



# EXPEDITION REPORT

Expedition dates: 21 March – 21 April 2022

Report published: February 2023

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





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

**Expedition dates:**  
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**Authors:**  
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Biosphere Expeditions

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# Abstract

In 2022 Biosphere Expeditions concluded its 16<sup>th</sup> year of cetacean photo-identification and distribution studies in the Azores, after a two-year break for COVID-19. 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 21 March to 21 April 2022. 139 sightings of 10 different species of cetacean and 15 turtles were recorded during the expedition period.

**Baleen whale Photo-ID: Blue Whale:** The expedition saw 3 blue whales in 2 encounters. Photos of individuals were shared with catalogues in Spain, Iceland and Canada. The two individuals that were seen together were seen previously in the Azores. Matches were made mainly by Richard Sears of Mingan Island Cetacean Society. **Humpback whale:** There were 6 humpback whales observed during the expedition in 3 encounters, including a leucistic animal that was over 95% white. Two matches to animals previously seen in the North Atlantic, including the leucistic animal were found. The North Atlantic Humpback Whale Catalogue currently holds over 11,000 individuals and plays an important role in discovering long-range matches. Since 2004 the expedition has contributed 26 ID photos. Matching movements to populations is important, because little is known about the movements of the eastern Atlantic humpback whales. Matches are also attempted online through *Happywhale* as well as being sent to other individuals working around the North Atlantic. **Minke whale:** A single minke whale was seen during the expedition. **Summary:** While still not as abundant as in previous years (2014-2017), more baleen whales were seen in 2022. More blue, fin and humpback whales were seen after the expedition.

**Sperm whale photo-ID:** Sperm whales were seen multiple times during the expedition. Sperm whale photo-identification, ongoing since 1987 in the Azores, continued. 44 identifiable individuals were photographed from 70 encounters, including 19 animals seen in previous years in the Azores. Matches now indicate that most of the males we observe 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 oceans.

**Dolphins:** Dolphin photo-identification, which began in 1987, also continued. Two of our main dolphin photo-ID target species were encountered: 5 groups of Risso's dolphin and 4 groups of bottlenose dolphin were recorded. In addition, there was a group of false killer whales, which are not encountered that frequently. Both the bottlenose and Risso's dolphins seen are known groups and the false killer whale group also had several known individuals.

**Europhlukes & Flukematcher:** 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 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 seventeenth 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 15 loggerhead turtles were seen, but none were caught and tagged due to weather conditions, other research priorities or turtles diving.

# Sumário

A Biosphere Expeditions 2022 concluiu o seu décimo sétimo ano de recolha de dados sobre a distribuição de cetáceos nos Açores, com recurso a observações visuais e foto-identificação, após uma pause por 2 anos para o Covid 19. 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 21 de Março e 21 de Abril 2022. Avistamentos de todas as espécies de cetáceos foram registados. 139 avistamentos de 10 espécies diferentes de cetáceos e 15 tartarugas foram registados durante o período da expedição.

**Baleias de barbas photo-ID. Baleia Azul:** A expedição viu 3 baleias azuis em 2 encontros. Fotos de indivíduos foram compartilhadas com catálogos na Espanha, Islândia e Canadá. Os dois indivíduos que foram vistos juntos foram vistos anteriormente nos Açores. As partidas são feitas principalmente por Richard Sears da Mingan Island Cetacean Society. **Baleia de bossas:** Foram observadas 6 baleias de bossas durante a expedição em 3 encontros, incluindo um animal leucístico que era mais de 95% branco!! Foram encontradas duas correspondências com animais anteriormente vistos no Atlântico Norte, incluindo o animal leucístico. O Catálogo de Baleias de Bossas do Atlântico Norte atualmente possui mais de 11.000 indivíduos e desempenha um papel importante na descoberta de correspondências de longo alcance. Desde 2004, a expedição contribuiu com 26 fotos de identificação. A correspondência dos movimentos com as populações é importante, porque pouco se sabe sobre os movimentos das baleias de bossas do Atlântico oriental. As partidas também são tentadas on-line através do Happywhale, além de serem enviadas para outras pessoas que trabalham no Atlântico Norte. **Baleia anã:** Uma única baleia anã foi vista durante a expedição. **Sumário:** Embora ainda não abundantes como nos anos anteriores (2014-2017), mais baleias de barbas foram vistas em 2022. Mais baleias azuis, barbatanas e bossas foram vistas após a expedição. Esperemos que esta tendência continue.

**Cachalote:** Cachalotes foram vistos várias vezes durante a expedição. Desde 1987 que está em curso nos Açores um programa de foto-identificação de cachalotes. Foram fotografados 44 indivíduos identificáveis em 70 encontros, incluindo reavistamentos de 19 animais vistos em anos anteriores. As reavistamentos detectados agora indicam que a maioria dos machos que observamos migra para as águas Noruega e as fêmeas passam a vida em grupos e efectuam migração/movimentações mais limitada. 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. Duas das nossas principais espécies-alvo de identificação de golfinhos foram encontradas: foram registados 5 grupos de grampos e 4 grupos de roaz. Além disso, tínhamos um grupo de falsas orcas, que não são encontradas com tanta frequência. Embora os roaz e os grampos sejam grupos conhecidos e o grupo de falsas orcas também tinha alguns indivíduos conhecidos.

**Euoplukes & Fluketracker:** As extrações de forma de cauda de cachalote foram feitas a partir das fotos tiradas durante a expedição e comparadas com as de cachalotes avistados em anos anteriores e em outras áreas do Atlântico. Nenhum dos cachalotes fotografados nos Açores foi reavistado noutras áreas.

**POPA:** Pelo décimo sétimo 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 devido às condições meteorológicas, outras prioridades ou mergulho de tartarugas. .

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# 1. Expedition review

M. Hammer (editor)  
Biosphere Expeditions

## 1.1. Background

Background information, location conditions and the research area are as per Steiner & Hammer (2020). This particular report deals with the expedition that ran from 21 March to 21 April 2022. 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.

## 1.2. Dates & team

The project ran over a period of one month divided into three 10-day groups, each composed of a team of national and international citizen scientists, professional scientists and an expedition leader. Group dates were as shown in the team list below. Dates were chosen to coincide with the migration of baleen whales past the archipelago.

The expedition scientist and co-author of this report was Lisa Steiner, the expedition leader was An Bollen. The expedition team of citizen scientists was recruited by Biosphere Expeditions and consisted of a mixture of ages, nationalities and backgrounds. They were (in alphabetical order and with country of residence):

21 – 30 March 2022

Valerie Apioleinus (Germany), Heather Bozic (UK), Stephen Crowther (UK), Kathrin Gusenbauer (Austria), Inge Johnson (Canada), Charlotte Schumann (Germany), Jane Valentine (Switzerland).

1 – 10 April 2022

Deborah Chusid (USA), Maria Franzheld (Germany), Sigalit Herz (Israel), Lucy Holder-Packer (Australia), Susen Jung (Switzerland), Karina Kempers (Switzerland), Anja Reineke (Germany), Irina Zeleneva (Russia).

12 – 21 April 2022

Susie Barrett (UK), Bryony Ann Jarmann (UK), Barbara Melchers (Germany), Lisa Mooney (UK), Shelagh Rowling (UK), Susanne Schex (Germany), Madeleine van Lieshout (Netherlands), Ellen Williams (USA).

A medical umbrella, safety and evacuation procedures were in place. There were no incidences that required the attention of health professionals. There was one minor incidence of a fall on the boat during high seas with minor bruising.

### 1.3. Partners

The expedition's main partner 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).

### 1.4. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our citizen scientists (listed above) who provided an expedition contribution and gave up their spare time to work as research assistants, none of this 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 skipper Siso as well as James Rosa and Claudia Steube, our excellent hosts at Banana Manor.

### 1.5. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and more 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 the address given on the website.

A copy of this and all other reports and scientific publications produced by or in association with this expedition can be found on the [Biosphere Expeditions ResearchGate page](#).

## 1.6. Expedition budget

Each citizen scientist paid towards expedition costs a contribution of €1,980 per person. 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>	<b>€</b>
Expedition contributions	51,159
<b>Expenditure</b>	
<b>Base camp and food</b> includes all board & lodging, base camp equipment	8,537
<b>Research vessel &amp; transport</b> includes fuel, oils, wear & tear for research vessel, taxis on land	15,839
<b>Equipment and hardware</b> includes research materials & gear, etc.	118
<b>Staff</b> includes local and Biosphere Expeditions staff & expenses	8,419
<b>Administration</b> includes registration fees, sundries, etc.	89
<b>Team recruitment Azores</b> as estimated % of PR costs for Biosphere Expeditions	3,998
<b>Income – Expenditure</b>	<b>14,169</b>
<b>Total percentage spent directly on project</b>	<b>72%</b>



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.

## 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 May, which is why the expedition usually takes place in March and April. In 2022, the expedition began on 21 March 2022.

Baleen whales have been seen fairly regularly migrating past the islands from February to the end of May over the last fifteen years, but it is unknown exactly where they have come from or where they are migrating to. It is thought that most are travelling north to feed in the waters around Iceland, Greenland, Norway or even Nova Scotia for the summer. Conversely, in the very early part of the spring, February & March, humpbacks may be heading south to the breeding areas (Fredrik Broms pers. comm.). Photo-identification of the animals passing the Azores enables us to match photos taken in the Azores with photos taken elsewhere to hopefully determine some of these migration routes. So far, there have been matches between blue whales seen in the Azores to feeding grounds to the north: several have matched to Spitzbergen, Norway. There are two matches to 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 to Northern Spain and Ireland. In addition, several blue whales have now been seen in multiple years in the Azores (Richard Sears pers. comm.). Thirteen humpback whales have been observed in both the Azores and the Cape Verde Islands and eleven have also been re-sighted in Norway. Two individuals have been seen in all three places. In 2018, outside the expedition dates, a humpback previously seen in Scotland was photographed in the Azores. One humpback match has been made to Newfoundland, also not by the expedition. There are only 3 humpback matches between the Azores and the Caribbean, so far, including an individual sighted during this expedition.

Although sperm whales were caught during whaling 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 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. And some opportunistic trips to sea in the winter have shown the presence of females and calves over winter too. In future, we would like to expand the effort to include more time at sea in the winter months, to see if some groups of females and calves are present in the archipelago all year round as residents, rather than just repeat visitors.

Photo-identification of sperm whales began in the Azores in 1987 and over 3,000 individuals have been identified since then (just under 550 during expeditions). The Europhlukes matching program, designed in 2002, made matching individuals much faster than when done manually by eye. Since 2021, a new online algorithm designed during Capgemini's "Global Data Science Challenge" and incorporated into "Happywhale" has made most matching even faster. Although when a match is not made online, the old Phlex & Match programs still need to be used, because not all researchers have uploaded their photos online.

Photo-ID work by other researchers has shown that some bottlenose and Risso's dolphin are resident in the islands year round, and there are a few transient groups just passing through (Silva 2007, Hartman 2014). Preliminary analysis of false killer whales shows that this species may be resident around the archipelago, rather than restricted to the Central Group of Islands (Steiner et al. 2019). Not much is known about the orcas that are occasionally observed around the islands. Interestingly, 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 São Miguel in 2013 (I. Korpöga Eriksson pers. comm.) and seen again off Faial in 2016.

By photographing individual dolphin 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.

## 2.2. Summary of expedition work and results 2004-2022

Over the past 19 years (2004-2022 with the exceptions of 2017, 2020 & 2021 when no expedition took place), the expedition has spent 1627.5 hours at sea looking for cetaceans: 108.5 hours in March, 1036 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:

- 545 new sperm whales were identified, including 197 re-sighted animals. During the 2007 expedition, a record 167 sperm whales were encountered (not all different individuals), with another four expeditions yielding over 100 sightings each.
- 127 separate blue whale sightings were made, with 5 individual blue whales being identified in different years, including two swimming together in 2022. 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.

- 30 humpback whale sightings were made, with 2 individuals re-sighted in the Cape Verde Islands and 1 match to Norway. In 2022, a leucistic individual (98% white) was matched to both Norway and the Caribbean and another individual matched to Norway. One individual first seen during the expedition was seen over a two-month period in 2016. No other humpbacks sighted during an expedition have been matched to other areas of the Atlantic, although outside of the expedition, there are quite a few long-range matches.
- 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 and tagged during the expeditions, but none of them have been recaptured elsewhere.
- Since the expeditions began in 2004, the lead author has given presentations or presented posters at marine mammal conferences. 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, at the Society for Marine Mammalogy (SMM) in Quebec City, a 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 at the SMM in San Francisco, 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 at the ECS in Madeira on habitat use of species of baleen whale in the Azores (Chevallard et al. 2016). And in 2019, a poster was presented at the SMM in Barcelona about false killer whales in the Azores (Steiner et al. 2019). In 2022, there were 2 presentations at the 33rd ECS virtual conference: one on site fidelity and residency patterns of sperm whales (Ferreira et al 2022) and the other on connectivity of cetaceans in Macaronesia (Alves et al. 2022).
- 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). Matches of male sperm whales between the Azores and Norway were published in 2012 (Steiner et al 2012). 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, Madeira and the Canaries (Alves et al. 2019), a paper on abundance of sperm whales in the Azores (Boys et al. 2019) and a note about a match of a sperm whale between the Gulf of Mexico and the Azores (Mullin et al 2022). Most of these publications 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). The paper on the male matches around the North Atlantic is going to be updated in 2023 and a paper on the movements of female groups of sperm whales around Macaronesia is also in preparation.

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.

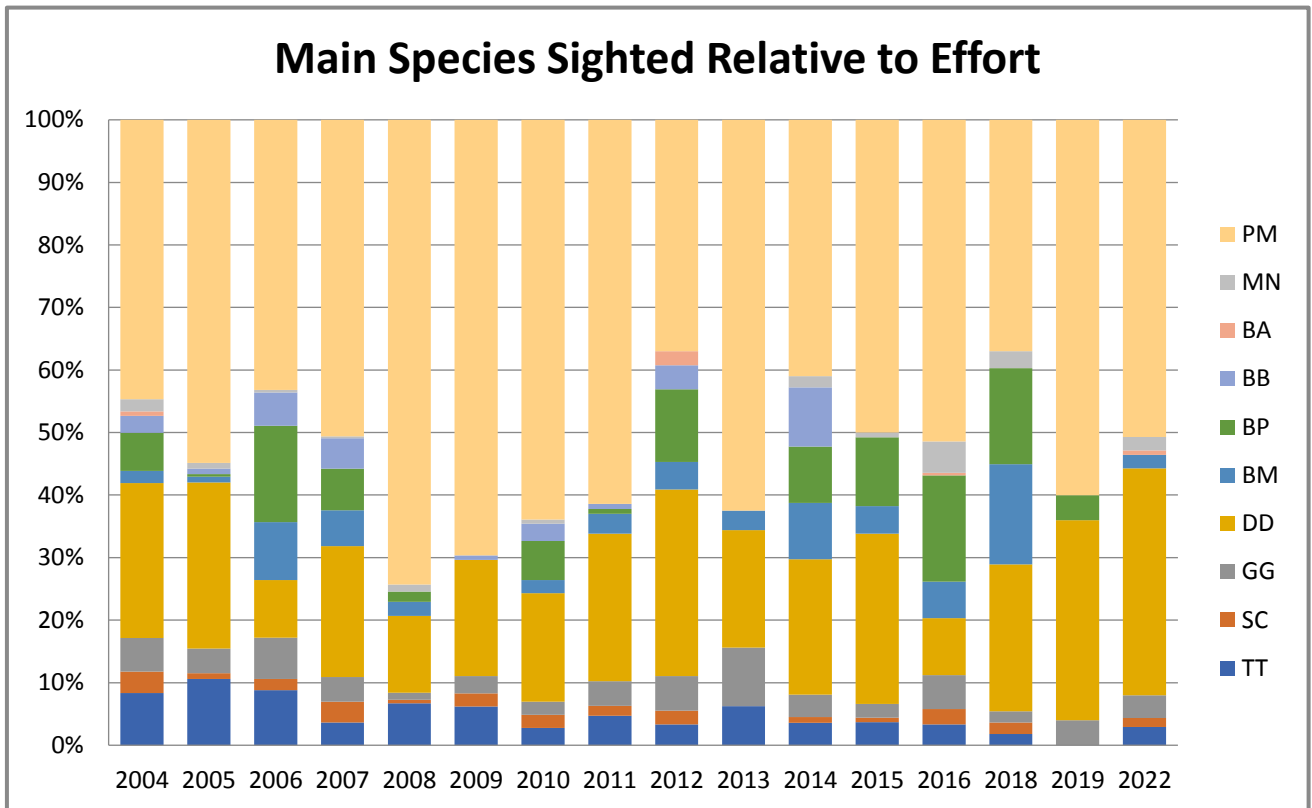


Figure 2.2a. Species sightings 2004-2022 adjusted for effort.

### 2.3. Methods

The *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 (Fig. 2.3a). If the lookouts did not spot 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. 2.3b) and one looking aft (behind the boat) searching for cetaceans.



**Figure 2.3a.** Vigia Marco Medeiros on Monte da Guia.



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

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

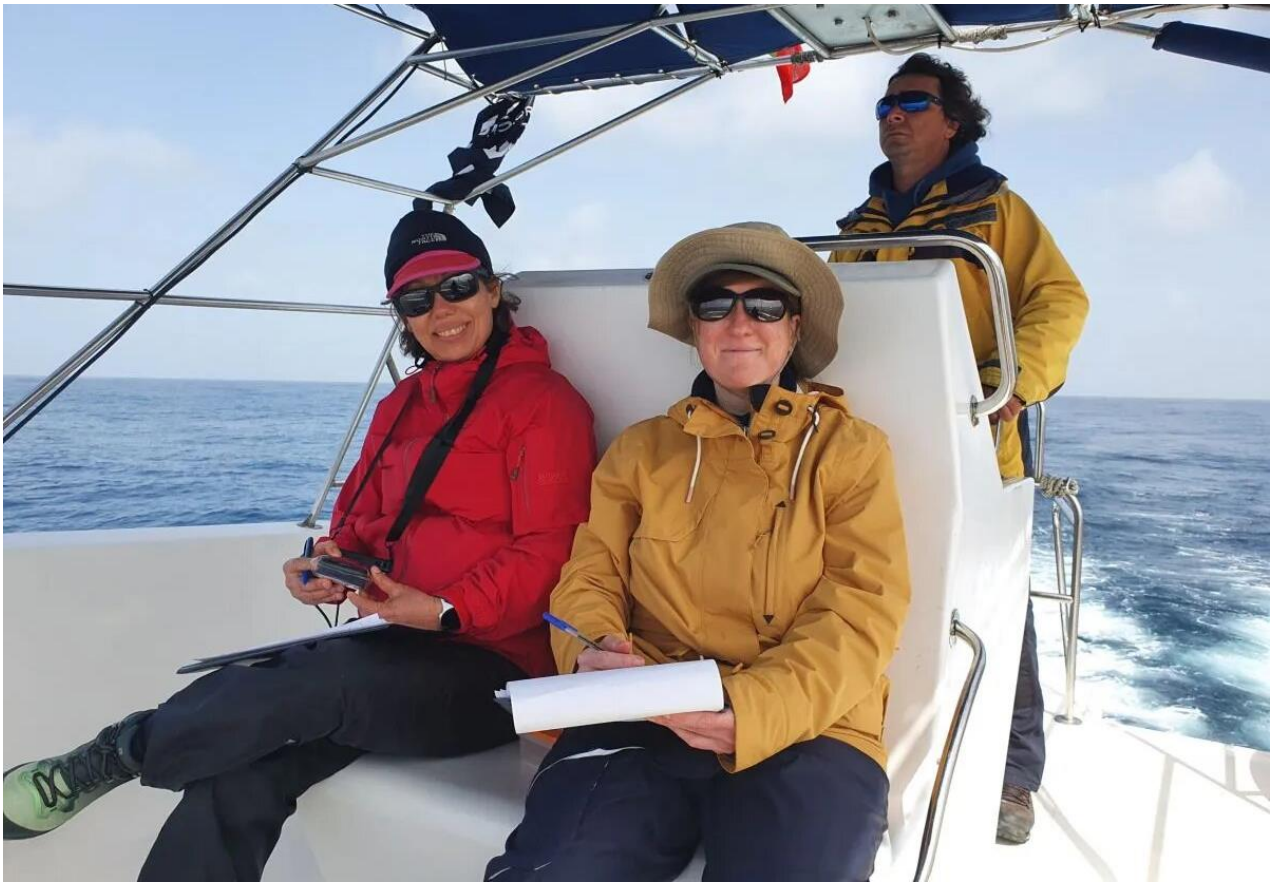


Figure 2.3c. POPA sheet duty.



Figure 2.3d. Hydrophone deployment and listening.



**Figure 2.3e.** Camera Duty with support from an observer.

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. Bottlenose and Risso's dolphins and false killer whales were also paralleled in order to obtain dorsal fin 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 were 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. If conditions were good and we were not heading to another sighting, an attempt to catch the turtle 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 2022 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 sixteen days during the expedition and spent between 3 and 10 hours (h) per day on the water, the average being 6.25 h. A total of 96.5 h with sea conditions below sea state 5 were spent at sea. A comparison of the yearly effort since 2004 is presented below (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. In 2018 the expedition began in March for the first time, with no groups in May. There were no expeditions in 2017 (due to lack of citizen scientists), 2020 and 2021 (due to COVID-19).

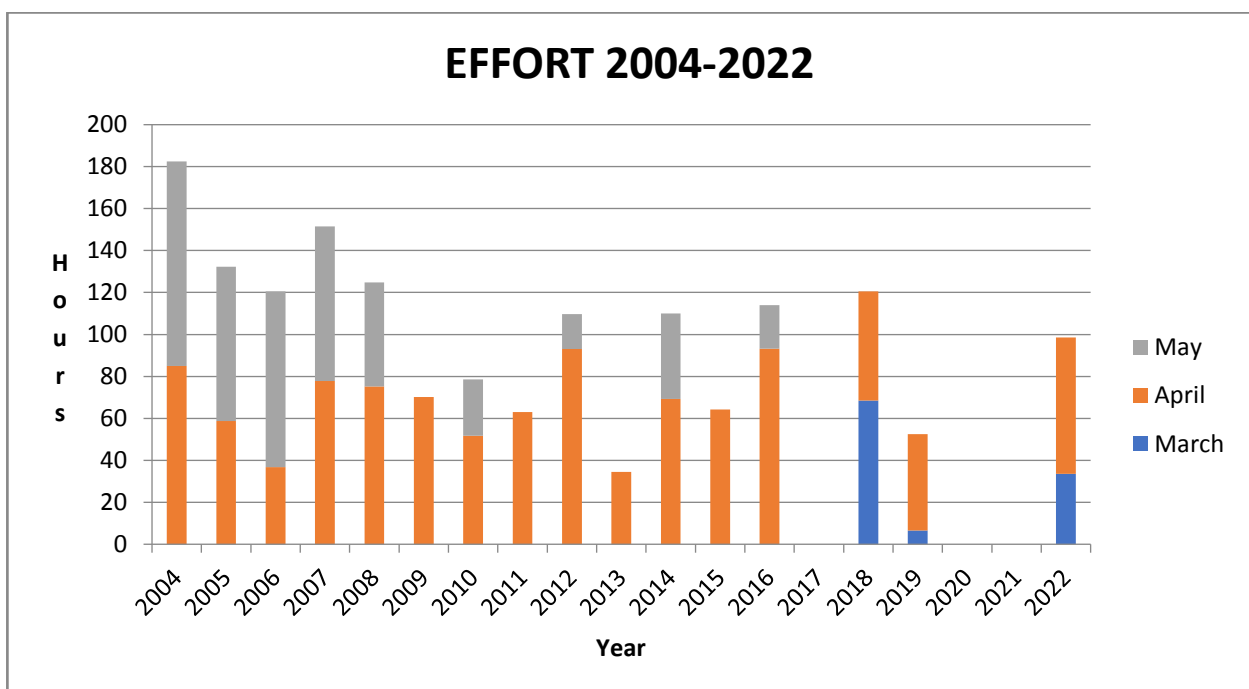


Figure 2.4a. Yearly effort 2004-2022.



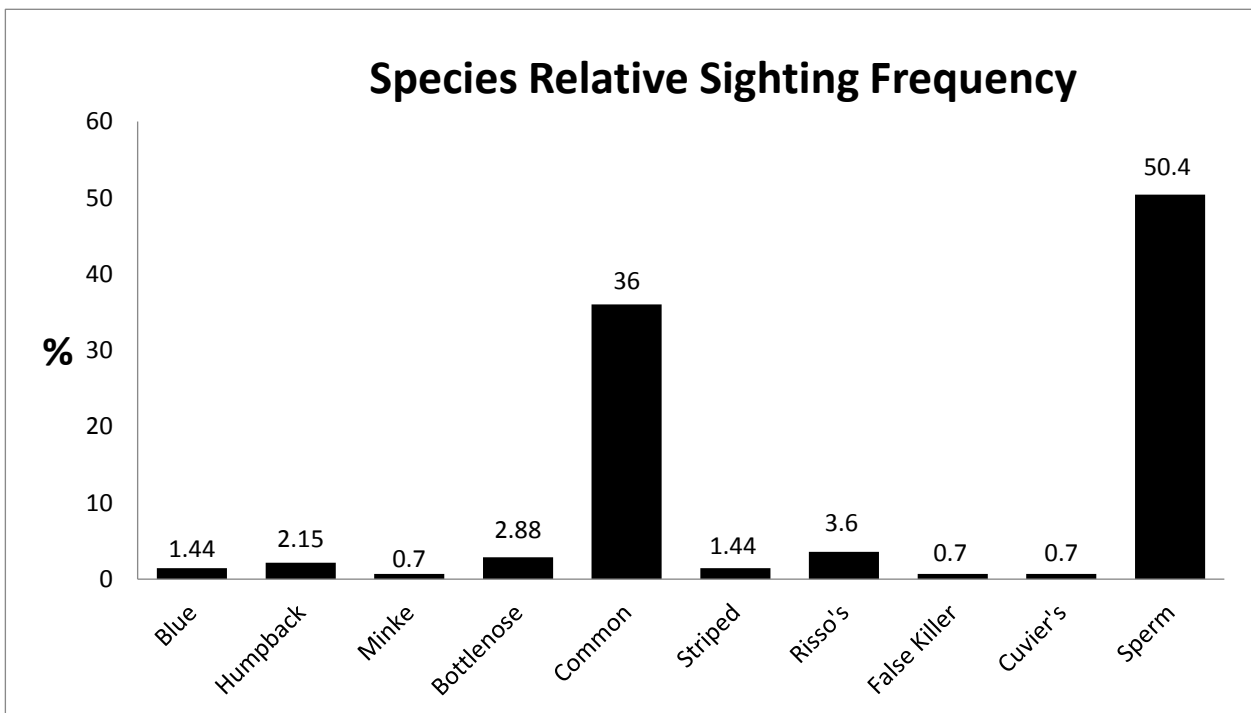
## 2.4.2. Encounters

During the 2022 expedition, 69 groups of non-sperm whales from nine different species and 70 sperm whale encounters were recorded (Table 2.4a).

**Table 2.4a** Expedition sightings.

COMMON DOLPHIN, <i>Delphinus delphis</i>	50
RISSE'S DOLPHIN, <i>Grampus griseus</i>	5
BOTTLENOSE DOLPHIN, <i>Tursiops truncatus</i>	4
STRIPED DOLPHIN, <i>Stenella coeruleoalba</i>	2
FALSE KILLER WHALE, <i>Pseudorca crassidens</i>	1
CUVIER'S BEAKED WHALE, <i>Ziphius cavirostris</i>	1
BLUE WHALE, <i>Balaenoptera musculus</i>	2
HUMPBACK WHALE, <i>Megaptera novaeangliae</i>	3
MINKE WHALE, <i>Balaenoptera acutorostrata</i>	1
SPERM WHALE, <i>Physeter macrocephalus</i>	70

These encounters resulted in a relative sightings frequency as shown in Fig. 2.4b. Sperm whales were the species encountered most at 50% and, along with common dolphin at 35.7%, made up over 80% of the sightings.



**Figure. 2.4b.** Relative sighting frequency of species.

## Common dolphin

This species was encountered 50 times. Group sizes ranged from 1-300 with an average of 39 (Fig. 2.4c). This group size is consistent with what we have previously observed. Calves were first observed on 22 March 2022 and seen in less than 50% of sightings during the expedition. There was no significant difference in group size based on the presence of calves ( $p>0.05$ ). It is generally thought that calves are present in larger groups, which provide greater protection for the youngsters (Schaffar-Delaney 2004, Tezanos-Pinto 2009). Two melanistic (darker pigmentation than normal) individuals were observed; one on 5 April and the other on 19 April (Fig. 2.4d)

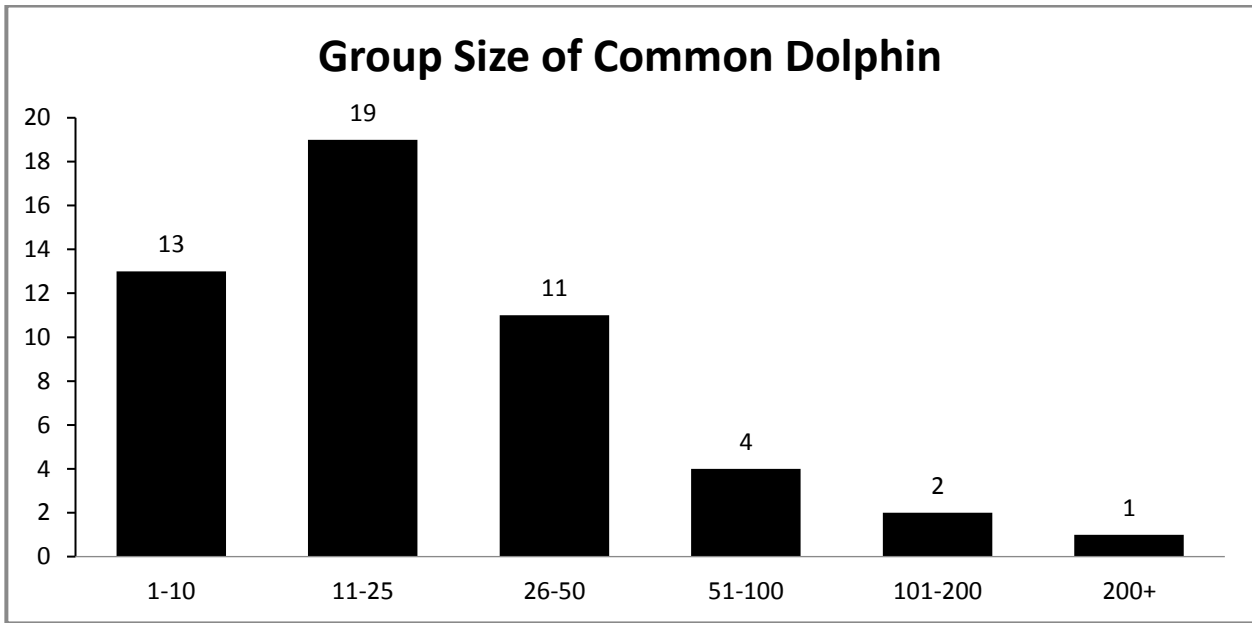


Figure 2.4c. Group size of common dolphin.



Figure 2.4d Melanistic common dolphin.

Common dolphin spent more time milling than travelling. They bowrode on just over 50% of encounters and were seen feeding in just over 10% of sightings (Fig. 2.4e).

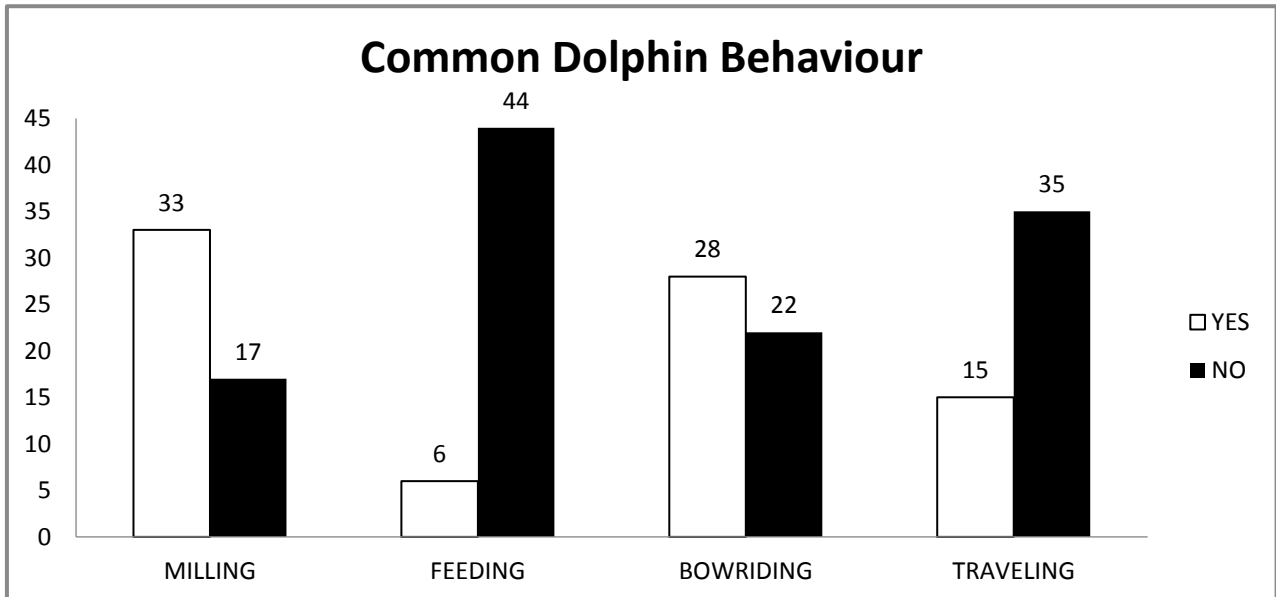


Figure 2.4e. Common dolphin behaviour.

### Striped dolphin

Two groups of striped dolphin were observed. One group had 75 individuals and the other 50. Both groups had calves and both groups were milling. One group also bowrode, which is quite unusual for this species.

### Risso's dolphin

Five groups of Risso's dolphin were seen, four of the groups had calves present. The one group without calves was a group of males that are usually seen around Faial (Karin Hartman pers. comm.). The groups of mothers and calves also had some males mixed in. Photographs were taken of dorsal fins to identify individuals (Fig. 2.4f). There were several females, including "Albi", with her first calf and MR1 with her fourth calf (Karin Hartman pers. comm.). There was a leucistic (lighter pigmentation than usual) calf seen during the expedition. During all encounters, the Risso's dolphin were travelling.





**Figure 2.4f.** Risso's dolphin dorsal fin ID photos.

## Bottlenose dolphin

Four groups of bottlenose dolphin were seen. Group size ranged from 12-75. Calves were seen in three of the four groups. The two groups seen on 20 April were probably the same group, seen a couple of hours apart. Photo-ID of the dorsal fins showed several of the well-known resident individuals (Fig. 2.4g). Milling was observed in all of the sightings, with feeding observed in two of those encounters. They only bowrode once. They appeared to be socialising on two occasions, with leaping observed.



**Figure 2.4g.** Bottlenose dolphin ID photos.

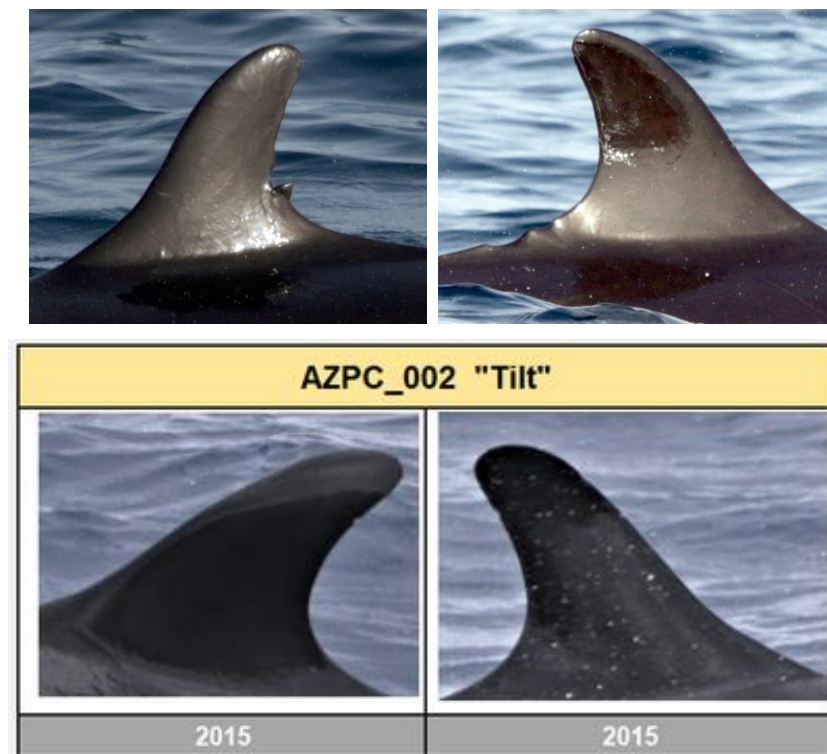
## False killer whales

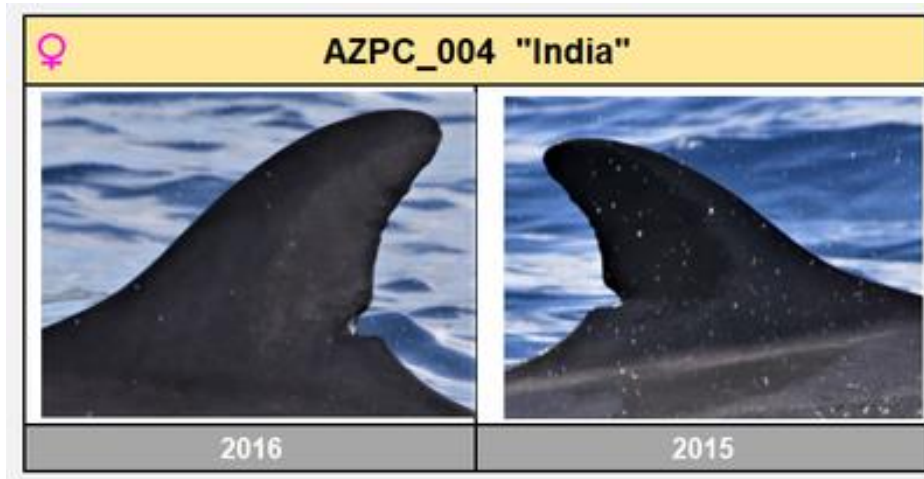
One group of 75 false killer whales, including calves, was encountered. They were first observed travelling at high speed to the NNW, before stopping. Then they were feeding on tuna (probably), with hundreds of Cory's shearwaters. Large pieces of fish were seen in the mouth of a few individuals (Fig. 2.4h).



Figure 2.4h. Feeding false killer whales.

Photo-IDs were taken of dorsal fins to compare to the existing catalogue of false killer whales. After preliminary analysis, several individuals are known AzPc002 "Tilt", AzPc004 "India", & AzPc024 among the known individuals. (Fig. 2.4i).





**Figure 2.4i.** False killer whale ID photos.

### Cuvier's beaked whale

Five individuals were seen on 23 March 2022. Photographs captured the distinctive white head of this species (Fig. 2.4j). Extensive scarring on the backs of three individuals suggested that they were males (Fig. 2.4k). No calves were seen. Three distinctive dorsal fins were photographed, which can be used for photo-ID in future encounters with this species (Fig. 2.4l). They appeared to be travelling to the SE, but it is difficult to determine beaked whale behaviour in such brief encounters. This is only the second time during an expedition that Cuvier's beaked whales have been sighted.



**Figure 2.4j.** Distinctive white head of the Cuvier's Beaked whale.



**Figure 2.4k.** Extensive scarring indicates males.



**Figure 2.4l.** Cuvier's beaked whales.ID photos.



## Blue whale

Two groups of blue whales were seen during the expedition. They were travelling NW. One individual showed its fluke. Photo identification pictures of the mottling patterns behind the head and around the dorsal fin were taken (Fig. 2.4m) and these photos were sent to Richard Sears at Mingan Island Cetacean Society (MICS), 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 to other regions have been found during the expedition to date. However, the two individuals that were swimming together had been previously seen in the Azores by the author, although not together.



Figure 2.4m. Blue whale ID photos.

## Humpback whale

Humpback whales were observed 3 times and on another day, one was heard on the hydrophone, but the expedition was unable to locate it. Group size was between 1–3. The first animal was travelling E, while the others were travelling NW. The animal travelling E did not show the fluke, but the other 5 were identified by fluke photos (Fig. 2.4n). One of the individuals seen on the 5 April 2022 matched to Norway. On 16 April 2022, the expedition observed a leucistic individual (whiter than normal - 98%) travelling with a normally pigmented individual. The leucistic individual has been seen in Norway a few times and also in Guadalupe (Fig. 2.4o).



Figure 2.4n. Humpback whale fluke ID photos.



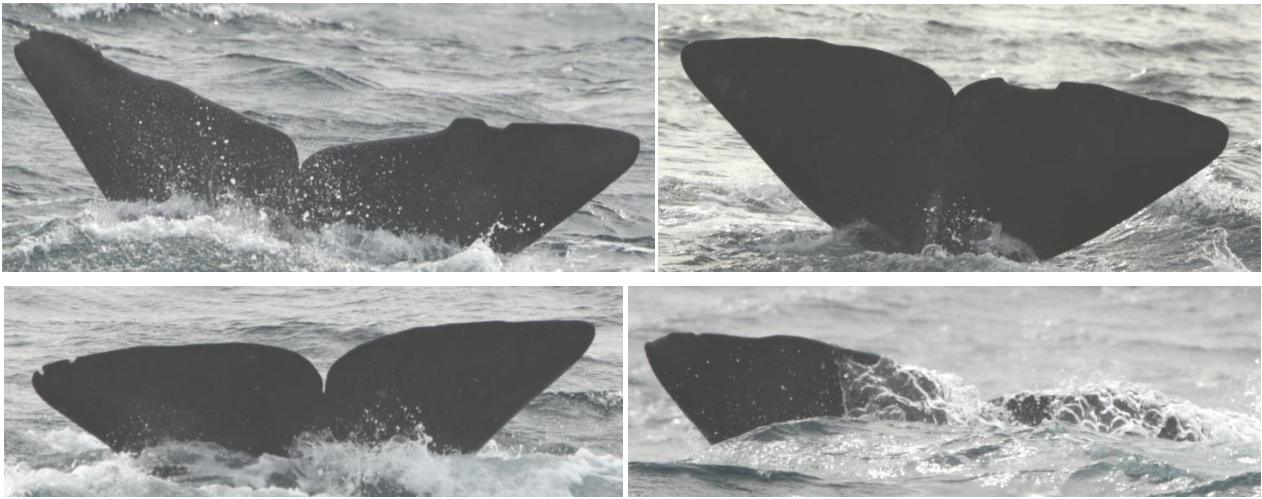
**Figure 2.4o.** Leucistic humpback whale.

## Sperm whale

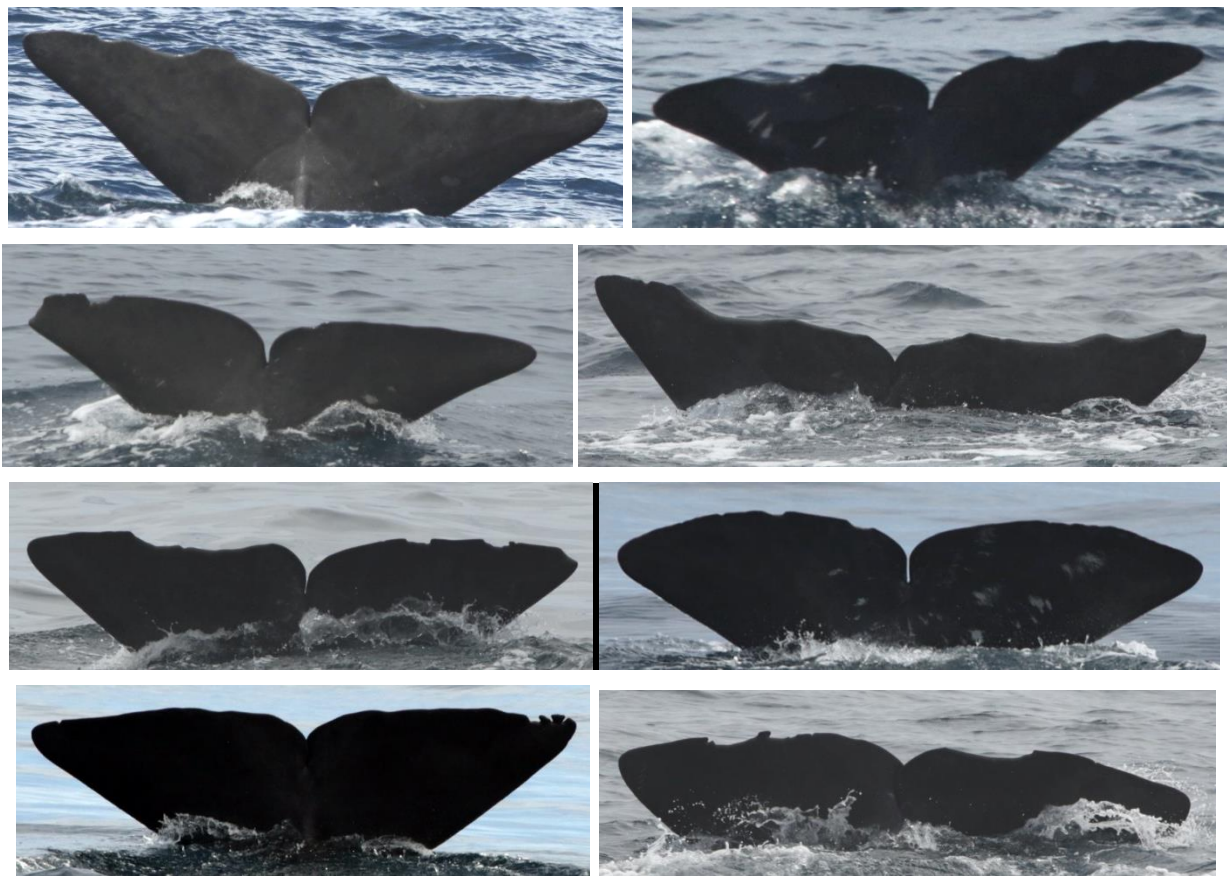
Sperm whales are one of the target species of the expedition. They were encountered 70 times. 22 calves were seen in 19 encounters. Photographs were taken of all whales that fluked up. Individuals can be recognised by the nicks and scallops formed on the trailing edge of the tail, due mainly to wear and tear as the flukes beat through the water. 44 different individuals were identified. There were 19 re-sighted animals, including “19” first seen in 1987 and “TicToc” the male that is seen frequently around São Miguel and known as “Mr Liable” there (Fig. 2.4p). The well-known “winter whales” group was also observed (Fig. 2.4q). There were 25 new individuals and 2 flukes that were not identifiable (Fig. 2.4r). The average group size was 1.44, ranging from 1-6, which is similar to that encountered during other parts of the summer.



**Figure 2.4p** “19” and “Tictoc”/“Mr. Liable”.



**Figure 2.4q** “2448”, “2808”, “3843” & “6089” the “Winter Whales” group



**Figure 2.4r.** Some of the new individual sperm whale ID photos.

## Miscellaneous sightings

Loggerhead turtles were observed fifteen times during the expedition. None were caught for tagging due to weather conditions, other research priorities or – on most occasions – the turtles diving (Fig. 2.4s).



**Figure 2.4s.** Loggerhead turtle.

## Visualisations of group encounters and tracks

Figs. 2.4t, 2.4u and 2.4v show tracks and locations of species sightings in relation to the islands of Pico, Faial and São Jorge, and over the three expedition groups. These plots were made possible by the use in 2022, for the first time, of a Garmin Montana GPS, which could record the tracks of the boat and encounters throughout the day.

## Monicet app

In 2022, a new version of the Monicet data collection app was trialled on a smartphone. Monicet is a platform that collects cetacean sightings, mainly from around the Azores. It is used primarily by whale watching companies ([www.monicet.net](http://www.monicet.net)). The trial was successful. The tracks collected using the app during all three groups are shown in Fig. 2.4w. The grey lines are the tracks and the blue flags represent every sighting. When zoomed in, you can see the details of the sighting (Fig. 2.4x). The sighting information was sent directly to Monicet at the end of every trip.

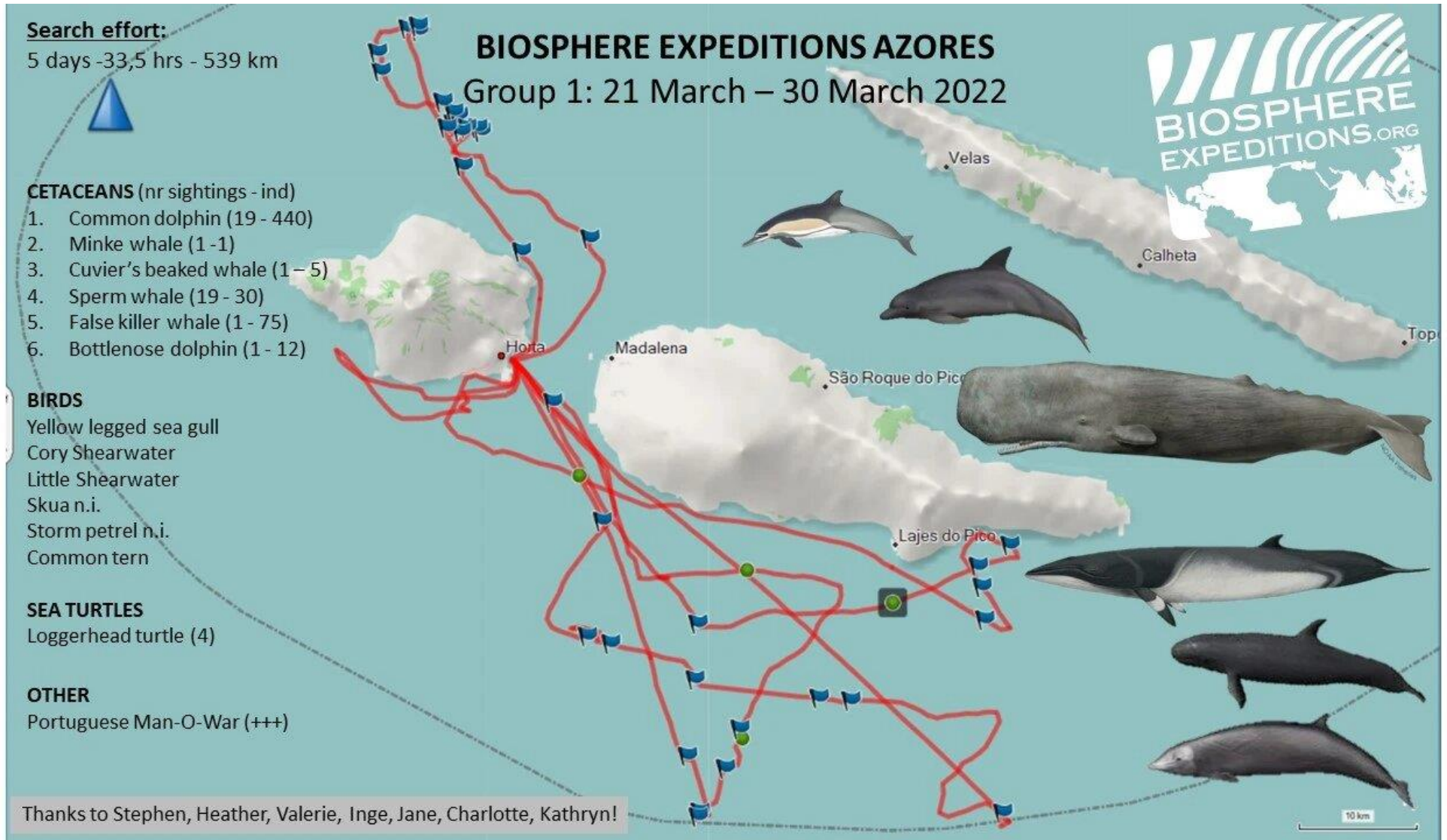


Figure 2.4t. Group 1 tracks and sightings.

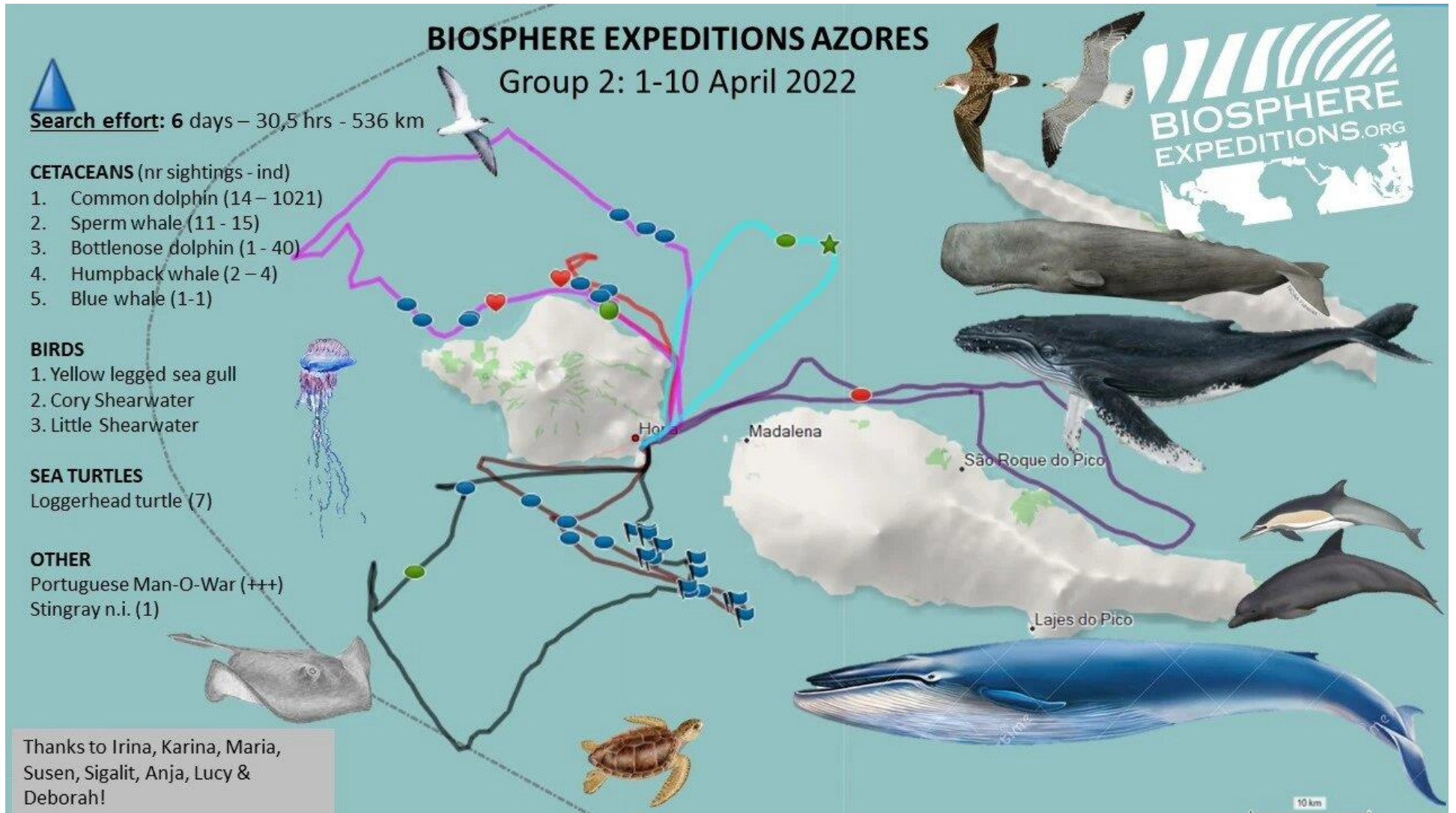


Figure 2.4u. Group 2 tracks and sightings.

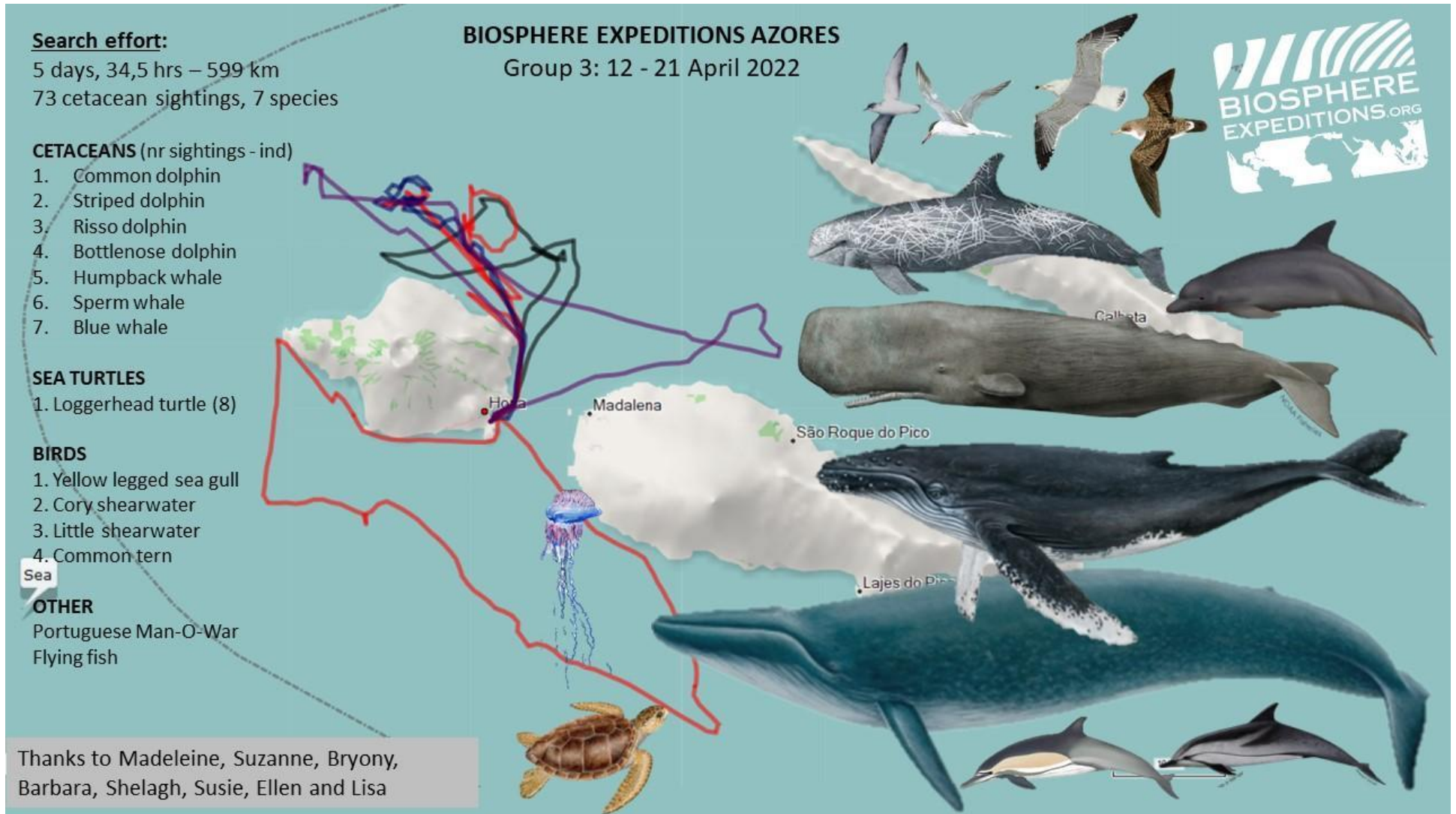


Figure 2.4v1. Group 3 tracks.



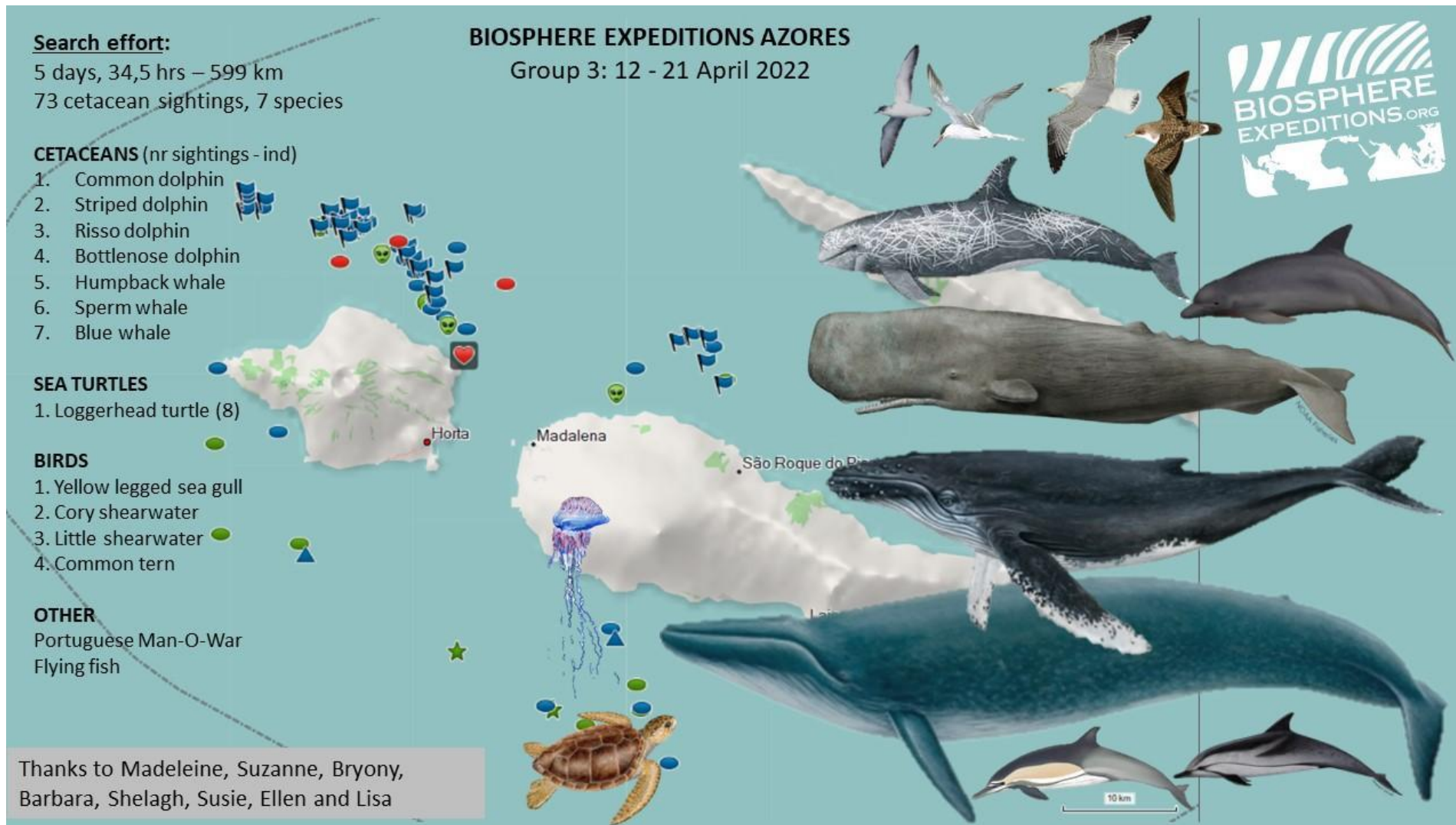


Figure 2.4v2. Group 3 sightings.

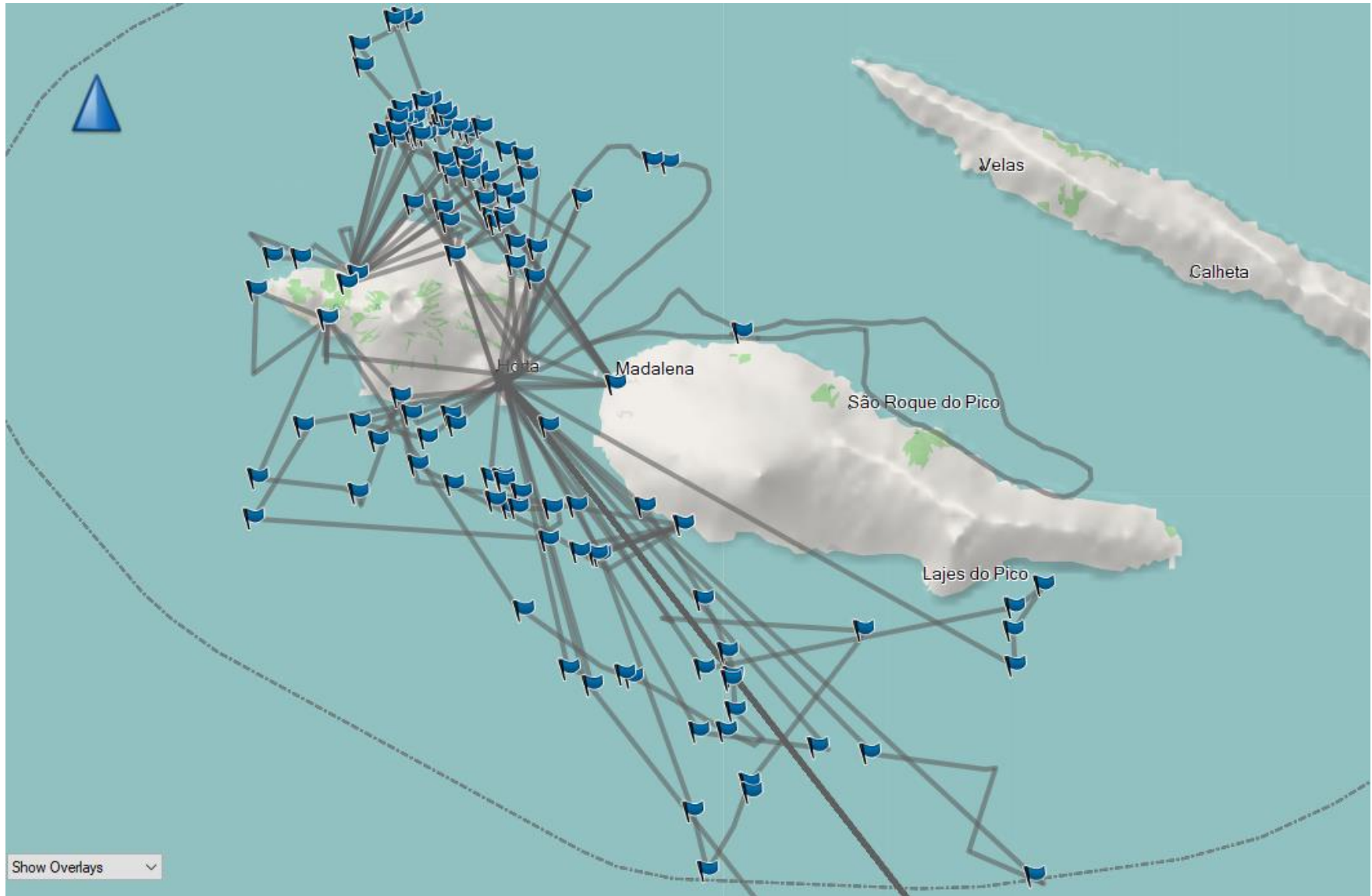


Figure 2.4w. Tracks and sightings for all three groups on Monicet app.



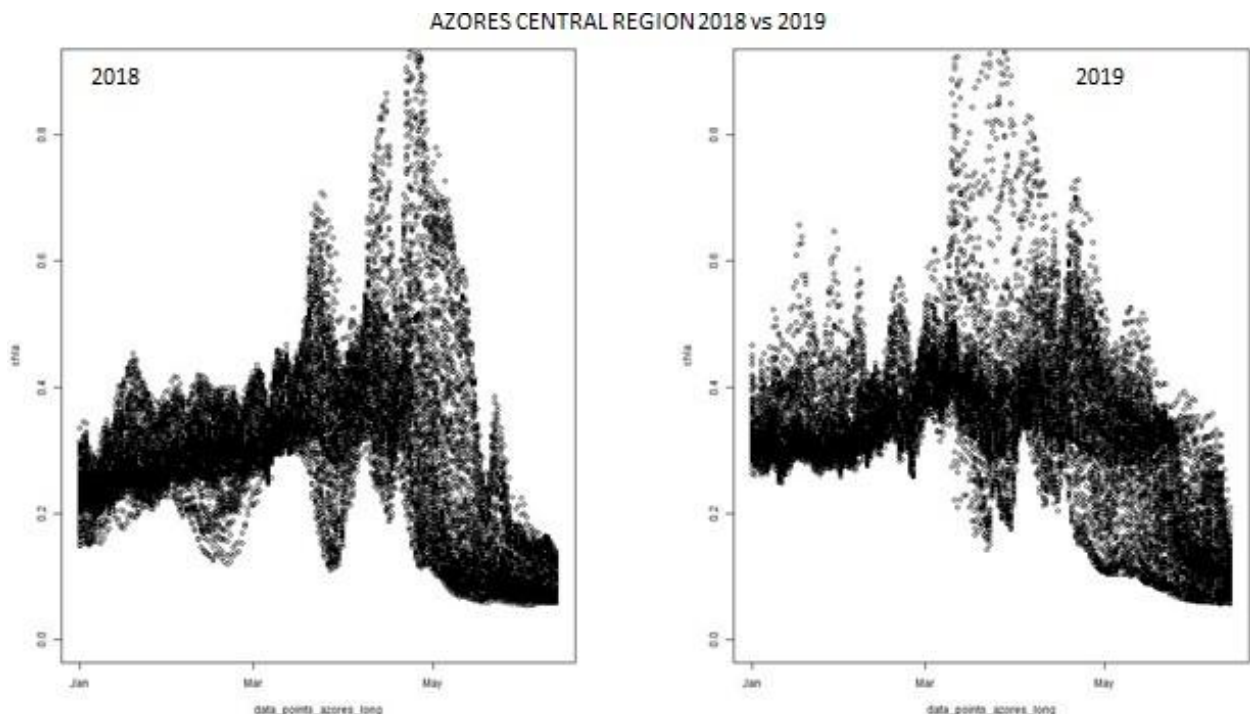
## 2.5. Discussion & conclusions

March, April and May are usually a good time for cetacean sightings in the Azores. Biosphere Expeditions plays an important role by 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. This trend is slowly changing, with more tourists coming to try and see the baleen whales passing on their migration.

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 at 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.

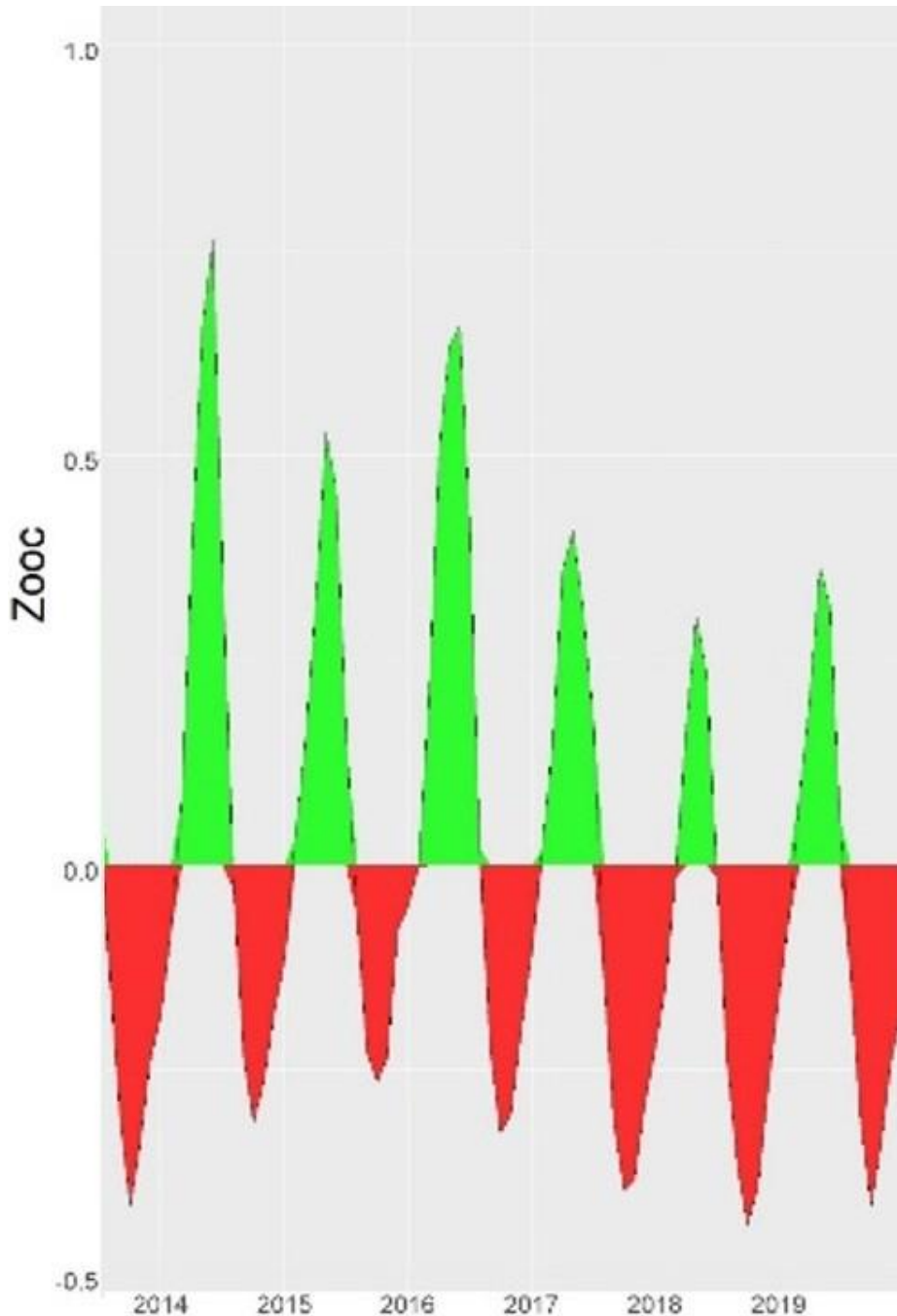
The weather in 2022 was good for most of our surveys. The expedition was at sea for over 98 hours over the three groups and was often limited by the weather as to where it could go. Only a few days were in difficult conditions.

Three species of baleen whales were sighted six times during the expedition, which is slightly below average. There were more sightings after the expedition, but still below the record years of 2014-2016. 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 (L. Steiner, unpublished data). 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.).

Fig. 2.5b shows zooplankton biomass from 2014-2019, also showing the same trend, with 2014-2016 having higher density of zooplankton, decreasing in density to 2019 (Sergi Perez Jorge pers. comm.). We believe the 2017 drop in zooplankton density may be linked to the lower sightings of baleen whales.



**Figure 2.5b.** Zooplankton biomass 2014-2019 (Data was extracted from the SEAPODYM model). The green = more biomass than the average (Feb – August), red = less biomass for the rest of the year. Also see [https://youtu.be/i23v\\_wdFIQk](https://youtu.be/i23v_wdFIQk) for a visual representation of this.

## Minke whales

There was a single minke whale sighted during the expedition. Minke whales are not observed very often as the lack of blow and their low surface profile make them difficult to spot. There is no confirmed information on where the minke whales that we see in the Azores are coming from or going to (Risch et al 2014). The minke whale feeding grounds are the same as those of blue and fin whales, but the breeding grounds have not yet been identified (Risch et al 2014). Dorsal fin photos were taken to identify the whale (Bertulli et al 2015). To date there has never been a match of a minke seen in the Azores to any other area in the North Atlantic.

## Blue whales

Three blue whales were seen in two encounters. The blue whales seen this year were heading NW, so on their way to feeding grounds, most likely in either Norway or Iceland. The two individuals that were seen swimming together had previously been seen in the Azores. As far as we know from tags placed on blue whales by the University of the Azores (Fig. 2.5c), their general movement is northwards in the spring, but the tags have stopped working or fallen off before the animals reached their main feeding grounds (Silva et al 2013).

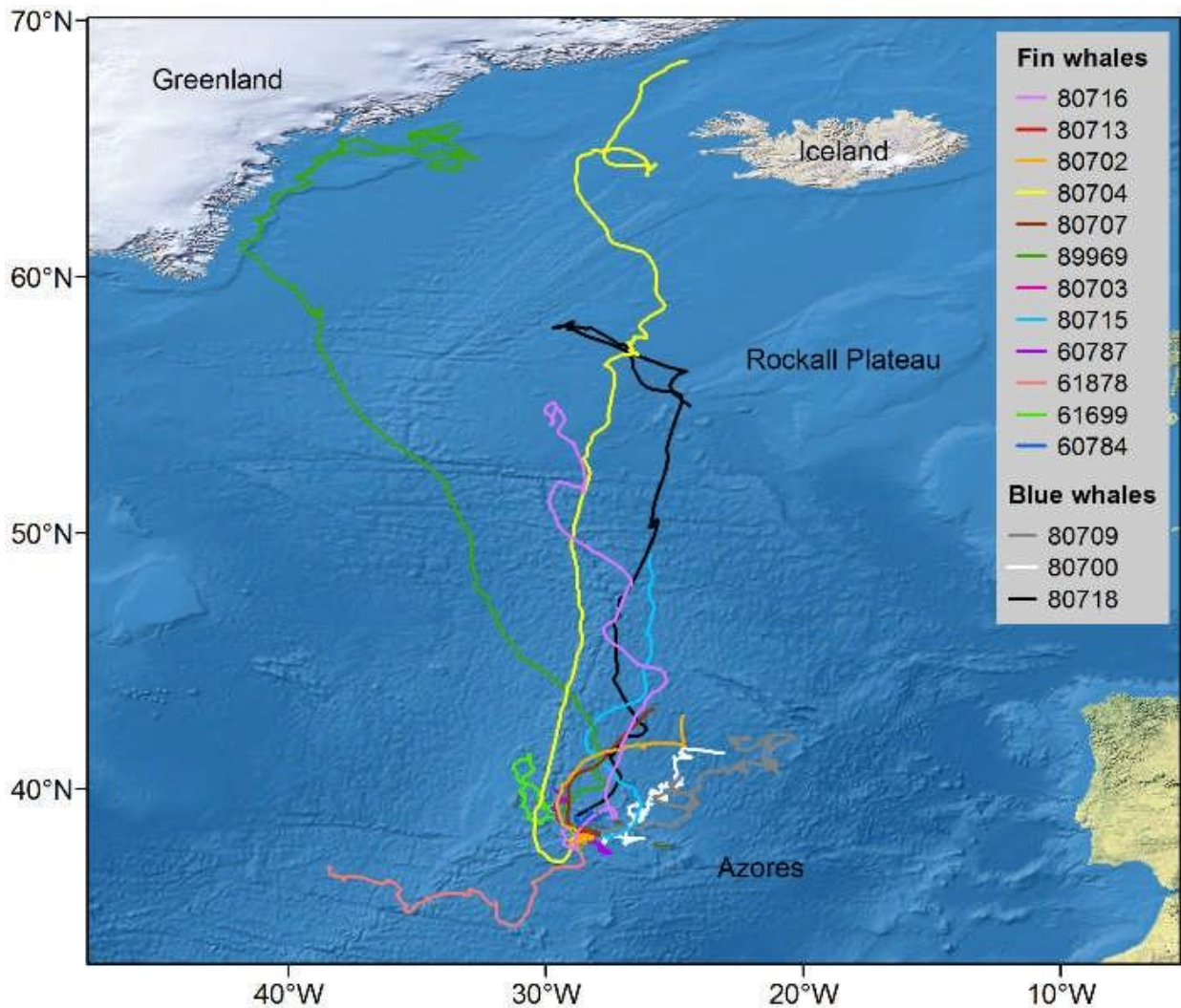
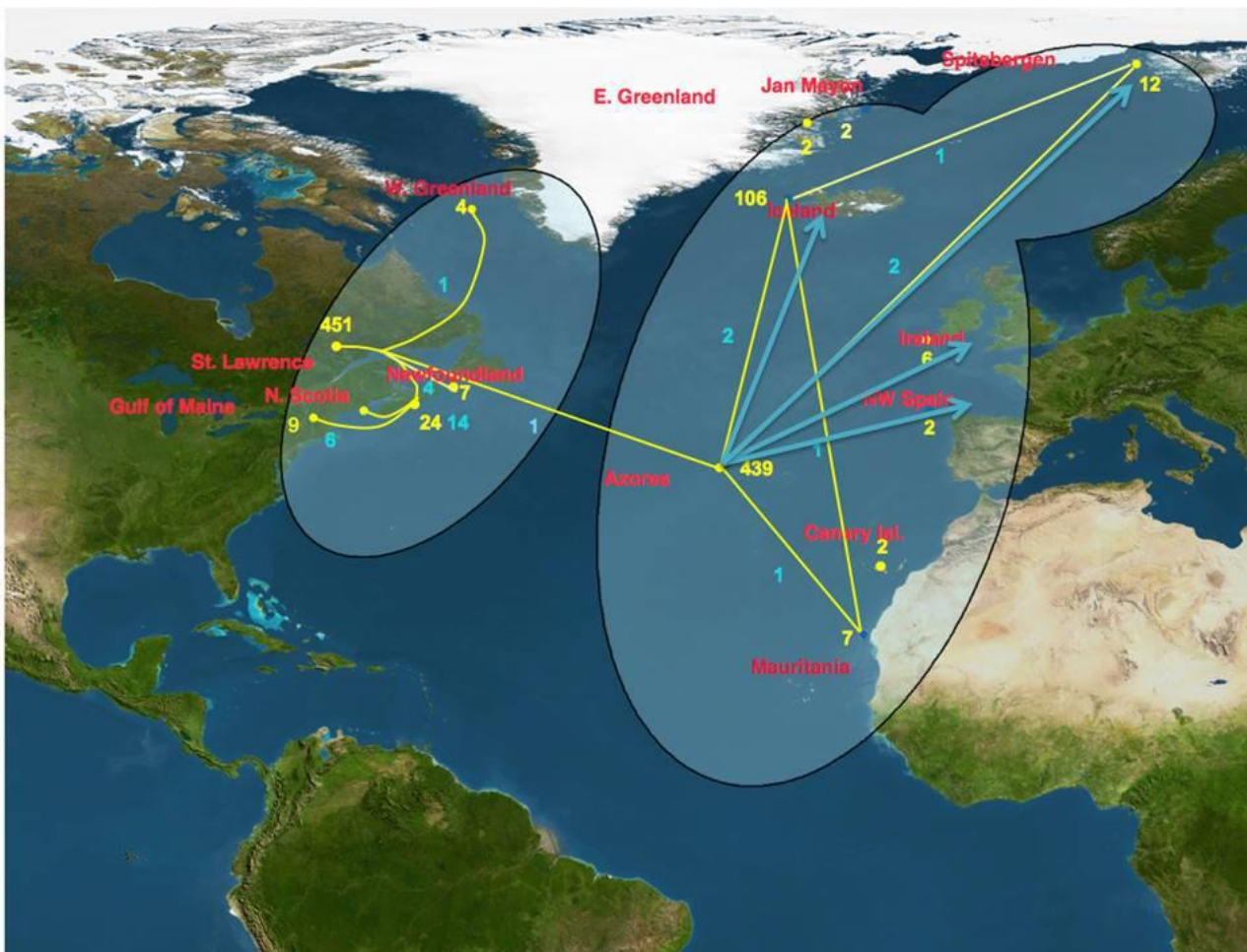


Figure 2.5c. Movement of blue and fin whales tagged in the Azores.

The Azores blue whale catalogue now contains almost 500 individuals (not all the author's or expedition photos), making up the majority of the Northeast Atlantic blue whale catalogue, just over 800, while the Northwest Atlantic blue whale catalogue has around 550 individuals. There are an estimated 2,000-3,000 blue whales in the North Atlantic. This number is still speculative, because reliable capture-recapture studies cannot be carried out with limited sightings (R. Sears pers. comm.).

Within the North Atlantic, the rarity of matches (only two to date) between the East and West North Atlantic catalogues suggest that there are two largely discrete populations in the North Atlantic. One population appears to live between West Greenland south along the coast of North America, centred in Eastern Canadian waters. The other extends from the Denmark Strait, Iceland and Jan Mayen, Spitzbergen, to the Barents Sea in the summer, and South to the Northwest African coast in the winter. Recent matches of blue whales to Ireland and Galicia, Spain are also in line with the more common matches to Norway (Fig. 2.5d). These are also supported by the genetic structure of blue whales across the Atlantic (Oosting et al. 2014 in Sears et al. 2015). The tags put on blue (and fin) whales by the University of the Azores corroborate evidence for blue whale northward routes from the Azores that stay within the East North Atlantic population/catalogue (Fig. 2.5c).



**Figure 2.5d.** Blue whale movements in the North Atlantic (from Sears et al. 2015).

One of the trans-Atlantic matches occurred in 2014. After the expedition, a blue whale was seen off the south coast of Pico that had previously been seen in the Gulf of St. Lawrence, Canada in 1984, 30 years previously. Its whereabouts over the last 30 years remain a mystery, demonstrating (1) that there may be limited mixing between East and West North Atlantic populations/catalogues, and (2) the need for continuous photo ID collection to elucidate whale movements and population boundaries. Elucidating such movements and population locations and boundaries is important, because blue whale populations do not seem to be recovering from population crashes at the same rate as other whales, making route determination with a view to establishing effective protected areas doubly important.

## Humpback whales

Six humpbacks were seen over three encounters, in addition to another one being heard singing on the hydrophone on 28 March 2022. In over 30 years of research, singing from a humpback whale has only been heard a few times in the Azores. The male humpbacks sing on the breeding grounds to attract females (Payne and McVay 1971). Unfortunately, the expedition was unable to locate the singer to obtain fluke photos to identify the individual.

Two of the individuals sighted during the expedition matched to other regions. One individual photographed on 5 April 2022 had previously been seen in Norway in October 2014. The second match was a very special one. A leucistic individual (98% white), was first seen in Norway in 2012 (Lydersen et al 2013) and again in 2018 (A. Rikardsen pers. comm.). It was also seen in Guadalupe in 2015, 2019 & 2020 (L. Bouveret pers. comm.). In 2018, a biopsy was taken, which showed that this individual is male (A. Rikardsen pers. comm.). There are not many leucistic whales. In fact, this individual is thought to be the only one in the North Atlantic. This whale may have been seen in the Barents Sea in 2004 & 2006 as well, but there are no fluke photos to confirm this. If this was the case, then this whale would be at least 30 years old. The rarity of observations of such white individuals suggests that they are born at very low frequencies or that the ontogenetic survival rates of the colour morph are low (Lydersen et al 2013).

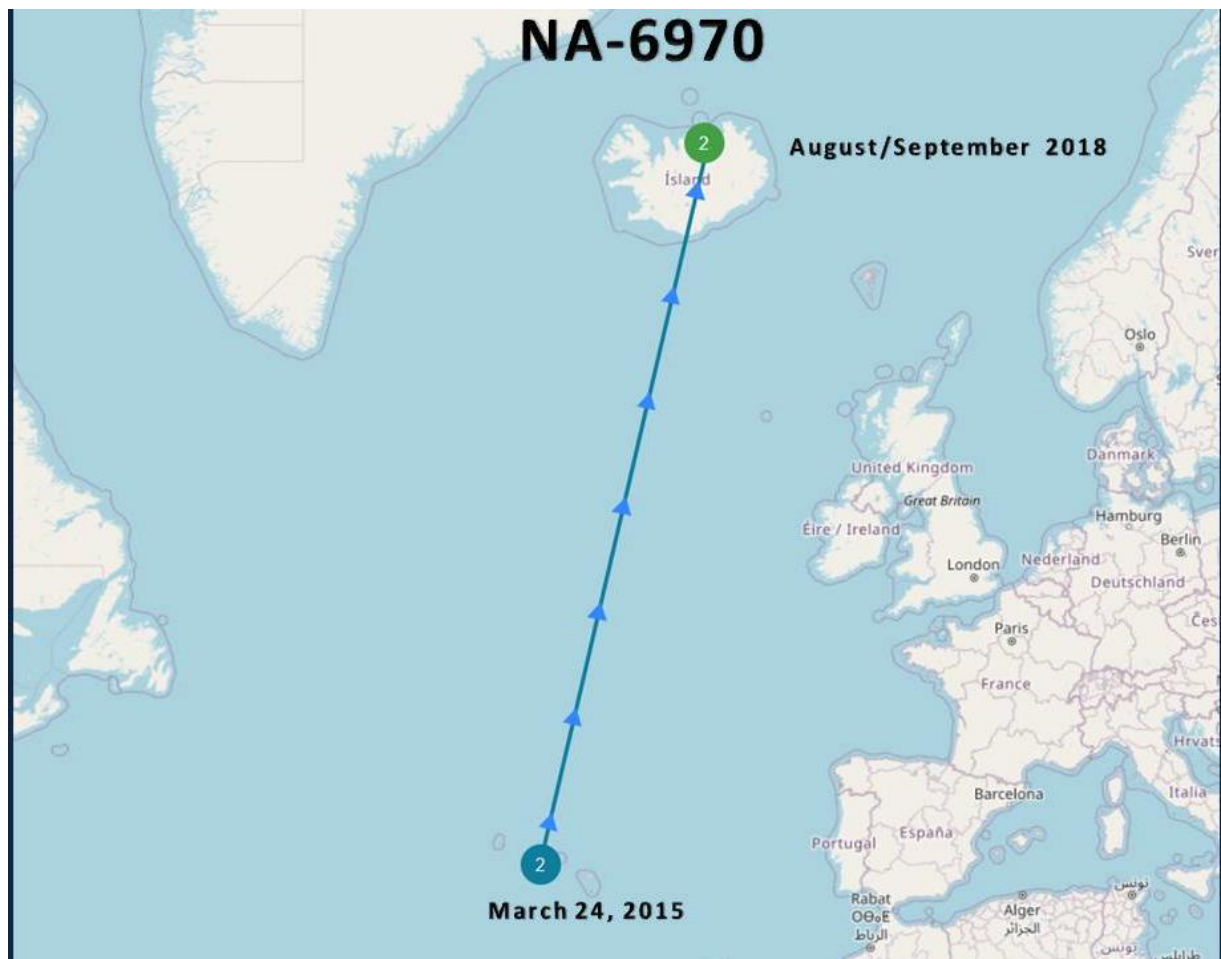
As this report was being written, a new humpback whale match was found to the Cape Verde Islands (F. Wenzl pers. comm.). An individual, possibly a calf, which was seen during the 2018 expedition on 24 March 2018, in a group of three, was seen in Cape Verde in May 2022. The other individual that fluked from this group in 2018, was seen in Norway. This is a good illustration of the importance of long-term data collection by the expedition.

With the expedition now starting earlier in the season, it is possible that some individuals observed are on their way to their breeding grounds, instead of on their way North to the feeding grounds. These individuals can be recognised by the yellow diatoms (algae) on the flukes. These are only present on individuals that have recently been in the colder regions of the feeding grounds and are usually absent on animals in or returning from the warmer waters of the breeding grounds because the algae need the cold water to survive (F. Broms pers. comm.).

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 21 matches between the Azores and Cape Verde (not all the author's or expedition photos) with five of those being seen in northern

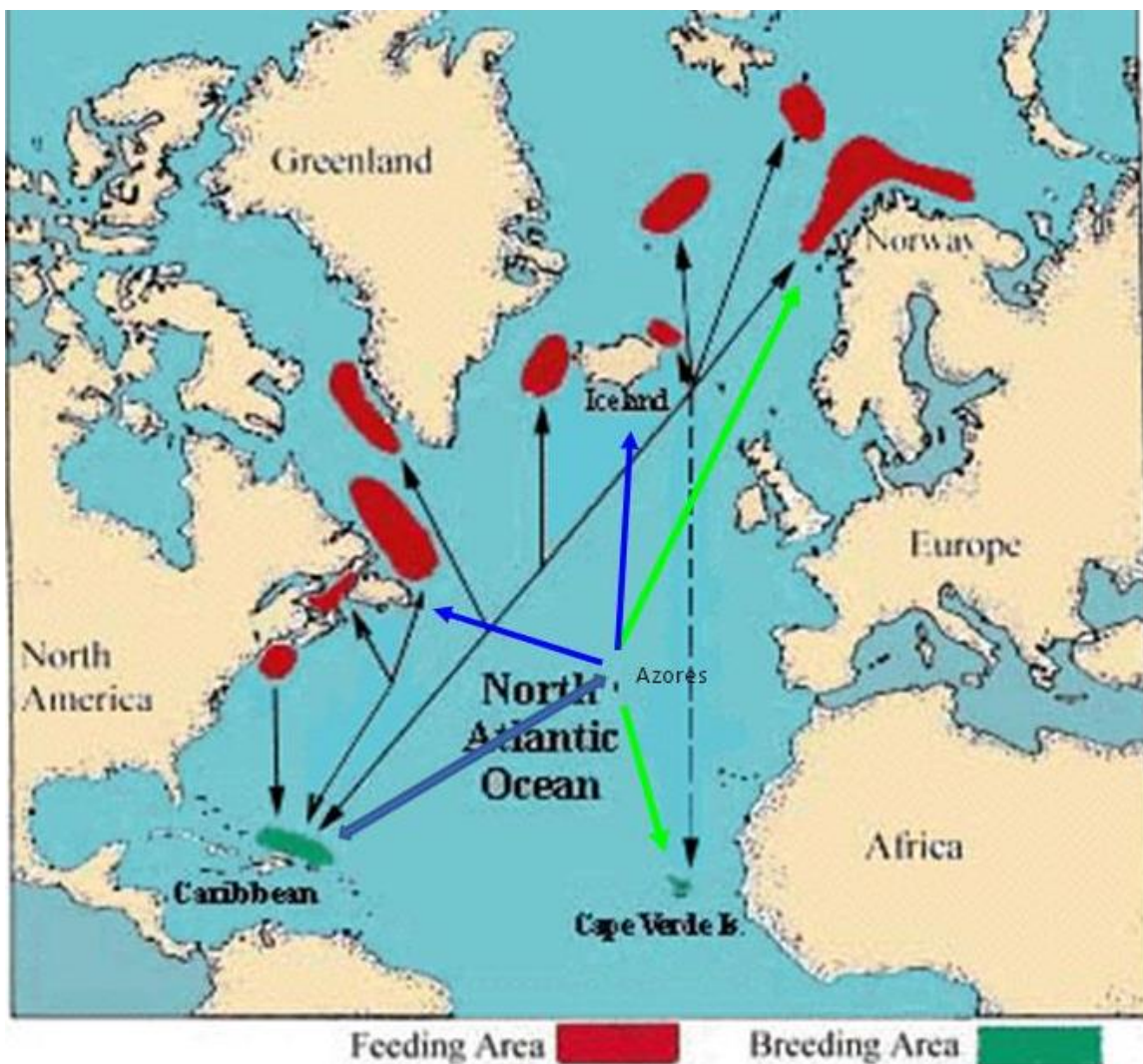


Norway (Fred Wenzel pers. comm.) and another nine matched to Norway (Fred Broms pers. comm.). One humpback whale sighted during a previous expedition was recently matched to a whale seen in northern Norway (2014/2015) and close to the Russian border (2016) (unpublished data). There has been a new match from the Azores (not the author's photo) to Newfoundland, which is the first trans-Atlantic match (unpublished data). Tagged humpbacks have passed by the Azores on their way to the Caribbean (unpublished data), but it was not until 2021 that the first fluke match was made. Two animals tagged in Norway in 2017 came close to Faial on their way to the Caribbean (unpublished data), just not close enough to be identified. There are now three fluke matches from the Azores to the Caribbean, including the leucistic individual seen during this expedition. Two new matches have also been made recently from the Azores catalogue to Iceland (N. Oria pers. comm.) using Happywhale, an online matching algorithm. One can be seen in Fig. 2.5e (unpublished data).



**Figure 2.5e.** Azores – Iceland Humpback whale match as seen on Happywhale.

The North Atlantic Humpback Whale Catalogue, managed by the College of the Atlantic, currently has over 10,000 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 26 ID photos to the catalogue, which produced two matches to the Cape Verde Islands in 2010, one in 2018 and one to Norway in 2018, and the two matches this year: one to Norway and the leucistic individual to both Norway and Guadalupe (unpublished data). The Cape Verde match made during 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. 2.5f, 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.



**Figure 2.5f.** Movement of humpbacks in the North Atlantic. Azores matches in green and blue.

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. This corroborated the results mentioned above, i.e. that some blue whales have been seen in multiple years, fin whales only rarely, and only one sei whale to date has been seen in multiple years. Some individual blue and fin whales remain in the Archipelago for a few weeks during the spring feeding, while the sei whales generally do not (Chevallard et al. 2016). However, in the summer of 2022, an unusual event occurred. Instead of observing a few sei whale individuals migrating through the islands during the summer, dozens of sei whales were observed feeding on abundant baitfish to the south of Faial and Pico for three months (Aug-Oct). At the moment, it is unclear whether the same individuals have remained in the area or if different animals are passing through and taking advantage of the ample food supply.

The significance for whale conservation and research of these findings is that they suggest that the Azores provide a crucial 'pit stop' (between breeding grounds further south, possibly Mauritania, Cape Verde and the Caribbean and feeding grounds in Iceland and Norway) for some of the migrating animals that do not feed 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. 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.

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 communicate repeatedly 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.).

### Dolphin species

Overall, dolphin sightings were good. Common dolphin were seen on most days. There were several bait balls and feeding frenzies with Cory's shearwaters observed in the area, including the false killer whale encounter. The last three years have had lower overall dolphin sightings during the expedition than previous years. To date, it is not known why. Although if there is lower primary productivity, then it follows that there will be less prey for some species to eat. Another factor is the amount of time that is spent with sperm whales. When we are with sperm whales, we stay in one general area and are not actively looking for dolphin, which will skew results.

Another possibility is that the dolphins have been stressed by humans swimming with dolphins that occurs mainly in the summer months, and are now spending less time in the main whale watching areas or even actively avoiding the boats. However, after two years of lower whale watching activity/swimming with dolphins due to COVID-19, this factor may have been less important this year.

### Risso's dolphin

The expedition saw five groups of resident Risso's dolphin. Two of the Risso's dolphin were the well-known females "M1r" and "Albi". Both have been seen since 2006, although at that time "M1r" was already an adult with a calf and "Albi" was a large calf. The calves seen with them this year were "M1r's" fourth calf and "Albi's" first. Karin Hartman of the Nova Atlantis Foundation was particularly happy to see that "Albi" has had her first calf. This is a regular "nursery" group of Risso's dolphin we see, usually near Faial. In the last few years, there have been a couple of leucistic calves observed, Risso's calves are usually born a darker colouration, making them less visible to potential predators, so light colouration is a disadvantage. Time will tell if these leucistic calves make it to adulthood (K. Hartman pers. comm.). Male Risso's dolphin tend to live in separate groups and usually only associate for breeding (Hartman et al 2009). The males that were seen are the ones usually observed around Faial and only occasionally seen to the South of Pico where Karin works, so are not very well known (Hartman pers. comm.). All of the 2022 ID photos were forwarded to Karin who wrote her PhD (Hartman 2014) on Risso's dolphin around Pico, for future analysis.

### Common dolphin

Fifty 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 similar to previous years, but smaller than those seen during the summer. If the food is spread out over a wider area, most likely the groups are smaller and spread out to find it. Feeding was seen on six occasions, although it was not determined what species they were eating.

Two melanistic (darker than usual) individual common dolphin were observed. This form is becoming more common (no pun intended) to see in recent years (unpublished data) and this genetic trait can be passed on to calves as the author has seen in a previous year.

### Striped dolphin

Striped dolphin were encountered at a lower rate than other species, mainly because in the Azores, they tend to avoid boats. When groups of striped dolphin are seen, if the boat goes faster, the dolphin go faster, often jumping in the carousel formation. Sometimes when the boat slows down, the dolphin become calmer and occasionally even bowride as happened on one of the sightings this year. It is unknown why this is the case here, in the Azores, because in other areas, like the Mediterranean, the striped dolphin will bowride.

## Bottlenose dolphin

Bottlenose dolphins are one of the resident species of dolphin that can be seen in the Azores (Silva, M. 2007). They were encountered four times, although the last two sightings were probably the same group a couple of hours apart. Both sightings were of socialising animals, with leaping observed. Those two groups were also larger than normal, at an estimated 75, rather than the usual 25 (unpublished data) so most likely there were a few groups of dolphin that met up to socialise and mate.

## False killer whales

This species was only observed once and it was a memorable encounter. There were roughly 75 individuals spread over quite a wide area, heading at high speed to the NNW. Eventually this rapid travel stopped and a feeding frenzy commenced. They were feeding on tuna or possibly mahi mahi, judging by the large pieces of fish, which could be observed in their mouths. There were also hundreds of Cory's shearwaters eating the scraps. Photo-ID work has only recently started, trying to work out if this species is resident. There are matches of individuals over long periods of time and also between islands, so it appears that they may be "resident" over the archipelago, rather than one specific island group (Steiner et al 2019). Dorsal fin ID photos were taken and - after preliminary analysis - several known individuals were seen. AzPc002 "Tilt" has been seen in several years since 2005. "India" has also been seen in several years since 2005 and has also been seen in all parts of the Azores. AzPc024 was first seen in 2011. This information supports the "resident" species hypothesis, although they are resident throughout the archipelago, rather than in one specific area of the islands.

## Sperm whales

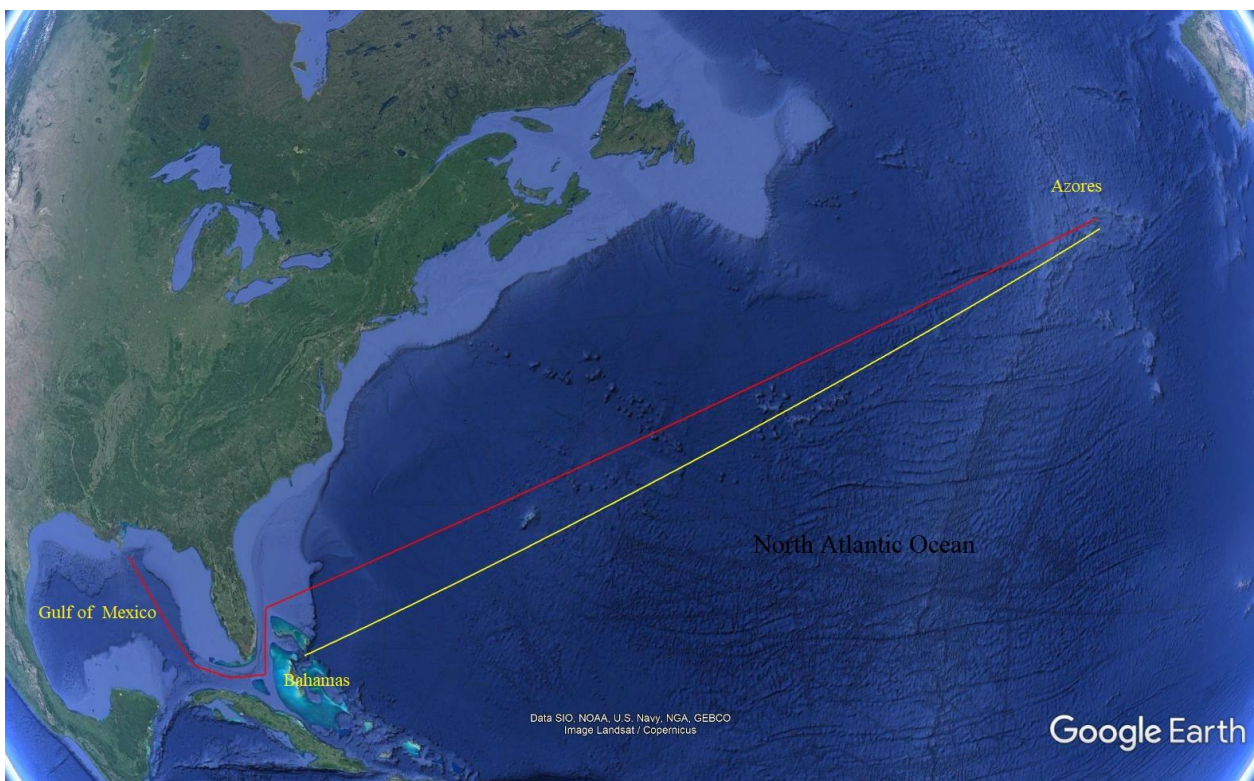
The 2022 expedition had a total of 70 encounters of 44 identifiable sperm whales, including females with suckling calves, as was observed during previous expeditions, in addition to 4 big males. One of the males is "resident" mainly in São Miguel, but has been seen in the Central Group in two previous years. Another male was associating with one of our "regular" female groups and was previously seen in 2008.

Also seen during the 2022 expedition was "19", which had first been seen in 1987 and is the longest photo-ID match to date. The group of "winter whales" was also seen. Seeing these whales return to the Azores repeatedly or possibly in the case of the "winter whales", remaining in the Azores, shows that the sea around the islands is an important area for these animals.

Before Biosphere Expeditions began working in the Azores, the expectation was that we would see mainly large males in spring, but year after year, this has proven not to be the case, although we do tend to see more males in the spring than in the summer. Four males were seen during this expedition. It is normal for very large males to become more solitary, the older they get. 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).

Re-sightings of male sperm whales in the Azores are rare, because they do not spend much time in one area. Rather, 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). It is not known how often mature males leave the feeding grounds to look for females to breed (Whitehead 2003). There have only been a few re-sighted males in the Azores over 30 years (unpublished data), including “3554”, seen this year and previously in 2008.

A few years ago, a match was made of a sperm whale seen in the Gulf of Mexico in 2002 which was re-sighted in the Central Group of the Azores in 2017 and another that had been seen in the Bahamas in 2005, which matched to São Miguel in 2017 (Fig. 2.5g). These are the first cross-Atlantic photo-ID matches of sperm whales (Mullin et al 2022). 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, to see if there might be some more matches.

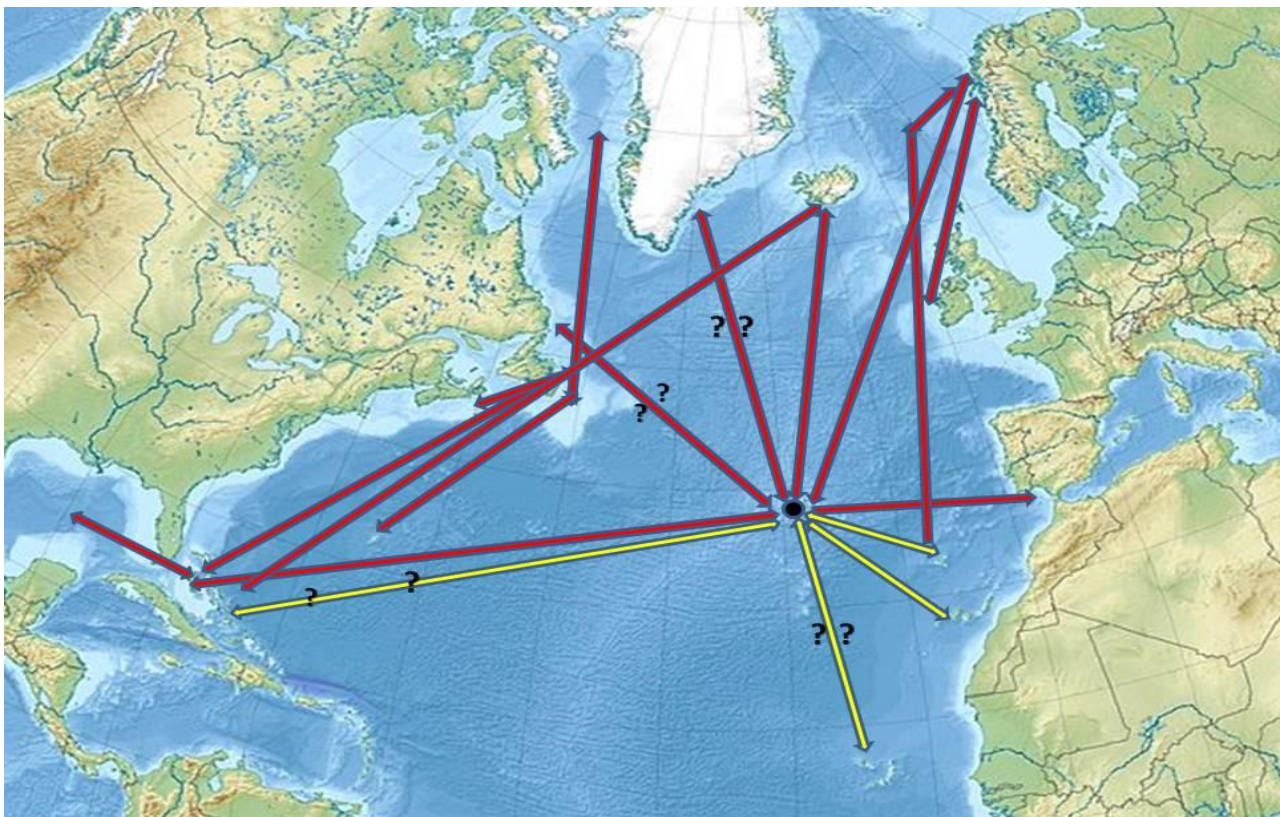


**Figure 2.5g.** Transatlantic sperm whale matches, using photo-ID.

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), which was subsequently published (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.

Since the first work in 2009, another 33 males have been matched between Norway and the Azores (unpublished data) and there are plans to update the 2012 paper. There are also new matches from Newfoundland to the Bahamas and Iceland to Dominica (unpublished data) which will also be included in the update. In 2019, a male sperm whale was tagged in the Davis Strait and followed for just over two months, until near Bermuda, when the tag stopped transmitting (Lefort et al 2022).

In addition to co-operating with colleagues working on male sperm whales, the lead author has been collaborating with whale watching companies from São Miguel, as well as Pico, since 2010. Several matches exist between the islands, indicating that there is movement of some animals around the archipelago, although most animals have been observed in only one area (unpublished data). The two groups of islands (Pico/Faial & São Miguel) are only 125 nautical miles apart, so it is not surprising that there is movement between the two areas. Collaboration between the expedition scientist with labs in 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 (21 Az-Can, 10 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 at least some female sperm whales undertake a limited migration. All photo-ID sperm whale links, or satellite tracked individuals, males and females are shown in Fig. 2.5h.



**Figure 2.5h.** North Atlantic sperm whale matches. Males in red, females in yellow. ? = unconfirmed routes.

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), thereby contradicting the photo-ID data. Collaboration will continue with other researchers to understand this phenomenon. This difference probably comes down to sample size. There were not many samples taken and there are not that many groups that have moved between the archipelagos to date, 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.

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. “19” was an adult in 1987 when first seen, so in 2022, she is at least forty years old.

In 2009 a PhD thesis by Ricardo Antunes was completed at St. Andrews University (Antunes 2009), 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).

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 and lack of citizen scientists or tourists for this challenging time of year reducing the chance to get out on the water and collect data are the main obstacles to investigating this theory.



## Conclusion and outlook

The expedition and its annual reports have, since 2004, 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 sixteenth year. It was great to be up and running after the unwelcome two-year break due to COVID-19. More sperm whales than baleen whales were observed and there were quite a few dolphin sightings. The weather conditions during the expedition were quite good, making most sightings and data recording relatively easy. Re-sighting individual sperm whales from previous years continues to show the value of the Europhlukes & Happywhale matching programmes 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.

The 2023 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 creating a catalogue of individuals and 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 2023 we can have a dedicated beach clean during the expedition
- continue to collect data with the Monicet app. We should also continue to use a GPS device, which can download the track of the boat & sightings, which proved very successful in 2022
- continue uploading new images and matching flukes to Happywhale 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 21 March and 21 April 2022 in Faial Island (Azores, Portugal). Onboard of the vessel *Physeter*, citizen scientists recorded the occurrence of several marine species such as dolphins and seabirds (see figures below), as well as marine debris. The information recorded during the expedition were added to the POPA (translated as [Azores Fisheries Observer Program](#)) database.

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 independent observers on tuna fishing vessels. The 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). Since 2015 the programme observers also collect information on marine debris. POPA is also responsible for the “Friend of the Sea” tuna fishery certification.

## 3.2. Results

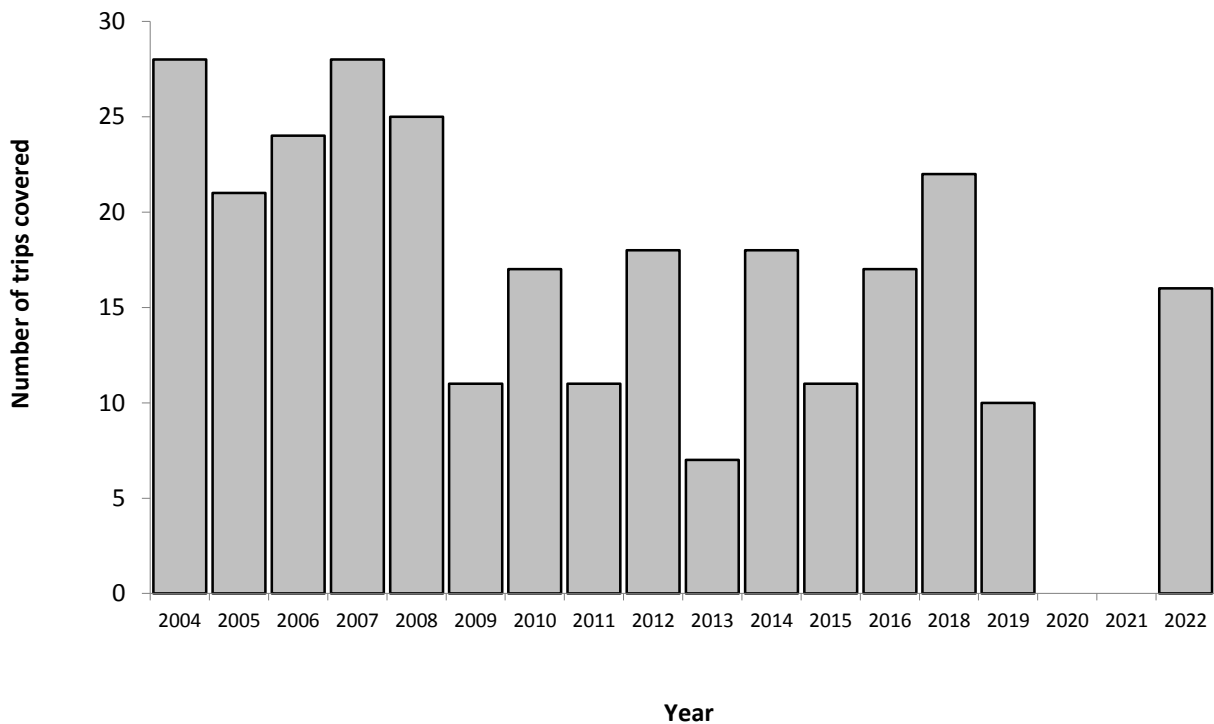


Figure 3.2a. Trip coverage during the 2004-2022 period.

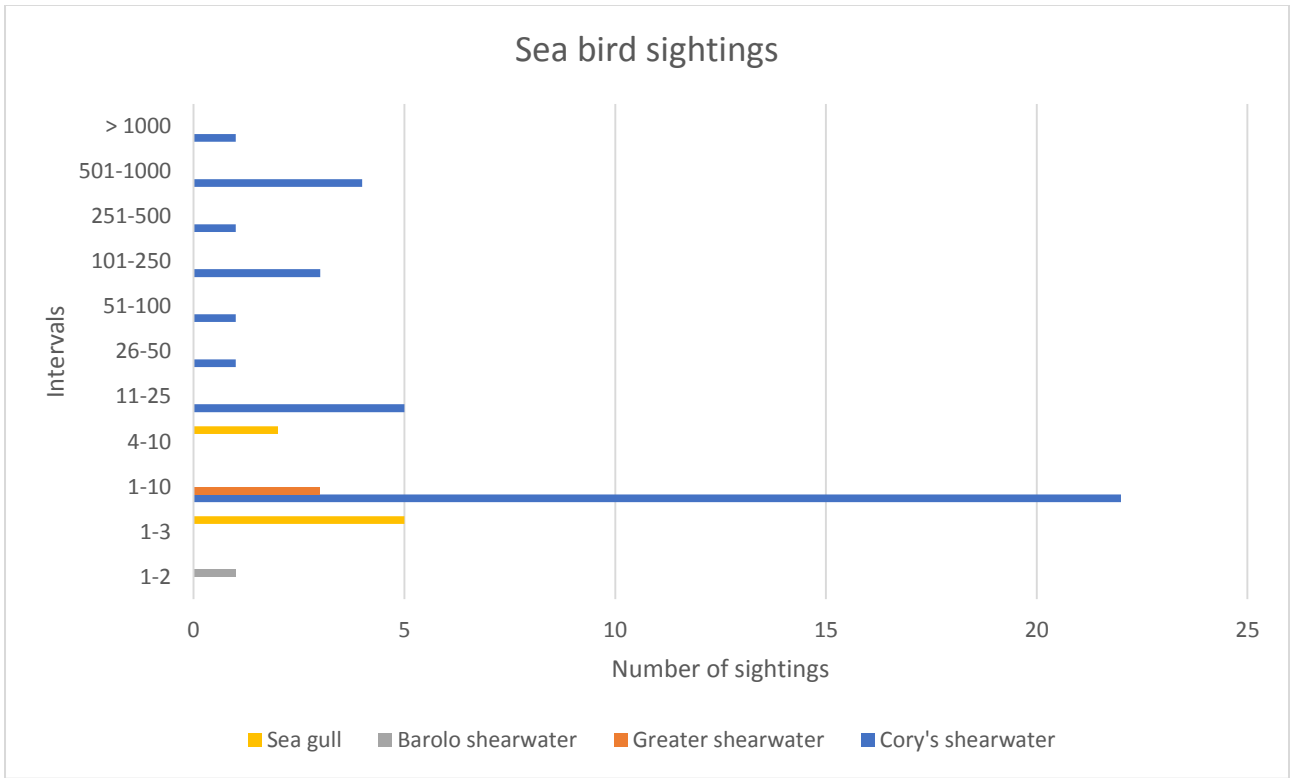


Figure 3.2b. Seabirds observed in 2022.

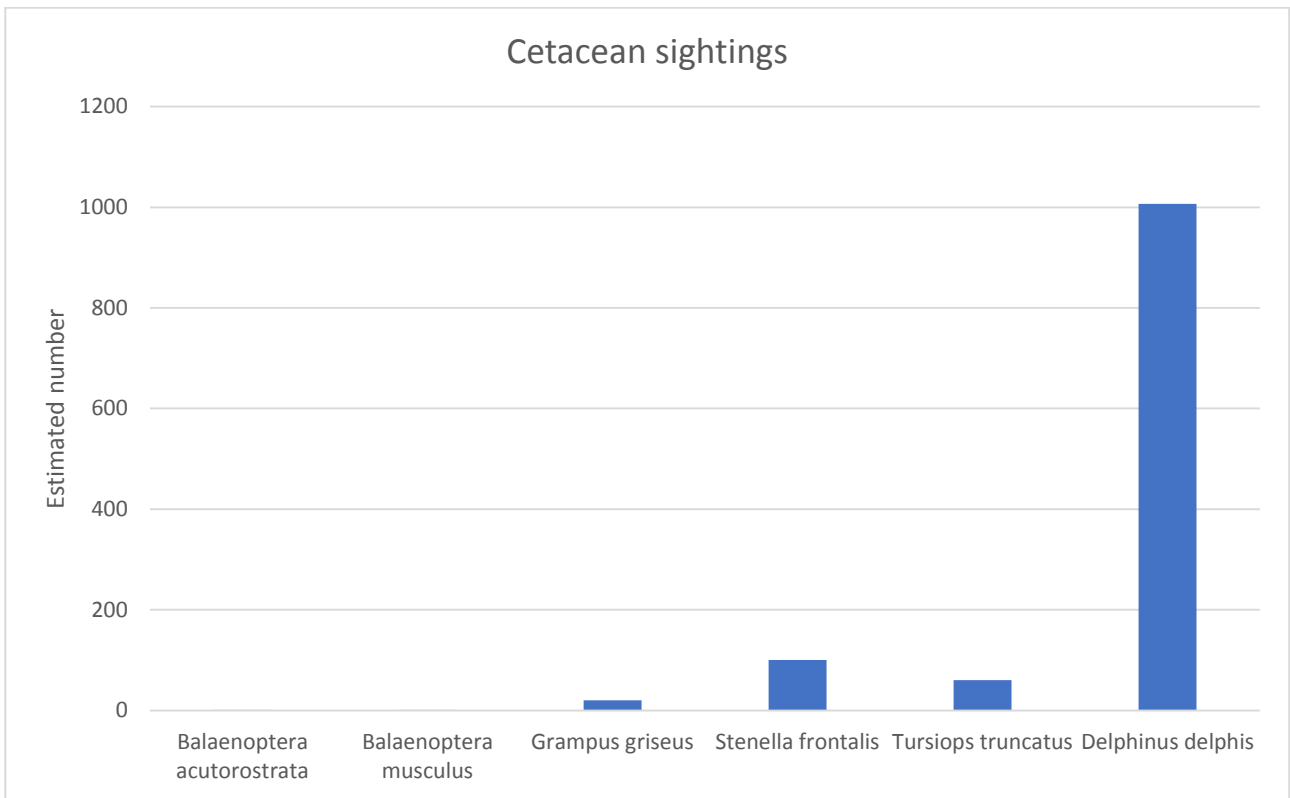
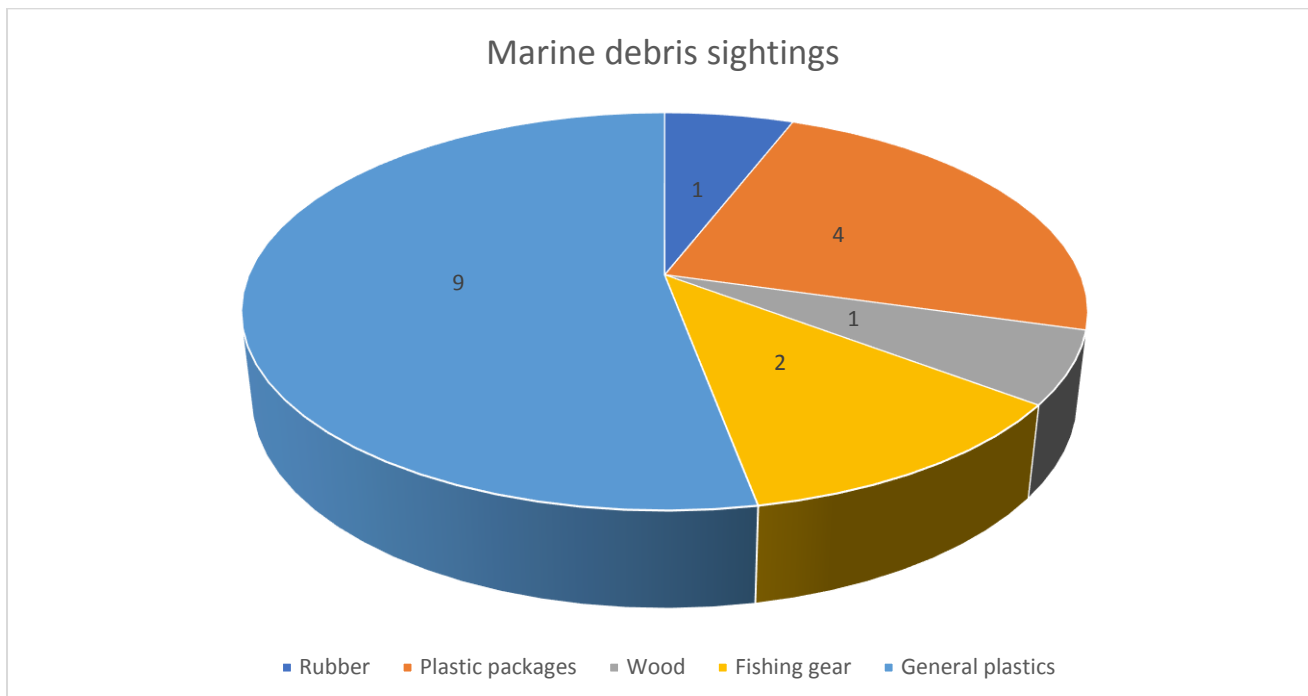


Figure 3.2c. Cetaceans observed in 2022.

From left to right: minke whale, blue whale, Risso's dolphin, spotted dolphin, bottlenose dolphin, common dolphin.



**Figure 3.2d.** Marine debris items (5-60 cm) observed in 2022.

### 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 have ever been 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 requested frequently 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 fisheries 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-2022/>.



All expedition reports, including this and previous Azores expedition reports, are available on [ResearchGate](#).