



**Seabird and Marine Mammal Monitoring Network (RAM)
Report for 2020-2021 in Portugal mainland**

Lisboa, November 2022

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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 Berlengas, Madeira and Azores.

Missão

Trabalhar para o estudo e conservação das aves e seus habitats, promovendo um desenvolvimento que garanta a viabilidade do património natural para usufruto das gerações futuras.

A **SPEA – Sociedade Portuguesa para o Estudo das Aves** é uma Organização Não Governamental de Ambiente que trabalha para a conservação das aves e dos seus habitats em Portugal. Como associação sem fins lucrativos, depende do apoio dos sócios e de diversas entidades para concretizar as suas ações. Faz parte de uma rede mundial de organizações de ambiente, a **BirdLife International**, que atua em 120 países e tem como objetivo a preservação da diversidade biológica através da conservação das aves, dos seus habitats e da promoção do uso sustentável dos recursos naturais.

A SPEA foi reconhecida como entidade de utilidade pública em 2012.

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Seabird and Marine Mammal Monitoring Network (RAM). Report for 2020-2021 in Portugal mainland

Sociedade Portuguesa para o Estudo das Aves, 2022

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SUMMARY

Although seabirds represent a relatively small portion of species among all birds, they have adapted to specific marine environments and conditions, which makes them good ecological indicators. The study of seabirds, their abundances, distributions and phenologies may be useful to assess the state of the ecosystems they inhabit, as well as provide data on the anthropogenic factors that threaten them. For these reasons, RAM (Seabird and Marine Mammal Monitoring Network) census is a valuable methodology used by Iberian researchers to collect data on seabirds in coastal areas.

This report presents the results of the RAM counts carried out between January 2020 and December 2021 at seven observation points along the Portuguese coastline: Berlengas, Cabo Carvoeiro, Cabo de São Vicente, Cabo Espichel, Cabo Raso, Ilha do Farol and Praia da Vagueira.

A total of 107 species were recorded, including 59 non-marine bird species and six marine mammal species. With the collaboration of 63 observers, both years sum an observational effort of 247 hours, with the highest effort at Ilha do Farol (57 hours) and Cabo de São Vicente with the least effort (23 hours). Regarding seabird species, Ilha do Farol showed the highest diversity with 30 species recorded, and the Berlengas the lowest with 17 species.

The collected data is presented as monthly and annual passage rates (birds/hour) accompanied by an analysis of the behaviour and direction of flight of the nine target species: Razorbill *Alca torda*, Cory's Shearwater *Calonectris borealis*, Great Skua *Catharacta skua*, European Shag *Gulosus aristotelis*, Mediterranean Gull *Larus melanocephalus*, Common Scoter *Melanitta nigra*, Northern Gannet *Morus bassanus*, Balearic Shearwater *Puffinus mauretanicus* and Sandwich Tern *Thalasseus sandvicensis*. The highest monthly average passage rate was recorded in November 2021 with 983,6 birds/hour and the highest annual average passage rate was at Cabo de São Vicente in 2021 with 613,2 birds/hour.

RESUMO

Apesar das aves marinhas representarem uma parcela relativamente pequena de todas as espécies de aves, foram capazes de se adaptar a ambientes e condições marinhas muito específicas, o que as torna bons indicadores ecológicos. O estudo das aves marinhas, suas abundâncias, distribuições e fenologias pode ser útil para avaliar o estado dos ecossistemas que habitam, bem como fornecer dados sobre os fatores antropogénicos que as ameaçam. Por estas razões, os censos RAM (Rede de observação de Aves e Mamíferos marinhos) são uma valiosa metodologia utilizada por investigadores ibéricos para recolher dados sobre aves marinhas nas zonas costeiras.

Este relatório apresenta os resultados das contagens RAM realizadas entre janeiro de 2020 e dezembro de 2021 em sete pontos de observação ao longo da costa portuguesa: Berlengas, Cabo Carvoeiro, Cabo de São Vicente, Cabo Espichel, Cabo Raso, Ilha do Farol e Praia da Vagueira.

Ao longo destes dois anos, foi registado um total de 107 espécies, incluindo 59 espécies de aves não marinhas e seis espécies de mamíferos marinhos. Com a colaboração de 63 observadores, ambos os anos somam um esforço observacional de 247 horas, com o maior esforço a registar-se na Ilha do Farol (57 horas) e o Cabo de São Vicente o local menos visitado (23 horas). Relativamente às espécies de aves marinhas, a Ilha do Farol apresenta a maior diversidade com 30 espécies registadas e as Berlengas a menor, com apenas 17 espécies.

Os dados recolhidos são apresentados na forma de taxas de passagem mensais e anuais (aves/hora) acompanhadas de uma análise do comportamento e direção de voo das nove espécies alvo: Torda-mergulheira *Alca torda*, Cagarra *Calonectris borealis*, Alcaide *Catharacta skua*, Galheta *Gulosus aristotelis*, Gaivota-de-cabeça-preta *Larus melanocephalus*, Negrola *Melanitta nigra*, Alcatraz *Morus bassanus*, Pardela-balear *Puffinus mauretanicus* e Garajau-de-bico-preto *Thalasseus sandvicensis*. A taxa média mensal de passagem mais elevada foi registada em novembro de 2021 com 983,6 aves/hora e a maior taxa média anual de passagem foi no Cabo de São Vicente em 2021, com 613,2 aves/hora.

1. INTRODUCTION

Seabirds represent a small portion of the total number of bird species, with about 350 species (3,5% of all birds) distributed throughout the planet. They are generally located at higher levels of the oceanic food chain, which is why they are usually good indicators of the health of marine ecosystems. In addition, they are easier to detect than other marine animals and have to come to land to breed, which may facilitate the study of their population dynamics (Croxall et al., 2012).

According to the latest evaluations carried out by the IUCN, in the context of global biodiversity degradation, bird species associated with the marine environment are in the worst situation within this group of animals (BirdLife International, 2008; 2013a). 97 of the 346 seabird species (28%) are Critically Endangered and Vulnerable, and a further 35 (10%) are Near Threatened. Compared to other groups of birds with a similar number of species, seabirds have a worse conservation status (BirdLife International, 2013b; 2017a).

Human activity is directly linked to the decline of these species. On the one hand, overfishing has degraded marine ecosystems, which limits the resources for these birds (Croxall et al., 2012), while bycatch affects almost half of the threatened species, either by longlines (BirdLife International, 2013c), trawls (BirdLife International, 2017b) or gillnets (BirdLife International, 2013d). On the other hand, invasive species are the most widespread threat to seabirds, mainly due to predation on eggs, hatchlings and, in some cases, the adults themselves (Doherty et al., 2016). Other threats include habitat loss, the effects of climate change, oil spills, the ingestion of plastics, and the development of urban infrastructures (e.g. Croxall et al., 2012; Vallarino & Gonzalez-Zuarth, 2015; Rodríguez et al., 2017).

In the specific case of Portugal, 65 species of seabirds, of which 20 are breeders, can be found in our waters. This great diversity is due, in part, to the location and size of the Exclusive Economic Zone (EEZ) of Portugal, the 20th largest in the world. Beyond birds, many marine species use this area for their migrations, so Portugal has the responsibility to protect and conserve these species and habitats (Meirinho et al., 2014).

For all these reasons and the need to know and monitor the population trends and dynamics of seabirds, the Seabird and Marine Mammal Monitoring Network (RAM, in Portuguese) was created in 2005. Although initially it was limited to the northern coast of the Iberian Peninsula, it quickly spread to the entire coastline of Iberia, the Canary Islands, the Balearic Islands, Madeira and the Azores, Ceuta and Melilla. The goals of this monitoring network are: (I) to obtain information on the abundance and distribution of seabirds and marine mammals on the Iberian coast, (II) to compile a database with movements, relative abundance and behaviour, (III) to create a standardized methodology, (IV) to foster cooperation between ornithologists and marine mammal specialists and (V) to involve volunteers in studies and conservation actions for the marine fauna.

In 2008, SPEA assumed the coordination of the RAM in Portugal and, to date, six reports have been published for different periods: 2009 to 2011 (Sengo et al., 2012), 2013 (Oliveira et al., 2014), 2014 to 2016 (Fagundes & Felipe, 2018), 2017 (Guedes & Fagundes, 2019), 2018 (Barradas & Fagundes, 2019) and 2019 (Adlard & Fagundes, 2020).

The main objectives of this seventh report, in which the data for 2020 and 2021 is collected, are: (I) to compile and analyse data for the seven observation points from mainland Portugal -from North to South: Praia da Vagueira (Vagos), Berlengas, Cabo Carvoeiro (Peniche), Cabo Raso (Cascais), Cabo Espichel (Sesimbra), Cabo de São Vicente (Sagres) and Ilha do Farol (Faro)-, (II) to analyse target species concerning their phenology, passage rate and behaviours and (III) to compare and contrast the data collected in this report with that of previous reports to improve understanding of population trends and patterns.

1.1 Target species Espécies-alvo

A wide variety of seabird species occur in the Portuguese EEZ, but the use that each one makes of it or the season in which we find them is different. Some can be detected while migrating, others are seasonal residents (wintering or breeding), and others are present all year round.

Based on abundance and regularity criteria across the different observation points, nine target species were chosen to focus on the results of this report (Table 1). Furthermore, these species are present in previous RAM reports, which makes it possible to compare their data.

Table 1 | Species identification, conservation status, breeding and wintering distribution, and presence in Portugal mainland.
Identificação das espécies, estado de conservação, distribuição de reprodução e invernada e presença em Portugal continental.

Scientific name	Common name	Conservation status (IUCN)	Breeding area	Wintering area	Present in Portugal
<i>Alca torda</i>	Razorbill	Least Concern	Northern Atlantic (France to Russia)	Mediterranean & Northern Africa	Wintering (November to April)
<i>Calonectris borealis</i>	Cory's Shearwater	Least Concern	North Atlantic (Iberia to Canaries)	Southern Atlantic	Breeding (February to November)
<i>Catharacta skua</i>	Great Skua	Least Concern	Northern Europe (Iceland, Norway & Scotland)	Atlantic Coast, France & Iberia	Wintering (September to January)
<i>Gulosus aristotelis</i>	European Shag	Least Concern	Europe & Mediterranean	Europe & Mediterranean	Resident
<i>Larus melanocephalus</i>	Mediterranean Gull	Least Concern	Throughout Europe (Spain to Ukraine)	Mediterranean, Black Sea, Northwest Europe & Northwest Africa	Wintering (October to March)
<i>Melanitta nigra</i>	Common Scoter	Least Concern	Northern Europe (Iceland & Scandinavia)	West coast of Europe, Mediterranean & North Africa	Passage migrant (March to April & August to December)
<i>Morus bassanus</i>	Northern Gannet	Least Concern	Northern France, UK, Iceland & Norway	Iberia, Mediterranean coast & Northwest Africa	Passage migrant (January to March & October to November)
<i>Puffinus mauretanicus</i>	Balearic Shearwater	Critically Endangered	Balearic Islands	Atlantic & along Southwest European coast	Passage migrant (June to October)
<i>Thalasseus sandvicensis</i>	Sandwich Tern	Least Concern	Throughout European coast	Mediterranean & Western Africa	Passage migrant (April to May & September to October)

2. METHODOLOGY

2.1 Counts methodology Metodologia de contagem

RAM censuses are usually held on the first Saturday of each month for three consecutive hours (7 am-10 am from May to September and 8 am-11 am from October to April) in coastal capes, where there is good and wide visibility. This methodology allows the counts to be standardized and to be done simultaneously at all observation points, although there may be alterations due to weather conditions.

It is recommended that the counts are carried out by a minimum of two observers so that one makes the observations with a scope (generally 20x) while the other covers the rest of the area with binoculars. In case of being done with a single observer, it is highly advisable to use a voice recorder. During this period, for each observation, the observer registers the following: species name, number of individuals, age group (when the plumage allows it to be determined), behaviour and, in case of flight, the direction. These records include other birds, such as waders, birds of prey or passerines and the marine mammals sighted. When species identification is not possible, the bird should be classified at the genus or family level.

2.2 Study area Área de estudo

In 2020 and 2021, RAM censuses took place in seven sites along the Portuguese coastline (Figure 1). In contrast to the previous RAM report, the observation points of Cabo Espichel (Sesimbra) -inactive since 2017- and the Berlengas were added. The observation points at Praia da Vagueira (Vagos), Cabo Carvoeiro (Peniche), Cabo Raso (Cascais), Cabo de São Vicente (Sagres) and Ilha do Farol (Faro) were maintained.

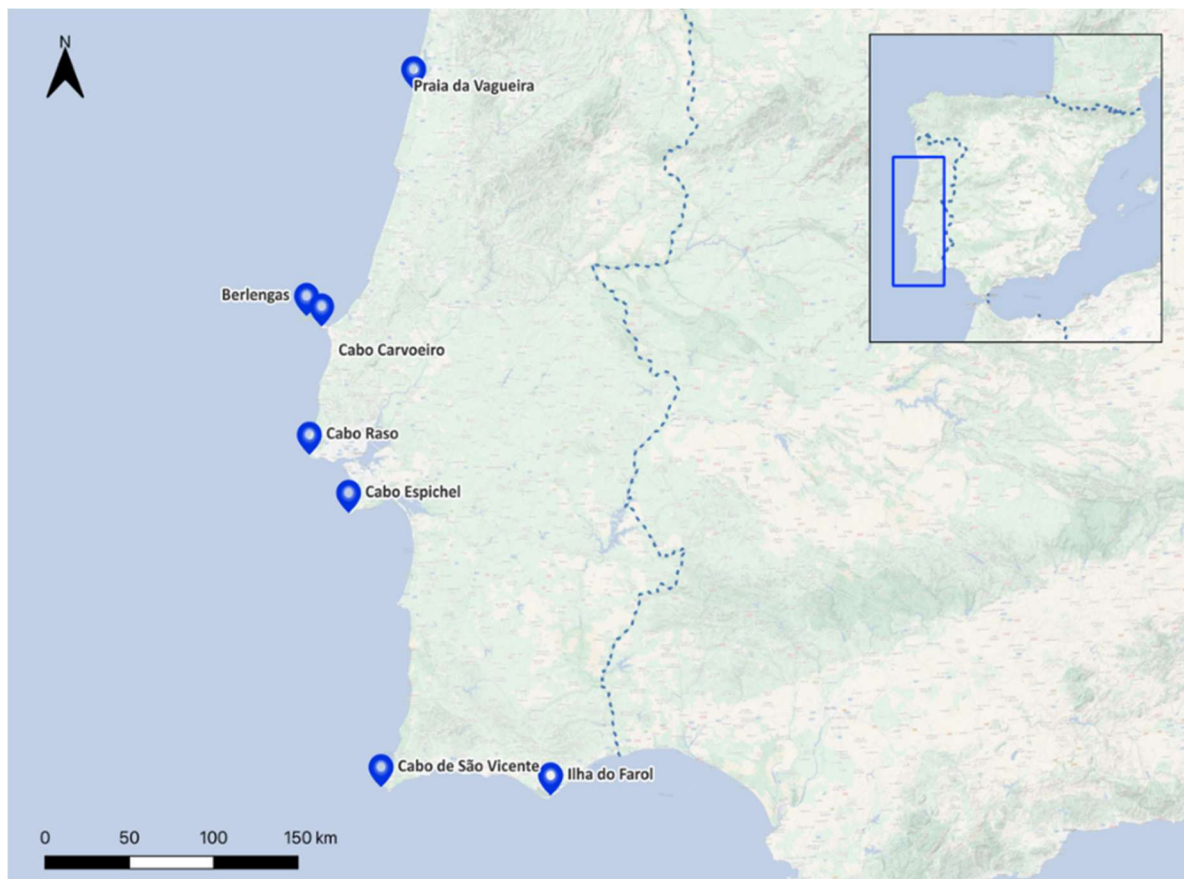


Figure 1 | Location of RAM census observation points in 2020 and 2021.

Localização dos pontos de observação dos censos RAM em 2020 e 2021.

2.3 Data analysis Análise de dados

The data obtained from the censuses have been compiled in a database using Microsoft Excel software. For each observation point, the sampling effort (total hours of observation/year) and the specific richness of seabirds, other birds and marine mammals (number of species/site) were calculated. In the case of species richness, or alpha diversity, it is presented for the entire study period and, regarding seabirds, also the monthly values for each year. The species' scientific and common names followed the HBW and BirdLife Taxonomic Checklist version 6, published on BirdLife's Data Zone website.

In parallel, for the target species, the average annual and monthly passage rates were calculated for each observation point, which are presented as the number of birds per hour of observation. For these species, the observed behaviours were also analysed, presented as the proportion of the total birds observed. Due to the geographical location of Ilha do Farol, it has been analysed independently. Finally, the predominant flight direction of these species was analysed at the two observation points where each one was more abundant. This calculation was made based on the proportion of flights to the four cardinal points and is presented for north and south, except for Ilha do Farol, which is for east and west.

3. RESULTS

3.1 Observational effort Esforço de observação

During the years 2020 and 2021, RAM censuses were carried out for a total of 247 hours. Of these, 125 were in 2020 and 122 in 2021 (Figure 2). A total of 63 observers have helped to assure the counts at the seven observation points.

Ilha do Farol and Cabo Carvoeiro were the sites with the highest sampling effort, with a total of 57 and 55 hours, respectively, while the locality with the least effort was Cabo de São Vicente, with 23 hours. Except for Cabo Espichel and Cabo de São Vicente, the observational effort remained generally stable between the two years studied. At none of the sites the maximum effort of 36 hours per year and site was reached.

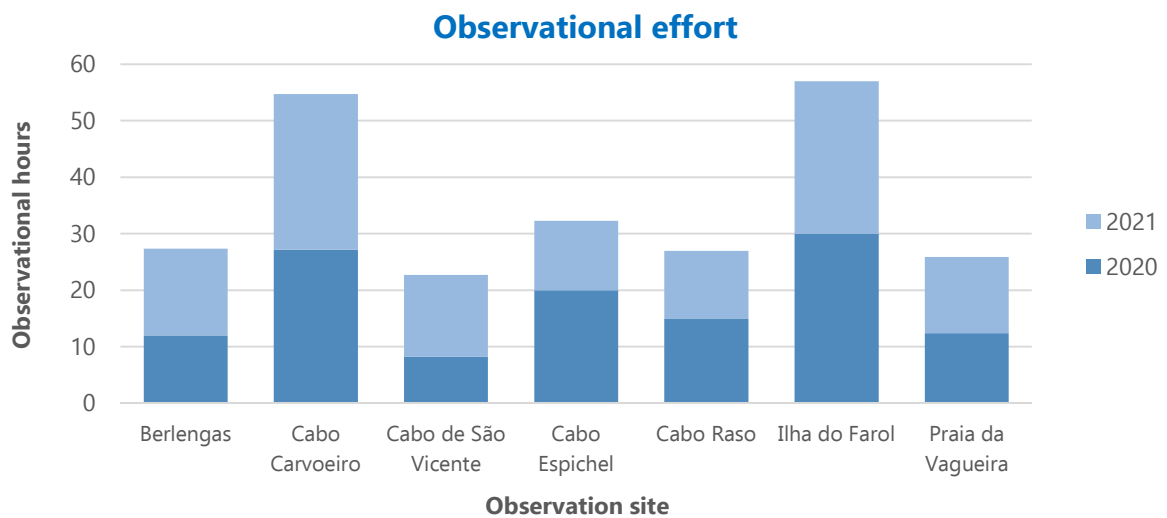


Figure 2 | Observational effort (as hours) at each observation point for 2020 and 2021 censuses.

Esforço de observação (em horas) em cada ponto de observação para os censos de 2020 e 2021.

3.2 Species richness Riqueza específica

A compilation of the species observed at each observation point throughout 2020 and 2021 is presented in the following tables. Table 2 shows marine bird species, or those directly related to marine habitats, and all other detected bird species are listed in Table 3. Table 4 shows the recorded marine mammal species. At the end of each table, the total number of species for each site is presented, as the site-specific species richness.

Table 2 | List of presence of marine bird species recorded at each observation point in 2020 and 2021.*Lista de presença de espécies de aves marinhas registadas em cada ponto de observação em 2020 e 2021.*

Species		Observation site						
Scientific name	Common name	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
<i>Alca torda</i>	Razorbill	X	X	X	X	X		X
<i>Alcidae sp.</i>	Not id. Auk Species		X		X	X		X
<i>Ardenna gravis</i>	Great Shearwater	X	X				X	
<i>Ardenna grisea</i>	Sooty Shearwater		X	X	X		X	X
<i>Calonectris borealis</i>	Cory's Shearwater	X	X	X	X	X	X	X
<i>Catharacta skua</i>	Great Skua	X	X	X	X	X	X	X
<i>Charadriforme sp.</i>	Not id. Sandpiper Species							X
<i>Chlidonias niger</i>	Black Tern							X
<i>Fratercula arctica</i>	Atlantic Puffin		X	X				
<i>Fulmarus sp.</i>	Not id. Fulmar Species						X	
<i>Gavia immer</i>	Common Loon					X		X
<i>Gavia sp.</i>	Not id. Loon Species		X					
<i>Gulosus aristotelis</i>	European Shag	X	X	X	X	X	X	
<i>Hydrobates pelagicus</i>	European Storm-petrel						X	X
<i>Hydrobates socorroensis</i>	Townsend's Storm-petrel						X	
<i>Hydrobates sp.</i>	Not id. Storm-petrel Species	X			X		X	
<i>Hydroprogne caspia</i>	Caspian Tern						X	
<i>Larus audouinii</i>	Audouin's Gull		X	X		X	X	
<i>Larus canus</i>	Mew Gull				X			
<i>Larus fuscus</i>	Lesser Black-backed Gull	X	X	X	X	X		
<i>Larus marinus</i>	Great Black-backed Gull		X			X		
<i>Larus melanocephalus</i>	Mediterranean Gull	X	X	X	X	X	X	X
<i>Larus michahellis</i>	Yellow-legged Gull	X	X	X	X	X		
<i>Larus michahellis/fuscus</i>		X	X		X			
<i>Larus ridibundus</i>	Black-headed Gull			X	X	X	X	X
<i>Larus sp.</i>	Not id. Larus Gull Species			X	X	X	X	
<i>Melanitta nigra</i>	Common Scoter	X	X	X	X	X	X	X
<i>Morus bassanus</i>	Northern Gannet	X	X	X	X	X	X	X

Species		Observation site						
Scientific name	Common name	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
<i>Oceanites oceanicus</i>	Wilson's Storm-petrel					X	X	
<i>Phalacrocorax carbo</i>	Great Cormorant	X	X	X	X	X	X	X
<i>Phalaropus fulicarius</i>	Red Phalarope		X					
<i>Puffinus mauretanicus</i>	Balearic Shearwater	X	X	X	X	X	X	X
<i>Puffinus puffinus</i>	Manx Shearwater	X	X	X	X	X	X	X
<i>Puffinus sp.</i>	Not id. Shearwater Species	X	X	X		X	X	
<i>Rissa tridactyla</i>	Black-legged Kittiwake		X		X		X	X
<i>Stercorarius longicaudus</i>	Long-tailed Jaeger							X
<i>Stercorarius parasiticus</i>	Arctic Jaeger		X				X	X
<i>Stercorarius pomarinus</i>	Pomarine Jaeger		X		X		X	X
<i>Stercorarius sp.</i>	Not id. Skua Species					X	X	
<i>Sterna hirundo</i>	Common Tern					X	X	X
<i>Sterna paradisaea</i>	Arctic Tern						X	
<i>Sterninae sp.</i>	Not id. Tern Species						X	X
<i>Sternula albifrons</i>	Little Tern						X	X
<i>Thalasseus sandvicensis</i>	Sandwich Tern	X	X	X	X	X	X	X
<i>Uria aalge</i>	Common Murre		X		X			X
	Total	17	27	19	23	23	30	25

A total of 35 species of seabirds were identified at the seven observation points, plus ten taxa that could not be identified at the species level (Table 2). Of the species identified, nine were found at all sites (Cory's Shearwater, Great Skua, Mediterranean Gull, Common Scoter, Northern Gannet, Great Cormorant, Balearic Shearwater, Manx Shearwater and Sandwich Tern), and two were found at six sites (Razorbill and European Shag). In terms of species richness, Ilha do Farol and Cabo Carvoeiro were the most diverse, with 30 and 27 species, respectively, while Berlengas had the lowest value with 17 species.

Table 3 | List of presence of non-marine bird species recorded at each observation point in 2020 and 2021.

Lista de presença de outras espécies de aves registadas em cada ponto de observação em 2020 e 2021.

Species		Observation site						
Scientific name	Common name	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
<i>Actitis hypoleucos</i>	Common Sandpiper						X	X
<i>Alcedo atthis</i>	Common Kingfisher					X		
<i>Anas acuta</i>	Northern Pintail						X	X
<i>Anas crecca</i>	Common Teal						X	X
<i>Anas platyrhynchos</i>	Mallard						X	
<i>Anas sp.</i>	Not id. Duck Species						X	
<i>Anthus pratensis</i>	Meadow Pipit		X				X	X
<i>Anthus sp.</i>	Not id. Pipit Species						X	
<i>Anthus trivialis</i>	Tree Pipit							X
<i>Apus apus</i>	Common Swift		X				X	X
<i>Ardea alba</i>	Great White Egret						X	
<i>Ardea cinerea</i>	Grey Heron		X			X	X	X
<i>Ardea purpurea</i>	Purple Heron		X					
<i>Arenaria interpres</i>	Ruddy Turnstone		X			X	X	X
<i>Calidris alba</i>	Sanderling					X	X	X
<i>Calidris alpina</i>	Dunlin							X
<i>Calidris maritima</i>	Purple Sandpiper					X	X	
<i>Calidris sp.</i>	Not id. Sandpiper Species						X	
<i>Carduelis carduelis</i>	European Goldfinch		X					
<i>Cecropis daurica</i>	Red-rumped Swallow							X
<i>Charadrius alexandrinus</i>	Kentish Plover							X
<i>Charadrius hiaticula</i>	Common Ringed Plover						X	X
<i>Charadrius sp.</i>	Not id. Plover Species							X
<i>Chloris chloris</i>	European Greenfinch		X				X	X
<i>Circus aeruginosus</i>	Western Marsh-harrier						X	
<i>Cisticola juncidis</i>	Zitting Cisticola		X					
<i>Columba livia</i>	Rock Dove		X					
<i>Delichon urbicum</i>	Northern House Martin		X				X	
<i>Egretta garzetta</i>	Little Egret					X	X	X
<i>Falco peregrinus</i>	Peregrine Falcon		X		X			
<i>Falco tinnunculus</i>	Common Kestrel		X			X	X	
<i>Galerida cristata</i>	Crested Lark		X					
<i>Haematopus ostralegus</i>	Eurasian Oystercatcher		X				X	

Species		Observation site						
Scientific name	Common name	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
<i>Hirundo rustica</i>	Barn Swallow						X	X
<i>Mareca penelope</i>	Eurasian Wigeon						X	
<i>Motacilla alba</i>	White Wagtail						X	X
<i>Motacilla flava</i>	Western Yellow Wagtail		X				X	
<i>Numenius phaeopus</i>	Whimbrel	X				X	X	X
<i>Oenanthe oenanthe</i>	Northern Wheatear		X					
<i>Pandion haliaetus</i>	Osprey						X	
<i>Passer domesticus</i>	House Sparrow						X	X
<i>Phoenicurus ochruros</i>	Black Redstart		X			X	X	X
<i>Phylloscopus collybita</i>	Common Chiffchaff						X	
<i>Plegadis falcinellus</i>	Glossy Ibis						X	
<i>Riparia riparia</i>	Collared Sand Martin							X
<i>Serinus serinus</i>	European Serin							X
<i>Serinus serinus</i>	European Serin							X
<i>Spinus spinus</i>	Eurasian Siskin						X	
<i>Streptopelia decaocto</i>	Eurasian Collared-dove						X	X
<i>Sturnus unicolor</i>	Spotless Starling		X					
<i>Sturnus vulgaris</i>	Common Starling						X	
<i>Tadorna tadorna</i>	Common Shelduck						X	
<i>Turdus merula</i>	Eurasian Blackbird		X					
	Total	1	19	0	1	8	31	22

Regarding other birds, 49 species were identified, plus four uncertain taxa (Table 3). Ilha do Farol had the highest diversity, with 31 species, followed by Praia da Vagueira and Cabo Carvoeiro with 22 and 19 species. The other sites showed little diversity, but it should be noted that some observers concentrate only on registering the seabird species and don't register other bird species. This situation explains the low number of species at Berlengas, Cabo de São Vicente, Cabo Espichel and Cabo Raso.

Table 4 | List of presence of marine mammal species recorded at each observation point in 2020 and 2021.
Lista de presença de espécies de mamíferos marinhos registadas em cada ponto de observação em 2020 e 2021.

Species		Observation site						
Scientific name	Common name	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
<i>Balaenoptera acutorostrata</i>	Common Minke Whale				X			
<i>Cetacea sp.</i>	Not id. Cetacean Species						X	
<i>Delphinidae sp.</i>	Not id. Dolphin Species							X
<i>Delphinus delphis</i>	Common Dolphin	X			X	X	X	
<i>Phocoena phocoena</i>	Harbour Porpoise	X	X					
<i>Tursiops truncatus</i>	Bottlenose Dolphin				X	X	X	
Total		2	1	0	3	2	3	1

Regarding marine mammal species, four species were identified, and two taxa were identified only at family level (Table 4). None of them was sighted at all sites, although Common Dolphins were seen at four observation points. Cabo Espichel and Ilha de Farol were the sites with more diversity, with three species.

3.3 Passage rates *Taxas de passagem*

The average monthly passage rates (number of seabirds per hour of observation) are represented in Figure 3, where all the sampled observation points have been considered for each month. The average monthly passage rates of 2019 are shown for comparison purposes. The highest average monthly passage rates occurred in November 2021 and October 2020, with 983,7 and 688,8 birds/hour, respectively. The lowest value was in December 2020, although on that month only the census of Ilha do Farol was done. The remaining values were between 150 and 400 birds/hour approximately, showing not much difference in comparison to those of 2019.

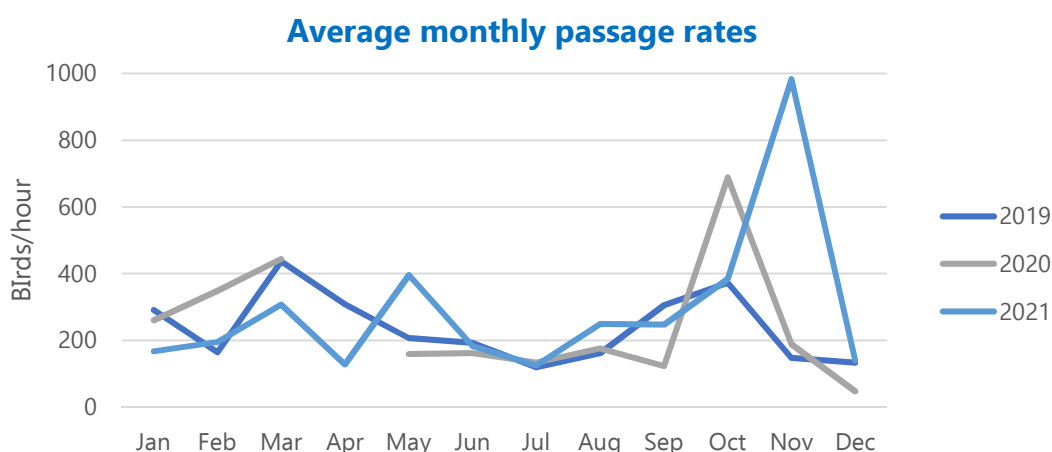


Figure 3 | Comparison of average monthly passage rates (birds/hour) between years 2019, 2020 and 2021.
Comparação das taxas de passagem médias mensais (aves/hora) entre os anos 2019, 2020 e 2021.

For each observation point, the monthly passage rate was calculated for each study year (Table 5). In addition, the average annual passage rate for each site is presented, as well as the average monthly rate for all sites. The blank cells correspond to months in which the census was not carried out.

Table 5 | Monthly passage rates (seabirds/hour) for each observation point for years 2020 and 2021. The average annual passage rate for each site and year is shown at the bottom part. The average monthly passage rate is shown at the last column.

Taxas de passagem mensais (aves marinhas/hora) para cada ponto de observação para os anos 2020 e 2021. A taxa média anual de passagem para cada local e ano é mostrada na parte inferior. A taxa de passagem média mensal é mostrada na última coluna.

	Berlengas		Cabo Carvoeiro		Cabo de São Vicente		Cabo Espichel		Cabo Raso		Ilha do Farol		Praia da Vagueira		Average monthly	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
January	31,0		140,0	333,0		64,3		216,1	918,2		92,0	57,3	120,5		260,3	167,7
February	103,3	173,0	187,9	72,3	246,2	340,7			978,7		228,0				348,8	195,3
March		243,7	214,0	443,7		236,7	846,7				170,0		546,5		444,3	308,0
April								128,3								128,3
May	87,3	758,1	313,7	416,4			77,3				122,3		289,0	159,4	396,5	
June			335,6		87,1		189,7		144,7		69,0	161,0	146,4	205,0	162,1	183,0
July	86,7		168,3	234,0			27,7				152,3	115,0	129,3		134,2	125,6
August				155,2	231,7		88,0	133,3	161,7	247,0	124,0	94,3	277,2	618,0	176,5	249,6
September		109,0	23,2	268,4			96,0		211,5	233,0	164,3	51,3		576,9	123,7	247,7
October			1665,7	373,7			242,0			324,7	137,0	161,0	710,7	680,0	688,8	384,8
November			248,6	526,3		2334,7	214,7				102,3	143,7		930,0	188,5	983,7
December		50,7		234,8		90,0				180,3	47,3	149,3			47,3	141,0
Average annual	77,1	266,9	366,3	305,8	188,3	613,3	250,6	126,4	482,9	246,3	128,6	117,3	321,8	549,8		

November 2021 had the highest value with 2334,7 birds/hour at Cabo de São Vicente, followed by October 2020 at Cabo Carvoeiro with 1665,7 birds/hour. Despite these two high values, all other monthly rates remain below 1000 birds/hour. The lowest value observed was in September 2020 at Cabo Carvoeiro, with only 23.2 birds/hour.

The highest average annual rate was registered in 2021, with 613,3 birds/hour at Cabo de São Vicente, followed by Praia da Vagueira, also in 2021, where 549,8 birds/hour were observed. The lowest value was at the Berlengas in 2020 with a rate of 77,1 birds/hour, even though it should be noted that only four censuses were conducted that year on this site.

It should be noted that in April 2020 and February/March 2021 the counts weren't performed at most of the sites due to the COVID-19 lockdown, which certainly influenced the numbers obtained.

3.3.1 *Alca torda*

The highest average passage rate for the whole study period (2020 and 2021) was recorded at Cabo de São Vicente with 1,59 birds/hour, while the highest monthly value at this observation point was 7,88 birds/hour in December 2021. Cabo Raso showed the second highest average passage rate with 1,27 birds/hour. There were no records of Razorbills at Ilha do Farol during the study period. Even though not all observation points were visited all year round, all the sightings of this species occurred between November and March (Figures 4 to 9).

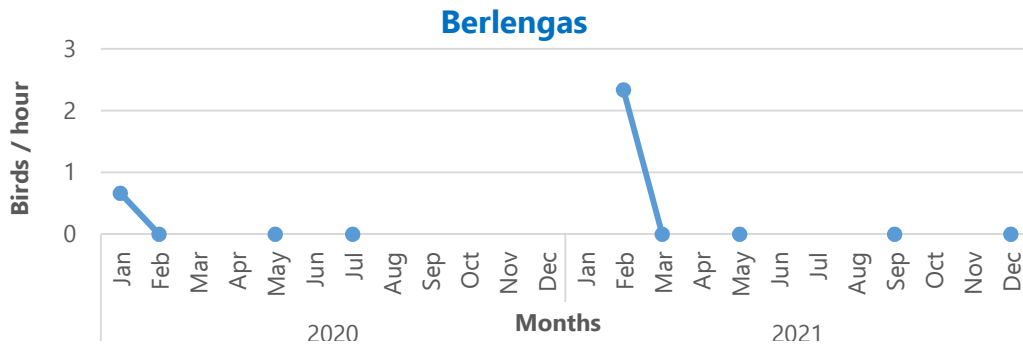


Figure 4 | Monthly passage rates (birds/hour) of *Alca torda* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Alca torda nas Berlengas para os anos 2020 e 2021.

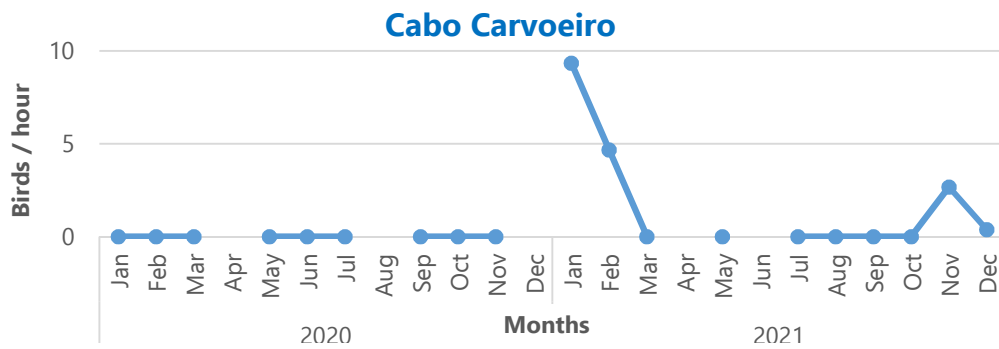


Figure 5 | Monthly passage rates (birds/hour) of *Alca torda* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Alca torda no Cabo Carvoeiro para os anos 2020 e 2021.

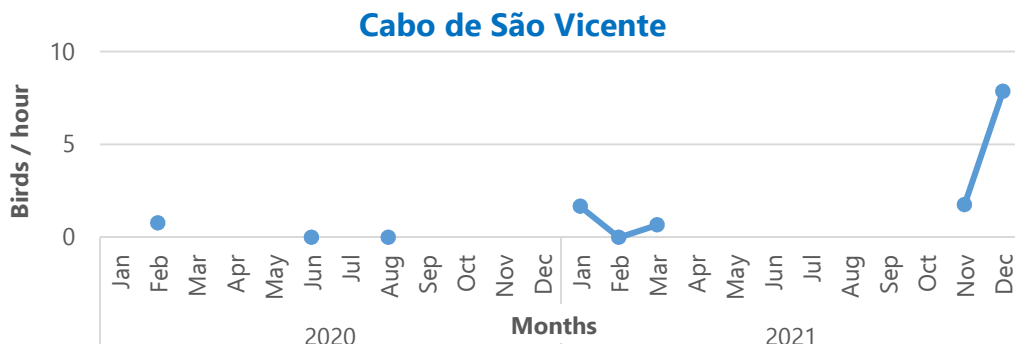


Figure 6 | Monthly passage rates (birds/hour) of *Alca torda* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Alca torda no Cabo de São Vicente para os anos 2020 e 2021.

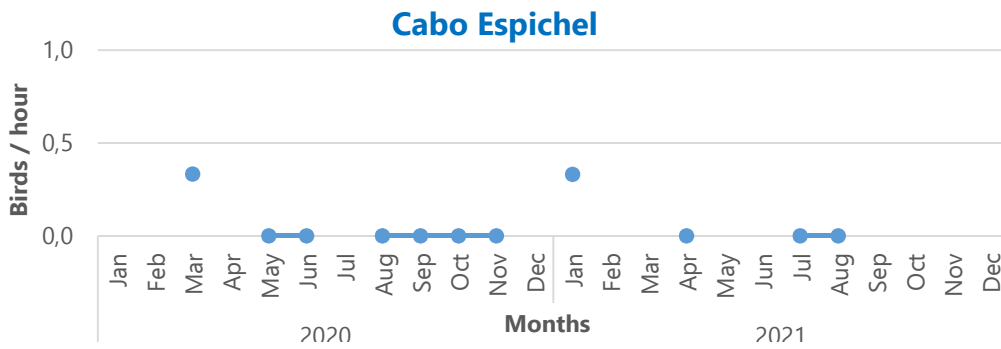


Figure 7 | Monthly passage rates (birds/hour) of *Alca torda* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Alca torda no Cabo Espichel para os anos 2020 e 2021.

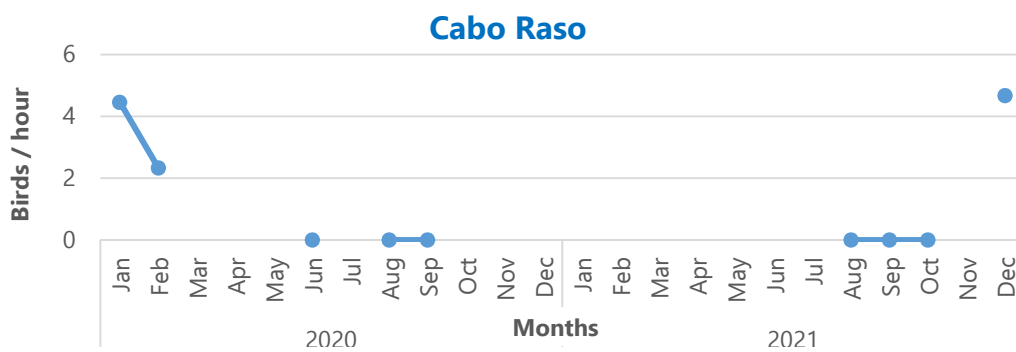


Figure 8 | Monthly passage rates (birds/hour) of *Alca torda* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Alca torda no Cabo Raso para os anos 2020 e 2021.

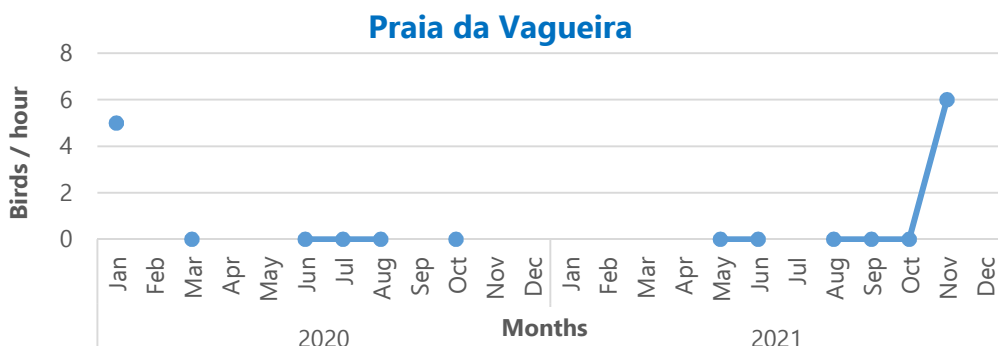


Figure 9 | Monthly passage rates (birds/hour) of *Alca torda* at Praia da Vagueira for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Alca torda na Praia da Vagueira para os anos 2020 e 2021.

Cabo de São Vicente showed the highest annual average passage rate of Razorbills among observation sites during the study period with 2,4 birds/hour, followed by Cabo Carvoeiro with 1,7 birds/hour. Compared with the results from the previous report, the passage rate per year decreased at the sites visited except Cabo de São Vicente (Table 6).

Table 6 | Average annual passage rates (birds/hour) of *Alca torda* in each observation point for the last three years.
Taxas de passagem médias anuais (aves/hora) de Alca torda em cada ponto de observação durante os últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		1,8	0,8		2,2	0,7	6,9
2020	0,2	0	0,2	0,1	1,4	0	0,8
2021	0,5	1,7	2,4	0,1	1,2	0	1,00

3.3.2 *Calonectris borealis*

Cabo Raso had the highest average passage rate for the study period with 34,8 birds/hour although the highest average monthly passage rate was recorded at Cabo Carvoeiro in May 2021 with 146,8 birds/hour. This observation point had the second highest average passage rate (26,2 birds/hour), followed closely by Berlengas (25,5 birds/hour), Cabo Espichel (20,9 birds/hour), and Ilha do Farol (20,7 birds/hour). With lower values, this species was recorded at an average passage rate of 5,3 birds/hour at Cabo de São Vicente and 2,3 birds/hour at Praia da Vagueira. Despite some sparse observations, sightings of Cory's Shearwater were mostly concentrated between May to October, with barely any observation from December to February (Figures 10 to 16).

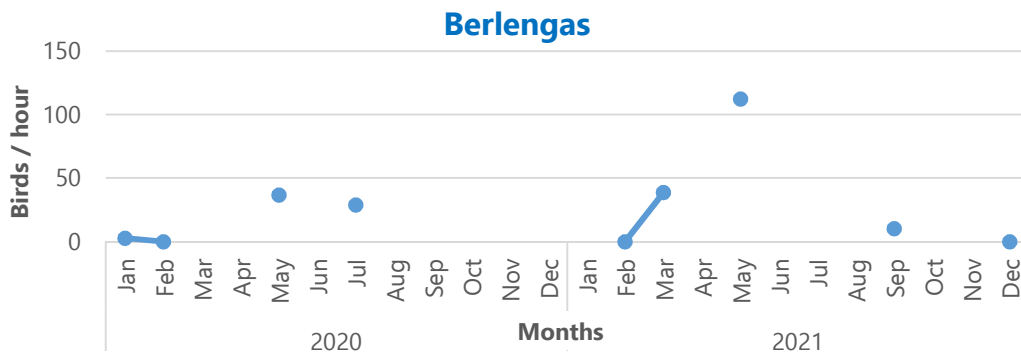


Figure 10 | Monthly passage rates (birds/hour) of *Calonectris borealis* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Calonectris borealis nas Berlengas para os anos 2020 e 2021.

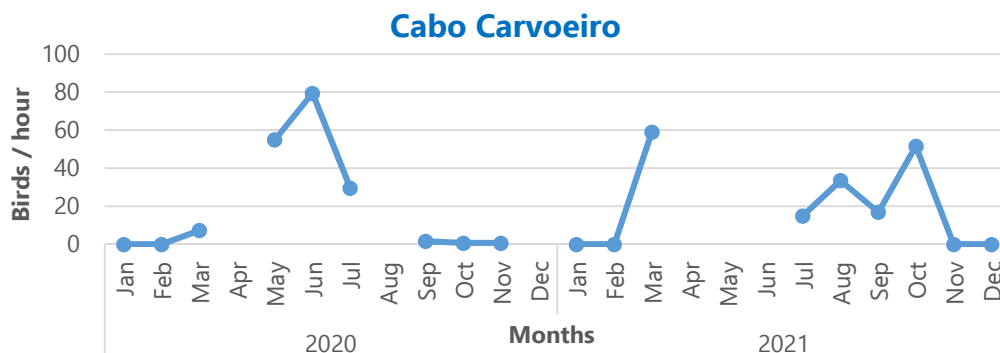


Figure 11 | Monthly passage rates (birds/hour) of *Calonectris borealis* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Calonectris borealis no Cabo Carvoeiro para os anos 2020 e 2021.

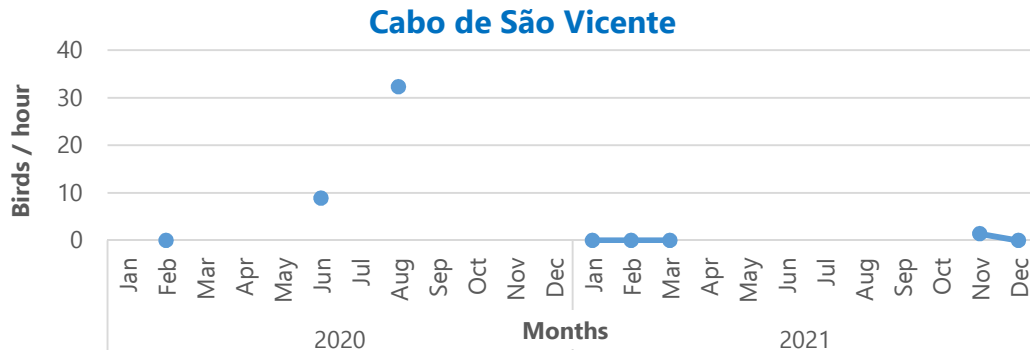


Figure 12 | Monthly passage rates (birds/hour) of *Calonectris borealis* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Calonectris borealis no Cabo de São Vicente para os anos 2020 e 2021.

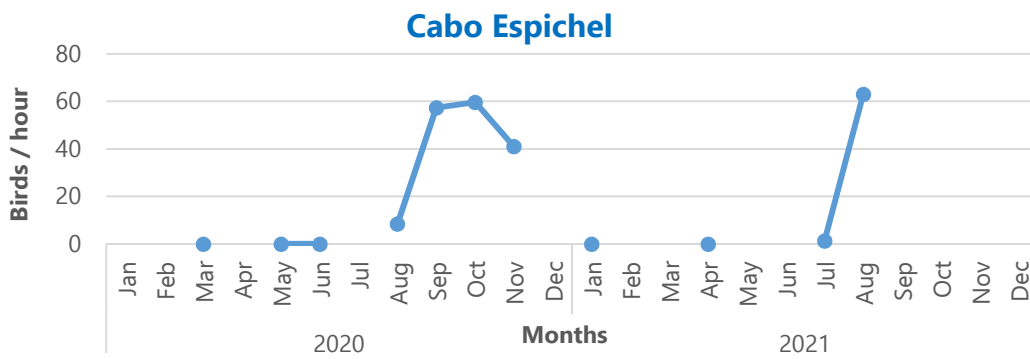


Figure 13 | Monthly passage rates (birds/hour) of *Calonectris borealis* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Calonectris borealis no Cabo Espichel para os anos 2020 e 2021.

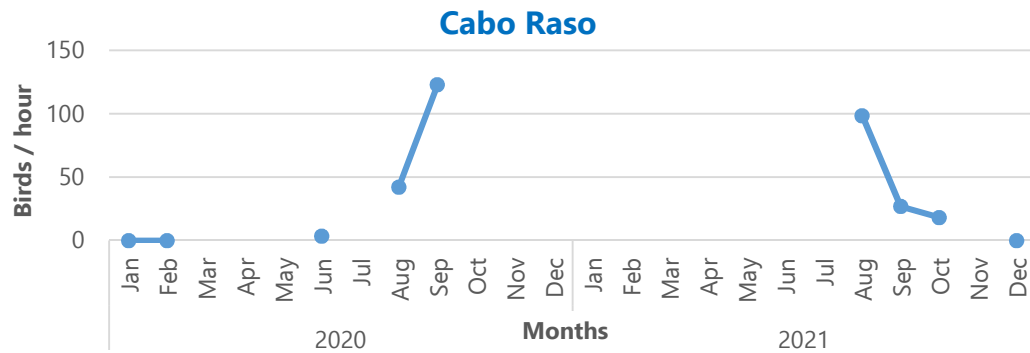


Figure 14 | Monthly passage rates (birds/hour) of *Calonectris borealis* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Calonectris borealis no Cabo Raso para os anos 2020 e 2021.

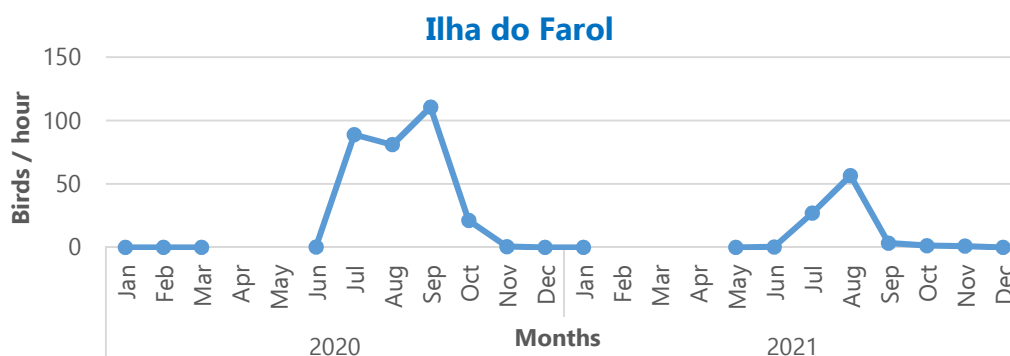


Figure 15 | Monthly passage rates (birds/hour) of *Calonectris borealis* at Ilha do Farol for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Calonectris borealis na Ilha do Farol para os anos 2020 e 2021.

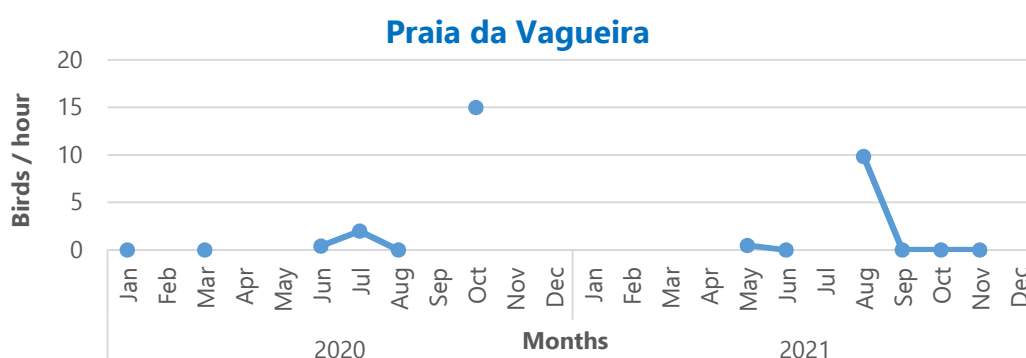


Figure 16 | Monthly passage rates (birds/hour) of *Calonectris borealis* at Praia da Vagueira for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Calonectris borealis na Praia da Vagueira para os anos 2020 e 2021.

Cory's Shearwater presented highly variable average annual passage rates for each year of study, also when comparing with data from 2019 (Table 7). Out of the seven observation points, Cabo de São Vicente and Ilha do Farol showed an alarming decrease, as did Praia da Vagueira but with less expression. On the contrary, Cabo Raso was the most stable site regarding this species, while the Berlengas and Cabo Carvoeiro showed increases in the average annual passage rates.

Table 6 | Average annual passage rates (birds/hour) of *Calonectris borealis* in each observation point for the last three years.
Taxas de passagem médias anuais (aves/hora) de Calonectris borealis em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		27,1	25,6		35,2	24,3	6,7
2020	17,1	19,4	13,7	23,8	33,8	30	2,9
2021	32,3	32,3	0,3	16,1	36,0	10	1,7

3.3.3 *Catharacta skua*

Ilha do Farol showed the highest average passage rate for the study period (4,2 birds/hour). The maximum monthly passage rate for this site was recorded in December 2021 with 18,3 birds/hour. Other sites had lower average passage rates such as Cabo Raso with 1,8 birds/hour and Cabo de São Vicente (0,3 birds/hour). The sightings of this species seem to be spread throughout the year (Figures 17 to 23).

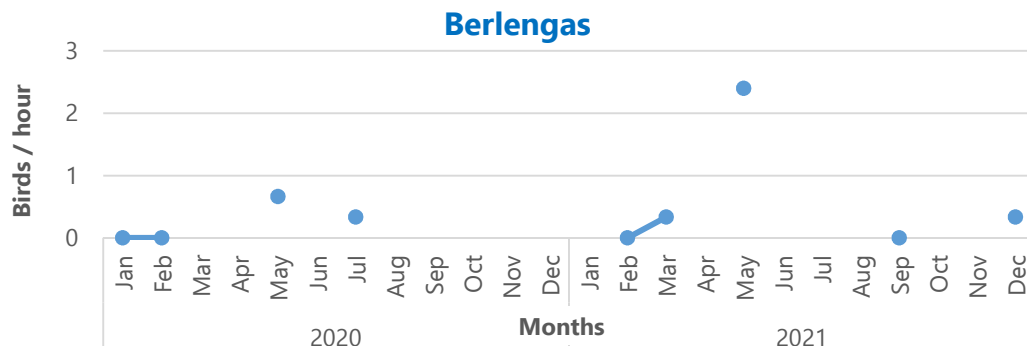


Figure 17 | Monthly passage rates (birds/hour) of *Catharacta skua* at Berlengas for years 2020 and 2021.

Taxas de passagem mensais (aves/hora) de Catharacta skua nas Berlengas para os anos 2020 e 2021.

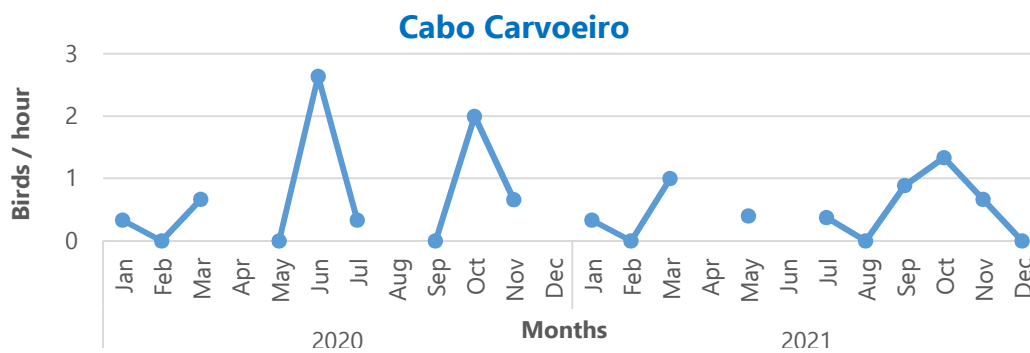


Figure 18 | Monthly passage rates (birds/hour) of *Catharacta skua* at Cabo Carvoeiro for years 2020 and 2021.

Taxas de passagem mensais (aves/hora) de Catharacta skua no Cabo Carvoeiro para os anos 2020 e 2021.

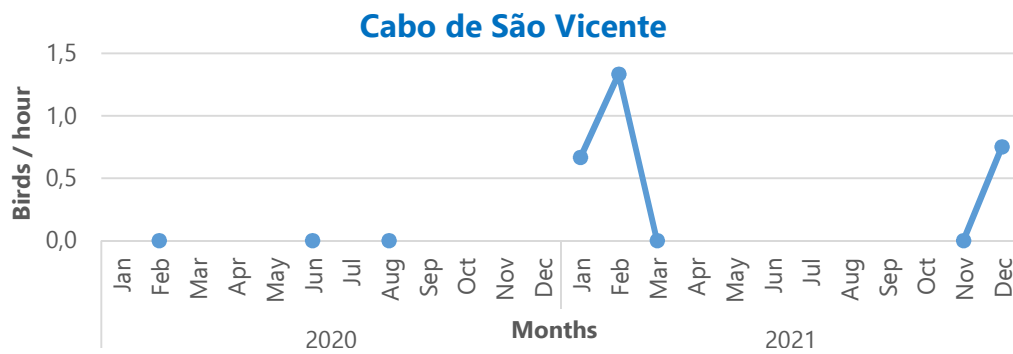


Figure 19 | Monthly passage rates (birds/hour) of *Catharacta skua* at Cabo de São Vicente for years 2020 and 2021.

Taxas de passagem mensais (aves/hora) de Catharacta skua no Cabo de São Vicente para os anos 2020 e 2021.

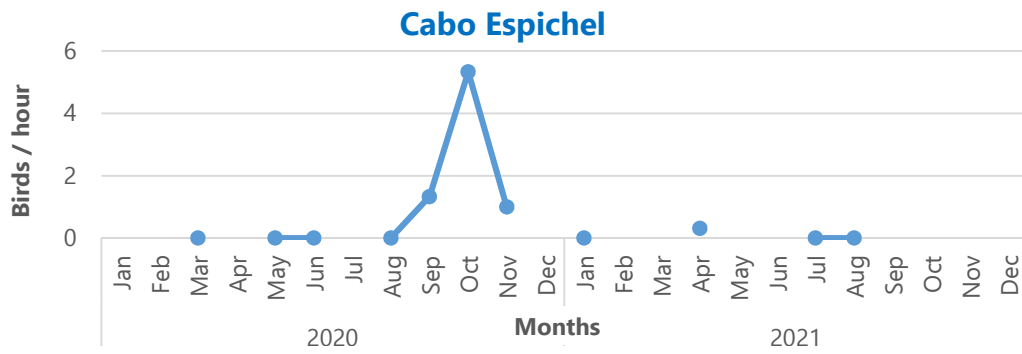


Figure 20 | Monthly passage rates (birds/hour) of *Catharacta skua* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Catharacta skua no Cabo Espichel para os anos 2020 e 2021.

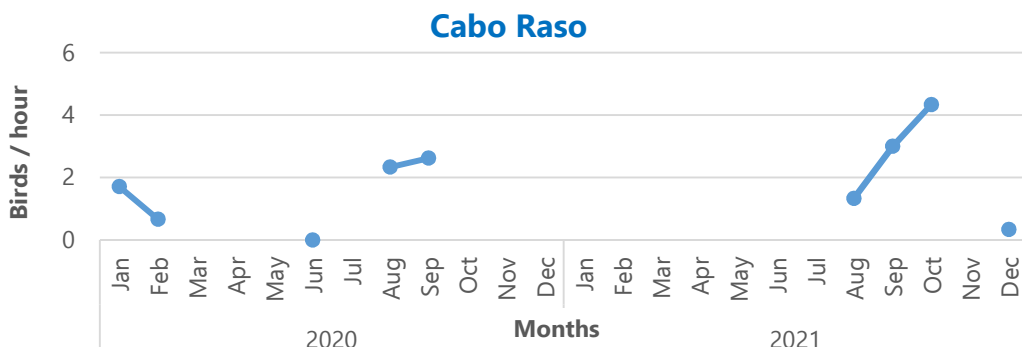


Figure 21 | Monthly passage rates (birds/hour) of *Catharacta skua* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Catharacta skua no Cabo Raso para os anos 2020 e 2021.

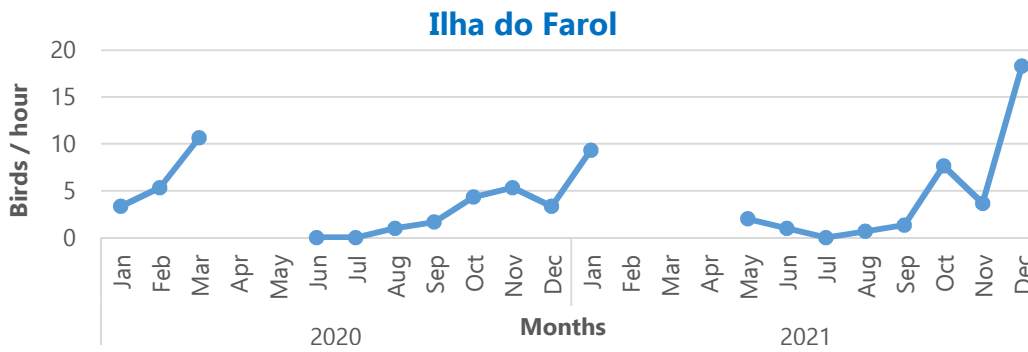


Figure 22 | Monthly passage rates (birds/hour) of *Catharacta skua* at Ilha do Farol for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Catharacta skua na Ilha do Farol para os anos 2020 e 2021.

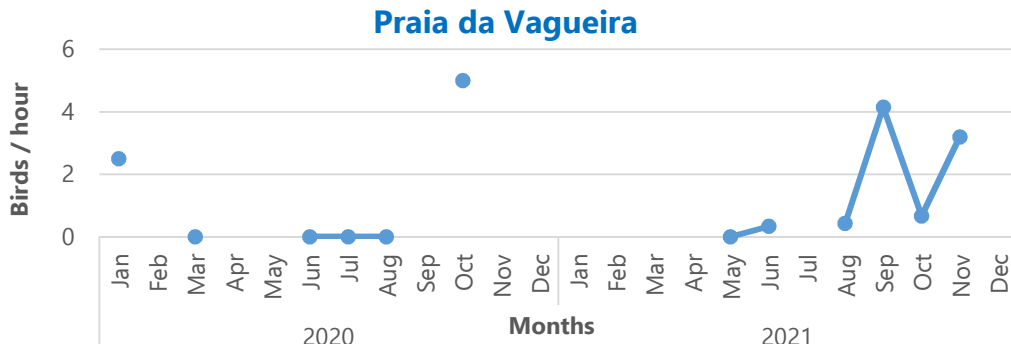


Figure 23 | Monthly passage rates (birds/hour) of *Catharacta skua* at Praia da Vagueira for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Catharacta skua na Praia da Vagueiral para os anos 2020 e 2021.

Ilha do Farol showed the highest annual average passage rates for the years 2020 and 2021, with 3,5 and 4,9 birds/hour, respectively (Table 8). Cabo Raso showed a slight increase in 2021, compared with the results of 2019, while Praia da Vagueira seems to have decreased its passage rates by half. Cabo Carvoeiro and Cabo de São Vicente showed low but stable rates.

Table 7 | Average annual passage rates (birds/hour) of *Catharacta skua* in each observation point for the last three years.
Taxas de passagem médias anuais (aves/hora) de Catharacta skua em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		0,7	0,9		1,3	3,5	3,5
2020	0,3	0,7	0	1,1	1,5	3,5	1,3
2021	0,6	0,5	0,6	0,1	2,3	4,9	1,5

3.3.4 *Gulosus aristotelis*

The highest average passage rate for European Shags was at Cabo Carvoeiro with 13,7 birds/hour, whereas the highest monthly passage rate was recorded in July 2020 with 39,7 birds/hour. Berlengas and Cabo Raso recorded lower average passage rates (5,9 and 5,6 birds/hour, respectively), whereas the other sites showed sporadic sightings and even fewer rates. Only one individual was recorded at Ilha do Farol in October 2020 (0,02 birds/hour), and there were no sightings at Praia da Vagueira. This species appeared all year round across most of the observation points (Figures 24 to 29).

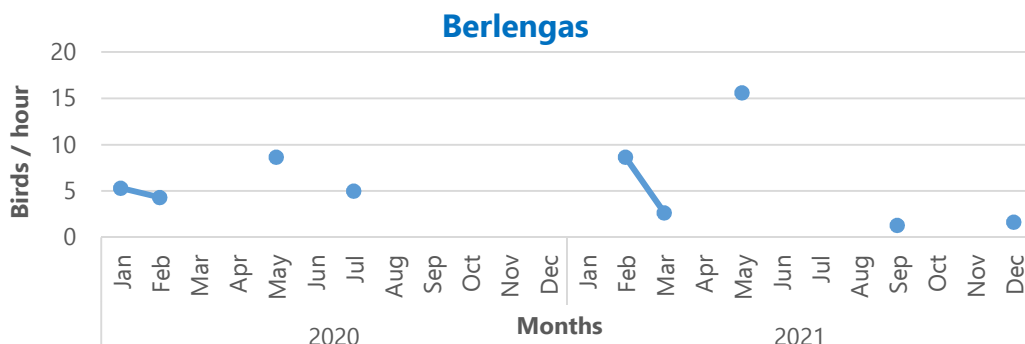


Figure 24 | Monthly passage rates (birds/hour) of *Gulosus aristotelis* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Gulosus aristotelis nas Berlengas para os anos 2020 e 2021.

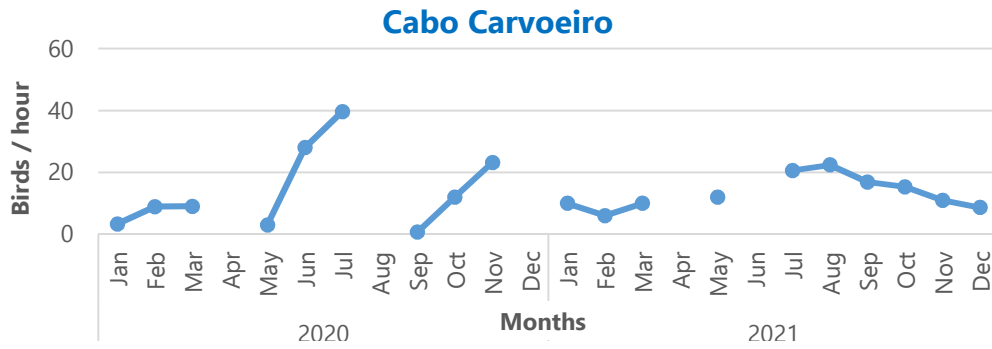


Figure 25 | Monthly passage rates (birds/hour) of *Gulosus aristotelis* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Gulosus aristotelis no Cabo Carvoeiro para os anos 2020 e 2021.

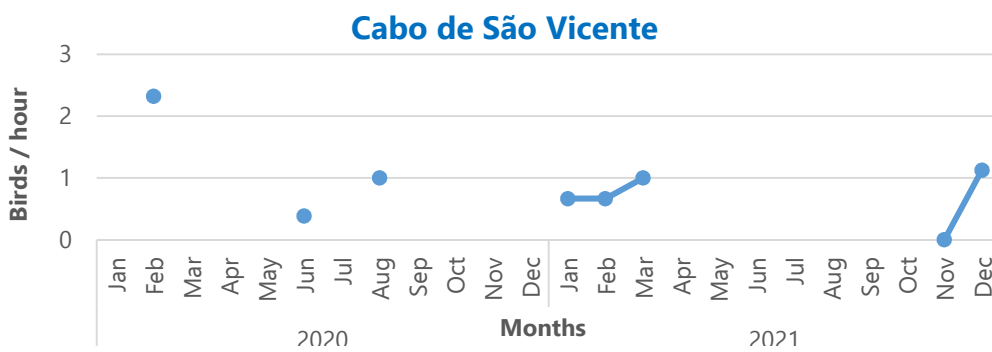


Figure 26 | Monthly passage rates (birds/hour) of *Gulosus aristotelis* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Gulosus aristotelis no Cabo de São Vicente para os anos 2020 e 2021.

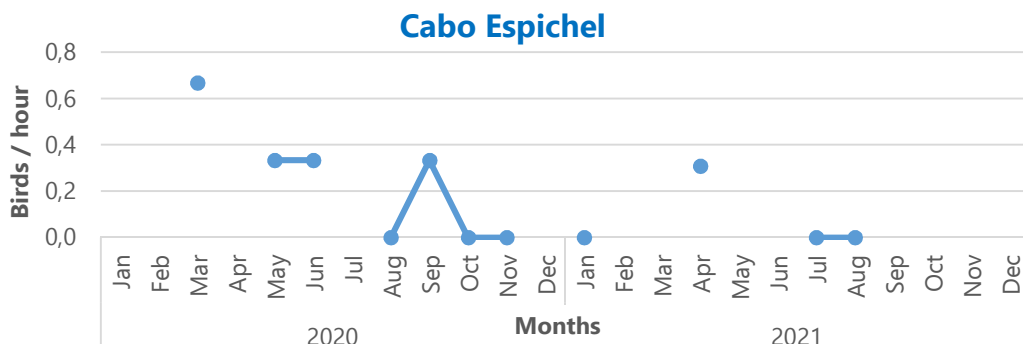


Figure 27 | Monthly passage rates (birds/hour) of *Gulosus aristotelis* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Gulosus aristotelis no Cabo Espichel para os anos 2020 e 2021.

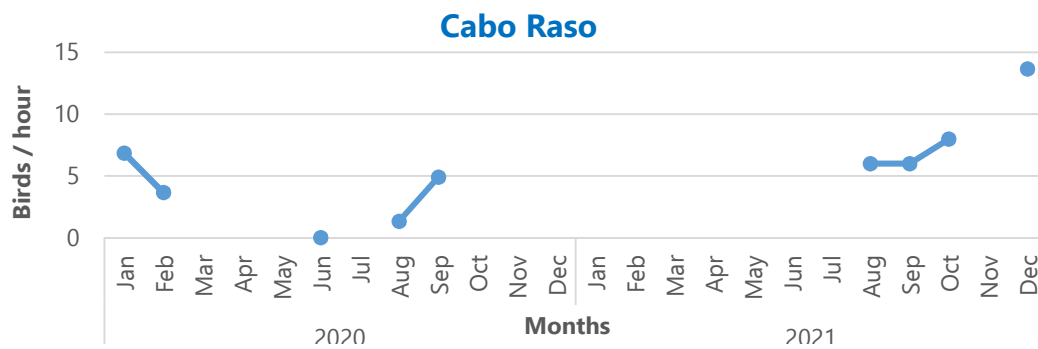


Figure 28 | Monthly passage rates (birds/hour) of *Gulosus aristotelis* at Cabo Raso for years 2020 and 2021.

Taxas de passagem mensais (aves/hora) de Gulosus aristotelis no Cabo Raso para os anos 2020 e 2021.

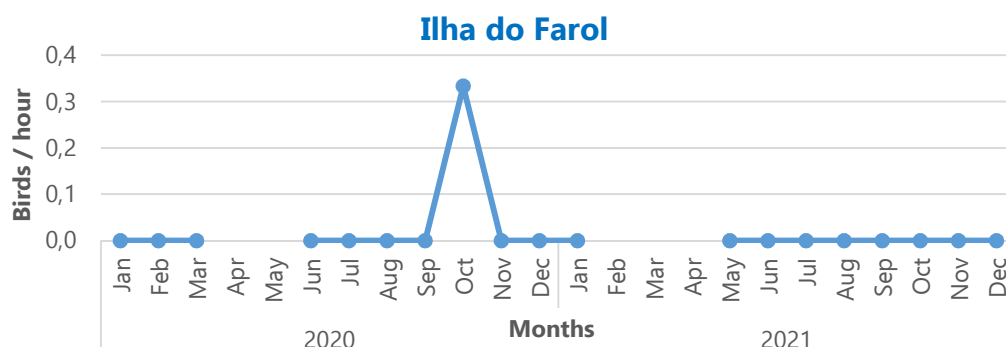


Figure 29 | Monthly passage rates (birds/hour) of *Gulosus aristotelis* at Ilha do Farol for years 2020 and 2021.

Taxas de passagem mensais (aves/hora) de Gulosus aristotelis na Ilha do Farol para os anos 2020 e 2021.

Cabo Carvoeiro showed higher average annual passage rates for European Shag, with 14,2 and 13,3 birds/hour for 2020 and 2021, respectively. Cabo Raso showed an increasing trend for the period 2019-2021, going from 2,0 to 8,4 birds/hour, and the Berlengas, Cabo de São Vicente and Cabo Espichel presented low but stable average annual rates (Table 9).

Table 8 | Average annual passage rates (birds/hour) of *Gulosus aristotelis* in each observation point for the last three years.

Taxas de passagem médias anuais (aves/hora) de Gulosus aristotelis em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		11,2	0,8		2,0	0	0
2020	5,8	14,2	1,2	0,2	3,4	0,03	0
2021	6,0	13,3	0,7	0,1	8,4	0	0

3.3.5 *Larus melanocephalus*

Cabo Raso had the highest average passage rate of Mediterranean Gull recorded for the study period, with 14,3 birds/hour. The highest value at this site was 121 birds/hour in February 2020. Ilha do Farol showed the second highest average passage rate with 4,3 birds/hour. The records of this species were intermittent throughout the observation points, except at Ilha do Farol, where it appeared practically every month (Figures 30 to 36).

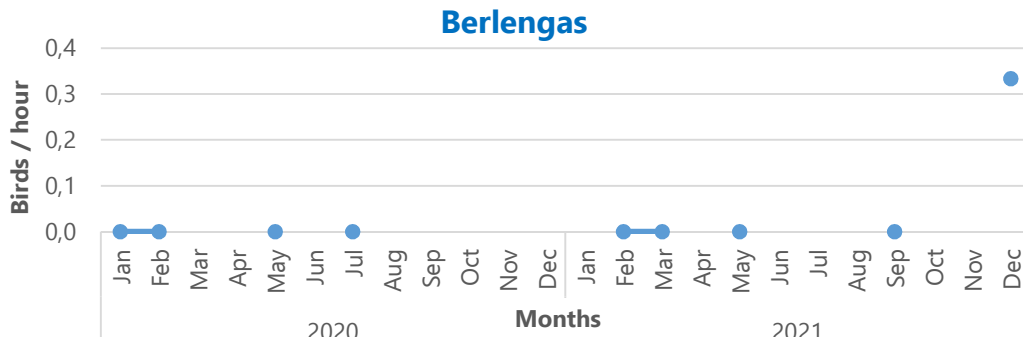


Figure 30 | Monthly passage rates (birds/hour) of *Larus melanocephalus* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Larus melanocephalus nas Berlengas para os anos 2020 e 2021.

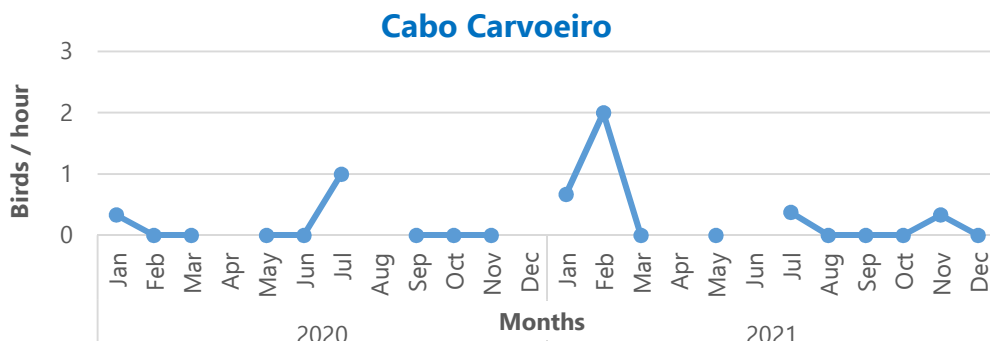


Figure 31 | Monthly passage rates (birds/hour) of *Larus melanocephalus* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Larus melanocephalus no Cabo Carvoeiro para os anos 2020 e 2021.

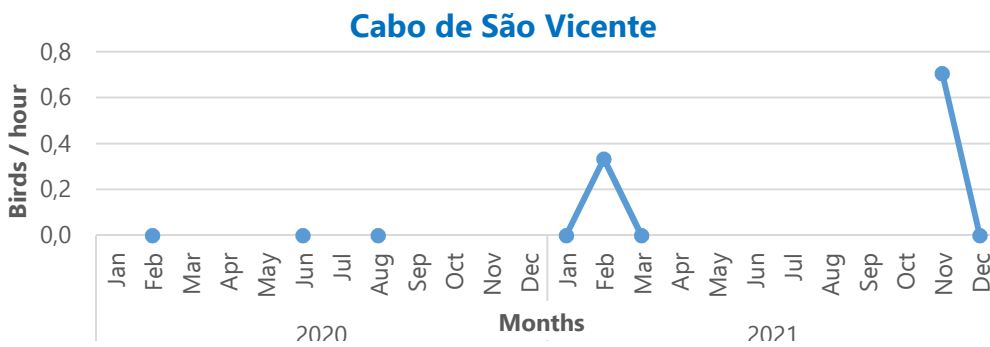


Figure 32 | Monthly passage rates (birds/hour) of *Larus melanocephalus* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Larus melanocephalus no Cabo de São Vicente para os anos 2020 e 2021.

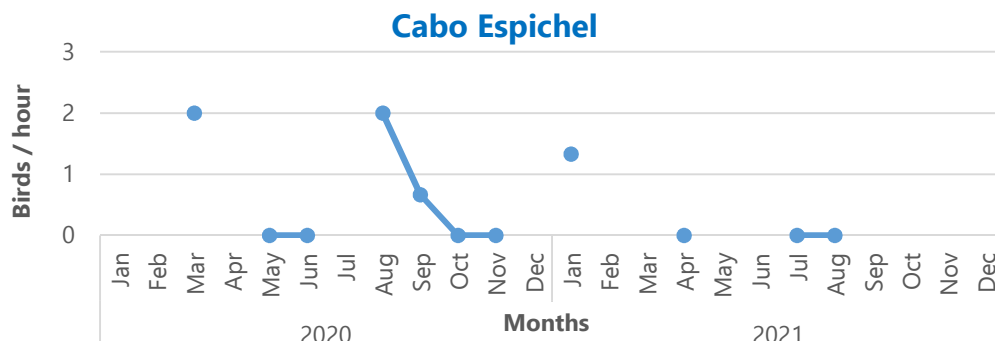


Figure 33 | Monthly passage rates (birds/hour) of *Larus melanocephalus* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Larus melanocephalus no Cabo de São Vicente para os anos 2020 e 2021.

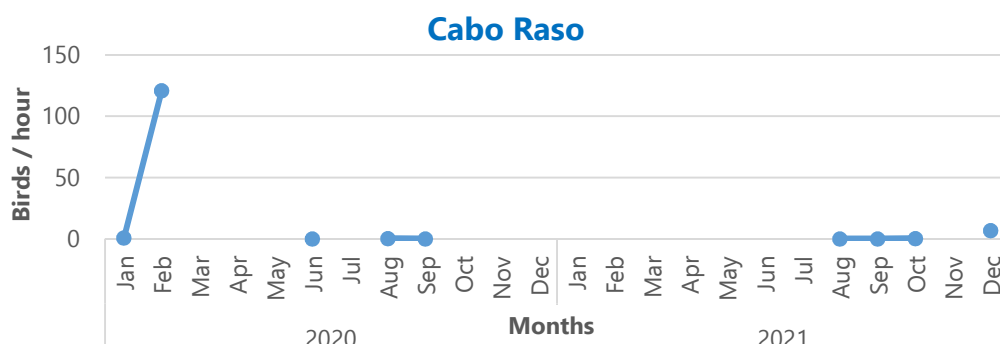


Figure 34 | Monthly passage rates (birds/hour) of *Larus melanocephalus* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Larus melanocephalus no Cabo Raso para os anos 2020 e 2021.

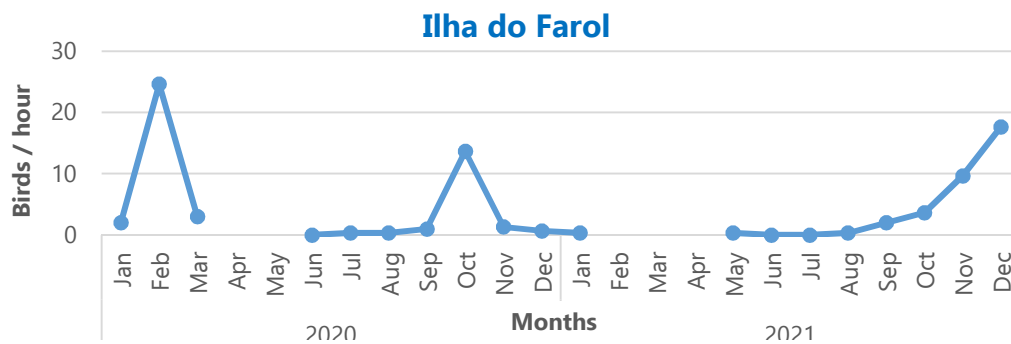


Figure 35 | Monthly passage rates (birds/hour) of *Larus melanocephalus* at Ilha do Farol for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Larus melanocephalus na Ilha do Farol para os anos 2020 e 2021.

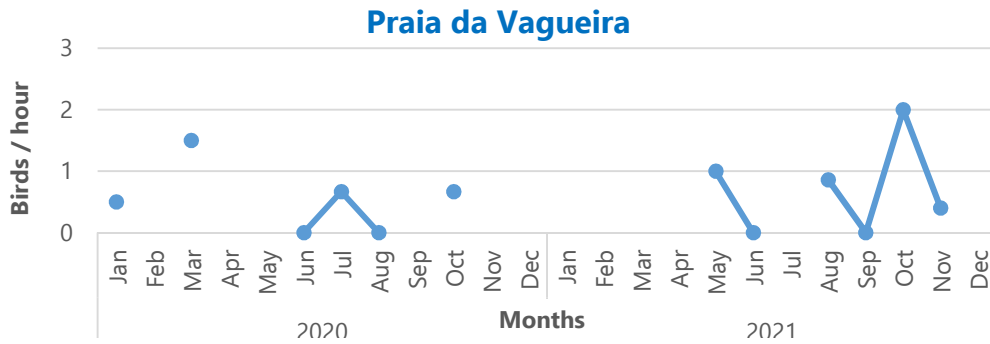


Figure 36 | Monthly passage rates (birds/hour) of *Larus melanocephalus* at Praia da Vagueira for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Larus melanocephalus na Praia da Vagueira para os anos 2020 e 2021.

As for the average annual passage rates, the highest record was at Cabo Raso, with 24,4 birds/hour in 2020, followed by Ilha do Farol with 4,7 and 3,8 birds/hour in 2020 and 2021, respectively. All other values were between 0 and 1 approximately, not showing any appreciable trend, except at Praia da Vagueira, where the average annual passage rates showed a steep decrease (Table 10).

Table 9 | Average annual passage rates (birds/hour) of *Larus melanocephalus* in each observation point for the last three years.
Taxas de passagem médias anuais (aves/hora) de Larus melanocephalus em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		0,7	0,9		2,5	3,3	18,6
2020	0	0,1	0	0,7	24,4	4,7	0,6
2021	0,1	0,3	0,2	0,3	1,8	3,8	0,7

3.3.6 *Melanitta nigra*

The site where most Common Scoters were recorded was Praia da Vagueira, with a remarkably high average passage rate of 131,9 birds/hour for the study period. There were two noticeable peaks of this species at this site, with passage rates of 535,5 birds/hour in March 2020 and 419,2 birds/hour in November 2021. Far from these values, Cabo Raso showed the second highest value with an average passage rate of 5,91 birds/hour. As can be seen in figures 37 to 43, the records for this species were mainly between late summer and winter.

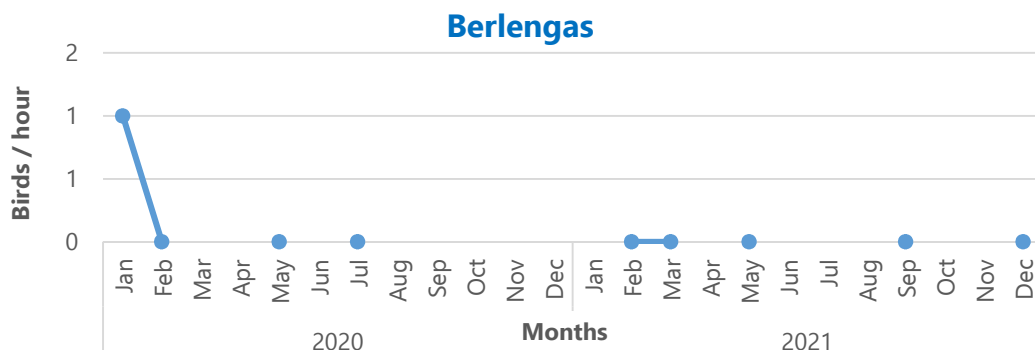


Figure 37 | Monthly passage rates (birds/hour) of *Melanitta nigra* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Melanitta nigra nas Berlengas para os anos 2020 e 2021.

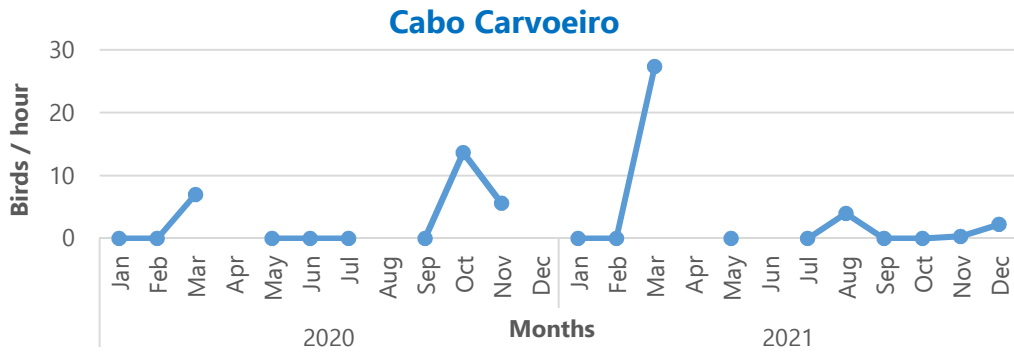


Figure 38 | Monthly passage rates (birds/hour) of *Melanitta nigra* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Melanitta nigra no Cabo Carvoeiro para os anos 2020 e 2021.

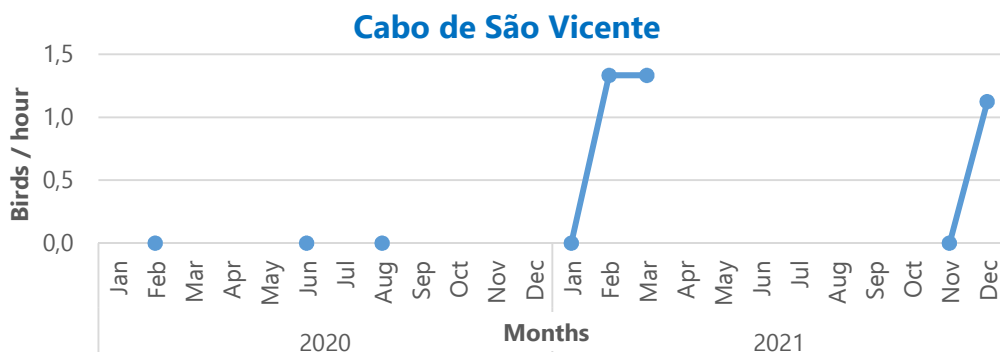


Figure 39 | Monthly passage rates (birds/hour) of *Melanitta nigra* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Melanitta nigra no Cabo de São Vicente para os anos 2020 e 2021.

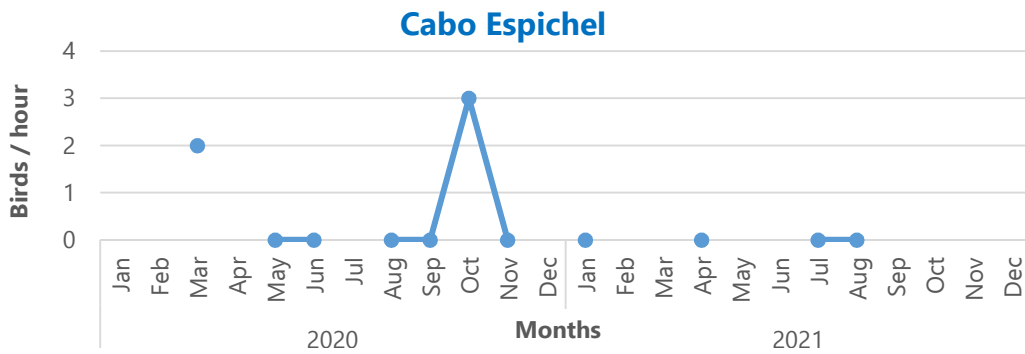


Figure 40 | Monthly passage rates (birds/hour) of *Melanitta nigra* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Melanitta nigra no Cabo Espichel para os anos 2020 e 2021.

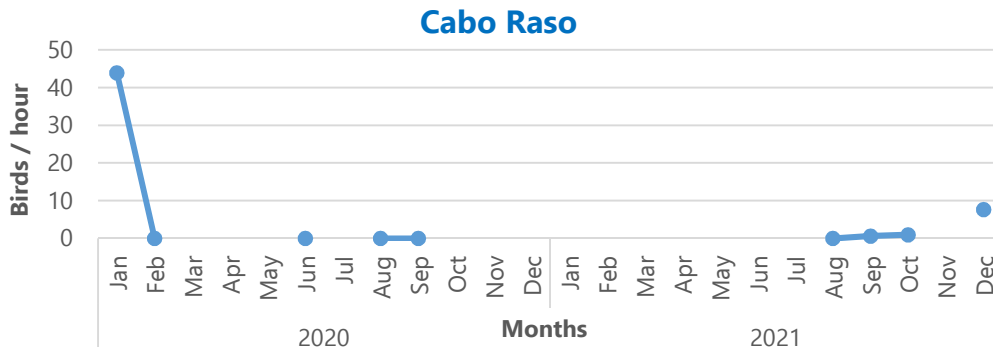


Figure 41 | Monthly passage rates (birds/hour) of *Melanitta nigra* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Melanitta nigra no Cabo Raso para os anos 2020 e 2021.

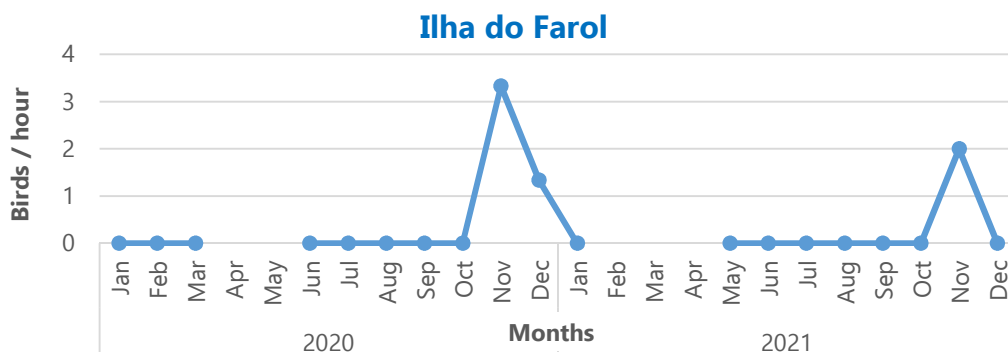


Figure 42 | Monthly passage rates (birds/hour) of *Melanitta nigra* at Ilha do Farol for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Melanitta nigra na Ilha do Farol para os anos 2020 e 2021.

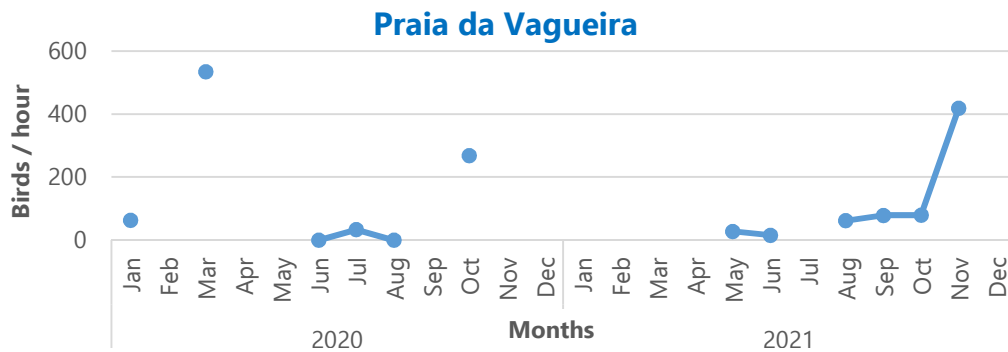


Figure 43 | Monthly passage rates (birds/hour) of *Melanitta nigra* at Praia da Vagueira for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Melanitta nigra na Praia da Vagueira para os anos 2020 e 2021.

Regarding average annual passage rates of Common Scoter, Praia da Vagueira showed the highest values, with rates of 150,1 birds/hour in 2020 and 113,7 birds/hour in 2021. This represents an increase compared with 2019 when the average rate was 80,4 birds/hour. Cabo Raso followed this site with a lower average passage rate of 8,8 birds/hour in 2020. The other observation points showed pretty stable average rates, except Cabo Carvoeiro, where a significant reduction occurred in comparison with 2019 (Table 11).

Table 10 | Average annual passage rates (birds/hour) of *Melanitta nigra* in each observation point for the last three years.
Taxas de passagem médias anuais (aves/hora) de Melanitta nigra em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		13,7	0		3,5	0,5	80,4
2020	0,3	2,9	0	0,7	8,8	0,5	150,1
2021	0	3,4	0,8	0	2,3	0,2	113,7

3.3.7 *Morus bassanus*

Northern Gannet was the most abundant species, with higher average passage rates throughout the observation points. This species had the highest average rate for the study period at Cabo de São Vicente, with 431,8 birds/hour and a peak of 2326,6 birds/hour in November 2021. Cabo Raso also had high numbers (272,9 birds/hour recorded as average). Although it is a passage migrant with two seasonal peaks (January-March and October-November), its presence varied depending on the site and year (Figures 44 to 50).

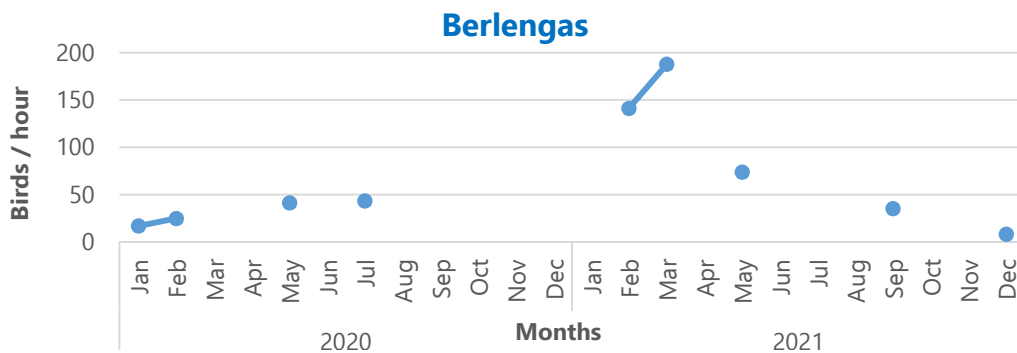


Figure 44 | Monthly passage rates (birds/hour) of *Morus bassanus* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Morus bassanus nas Berlengas para os anos 2020 e 2021.

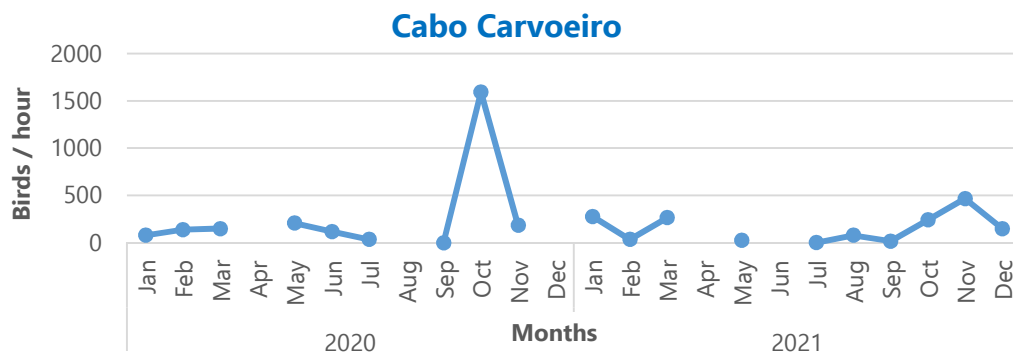


Figure 45 | Monthly passage rates (birds/hour) of *Morus bassanus* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Morus bassanus no Cabo Carvoeiro para os anos 2020 e 2021.

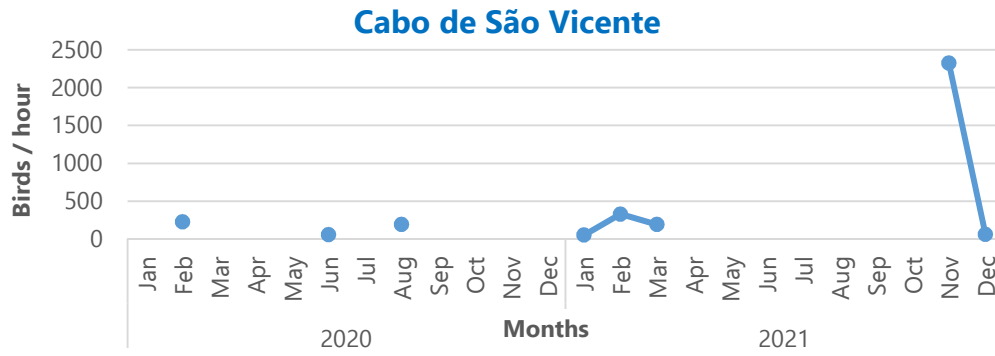


Figure 46 | Monthly passage rates (birds/hour) of *Morus bassanus* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Morus bassanus no Cabo de São Vicente para os anos 2020 e 2021.

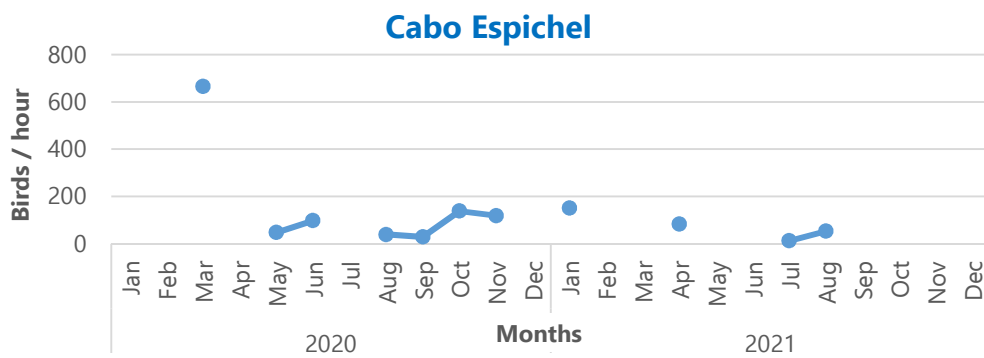


Figure 47 | Monthly passage rates (birds/hour) of *Morus bassanus* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Morus bassanus no Cabo Espichel para os anos 2020 e 2021.

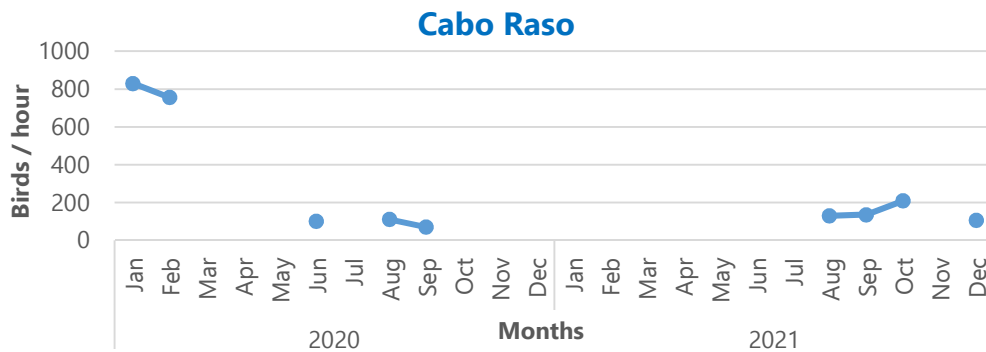


Figure 48 | Monthly passage rates (birds/hour) of *Morus bassanus* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Morus bassanus no Cabo Raso para os anos 2020 e 2021.

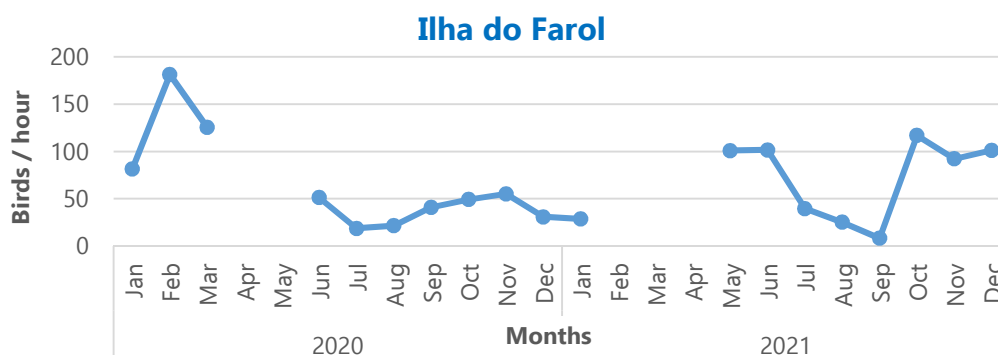


Figure 49 | Monthly passage rates (birds/hour) of *Morus bassanus* at Ilha do Farol for years 2020 and 2021.

Taxas de passagem mensais (aves/hora) de Morus bassanus na Ilha do Farol para os anos 2020 e 2021.

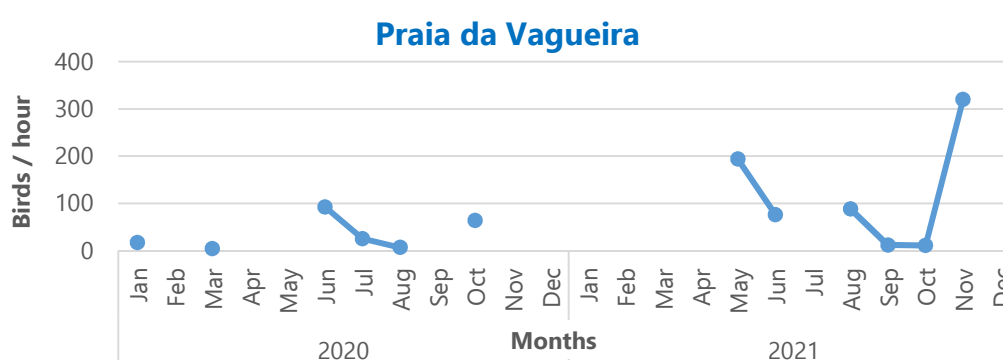


Figure 50 | Monthly passage rates (birds/hour) of *Morus bassanus* at Ilha do Farol for years 2020 and 2021.

Taxas de passagem mensais (aves/hora) de Morus bassanus na Ilha do Farol para os anos 2020 e 2021.

Average annual passage rates for this species varied markedly over the sites and years of study (Table 12). As with monthly passage rates, Cabo de São Vicente and Cabo Raso had the highest values, with 594,2 birds/hour in 2021 and 374,3 birds/hour in 2020, respectively, followed by Cabo Carvoeiro with 279,4 birds/hour in 2020. Cabo de São Vicente and Praia da Vagueira showed an increasing trend from 2019 to 2021. The average annual passage rates at Ilha do Farol seemed to be stable, while they were uncertain at Cabo Carvoeiro and Cabo Raso.

Table 11 | Average annual passage rates (birds/hour) of *Morus bassanus* in each observation point for the last three years.

Taxas de passagem médias anuais (aves/hora) de Morus bassanus em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		146,2	151,7		293,1	84,6	61,7
2020	31,8	279,4	161,2	162,7	374,3	65,7	35,5
2021	89,4	156,7	594,2	75,5	146,3	68,4	117,3

3.3.8 *Puffinus mauretanicus*

Balearic Shearwater was particularly visible at Praia da Vagueira during the study period. On average, 197 birds/hour were observed at this point, with the two highest monthly values recorded in October 2021 (580,7 birds/hour) and September 2020 (459,4 birds/hour). These values were much higher than those registered at the other observation sites. The second highest values were obtained at Cabo Raso and Cabo Carvoeiro, with 23,3 and 23,2 birds/hour, respectively. Even though most individuals were registered between June and December, figures 51 to 57 show that there were sightings at some sites outside this period, like at Cabo Carvoeiro or Cabo Raso.

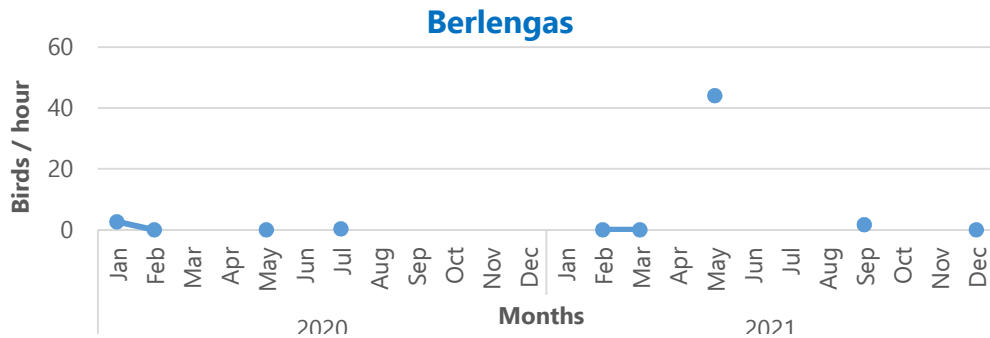


Figure 51 | Monthly passage rates (birds/hour) of *Puffinus mauretanicus* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Puffinus mauretanicus nas Berlengas para os anos 2020 e 2021.

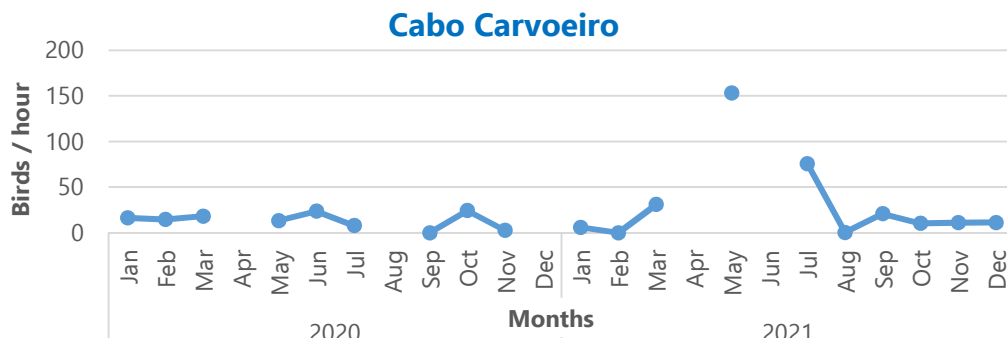


Figure 52 | Monthly passage rates (birds/hour) of *Puffinus mauretanicus* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Puffinus mauretanicus no Cabo Carvoeiro para os anos 2020 e 2021.

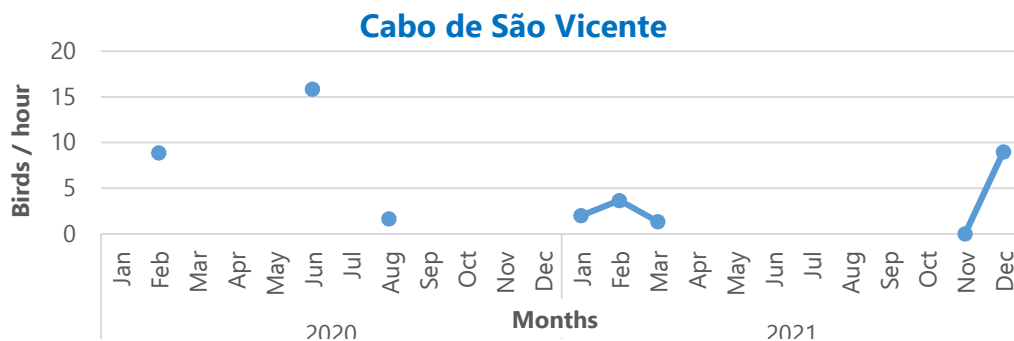


Figure 53 | Monthly passage rates (birds/hour) of *Puffinus mauretanicus* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Puffinus mauretanicus no Cabo de São Vicente para os anos 2020 e 2021.

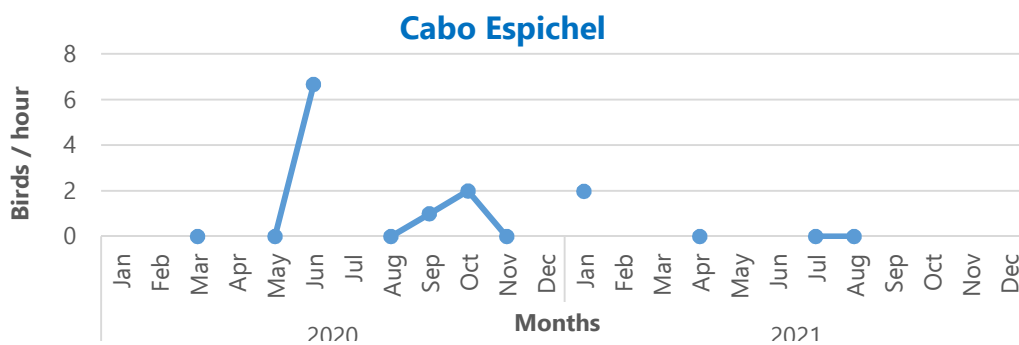


Figure 54 | Monthly passage rates (birds/hour) of *Puffinus mauretanicus* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Puffinus mauretanicus no Cabo Espichel para os anos 2020 e 2021.

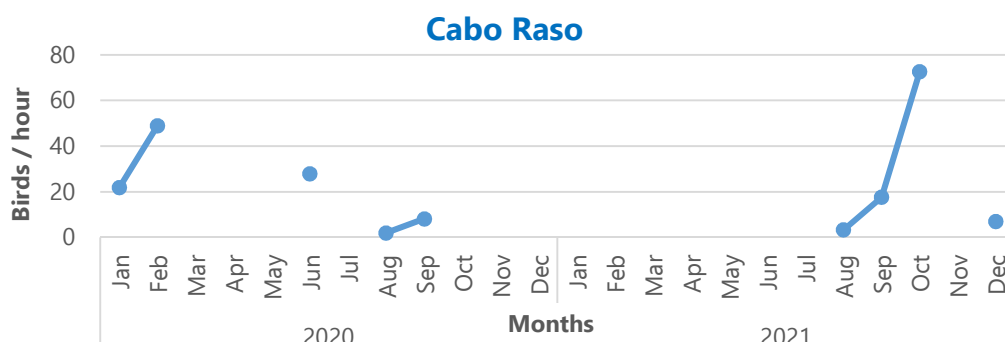


Figure 55 | Monthly passage rates (birds/hour) of *Puffinus mauretanicus* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Puffinus mauretanicus no Cabo Raso para os anos 2020 e 2021.

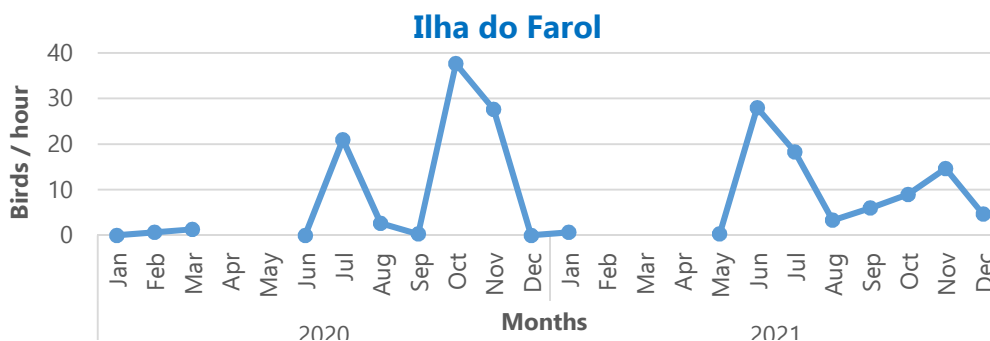


Figure 56 | Monthly passage rates (birds/hour) of *Puffinus mauretanicus* at Ilha do Farol for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Puffinus mauretanicus na Ilha do Farol para os anos 2020 e 2021.

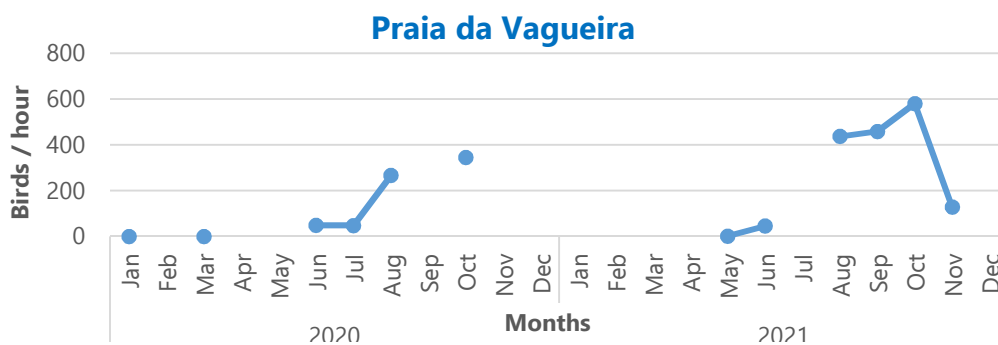


Figure 57 | Monthly passage rates (birds/hour) of *Puffinus mauretanicus* at Praia da Vagueira for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Puffinus mauretanicus na Praia da Vagueira para os anos 2020 e 2021.

As for the average annual passage rates, there is no clear trend for those sites with data for 2019 to 2021, except for Praia da Vagueira, where a constant and notably increase seemed to occur. This site had the highest values for 2020 and 2021, with 118,3 and 275,7 birds/hour, respectively. Other sites, such as Cabo Carvoeiro or Cabo Raso, had recordings for this species at around 30 birds/hour while other observation points had average annual passage rates under 10 birds/hour (Table 13).

Table 12 | Average annual passage rates (birds/hour) of *Puffinus mauretanicus* in each observation point for the last three years.
Taxas de passagem médias anuais (aves/hora) de Puffinus mauretanicus em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		44,5	5,4		36,0	16,3	35,5
2020	0,8	13,5	8,8	1,4	21,8	9,1	118,3
2021	9,2	32,0	3,2	0,5	25,2	9,4	275,7

3.3.9 *Thalasseus sandvicensis*

Praia da Vagueira recorded an average passage rate of 10,7 birds/hour for the study period, presenting the highest value among the study sites. The highest monthly value was registered in June 2021 with 54,7 birds/hour, notably above the average rates. Although with the second highest value, Cabo Carvoeiro showed a lower average passage rate of 7,7 birds/hour. Sightings of this species were rare at Cabo de São Vicente and the Berlengas, with average passage rates under 1 (0,8 and 0,2 birds/hour, respectively). The records of Sandwich Tern occurred mainly during their migratory passages between March-June and August-October (Figures 58 to 64).

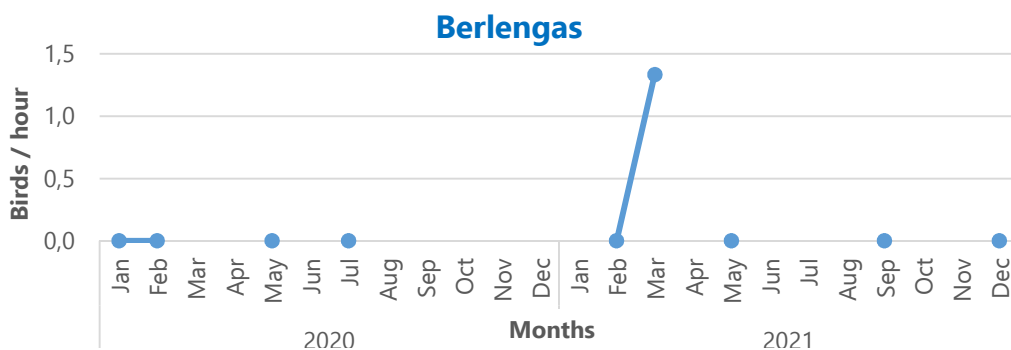


Figure 58 | Monthly passage rates (birds/hour) of *Thalasseus sandvicensis* at Berlengas for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Thalasseus sandvicensis na Praia da Vagueira para os anos 2020 e 2021.

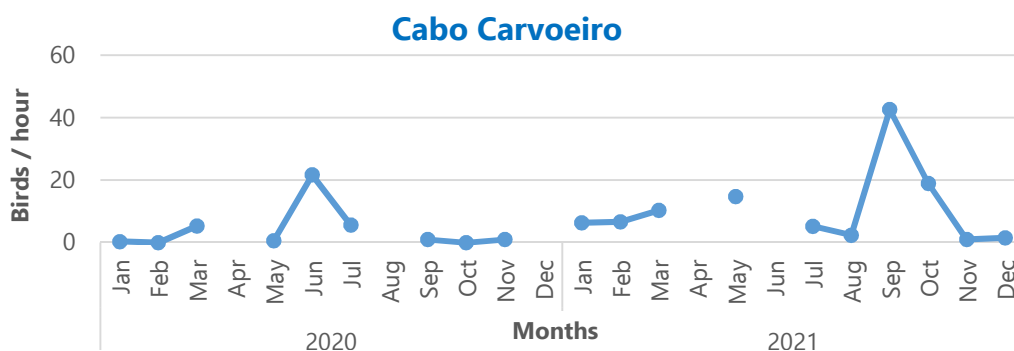


Figure 59 | Monthly passage rates (birds/hour) of *Thalasseus sandvicensis* at Cabo Carvoeiro for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Thalasseus sandvicensis no Cabo Carvoeiro para os anos 2020 e 2021.

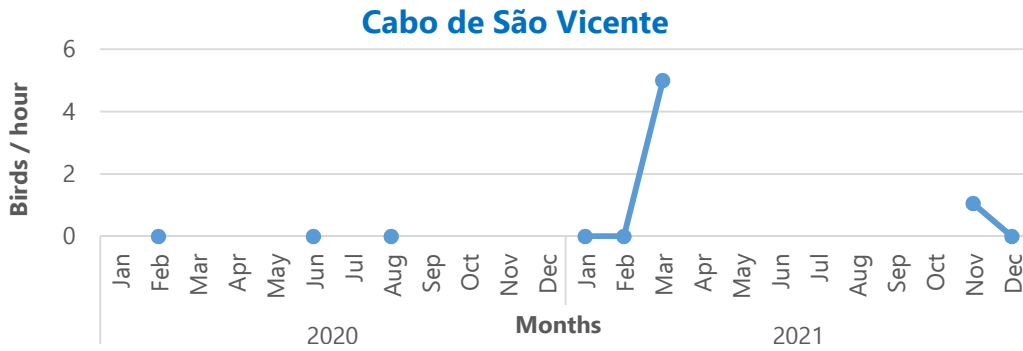


Figure 60 | Monthly passage rates (birds/hour) of *Thalasseus sandvicensis* at Cabo de São Vicente for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Thalasseus sandvicensis no Cabo de São Vicente para os anos 2020 e 2021.

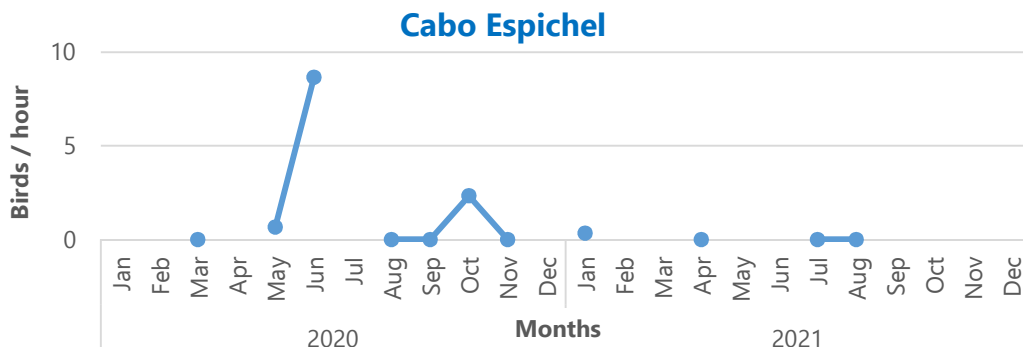


Figure 61 | Monthly passage rates (birds/hour) of *Thalasseus sandvicensis* at Cabo Espichel for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Thalasseus sandvicensis no Cabo Espichel para os anos 2020 e 2021.

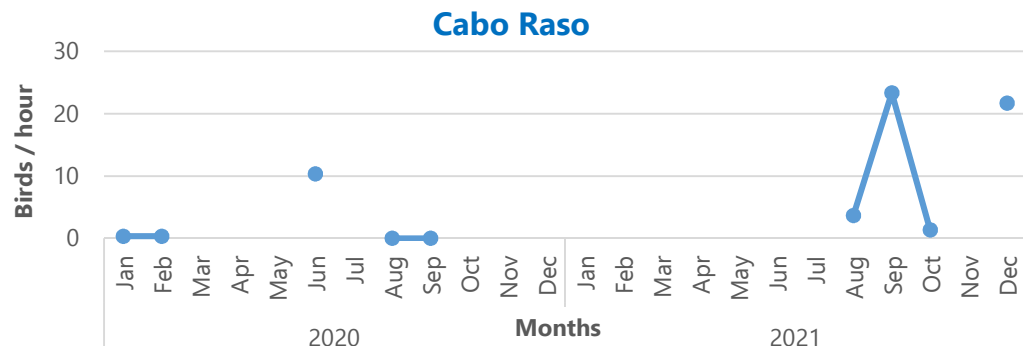


Figure 62 | Monthly passage rates (birds/hour) of *Thalasseus sandvicensis* at Cabo Raso for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de Thalasseus sandvicensis no Cabo Raso para os anos 2020 e 2021

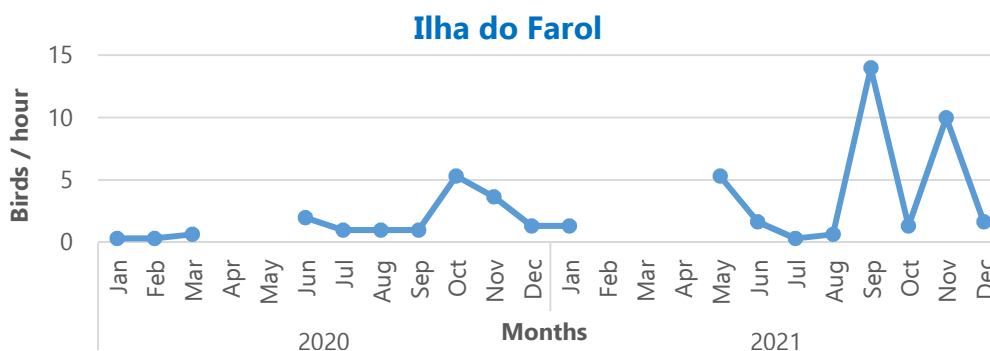


Figure 63 | Monthly passage rates (birds/hour) of *Thalasseus sandvicensis* at Ilha do Farol for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de *Thalasseus sandvicensis* no Ilha do Farol para os anos 2020 e 2021.

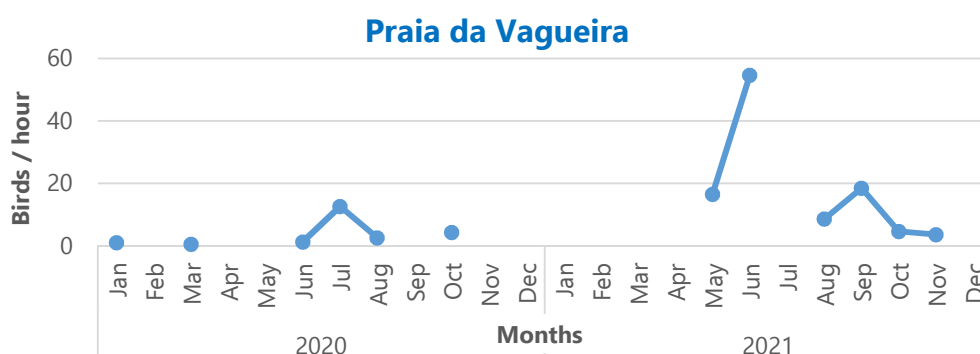


Figure 64 | Monthly passage rates (birds/hour) of *Thalasseus sandvicensis* at Praia da Vagueira for years 2020 and 2021.
Taxas de passagem mensais (aves/hora) de *Thalasseus sandvicensis* na Praia da Vagueira para os anos 2020 e 2021.

Regarding the average annual passage rates, Praia da Vagueira recorded the highest value in 2021 with 17,7 birds/hour, followed by Cabo Raso and Cabo Carvoeiro with 12,5 and 11 birds/hour, respectively, both also in 2021. The year 2020 was characterized by low values, compared with data from 2019 and 2021, except at Cabo Espichel. Cabo Carvoeiro showed a steep decrease compared with the results of 2019, while at Praia da Vagueira the average passage rate increased. All other sites presented stable average annual passage rates (Table 14).

Table 13 | Average annual passage rates (birds/hour) of *Thalasseus sandvicensis* in each observation point for the last three years.
Taxas de passagem médias anuais (aves/hora) de *Thalasseus sandvicensis* em cada ponto de observação nos últimos três anos.

Year	Berlengas	Cabo Carvoeiro	Cabo de São Vicente	Cabo Espichel	Cabo Raso	Ilha do Farol	Praia da Vagueira
2019		44,2	1,9		13,7	2,8	7,2
2020	0	4,0	0	1,7	2,2	1,7	3,7
2021	0,3	11,0	1,2	0,1	12,5	4,0	17,7

3.4 Behavioural analysis *Análise de comportamentos*

Parallel to the abundances and passage rates, the seabirds' behaviour and flight direction has also been recorded at the seven observation points during the years 2020 and 2021. The results for the nine target species are presented below (Table 15). Data collected at Ilha do Farol are presented separately due to the different geographical situation of this site, which is on the south coast instead of the west coast of Portugal.

Table 14 | Behavioural proportions for each of the target species observed across all observation points (Ilha do Farol and the other 6 sites as General). Types of behaviour: N - North, S - South, E - East, W - West, P - Perched, M - Local Movement, A - Feeding, C - Cleptoparasitism, AB - Associated with boats, J - Raft, AC - Associated with Cetaceans.

Proporções comportamentais para cada uma das espécies alvo observadas em todos os pontos de observação (Ilha do Farol e os outros 6 locais como General). Tipos de comportamento: N - Norte, S - Sul, E - Leste, W - Oeste, P - Empoleirado, M - Movimento Local, A - Alimentando-se, C - Cleptoparasitismo, AB - Associado a barcos, J - Jangada AC - Associado com cetáceos.

Species	Site	Year	N	S	E	W	P	M	A	C	AB	J	AC
<i>Alca torda</i>	General	2020	0,97	0,03	0	0	0	0	0	0	0	0	0
		2021	0,49	0,46	0,01	0	0,04	0	0	0	0	0	0
<i>Calonectris borealis</i>	General	2020	0,54	0,19	0,00	0,02	0,01	0,16	0,01	0,00	0	0,09	0,00
		2021	0,36	0,17	0,01	0,13	0,02	0,16	0,01	0,00	0,00	0,09	0,04
	Ilha do Farol	2020	0	0	0,01	0,61	0,00	0,03	0	0	0,00	0	0,34
		2021	0	0	0	0,92	0,00	0,08	0	0	0	0	0
<i>Catharacta skua</i>	General	2020	0,48	0,35	0,02	0	0,02	0,01	0	0,07	0	0,05	0
		2021	0,49	0,36	0,03	0	0,03	0,06	0	0,03	0,01	0	0
	Ilha do Farol	2020	0,01	0	0,02	0,77	0,04	0,04	0	0,02	0,06	0	0,05
		2021	0,01	0	0,02	0,73	0,08	0,09	0	0,04	0,05	0	0
<i>Gulosus aristotelis</i>	General	2020	0,09	0,35	0,18	0,03	0,06	0,28	0,00	0	0	0	0
		2021	0,05	0,35	0,22	0,09	0,07	0,20	0,02	0	0	0	0
	Ilha do Farol	2020	0	0	0	1,00	0	0	0	0	0	0	0
		2021	0	0	0	0	0	0	0	0	0	0	0
<i>Larus melanocephalus</i>	General	2020	0,34	0,57	0	0	0	0,08	0	0	0	0	0
		2021	0,57	0,26	0	0,02	0	0,13	0,02	0	0	0	0
	Ilha do Farol	2020	0,47	0,02	0,01	0,22	0,04	0,24	0	0	0	0	0
		2021	0,28	0,03	0,11	0,43	0	0,15	0	0	0	0	0
<i>Melanitta nigra</i>	General	2020	0,48	0,14	0	0	0	0,37	0	0	0	0	0
		2021	0,61	0,39	0	0	0	0	0	0	0	0	0
	Ilha do Farol	2020	0	0	0	1,00	0	0	0	0	0	0	0
		2021	0	0	0,50	0,50	0	0	0	0	0	0	0
<i>Morus bassanus</i>	General	2020	0,56	0,39	0,00	0,00	0,00	0,04	0,00	0	0,00	0,00	0,00
		2021	0,38	0,20	0,00	0,00	0,35	0,01	0,05	0	0,00	0,00	0,01
	Ilha do Farol	2020	0	0,00	0,02	0,91	0	0,02	0	0	0,01	0	0,04
		2021	0,00	0	0,01	0,78	0,00	0,03	0,05	0	0,00	0	0,12
<i>Puffinus mauretanicus</i>	General	2020	0,76	0,23	0	0,00	0	0,00	0,00	0	0,00	0,00	0
		2021	0,62	0,34	0,00	0,02	0,00	0	0	0,00	0	0,01	0
	Ilha do Farol	2020	0	0	0	0,98	0	0	0	0	0,01	0	0,00
		2021	0	0	0,03	0,94	0,03	0	0	0	0	0	0
<i>Thalasseus sandvicensis</i>	General	2020	0,80	0,20	0	0	0	0	0	0	0	0	0
		2021	0,54	0,42	0	0	0	0,02	0,02	0	0	0	0
	Ilha do Farol	2020	0	0,02	0,22	0,28	0	0,48	0	0	0	0	0
		2021	0,11	0	0,21	0,28	0	0,39	0,02	0	0	0	0

The main flight directions of the target species have been analysed and represented separately, with the aim of verifying whether there are temporary patterns, for example, related to migration. The graphs below show, case by case, the monthly proportion of individuals observed in north/south flight (west/east for Ilha do Farol). For each species, the two sites with the highest average passage rate for the study period were selected (detailed in 3.3 Passage rates).

In the case of the Razorbill, the observations were concentrated in the winter months, with birds at Cabo Raso predominantly flying to the north. At Cabo de São Vicente they were observed flying in all directions, although the lack of observations makes it impossible to draw a clear pattern.

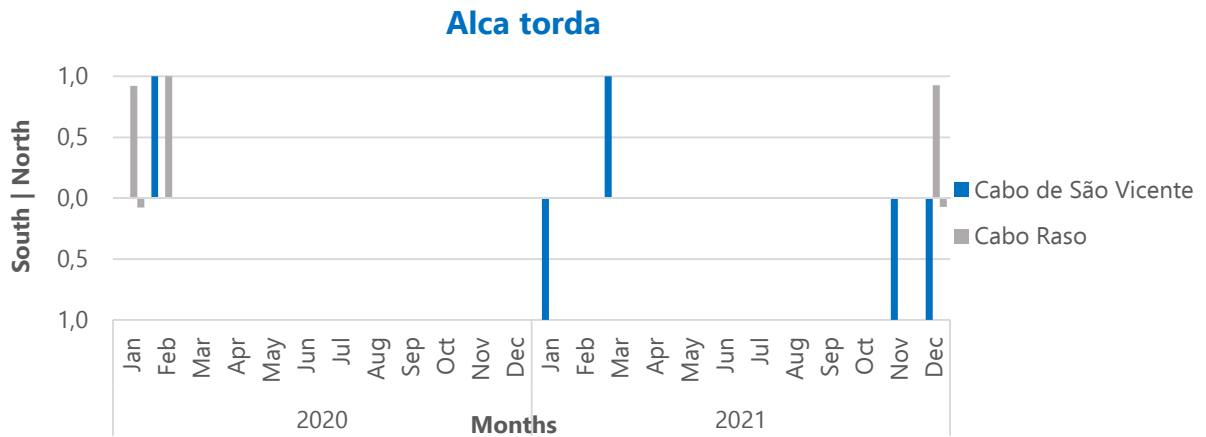


Figure 65 | Proportional split of flight direction of *Alca torda* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north and bottom columns birds flying south.

Divisão proporcional da direção de voo de Alca torda nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte e as colunas inferiores as aves em voo para o sul.

The Cory's Shearwaters observed in directional flight showed a similar pattern at both the Berlengas and Cabo Raso. Though in January 2020 a large proportion of Cory's was flying south, for the rest of the year most birds were flying to the north. Observations for 2021 followed this line, but in September a higher proportion of individuals moved to the south.

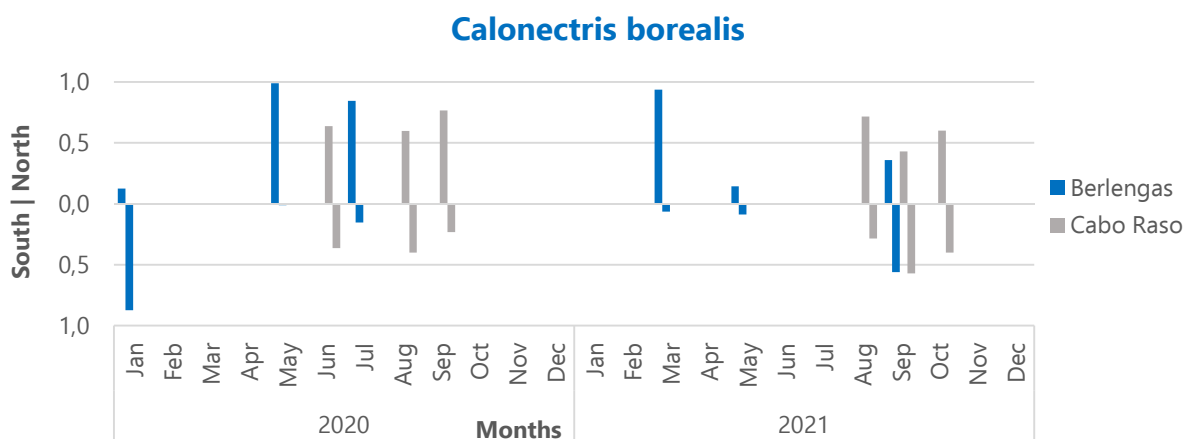


Figure 66 | Proportional split of flight direction of *Calonectris diomedea* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north and bottom columns birds flying south.

Divisão proporcional da direção de voo de Calonectris diomedea nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte e as colunas inferiores as aves em voo para o sul.

Great Skuas showed different directions of flight at the two studied sites. During the first months at Cabo Raso, a similar proportion of individuals flying to the north and south was seen, while in late summer, the predominant flight was to the south. Later, during winter, they switched the flight direction to the north. At Ilha do Farol, there was a clear dominance of the flight to the west.

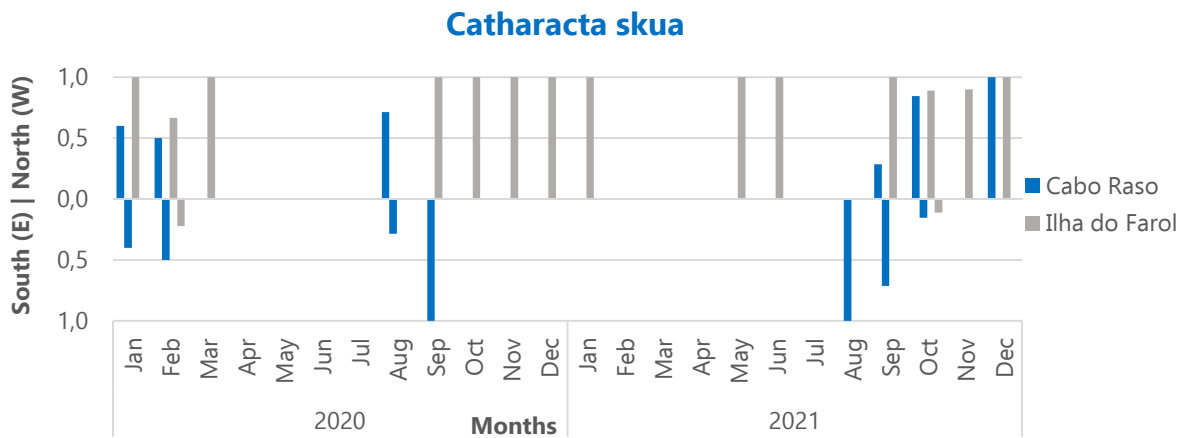


Figure 67 | Proportional split of flight direction of *Catharacta skua* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north (west on Ilha do Farol) and bottom columns birds flying south (east on Ilha do Farol).

Divisão proporcional da direção de voo de Catharacta skua nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte (oeste para a Ilha do Farol) e as colunas inferiores as aves em voo para o sul (este para a Ilha do Farol).

The Berlengas and Cabo Carvoeiro were the observation points with the highest average passage rate of European Shag although this species did not seem to show any seasonal pattern in the direction of flight. At Cabo Carvoeiro, a significant proportion of birds appeared to be moving south, but in May and September 2020 this behaviour was reversed. At the Berlengas, the flight to the south predominated, but in January 2020 and March 2021 exceptionally more individuals were observed to the north.

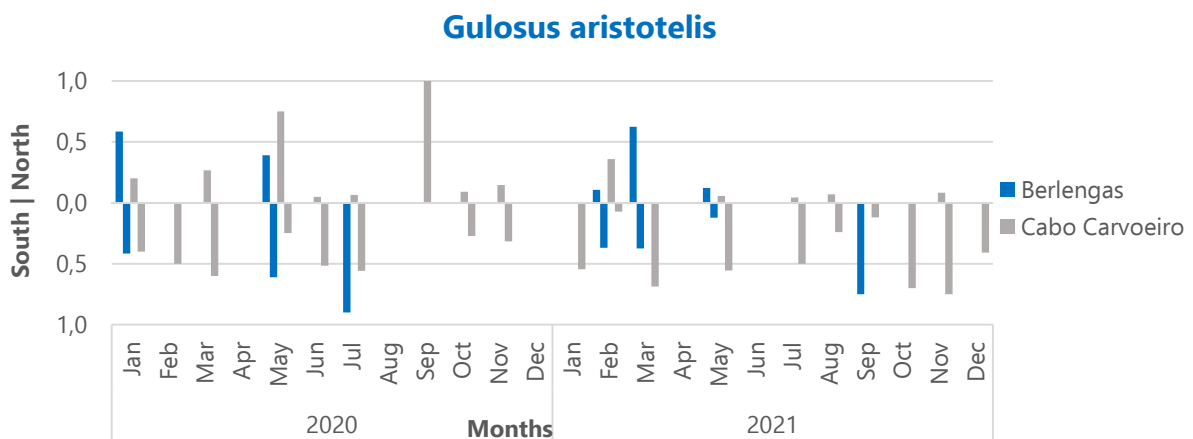


Figure 68 | Proportional split of flight direction of *Gulosus aristotelis* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north and bottom columns birds flying south.

Divisão proporcional da direção de voo de Gulosus aristotelis nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte e as colunas inferiores as aves em voo para o sul.

Regarding the Mediterranean Gull, the recorded flight directions were different depending on the observation point. While in the first two months recorded at Cabo Raso the flight to the south predominated, in the remaining months, the direction of flight was to the north. At Ilha do Farol, on the other hand, records were concentrated in the fall and winter, and most flights were to the west.

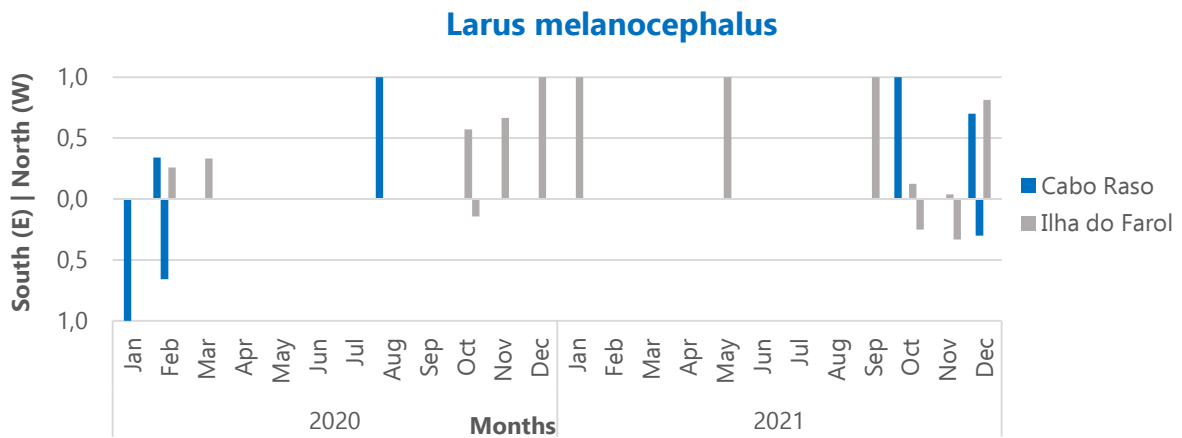


Figure 69 | Proportional split of flight direction of *Larus melanocephalus* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north (west on Ilha do Farol) and bottom columns birds flying south (east on Ilha do Farol).

Divisão proporcional da direção de voo de Larus melanocephalus nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte (oeste para a Ilha do Farol) e as colunas inferiores as aves em voo para o sul (este para a Ilha do Farol).

In the case of Common Scoter, the predominant flight direction was north at Praia da Vagueira, except in the summer months (both in 2020 and 2021). At Cabo Raso, it's difficult to establish a pattern due to a lack of observations, but by the end of the summer of 2021, most of the individuals were moving north, while during the fall and winter the flight to the south predominated.

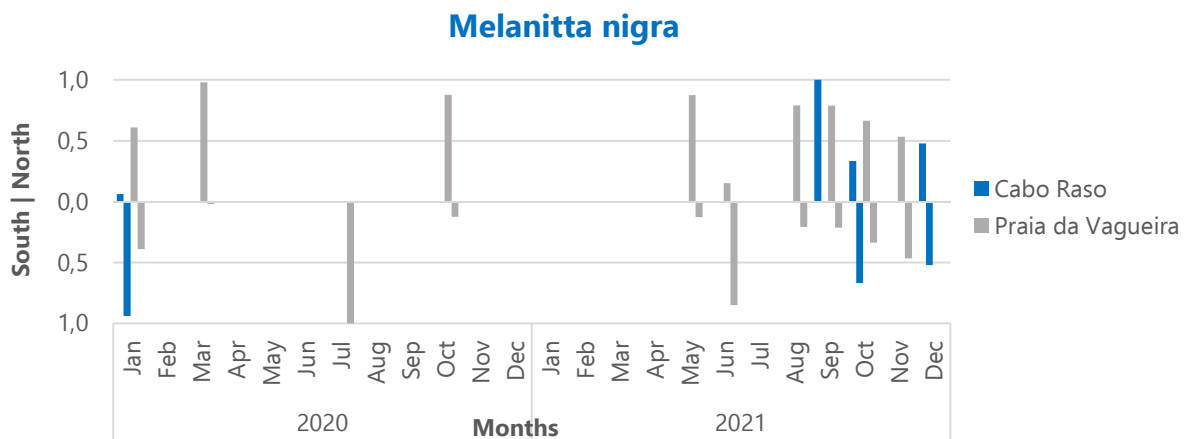


Figure 70 | Proportional split of flight direction of *Melanitta nigra* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north and bottom columns birds flying south.

Divisão proporcional da direção de voo de Melanitta nigra nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte e as colunas inferiores as aves em voo para o sul.

The highest abundance of Northern Gannet occurred between October and March, but the direction of flight varied according to season. At Cabo de São Vicente, most birds were flying to the north in the first months of the year and flying south in November and December. The exception is the high number of birds flying to the south in June 2020. At Cabo Raso, the pattern was similar, although the number of birds flying North in June and August 2020 and August-September in 2021 was a surprise.

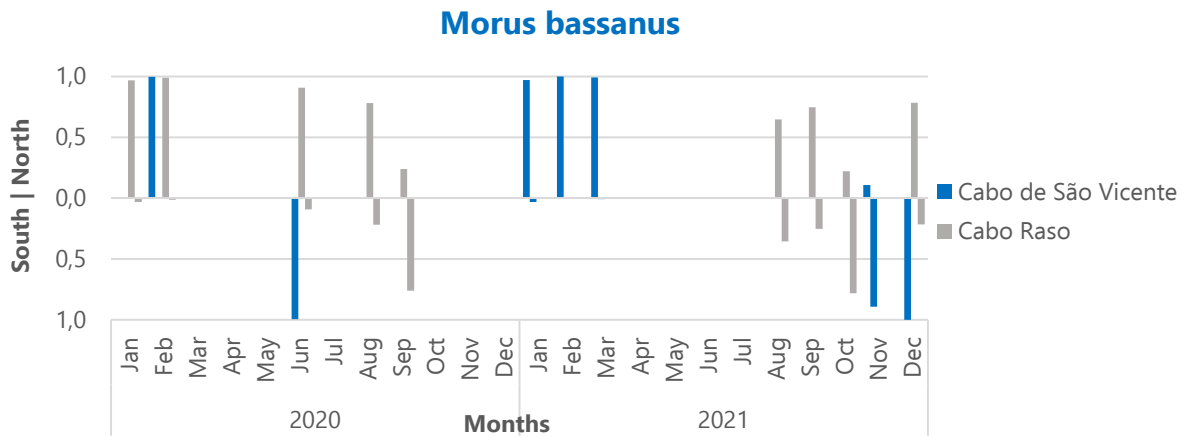


Figure 71 | Proportional split of flight direction of *Morus bassanus* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north and bottom columns birds flying south.

Divisão proporcional da direção de voo de Morus bassanus nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte e as colunas inferiores as aves em voo para o sul.

The direction of flight in the Balearic Shearwaters was similar at both studied sites. At Cabo Raso, exceptionally in February 2020, many individuals headed to the south. In the summer, after the breeding season, at Cabo Raso and Praia da Vagueira, northbound flight predominated, while in autumn and winter, especially in 2021, the recorded flight direction split into equal parts between north and south.

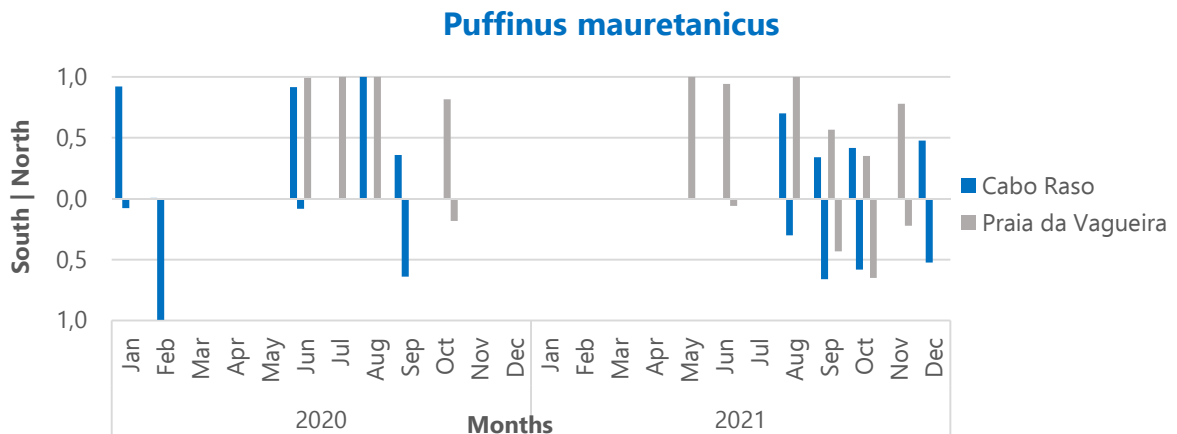


Figure 72 | Proportional split of flight direction of *Puffinus mauretanicus* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north and bottom columns birds flying south.

Divisão proporcional da direção de voo de Puffinus mauretanicus nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte e as colunas inferiores as aves em voo para o sul.

Regarding the Sandwich Tern, there was high variability in flight patterns, probably due to local movements. At both sites, generally, most individuals were observed heading north in the spring and early summer months. This trend changed in late summer and autumn until winter, in which the predominant flight direction was to the south.

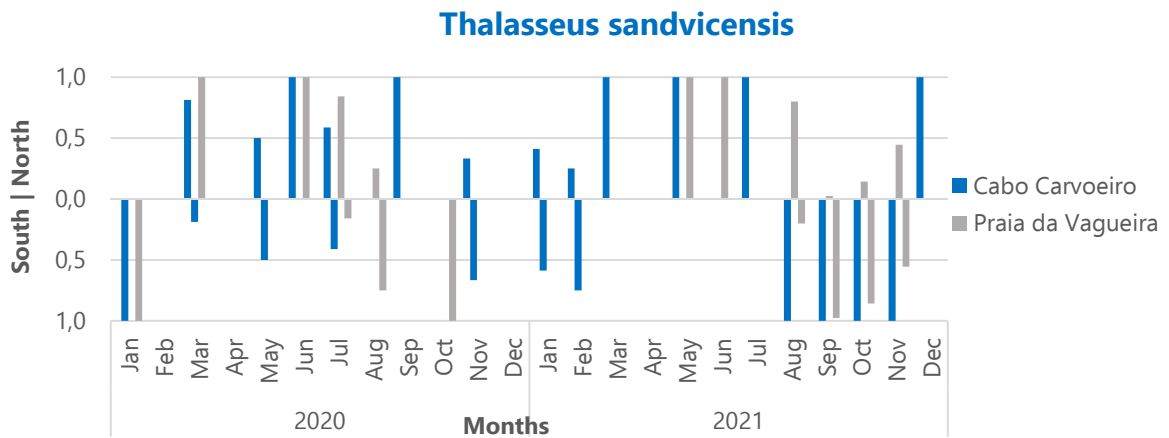


Figure 73 | Proportional split of flight direction of *Thalasseus sandvicensis* at the two observation points with the highest average passage rate for years 2020-2021. Upper columns indicate birds flying north and bottom columns birds flying south.

Divisão proporcional da direção de voo de Thalasseus sandvicensis nos dois pontos de observação com maior taxa média de passagem para os anos 2020-2021. As colunas superiores indicam as aves em voo para o norte e as colunas inferiores as aves em voo para o sul.

4. DISCUSSION

The observational effort of the RAM censuses has been variable over the years due to several factors. A clear example, in the study period of this report, was the difficulty in carrying out the observations during most of 2020 and the spring of 2021, caused by the mobility restrictions decreed due to the COVID-19 pandemic. This situation led to a certain lack of continuity in the number of visits per year at each sampling point, which had an evident impact on the data analysis. Also, the variability in the number of observation points over the years also caused fluctuation in these values. Even so, efforts were made to keep observations above 120 hours per year, with 125 hours in 2020 and 122 hours in 2021, although it was far from the 158 hours expended in 2011 (Sengo et al., 2012), 143 hours in 2013 (Oliveira et al., 2014) or 136 hours in 2014 (Fagundes & Felipe, 2018). Since 2011 an average of 130,2 hours per year were spent in RAM censuses.

Since 2014, Ilha do Farol has remained the site with the highest observation effort, with 30 hours in 2020 and 27 hours in 2021, although it represents a decrease compared to 2019 values (Adlard & Fagundes, 2020). This site was visited for 19 months, the same as Cabo Carvoeiro. For the last though, the counts occurred during 27 and 28 hours in 2020 and 2021, respectively. The least visited site was Cabo de São Vicente, with 23 hours in only eight visits in the last two years of study.

Regarding the diversity of seabird species, no clear trend was observed. In 2017, 26 species were detected (Guedes & Fagundes, 2019), a number that increased to 32 and 35 species in 2018 and 2019, respectively (Barradas & Fagundes, 2019; Adlard & Fagundes, 2020). Later in 2020, it decreased to 27 species, and in 2021 34 species were detected. For the last two years, a total of 35 species of seabirds were recorded. Ilha do Farol and Cabo Carvoeiro were the places with the highest diversity, with 18 and 21 species and 17 and 22 species for the years 2020 and 2021, respectively.

The passage rates followed the same dynamics shown in previous reports (Adlard & Fagundes, 2020), with peaks of abundance at the beginning of spring and at the end of autumn. In October 2020 and November 2021, two remarkable peaks were recorded, with 1665,7 and 2334,7 birds/hour, respectively. In the first case, 4786 Northern Gannets were counted in 3 hours of observation, while in November of the following year, 6592 individuals were counted. In both cases, they accounted for more than 95% of the birds counted that day. On the other hand, the lowest passage rate was recorded in the month of July, which did not exceed 140 birds/hour. The months with minimum values varied between previous reports but have always been around summer. We cannot establish comparisons because there is natural variability in the passage peaks due to different factors such as variations in climatic and meteorological conditions, the species phenology and the sampling effort. The latter varied significantly during the study period, with a direct effect on the calculation of passage rates too. It is easily noticeable in April 2020, when no census was carried out or in the months of December 2020 and April 2021, when only one site was visited. As the time series of RAM censuses becomes more consistent over the years, it would be interesting to analyse separately those sites that have been visited continuously.

For the first time since 2009 (Adlard & Fagundes, 2020), Razorbills were not detected at Ilha do Farol, although they were present at the other six sites. The number of individuals observed on each day rarely exceeded 15, a fact that fits with previous reports, as well as the time of year when this species was present on the Portuguese coast. During 2020 and 2021, Razorbills were sighted between November and February, with some isolated individuals in March. In addition, it seems that the flight patterns correspond with the species' migratory phenology, given that at the end of autumn they flew towards the south and, before the beginning of the breeding season, they moved back towards the north.

Cory's Shearwaters, on the other hand, were found at all observation points. The sites with the highest passage rates were the Berlengas and Cabo Raso, with a maximum value of 123 birds/hour in September 2020 at Cabo Raso. Sightings were concentrated between June and October, with sporadic cases in winter, although they varied slightly between 2020 and 2021. The observations at Cabo Carvoeiro seem to indicate that this species was detected a bit earlier at this point, but comparisons cannot be established due to the lack of visits at other sites in early spring. The number of individuals observed remained stable or little below the results of 2019, except at Ilha do Farol, where there was a little increase (Adlard & Fagundes, 2020). For this species, and in line with previous reports (Guedes & Fagundes, 2019; Barradas & Fagundes, 2019; Adlard & Fagundes, 2020), the flight towards the north generally predominated, which could be explained by the movements towards the feeding areas of the Berlengas and other points in the north-west of the Iberian Peninsula.

In the case of the Great Skua, they remained present at all observation points, with significantly higher passage rates at Ilha do Farol. Here, the number of birds/hour reached 20, while the other sites registered values between 1 and 5 birds/hour. These results are similar to previous reports despite variations (Barradas & Fagundes, 2019;

Adlard & Fagundes, 2020). Regarding the flight direction, there are differences between Ilha do Farol and the other sites due to the different geographical situation. In Ilha do Farol, the flight to the west predominated, which could be related to the fact that generally, the wind in this region is of an easterly component, and this would facilitate the movement in this direction near the coast, where they are detectable by RAM observers. In the other sites, northward flight predominated, except in autumn when individuals were recorded flying south. This pattern fits well with the species' migratory phenology, spending the winter on the western coasts of Europe and returning to the breeding grounds in the north of the continent in mid-spring.

European Shags were observed at all sites except Praia da Vagueira. Also, only one individual was recorded at Ilha do Farol in October 2020, so it can be considered an isolated case. These results are in line with those of previous reports and are explained by the lack of rocky cliffs in this part of the Portuguese coast, which is the species preferred habitat (Meirinho et al., 2014; Barradas & Fagundes, 2019; Adlard & Fagundes, 2020). Even though some movements between breeding colonies and non-breeding areas have been described in the Adriatic Sea (Sponza et al., 2013), in general, European Shags are a sedentary species, so they were observed throughout the study period, although irregularly. Regarding the movement patterns, no clear trend was observed since the recorded movements probably corresponded to movements between feeding and resting areas.

The Mediterranean Gull is another species detected at the seven observation points. However, the number of records at the Berlengas and Cabo de São Vicente is anecdotal as it did not exceed three individuals in two years. On the other hand, the 363 individuals observed in Cabo Raso in February 2020 stand out. Records of this species were concentrated between October and March, although individuals were detected throughout the year. Between April and June, there were no records of Mediterranean gulls. Passage rates remained similar to previous years, but there were variations at Praia da Vagueira and Cabo Raso due to the unusual peaks of individuals observed in 2019 and 2020, respectively (Adlard & Fagundes, 2020). The lack of observations makes it difficult to establish a pattern in the flight direction of this species, which gathers in the breeding colonies between February and April and disperses in the post-nuptial migration from the end of June (Olsen & Larsson, 2003).

Common Scoters were observed at all sites, including Cabo de São Vicente, where there were no records in the previous year (Adlard & Fagundes, 2020). Monthly passage rates increased in Praia da Vagueira compared to 2019, which presented two notable peaks in March 2020 and November 2021 with 535,5 and 419,2 birds/hour, respectively. These large groups of scoters fit the species' behaviour, which can gather in large flocks during the non-breeding season. On the other hand, the annual passage rates in Praia da Vagueira showed a positive trend, increasing from 35 birds/hour in 2014-2016 to 132 birds/hour in 2020-2021. At all other sites, passage rates remained similar despite little variations. Common Scoters are a species with long-distance migrations between breeding ranges in Iceland and Scandinavia and wintering areas from the west coast of Europe to the northwest coast of Africa. This distribution would explain why fewer individuals were recorded at the southernmost observation points, located at the limit of their migratory range. Regarding the flight direction patterns, it is difficult to draw conclusions about Cabo Raso, due to the lack of observations. The results at Praia da Vagueira seem to show differences with what would be expected from the species' migratory phenology. This could also be due to the fact that the individuals counted in the RAM censuses are at the southern limit of their distribution area, and what is actually being registered would be regional-scale movements in wintering areas. This phenomenon has also been observed in previous reports (Guedes & Fagundes, 2019; Barradas & Fagundes, 2019; Adlard & Fagundes, 2020).

Northern Gannets have, once again, been the most abundant species in the RAM censuses and were detected at all observation points, as in previous reports (Sengo et al., 2012; Oliveira et al., 2014; Fagundes & Felipe, 2018; Guedes & Fagundes, 2019; Barradas & Fagundes, 2019; Adlard & Fagundes, 2020). The species passage peaks were recorded in autumn, between October and November. At the beginning of spring, between March and April, a great number of individuals was also detected, but the discontinuity in the censuses makes it difficult to give conclusive results. These peaks of passage coincide with the phenology of this species, which performs its pre-nuptial migration to the coasts of the North Atlantic between January and February and returns to its wintering areas between September and November (Meirinho et al., 2014). Passage rates have been quite variable since the first RAM reports. An increase in the number of individuals has been observed in Cabo Carvoeiro, Cabo de São Vicente and Praia da Vagueira, while in the other sites, the passage rates remained slightly lower than in previous years (Adlard & Fagundes, 2020). It is remarkable that an average of 594.2 birds/hour were counted at Cabo de São Vicente in 2021. Regarding the direction of flight, the results fit perfectly with the displacements described above, despite the periods without censuses at some sites.

The Balearic Shearwater was sighted at all the observation points and has been so since the first RAM censuses (Sengo et al., 2012; Oliveira et al., 2014; Fagundes & Felipe, 2018; Guedes & Fagundes, 2019; Barradas & Fagundes, 2019; Adlard & Fagundes, 2020). The highest passage rates were recorded in Praia da Vagueira, surpassing even the values of 2018 (Barradas & Fagundes, 2019) and being the highest so far. With respect to previous reports, these values also increased in Cabo Carvoeiro and Cabo Raso, while they have remained variable in Cabo de São Vicente and Ilha do Farol (Barradas & Fagundes, 2019; Adlard & Fagundes, 2020). This increase might be due to higher concentrations on the Portuguese coast or to the conservation measures implemented for the species at sea and on breeding grounds. Although, the information pointed out by Arcos et al. (2022) contradicts both hypotheses. This species was observed throughout all study period, but the highest abundances were recorded from mid-summer to late autumn. These results are in line with the movements described by Meirinho et al. (2014), especially regarding post-nuptial migration from the Balearic Islands to the Portuguese coasts. In the months with higher passage rates, the flight to north predominated, although, in 2021, it was quite irregular. These variations could be explained by displacements between feeding areas.

Sandwich Terns were also present at the seven observation points since 2009 (Sengo et al., 2012; Oliveira et al., 2014; Fagundes & Felipe, 2018; Guedes & Fagundes, 2019; Barradas & Fagundes, 2019; Adlard & Fagundes, 2020). Only in 2018, they were not detected in Cabo de São Vicente (Barradas & Fagundes, 2019). This species was present throughout the study period, but two peaks of abundance were observed in May-June and September-October. These results agree with the presence of a small wintering population in Portugal and the migratory phenology described by Meirinho et al. (2014). Although, the prenuptial migration starts in April, when virtually no censuses could be carried out in either 2020 or 2021. Surprisingly, fewer individuals than expected were detected in the autumn 2020. The highest Sandwich Tern passage rates were recorded at Praia da Vagueira, with up to 54,7 birds/hour in June 2021, while generally low passage rates were recorded at all other points in 2020. The most significant change occurred at Cabo Carvoeiro because 2019 was exceptional for this species at this site (Adlard & Fagundes, 2020). Regarding the direction of flight, the results are in line with the movements towards the breeding areas throughout the European coast during the spring and the return to the wintering areas in their postnuptial migration.

After years of applying this methodology, some advantages and disadvantages have been found. On one side, it is easy and cheap to carry out the census, and the process is intuitive and standardized, making it very useful in obtaining data on population trends, phenologies and behaviours. On the contrary, there is a strong dependence on external factors such as observer availability or meteorological conditions, which can cause variations in the sampling effort over time or limit the observers' visibility range. Other unexpected situations, such as the COVID-19 pandemic and the mobility restrictions that were decreed, also have a direct effect on the results of these studies. Due to these external variables, in some cases, it is difficult to establish comparisons between years or reports. Even so, it is very important to continue with these censuses because, as the time series available grows, the information it provides is more consistent and allows us to detect changes in the species abundances, phenologies or behaviour patterns. After all, these censuses are another effective tool for the conservation of both threatened and non-threatened seabird species. Besides, the RAM censuses have the value of introducing seabirds to new people, such as young students who are trained to dedicate themselves to biodiversity conservation.

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