



Iberian Network for Seabirds and Marine Mammals _Portugal mainland counts during 2019

Lisbon, December, 2020



Iberian Network for Seabirds and Marine Mammals _Portugal mainland counts during 2019

Lisbon, December, 2020



RAM counts in Cabo São Vicente ©Ana Isabel Fagundes

The Seabird and Marine Mammal Monitoring Network (RAM) is a monitoring network that started off the Cantabrian and Galician coasts. Since 2008 it has been extended to the entire Iberian Peninsula, including the Portuguese coast and the archipelagos of Madeira and Azores.



Mission

Work for the study and conservation of birds and their habitats, promoting a development that guarantees the viability of the natural heritage for the enjoyment of future generations. Environmental awareness and the promotion of birdwatching are also other priorities.

[SPEA - Portuguese Society for the Study of Birds](#) is a Non-Governmental Environment Organization that works for the conservation of birds and their habitats in Portugal. As a non-profit association, it depends on the support of members and various entities to carry out its actions. It is part of a worldwide network of environmental organizations, BirdLife International, which operates in 121 countries and aims to preserve biological diversity through the conservation of birds, their habitats and the promotion of the sustainable use of natural resources.

SPEA was recognized as a public benefit entity in 2012.

www.spea.pt

www.facebook.com/spea.Birdlife
https://twitter.com/spea_birdlife



Iberian Network for Seabirds and Marine Mammals _Portugal mainland counts during 2019

Sociedade Portuguesa para o Estudo das Aves, 2020

National board: Graça Lima, Paulo Travassos, Peter Penning, Alexandre Leitão, Martim Melo, Nuno Barros e Maria José Boléo

Executive direction: Domingos Leitão

Project coordination: Ana Isabel Fagundes

Acknowledgements: We are grateful to those responsible for the observation points, who have voluntarily coordinated the RAM counts in the 5 points distributed from north to south of the country: Leonel Rocha (Praia da Vagueira), Ana Santos and Elisabete Silva (Cabo Carvoeiro), Tiago Caldeira (Cabo de São Vicente) and Miguel Mendes (Ilha do Farol). This work would not have been possible without the dedication of the observers who have voluntarily collaborated in the counts.

Citation: Adlard, E. & A. I. Fagundes. 2020. Iberian Network for Seabirds and Marine Mammals _Portugal mainland counts during 2019. Sociedade Portuguesa para o Estudo das Aves, Lisboa (non published report)



INDEX

SUMMARY/RESUMO	5
<hr/>	
1. INTRODUCTION	6
<hr/>	
1.1 Target Species	7
2. METHODOLOGY	8
<hr/>	
2.1 Counts methodology	8
2.2 Study Area	8
2.3 Data Analysis	9
3. RESULTS	10
<hr/>	
3.1 Observational Effort	10
3.2 Species Richness	10
3.3 Passage Rate	13
3.3.1 Razorbill	14
3.3.2 Cory's Shearwater	16
3.3.3 Great Skua	17
3.3.4 Mediterranean Gull	18
3.3.5 Common Scoter	19
3.3.6 Northern Gannet	20
3.3.7 European Shag	22
3.3.8 Balearic Shearwater	23
3.3.9 Sandwich Tern	24
3.4 Behavioural Analysis	26
4. DISCUSSION	33
<hr/>	
BIBLIOGRAPHY	38
<hr/>	

SUMMARY

Seabirds are a relatively small group of birds but they have a global reach as they occur in every marine environment around the world. Due to their global abundance they are vital to understanding the status and ecology of marine environments. In recent decades, their status has been put under serious threat due to a wide range of anthropogenic factors. To better understand the seabirds ecology the RAM (Seabird and Marine Monitoring Network) census is used by Iberian researchers to collect data on seabirds in coastal areas.

This report refers to data collected during 2019 for the RAM census of Portugal. Census were carried out at 5 observation points - Praia da Vagueira, Cabo Carvoeiro, Cabo Raso, Cabo de São Vicente and Ilha do Farol. An observational effort of 116 hours was made, with Ilha do Farol having the highest observational time (36 hours) and Praia da Vagueira the lowest one (15 hours).

Data was collected to show monthly and annual passage rates (birds/hour) and also to carry out a behavioural analysis on the 9 target species: Razorbill (*Alca torda*), Cory's Shearwater (*Calonectris borealis*), Great Skua (*Catharacta skua*), Mediterranean Gull (*Larus melanocephalus*), Common Scoter (*Melanitta nigra*), Northern Gannet (*Morus bassanus*), European Shag (*Gulosus aristotelis*), Balearic Shearwater (*Puffinus mauretanicus*) and Sandwich Tern (*Thalasseus sandvicensis*). The observation point with the highest species diversity of seabirds was Praia da Vagueira (24 species), closely followed by Ilha do Farol (22 species). The month with the highest passage rate was March (436.96 birds/hour) and the observation point was Cabo Raso with 382.09 birds/hour.

RESUMO

As aves marinhas são um grupo de aves relativamente pequeno, mas têm uma distribuição global, visto que ocorrem em todos os ambientes marinhos do mundo. Devido à sua abundância global, são vitais para a compreensão do estado e da ecologia dos ambientes marinhos. Nas últimas décadas, os seus estatutos de conservação têm estado sob grave ameaça devido a uma ampla gama de fatores antropogénicos. Para melhor compreender a ecologia das aves marinhas, os censos RAM (Rede de Observação de Aves e Mamíferos Marinhos) é utilizado por investigadores ibéricos para recolher dados sobre as aves marinhas nas zonas costeiras.

Este relatório refere-se a dados recolhidos durante o ano 2019 em Portugal continental, em 5 pontos de observação - Praia da Vagueira, Cabo Carvoeiro, Cabo Raso, Cabo de São Vicente e Ilha do Farol. No total foi realizado um esforço de observação de 116 horas, sendo a Ilha do Farol o local com maior tempo de observação (36 horas) e a Praia da Vagueira o local com menos horas (15 horas).

Os dados colhidos permitiram estimar as taxas de passagem mensais e anuais (aves/hora) e efetuar uma análise comportamental das 9 espécies-alvo: torda-mergulheira (*Alca torda*), cagarra (*Calonectris borealis*), alcaide (*Catharacta skua*), gaivota-de-cabeça-preta (*Larus melanocephalus*), negrola (*Melanitta nigra*), alcatraz (*Morus bassanus*), galheta (*Gulosus aristotelis*), pardela-balear (*Puffinus mauretanicus*) e garajau-de-bico-preto (*Thalasseus sandvicensis*). O ponto de observação com maior riqueza específica de aves marinhas foi a Praia da Vagueira (24 espécies), seguida pela Ilha do Farol (22 espécies). O mês com taxa de passagem mais elevada foi março (436,96 aves/hora) e o ponto de observação com maior taxa de passagem foi o Cabo Raso com 382,09 aves/hora.

1. INTRODUCTION

According to Birdlife International's taxonomic definition, seabirds include all species of bird which rely upon the marine environment for at least part of their life cycle [Birdlife International, 2018]. This definition produces 346 species worldwide (3.5% of all birds). It has been shown that seabirds are the more threatened than any other group of birds and that over the recent decades their global status has started to decline faster. This decline is widely accepted to have been caused by a range of anthropogenic factors which include habitat changes, ingestion of plastics, invasive species, overfishing, fishing practices, oil spills and climate change (Croxall et al 2012; Dias et al 2019).

It's been shown that climate change effects 25% of seabird species and that almost 75% of seabirds are threatened by two factors, with close to half being impacted negatively by three different factors (Dias et al 2019). The combination of factors which effect seabirds shows that the need for co-ordinated conservation efforts and collection of data is more important than ever.

Despite seabirds representing a relatively small proportion of the global bird population, their abundance across all oceans makes them fantastic ecological indicators for marine environments. In addition to this, when you compare them to other marine animals, they are easier to study because of their visibility above the water and their necessity to reproduce on land (Dias et al. 2019). This has led to seabirds being exceptionally well studied compared to other marine species and as a consequence our understanding of the conservation status of seabirds is the most reliable out of all marine life (Croxall et al 2012; Dias et al 2019). Therefore, taking an interest and collecting data on seabird populations and behaviour is a reliable way to establish an accurate baseline on the ecological status of seabirds but also more generally of marine environments.

Portugal has 65 species of seabird (18 nesting). This diversity of species is caused by Portugal's EEZ which lies on a vital seabird migratory route between North Africa and Western/Northern Europe (Meirinho et al 2014), in addition to its geographical location it is large in area at the 10th largest in the world. The geographical location and size of the EEZ gives Portugal a responsibility to protect and conserve the marine habitat in this area, because it is a mandatory crossing point for a large number of seabirds in the North Atlantic Region. These migration routes are vital not only for seabirds which breed or winter in Portugal but also for those which are passage migrants (Meirinho et al 2014).

The RAM survey covers the coastline of Portugal but also the rest of the Iberian Peninsula. It started in 2005 and originally only took place on the northern coastline of Iberia, but it was quickly expanded to include the whole of Iberia, and the archipelagos of Canaries, Madeira and the Azores (Valeiras et al 2006; Sengo et al 2012). The survey has several clear objectives:

- To obtain information on the abundance and distribution of birds and marine mammals on the Iberian coast.
- Compile a base data set with movements, relative abundance and behaviour.
- Create a standard methodology.
- Foster co-operation between ornithologists and marine mammal specialists.
- Involve volunteers in studies and conservation actions of the marine fauna because participation is open to anyone with an interest in birds and marine species.

In 2008, SPEA took over responsibility for co-ordinating the RAM counts within Portugal and have maintained control until present day. Since SPEA took over the responsibility, 5 reports have been published regarding different years: 2009-2011 (Sengo et al. 2012); 2013 (Oliveira et al. 2014); 2014-2016 (Fagundes & Felipe 2018); 2017 (Guedes & Fagundes 2019) and 2018 (Barradas & Fagundes 2019).

This report will cover the data from the 2019 RAM census and will aim to achieve the following objectives:

1. Compile and analyse data for the 5 observation points from mainland Portugal: Praia da Vagueira (Vagos), Cabo Carvoeiro (Peniche), Cabo Raso (Cascais), Cabo de São Vicente (Sagres) and Ilha do Farol (Faro).
2. To analyse target species in relation to their phenology, passage rate and behaviours.
3. Compare and contrast the data collected in this report with that of previous reports in an effort to improve understanding of population trends and patterns.

1.1 Target Species Espécies-alvo

The use of the Portuguese EEZ varies between each species of seabird, they range from passage migrants moving to and from North/-West Africa and North/-West Europe, wintering populations and species which use it to breed. Due to this variation in populations, it's generally considered that the highest number and diversity of species occurs during the migration periods (Spring/Autumn). There are a group of species which are present in high numbers all year round compared to global populations, these include Balearic Shearwater (*Puffinus mauretanicus*), Northern Gannet (*Morus bassanus*), Great Skua (*Catharacta skua*) and Sandwich Tern (*Thalasseus sandvicensis*).

For this report, 9 target species were chosen to be a focus of the data analysis (Table 1). This selection was based upon those birds which occur in the Portuguese EEZ for the majority of the year and in sufficiently high numbers. These species have also been studied in detail in previous RAM reports which aids with comparison of data trends.

Table 1_ Target Species Identification

Tabela 1_ Identificação das espécies-alvo

Common Name	Scientific Name	Conservation Status (IUCN)	Breeding Area	Wintering Area	Present in Portugal
Razorbill	<i>Alca torda</i>	Near Threatened	Northern Atlantic (France to Russia)	Mediterranean & North Africa	Winter (November to March)
Cory's Shearwater	<i>Calonectris borealis</i>	Least Concern	North Atlantic (Spain to Canaries)	Southern Atlantic	Breeding (February to November)
Great Skua	<i>Catharacta skua</i>	Least Concern	Northern Europe (Iceland, Norway, and Scotland)	Atlantic Coast, France & Iberian Peninsula	Winter (July to November)
Mediterranean Gull	<i>Larus melanocephalus</i>	Least Concern	Throughout Europe (Spain to Ukraine)	Mediterranean, Black Sea, Northwest Europe & Northwest Africa	Passage Migrant (February to April/ June to November)
Common Scoter	<i>Melanitta nigra</i>	Least Concern	Northern Europe (Iceland & Scandinavia)	West coast of Europe, North Africa & Mediterranean	Passage Migrant (March and April/ August to October)
Northern Gannet	<i>Morus bassanus</i>	Least Concern	Northern France, UK, Iceland and Norway	Iberian Peninsula Coast, Mediterranean and Northwest Africa	Winter (September to February)
European Shag	<i>Gulosus aristotelis</i>	Least Concern	Europe & Mediterranean	Europe & Mediterranean	Breeding & Wintering
Balearic Shearwater	<i>Puffinus mauretanicus</i>	Critically Endangered	Balearic Islands	Atlantic & Along the coast of SouthWest Europe	Summer (July to December)
Sandwich Tern	<i>Thalasseus sandvicensis</i>	Least Concern	All along the European Coast	Mediterranean and Western Africa	Passage Migrant (March to June/August to October)

2. METHODOLOGY

2.1 Counts methodology metodologia da contagem

The counts usually occur on the first Saturday of each month, starting at sunrise and lasting for 3 hours (7am-10am May → September and 8am-11am October → April). The count ideally requires at least two observers, one person to operate a fixed telescope positioned perpendicular to the coastline and another to use binoculars to observe the area not covered by the telescope. If only one observer is available to record then it is recommended that he uses a recorder, to enable the recording of observations.

Over the course of the 12 years of RAM reports, several advantages and disadvantages of this recording methodology have been discovered. The main advantages include it being very cheap, simple to apply, universal application to all observation points and in the long term it has proved useful in understanding population trends and behaviour when analysing the data. However, it has also shown to have some drawbacks such as its dependence upon good climatic conditions which has the potential to create a reduced field of view or length of sampling period. This limitation has been shown as the consistency of observation effort varies from year to year.

The characteristics which are used when recording include species, number of individuals, behaviour (eg. direction of flight, search flight, food, raft, associated with cetaceans or fishing boats), age and time of observation. In addition to observing seabirds, other species such as waders, passerines or marine mammals are also recorded. If a bird cannot be identified down to a species then its family or genus must be recorded.

2.2 Study Area Área de estudo

In 2019, there were 5 observation points used on the mainland of Portugal for RAM censuses, Praia da Vagueira (Vagos), Cabo Carvoeiro (Peniche), Cabo Raso (Cascais), Cabo de São Vicente (Sagres) and Ilha do Farol (Faro). These are shown in figure 1.

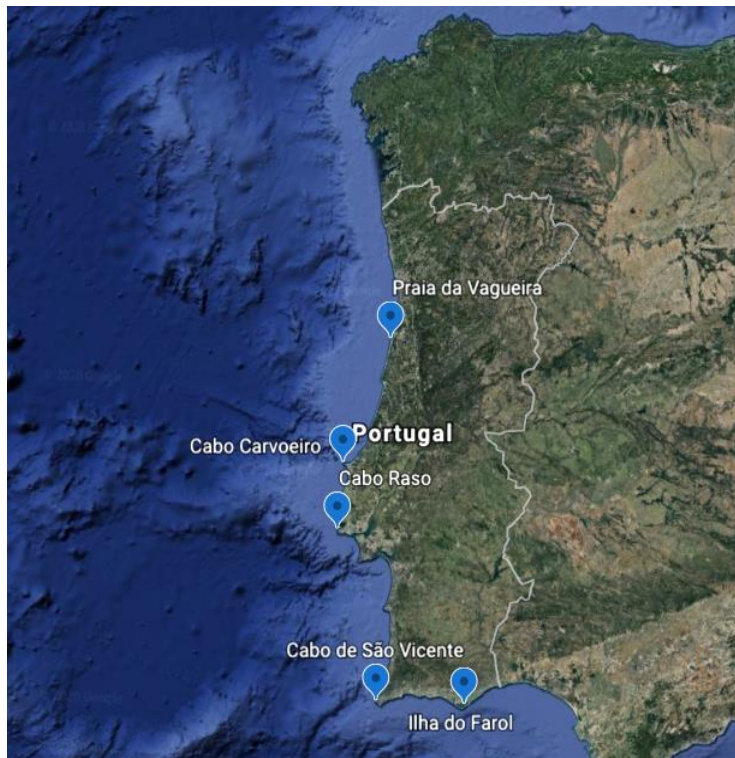


Figure 1_ Location of observation points in 2019

Figura 1_Localização dos pontos de observação dos censos RAM em 2019

2.3 Data Analysis *Análise ds dados*

The data presented in this report was collected at the 5 observation points between January and December 2019, it was then compiled into a database. For each observation point these values were calculated:

- Observation Effort (total hours of observation / year).
- Specific Richness (number of species observed).
- Average Annual Passage Rate for Target Species (number of birds / hour).
- Average Monthly Passage Rate for Target Species (number of birds / hour).

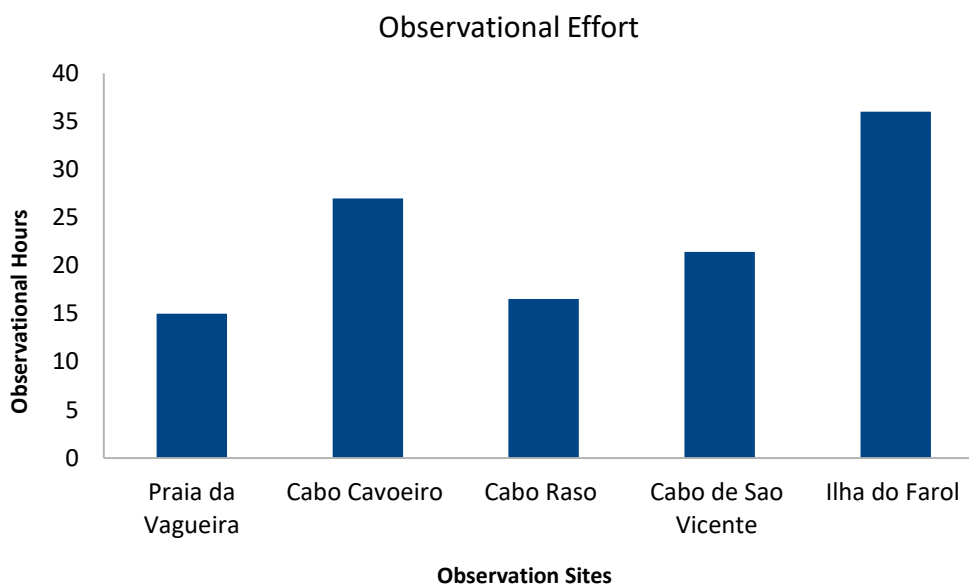
The passage rate was calculated by the number of individuals for each species divided by the observational effort (in hours).

The behavioural analysis of flight direction was calculated by dividing the number of birds / hour of behaviour x (eg. North or south. East or West for Ilha do Farol) by the total number of birds / hour of the species in question. This calculation was only made for the two observation points which had the highest passage rates. Ilha do Farol geographical location on the south coast of Portugal sets it apart from the rest of the observation points when analysing the flight direction, so the flight direction was east to west, as opposed to north to south.

3. RESULTS

3.1 Observational Effort Esforço de observação

The data in this report was collected through approximately 115 hours of observation across the 5 different observation points. The observational effort according to each location is listed in the graph below (Graph 1)



Graph 1_Observational effort (hours) at each observation site

Gráfico 1_Esforço de observação, em horas, para cada ponto de observação

As with previous years, the observation point with the highest observation effort was Ilha do Farol at 36 hours and the second highest observational effort occurred at Cabo Cavoeiro with 27 hours. The time spent observing at Ilha do Farol is the maximum effort available with it being observed for 3 hours for every month of the 12 month period. The location with the lowest observation effort was Praia da Vagueira at approximately 16 hours.

3.2 Species Richness Riqueza específica

A compilation of all the species observed at each observation point throughout 2019 can be found in the following tables. Table 2 presents the marine bird species and Table 3 the non-marine bird species.

Table 2_Marine bird species recorded at each observation point in 2019

Tabela 2_Espécies de aves marinhas registadas em cada ponto de observação, em 2019

Species		Observation Point				
Scientific Name	Common Name	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
<i>Alca Torda</i>	Razorbill	X	X	X	X	X
<i>Ardenna gravis</i>	Great Shearwater		X		X	
<i>Ardenna grisea</i>	Sooty Shearwater	X	X	X		
<i>Calonectris borealis</i>	Cory's Shearwater	X	X	X	X	X

<i>Catharacta skua</i>	Great Skua	X	X	X	X	X
<i>Chlidonias niger</i>	Black tern	X				
<i>Fratercula artica</i>	Atlantic Puffin				X	
<i>Gaviar immer</i>	Common Diver	X				
<i>Gulosus aristotelis</i>	European Shag		X	X	X	
<i>Hydrobates pelagius</i>	European Storm Petrel					X
<i>Hydrobates sp.</i>	Storm Petrel Sp.					X
<i>Hydroprogne caspia</i>	Caspian Tern					X
<i>Larus audouinii</i>	Audouin's Gull	X				X
<i>Larus fuscus</i>	Lesser Black-Backed Gull	X	X		X	X
<i>Larus genei</i>	Slender-Billed Gull					X
<i>Larus marinus</i>	Greater Black-Backed Gull	X				
<i>Larus melanocephalus</i>	Mediterranean Gull	X	X	X	X	X
<i>Larus michahellis</i>	Yellow-Legged Gull	X	X		X	X
<i>Larus minutus</i>	Little Gull	X				
<i>Larus ridibundus</i>	Black-Headed Gull	X	X	X	X	X
<i>Larus sp.</i>	Gull Species	X	X		X	X
<i>Melanitta nigra</i>	Common Scoter	X	X	X		X
<i>Morus bassanus</i>	Northern Gannet	X	X	X	X	X
<i>Phalacrocorax carbo</i>	Great Cormorant	X	X	X	X	X
<i>Puffinus maureanicus</i>	Balearic Shearwater	X	X	X	X	X
<i>Puffinus puffinus</i>	Manx Shearwater		X	X	X	X
<i>Puffinus sp.</i>	Shearwater Species		X	X	X	X
<i>Rissa tridactyla</i>	Black-Legged Kittiwake	X	X			
<i>Stercoraris parasiticus</i>	Parasitic Jaegar	X	X			X
<i>Stercoraris pomarinus</i>	Pomarine Jaegar	X				
<i>Sterna albifrons</i>	Little Tern	X				X
<i>Sterna hirundo</i>	Common Tern	X				X
<i>Sterna sp.</i>	Tern Species					X
<i>Sula sp.</i>	Booby Species					X
<i>Thalasseus sandvicensis</i>	Sandwich Tern	X	X	X	X	X
TOTAL		24	20	14	17	25

Table 3_Non-Marine bird species recorded at each observation point in 2019

Tabela 3_Outras espécies de aves registadas em cada ponto de observação, em 2019

Species		Observation Point				
Scientific Name	Common Name	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
<i>Actitis hypoleucos</i>	Common Sandpiper					X
<i>Anas acuta</i>	Pintail					X
<i>Anas sp.</i>	Duck Species	X				
<i>Anser Anser</i>	Greylag Goose	X				
<i>Anthus pratensis</i>	Meadow Pipit					X
<i>Apus apus</i>	Common Swift	X				X
<i>Apus pallidus</i>	Pallid Swift	X				
<i>Apus sp</i>	Swift Species	X				
<i>Arenaria interpres</i>	Ruddy Turnstone	X	X	X		X
<i>Asio flameus</i>	Short-Eared Owl	X				
<i>Calidris alba</i>	Sanderling	X				
<i>Calidris alpina</i>	Dunlin					X
<i>Cecropis daurica</i>	Red-Rumped Swallow	X				
<i>Charadrius alexandrinus</i>	Kentish Plover	X				
<i>Chloris chloris</i>	Greenfinch	X				
<i>Columba livia</i>	Rock Dove	X				
<i>Delichon urbicum</i>	House Martin					X
<i>Falco peregrinus</i>	Peregrine Falcon		X			
<i>Hirundo rustica</i>	Barn Swallow	X				X
<i>Mergus serrator</i>	Red-Breasted Merganser	X				
<i>Motacilla alba</i>	White Wagtail	X				
<i>Motacilla flava</i>	Yellow Wagtail	X				X
<i>Numenius arquata</i>	Eurasian Curlew					X
<i>Numenius phaeopus</i>	Whimbrel	X	X	X		
<i>Pandion haliaetus</i>	Osprey					X
<i>Passer domesticus</i>	House Sparrow	X				X
<i>Phalaropus sp.</i>	Phalarope Species		X			
<i>Philomachus pugnax</i>	Ruff				X	
<i>Phoenicurus ochrorus</i>	Black Redstart	X				X

<i>Riparia riparia</i>	Sand Martin	X				
<i>Serinus serinus</i>	European Serin	X				X
<i>Sterna unicolor</i>	Spotless Starling		X			
<i>Tringa totanus</i>	Common Redshank					X
Total		21	5	2	1	15

Ilha do Farol and Praia da Vagueira had the highest number of recorded marine bird species with 25 and 24 species respectively. These two observation sites also had the highest values for non-marine bird species with 21 for Praia da Vagueira and 15 for Ilha do Farol. Cabo Raso had the lowest number of overall species recorded.

There were 9 species recorded at all observation points in 2019, they are as follows: Razorbill (*Alca torda*), Great Skua (*Catharacta skua*), Cory's Shearwater (*Calonectris borealis*), Mediterranean Gull (*Larus melanocephalus*), Black-Headed Gull (*Larus ridibundus*), Northern Gannet (*Morus bassanus*), Great Cormorant (*Phalacrocorax carbo*), Balearic Shearwater (*Puffinus mauretanicus*) and Sandwich Tern (*Thalasseus sandvicensis*).

3.3 Passage Rate Taxa de passagem

In Table 4 below, the average passage rate for 2019 is shown in each month at each observation point.

Table 4_2019 monthly and average annual passage rate (seabirds/hour) for each observation point. Average monthly passage rate for all observation points and average yearly passage rate for each observation point.

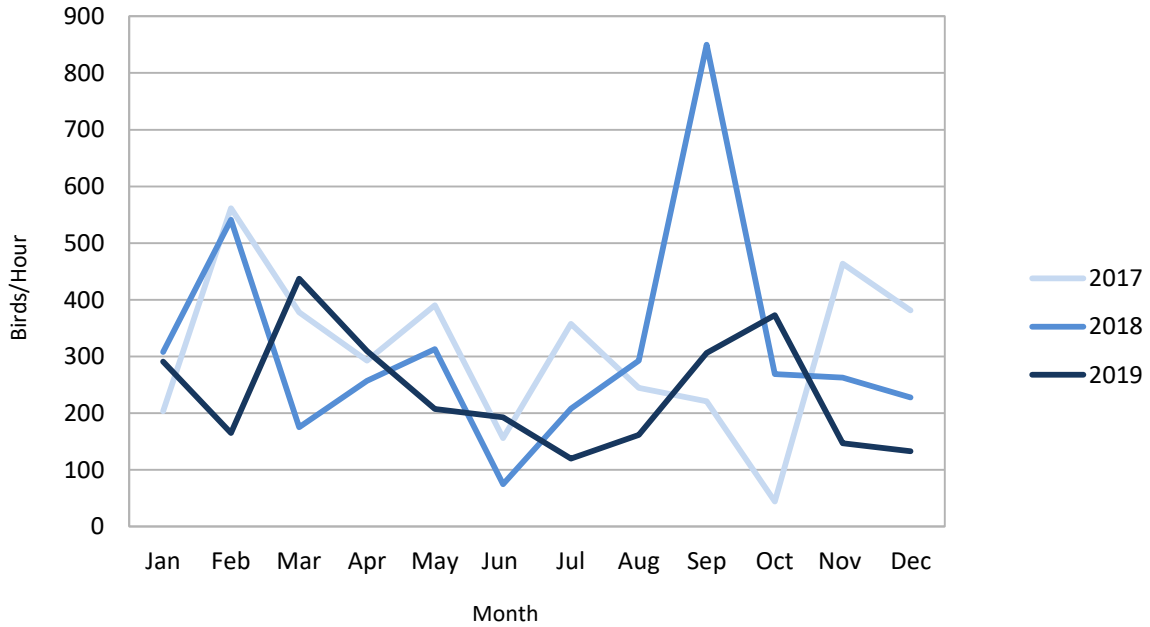
Tabela 4_Taxa de passagem mensal (aves/hora) para cada ponto de observação no ano de 2019; Taxa média mensal para todos os pontos de contagem e Taxa média anual por ponto de observação.

	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol	Average Monthly Passage Rate
January	560.33	264.67			48	291
February	126			188.14	181	165.05
March		528.33	606	462.17	151.33	436.96
April		253.67	328.02	211.54	444.33	309.39
May		262		150.55	210	207.51
June	312.86	199.5			66	192.78
July		195.5	134.33	98.06	51.33	119.80
August		208	209.67	153.26	75.67	161.65
September	538				74.33	306.17
October	192.5	578.33	924	75.48	93.33	372.73
November	137.4	194.67	90.54		165.67	147.07
December	125.5	273.67		82.08	49	132.56
Average Yearly Passage Rate	284.65	295.83	382.09	177.66	134.17	

March was the month with the highest average passage rate with 436.96 birds/hour, there were high counts at Cabo Carvoeiro, Cabo Raso and Cabo de São Vicente during this month. July was the month with the

lowest average monthly passage rate with 119.80 birds/hour. Cabo Raso was the observation point with the highest passage rate at 382.09 birds/hour, however there were only 6 months where recordings were made, and several of the months where no recordings were made are times during low migration. Ilha do Farol was the observation point with lowest passage rate of 134.17 birds/hour.

When comparing the average passage rate of 2019 with the 2 most recent reports (graph 2), we can see that in 2019 continues the trends shown over the past reports. Namely, increase in passage rate during the early months of the year (February and March), and during the later months of the year (September, October, November). Secondly, a clear decrease is shown across all 3 reports during June and July.



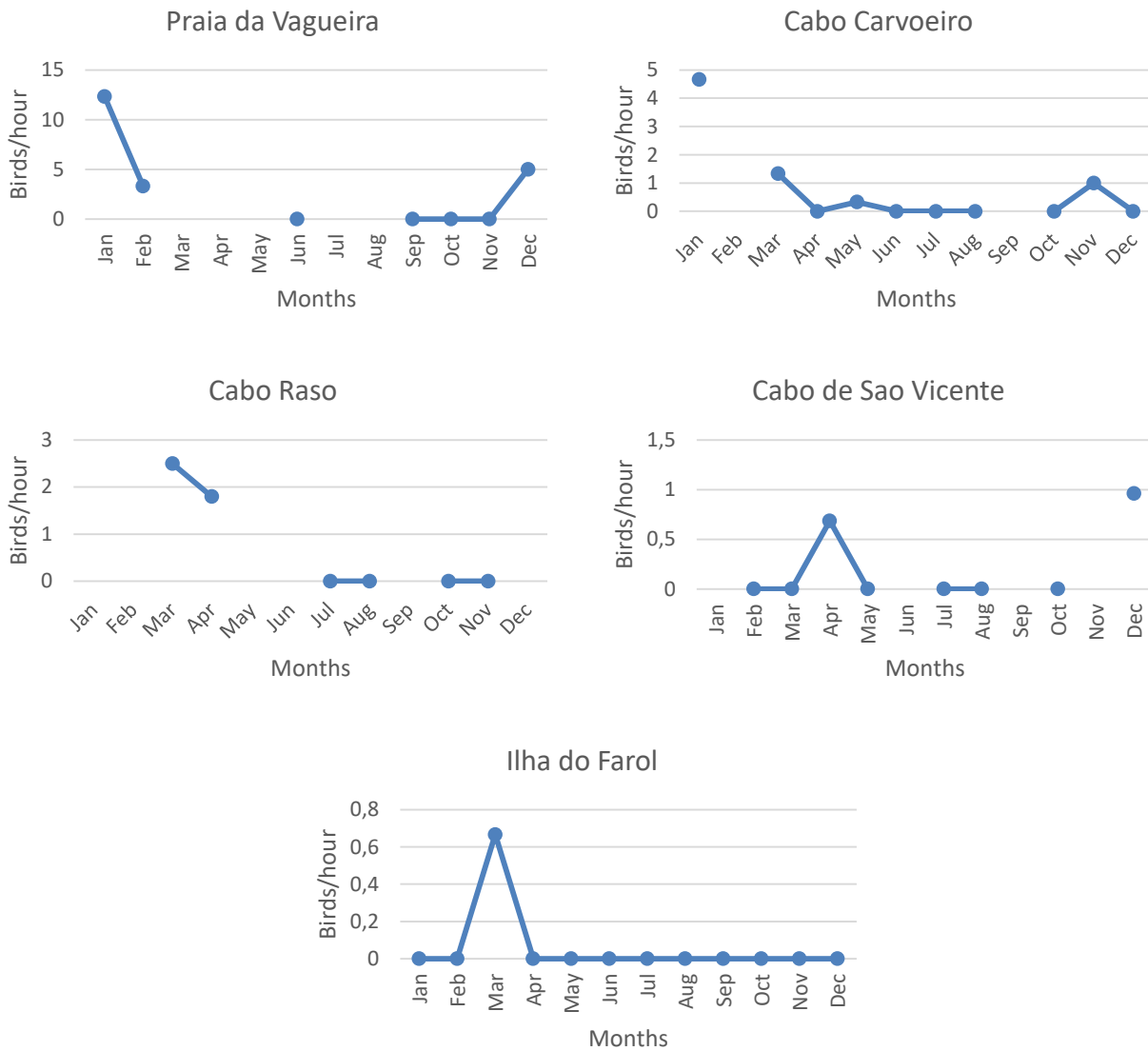
Graph 2_Comparison of average monthly passage rate (birds/hour) between the years 2017, 2018 and 2019.

Gráfico 2_Comparação da taxa de passagem mensal média (aves/hora) entre os anos 2017, 2018 e 2019.

3.3.1 Razorbill torda-mergulheira

The highest annual average passage rate was recorded in Praia da Vagueira with 6.89 birds/hour, this species only being recorded in January (12.33 birds/hour), February (3.33 birds/hour) and December (5.00 birds/hour). The second highest annual passage rate was found in Cabo Raso at 2.15 birds/hour where records were only found in the months of March (2.50 birds/hour) and April (1.80 birds/hour). The final three sites in order of decreasing annual passage rate are as follows; Cabo Carvoeiro with 1.83 birds/hour, Cabo de São Vicente with 0.82 birds/hour and Ilha do Farol with 0.67 birds/hour.

As with the records taken in 2018, it should be noted that between the months of June and October no observations of this species were made and the month with the highest average passage rate was January with 8.50 birds/hour.



Graph 3_Monthly Razorbill passage rate in 2019 for each observation point

Gráfico 3_Taxa de passagem mensal de torda-mergulheira em 2019, para cada ponto de observação

Table 5_Average annual Razorbill passage rate at each observation point for the last three years

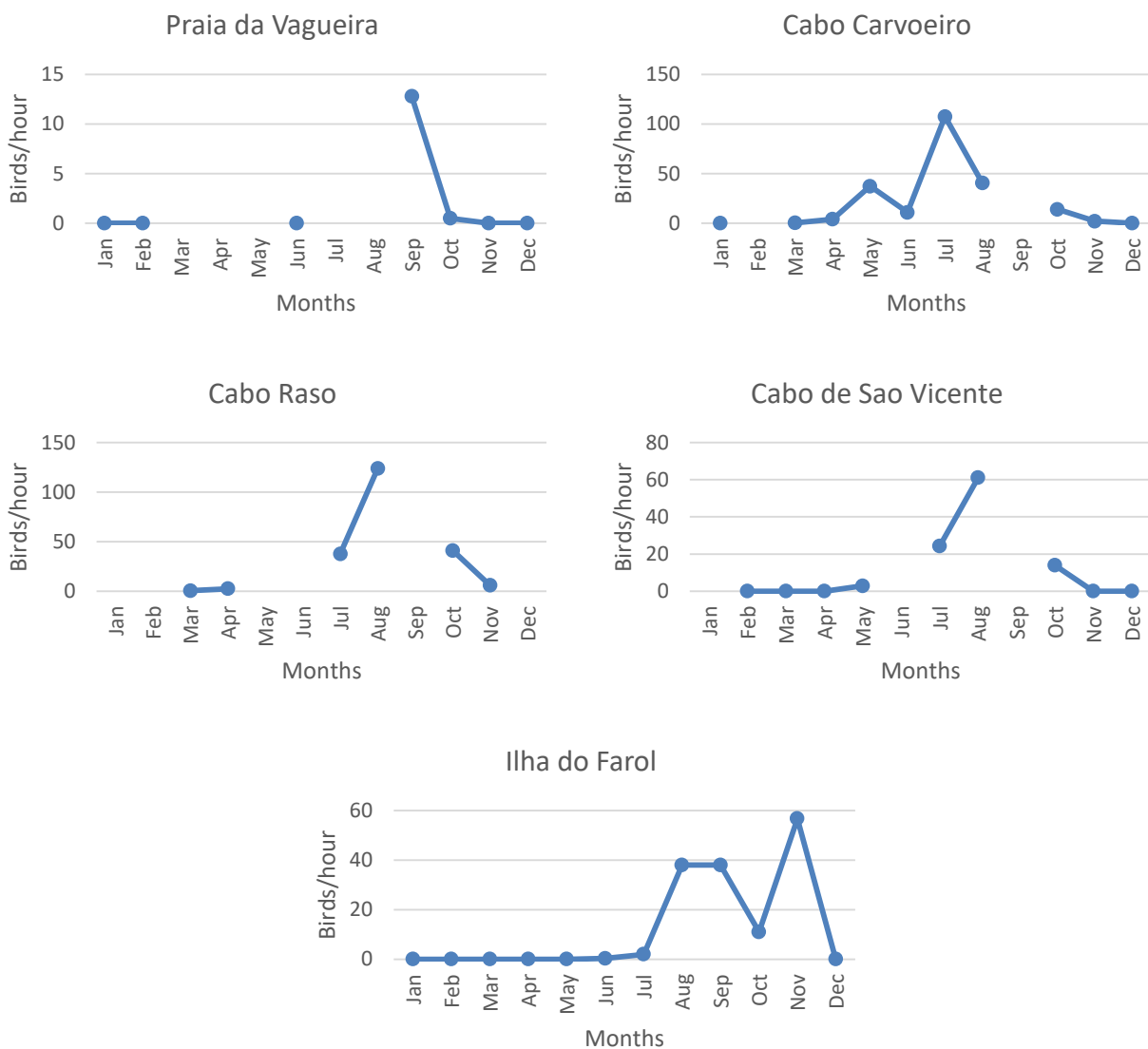
Tabela 5_Taxa de passagem média anual de torda-mergulheira em cada ponto de observação nos últimos três anos

Year	Praia da Vagueira	Cabo Cavoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	6.89	1.83	2.15	0.82	0.67
2018	2.75	2.83	3.54	0.87	0.19
2017	12.50	4.80	21.20	3.80	1.40

When we compare the average annual passage rates from the 2019 results to those from the previous two reports, we can see that the passage rate for this species showed a decrease in all sites especially Cabo Carvoeiro, Cabo Raso and Cabo de São Vicente. The 2018 results had decreases across all of the observation sites, however the 2019 results showed increases on the 2018 results in the observation sites of Praia da Vagueira and Ilha do Farol.

3.3.2 Cory's Shearwater *cagarra*

The highest annual passage rate was recorded in Cabo Raso at 35.19 birds/hour, with the highest passage rate being recorded in August (123.67 birds/hour) and the lowest being recorded in March (0.5 birds/hour). The next three records in decreasing order of passage rate were: Cabo Carvoeiro with 27.08 birds/hour, Cabo de São Vicente with 25.55 birds/hour and Ilha do Farol with 24.33 birds/hour. Cabo Carvoeiro, Cabo de São Vicente and Ilha do Farol have the highest passage rates in July (107.50 birds/hour), August (61.03 birds/hour) and November (56.67 birds/hour), respectively. Praia da Vagueira has the lowest annual passage rate at 6.65 birds/hour, with this species only recorded in the months of September and October. In January and February there were no recordings of this species at any of the observation points. The month with the highest average passage rate was August at 65.80 birds/hour.



Graph 4_Monthly Cory's Shearwater passage rate in 2019 for each observation point

Gráfico 4_Taxa de passagem mensal de cagarra em 2019, para cada ponto de observação

Table 6_Average annual Cory's Shearwater passage rate at each observation point for the last three years

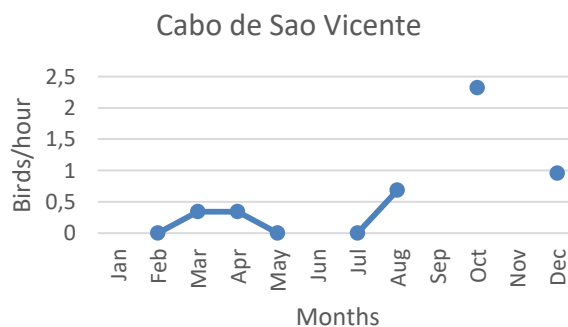
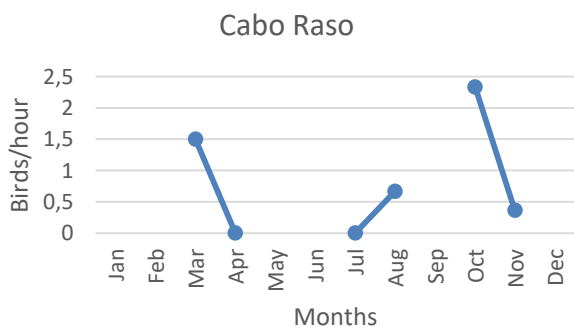
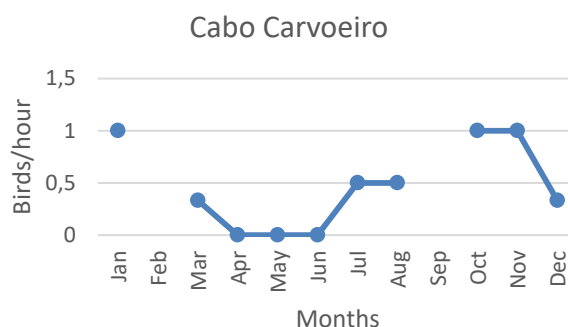
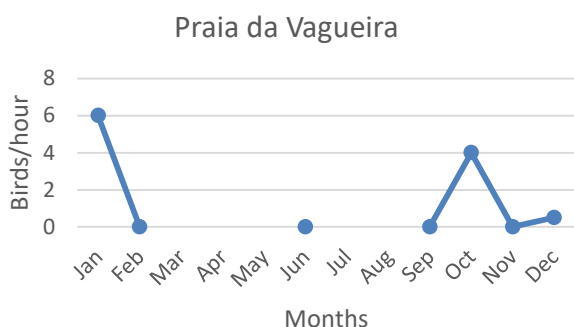
Tabela 6_Taxa de passagem média anual de cagarra em cada ponto de observação nos últimos três anos

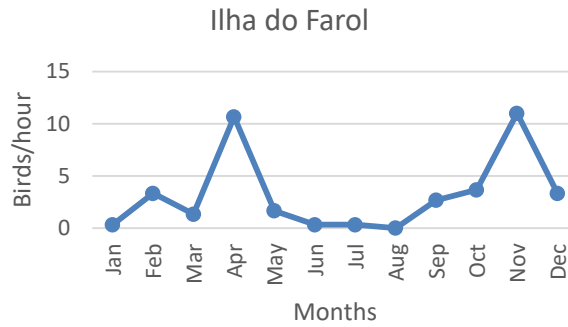
Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	6.65	27.08	35.19	25.55	24.33
2018	1.32	6.80	25.27	13.79	38.86
2017	14.60	39.20	35.10	2.20	10.75

In 2018, the data showed an alarming decrease in annual passage rate of Cory's Shearwater in the north of Portugal (namely in Praia da Vagueira and Cabo Carvoeiro) compared to previous year. However, when comparing the annual passage rate from 2019 to that from 2018, it can be seen that there was a significant increase at all observation points except for Ilha do Farol.

3.3.3 Great Skua *alcaide*

The highest average annual passage rate was recorded at Ilha do Farol with 3.52 birds/hour, and April was the month with the highest passage rate (10.67 birds/hour). The second highest average annual passage rate was found at Praia da Vagueira with a rate of 3.50 birds/hour, with the highest passage rate recorded in January (6.00 birds/hour). In Cabo Raso average annual passage rate was 1.26 birds/hour with October having the highest passage rate of 2.34 birds/hour. The observation points with the lowest average annual passage rate were Cabo de São Vicente and Cabo Carvoeiro, with values of 0.93 and 0.67 birds/hour respectively.





Graph 5_Monthly Great Skua passage rate in 2019 for each observation site

Gráfico 5_Taxa de passagem mensal de alcaide durante 2019 para cada ponto de observação

Table 7_Average annual Great Skua passage rate at each observation point for the last three years

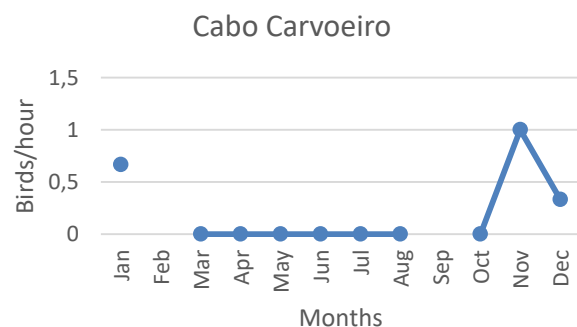
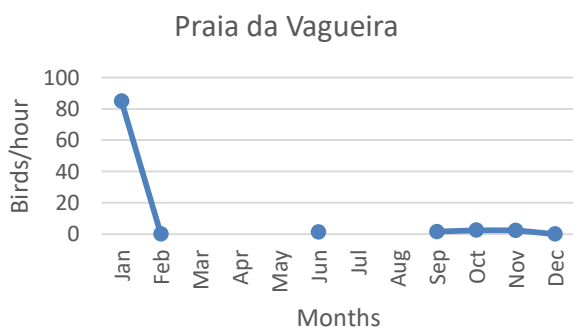
Tabela 7_Taxa de passagem média anual de alcaide em cada ponto de observação nos últimos três anos

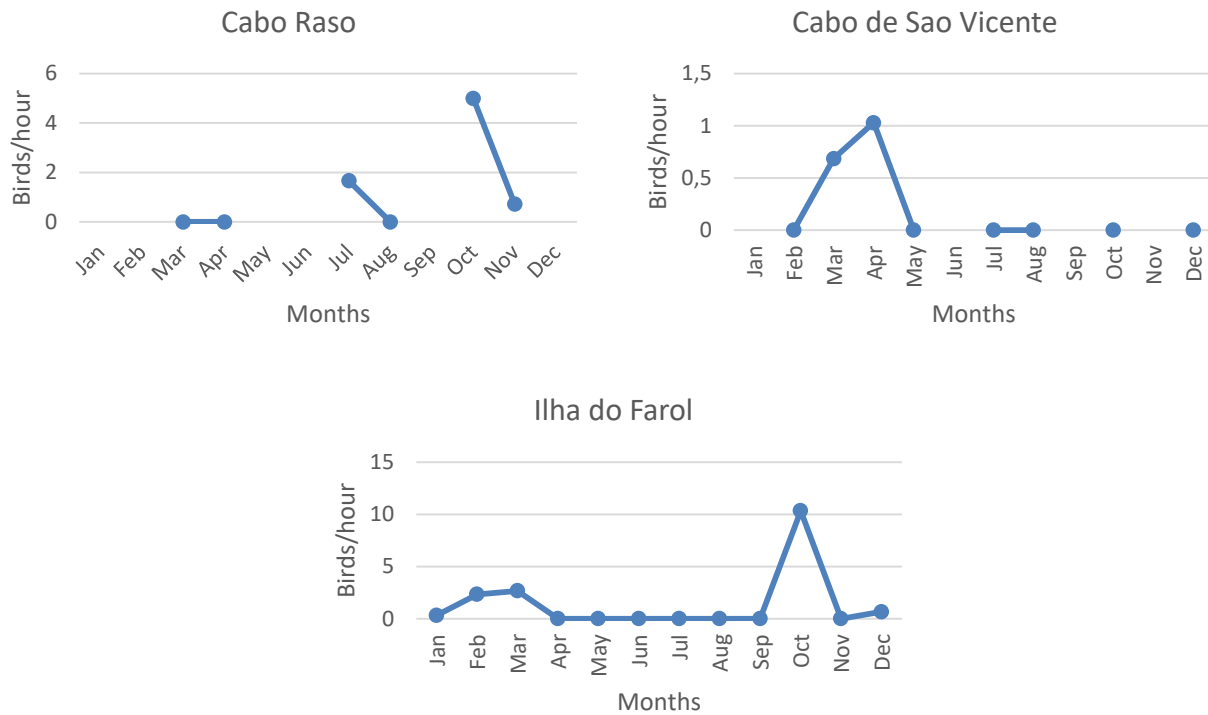
Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	3.50	0.67	1.26	0.93	3.52
2018	0.50	0.18	1.05	0.57	4.90
2017	1.80	1.00	0.40	0	3.80

When comparing and contrasting the average annual passage rates between the 2019 data and the 2018 data, it can be seen that there was an increase in average annual passage rate across all observation points except Ilha do Farol. When looking at the data since 2017, we can see that there has been no significant variation in values during this time.

3.3.4 Mediterranean Gull *gaivota-de-cabeça-preta*

The highest average annual passage rate was recorded in Praia da Vagueira with 18.56 birds/hour. However, it should be noted that this is heavily skewed by the passage rate recorded in January which was 85 birds/hour. The month with the second highest passage rate at this observation point is October at 2.50 birds/hour. Ilha do Farol has the second highest average annual passage rate at 3.27 birds/hour, where the months of October (10.33) and January (0.33) provided respectively the highest and lowest average passage rates. The third highest average annual passage rate was found at Cabo Raso with a value of 2.46 birds/hour, with the highest passage rate found in the month of October (5.00 birds/hour). The observation sites with the lowest average annual passage rates are Cabo de São Vicente and Cabo Carvoeiro with averages of 0.86 and 0.67 birds/hour, respectively.





Graph 6_Monthly Mediterranean Gull passage rate in 2019 for each observation site

Gráfico 6_Taxa de passagem mensal da gaivota-de-cabeça-preta em 2019 para cada ponto de observação

Table 8_Average annual Mediterranean Gull passage rate at each observation point for the last three years

Tabela 8_Taxa de passagem média anual de gaivota-de-cabeça-preta em cada ponto de observação nos últimos três anos

Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	18.56	0.67	2.46	0.86	3.27
2018	1.72	0.15	8.69	1.48	1.48
2017	0.20	0.17	3.20	1.10	1.10

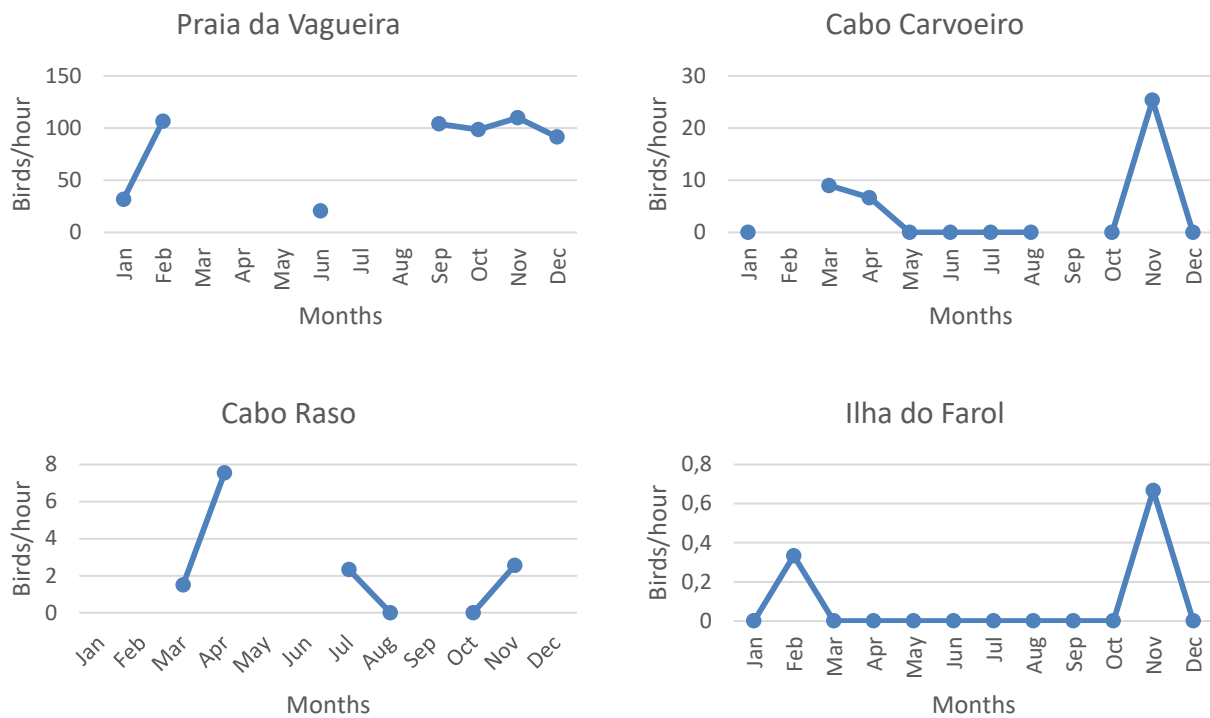
When comparing 2019 to 2018 results, it can be seen that there are increases in average annual passage rate in three of the five observation sites, these sites are Praia da Vagueira, Cabo Carvoeiro and Ilha do Farol. It should be noted that there is a significant increase in the Praia da Vagueira passage rate on previous years, with an increase from 0.20 in 2017 to a 2019 value of 18.56 birds/hour. There were decreases seen in Cabo Raso and Cabo de São Vicente compared to 2018 average annual passage rates.

3.3.5 Common Scoter *negrola*

Common Scoter was only recorded in 4 of the 5 sites, with no recordings being made in Cabo de São Vicente. The average annual passage rate was highest in Praia da Vagueira at 80.39 birds/hour. The month with the highest passage rate is November at 109.80 birds/hour, closely followed by February with 106.67 birds/hour. Conversely, the month with the lowest passage rate was June with a value of 20.57 birds/hour. Cabo Carvoeiro has the second highest average annual passage rate, with a value of 13.67 birds/hour, and the month with the highest passage rate is November (25.33 birds/hour).

Cabo Raso has an average annual passage rate of 3.48 birds/hour and Ilha do Farol an average annual

passage rate of 0.5 birds/hour. It is worth noting that at Ilha do Farol this species was only recorded during two months – February (0.33 birds/hour) and November (0.67 birds/hour). The highest monthly average across all of observation points is seen in October, with an average passage rate of 98.50 birds/hour.



Graph 7_Monthly Common Scoter passage rate in 2019 for each observation site

Gráfico 7_Taxa de passagem mensal de negrola em 2019 para cada ponto de observação

Table 9_Average annual Common Scoter passage rate at each observation point for the last three years

Tabela 9_Taxa de passagem média anual de negrola em cada ponto de observação nos últimos três anos

Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	80.39	13.67	3.48	0	0.50
2018	148.04	2.82	1.56	0.19	0.61
2017	72.20	6.00	16.80	1.40	1.38

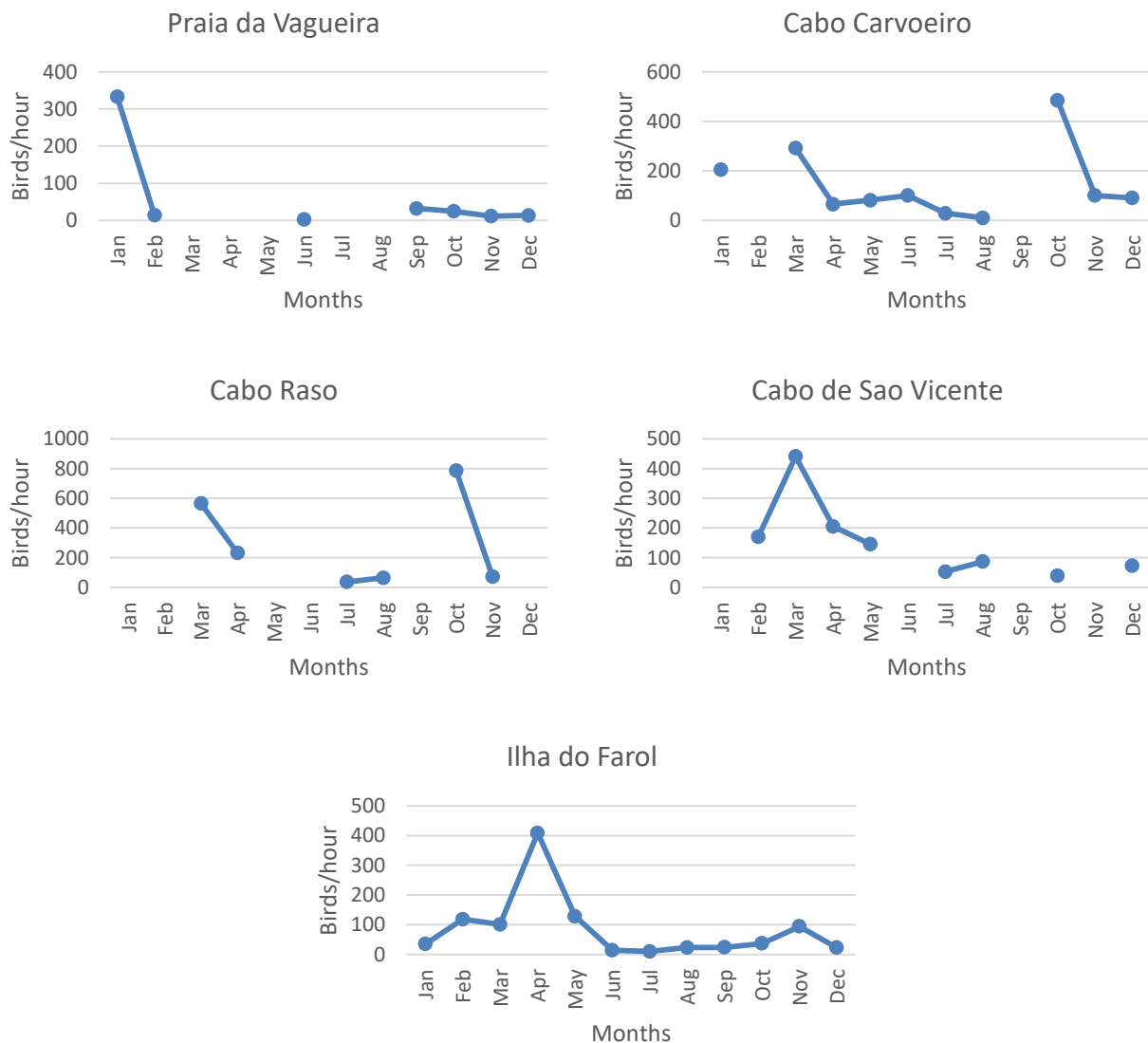
When comparing annual passage rate results between 2018 and 2019, we can see that there has been a significant increase in Cabo Carvoeiro where the 2019 result (13.67 birds/hour) is more than four times that of 2018 (2.82 birds/hour). In contrast to this, there is a significant decrease by almost half in Praia da Vagueira, decreasing from 148.04 birds/hour in 2018 to 80.39 birds/hour in 2019. Cabo Raso showed an increase on 2018 data but still a significant decrease when comparing to 2017 results. Iha do Farol showed no significant change along the years.

3.3.6 Northern Gannet *alcatraz*

The observation site with the highest average annual passage rate of Northern Gannets was Cabo Raso with a value of 293.06 birds/hour. The month with the highest passage rate was October (786.00 birds/hour) and the lowest was July (37.67 birds/hour). The site with the second highest average annual passage rate was Cabo de São Vicente at 151.74 birds/hour, closely followed by Cabo Carvoeiro at 146.23 birds/hour. The

months with the highest passage rates for Cabo de São Vicente and Cabo Carvoeiro were March (440.91 birds/hour) and October (484.67 birds/hour) respectively. The months with the lowest passage rates for these two observation sites were October (39.48 birds/hour) and July (29.00 birds/hour). Ilha do Farol and Praia da Vagueira had the two lowest average annual passage rates with values of 84.61 birds/hour and 61.73 birds/hour respectively.

The month with the highest average passage rate when looking at all the observation points in 2019 was March (349.60 birds/hour), with Cabo Raso, Cabo Carvoeiro and Cabo de São Vicente all having either their highest or second highest passage rate in this month. The lowest average monthly passage rate was found in September (28.03 birds/hour) but it should be noted that this species was only observed in September at two of the five observation points (Ilha do Farol and Praia da Vagueira).



Graph 8_Monthly Northern Gannet passage rate in 2019 for each observation point

Gráfico 8_Taxa de passagem mensal de alcatraz em 2019 para cada ponto de observação

Table 10_ Average annual Northern Gannet passage rate at each observation point for the last three years

Tabela 10_ Taxa de passagem média anual de alcatraz em cada ponto de observação nos últimos três anos

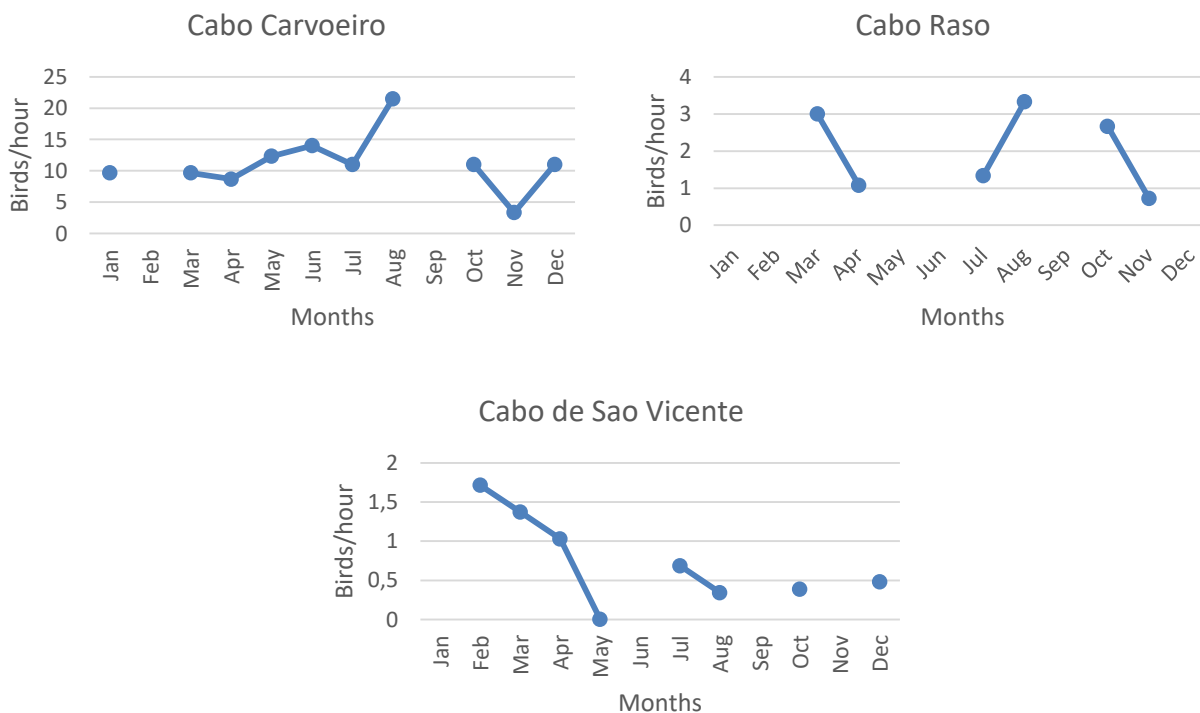
Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	61.73	146.23	293.06	151.74	84.61
2018	66.90	109.60	187.10	177.50	78.60
2017	117.60	182.00	218.30	298.50	125.70

Comparisons between 2019 and 2018 data show that there has been little significant change in passage rate of Northern Gannets. The order of highest to lowest average annual passage rate for each observation point has remained the same. The only significant change being the increase in passage rate for Cabo Raso, where it has increased from 187.10 birds/hour in 2018 to 293.06 birds/hour in 2019. When looking further back in the results, we can see that since 2018 there are declines in average annual passage rate for all sites, except for Cabo Raso.

3.3.7 European Shag galheta

In 2019, this species was only observed in 3 of the 5 observation points, with no observations being made in Ilha do Farol or Praia da Vagueira. The highest average annual passage rate was found in Cabo Carvoeiro with a value of 11.22 birds/hour. At this observation point, the month with the highest passage rate was August (21.50 birds/hour), and the month with the lowest was November (3.33 birds/hour). Cabo Raso had the second highest average annual passage rate at 2.02 birds/hour. Finally, Cabo de São Vicente has the lowest passage rate at 0.75 birds/hour.

The month with the highest average passage rate for all observation points was June with a value of 14.00 birds/hour. However, it's important to note that in June, this species was only recorded at Cabo Carvoeiro. The month with the lowest passage rate was September where no observations were made.



Graph 9_ Monthly European Shag passage rate in 2019 for each observation site

Gráfico 9_ Taxa de passagem mensal de galheta em 2019 para cada ponto de observação

Table 11_Average annual European Shag passage rate at each observation point for the last three years

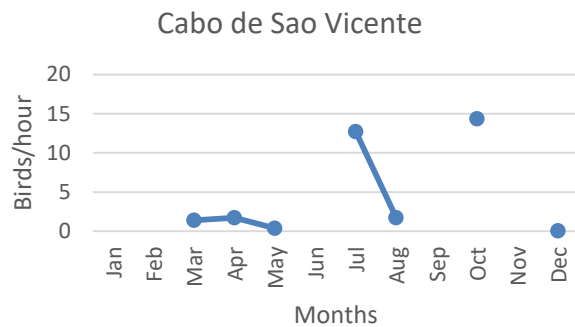
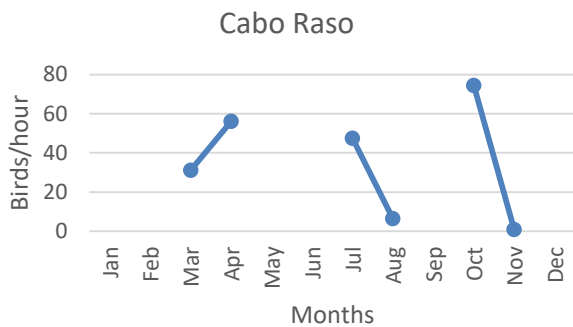
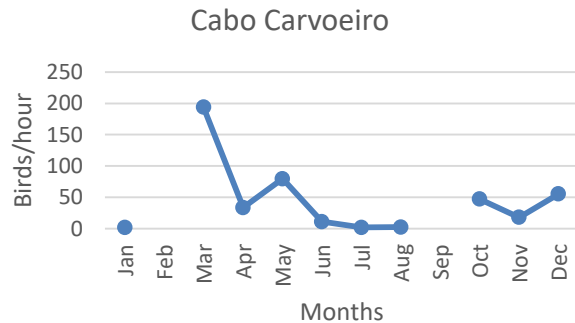
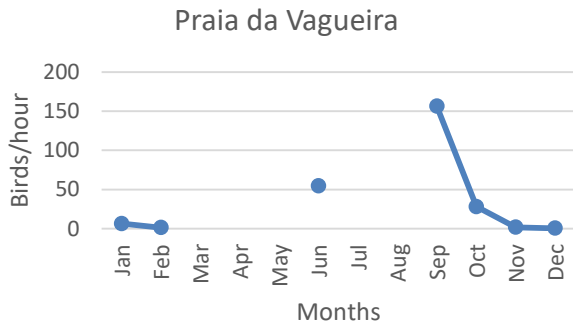
Tabela 11_Taxa de passagem média anual de galheta em cada ponto de observação nos últimos três anos

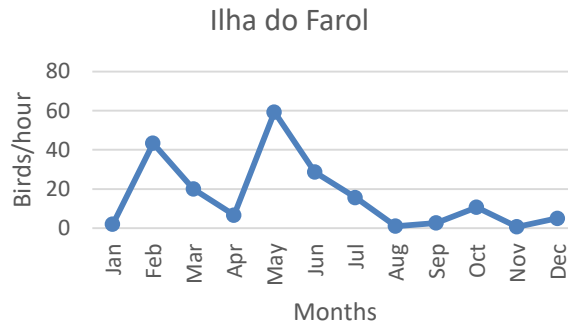
Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	0	11.22	2.02	0.75	0
2018	0	16.10	2.90	0.60	0.03
2017	0	16.50	1.30	0.70	0

Comparing the average annual passage rate to previous years, we can see that there has been no significant change in the trend presented. There were no recordings from Praia da Vagueira and Ilha do Farol which is in line with the data from previous years. The data for the three remaining observation points shows no significant increase or decrease in average annual passage rate.

3.3.8 Balearic Shearwater *pardela-baleiar*

The highest average annual passage rates were recorded in Cabo Carvoeiro, Cabo Raso and Praia da Vagueira with values of 44.48, 35.96 and 35.54 birds per hour, respectively. At Cabo Carvoeiro, March had the highest passage rate at 193.66 birds/hour. The months with the highest passage rates for Cabo Raso and Praia da Vagueira both occurred in the Autumn: October (74.33 birds/hour) and September (156.40 birds/hour) respectively for Cabo Raso and Praia da Vagueira. Ilha do Farol had the second lowest average annual passage rate with a value of 16.31 birds/hour, with the observations being at their highest during the months of February (43.33 birds/hour) and May (59.33 birds/hour). The observation point with the lowest average annual passage rate was Cabo de São Vicente (5.36 birds/hour).





Graph 10_Monthly Balearic Shearwater passage rate in 2019 at each observation site

Gráfico 10_Taxa de passagem mensal de pardela-baleiar durante 2019 para cada ponto de observação

Table 12_Average annual Balearic Shearwater passage rate at each observation point for the last three years

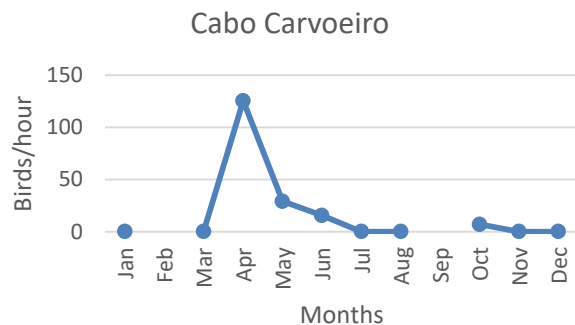
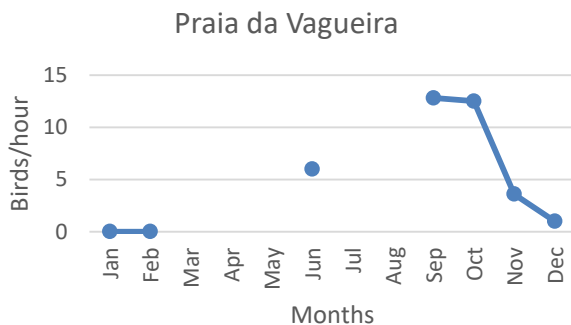
Tabela 12_Taxa de passagem média anual de pardela-baleiar em cada ponto de observação nos últimos três anos

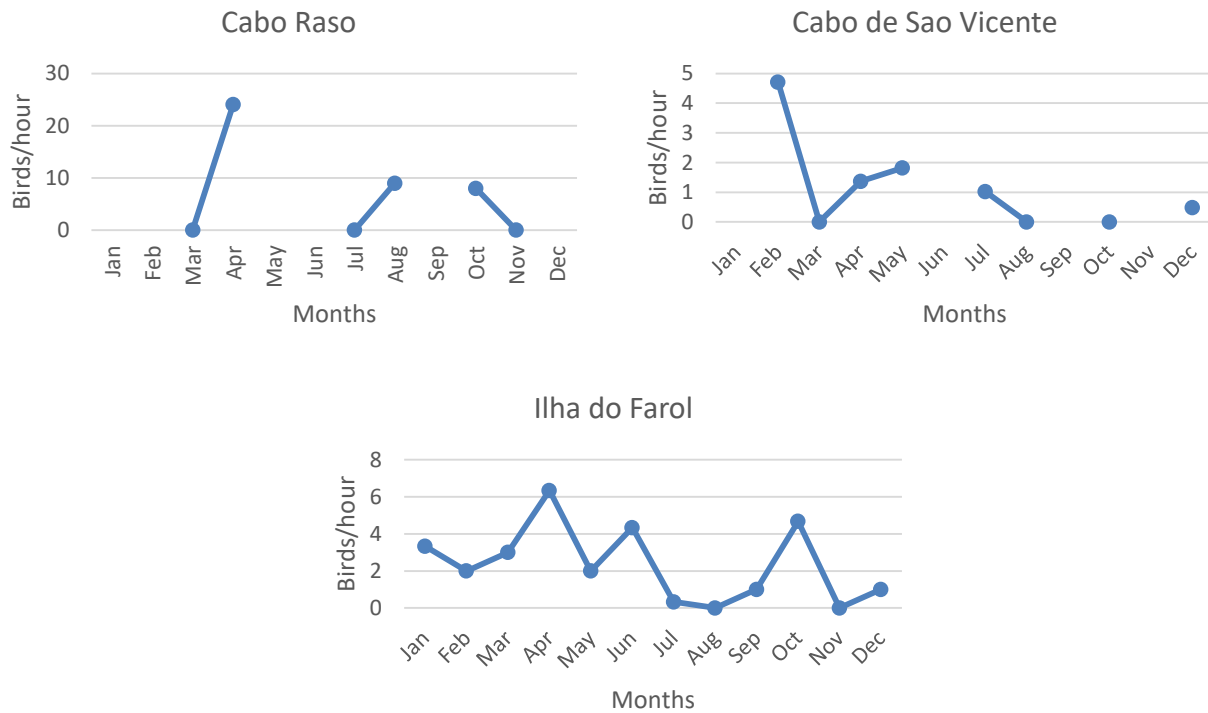
Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	35.54	44.48	35.96	5.36	16.31
2018	115.30	14.50	17.70	2.50	17.00
2017	110.00	11.00	12.60	1.10	5.90

The comparisons of 2019 average annual passage rate to previous years, shows an increase at three observation points. Cabo Carvoeiro and Cabo Raso showed a continuous increase from 2017 to 2019, as also Cabo de São Vicente but in a smaller rate. Praia da Vagueira and Ilha do Farol both showed a decrease in average annual passage rate, with the former showing a significant decrease. Ilha do Farol showed a small decrease from 2018 to 2019, however the 2019 value is an increase compared to 2017 result.

3.3.9 Sandwich Tern garajau-de-bico-preto

The observation point with the highest average annual passage rate was Cabo Carvoeiro with a value of 44.21 birds/hour. Cabo Raso and Praia da Vagueira had average annual passages rates of 13.69 and 7.18 birds/hour respectively. Ilha do Farol and Cabo de São Vicente had the two lowest passage rates at 2.80 and 1.88 birds/hour, respectively. April was the month with the highest passage rate for three observation points; Cabo Carvoeiro (125.33 birds/hour), Cabo Raso (24.07 birds/hour) and Ilha do Farol (6.33 birds/hour).





Graph 11_Monthly Sandwich Tern passage rate in 2019 at each observation site

Gráfico 11_Taxa de passagem mensal de garajau-de-bico-preto durante 2019 para cada ponto de observação

Table 13_Annual Sandwich Tern passage rate at each observation point for the last three years

Tabela 13_Taxa de passagem média anual de garajau-de-bico-preto em cada ponto de observação nos últimos três anos

Year	Praia da Vagueira	Cabo Carvoeiro	Cabo Raso	Cabo de São Vicente	Ilha do Farol
2019	7.18	44.21	13.69	1.88	2.80
2018	7.43	7.30	13.57	0.00	7.33
2017	9.40	11.30	2.00	0.50	1.75

When comparing 2019 average annual passage rates with previous years it can be clearly seen that there has been a large increase at Cabo Carvoeiro, where the 2019 value of 44.21 birds/hour is significantly higher than the 2018 and 2017 values. Cabo Raso and Cabo de São Vicente in 2019 show slight increases comparing to previous years. Ilha do Farol is the only observation point to show a significant decrease when comparing to 2018 value but an increase when comparing to 2017 data. Finally, Praia da Vagueira shows a continuation of the slow decrease in average annual passage rate.

3.4 Behavioural Analysis *Análise de comportamentos*

Behaviour analysis was carried out on the data for the 9 target species, from all of the observation points in 2019. However, the data from Ilha do Farol is presented separately from the other 4 observation points because of its geographical location. It is the only observation point which does not lie on the west coast of Portugal, instead it lies on the south.

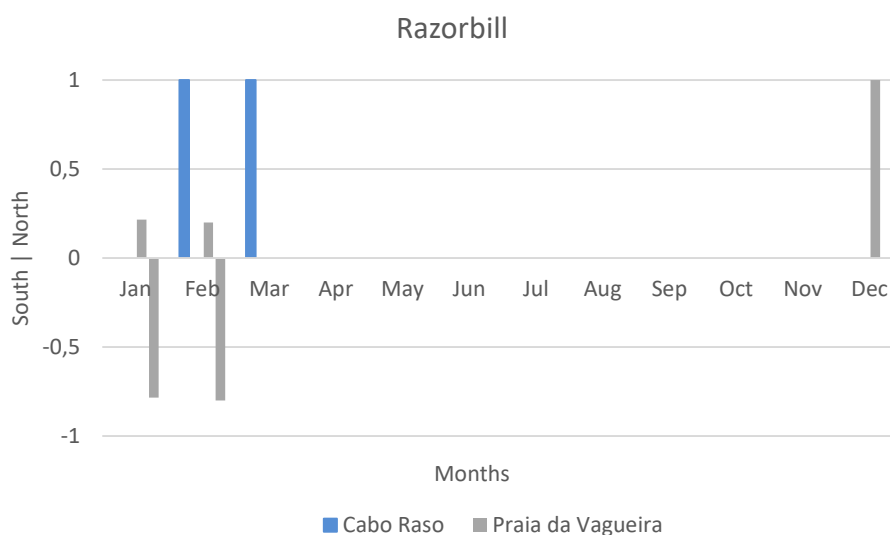
Table 14 Behavioural proportions for each of the target species observed across all observation points. Ilha do Farol results are presented separately from the other 4 observation points (General). Types of behaviour: N - North, S - South, E - East, O - West, P - Perched, M - Local Movement, A - Feeding, C - Cleptoparasitism, AB - Associated with boats, J - Raft, AC - Associated with Cetaceans

Tabela 14 Proporção de aves nos diferentes comportamentos observados nos cinco pontos de observação, para cada espécie-alvo. Os resultados referentes à Ilha do Farol são apresentados separadamente dos outros cabos (designados como “Geral”). Tipos de comportamentos: N-norte, S-sul, E-este, O-oeste, P-Pousada, M-Movimento local, A-Alimentação, C-Cleptoparasitismo, AB-Associado a Barcos, J-Jangada, AC-Associado a Cetáceos.

	Species	N	S	E	O	P	M	A	C	AB	J	AC
General		0.52	0.47	0	0	0	0	0	0	0	0	0
Ilha do Farol	Razorbill	0	0	0	0	0	0	0	0	0	0	0
General		0.63	0.26	0	0.001	0.04	0.02	0.001	0	0.004	0.03	0
Ilha do Farol	Cory's Shearwater	0	0	0.07	0.63	0.18	0.10	0	0	0	0	0
General		0.32	0.64	0	0.02	0	0	0	0.02	0	0	0
Ilha do Farol	Great Skua	0.007	0	0.02	0.94	0.02	0.007	0	0	0	0	0
General		0.81	0.18	0	0	0	0.005	0	0	0	0	0
Ilha do Farol	Mediterranean Gull	0.32	0	0	0.24	0.05	0.14	0.24	0	0	0	0
General		0.58	0.41	0	0	0.006	0	0	0	0	0	0
Ilha do Farol	Common Scoter	0	0	0	1	0	0	0	0	0	0	0
General		0.57	0.42	0	0	0.003	0.002	0.003	0	0.001	0	0
Ilha do Farol	Northern Gannet	0.001	0	0.02	0.95	0.002	0.007	0.01	0	0	0	0.01
General		0.08	0.34	0.12	0.07	0.07	0.31	0.01	0	0	0	0
Ilha do Farol	European Shag	0	0	0	0	0	0	0	0	0	0	0
General		0.71	0.27	0	0	0.01	0.002	0	0	0.001	0	0
Ilha do Farol	Balearic Shearwater	0	0	0.007	0.99	0	0.004	0	0	0	0	0

General		0.82	0.14	0	0	0	0.004	0.03	0	0	0	0
	Sandwich											
Ilha do Farol	Tern	0.04	0	0.04	0.55	0	0.28	0.07	0	0	0	0

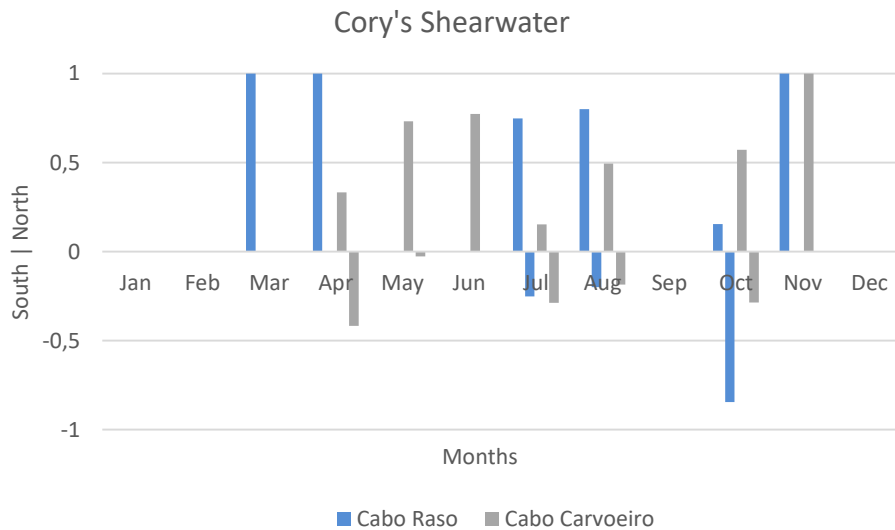
The following graphs only show the north and south (east and west for Ilha do Farol) direction of flight for the two observation points where the highest average annual passage was recorded in 2019, for the target species. Individuals flying north was given a positive value and those flying south was given a negative value, in order to allow for better data interpretation.



Graph 12_Razorbill proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north and negative values birds flying to south.

Gráfico 12_Proporção de voo direcional de torda-mergulheira nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte e valores negativos indivíduos a voar para sul.

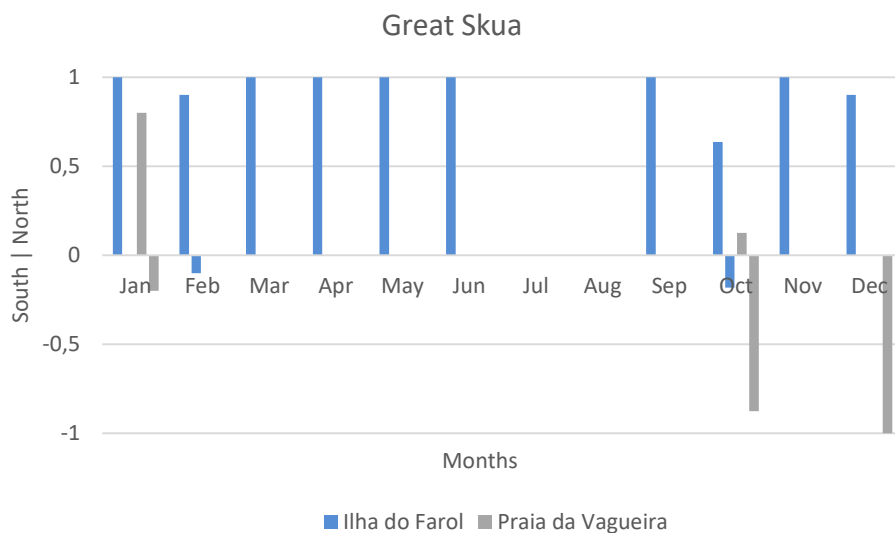
In Cabo Raso, observations were only made in February and March, with the direction of flight only being to the North. However, in Praia da Vagueira, birds were recorded in January, February and December and in contrast to Cabo Raso the majority of birds were flying south. In December all individuals recorded were flying north.



Graph 13_Cory's Shearwater proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north and negative values birds flying to south.

Gráfico 13_Proporção de voo direcional de cagarra nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte e valores negativos indivíduos a voar para sul.

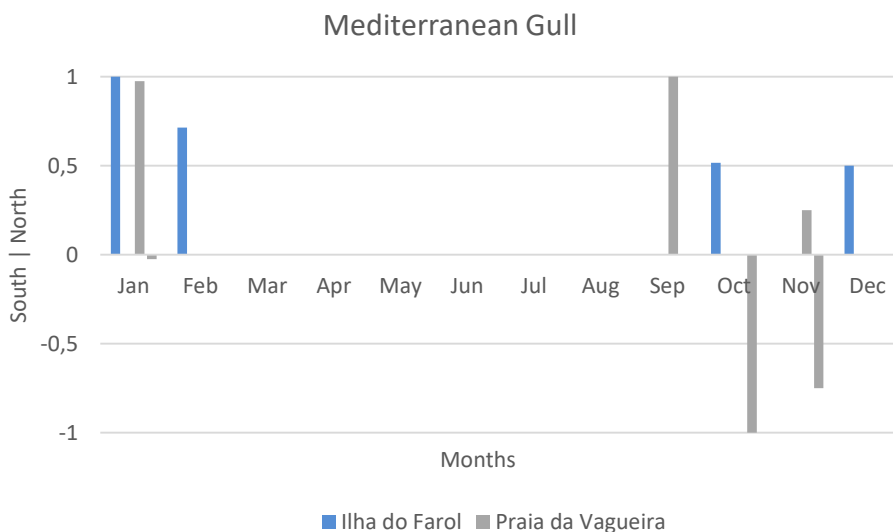
At Cabo Raso, the majority of birds observed were flying north in every month except for October. Similarly, at Cabo Carvoeiro the higher proportion of birds were flying in a northerly direction, the months which were exceptions to this rule were April and July.



Graph 14_Great Skua proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north (west on Ilha do Farol) and negative values birds flying to south (east on Ilha do Farol).

Gráfico 14_Proporção de voo direcional de Alcaide nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte (oeste na Ilha do Farol) e valores negativos indivíduos a voar para sul (este na Ilha do Farol).

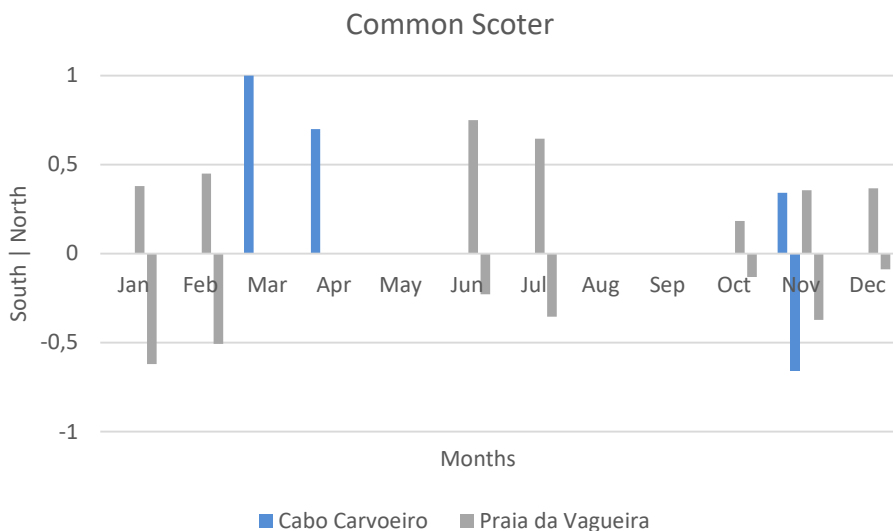
In every month where Great Skuas were observed on Ilha do Farol, the majority were seen to be flying west and only in two months were any observed to be flying east (October and February). Praia da Vagueira shows a different trend, with the majority flying north in January but then in the months of October and December, the highest proportion of individuals are shown to be flying south.



Graph 15_Mediterranean Gull proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north (west on Ilha do Farol) and negative values birds flying to south (east on Ilha do Farol).

Gráfico 15_Proporção de voo direcional de Gaivota-de-cabeça-preta nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte (oeste na Ilha do Farol) e valores negativos indivíduos a voar para sul (este na Ilha do Farol)

In the four months where Mediterranean Gulls were observed on Ilha do Farol, they were only seen to be flying west. However, in Praia da Vagueira, the higher proportion of birds was flying north in January and September but in November and December it was the opposite, the majority were flying south.

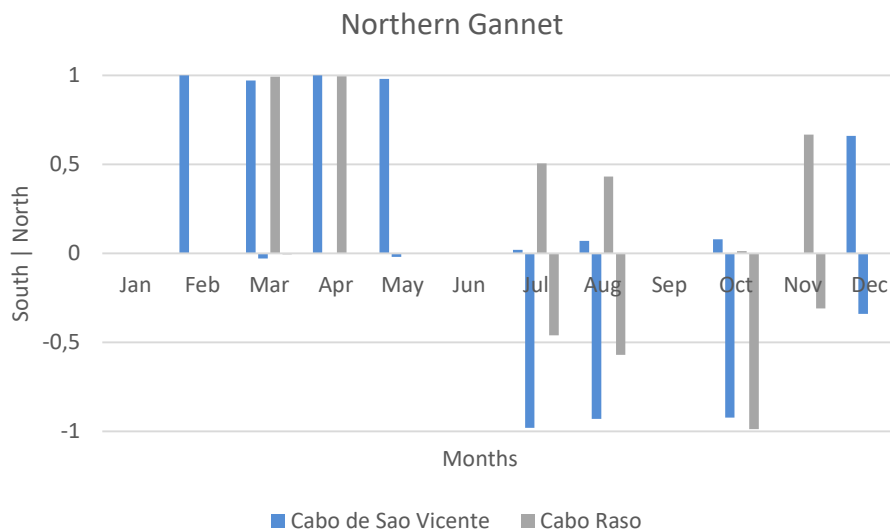


Graph 16_Common Scoter proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north and negative values birds flying to south.

Gráfico 16_Proporção de voo direcional de Negrola nos dois pontos de observação com maior taxa de

passagem média anual. Valores positivos referem-se a indivíduos a voar para norte e valores negativos indivíduos a voar para sul

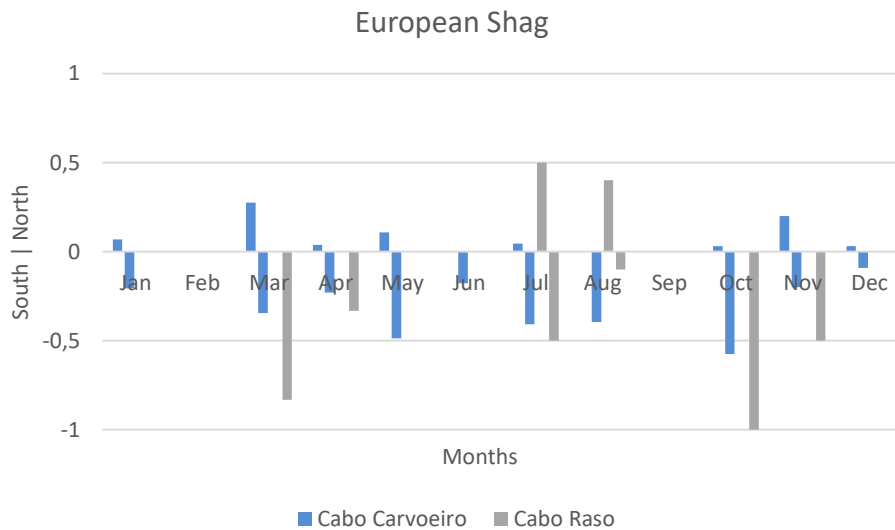
In Cabo Carvoeiro there were only three months where Common Scoter was recorded; March, April and November. In the two months early in the year (March and April), birds were predominantly seen flying north, but in contrast in November, the higher proportion of birds were flying in a southerly direction. Common Scoter was recorded in 7 months of the year at Praia da Vagueira and in every month birds were observed flying both north and south. In January and February, the higher proportion of birds observed were flying south. Later in the year during the months of June, July, October and December, the opposite occurred and the majority were moving north. The month of November was very close to being equal in terms of directional movement, but a slightly higher proportion of birds were observed flying south.



Graph 17_Northern Gannet proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north and negative values birds flying to south.

Gráfico 17_Proporção de voo direcional de Alcatraz nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte e valores negativos indivíduos a voar para sul

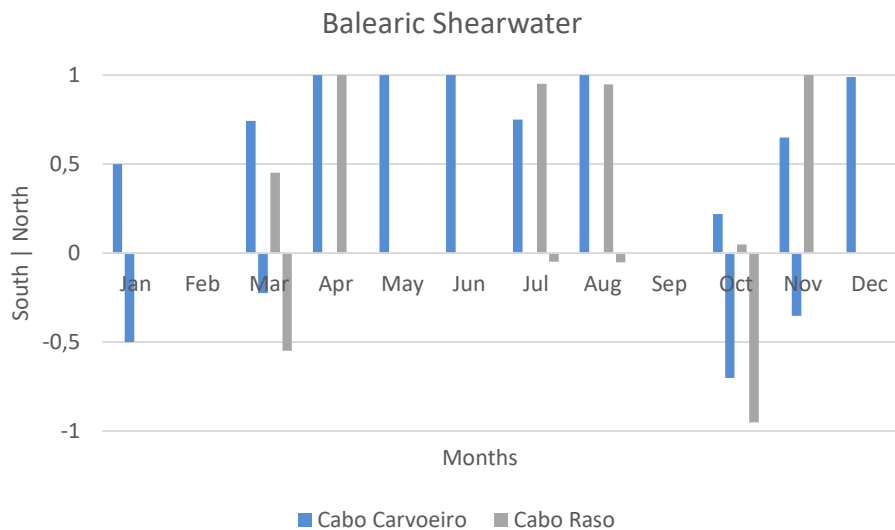
At both Cabo de São Vicente and Cabo Raso, the majority of Northern Gannets were observed flying to the north early in the year (February to May). In July, the majority for Cabo de Sao Vicente were seen to be flying south, but for Cabo Raso in this month the majority were flying north. In the months of August and October the majority of birds were flying to the south at both observation points. Finally, in the last months of the year (November and December), the majority of birds are observed moving to the north for both sites.



Graph 18_European Shag proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north and negative values birds flying to south.

Gráfico 18_Proporção de voo direcional de Galheta nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte e valores negativos indivíduos a voar para sul

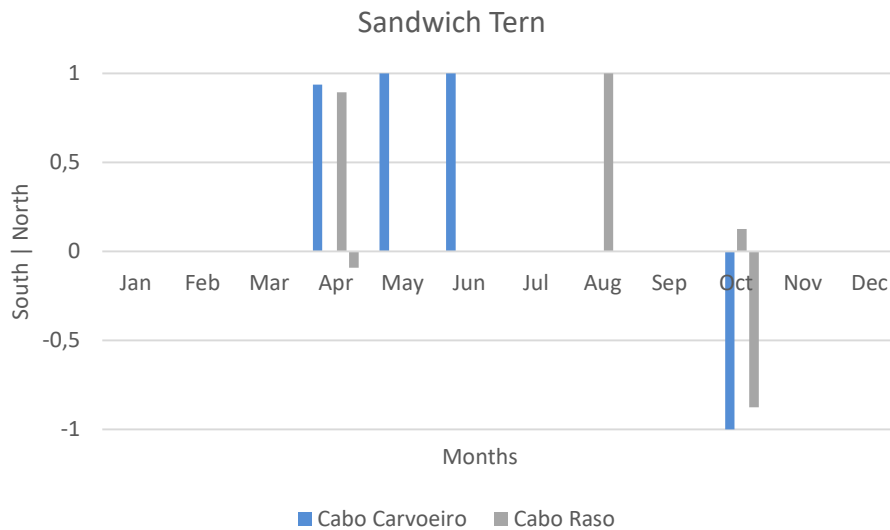
For the entirety of 2019, and at both sites, most of the European Shags were observed flying in an equal proportion to south and north, except for the months of March and October in Cabo Raso and August and October in Cabo Carvoeiro.



Graph 19_Balearic Shearwater proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north and negative values birds flying to south.

Gráfico 19_Proporção de voo direcional de Pardela-baleiar nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte e valores negativos indivíduos a voar para sul

Balearic Shearwater was observed in Cabo Carvoeiro for 10 months of the year but there was only one month (October) where the higher proportion of birds recorded were flying south. Cabo Raso reflects a similar story, with the higher proportion of birds flying to the south occurring in October and March.



Graph 20_ Sandwich Tern proportional split of flight direction at the two observation points with the highest average annual passage rate. Positive values indicates birds flying north and negative values birds flying to south.

Gráfico 20_ Proporção de voo direcional de Garajau-de-bico-preto nos dois pontos de observação com maior taxa de passagem média anual. Valores positivos referem-se a indivíduos a voar para norte e valores negativos indivíduos a voar para sul

At both Cabo Carvoeiro and Cabo Raso, Sandwich Tern was recorded for 5 months of year. During the months between April and August, the majority of birds were observed to be flying north at both observation points. Then in October, the higher proportion of birds are seen to be flying in a southerly direction.

4. DISCUSSION

Since the beginning on the RAM Census the sampling effort has lacked consistency, in 2015 it was 97 hours (Fagundes & Felipe 2018) but in 2011 it was 158 hours. The observational effort increased in previous years with 2017 (Guedes & Fagundes, 2019) showing an increase to 138 hours and 2018 (Barradas & Fagundes 2019) showing an increase again to 145 hours. 2019 does not follow this trend and sees a dip in observational effort, decreasing to 116 hours across the 5 observation points. Comparing sampling effort between observation points, Ilha do Farol was the site with the highest observational effort with a total 36 hours over the course of 2019. This is consistent with previous years where it has been the point with the highest observational effort since 2014 (Fagundes & Felipe 2018; Guedes & Fagundes 2019; Barradas & Fagundes 2019). The point with the lowest observational time was Praia da Vagueira with only 15 hours.

The species diversity of seabirds recorded has increased in recent years, with an increase from 26 species in 2017 (Guedes & Fagundes 2019) to 32 species in 2018 (Barradas & Fagundes 2019). 2019 has continued this yearly increase, with 35 seabird species being recorded across the 5 observation points. The observation points with the highest species diversity were Praia da Vagueira (24 species) and Ilha do Farol (22 species). This is similar to both previous years (Guedes & Fagundes 2019; Barradas & Fagundes 2019). Cabo Raso had the lowest species diversity, with only 14 species of seabird recorded, this is different to previous years where Cabo de São Vicente had the lowest species diversity in 2017 and 2018.

Nine species of seabird were observed at every observation point in 2019, this is an increase on previous years and is the highest value since 2009-2011 where 12 species were detected across all observation points but it should be noted that the observation sites were different, therefore a direct comparison is not possible.

As seen in the previous reports (Guedes & Fagundes 2019; Barradas & Fagundes 2019) the passage rate has peaked in the spring (March) and autumn (October), while the lowest passage rate occurred in July. In the reports since 2014, the lowest passage rate has varied between May, August and October, however it can be generally explained that low passage rate can be heavily influenced by weather conditions or sampling effort, particularly the latter. With sampling effort lacking consistency from year to year, the significant difference not being the total number of observational hours but the months in which observations are made, this means having a large number of observational hours in months which are not the most active in terms of migration.

In 2019, the Razorbill was present at all observation sites, as it has been since 2009 (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes & Fagundes 2019; Barradas & Fagundes 2019). The information on Razorbill migration states that they generally fly south post breeding season and stay for the winter, then fly north during pre-breeding season back to their breeding grounds. This information fits with their presence at observation points, with no recordings being made between June and October, and only one site (Cabo Carvoeiro) having any sightings in May. The highest passage rates were recorded in December (Cabo de São Vicente), January (Praia da Vagueira and Cabo Carvoeiro) and March (Cabo Raso and Ilha do Farol). This is consistent with previous years where the peak passage rates have occurred either late in the year or in early spring.

Cory's Shearwater was present at all observation points in 2019, and its passage rate was highest at Cabo Carvoeiro and Ilha do Farol. Cory's Shearwater was spotted most often between May and August, however it was not spotted anywhere in the months from December to March. This is in line with the ecology of the species within Portugal, where they tend to arrive in March and remain until the chicks fledge which can occur in October or early November. This is why the number of sightings are higher later in the year as they will include adults and recently fledged juveniles. As in previous years, the direction of flight was predominantly to the North (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes & Fagundes, 2019; Barradas & Fagundes 2019) and this behavior is thought to be a reflection of the foraging habits of individuals in the Berlengas colony.

Great Skuas were observed at all observation points in 2019. The passage rate predominantly had two peaks throughout the year; from January to March and October to November. The passage rate showed a big increase at Praia da Vagueira and Cabo Carvoeiro, but decreased at Ilha do Farol. This contrasts the

2018 data where, there was an increase in the southern observation points (Barradas & Fagundes 2019). Analysing the direction of flight, individuals tended to fly north (west for Ilha do Farol) earlier in the year and south during the later months of the year, this trend fits with the information about the Great Skuas seasonality and with data from previous census years (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes & Fagundes 2019; Barradas & Fagundes 2019).

The presence of Mediterranean Gull at observation points has not been consistent since the beginning of RAM censuses, however it was observed at all locations during 2019. The passage rate was highest in Praia da Vagueira, but this was heavily influenced by a recording in January of 255 individuals. After Praia da Vagueira, the sites with the highest passage rates were Cabo Raso and Ilha do Farol. These two sites have also had the highest passage rate since 2014 (Fagundes & Felipe 2018; Guedes & Fagundes 2019; Barradas & Fagundes 2019), showing a concentrated population in this area. This is down to the species being more concentrated in the south of the country as previously reported by Poot & Flamant (2006). The higher rates of passage generally occur in the autumn and spring months due to passage migration, but in the north of Portugal (Praia da Vagueira and Cabo Carvoeiro) the passage rate is highest during November, December and January. This fits with the current migration patterns and that nowadays the species is considered a wintering species in our country.

The Common Scoter was recorded at every observation site except Cabo de São Vicente, where it was the first time since the start of the RAM census that it was not recorded (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes & Fagundes 2019; Barradas & Fagundes 2019). Over the course of the past years the number of Common Scoter observed in both Ilha do Farol and Cabo de São Vicente has markedly decreased, this could be as a result of those areas being at the edge of their migration range but to fully understand if it is cause for concern more data is required. The passage rate in Praia da Vagueira is significantly higher than other sites, this agrees with assertions that the species is more common in northern Portugal as opposed to the south (Petronilho et al. 2004). Not only is it significantly higher than other observation points but it is also clear that had been increasing each year; in 2016 it was recorded as 35 birds/hour annually but in 2019 this figure had jumped to 80.39 birds/hour. The direction of flight shows birds flying south and north in close-to equal measure throughout the year at Praia da Vagueira, but this is not what is expected as in 2018 (Barradas & Fagundes 2019) the direction of flight was a clear reflection of the migratory movement: flying north in the first half of the year and south in the second. This behaviour may suggest that some of the birds don't migrate further south and can spend all winter season in the North of Portugal, as already reported by Petronilho et al (2004).

Over the course of the RAM census, the Northern Gannet has consistently been the most abundant seabird species (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes & Fagundes 2019; Barradas & Fagundes 2019), and as with previous years it occurred at all observation points in 2019. January, March, April and October consistently had the highest rates of passage which fits with the pre breeding migration in January and February, and then post breeding migration in October and November. It was observed in 2018 that there had been a decrease in passage rate at all observation points when compared to previous years (Barradas & Fagundes 2019) but this trend has not continued in 2019, with Cabo Carvoeiro and Cabo Raso showing significant increases compared to 2018, and Ilha do Farol also showed a slight increase. However, Praia da Vagueira and Cabo de São Vicente have continued to decrease. The flight pattern of the Northern Gannet in 2019 reflects its migratory habits perfectly, with the majority flying north between February and July, then the majority flying south from August to November (Catry et al 2010; Meirinho et al 2014).

As with previous years, the European Shag was only recorded at 3 observation points, with none being sighted at Ilha do Farol or Praia da Vagueira, which is consistent with previous years (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes & Fagundes 2019; Barradas & Fagundes 2019). The lack of recordings at Praia da Vagueira and Ilha do Farol is likely due to their lack of coastal cliff areas and they are outside of the usual resident range. Passage rate remained consistent at Cabo Raso and Cabo de São Vicente but at Cabo Carvoeiro there was a decrease compared to 2018 data and the lowest passage rate since 2014 (Fagundes & Felipe 2018). The species is resident to Portugal, thus it is difficult to determine a clear pattern to its directional flight behaviour.

The Balearic Shearwater was observed at all sites in 2019, with Cabo Carvoeiro showing the highest

concentrations of the species. This is in contrast to previous years where the highest passage rate has always occurred at Praia da Vagueira, but this site saw a dramatic decrease between 2018 and 2019 (Barradas & Fagundes 2019). The months with the highest passage rates vary but there is a clear trend towards the summer and latter months of 2019 which agrees with the post-breeding migration. With regard to behavioural analysis, every month except for October shows a majority of individuals flying north. Which fits with migration trends where in the post-breeding migration individuals return to the Portuguese waters after breeding on the Balearic Islands (Meirinho et al 2014).

Sandwich Terns were recorded at all observation points, unlike in 2018 where no recordings were made at Cabo de São Vicente (Barradas & Fagundes 2019). The highest passage rates were at Cabo Carvoeiro and Cabo Raso, with a significant increase being found at the former. Migration occurs between March and June to breeding sites and in August to October for post breeding. The changes in passage rate could be due to effects related to climate change or intentional capture in its West African wintering grounds (Birdlife International 2020).

Despite efforts to compare and contrast passage rates, behavioural analysis and populations from 2019 to previous years it is not possible to accurately understand variations in these parameters and draw conclusions from these variations. With this in mind it is important to continue RAM censuses, with as much observational effort as time and weather conditions allow. In addition, it is vital that regular reports on the data should continue, to better understand the data which is collated.

Desde o início do RAM que o esforço de amostragem tem sido inconstante, sendo 2015 o ano com menos horas de observação (97 horas; Fagundes & Filipe 2018) e 2011 o ano com mais horas de observação (158 horas). Nos últimos anos o esforço de observação aumentou, no ano 2017 foram efetuadas 138 horas de observação (Guedes & Fagundes, 2019) e em 2018 um total de 145 horas (Barradas & Fagundes 2019). No entanto, 2019 não segue essa tendência e registou-se uma quebra no esforço de amostragem para 116 horas nos 5 pontos de observação. Comparando o esforço de amostragem, o ponto com mais horas de observação foi a Ilha do Farol, com um total de 36 horas. Este esforço tem sido consistente com este local a ter sempre maior esforço de amostragem desde 2014 (Fagundes & Filipe 2018, Guedes & Fagundes 2019; Barradas & Fagundes 2019). O local com menor tempo de observação foi a Praia da Vagueira com apenas 15 horas.

A diversidade de espécies de aves marinhas registada, aumentou nos últimos anos, com um aumento de 26 espécies em 2017 (Guedes e Fagundes 2019) para 32 espécies em 2018 (Barradas e Fagundes 2019). Em 2019 verificou-se novo aumento, com 35 espécies de aves marinhas registradas nos 5 pontos de observação. Os pontos de observação com maior diversidade de espécies foram a Praia da Vagueira (24 espécies) e a Ilha do Farol (22 espécies). Esta situação é semelhante ao verificada nos últimos dois anos (Guedes & Fagundes 2019; Barradas & Fagundes 2019). O Cabo Raso teve a menor diversidade de espécies, com apenas 14 espécies de aves marinhas registadas, o que é diferente dos anos anteriores onde o Cabo de São Vicente teve a menor diversidade de espécies em 2017 e 2018.

Em 2019, nove espécies de aves marinhas foram observadas em todos os pontos de observação, este é um aumento em relação aos anos anteriores e é o valor mais alto desde 2009-2011, onde 12 espécies foram detetadas em todos os pontos de observação, mas de salientar que os locais de observação eram diferentes, portanto, uma comparação direta não é possível.

Conforme observado nos relatórios anteriores (Guedes & Fagundes 2019; Barradas & Fagundes 2019), a taxa de passagem ocorre na primavera (março) e no outono (outubro), enquanto a menor taxa de passagem ocorreu em julho. Desde 2014, a menor taxa de passagem variou entre maio, agosto e outubro, no entanto, pode-se explicar de forma geral que a baixa taxa de passagem pode ser fortemente influenciada pelas condições climáticas ou pelo esforço de amostragem, principalmente o último. Faltando consistência, de ano para ano, no esforço de amostragem, em especial na diferença entre os meses em que as observações são feitas, pode significar ter um grande número de horas de observação em meses que não são os mais ativos em termos de migração.

Em 2019, a torda-mergulheira esteve presente em todos os locais de observação, tal como tem ocorrido desde 2009 (Sengo et al. 2012; Oliveira et al. 2014; Fagundes e Felipe 2018; Guedes e Fagundes 2019;

Barradas e Fagundes 2019). As informações sobre a migração da torda-mergulheira indicam que, de forma geral, voam para o sul após a temporada de reprodução e permanecem na nossa costa durante o inverno, e voam para o norte durante o período pré-reprodutor. Esta informação enquadra-se com a presença registada nos pontos de observação, não havendo quaisquer registos entre junho e outubro, e apenas um local (Cabo Carvoeiro) com avistamentos em Maio. As maiores taxas de passagem foram registadas em dezembro (Cabo de São Vicente), janeiro (Praia da Vagueira e Cabo Carvoeiro) e março (Cabo Raso e Ilha do Farol). Isto é consistente com os anos anteriores, onde as taxas de passagem mais elevadas ocorreram no final do ano ou no início da primavera.

A cagarra esteve presente em todos os pontos de observação em 2019, sendo a sua taxa de passagem mais elevada no Cabo Carvoeiro e na Ilha do Farol. A cagarra foi detetada com mais frequência entre maio e agosto, no entanto, não foi detetada em nenhum ponto de contagem entre os meses de dezembro e março. Isto está de acordo com a ecologia da espécie em Portugal, onde tendem a chegar às colónias em março e permanecem até à saída dos juvenis dos ninhos, o que ocorre em outubro ou início de novembro. É por isso que o número de avistamentos é maior no final do ano, pois incluirá adultos e os juvenis que acabaram de sair do ninho. Como nos anos anteriores, a direção do voo era predominantemente para o Norte (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes & Fagundes, 2019; Barradas & Fagundes 2019) e esse comportamento é considerado um reflexo dos hábitos de alimentação dos indivíduos da colónia das Berlengas.

O alcaide também foi observado em todos os pontos de contagem. Relativamente à taxa de passagem registaram-se dois picos ao longo do ano; um de janeiro a março e outro em outubro e novembro. A taxa de passagem apresentou um aumento acentuado na Praia da Vagueira e Cabo Carvoeiro, mas diminuiu na Ilha do Farol. Isso contrasta com os dados de 2018 onde, houve um aumento nos pontos de observação do sul do País (Barradas & Fagundes 2019). Analisando a direção do voo, os indivíduos predominantemente voaram para o norte (oeste na Ilha do Farol) no início do ano e para o sul durante os últimos meses do ano. Esta tendência ajusta-se com as informações sobre a sazonalidade da espécie e com dados de anos anteriores (Sengo et al. 2012; Oliveira et al. 2014; Fagundes e Felipe 2018; Guedes e Fagundes 2019; Barradas e Fagundes 2019).

A presença da gaivota-de-cabeça-preta nos pontos de observação não tem sido consistente desde o início dos censos RAM, no entanto foi observada em todos os locais durante 2019. A taxa de passagem mais elevada foi registada na Praia da Vagueira, mas foi fortemente influenciada por um registo em Janeiro de 255 indivíduos. Após a Praia da Vagueira, os locais com maiores taxas de passagem foram o Cabo Raso e a Ilha do Farol. Estes dois locais têm tido as maiores taxas de passagem desde 2014 (Fagundes e Felipe 2018; Guedes e Fagundes 2019; Barradas e Fagundes 2019), apresentando uma população concentrada nesta área. Isto deve-se ao facto da espécie estar mais concentrada no Sul do país, conforme relatado anteriormente por Poot & Flamant (2006). As taxas de passagem mais elevadas ocorrem geralmente nos meses de outono e primavera, mas no centro e norte de Portugal (Cabo Carvoeiro e Praia da Vagueira) a taxa de passagem é mais elevada durante novembro, dezembro e janeiro. Isto enquadra-se no facto da espécie atualmente ser considerada uma invernante no nosso País.

A negrola foi registada em todos os locais de observação, exceto no Cabo de São Vicente, situação que é a primeira vez que acontece (Sengo et al. 2012; Oliveira et al. 2014; Fagundes & Felipe 2018; Guedes e Fagundes 2019; Barradas e Fagundes 2019). Ao longo dos últimos anos, o número de negrolas observadas tanto na Ilha do Farol como no Cabo de São Vicente tem diminuído acentuadamente, o que pode ser devido ao facto dessas áreas estarem no limite da sua área de migração. A taxa de passagem na Praia da Vagueira é significativamente mais elevada do que noutros locais, o que está de acordo com as afirmações de que a espécie é mais comum no norte de Portugal (Petronilho et al. 2004). De referir também que o número de aves registado tem aumentado ao longo dos anos: em 2016 foi registado um valor médio anual de 35 aves/hora, mas em 2019 esse número passou para 80,39 aves/hora. Em termos de direção do voo, não foi registada uma direção de voo predominante, com a proporção de aves em voo para norte e para sul a ser muito semelhante. Em 2018 (Barradas & Fagundes 2019) a direção do voo era um reflexo do movimento migratório: voo para o norte na primeira metade do ano e para o sul na segunda metade. No entanto, o comportamento registado em 2019 pode sugerir que algumas das aves não migram mais para o sul e podem passar todo o inverno no Norte de Portugal, conforme já relatado por Petronilho et al (2004).

Ao longo dos censos RAM, o alcatraz tem sido, consistentemente, a espécie de ave marinha mais abundante (Sengo et al. 2012; Oliveira et al. 2014; Fagundes e Felipe 2018; Guedes e Fagundes 2019; Barradas e Fagundes 2019) e, tal como nos anos anteriores, em 2019 ocorreu em todos os pontos de observação. Janeiro, março, abril e outubro foram os meses em que se registaram as taxas de passagem mais elevadas, o que está de acordo com os movimentos migratórios de pré-reprodução (janeiro a março) pós-reprodução (outubro e novembro). Em 2018 observou-se uma diminuição da taxa de passagem em todos os pontos de observação, em relação aos anos anteriores (Barradas e Fagundes 2019) mas esta tendência não continuou em 2019, com o Cabo Carvoeiro e o Cabo Raso a apresentarem aumentos significativos em relação a 2018. Também a Ilha do Farol apresentou um ligeiro aumento. No entanto, o número de indivíduos na Praia da Vagueira e no Cabo de São Vicente tem continuado a diminuir. Em 2019 o padrão de voo do alcatraz reflete os seus hábitos migratórios, com predominância de voo para o norte entre fevereiro e julho, e voo para sul de agosto a novembro (Catry et al 2010; Meirinho et al 2014).

À semelhança dos anos anteriores, a galheta só foi registada em 3 pontos de observação, não sendo registada na Ilha do Farol e na Praia da Vagueira, o que é consistente com os anos anteriores (Sengo et al. 2012; Oliveira et al. 2014; Fagundes e Felipe 2018; Guedes e Fagundes 2019; Barradas e Fagundes 2019). A falta de observações na Praia da Vagueira e na Ilha do Farol deve-se provavelmente à falta de arribas costeiras, locais importantes para a presença da espécie. A taxa de passagem manteve-se consistente no Cabo Raso e no Cabo de São Vicente, mas no Cabo Carvoeiro houve uma diminuição em relação aos dados de 2018 e a menor taxa de passagem desde 2014 (Fagundes & Felipe 2018). A espécie é residente em Portugal, pelo que é difícil determinar um padrão claro do seu comportamento relativamente ao seu voo direccional.

Em 2019 a pardela-baleiar também foi observada em todos os locais, com as maiores concentrações a serem registadas no Cabo Carvoeiro. Isto contrasta com os anos anteriores, onde a maior taxa de passagem ocorreu na Praia da Vagueira, mas neste local ocorreu uma diminuição acentuada entre 2018 e 2019 (Barradas & Fagundes 2019). Os meses com maiores taxas de passagem variam, mas há uma tendência clara para o verão e os últimos meses de 2019, o que coincide com a migração pós-reprodução. Em relação à análise comportamental, todos os meses, exceto outubro, mostram uma predominância de voo para o norte, o que se enquadra no movimento migratório pós-reprodutor, quando os indivíduos regressam às águas portuguesas após a reprodução nas Ilhas Baleares (Meirinho et al 2014).

O garajau-de-bico-preto foi registado em todos os pontos de observação, ao contrário de 2018 onde não foram efetuados registos no Cabo de São Vicente (Barradas & Fagundes 2019). As taxas de passagem mais elevadas ocorreram no Cabo Carvoeiro e no Cabo Raso, verificando-se um aumento significativo no primeiro. A migração pré-reprodutora ocorre entre março e junho e de agosto a outubro a migração pós-reprodução. As variações na taxa de passagem podem ser resultado de efeitos relacionados com as alterações climáticas ou captura intencional nas suas áreas de invernada (Birdlife International 2020).

Apesar dos esforços para comparar as taxas de passagem, análises comportamentais e tendências populacionais, entre 2019 e os anos anteriores, não é possível compreender, com precisão, as variações nesses parâmetros e tirar conclusões. Considerando este facto, é importante continuar os censos RAM, com o maior esforço de observação possível, quanto a disponibilidade e as condições meteorológicas permitirem. Além disso, é vital a continuação da publicação de relatórios anuais, para melhor compreender os dados recolhidos e as variações observadas na passagem de aves.

BIBLIOGRAPHY

- Barradas C & Fagundes AI (2019). Censos RAM em Portugal Continental em 2018. Sociedade Portuguesa para o Estudo das Aves, Lisboa (relatório não publicado)
- BirdLife International. (2018). European Red List of Birds. Luxembourg: Office for Official Publications of the European Communities, Luxembourg
- BirdLife International. (2020). IUCN Red List for Birds. Downloaded from <http://www.birdlife.org> on 04/04/2020
- Catry P, Costa H, Elias G & Matias R (2010). Aves de Portugal, Ornitologia do Território Continental. Assírio e Alvim, Lisboa.
- Croxall JP, Butchart SHM, Lascelles B, Statrsfield AJ, Sullivan B, Symes A & Taylor P (2012). Seabird conservation status, threats and priority actions: a global assessment. Bird Conservation International. 22:1–34. BirdLife International.
- Dias MP, Martin R, Pearmain EJ, Burfield IJ, Small C, Phillips RA, Yates O, Lascelles B, Borboroglu PG & Croxall JP (2019). Threats to seabirds: a global assessment. Biological Conservation 237: 525–537.
- Fagundes AI & Filipe A (2018). Contagens RAM em Portugal Continental entre 2014 e 2016. Sociedade Portuguesa para o Estudo das Aves, Lisboa (relatório não publicado)
- Guedes P & Fagundes AI (2019). Censos RAM em Portugal Continental durante o ano 2017. Sociedade Portuguesa para o Estudo das Aves, Lisboa (relatório não publicado)
- Meirinho A, Barros N, Oliveira N, Catry P, Lecoq M, Paiva V, Geraldés P, Granadeiro JP, Ramírez I & Andrade J (2014). Atlas das Aves Marinhas de Portugal. Sociedade Portuguesa para o Estudo das Aves. Lisboa.
- Oliveira N, Barros N, Meirinho A, Geraldés P, Ramírez I & Andrade J (2014). Relatório RAM em Portugal Continental - 2013. Sociedade Portuguesa para o Estudo das Aves, Lisboa (relatório não publicado)
- Petronilho JMS, Vingada JV, Ferreira M., Paulino NAC, Eira C, Costa RA & Tenreiro PJQ (2004). Seabird Census along the Figueira da Foz-Aveiro coastline (Portugal) during August / September 2002. Airo 14: 94 – 101.
- Poot M & Flamant R (2006). Numbers, behavior and origin of Mediterranean gulls *Larus melanocephalus* wintering along the west coast of southern Portugal. Airo 16: 13-22
- Sengo R, Oliveira N, Andrade J, Barros N & Ramírez I. (2012). Três anos de RAM em Portugal Continental (2009 - 2011). Sociedade Portuguesa para o Estudo das Aves, Lisboa (relatório não publicado).
- Valeiras X, Abad E, Menéndez L, Ócio G, Fernández Pajuelo MA & Sandoval A (2006). Boletín Digital de la Red de Observación de Aves Marinas del Cantábrico y Galicia (R.A.M.). Acedido a 17/07/2019: https://sites.google.com/site/xulioval/BoletinRAM_num1.pdf?attredirects=0.