4j and k show locations of species sightings in relation to the islands of Pico, Faial and São Jorge, and over the two expedition slots.

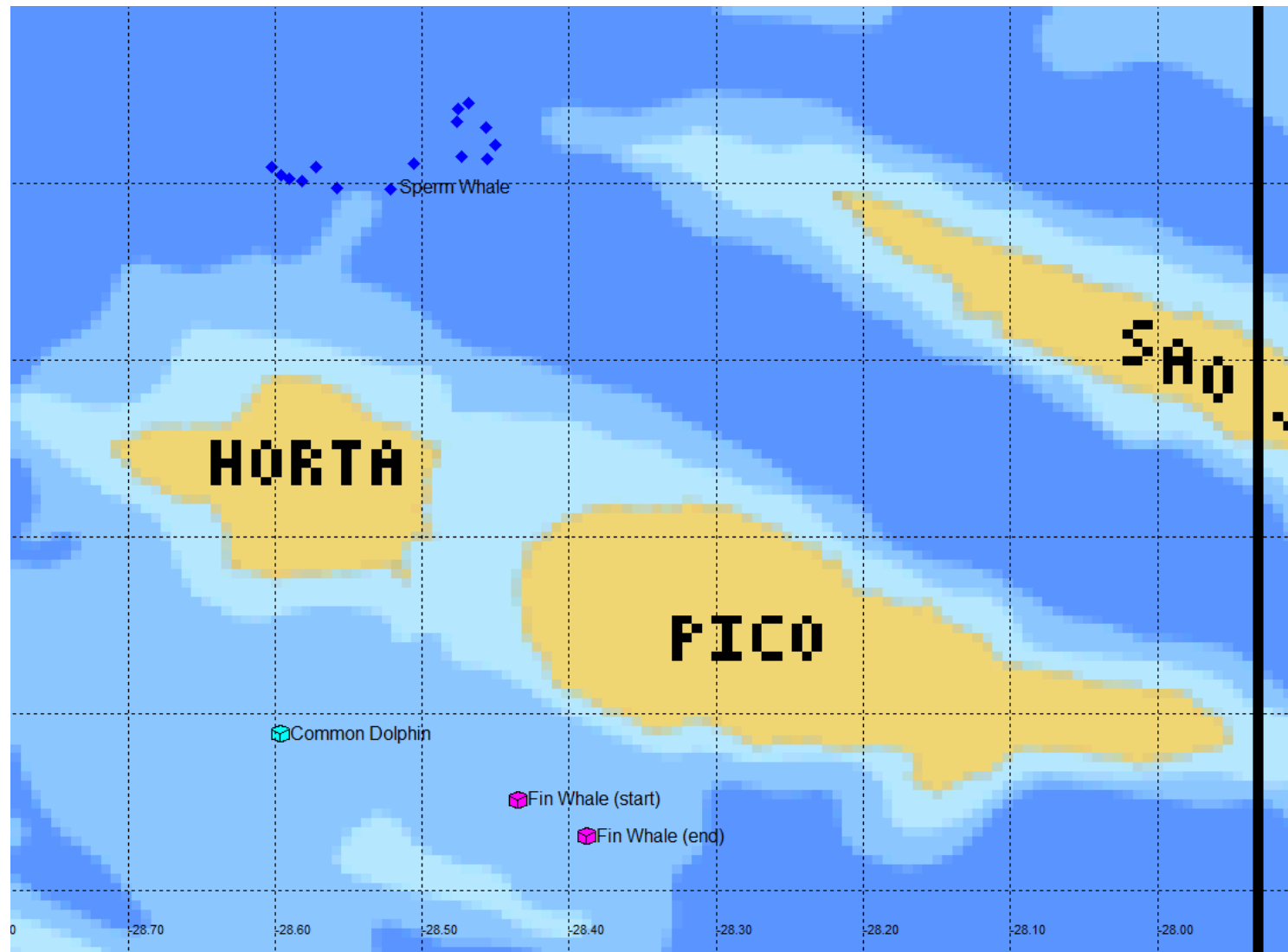
## Monicet app

In 2019, a beta version of the Monicet data collection app was trialled on a smartphone. Monicet is a platform that collects sightings from mainly around the Azores, used primarily by whale watching companies ([www.monicet.net](http://www.monicet.net)). It was partially successful. Three of the tracks collected using it are shown in Figs. 2.4l-n. Green and yellow icons are GPS locations and blue are the start/end points of sightings. The blue icon at Horta bay was necessary in order to end the app recording on 31 March 2019, which demonstrates one of its glitches. From gaps in the track lines, it can be seen that GPS points were not always recorded. It is unknown why this occurred. Monicet has funding to create a new and improved app for 2020. However, at the time of writing this was unlikely to be ready by the time of the 2020 expedition.



**Figure 2.4j.** Sightings during group 1 (29 March – 7 April 2019).

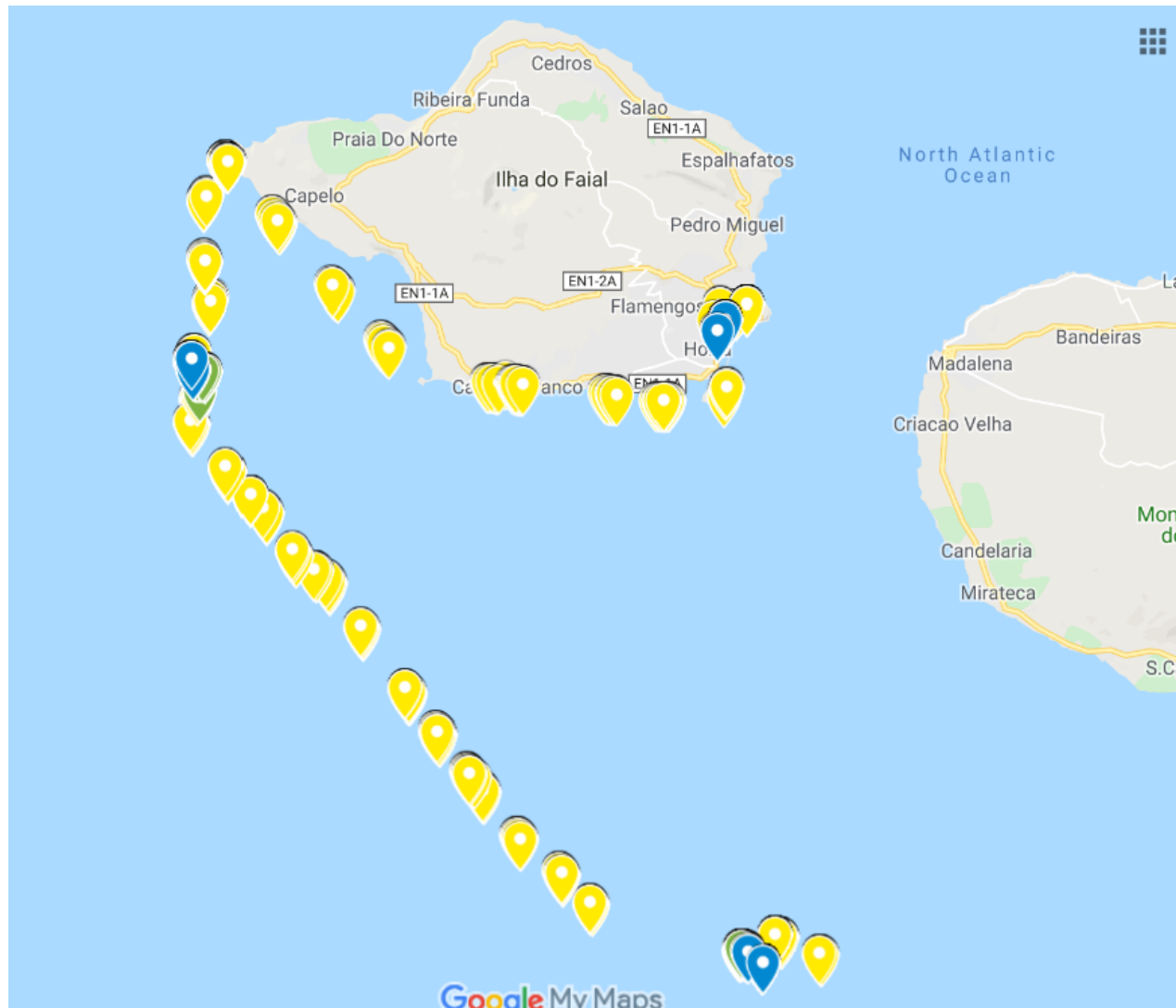




**Figure 2.4k.** Sightings during group 2 (9 – 18 April 2019).



**Figure 2.41.** Track recorded by Monicet app on 31 March 2019. Green and yellow icons are GPS locations (from a phone and a dedicated GPS unit respectively), and blue are the start/end points of sightings.



**Figure 2.4m.** Track recorded by Monicet app on 2 April 2019.  
Green and yellow icons are GPS locations (from a phone and a dedicated GPS unit respectively), and blue are the start/end points of sightings.



**Figure 2.4n.** Track recorded by Monicet app on 4 April 2019.  
Green and yellow icons are GPS locations (from a phone and a dedicated GPS unit respectively), and blue are the start/end points of sightings.

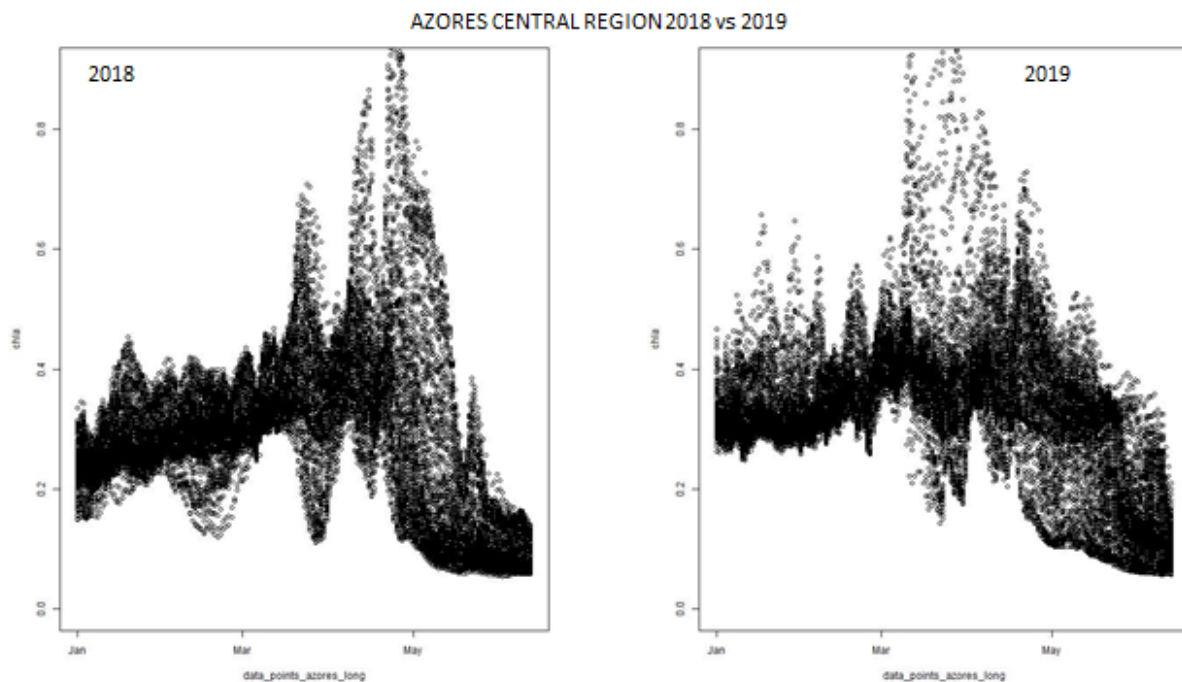
## 2.5. Discussion & conclusions

March, April and May are usually a good time for cetacean sightings in the Azores. Biosphere Expeditions are playing an important role in collecting vital information at a time of year when little or no work has been done in the past, mainly due to low numbers of tourists and lack of independent funding.

Many species of cetacean can be observed in the archipelago. In fact, the variety of cetaceans is usually greater at this time of year than any other time of the whale watching season. Sightings of baleen whales are unpredictable, but the use of lookouts (vigias) on the cliffs greatly enhances the probability of sighting them. Orcas are an uncommon sight in the Azores. They can appear at any time of the year, although there are more observations in the spring than at other times.

The weather in 2019 was not favourable for our surveys. While we did manage to get out to sea for over 50 hours during the 2 groups, we were often limited by the weather as to where we could go and often worked in difficult conditions. When the sea state is over 3, it becomes very difficult to spot dolphins, which may account for the lack of sightings as reported above.

Baleen whales were only sighted once during the expedition, which is very unusual. In fact, sightings during the whole 2019 season were significantly below average. This could possibly be explained by a lower primary productivity (plankton) in the area, which means that there is less food for the animals to eat, so they look elsewhere. The productivity in the Azores had been increasing up until 2014, the year which to date has had the most sightings of baleen whales (Steiner et al. 2014). After 2014, the productivity began to decrease in the Azores and appear further north (Sergi Perez Jorge pers comm.). Fig. 2.5a shows a comparison between 2018 and 2019 productivity levels. Between these two years there is not too much difference. It may be that a gradual decline in productivity over the past few years has led to animals taking a different route to their feeding grounds.

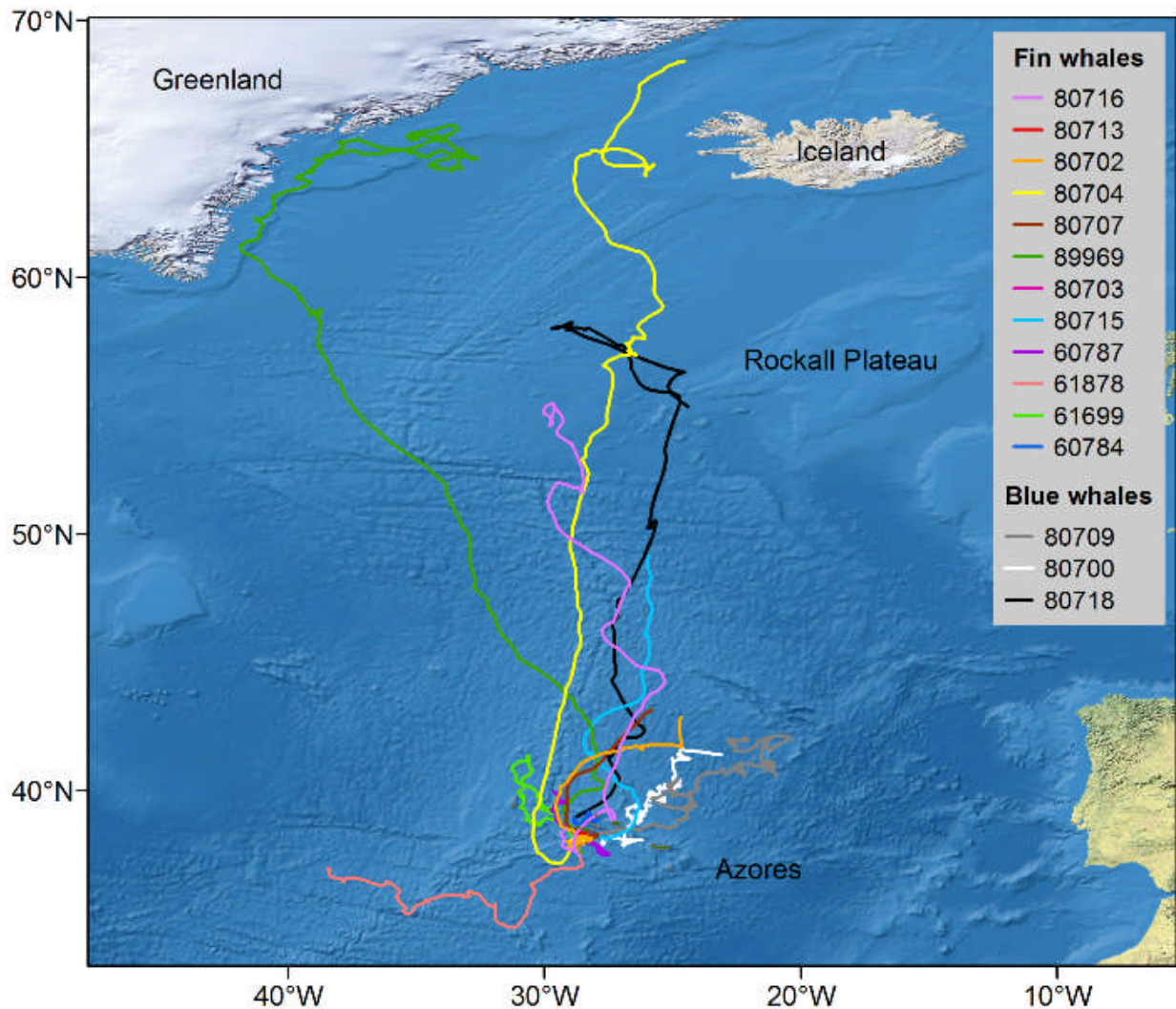


**Figure 2.5a.** Comparison of Chlorophyll A between 2018 and 2019 (Sergi Perez Jorge pers comm).



## Fin whales

Fin whales were encountered once in 2019. A group of three individuals was recorded travelling to the southeast. These whales were on their northward migration; exactly where they travelled to is still unknown. During the expedition, some initial photo-ID matching began with photos taken previously in the Azores, and photographs of individuals were forwarded to interested groups in the US and Spain to attempt to make matches (see next paragraph for a Spain match), as well as the College of the Atlantic, which currently oversees the humpback whale catalogue. As far as we know from tags placed on fin whales by the University of the Azores (Fig.2.5b), their general movement is northwards in the spring, but the tags have stopped working or fallen off, before the animals reached the main feeding grounds.



**Figure 2.5b.** Movement of blue and fin whales tagged in the Azores (Silva et al. 2013).

The only match to date is of one leucistic (i.e. with partial loss of pigmentation) fin whale, very well marked with white patches, that was observed in the Azores in June 2017 and was re-sighted off northern Spain in October 2017 (Methion and Diaz Lopez, 2019) Fig. 2.5c.





**Figure 2.5c.** Movements of fin whales in the North Atlantic (BDRI Facebook post).

Knowledge of fin whale movements and identification is important, because in 2017 and 2018, one company in Iceland began hunting fin whales in order to export the meat to Japan. Although no fin whales were hunted in 2019, the licence is valid until 2023. It is possible that animals from the Azores migrating to Iceland may face an extra threat on one of their possible feeding grounds.

### Humpback whales

No humpback whales were observed during the 2019 expedition. One individual humpback was seen just before the expedition started, and on 4 April 2019 a humpback whale was heard singing on the hydrophone. In over 30 years of research, singing from a humpback whale has never been heard in the Azores. The male humpbacks sing on the breeding grounds to attract females (Payne and McVay 1971). Unfortunately, we were unable to locate the singer to obtain fluke photos for photo ID.

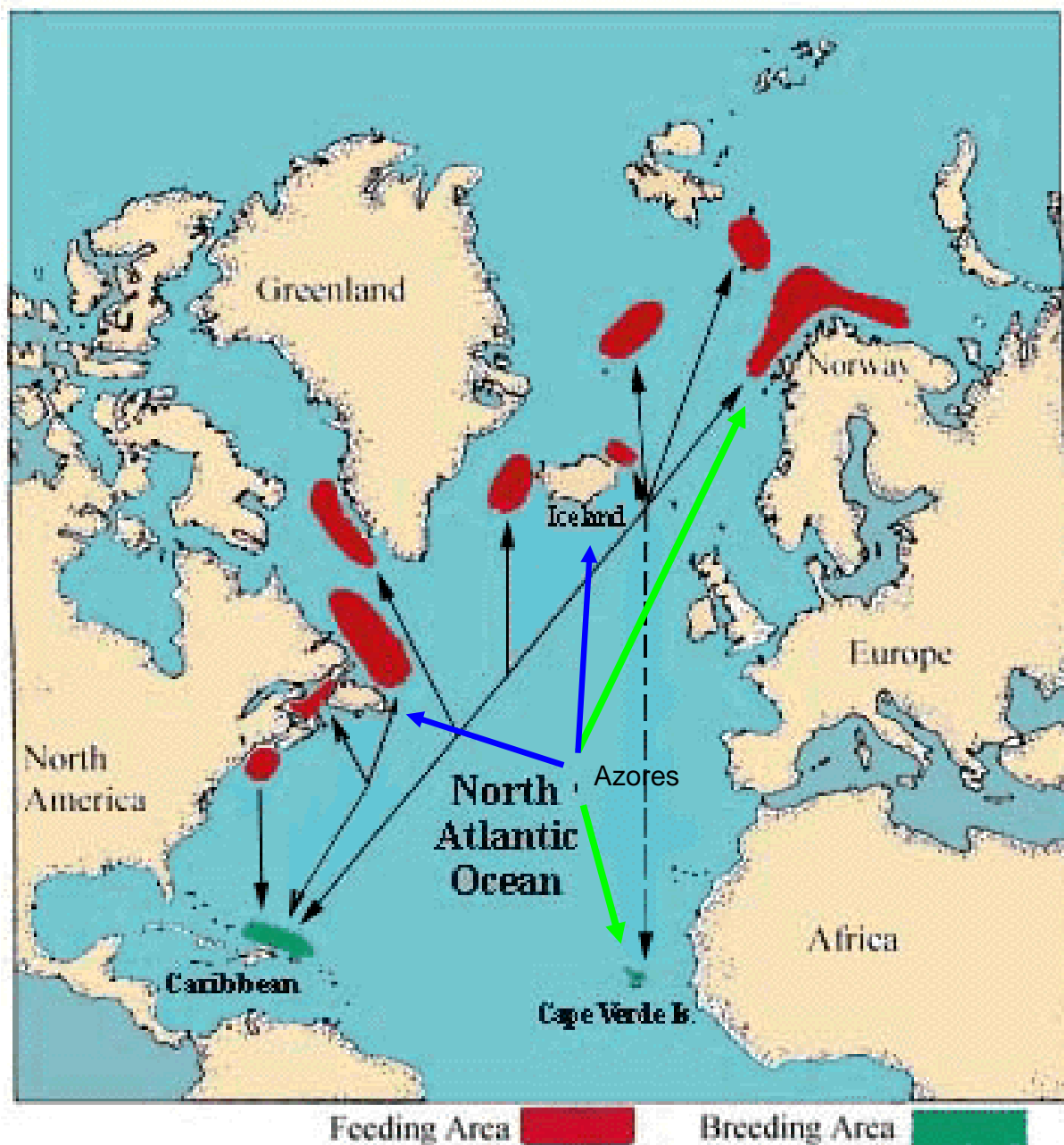
In wider research on this species outside the expedition, there have been several humpback whales sighted in the Azores that have also been seen in the Cape Verde Islands (Wenzel et al. 2009). To date there are ten matches between the Azores and Cape Verde with five of those being seen in northern Norway (Fred Wenzel pers. comm.). One humpback whale sighted during a previous expedition was matched to a whale seen in northern Norway (2014/2015) and close to the Russian border (2016) (unpublished data). There has been a new match from the Azores (not the author's photo) to Newfoundland, which is the first trans-Atlantic match (unpublished data). Tagged animals have passed by the Azores on their way to the Caribbean (unpublished data), but have not been photographed yet, so it is just a matter of time before a match is found to the Caribbean population as well. Two animals tagged in Norway a few years ago came close to Faial on their way to the Caribbean (unpublished data), just not close enough to be identified. A new match has also been made recently from the Azores catalogue to Iceland (unpublished data).

The [North Atlantic Humpback Whale Catalogue](#), managed by the College of the Atlantic, is currently approaching 11,000 individuals on record and although the Azores photos are a very small part of this catalogue, they play an important role in discovering some long-range matches. Since 2004, the expedition has contributed 21 ID photos to the catalogue, which produced one match to the Cape Verde Islands in 2010 and one to Norway in 2018 (unpublished data). The Cape Verde match made by the expedition, as well as data collected outside the expedition and by Wenzel et al. (2009), suggest that most of the humpbacks that are seen in the Azores are part of the endangered Cape Verde population, rather than the Caribbean population which was taken off the endangered list in 2016 (Fig. 2.5d, Wenzel et al. 2009). Matching movements and populations is important, because little is known about the movements of the eastern Atlantic humpback whales and as an endangered population, it is good to monitor its status in order to take action as soon as possible if a decline is noticed. Some animals appear to stop in the Azores to feed on their way to the final feeding grounds as well as on their way back to the breeding grounds (Cucuzza et al. 2015). With several matches made to Norway, it would appear that many of the Cape Verde animals make their way to Norway as a preferred feeding area (Wenzel et al. 2009). This project has made a significant contribution to these important insights.

Most researchers will not risk coming to the Azores to find baleen whales, because their migration patterns are too unpredictable, as can be seen by the expedition's very variable success in recording baleen whales. Researchers could come to the islands for a few months and not find a single baleen whale. The expedition has the luxury of already being in place and with the vigia (lookout) network, if the animals are present, can take advantage of any opportunities that present themselves. Researchers responsible for the baleen whale catalogues are always thankful for data gathered during the expedition, and continue to repeatedly communicate to the author the importance of the baleen whale photos taken during the expedition, since the Azores may be a route marker for animals travelling north (Richard Sears, Peter Stevick, pers comm.).

Two collaborative projects were conducted with the University of the Azores, looking at sightings of (non-baleen) sperm whales (Boys et al. 2016, 2019), as well as baleen whales, with respect to environmental data collected by the university (depth, slope and tide as a few examples). One poster on baleen whales, using photo-ID from 1998-2015, was presented at the 2016 European Cetacean Society conference in Madeira (Chevallard et al. 2016). This corroborated the results mentioned above, i.e. that some blue whales have been seen in multiple years, fin whales have not, and only one sei whale has been seen in multiple years. Some individual blue and fin whales remain in the Archipelego for a few weeks, while the sei whales do not.

The significance for whale conservation and research of these findings is that the Azores may provide a crucial 'pit stop' (between breeding grounds further south, possibly Mauritania and feeding grounds in Iceland and Norway) for some of the migrating animals that have not been feeding for a few months on the breeding grounds. The resources that they find in the Azores could make the difference between survival and death. Having a baseline of information on the number of animals and the areas that they are using may also be useful in detecting any early changes in prey abundance due to global warming. In this regard, 2019 may be an indicator of things to come, if global warming is responsible for the decline in productivity in the Azores over the past few years. Only over the next few years will we be able to determine if this slowdown in productivity is a normal variation in productivity, or an indication of future trends due to global warming.



**Figure 2.5d.** Movement of humpback whales in the North Atlantic (Wenzel et al. 2009). Azores matches in green and blue.

### Dolphin species

Overall, dolphin sightings continued to be low. This may have been due to the weather conditions we were operating under, or possibly due to a lack of food. There were no bait balls or feeding frenzies of Cory's shearwaters observed in the area. The last three years have had lower overall dolphin sightings than previous years. To date, it is not known why. If there is lower primary productivity, then it follows that there will be less prey for some species to eat. Another possibility is that the dolphins have been stressed by the swimming with dolphins that occurs mainly in the summer months, and are now spending less time in the main whale watching areas.

The expedition saw one group of resident Risso's dolphin. Two of the Risso's dolphin were the well-known females "Resa" and M3a. "Resa" has been seen since 2004 and M3a since 2006. Resa had her fourth calf and M3a had her third calf with them. This is a regular "nursery" group of Risso's dolphin we see regularly. The males tend to live in separate groups. Also identified in 2019 were a couple of males, mixed in with the females, "Loopy" and "S22", who had not been seen for several years prior to this sighting (K. Hartman pers.comm.). The males were part of a very well-known group of males, but over the years that group has declined and been moved out of the prime area for females by new, younger and stronger groups of males. The remaining males are no longer affiliated to any specific group and tend to roam around in small unaffiliated groups, which was probably why the males were associating with a nursery group (Hartman pers.comm.). All of the ID photos of the Risso's were forwarded to Karin Hartman who wrote her PhD (Hartman 2014) on Risso's around Pico, for future analysis.

Eight groups of common dolphin were seen. These dolphins are not part of the photo-ID project, since group sizes can often be quite large making it difficult to identify all the individuals and prior to digital photography, prohibitively expensive. The group sizes were smaller than usually observed, but this could be due to prey being dispersed over a wide area, or because there were not enough sightings to get a complete picture.

Orcas were observed for the first time during an expedition. A group of eight individuals was seen on 31 March 2019, the expedition's first day out at sea. Orcas are not a regular sighting in the Azores though they can be seen at any time of the year. For an unknown reason, there are more sightings in the spring than at other times of the year. ID photos were compared to the orca catalogue and no matches were found. Other groups of orcas have been re-sighted between groups of islands and in different years, leading to the hypothesis that there may be some resident orcas in the Azores, spending most of their time offshore hunting tuna or other large fish, and only occasionally coming closer to the coast where they can be observed. This would explain the paucity of sightings.

## Sperm whales

The 2019 expedition had a total of 15 encounters of 19 sperm whales, including females with suckling calves, as was observed during previous expeditions, in addition to one big male. We heard sperm whales on the hydrophone on two additional days, but were unable to locate them in the time available.

Before Biosphere Expeditions began working in the Azores, the expectation was that we would see mainly large males in spring, but this has proven not to be the case, although we do tend to see more males in the spring than in the summer. One male was seen during this expedition. He was observed in the same area as a group of female sperm whales. It is normal for very large males to become more solitary the older they get, but after they leave their natal group, at around 15 years old, they usually associate with other male "teenagers" in bachelor groups (Whitehead 2003). When mature, 25 years or more, they move around the north Atlantic (in this case) looking for females that are ready to breed (Whitehead 2003). This may have been occurring here, although no socialising or mating was observed.

Re-sightings of male sperm whales are rare, because they move around looking for female groups to breed with when not in their feeding areas, which tend to be further north than the Azores (Whitehead 2003). There have only been a few re-sighted males over 30 years (unpublished data).



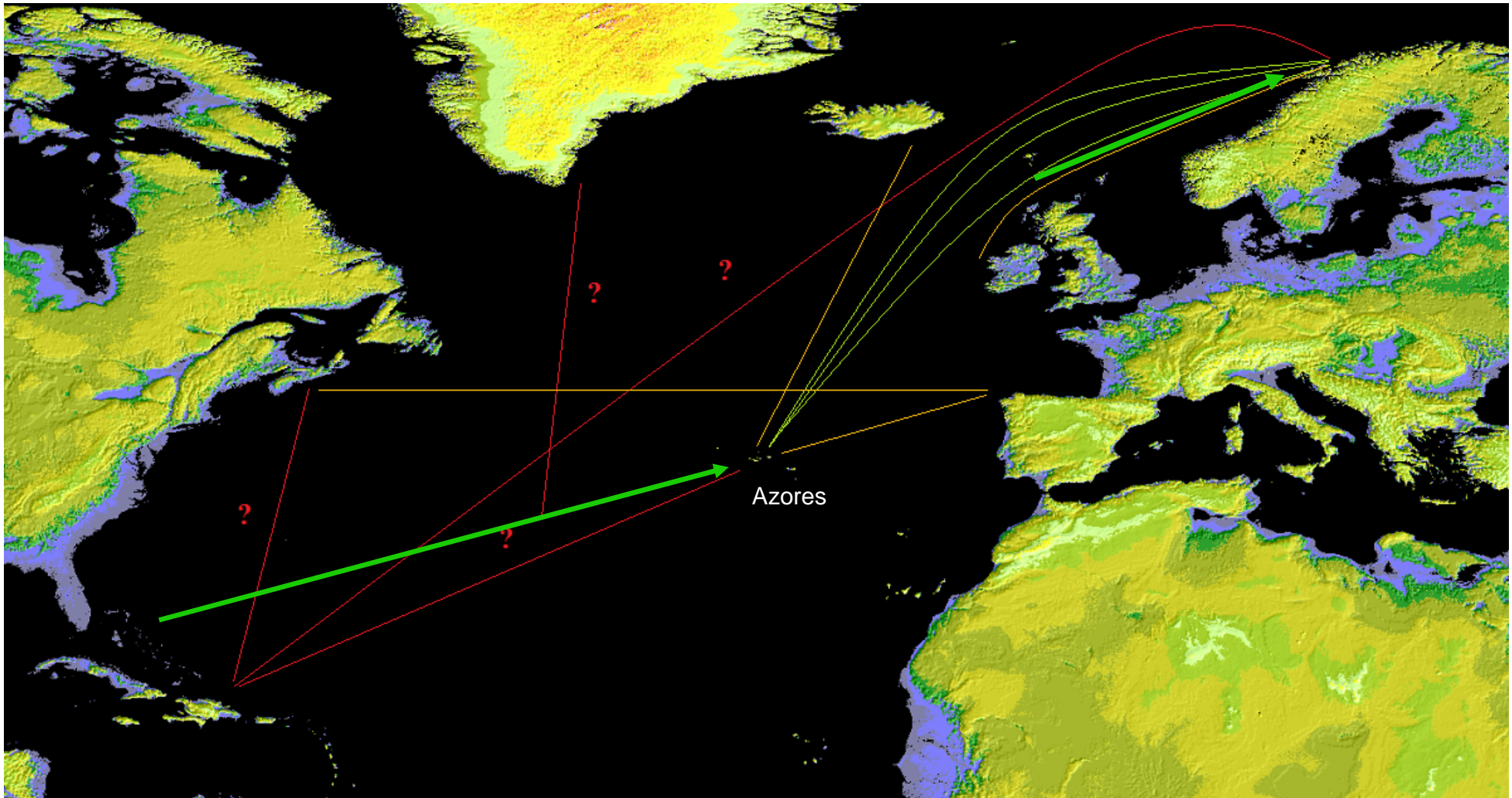
Recently, a match was made of a sperm whale seen in the Gulf of Mexico in 2002. It was re-sighted in the Azores in 2017 (unpublished data). This is the first cross-Atlantic match of a sperm whale. Little is known about movements of young males (Whitehead 2003). This whale had not been identified as a male in the Gulf of Mexico, but was positively identified as one 15 years later. The author has been trying to get access to images of bachelor groups from the Caribbean, without success to date.

In October 2009, the author presented a poster on the movements of male sperm whales around the Atlantic, at the Marine Mammal Conference in Quebec (with assistance from the Friends of Biosphere Expeditions) (Steiner et al. 2012). Three males seen in the Azores were matched to animals re-sighted in Norway in 2007 and 2008. This gave researchers the first indication of where the males observed by the expedition may go when they are not in the Azores. The collaboration with biologists working in Norway is ongoing, but the male from this year's expedition did not match to Norway. The movement of males has now been published (Steiner et al. 2012). Since then another nine males have been matched from Norway to the Azores. The last match made was a male seen on 9 August 2016, having been seen previously in Norway in 1993, 23 years ago (Fig. 2.5e) (unpublished data).

Data collected at this time of year are valuable to elucidate whether some of the same individual sperm whales remain in the archipelago for long periods of time. There is some indication that more 'unknown' individuals are present in the early part of the season with the 'known' animals arriving later. It would be very interesting to see which individuals are present in the archipelago over the winter. Maybe some groups prefer summer in the Azores and others prefer winter. The weather in the winter, as well as the difficulty of recruiting citizen scientists or even tourists for this harsh and challenging time of year, and therefore getting research vessels out on the water, are the main obstacles to investigating this theory.

Seeing re-sighted animals this early in the season shows that some of the sperm whales that return to the area do not have a seasonal preference and can be seen in all months, or they possibly move around the archipelago all year round. ID photographs confirm that female sperm whales spend their whole lives together (Whitehead 2003); it is the juvenile males that leave the group (Whitehead 2003). Some of the animals observed in previous years have been seen together for 28 years. Usually when one animal from a group has been seen before, the rest of the animals in the group have also been seen. Sometimes it is not possible to identify all the animals of a group on a given day, but repeated sightings of the same group over time give more chances to catalogue all of the individuals from that group. Sperm whales live for around 60-70 years, so some of these animals re-sighted in the Azores have been recorded for almost half of their lives.

We have been collaborating with two whale watching companies that operate out of São Miguel, as well as one of the companies from the south of Pico, since 2010. Several matches exist between the catalogues from the other whale watching companies, indicating that there is movement of some animals around the archipelago, although most animals have been observed in only one area. The two groups of islands are only 125 nautical miles apart, so it is not surprising that there is movement between the two areas.



**Fig. 2.5e.** Movements of male sperm whales in the Atlantic (some data from Steiner et al 2012).  
Azores matches in green.

Collaboration between the expedition scientist, Madeira and the Canaries has been going since 1998. The Whale Museum of Madeira ([www.museudabaleia.org](http://www.museudabaleia.org)) and more recently the Oceanic Observatory of Madeira ([www.oom.arditi.pt](http://www.oom.arditi.pt)), as well as SECAC (Sociedade para el Estudio de los Cetaceos en el Archipelago Canario, [www.cetaceos.org](http://www.cetaceos.org)) and CEAMAR (Cetaceans and Marine Research Institute of the Canary Islands [www.ceamar.org](http://www.ceamar.org)) from the Canaries, share sperm whale photos to investigate matches within Macaronesia. This collaboration has already provided 32 matches for females between the areas (13 Az-Can, 8 Az-Mad, 11 Mad-Can). A few of the animals that have been sighted in the Azores and then in Madeira or the Canary Islands, have returned to the Azores. This shows that some female sperm whales undertake at least a limited migration.

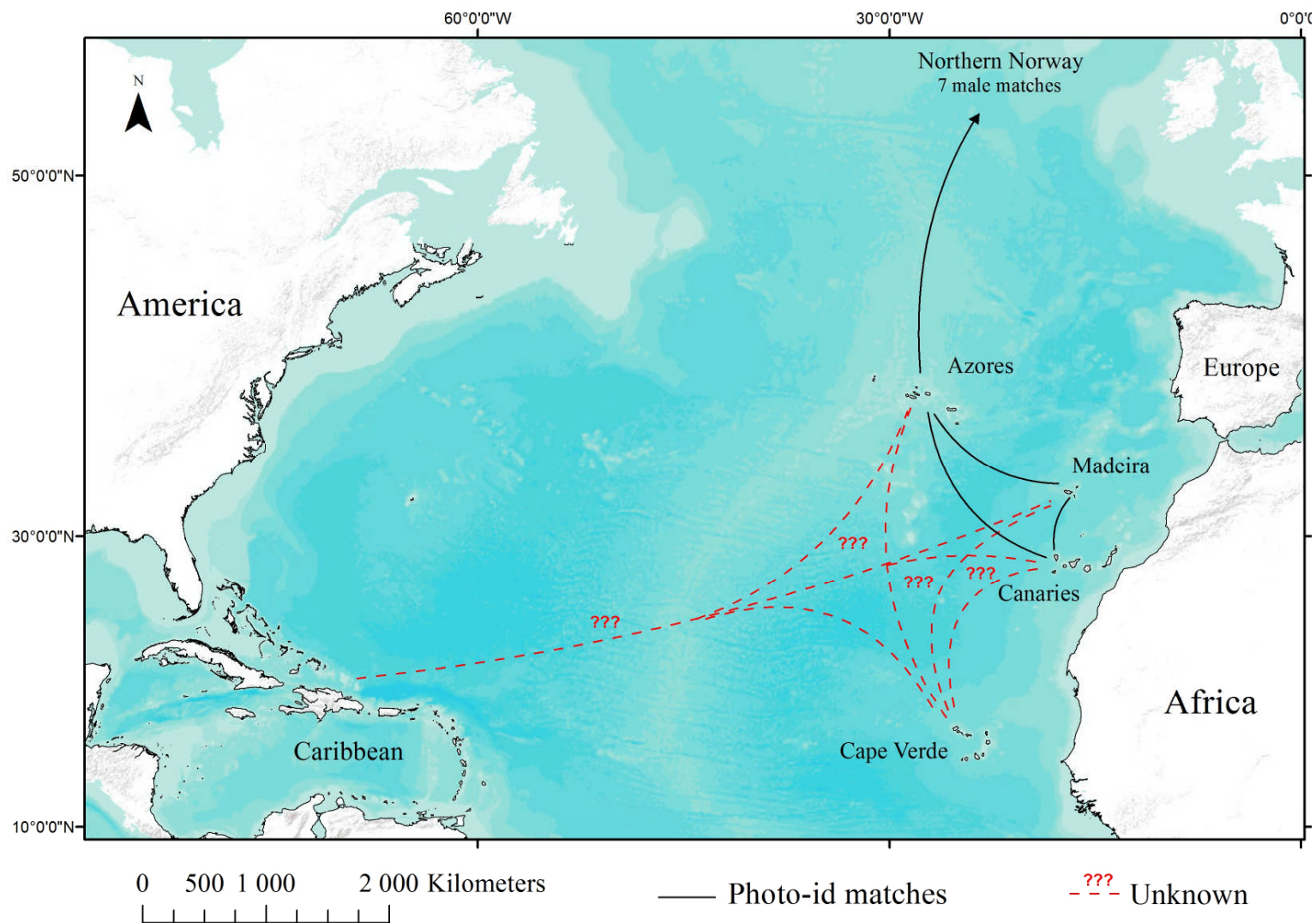
One of those individuals ("1019"), a whale identified in 1988, was first observed with a calf in 2010. She was photographed in the Canaries with the calf in the winter of 2010/2011 and returned to the Azores with the calf in the summer of 2011. She was again seen in the Canaries during the winter of 2011/2012 and in 2012 she was back in the Azores, with her calf, which was starting to make independent dives on its own.

As of 2013, the calf has not been seen, so it is unlikely to have survived independently. The movement of these female sperm whales was presented at the Society for Marine Mammalogy Conference in San Francisco in December 2015, with help from the Friends of Biosphere Expeditions (Fig. 2.5f, Steiner et al. 2015) and is being prepared for publication.

An interesting development is that DNA samples that have been taken from sperm whales in the three archipelagos show distinct differences in DNA, indicating that the populations are separate (Rodrigues et al 2019). Collaboration will continue with other researchers to understand this phenomenon. It probably comes down to sample size: There are not that many groups that have moved between the archipelagos, so it is possible that there are some groups that tend to "roam" around the mid-Atlantic looking for food, while others are more resident in a particular archipelago.

In 2009 a PhD by Ricardo Antunes (Antunes 2009) was completed at St. Andrews University, using the Azores photo-ID database of individuals from 1987 to 2007. This was used to analyse the social structure of sperm whale groups found in the Azores, looking at long-term relationships between individuals and patterns of residency around the archipelago. He showed that there are differences between the groups of sperm whales observed here to those in the Pacific. The groups of animals we observe in the Azores are more stable and associations between individuals last for much longer than they do in the Pacific. This is most likely due to food availability in the different areas. In addition, information on the difference in group sizes between the Atlantic (Azores/Caribbean) and the Pacific has been linked to a lack of orca predation in the Atlantic. The larger groups in the Pacific provide protection to individuals from orca attacks (Whitehead et al. 2012).





**Figure 2.5f.** Movements of female sperm whales in the North Atlantic (from Steiner et al. 2015).

## Conclusion and outlook

The expedition and its annual reports have, since 2004, (see [www.biosphere-expeditions.org/reports](http://www.biosphere-expeditions.org/reports)) demonstrated the value of long-term studies on cetaceans. There should be more publications arising from the author's work on sperm whales in the next year or so. Initial work has started on using the matching information between islands to determine how often groups of sperm whales move between the central and eastern groups of islands.

In conclusion, this expedition was a success for the fifteenth year. Sightings were fewer than we had hoped for, presenting more questions to answer, particularly in relation to the effects of global warming. More sperm whales than baleen whales were observed and there were not many dolphin sightings. The weather conditions during the expedition were poor, making sightings difficult. Re-sighting individual sperm whales from previous years continues to show the value of the [Europhlukes](#) matching programme alongside digital cameras. We are able to identify individuals sighted on the day they are seen, rather than waiting until the end of the summer to do the matching manually. This is also a very satisfying way to end a day's work of observations. In 2020 we will also have another programme for matching sperm whales, [Flukebook](#). There are images in that catalogue that are not present in the current catalogue (compiled by the lead author).

The 2020 expedition should:

- continue the photo-ID work on the various species
- continue matching fin whales to confirm if they visit in multiple years and send to other catalogues around the Atlantic
- start matching Sei whales to confirm if they are visiting repeatedly as well as sending images to other catalogues around the Atlantic
- start matching false killer whales with a view to creating a catalogue of individuals
- put more effort into the trash survey, as part of the POPA programme, which began in 2016. Marine litter is already a huge problem, with micro plastics finding their way into the fish we eat. Perhaps in 2020 we can have a dedicated beach clean during the expedition
- continue to collect data with a mobile app. In 2020 we will use the Seafari app, since the new Monicet app will not be ready. We will also continue to use a GPS device, which can also download the track of the boat
- start uploading new images and matching flukes to Flukebook to match sperm whales to animals that are not included in the present catalogue compiled by the lead author.

Thank you to all expedition members for your assistance.

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### 3. Observer Programme for the Fisheries of the Azores (POPA)

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#### 3.1. Introduction

The Biosphere Expeditions research project took place between 29 March and 18 April 2019 in Faial Island (Azores, Portugal). Onboard of the vessel *Physeter*, several participants had the opportunity to collect some information on marine life of the Azores. During the expedition period, citizen scientists recorded the occurrence of several marine species such dolphins and seabirds (see figures below). Sightings on surface marine debris were also performed. The information recorded during the expedition will be processed and included in the database of the POPA ([Azores Fisheries Observer Program](#)).

POPA was launched in 1998 with the main goal of certifying the tuna caught around the Azores as a “Dolphin Safe” product. This label is attributed by the NGO Earth Island Institute to catches made without mortality of cetaceans. POPA has built an extensive database with information collected by the observers on board the tuna fishing vessels. This database includes information on tuna fisheries (e.g. location of fishing events, catches, and fishing effort), weather conditions (e.g. sea surface temperature, wind and visibility), live bait fisheries (e.g. location of fishing events, catches, gear used), cetaceans (e.g. occurrences, interaction with fishing events and association with other species), birds and sea turtles (e.g. occurrences) and since 2015 the programme observers also collect information on marine debris. POPA is also responsible for the “Friend of the Sea” tuna fishery certification and since 2016 is coordinating the Azores nucleus of the ICCAT Atlantic Ocean Tropical Tuna Tagging Programme.

#### 3.2. Results

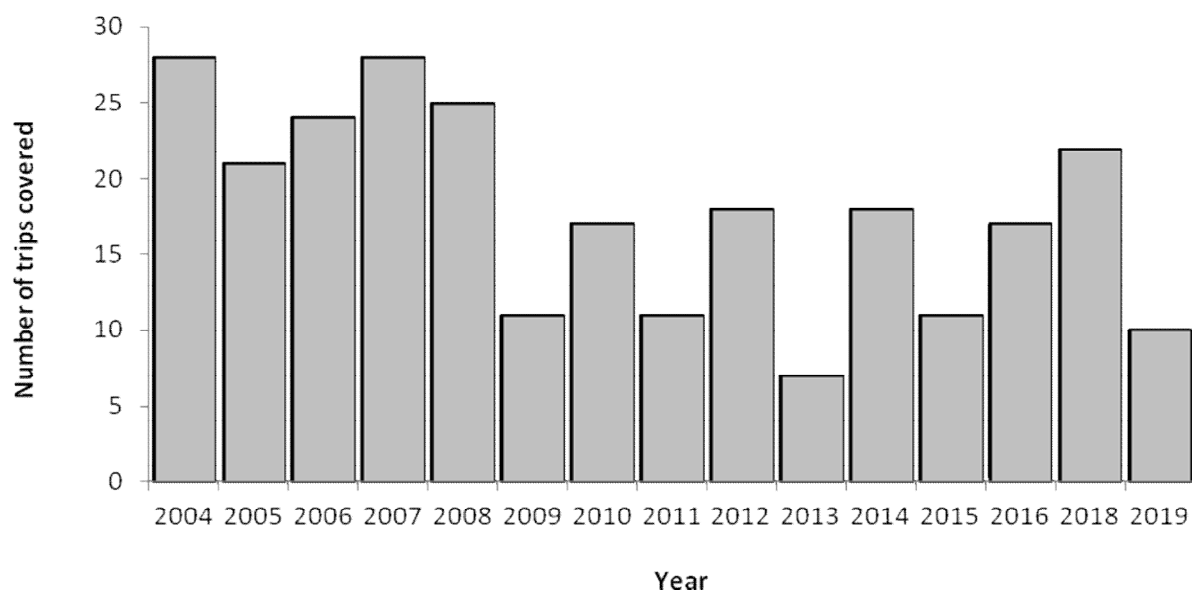
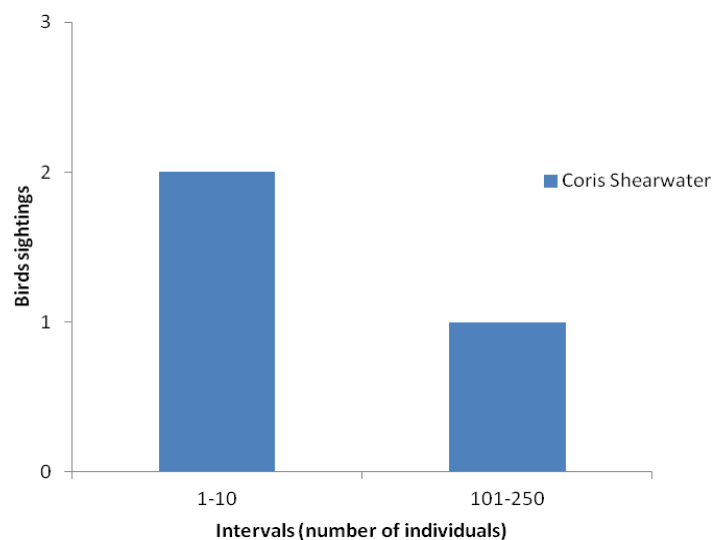
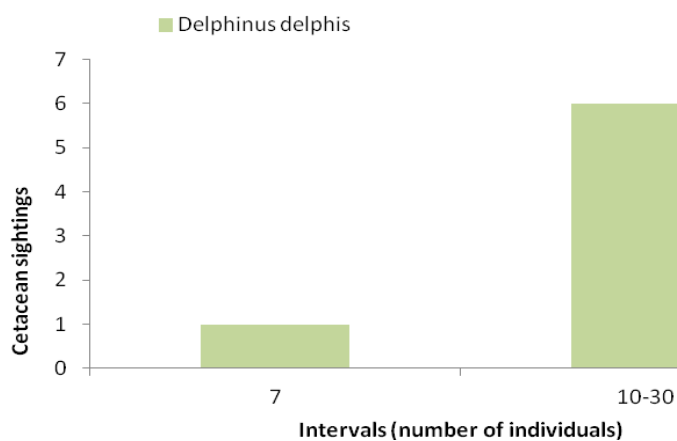


Figure 3.2a. Trip coverage during the 2004-2019 period.

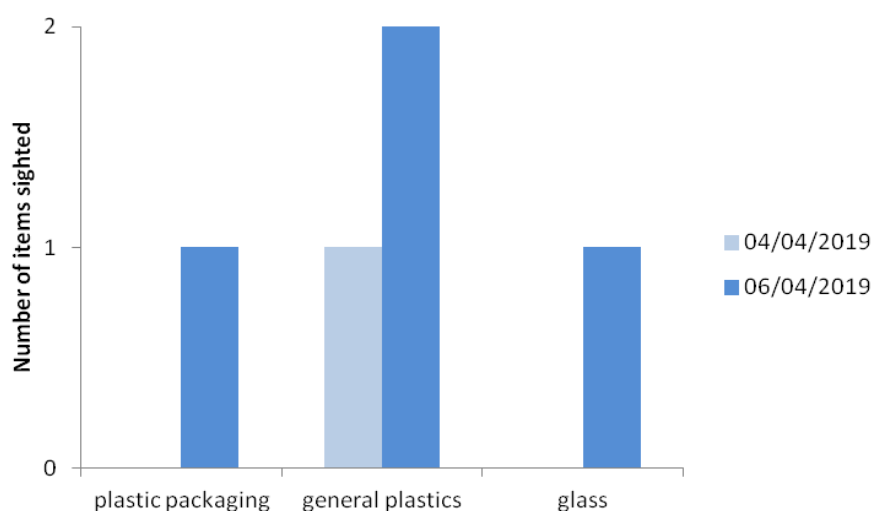




**Figure 3.2b.** Seabirds observed in 2019.



**Figure 3.2c.** Species of cetaceans observed in 2019.



**Figure 3.2d.** Debris items (5-60 cm) observed in 2019.

### 3.3. Discussion

POPA has proved that accidental capture of cetaceans in the tuna fishery in the Azores is highly insignificant and no records of mortality of cetaceans were ever reported (Silva et al. 2002, Cruz et al. 2016). But the programme has a much wider range than just the “Dolphin safe” topic. In recent years the POPA dataset has been frequently requested for several research projects regarding the ecology, biology and fisheries of target and associated species. Examples are the inclusion of POPA data in the [OBIS-SEAMAP](#) and [EMODnet](#) map databases and the papers published regarding information on fisheries’ discards in the Azores (Fauconnet et al. 2019) and marine turtle distribution (Vandeperre et al. 2019). Besides the scientific outputs, the data collected by POPA observers are also available for NGOs, government and the fishery industry.

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## Appendix I: Expedition diary & reports



A multimedia expedition diary is available at <https://blog.biosphere-expeditions.org/category/expedition-blogs/azores-2019/>.



All expedition reports, including this and previous Azores expedition reports, are available at [www.biosphere-expeditions.org/reports](http://www.biosphere-expeditions.org/reports).