

BIRDWATCHING AND BIRDING BY EAR: AN ACCESSIBLE AND INCLUSIVE TOURISM PROPOSAL FOR THE CITY OF LAGOS

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Abstract: Accessible tourism goes beyond the physical dimension, associating services with sensory experiences, considering the specificities of people with disabilities. Birdwatching and birding by ear can be a good example of an activity that links visiting new places with outdoor activities. It can bring positive outcomes to the visitors through the benefits of being outside and connecting with nature, consequently, with ecosystem services; moreover, it can be an inclusive and accessible activity. Urban areas are increasing all over the world. In a sustainable context, green and blue infrastructures have received increasing attention in urban strategies. They create new habitats, contributing to urban biodiversity and, at the same time, providing many ecosystem services that guaranty well-being for the communities. The main goal of this study was to inventory and characterize the bird community in the urban area of Lagos, a touristic city in the South of Portugal. Birdwatching and birding by ear in the city could have the potential for an inclusive and accessible touristic activity. Three different sites along the city were sampled

and a total of 35 species were sighted and identified. Some of these species could be identified through specific web sites which describe the bird and give the respective bird singing sound. Most species identified were migratory, which increases the potential to sight different species through the year. The three sites' location has high potential to be integrated into accessible walking routes or tours, which increases the relevance of this study.

Keywords: Birdwatching; Birding by ear; urban environment; avifauna; well-being; accessible tourism; inclusive tourism.

Introduction

Tourism among green and blue spaces can positively impact on their visitors, not only concerning their physical and mental health but also in providing a sensorial experience regarding the surrounding environment.

Various types of habitats, which we will designate as green and blue spaces, such as forest, grasslands, woodlands, gardens, wetlands, riverbanks, lakes, sea, among others, can provide ecosystem services (Maidstone Borough Council, 2016; Barbie et al., 2011); Nowak, Crane & Stevens, 2006) that can be defined as “components of nature, directly enjoyed, or used to yield human well-being” (Boyd & Banzhaf, 2007). More specifically, different types of ecosystems can contribute with a variety of services such as provisions (food, fresh water, soil, biomass fuels, natural medicines), regulating (regulation of climate, air and water purification, noise mitigation, natural hazard mitigation), supporting (formation of soil and biomass, recycling and renewal of nutrients, oxygen production through photosynthesis, nursery habitat) and cultural services (nature' aesthetic value and appreciation, recreation opportunities and spiritual/religious enrichment) (Elmqvist, 2013; de Groot, Alkemade, Braat, Hein, & Willemen, 2010; Millennium Ecosystem Assessment, 2005; Turner & Chapin, 2005).

Visiting urban green and blue spaces can benefit human's well-being in a variety of forms. More specifically, in terms of health, these places can function as a motivational localization to increase physical exercise in a

natural environment by the local population; which in turn, is associated with an increase of self-reported health, from a physical and mental point of view (Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007; de Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003). Regarding physical health, some studies reported that being in contact with natural environments can improve the function of the immune system due to exposure to a variety of beneficial microorganism (Kuo, 2015; Rook, 2013). Recreational walking in green spaces or near blue spaces enhances people's physical activity, contributing to a reduction in sedentary time. As a result, it helps to reduced obesity, to improve cardiovascular health and osteoporosis disorder, among other benefits (Dadvand et al. 2015; Owen, Healy, Matthews, & Dunstan, 2010; Edensor, 2012). As for mental health, being in contact with natural places can help in the reduction of stress and negative emotions and improve general personal satisfaction (Bowler, Buyung-Ali, Knight, & Pullin, 2010; White, Alcock, Wheeler, & Depledge, 2013). Walking in green spaces or near blue spaces can enhance the feeling of relaxation and mental restoration, can help to reduce mental fatigue and to improve the performance in cognitively demanding tasks (Kaplan, 2001; Kaplan & Kaplan, 2011). Moreover, green and blue spaces can enhance social interactions and cohesion by facilitating social networking and social inclusion, promoting an improved sense of community (Kim & Kaplan, 2004; Seeland, Dübendorfer, & Hansmann, 2009).

In addition to the benefits previously exposed, tourism among natural locations can provide visitors with a sensorial experience regarding the surrounding environment. These multi-sensory experiences can generate a greater link between the visitor and the surrounding environment and can lead to a memorable physical reminder of that place, which in turn, can lead to "long term changes in conservation behaviour" by the visitors (Ballantyne, Packer, & Falk, 2011). The sensory elements that can be experienced by the visitors in a natural environment are visual, smell, sounds, taste, texture, personal feelings, mobility and, together, the individual's perception of the surrounding habitat results in their conscious sensory experience (Goldstein, 2010). All these multi-sensory stimuli can enhance visitors experience and knowledge concerning their surrounding natural habitats and provide a memorable visit for them (Zainol, 2014; van Hoven, 2005). These aspects are

important in nowadays tourism to allow a full and meaningful experience in the final destination. For example, the sound of birds singing can be heard by the visitors and, later, this sensorial stimulus can remind the visitors and give them an image of that specific destination (Gibson & Connell, 2007).

As mentioned above, natural environments can benefit mental health by reducing stress and inducing positive emotion. However, few studies are demonstrated a direct link between human's well-being when exposing to biodiversity. Nevertheless, Fuller et al. (2007) showed that physical and psychological benefits of contact with natural environments increased with habitat diversity and species richness, being bird richness positively correlated with psychological well-being perceived by the population. Dallimer et al. (2012) observed that the perceived biodiversity of plants, butterflies and birds by the population can increase their sense of psychological well-being. Carrus et al. (2015) observed that both the greenspaces' location and the biodiversity it contains are important factors contributing to the sensation of restorative benefits of their visitors. Another study showed that watching marine coastal wildlife was associated with the improvement of visitors' mood and happiness (Wyles, Pahl, & Thompson, 2014).

Taking into account the benefits mentioned of being in contact with nature and its biodiversity, from the tourism point of view, birdwatching is a good example that links visiting new places with outdoor activities that bring positive outcomes to the visitors. In this way, birdwatching can be seen as niche tourism which is designated as "special interest, culture and/or activity-based tourism, involving smaller numbers of tourist in more authentic settings, and could be more sustainable and less damaging tourism" (Novelli, 2004). In this sense, niche tourists are the ones that have specific motivations and interests and, therefore, will visit destinations to meet their specific interest. Hereupon, birdwatching has the potential to diversify the product in tourism, reduce seasonality and disperse tourist to less-visited places (Acorn Consultants, 2008). Concerning the Algarve region, it has a great potential for birdwatching due to its bird diversity, around 360 regularly occurring species, as well as good climate conditions (Machado, 2011; Costa, 2015). However, birdwatching is usually designed for people who have good sight and hearing. Besides, as a tourist activity, it tends not to consider the human diversity, the

need for universal design of the built environment and the associated accessibility for all.

According to the European Concept for Accessibility, accessibility “is the characteristic of an environment or object which enables everybody to enter into a relationship with, and make use of, that object or environment in a friendly, respectful and safe way” (Aragall et al., 2003). It is associated with Universal Design, which aims to make the design and composition of different environments and products accessible and understandable, as well, as usable by everyone, to the greatest extent, most independently and naturally possible, without the need to adapt design solutions (Center for Universal Design, 1997). According to these authors, there are seven principles associated with the universal design: 1) equitable use; 2) flexibility in use; 3) simple and intuitive use; 4) perceptible information; 5) tolerance for error; 6) low physical effort; 7) size and space for approach and use. These principles must always be incorporated in the conception of products and physical environments to create a fair built-up environment, where all have the right to use it in the same way, any part of the built-up environment, independently and naturally. Thus, Universal Design is a key attribute of accessible and inclusive tourism. Since providing access and opportunities to people with disabilities, it is not only an ethical issue and a legal obligation but also a business opportunity in the tourism sector (Asia-Pacific Economic Cooperation, 2013).

Accessible tourism can be designated as a “process of enabling people with disabilities - mobility, vision, hearing and cognitive - and seniors to function independently and with equity and dignity through the delivery of universal tourism products, services and environments” (Darcy, 2006). So, accessible tourism for everyone is transversal to many kinds of tourism, which develops leisure and spare time activities in such a way that every type of people may enjoy it, regardless of their physical, social or cultural conditions.

Studies have shown that people with disabilities feel satisfied after visiting natural environments and participate in wilderness activities (Jaquette, 2005; Zeller, 2008). According to a few studies, people with disabilities want to visit nature-based tourism as an escape from the urban/mundane space, to

experience the natural habitat beauty, for relaxation purpose, for boosting family interactions, to increase self-confidence and social adjustments and to experience personal challenges (Saayman, Slabbert, & van der Merwe, 2010; Slabbert & du Plessis, 2013; McAvoy, Holman, Goldenberg, & Klenosky, 2006). Activities such as sightseeing and birdwatching are known to be enjoyed by people with disabilities regarding tourism in natural areas (McAvoy et al., 2006; McCormick, 2004; Chikuta, du Plessis, & Saavman, 2019). However, the configuration of natural environments, generally accessible by pedestrian trails with irregular surfaces or steep slopes, does not guarantee universal accessibility conditions in its physical dimension. So, the focus of the present paper is naturalized urban environments since sustainable and resilient cities have provided green and blue infrastructure in their area, which holds diverse ecosystem services on an urban scale.

Although the visitors' sensations are unique and can vary from person to person, urban planners and tourism operators can facilitate the development of the right environment to enhance a positive and memorable visiting experience (Tung & Ritchie, 2011). Visiting green and blue spaces, near or within the urban context, can offer a specific aesthetical and multi-sensorial experience and appreciation of the surrounding habitat, which, in turn, can lead to an engagement with nature (Todd 2019; Berleant, 2011; Barbier et al., 2008). This is the case of Lagos, a historic city located in the Algarve region in the south of Portugal, a coastal city known for its importance on the Portuguese Discoveries in the 15th century and wonderful landscapes. Moreover, Portugal has more than 400 bird species, residential and migratory, (SPEA, 2008) and around 360 different species in the Algarve region (ERTA, 2009), which is a key region where it is possible to observe rare migratory birds that came from Africa, North America and North Europe. Moreover, in Portugal, the majority of studies regarding species characterization are performed in natural habitats, being the studies about bird community on an urban scale still scarce (Santos et al., 2012; Mexia et al., 2018).

Taking this into consideration, this study aims to inventory and characterize the existing avifauna in the urban area of Lagos. It studies the potential for birdwatching and birding by ear in three different points of the city, assuming an inclusive approach promoting sensorial experiences for all tourists related

to urban green and blue spaces located in the city of Lagos. Additionally, it proposes accessible birdwatching stations that permit their use for all interested people, promote access to ecosystem services through watching and hearing wildlife, and improve residents' and visitors' well-being and happiness. To the best of our knowledge, is the first study regarding Lagos city to propose possible inclusive and accessible birdwatching routes at an urban scale.

Methods

Case study: Bird-fauna in the urban area of Lagos

Study area

The city of Lagos is in the Algarve region, south of Portugal (Figure 1). It is a coastal city, part of Faro district, known as the city of Discoveries. It has a markedly Mediterranean climate and an average temperature of 15.9°C (INE, 2018). It is crossed by a small river (Ribeira de Bensafrim) connected to the sea by a Marina, a prominent place in the city. Along the river, wetland regions and salt marshes can be found. As a coastal city, the rock surrounded beaches are an attraction point, making this city a reference point in the region for Tourism. The municipality has a total area of 212.99 km² (Instituto Geográfico Português, 2013) with a resident population of 30 442 (INE, 2018). Besides the historic centre, along the periphery, the city has grown through the years, receiving every year thousands of tourists (INE, 2018). Although there is no forest area inside the city, there are approximately 20 green spaces, mostly with small dimensions and characterized by green elements and urban furniture. In Lagos, there are some routes and walking tours around the city, namely: a) guided audio tour “Lagos dos Descobrimentos” - which is a 4,1 km tour around the urban area, going through the most emblematic cultural monuments and touristic places in the city. It is a circular tour, with the start and ending point in Avenida dos Descobrimentos, going through the historic centre, city park, and rock surrounded beach. b) Fishermen route (Trilho dos Pescadores) - located along the sea, follows the routes used by locals to access beaches and fishing spots. c) Lagos Bensafrim pedestrian and cycling route,

connected to Via Algarviana. Via Algarviana is a big pedestrian route in the Algarve region that connects Alcoutim to cape São Vicente, covering around 300 km, and allowing pedestrians to know the mountain areas and the Southwest Alentejo and Vicentine Coast natural park.

For this study were selected three different sites with potential for birdwatching (Figure 2). The first site Avenida dos Descobrimentos (Figure 3) was chosen considering it is the biggest avenue in the city. It has a large sidewalk being a reference point for tourists.

Additionally, its association with Marina, a blue space, make this site a potential candidate for birdwatching. It has a high urbanization degree, and the two sides of the Marina are connected by a moveable bridge. This allows the passage of pedestrians and big vessels. Especially in the morning, the maritime traffic can be very intense.

Figure 1. Portugal map and the location of Lagos city (orange circle). Source: Map data copyrighted by OpenStreetMap contributors. Available from: <https://www.openstreetmap.org>.

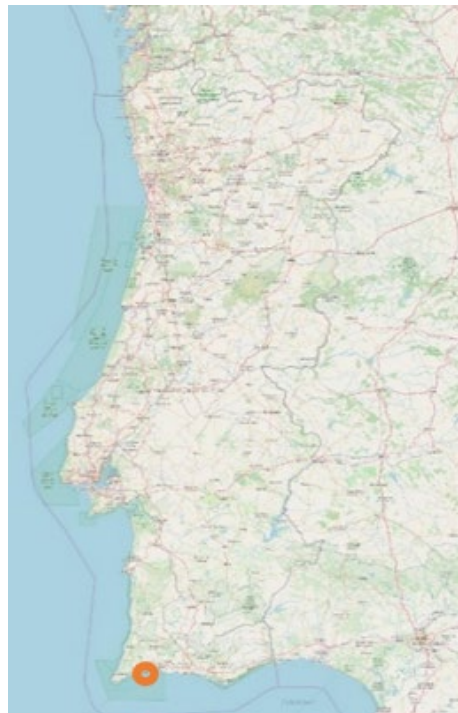


Figure 2. Location of the study area in the city of Lagos. Source: Orthophotomaps. Source: downloaded from Direção Geral do Território. Available from <https://www.dgterritorio.gov.pt>



Figure 3. View of Avenida dos Descobrimentos. Source: Photograph taken by the authors.



Along the avenue, many small kiosks are found selling souvenirs and clothes as well as promoting private maritime-touristic activities. The second site - Ribeira de Bensafrim - located between two bridges of Lagos (Ponte da Ribeira de Bensafrim and Ponte Dona Maria) is an area with lower levels of urbanization (Figure 4). This site is located near the municipal swimming pool and sports centre. It has a view of a natural area with saltmarshes crossed by a small river (Ribeira de Bensafrim). The proximity to the city centre (around 1500 m) makes this site potentially interesting for birdwatching. Urban furniture elements can be found in the local. However, it is not widely used by tourists or residents. The last site chosen was the “City Park” (Figure 5). Built between 2003 and 2009, it is the biggest green space in the city with a total area of 4.2 hectares. The trees’ community is mainly composed of native tree species, as is the case of the Almond Tree (*Prunus dulcis*), Carob Tree (*Ceratonia siliqua*), Olive Tree (*Olea Europea*) and Strawberry Tree (*Arbutus unedo*). People can touch these Mediterranean trees, and different smell are associated with this type of landscape. Located in the city centre and surrounded on one side by the city walls it is an inviting area, used for recreation and leisure activities. Bellow the park an underground car park with capacity for approximately 400 cars can be found. There are some touristic places nearby as historical monuments and a mini-golf centre. These characteristics have the potential to attract several people to the area.

Survey methodology

The avifauna survey was conducted from September to October 2020. A total of 30 visits were randomly done to the three sites. Many factors may have an effect on bird activity and behaviour which consequently may affect surveys. Therefore choosing the right time and conditions for surveying is crucial (Bibby, Jones, & Marsden, 1998). Considering the aims of this study, the sites were visited during working days in the morning (8:30-11:00) and in the late afternoon before sunset (16:30-19:00). Birds tend to display morning and evening peaks of activity, reducing their activity during the middle of the day (Bibby et al., 1998; Sutherland et al., 2007).

Figure 4. View of Ribeira de Bensafrim in the urban area of Lagos. Source: Photograph taken by the authors.



Figure 5. View of Lagos City Park. Source: Photograph taken by the authors.



Surveying these periods may increase the probability of detecting individuals in an area. Each visit - morning or afternoon - was considered a sampling period. Weather can influence the occurrence of certain species (Service et al., 1996), as result, surveys during bad weather (e.g. rain; strong wind) conditions were not conducted. Two different survey methodologies (Carbó-Ramírez & Zuria, 2011), comparable to each other, were used for counting birds and were chosen considering the characteristics of each study site. The first method, 500 m line transects (Carbó-Ramírez & Zuria, 2011), was used in the study site Avenida dos Descobrimentos. In total, 3 transects per visit were performed. The transects were walked slowly in a straight line for 10 minutes each. All birds seen using the area were recorded and incorporated in the calculations. This method was preferred for this site, considering the linear nature and narrow width of the site. The second method used was 10 minutes unlimited radius point counts (Nichols, Thomas, & Conn, 2009). This method consisted of selecting random points and during the 10 minutes periods, all the birds seen were counted. It was used in the other two study sites (Ribeira de Bensafrim and City Park). In each site, three-point counts were conducted, totaling 30 minutes of observation per sampling period. The points were at least 100 m apart to assure independence and avoid double count (Bălescu & Gache, 2017).

For data collection was used a DSLR camera (Canon-EOS 2000D with Lens 75-300 mm) to photograph all individuals seen during the sampling period. This ensured a photo-documentation of all individuals detected. Posterior analysis of the images was performed to accurately identify the species observed. The identification was performed using online tools such as Birds of Portugal (Aves de Portugal info, n.d.) as well as a taxonomic book (Svensson, 2017). For each specie, the ICNF conservation status (Cabral et al., 2005) and residence status (Aves de Portugal info, n.d.) in Portugal was accessed.

Data analysis

To describe the avifauna community of Avenida dos Descobrimentos and Ribeira de Bensafrim, species richness and species diversity were calculated (Table 1). Species richness accounts for the number of species in a sample

(Supriatna, 2018), while species diversity - Shannon index (H) - considers not only the number of species but also the dominance of each species (Colby, 2018). Due to the natural landscape and logistic constraints, the number of individuals per species for the study site City Park was not obtained. The presence of trees made it difficult to detect and capture photographically all individuals. This conjugated with the fact that acoustic recordings were not being made, accurate estimates would not be obtained. Therefore, it was not possible to calculate species richness and species diversity for this place. Instead, for the “City Park”, only the characterization of the avifauna species identified was performed. It was observed a high number of individuals of synanthropic species (*Columba livia*, *Larus michahellis*, *Passer domesticus* and *Turdus merula*) simultaneously during the sampling period. This made it impossible to count all of them. Due to this constraint, the number of individuals of these species were not obtained for any of the study sites and, therefore, were not used in the diversity index calculations.

To assess if the survey effort was enough, accumulation curves of the cumulated number of species for each site were constructed. This allowed ensuring that most species present in the study sites were detected and that a representative sample of the avifauna was obtained. To obtain the accumulation curves the cumulative number of species in each site as a function of the number of the sampling period (effort) was used.

To investigate whether there is a potential for birdwatching in each study site the frequency of occurrence (Table 1) during the study period was obtained. This allowed to compare the three study sites and to determine which species were more frequently sighted and have some insights on their occurrence in the study area and possible differences between sites.

Accessible Pedestrian Trails and Birdwatching Stations

To guaranty the universal accessibility of the Birdwatching and Birding by ear Stations, its surrounding must have specific attributes of an accessible pedestrian network. It is necessary to act upon the different constituent elements of these, namely: a) accessible pedestrian sidewalks (including infrastructures, urban furniture, traffic signals); b) pedestrian crossings; c)

modal interface areas, considering bus stops, terminals, reserved parking places for people with disability.

Table 1: Equations used to obtain ecological index and frequency of occurrence. Source: Authors' elaboration

Name	Equation
Species Richness (Supriatna, 2018)	$D = \frac{s}{\sqrt{N}}$; s – number of species; N – total number of individuals
Species Diversity (Colby, 2018)	$H = \sum(p_i) * \ln p_i$; p_i – the proportion of the total number of individuals in the population that are in species "i"
Frequency of occurrence (Martos-Martins & Donatelli, 2020)	$F (\%) = \frac{t_i}{t} * 100$; t_i – number of days specie "i" was observed; t – total sampling days

The universal accessibility of the stations is dependent on the accessibility according to the universal design of the built environment. Sidewalks are urban infrastructures that support pedestrian walking and the use thereof by people with disabilities, including citizens that use wheelchairs. They must be dimensioned as a channel of slow circulation and be continuous, safe and free from obstacles. The dimensioning of trails requires a minimum width free from obstacles. When people are continually meeting and passing each other a useful width above 1.80 m is recommended (Aragall & EuCAN members, 2003), which permits the crossing of two people in wheelchairs. Another aspect to take into consideration is the quality of the surface/pavement of a pedestrian walkway, which must-have materials that provide a stable, durable, firm, continuous, non-slip, anti-skidding and regular surface (but not too smooth). The longitudinal and cross slopes of pedestrian areas is another important factor for the movement of people, mainly for those with reduced mobility. The choice of levelled pathways and suitable gradients of the ramps contribute to the creation of accessible pedestrian networks for all users, influencing

their speed and safety. Pedestrian crossings must be accessible, too. It must be clear of obstacles, well illuminated and the access to the carriageway must be ramped through a dropped kerb and small gradient. This slope is essential to cater to the mobility of people with motor disabilities, especially wheelchair users. On this ramp, there should be a surface with contrast colour and tactile marking strip to guide the pedestrian with impaired vision.

The Birdwatching and Birding by Ear Stations must be accessible for all. Usually, there are only stairs to access a high platform. The access to this floor must be made through stairs that must have specific dimensions, as well as adequate width of the stairs, these must-have strips with chromatic differentiation, guardrails, and handrails. The layout must consider a ground floor too (example can be seen in Figure 6). The ground floor must guaranty access to people in wheelchairs, senior people and children. The floors must have a levelled and paved waiting area. An adequate barrier-free space provides a safe, secure, non-slip, smooth surface for people. On the ground floor, there must be room for manoeuvring a wheelchair with no obstacles. The doors must have adequate width and contrast colour to guarantee orientation for people with low sight. The small windows must be positioned at a height that allows birdwatching by people in wheelchairs or by children. This type of station for birdwatching should provide some benches and seats. The benches should be installed at an adequate height from the platform. Signage of timetables, route maps and line services must be clear, simple, easily visible and understandable. Braille information should also be provided.

In the context of smart cities, this type of stations should have QR codes (Quick Response) or technology NFC (Near Field Communication) that increase the access to information for those who have smart mobile phones.

To verify the web accessibility of a set of sites with bird sounds, which could be a useful tool for birding by ear, AccessMonitor was used. It is an automatic validation tool that verifies a set of accessibility guidelines of HTML contents in a website. AccessMonitor performs tests based on WCAG 2.1 (Web Content Accessibility Guidelines). The output is a qualitative report as well as quantitative indexes.

Figure 6: Example of a birdwatching accessible station. Source: photograph taken by the authors.



Results

A total of 35 species from 22 families were sighted and identified from the three study sites (Table 2). From the identified species, 15 are considered resident in Portugal, while 10 species are migratory, and 10 species have a small resident population with most individuals being migratory. The majority of species do not have threatened conservation status and are classified as Least Concern (LC). However, there are a few species that are in the red list of ICNF (n.d), namely the Eurasian Whimbrel (*Numenius phaeopus*) (Figure 7) that has a vulnerable status, which is considered the level below an

endangered status; the resident population in Portugal of the Common redshank (*Tringa tutanos*) has a critically endangered status (Figure 8). As for the migratory species, the Sandwich tern (*Thalasseus sandvicensis*) has a near-threatened conservation status and the Black-tailed godwit (*Limosa limosa*), has a near-threatened status in the world by International Union for Conservation of Nature (IUCN), even though it has the least concern status in Portugal.

*Figure 7. Example of a vulnerable bird watched in the city of Lagos - Eurasian whimbrel (*Numenius phaeopus*). Source: Photograph taken by the authors.*



Table 2: Birds species sighted and identified in the study area considered. Source: Authors' elaboration

Conservation status: LC = least concern, NT= Nearly Threatened, Vu = Vulnerable, CR = Critically endangered.

Residence Status: Res = Resident, Mig = Migratory.

Family	Species	English common name	Conservation Status	Residence Status
Alcedinidae	<i>Alcedo atthis</i>	Common kingfisher	LC	Res
Anatidae	<i>Anas platyrhynchos</i>	Mallard	LC	Res
Ardeidae	<i>Egretta garzetta</i>	Snowy egret	LC	Res

Family	Species	English common name	Conservation Status	Residence Status
	<i>Ardea cinerea</i>	Grey heron	LC	Res
Charadriidae	<i>Charadrius hiaticula</i>	Common ringed plover	LC	Mig
Ciconiidae	<i>Ciconia Ciconia</i>	White stork	LC	Res/Mig
Columbidae	<i>Streptopelia decaocto</i>	Euroasian collared dove	LC	Res
	<i>Columba livia</i>	Rock dove	LC	Res
Corvidae	<i>Cyanopica cooki</i>	Azure-winged magpie	LC	Res
Emberizidae	<i>Emberiza calandra</i>	Corn bunting	LC	Res
Falconidae	<i>Falco tinnunculus</i>	Common kestrel	LC	Res
Fringillidae	<i>Carduelis cannabina</i>	Common linnet	LC	Res/Mig
	<i>Carduelis carduelis</i>	European goldfinch	LC	Res
	<i>Serinus serinus</i>	European serin	LC	Res
Hirundinidae	<i>Cecropis daurica</i>	Red-rumped swallow	LC	Mig
Laridae	<i>Chroicocephalus ribibundus</i>	Black-headed gull	LC	Res/Mig
	<i>Larus michahellis</i>	Yellow-legged Gull	LC	Res
Motacilidae	<i>Motacilla alba</i>	White wagtail	LC	Res/Mig
	<i>Motacilla cinerea</i>	Grey wagtail	LC	Res/Mig
Muscicapidae	<i>Erithacus rubecula</i>	European robin	LC	Res/Mig

Family	Species	English common name	Conservation Status	Residence Status
	<i>Oenanthe</i> <i>Oenanthe</i>	Northern wheatear	LC	Mig
	<i>Ficedula hypoleuca</i>	European pied flycatcher	LC	Mig
Passeridae	<i>Passer domesticus</i>	House sparrow	LC	Res
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great cormorant	LC	Mig
Phylloscopidae	<i>Phylloscopus trochilus</i>	Willow warbler	LC	Mig
Recurvirostridae	<i>Himantopus</i> <i>Himantopus</i>	Black-winged stilt	LC	Res/Mig
Scolopacidae	<i>Numenius phaeopus</i>	Eurasian whimbrel	Vu	Res/Mig
	<i>Actitis hypoleucos</i>	Common sandpiper	Vu	Res
	<i>Calidris alba</i>	Sanderling	LC	Mig
	<i>Tringa tetanus</i>	Common redshank	CR/LC ¹	Res/Mig
	<i>Limosa limosa</i>	Black-tailed godwit	LC ²	Mig
	<i>Arenaria interpres</i>	Ruddy turnstone	LC	Mig
Sternidae	<i>Thalasseus sandvicensis</i>	Sandwich tern	NT	Mig
Turdidae	<i>Turdus merula</i>	Common blackbird	LC	Res

¹ *Tringa tetanus* - conservation status: CR for the resident population; LC for Wintering population.

² *Limosa limosa* - conservation status in IUCN: NT.

Family	Species	English common name	Conservation Status	Residence Status
Upupidae	Upupa epops	Hoopoe	LC	Res/Mig

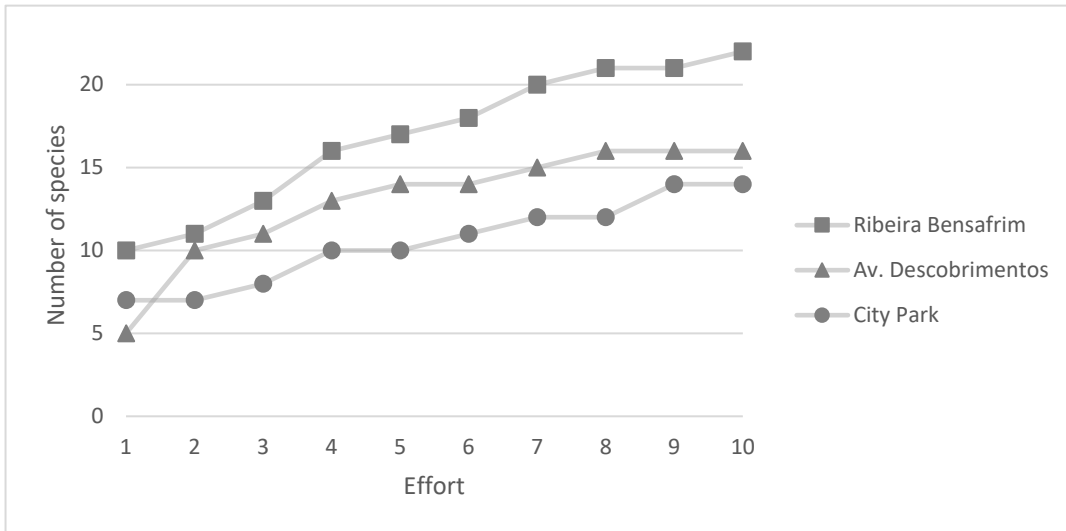
Figure 8. Example of a critically endangered bird watched in the city of Lagos - Common redshank (Tringa tetanus). Source: Photograph taken by the authors.



As for the accumulation curves (Figure 9), that is the cumulative number of species in each site as a function of the sampling period (effort), they did not completely flatten out, which can be an indicator that the inventory might have not been completed.

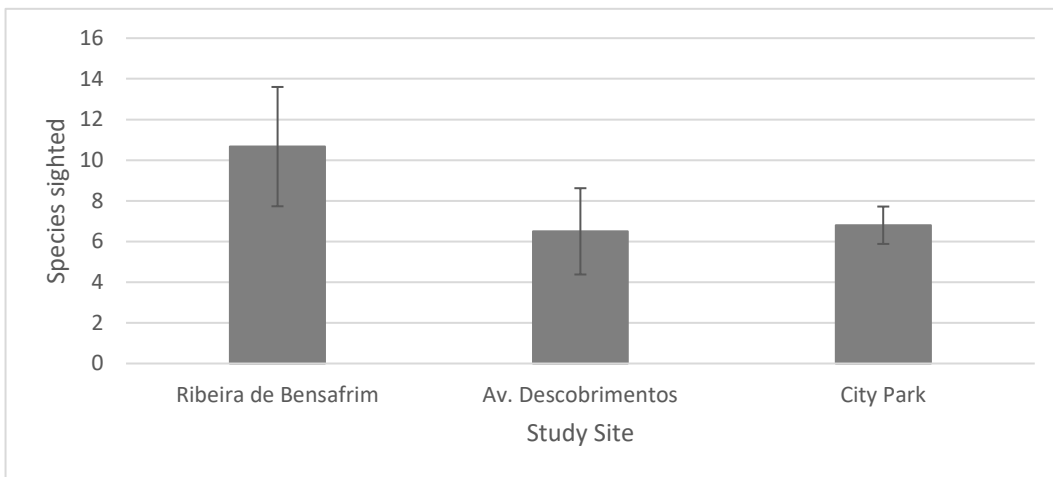
Regarding the number of species sighted in each site, the higher number of different species were sighted in Ribeira de Bensafrim (N=22), followed by Marina (N=16) and City Park (N=14). The species richness was higher in Marina (D=1.67) compared with Ribeira de Bensafrim (D=1.12). The Shannon Wiener's species diversity (H') was higher in the Ribeira de Bensafrim (H'= 2.32) compared with the other site (Avenida dos Descobrimentos).

Figure 9: Accumulation curves for each study site. Source: Authors' elaboration



In general, the number of species sighted during a sampling period was higher in the saltmarshes area (Ribeira de Bensafrim) compared with the other two sites (Figure 10). During the sampling period, on average, a total of 11 (± 2.93) species were sighted per sampling period on Ribeira de Bensafrim, 7 (± 2.12) species in Avenida dos Descobrimentos and 7(± 0.92) species in City Park.

Figure 10: Average number of species sighted per visit in each study site in Lagos City. Source: Authors' elaboration



Of the 35 species, 20 were only recorded in one site. Only 2 species were sighted in the three study sites. Important to note that these two species are synanthropic and classified as generalists. In total 24 species were sighted more than once, with most species displaying high values of frequency of occurrence (Table 3). The other 11 species were sighted only once during the sampling period, thus the

low values of frequency of occurrence, 3 of them were sighted only once in Ribeira de Besanfrim, 4 were sighted only once in Avenida dos Descobrimentos and 4 in the City Park.

Table 3: Frequency of occurrence (%) for each species per study site in Lagos City. Source: Authors' elaboration

Species	Frequency of Occurrence Av. Descobrimentos	Frequency of Occurrence Ribeira Bensafrim	Frequency of Occurrence City Park
Himantopus Himantopus	0	40	0
Numenius phaeopus	30	70	0
Actitis hypoleucos	70	90	0
Tringa tetanus	0	60	0
Limosa limosa	0	10	0
Arenaria interpres	90	20	0
Thalasseus sandvicensis	30	10	0
Turdus merula	10	30	100
Upupa epops	0	0	30

In general, the 3 websites chosen displayed poor accessibility practices. The “avesdePortugal.info” had a score of 4.4/10; the “m.bird-songs.com” had a

score of 2.7/10, and the “xeno-canto.org” had a score of 3.9/10. Regarding blind disabilities, alternative texts for images are missing. This prevents screen readers from translating image descriptions into sounds, not allowing alternative communication. Errors were also detected related to the contrast. This was lower than the minimum allowed, which might make it harder for people with low vision to access information.

Discussion

Nowadays, the world faces a continuous disconnection with nature. With increasing larger cities all around the world, the environment tends to become more urbanized. So, it is of major importance to protect the natural environments around urban areas to improve the connection between the local population and the surrounding nature. Studies suggest that direct contact with natural environments with perceived high biodiversity are related to positive benefits to humans' well-being regarding mental and physical health (de Vries et al., 2003; Fuller et al., 2007; Sandifer, Sutton-Grier & Ward, 2015). Nevertheless, it is important to bear in mind that not all-natural spaces contribute the same in terms of positive benefits to their users. Thus, it is important to assure healthy green and blue spaces within the urban areas, to sustain adequate biodiversity richness, healthy ecosystems. Besides, it is essential to create safe routes for all pedestrians and, at the same time, be accessible to everyone, especially for people with disabilities, because the natural environment is usually physically inaccessible (Handley et al., 2003). Moreover, people can experience a variety of multi-sensory elements when exposed to these urban and natural environments and their biodiversity. For instance, when asked about their nature-based sensorial experience, tourists visiting the southwest of Portugal highlighted the visual colour green and the different sounds of various animals (Agapito, Valle & Mendes, 2014).

These days, more and more tourists want to escape from cities and be in contact with nature (String & McAvoy, 1992). This has made ecotourism one of the biggest growing tourism sector (Hawkins & Lamoureux, 2009). Although niche tourism regarding disabled people is a recent sector in development, it has the potential to grow. People with disabilities are a significant consumer

in the tourism market, spending billions of dollars per year on holidays around the world (Buhalis, 2005; Darcy, Cameron, & Pegg, 2010; Tourism Australia, 2005).

Discovering which species are part of the avifauna community in the city of Lagos, located in southern Portugal, can be extremely useful to enhance the already existing urban routes or walking tours in the city. Birdwatching and birding by ear consist of observing and hearing, respectively, and then identify the bird's species in their natural environment. Both activities can be practised from a tourism perspective or as a personal recreation. From a tourism point of view, birdwatching is economically viable due to its educational character and, in most cases, can be compatible with conservational activities; also, it takes into consideration the sustainable use of resources and the involvement of local communities (Farias, 2007). Additionally, the birdwatcher community usually travel in groups and, in the majority of cases, have high levels of training and jobs with above-average income (Garrison, Patterson & Barnes, 2005), making this target group one of the main incomes in the ecotourism and nature-based tourism.

Moreover, the consideration of the accessible and inclusive design of local pedestrian infrastructures for proper birdwatching and birding by ear can create the conditions for positive and beneficial experiences for all people considering human diversity as the seven universal design principles. These accessible infrastructures and experiences enable people with access requirements, including mobility, vision, hearing and cognitive dimensions of access to function independently, that is, with autonomy, and equitable guarantee use (first principle). The proposed birdwatching and birding by ear stations consider two floors for the development of these activities, and so, guarantee flexibility in use (second principle). Related to information and web accessibility, the proposed QR codes or technology NFC can increase the access to the information which would be simple and intuitive use and guarantee perceptible information (third and fourth principles). Stations and surfaces with contrast colour and tactile marking strip to guide the pedestrian with impaired vision guarantee some tolerance for error (fifth principle). The quality of the pedestrian infrastructure, in an urban environment, guarantees low physical effort (the sixth principle), as well as the existence of a level

floor at the stations. Size and space for approach (seventh principle) were considered in the dimensions and gradients of the pedestrian infrastructure and in the position of the windows inside stations to allow the experiences of birdwatching by people in wheelchairs, by small adults or by children.

Considering these aspects, the city of Lagos has the potential for inclusive birdwatching and birding by ear activities. These will be very varied and rich, because it is possible to encounter diverse species such as residential ones (Common sandpiper, Common redshank, Hoopoe, among others) as migratory ones (Common ringed plover, Eurasian whimbrel, Black-tailed godwit, among others), some of them being protected species by Portugal red list of threatened species. Additionally, only 2 species, namely the Common blackbird (*Turdus merula*) and the Yellow-legged Gull (*Larus michahellis*) were sighted in the three study sites, demonstrating that it is possible to observe a diverse group of different bird species in different areas in the city of Lagos, which is an indicator of the potential for birdwatching and birding by ear in this city.

Regarding the sites chosen in this study, Avenida dos Descobrimentos and Ribeira de Bensafrim are both associated with blue spaces, being expectable the presence of a higher number of species. The presence of water bodies, such as wetlands, creates more ecological niches and provide valuable habitat for migratory bird species (Parihar et al., 2020). Other factors such as season, tide, the hour of the day and human disturbance (traffic or number of people in each site) can influence the chance of seeing certain species, however, due to the short duration of this study, this was not an object of analysis. Given that this is the first bird survey conducted specifically in the urban area of Lagos, it is expected that additional species may be recorded with further surveys targeting different temporal periods. Nevertheless, this study is a starting point for further research on the dynamic of the avifauna in Lagos. It presents a characterization of the avifauna in three different sites characterized by different levels of urbanization, adding more knowledge regarding this group of animals in Portuguese cities.

When analysing the avifauna community in Avenida dos Descobrimentos the number of species sighted (N= 16) was high, being this the reason why the

species richness had a higher value compared with Ribeira de Bensafrim. Considering the high level of urbanization and human disturbance, these results were not expected. The fact that this study was conducted during the end of high tourist season and in a year marked for the pandemic constraints, such as the lockdown and the travel restrictions, it is possible that the maritime traffic along the channel and Marina was low, as well as the number of tourists walking in the venue. These aspects might have contributed to a higher number of species using this area. This cannot be further explored since there is no prior inventory of the species present in this city area and their abundance. The presence of avifauna along the venue can be an asset for the city. Therefore, further research concerning the bird community presence throughout the year in the green and blue spaces surrounding Lago's urban area is necessary to better understand the usage of these habitats by the resident and migratory bird community.

Considering that many species are migratory, it is expected to assume that the avifauna community in Lagos was not entirely characterized. Possibly due to the time and logistic constraints, which limited the sampling period. In this sense, it is expected that different species might be sighted or heard during other seasons. Besides, the season during which this study was conducted is a migratory period. Possibly some species were arriving or leaving during this period, which might have contributed to the sighting of new species during all the study period. These findings are important to highlight the potential for birdwatching and birding by ear inside the urban area of Lagos. However, with the increasing urbanization, it is of major importance the maintenance and protection of green and blue spaces, being valuable for the city to preserve the natural characteristics of the salt marshes and water bodies, as well as the city Park. In this sense, the municipality and decision-makers should take action to ensure the conservation and maintenance of the natural environments surrounding the urban area. Environmental education should be promoted to increase awareness for the presence of iconic bird species that exist in this city, namely, the Azure-winged magpie (*Cyanopica cooki*), the Black-headed gull (*Chroicephalis ridibundus*), the Eurasian whimbrel (*Numenius phaeopus*), the Black-winged stilt (*Himantopus himantopus*), the

Common kingfisher (*Alcedo atthis*), the Common redshank (*Tringa tetanus*), among others.

Conclusions

Birdwatching is usually designed for people who have good sight and hearing. Considering people with disabilities, the accessibility of nature-based tourism is a field of study that is still marginalized (Kling & Ioannides, 2019). Therefore, it is important to add new knowledge regarding this field of study and encourage the tourism sector, the operators, and the decision-makers to consider the universal accessibility approach, which integrates the needs of people with disabilities.

This paper has an inclusive perspective of tourism activity and presents a valuation of the potential for birdwatching and birding by ear for the city of Lagos. It bears in mind an inclusive and accessible approach to allow, to all users, diverse kinds of sensorial experiences. Considering the different bird species observed in the study area, of which some are residents and others migratory, we considered that the city of Lagos has the potential for birdwatching from a tourism point of view. New species were detected through the whole study period, which highlights the importance of the study area. In the context of urban development and expansion, the possibility to observe and hear fauna in the urban environment is an asset as it can add value to green and blue spaces, increasing a cities' potential for ecotourism.

Accessible tourism should “enable people with access requirements, including mobility, vision, hearing and cognitive dimensions of access, to function independently and with equity and dignity through the delivery of universally designed tourism products, services and environments” (Darcy & Dickson, 2009). To guaranty the universal accessibility of birdwatching and birding by ear stations, their surrounding must have specific attributes of an accessible pedestrian network, namely accessible pedestrian sidewalks (including infrastructures, urban furniture, traffic signals), pedestrian crossings and modal interface areas, considering bus stops, terminals and reserved parking places for people with disability. For more inclusive tourism, it is crucial to make public and private sector websites and mobile applications related to

tourism activities accessible to everyone. This will allow reducing communication barriers for visually impaired people and other types of disabilities. An important aspect is to increase awareness of society regarding the web accessibility requirements, which in turn, can contribute to effectively make tourism accessible. Creating and facilitating the implementation of training programs related to websites' accessibility and mobile applications can be a way to achieve these aims.

People interested in engaging Birdwatching and Birding by Ear activities are more than 80 million with increasing demands relative to bird observation in the wild. This specific demand provides a direct interest in certain areas and periods of the year, such as wintering season, reproduction or migration (Farias, 2007; SPEA, 2019). In this sense, since the destination selection considers the biodiversity of that region, a direct relationship can be established between the local biodiversity and the financial return that birdwatching can provide to that specific place. Besides, at a local scale, this activity has the potential to provide financial motivation for the protection and conservation of the natural environments where birdwatching is practised (Cordell & Herbert, 2002; Sekercioglu, 2002; Farias, 2007). In conclusion, the ongoing urbanization of territories, the increase in health problems exhibit by the population and the link between nature and human well-being is of major importance. Promoting activities that may bring people closer to nature within cities has a huge value. This study highlights the potential of birdwatching and birding by ear as an inclusive and accessible activity in an urban area, being something that should be addressed in future inclusive urban planning, accessible tourist routes and nature conservation plans.

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References

- [1] Acorn Consultants. (2008) Developing a Niche Tourism Market Database for the Caribbean. Acorn Consulting Partnership Ltd. Retrieved from <https://www.onecaribbean.org/wp-content/uploads/NicheMarketsDatabase.pdf>
- [2] Agapito, D., Valle, P., Mendes, J. (2014). The sensory dimension of tourist experiences: Capturing meaningful sensory-informed themes in Southwest Portugal. *Tourism Management* 42, 224-237. Retrieved from <https://doi.org/10.1016/j.tourman.2013.11.011>
- [3] Aragall, F., EuCAN members. (2003). European concept for accessibility: technical assistance manual. Luxemburgo, EuCAN - European Concept for Accessibility Network. Retrieved from <http://www.eca.lu/index.php/documents/eucan-documents/13-2003-european-concept-for-accessibility-2003/file>
- [4] Asia-Pacific Economic Cooperation (APEC). (2013). APEC voices of the future, Nusa Dua, Bali, Indonesia. Retrieved September 1, 2020, from <http://apecvoices.org/documents/APECindonesiaRPRT.pdf>
- [5] Aves de Portugal. Retrieved October 6, 2020, from <http://www.avesdeportugal.info/>
- [6] Ballantyne, R., Packer, J., & Falk J. (2011). Visitors' learning for environmental sustainability: Testing short- and long-term impacts of wildlife tourism experiences using structural equation modelling. *Tourism Manage.* 32, 6, 1243-1252. Retrieved from <https://doi.org/10.1016/j.tourman.2010.11.003>.
- [7] Bălescu, C., Gache, C. (2017). Birds' Diversity and the anthropogenic impact in Preajba-Făcăi wetlands (Dolj, Romania). *Analele Stiințifice ale Universității "Alexandru Ioan Cuza" din Iași (Serie Nouă)*. Retrieved from http://www.bio.uaic.ro/publicatii/anale_zoologie/issue/2017/2017a01Bal escu&Gache.pdf
- [8] Barbier, E. B., Koch, E. W., Silliman, B. R., Hacker, S. D., Wolanski, E., Primavera, J., Granek, E. F., et al. (2008). Coastal ecosystem-based management with nonlinear ecological functions and values. *Science*, 319(5861). Retrieved from <https://doi.org/10.1126/science.1150349>

- [9] Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C., & Silliman, B. R. (2011). The value of estuarine and coastal ecosystem services. *Ecological Monographs*. Retrieved from <https://doi.org/10.1890/10-1510.1>
- [10] Berleant, A. (2011). The aesthetics of art and nature. *Landscape, Natural Beauty and the Arts*. Retrieved from <https://doi.org/10.1017/CBO9780511554605.011>.
- [11] Bibby, C., Jones, M., & Marsden, S. (1998). Expedition Field Techniques BIRD SURVEYS. In *Director* (Vol. 44). <https://doi.org/10.1073/pnas.0809077106>
- [12] Bowler, D. E., Buyung-Ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. *BMC Public Health*, 10. Retrieved from <https://doi.org/10.1186/1471-2458-10-456>
- [13] Boyd, J., & Banzhaf, S. (2007). What are ecosystem services? The need for standardized environmental accounting units. *Ecological Economics*, 63(2-3). Retrieved from <https://doi.org/10.1016/j.ecolecon.2007.01.002>
- [14] Buhalis, D. (2005). Disability tourism-OSSATE links. Retrieved from <http://www.ossate.org/>
- [15] Cabral, M.J. (coord.), Almeida, J., Almeida, P. R., Dellinger, T., Ferrand de Almeida, N., Oliveira, M. E., Palmeirim, J. M., Queiroz, A. I., Rogado, L., Santos-Reis, M. (eds.) (2005). *Livro Vermelho dos Vertebrados de Portugal - Aves*. Instituto da Conservação da Natureza. Lisboa. Retrieved from <http://www2.icnf.pt/portal/pn/biodiversidade/patrinatur/lv/lista-aves>
- [16] Carbó-Ramírez, P., & Zuria, I. (2011). The value of small urban greenspaces for birds in a Mexican city. *Landscape and Urban Planning*, 100(3). Retrieved from <https://doi.org/10.1016/j.landurbplan.2010.12.008>
- [17] Carrus, G., Scopelliti, M., Laforteza, R., Colangelo, G., Ferrini, F., Salbitano, F., Agrimi, M., et al. (2015). Go greener, feel better? The positive effects of biodiversity on the well-being of individuals visiting urban and peri-urban green areas. *Landscape and Urban Planning*, 134. Retrieved from <https://doi.org/10.1016/j.landurbplan.2014.10.022>
- [18] Center for Universal Design. (1997): The principles of universal design, Version 2.0. Raleigh: North Carolina State University - The Center for Universal Design. USA. By Connell, B. R.; Jones, M.; Mace, R.; Mueller, J.; Mullick, A.; Ostroff, E.; Sanford, J.; Steinfeld, E.; Story, M. & Vanderheiden, G. Available in: http://www.ncsu.edu/www/ncsu/design/sod5/cud/about_ud/udprinciplestext.htm. Accessed on: March 28, 2018.

- [19] Chikuta, O., du Plessis, E., & Saayman, M. (2019). Accessibility Expectations of Tourists with Disabilities in National Parks. *Tourism Planning and Development*, 16(1). Retrieved from <https://doi.org/10.1080/21568316.2018.1447509>
- [20] Colby. (2018). Calculating Biodiversity. Retrieved September 26, 2020, from www.colby.edu
- [21] Cordell, H. K., & Herbert, N. G. (2002). The popularity of birding is still growing. *Birding*, 34: 54-59 Available at <https://www.fs.usda.gov/treearch/pubs/2914>
- [22] Costa, A. S. (2015). Birdwatcher profile in the Ria Formosa Natural Park. Faro: University of Algarve, Faculty of Economics.
- [23] Dadvand, P., Villanueva, C. M., Font-Ribera, L., Martinez, D., Basagaña, X., Belmonte, J., Vrijheid, M., et al. (2015). Risks and benefits of green spaces for children: A cross-sectional study of associations with sedentary behavior, obesity, asthma, and allergy. *Environmental Health Perspectives*, 122(12). Retrieved from <https://doi.org/10.1289/ehp.1308038>
- [24] Dallimer, M., Irvine, K. N., Skinner, A. M. J., Davies, Z. G., Rouquette, J. R., Maltby, L. L., Warren, P. H., et al. (2012). Biodiversity and the feel-good factor: Understanding associations between self-reported human well-being and species richness. *BioScience*, 62(1). Retrieved from <https://doi.org/10.1525/bio.2012.62.1.9>
- [25] Darcy, S. (2006). Setting a research agenda for accessible tourism. Gold Coast, Australia: Sustainable Tourism for Cooperative Research Centre. Retrieved May 25, 2007, from <http://www.crctourism.com.au/BookShop/BookDetail.aspx?d=473>.
- [26] Darcy, S., & Dickson, T. J. (2009). A whole-of-life approach to tourism: The case for accessible tourism experiences. *Journal of Hospitality and Tourism Management*, 16(1). Retrieved from <https://doi.org/10.1375/jhtm.16.1.32>
- [27] Darcy, S., Cameron, B., & Pegg, S. (2010). Accessible tourism and sustainability: A discussion and case study. *Journal of Sustainable Tourism*, 18(4). Retrieved from <https://doi.org/10.1080/09669581003690668>
- [28] Edensor, T. (2012). Walking in the British Countryside: Reflexivity, Embodied Practices and Ways to Escape. *Bodies of Nature Bodies of nature*. Retrieved from <https://doi.org/10.1177/1357034X00006003005>
- [29] Elmqvist, T., Goodness, J., Marcotullio, P. J., Parnell, S., Sendstad, M., Wilkinson, C., Fragkias, M., et al. (2013). Urbanization, biodiversity and

- ecosystem services: Challenges and opportunities: A global assessment. Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities: A Global Assessment. Available in <https://link.springer.com/book/10.1007/978-94-007-7088-1>
- [30] ERTA - Entidade Regional de Turismo do Algarve (2009), Birdwatching no Algarve - Propostas de Estruturação e Organização, Faro. Entidade Regional de Turismo do Algarve. Available in https://www.academia.edu/8552659/Birdwatching_no_Algarve_Propostas_de_Estrutura%C3%A7%C3%A3o_e_Organiza%C3%A7%C3%A3o
- [31] Farias, G. B. (2007). A observação de aves como possibilidade ecoturística. *Revista Brasileira de Ornitologia*; 15(3): 474-477. Available in https://www.academia.edu/13845305/A_observa%C3%A7%C3%A3o_de_aves_como_possibilidade_ecotur%C3%ADstica
- [32] Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007). Psychological benefits of greenspace increase with biodiversity. *Biology Letters*, 3(4). Retrieved from <https://doi.org/10.1098/rsbl.2007.0149>
- [33] Garrison, B., Patterson, C. Barnes, B. (2005). Development and marketing strategies for birding and wildlife tourism in the Greater Reno Nevada Region. *Nature Tourism Planning*. Available in <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.527.1716&rep=rep1&type=pdf>
- [34] Gedan, K. B., Kirwan, M. L., Wolanski, E., Barbier, E. B., & Silliman, B. R. (2011). The present and future role of coastal wetland vegetation in protecting shorelines: Answering recent challenges to the paradigm. *Climatic Change*. Retrieved from <https://doi.org/10.1007/s10584-010-0003-7>
- [35] Gibson, C., & Connell, J. (2007). Music, tourism and the transformation of Memphis. *Tourism Geographies*, 9(2). Retrieved from <https://doi.org/10.1080/14616680701278505>
- [36] Gill, S. E., Handley, J. F., Ennos, A. R., & Pauleit, S. (2007). Adapting cities for climate change: The role of the green infrastructure. *Built Environment*, 33(1). Retrieved from <https://doi.org/10.2148/benv.33.1.115>
- [37] Goldstein, E. B. (2010). *Sensation and perception* (8th ed.). USA: Wadsworth. ISBN-13: 978-1305580299
- [38] de Groot, R. S., Alkemade, R., Braat, L., Hein, L., & Willemsen, L. (2010). Challenges in integrating the concept of ecosystem services and values in

- landscape planning, management and decision making. *Ecological Complexity*, 7(3). Retrieved from <https://doi.org/10.1016/j.ecocom.2009.10.006>
- [39] Handley, J., Pauleit, S., Slinn, P., Lindley, S., Baker, M., Barber, A., Jones, C. (2003). Providing Accessible Natural Greenspace in Towns and Cities - A Practical Guide to Assessing the Resource and Implementing Local Standards for Provision. Project Undertaken on behalf of English Nature. Centre for Urban and Regional Ecology. Retrieved from <http://publications.naturalengland.org.uk/file/78003>
- [40] Hawkins, D. E., & Lamoureux, K. (2009). Global growth and magnitude of ecotourism. *The encyclopedia of ecotourism*. Retrieved from <https://doi.org/10.1079/9780851993683.0063>
- [41] Hodson, M., & Marvin, S. (2010). Urbanism in the anthropocene: Ecological urbanism or premium ecological enclaves? *City*, 14(3). Retrieved from <https://doi.org/10.1080/13604813.2010.482277>
- [42] van Hoven, B. (2005). Multi-sensory tourism in the Great Bear Rainforest. *Power*. Retrieved from https://notendur.hi.is/~kben/2011/Landabrefid_2011_BvH.pdf
- [43] ICNF - Instituto de Conservação da Natureza e das Florestas, Lista vermelha dos Vertebrados de Portugal, n.d. Retrieved September 6, from <http://www2.icnf.pt/portal/pn/biodiversidade/patrinatur/lv/lista-aves>
- [44] INE. (2018). Statistical Yearbook of Algarve Region 2018 (PDF). Lisboa: Instituto Nacional de Estatística. ISSN 0873-0008. ISBN 978-989-25-0503-9
- [45] Instituto Geográfico Português (2013). Áreas das freguesias, municípios e distritos/ilhas da CAOP 2013. Carta Administrativa Oficial de Portugal (CAOP), Direção-Geral do Território. Retrieved from https://www.dgterritorio.gov.pt/sites/default/files/ficheiros-cartografia/Metadados_CAOP2013.pdf
- [46] Jaquette, S. (2005). "Maimed Away From The Earth": Disability and wilderness. *Spring*. Available in <https://www.semanticscholar.org/paper/%22MAIMED-AWAY-FROM-THE-EARTH%22%3A-DISABILITY-AND-Schreiner-Jaquette/e605a470a19b67ec4ba0b0da2aab31a1b6c5ef93>
- [47] Kaplan, S. (2001). Meditation, restoration, and the management of mental fatigue. *Environment and Behavior*, 33(4). Retrieved from https://www.nrs.fs.fed.us/pubs/jrnl/2001/nc_2001_kaplan_005.pdf

- [48] Kaplan, R., & Kaplan, S. (2011). Well-being, reasonableness, and the natural environment. *Applied Psychology: Health and Well-Being*, 3(3). Retrieved from <https://doi.org/10.1111/j.1758-0854.2011.01055.x>
- [49] Kim, J., & Kaplan, R. (2004). Physical and psychological factors in sense of community: New urbanist Kentlands and nearby orchard village. *Environment and Behavior*, 36(3). Retrieved from <https://doi.org/10.1177/0013916503260236>
- [50] Kling, K. G. & Ioannides D. (2019). Enhancing accessibility in tourism and outdoor recreation: A review of major research themes and a glance at best practice. ETOUR Rapport, Mid Sweden University
- [51] Kuo, M. (2015). How might contact with nature promote human health? Promising mechanisms and a possible central pathway. *Frontiers in Psychology*, 6. Retrieved from <https://doi.org/10.3389/fpsyg.2015.01093>
- [52] Machado, A. (2011). Bird-watching Tourism in Europe: case study of the Algarve. Faro: University of Algarve and School of Tourism, Bournemouth University.
- [53] Maidstone Borough Council. (2016). Green and blue infrastructure strategy. Retrieved September 10, 2020, from https://maidstone.gov.uk/_data/assets/pdf_file/0004/164659/Green-and-Blue-Infrastructure-Strategy-June-2016.pdf
- [54] Martos-Martins, R., & Donatelli, R. J. (2020). Community of diurnal birds of prey in an urban area in southeastern Brazil. *Neotropical Biology and Conservation*, 15(3). Retrieved from <https://doi.org/10.3897/neotropical.15.e52251>
- [55] Mcavoy, L., Holman, T., Goldenberg, M., & Klenosky, D. (2006). Wilderness and persons with disabilities: Transferring the benefits to everyday life. *International Journal of Wilderness*, 12(2). Available in https://digitalcommons.calpoly.edu/rpta_fac/6/
- [56] McCormick, B. P. (2004). People with disabilities - National survey of recreation and the environment. Retrieved October 6, 2020, from <http://www.ncaonline.org/recreation/nsre.shtml>
- [57] Mexia T., Vieira J., Príncipe A., Anjos A., Silva P., Lopes N., Freitas C., Santos-Reis M., Correia O., Branquinho C., Pinho P. (2018). Ecosystem services: Urban parks under a magnifying glass. *Environmental Research*, 160, 469-478. Retrieved from <http://dx.doi.org/10.1016/j.envres.2017.10.023>

- [58] Millennium Ecosystem Assessment. (2005). *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC. Available in <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>
- [59] Nichols, J. D., Thomas, L., & Conn, P. B. (2009). Inferences About Landbird Abundance from Count Data: Recent Advances and Future Directions. *Modeling Demographic Processes In Marked Populations*. Retrieved from https://doi.org/10.1007/978-0-387-78151-8_9
- [60] Novelli, M. (2004). *Niche tourism: Contemporary issues, trends and cases*. Niche Tourism: Contemporary issues, trends and cases. ISBN-13: 978-0750661331
- [61] Nowak, D. J., Crane, D. E., & Stevens, J. C. (2006). Air pollution removal by urban trees and shrubs in the United States. *Urban Forestry and Urban Greening*, 4(3-4). Retrieved from <https://doi.org/10.1016/j.ufug.2006.01.007>
- [62] Owen, N., Healy, G. N., Matthews, C. E., & Dunstan, D. W. (2010). Too much sitting: The population health science of sedentary behavior. *Exercise and Sport Sciences Reviews*, 38(3). Retrieved from <https://doi.org/10.1097/JES.0b013e3181e373a2>
- [63] Parihar, A., Dal, P., Khandla, Y., Parmar, D., Parihar, V., Parmar, H., (2020) Checklist of Avifauna from selected sites of Visnagar city, Mehshana, North Gujarat. *Journal of Entomology and Zoology studies*. 8. 1232-1243. Available in https://www.researchgate.net/publication/340447887_Checklist_of_avifauna_from_some_selected_sites_of_Visnagar_city_Mehshana_North_Gujarat
- [64] Rook, G. A. (2013). Regulation of the immune system by biodiversity from the natural environment: An ecosystem service essential to health. *Proceedings of the National Academy of Sciences of the United States of America*. Retrieved from <https://doi.org/10.1073/pnas.1313731110>
- [65] Saayman, M., Slabbert, E., & van der Merwe, P. (2010). Travel motivation: A tale of two marine destinations in South Africa. *South African Journal for Research in Sport, Physical Education and Recreation*, 32(1). Retrieved from <https://doi.org/10.4314/sajrs.v31i1.43794>
- [66] Sandifer, P. A., Sutton-Grier, A. E., & Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services*. Retrieved from <https://doi.org/10.1016/j.ecoser.2014.12.007>

- [67] Santos M. (2012). Biodiversidade na Cidade de Lisboa: uma estratégia para 2020. Biodiversidade Lisboa 2020, Relatório técnico
- [68] Seeland, K., Dübendorfer, S., & Hansmann, R. (2009). Making friends in Zurich's urban forests and parks: The role of public green space for social inclusion of youths from different cultures. *Forest Policy and Economics*, 11(1). Retrieved from <https://doi.org/10.1016/j.forpol.2008.07.005>
- [69] Sekercioglu, Ç. H. (2002). Impacts of birdwatching on human and avian communities. *Environmental Conservation*; 29(3): 282-289. Retrieved from <https://doi.org/10.1017/S0376892902000206>
- [70] Service, F., Ralph, C. J., Geupel, G. R., Pyle, P., Martin, T. E., Desante, D. F., Milá, B., et al. (1996). Manual de métodos de campo para el monitoreo de aves terrestres. Director. Available in https://www.avesdecostarica.org/uploads/7/0/1/0/70104897/manual_de_metodos.pdf
- [71] Shepard, C. C., Crain, C. M., & Beck, M. W. (2011). The protective role of coastal marshes: A systematic review and meta-analysis. *PLoS ONE*. Retrieved from <https://doi.org/10.1371/journal.pone.0027374>
- [72] Slabbert, E., & du Plessis, E. (2013). Do socio-demographic factors influence the travel behaviour of visitors to nature-based tourism products in South Africa? *African Journal for Physical Health Education, Recreation and Dance*(19). Available in <https://www.ajol.info/index.php/ajpherd/article/view/94924>
- [73] SPEA - Sociedade Portuguesa para o estudo das aves (2008). Observaram-se 404 espécies de aves em Portugal Continental. Comunicado em imprensa de 7 de Fevereiro de 2008. Retrieved from <https://core.ac.uk/download/pdf/61499549.pdf>
- [74] SPEA - Sociedade Portuguesa para o estudo das aves (2019). Anuário Ornitológico, volume 11. Retrieved September 31 from https://www.spea.pt/wp-content/uploads/2020/03/Anua%CC%81rio-11_2019_bx.pdf
- [75] Stringer, L. A., & McAvoy, L. H. (1992). The Need for Something Different: Spirituality and Wilderness Adventure. *Journal of Experiential Education*, 15(1). Retrieved from <https://doi.org/10.1177/105382599201500103>
- [76] Supriatna, J. (2018). Biodiversity Indexes: Value and Evaluation Purposes. *E3S Web of Conferences* (Vol. 48). Retrieved from <https://doi.org/10.1051/e3sconf/20184801001>

- [77] Sutherland, W. J., Newton, I., Green, R., Gregory, R. D., Gibbons, D. W., & Donald, P. F. (2007). Bird census and survey techniques. In *Bird Ecology and Conservation*.
<https://doi.org/10.1093/acprof:oso/9780198520863.003.0002>
- [78] Svensson, L. (2017). *Guia de aves: o guia de campo mais completo das aves de Portugal e da Europa / Lars Svensson; il. e legendas Killian Mullarney, Dan Zetterström; colab. Peter J. Grant; trad. Joana Andrade et al. - 3ª ed. rev. - Porto: Assírio & Alvim, 2017. - 443. ISBN: 978-972-37-1963-5*
- [79] Todd, C. S. (2019). Chapter 9. Nature, Beauty and Tourism. *Philosophical Issues in Tourism*. Retrieved from <https://doi.org/10.21832/9781845410988-010>
- [80] Tourism Australia. (2005). *Annual Report 2005/2006*. Sydney: Government of Australia. Available in <https://www.tourism.australia.com/en>
- [81] Tung, V. W. S., & Ritchie, J. R. B. (2011). Exploring the essence of memorable tourism experiences. *Annals of Tourism Research*, 38(4). Retrieved from <https://doi.org/10.1016/j.annals.2011.03.009>
- [82] Turner, M. G., & Chapin, F. S. (2005). Causes and Consequences of Spatial Heterogeneity in Ecosystem Function. *Ecosystem Function in Heterogeneous Landscapes*. Retrieved from https://doi.org/10.1007/0-387-24091-8_2
- [83] de Vries, S., Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P. (2003). Natural environments - Healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environment and Planning A*, 35(10). Retrieved from <https://doi.org/10.1068/a35111>
- [84] White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Coastal proximity, health and well-being: Results from a longitudinal panel survey. *Health and Place*, 23. Retrieved from <https://doi.org/10.1016/j.healthplace.2013.05.006>
- [85] Wyles, K. J., Pahl, S., & Thompson, R. C. (2014). Perceived risks and benefits of recreational visits to the marine environment: Integrating impacts on the environment and impacts on the visitor. *Ocean and Coastal Management*, 88. Retrieved from <https://doi.org/10.1016/j.ocecoaman.2013.10.005>
- [86] Zainol, R. (2014). Appreciating a World Heritage Site using Multisensory Elements: A Case Study in Kinabalu Park, Sabah, Malaysia. *SHS Web of Conferences*, 12. Retrieved from <https://doi.org/10.1051/shsconf/20141201080>

- [87] Zeller, J. A. (2008). Wilderness and accessibility. *International Journal of Wilderness*, 14(1), 15-24. Retrieved from https://www.nols.edu/media/filer_public/90/4a/904a793f-33ff-4f6a-ad73-1088e205265b/09_wrmc_wilderness_accessibility_zeller.pdf

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