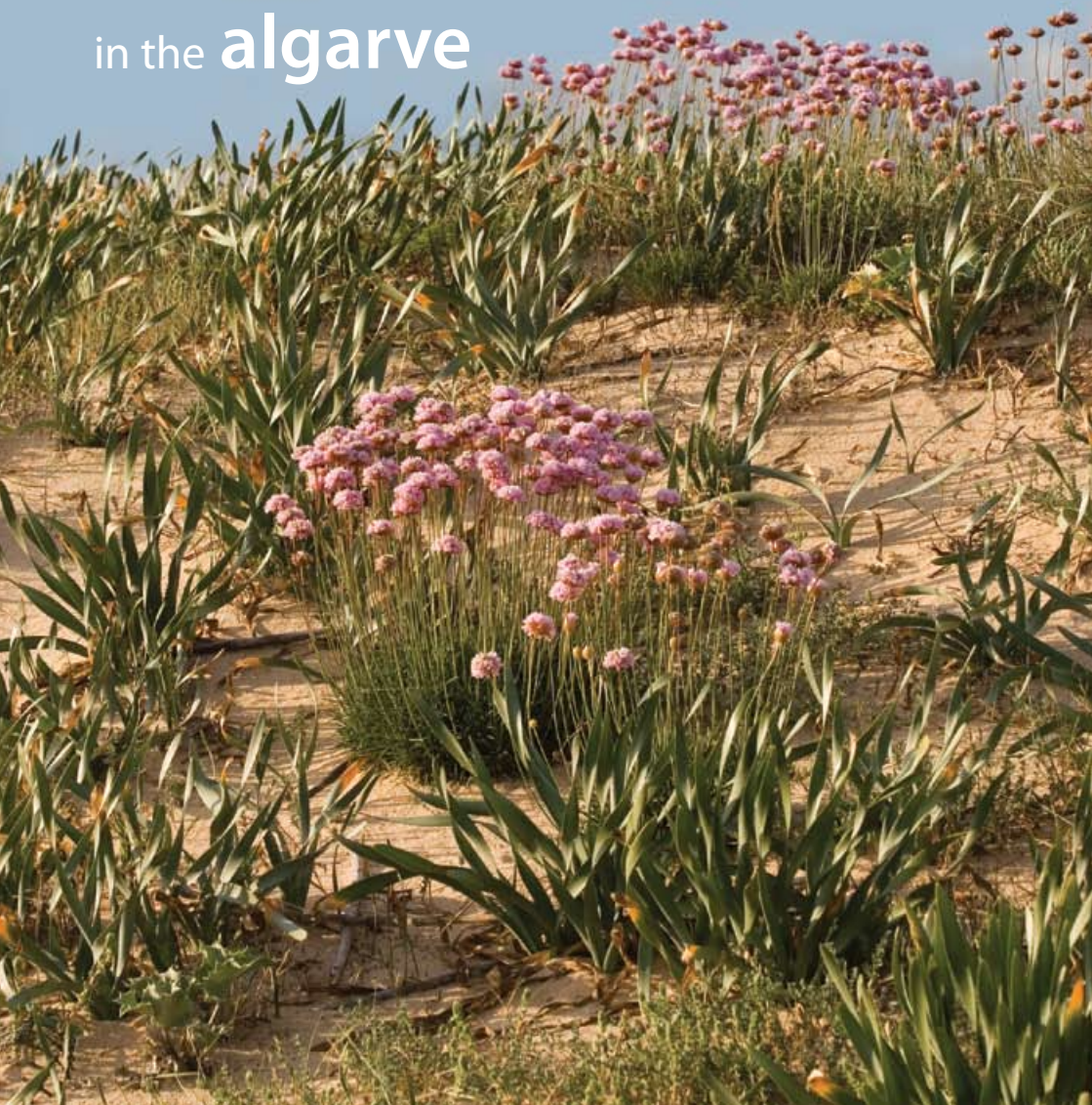


guide to

nature tourism

in the **algarve**



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Preface

Algarve's (still) hidden natural treasures

The Algarve is naturally big. Or rather big, naturally. This territory of nearly five thousand square kilometres goes far beyond the sands that concentrate the attention of tourists in the summer. From the Barlavento to the Sotavento, there are hidden protected natural areas or that haven't had the attention they deserve. They all wait patiently in the wild, for the looks and the passing by of true Nature lovers. If you are one of them, I warn you that here, in these pages, the journey begins, through the cliffs, the forest, the riparian corridors and estuarine systems of the Algarve.

In fact, we have so many landscapes and with such great biological importance that choosing just one would be a Herculean task. And if there is no possible selection among the various natural environments in the Algarve, the only solution is to discover them all. Slowly and with heightened senses.

This guide therefore strengthens the diversity of experiences that the destination offers to those who want to turn relaxation time into a real vacation. It is no coincidence that nature tourism emerges as one of the products that are "in development" in the Algarve, in the revision proposal document of the National Strategic Plan for Tourism (PENT). This adjustment to the initial PENT will take place around 2010-2015, which means that we must all try to materialize the goals defined in the document for that period. Editing this guide - helping to structure and promote the region's Nature offer - is already a step in that direction.

With nearly two hundred photographs and more than a hundred pages, the Guide to Nature Tourism in the Algarve is another step towards strengthening the image of the region as one of the destinations of the country with more sustainable development. It is with this conviction that I wish you a pleasant journey through our natural treasures and dare to offer a tip: take a camera. There are moments that are worth being remembered in vivid colours and at the present time. These will certainly be some of them.

Desidério Silva

President of the Algarve Tourism Board

Introduction

*Man's Place in Nature ... Why is it that, as science advances, this question becomes far more important and fascinating for us?**

Teilhard de Chardin answers himself by suggesting that, among other reasons, man and nature are inevitably deeply connected. From the mechanistic view of the seventeenth and eighteenth centuries, to the systemic view that, from the nineteenth century, took charge of the various areas of knowledge, from physics to ecology and psychology, a paradigm shift occurred, which now internalizes the perception of the connection and interdependence of all phenomena, the world being seen as an integrated whole. In the specific case of human ecology (relationship between man and nature), scientific research in health and wellness has been paying increasing attention to the benefits of nature and biodiversity to human health, these benefits now being considered and valued in the wide range of services that the ecosystems provide to society.

The greater ecological awareness of today's society and the search for experiences based on authenticity and on the contact with the natural world, have been creating new niches in the tourism market, with a growing preference for non-commoditized travel destinations with a natural environment in good condition, as well as for active holidays that include outdoor activities (hiking or contemplation of nature), practicing sports in nature (canoeing, sailing, climbing, caving, etc.) and activities that require expertise, such as birdwatching.

The trips motivated by the desire to contemplate, enjoy and discover nature, in Europe, have increased by an average

annual rate of about 7 % in recent years, and also the nature tourism market has grown enough to meet the growing demand. In the specific case of the Algarve region, the diversity of environments and the existence of unique natural values, the existence of protected natural areas (nearly 40 % of the Algarve territory is somehow rated) and good accessibility, makes this region extremely attractive for nature tourism.

This guide is thus an invitation to exploring nature in the Algarve, enabling you to check out the various environments and landscapes of the area and enjoy, through the proposed activities, genuine experiences of contact with nature and cultural events that recreate the ancestral human management of natural resources and landscape. The approach is thematic in nature, corresponding to a partial description of the natural sub-regions that constitute the Algarve region, not forgetting that they are inseparable from each other, composing a broader, integrated unit.

This publication begins with a brief ecogeographic characterization, focusing on some essential features of the Algarve, followed by six chapters subordinated to the natural sub-regions considered for this purpose - Costa Vicentina, South Coast, Barrocal, Serra, Guadiana and Marine Ecosystem. We chose to focus on the description of the natural and cultural values that could better express the uniqueness of each sub-region in the regional context, as well as the multiple uses to which the land is subject. Each chapter is associated with a

specific colour, visible in the top bar of the pages, and a cartographic representation of the territory. The chapters begin with an overview of each sub-region, followed by topic pages alluding to environments that are notable and distinguish that territory in the regional context. The topic pages may reference ecosystems (e.g. an estuary-lagoon system or dune complex on top of the Vincentino cliffs), the biophysical units (e.g. the Vincentino plateau or the Guadiana River watershed) and areas classified under national and community law (e.g. the geo-monument Rocha da Pena or Leixão da Gaivota). In each topic page there is a list of suggestions allusive to activities that were thought to provide a greater contact and enjoyment of the natural and cultural values.

The publication's annexes include an index of the common names of botanical and zoological species mentioned and respective correspondence with the scientific name, a glossary of the technical terms used, a summary bibliography, and also a list of useful contacts.

Before taking off, we recommend the use of a map with the road network and a prior query of weather forecasting, so as to avoid critical conditions of wind and waves on the coast and high temperatures during the summer and in the most arid interior. Sunscreen, water, energy food and comfortable footwear are always indispensable accessories for any outdoor activity.

The direct contact is the best way to discover

nature, placing the senses at the service of curiosity, internally registering the silence and the sounds, the smells, the natural rhythms, colours, shapes and textures. The paths can be explored or seen; there is an infinite number of ways to record the experience and thus prolong it for even longer: use field notebooks for writing, doodle and paint; use available materials (like dirt and dry leaves) in collages and compositions; take pictures or make short movies, etc. This attitude will surely be more rewarding than collecting natural objects such as minerals, fossils or plants. To observe with respect and without disturbing is the ethical principle of excellence in the contact with nature. Small practices can be adopted to avoid unnecessary disturbance: always follow the trails already marked and/or signposted, placing garbage in the appropriate place, preventing noise, and respecting customs and property when crossing farmland or settlements.

Have a good trip!

* Teilhard de Chardin (1997).

Algarve

Brief ecogeographic characterization



"(...)

But after the Caldeirão, it's as though a weight has been lifted from my shoulders. I feel free, relieved and happy, I am sadness in person! The whiteness of bodies and souls, the cleanliness of the houses and streets, and the harmony of beings and landscape wash off the soot that was clinging to my bones and clarify the grimy strips of land that I carry in my heart. Deep down, and just as our first kings called themselves lords of Portugal and of the Algarves, wisely separating in their titles that which was more centripetal than centrifugal in the whole of the nation, I do not truly see myself inside of the homeland. I also do not see myself outside of it. I see myself as in a sort of limbo of the imagination, where everything is easy, beautiful and spring-like. The land does not harass the feet, the sea does not tire the ears, the cold does not numb the limbs, and the fruits are sweet and always at an arm's reach. (...) The roads have no abysses, there are no barren or aggressive crags, there is no snow besides the open corollas, and the sea chores are as entertaining as the land ones (...)"

In Portugal
Miguel Torga, 1950.

The Algarve is a well-individualized geographical unit in the Portuguese territory, occupying the southernmost range of the country, with an administrative definition adjusted to the natural borders: to the north - a mountainous system; to the west and south - the sea; to the east - the Guadiana drawing the border with Spain. The Algarve sierra, difficult to transpose until the construction of the IC 1 road in the 70s, seems to have been decisive for the isolation of the region from the rest of the country. This natural barrier is not only home to the Algarve of the northernmost influences accentuating the Mediterranean characteristics of the climate, but has also favoured, throughout history, the development of a regional identity, both private and rich. An identity recognized by successive monarchs of the kingdom that kept the designation "King of Portugal and of the Algarves" until the establishment of the Republic at the beginning of the twentieth century.

Historically, the links of the Algarve coast with the Mediterranean world were almost always preferential; the design of the coastal geography favoured relations with the Mediterranean populations, very evident

since the first millennium BC, with the ports of Castro Marim, Tavira, Faro, Silves, Lagos and Aljezur establishing regular contact with Phoenician, Greek, Carthaginian and Tartessian merchants. For Orlando Ribeiro*, the Algarve is the last Mediterranean Riviera, forming a unit with Andalusia and North Africa (west of the Strait of Gibraltar), which he calls pre-Mediterranean territory.

Also the five centuries of Arab presence, between the eighth and thirteenth centuries, deeply influenced the region, emphasizing its connection to the cultures of the Mediterranean basin. The Moorish heritage in the Algarve continues today, first of all through its name, Al-Gharb - The West, and is also clearly visible in the architecture of the houses and monuments: in the terraces that replaced the roofs, in the cubism of the buildings or in the creative chimneys. The Arab culture subsists in farming practices and techniques - such as in water mills, the "levadas" (water channels) and dams, and fruit orchards that grow species that were introduced or spread by the Moors, such as the carob, fig and almond trees.

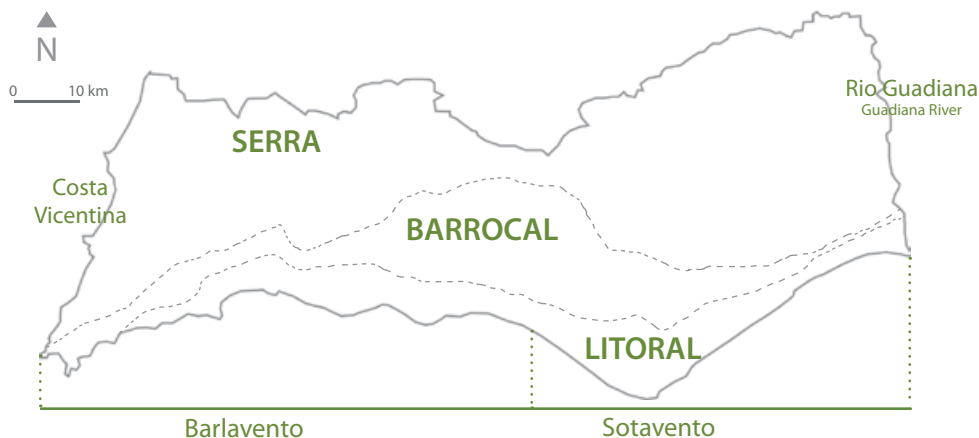
As part of the national ecology, the Algarve

* Portuguese geographer and historian (1911-1997).



region is individual from the rest of the Portuguese territory, firstly by the multitude of microclimates and geological areas, which translate into high geomorphological and biological diversity concentrated in an area of modest size (just over 540.000 hectares). The biogeographic history of this territory evokes connections to the cloudy Atlantic islands, the hot Maghreb, the luminous Andalusia and the rest of the European continent. Numerous species of Algarve flora today attest to these ancient ties; others are recreated every year

on migratory movements of birds and marine animals such as turtles and tunas. The weather in the Algarve is markedly Mediterranean, reinforced by the mountainous barrier to the north, but there is climatic variability due to the Atlantic influence and altitude. The territory is invaded simultaneously by maritime air masses from the southwest, protected from the major rigours of the north wind and exposed to the Levant (or Suão), a hot dry wind blowing from the east in the Mediterranean. Winters tend



to be mild and humid, and summers - long, hot and dry. The Barlavento (western sector of the Algarve, or the place where the wind blows from) becomes milder, influenced by the regulatory action of the Atlantic, while the Sotavento (eastern sector of the Algarve, the place where the wind blows to) is more arid and hot.

The complementarity between the Serra, the Barrocal and the coast, three large natural areas, physiognomically distinct, that follow from north to south, contributed to the region's identity and unity. These areas hold a very expressive geographical, geomorphological and biological and identity:

Coast – The coastal landscape, with a maximum elevation of 157 m in the Costa Vicentina (Torre de Aspa), includes three distinct areas: to the west, the territory of the Vicentino Plateau, essentially siliceous (consisting of sands and shales) and with a sub-humid climate; the Vicentino Promontory (Sagres Peninsula) carved in the stiff limestone of the Algarvian Barrocal, with a semiarid and dry tendency and intense exposure to the ocean, includes the only biogenetic reserve in the Algarve; and to the south, the Algarvico territory, a narrow sedimentary plain with a dry/sub-humid tendency, which extends to the sea in a fringe, including the limestone cliffs of the Barlavento and the sands of the Sotavento.

Barrocal – It is situated in central Algarve, with altitudes up to 300 m. Based on a limestone massif nestled between mountains and the coast, its climate is dry/sub-humid and displays a succession of hills extending from Cape São Vicente to Castro Marim. The rich and diverse Mediterranean flora has its best expression here. Also quite common is the agricultural landscape of Arab inspiration in the dryland orchards.

Serra - This is a system composed of three fundamental mountainous reliefs, Espinhaço



Costa Vicentina



Barrocal



Serra

de Cão (297 m), Monchique (902 m altitude in Fóia) and Caldeirão (589 m altitude in Pelados), where there is great climatic variability (tendency for being sub-humid/humid in the western sector and continental dry in the Guadiana basin). The Serra extends longitudinally along the extreme north of the Algarve and belongs to the Iberian Massif, a major structural unit that occupies the centre of the Iberian Peninsula. The Serra territory consists of shale terrain, poor in organic matter and low in floristic diversity. In Monchique, the outcropping of syenite, the presence of rich soils and water availability are differentiating factors of the area in the regional context.

At some point the territory was occupied by forests of small trees and thick barks, mostly oaks: the cork oak, the kermes oak, the holm tree and, less common: the Portuguese oak. The maquis is now the dominant cover and include sclerophyll shrubs and aromatic and melliferous plants, showcasing some unique floristic elements in the national context, such as the dwarf fan palm and the carob tree. These species are well-suited to the dryness of the environment, having thick small leaves, sometimes transformed into needles or spikes, or protected by hairs, resins and aromatic oils. Most of the trees are evergreen, except for

some species associated with the margins of watercourses, like the narrow-leaf ash and willow.

The fauna is diverse and well-adapted to the environmental conditions and some elements are particularly interesting as a result of geographical location and environmental conditions. Here animals that are representative of the Iberian Peninsula may be found, such as the rabbit, azure-winged magpie, the ocellated lizard and others easily associated with the current African wildlife, such as the Mediterranean chameleon, the common genet and the Egyptian mongoose. Just like the vegetation, the animals have their defences to survive the long, dry summers. Large numbers of aquatic birds fly to higher latitudes before the summer season. Others adopt the most varied strategies, decreasing their diurnal activity, the case of most of the carnivore vertebrates, or entering a period of aestivation, as it happens with terrapins. This is also an area with potential for being habitat to the most notable faunal elements of the Iberian fauna that, with the recent effort of environmental enhancement of the area, are likely to regain their natural habitat. This is the case of the Spanish imperial eagle, the osprey and the Iberian lynx.

A wide, sandy beach with dark rocks scattered across it, leading to the ocean under a cloudy sky. The beach is expansive and flat, with the ocean waves breaking in the distance. The sky is filled with soft, white clouds, and the overall scene is serene and natural.

Costa Vicentina

What there is more of on earth is landscape. As much as the rest lacks, the landscape always remained, abundance that only an indefatigable miracle can explain, for landscape is undoubtedly prior to man and despite so much existence it has not yet perished.

José Saramago



Corresponding to the western coast of the Algarve, Costa Vicentina comprises the territory between Odeceixe and Vila do Bispo, extending over 60 km. São Vicente, the patron saint of Lisbon, so named it, for in the Christian imaginary the first grave of the saint is attributed to Cape St. Vicente in Sagres. Upon the translocation of his relics to Lisbon in 1173, it is said that two crows veiled the body of the saint during the last sea voyage along this coast, an episode referenced in the coat of arms of Lisbon.

The hazy Costa Vicentina is a high plateau limited to the east by the Serra de Espinhaço de Cão and cut off, on its sea side, by wild cliffs that reach 156 m altitude in Torre de Aspa (Vila do Bispo). This imposing coastline is essentially rocky; the cliffs are carved in the Iberian Massif of dark-coloured shale and greywacke of the Paleozoic Era, of a very folded and fractured structure, except for the Pontal da Carrapateira and the Sagres peninsula, cut into the light-coloured and more recent limestone from the Mesozoic Era.

In some places other geological formations outcrop, such as the reddish Silves Sandstone or dune sandstones originated from ancient beaches, orangey and very sculpted, being also common the occurrence of veins of igneous rocks associated with the installation of the sub-volcanic mass in Serra de Monchique.

The landscapes that form this geological diversity are notorious for their high scenic value, displaying imposing and unique reliefs; such is the case of the Murração beach, the Ponta Ruiva beach or the Telheiro Geomonitorment (Vila do Bispo).

The cliffs are interrupted only in order to host vast extensions of sand attached to the mouth of the major streams, Seixe, Aljezur and Bordeira, which form small estuaries, diversifying the landscape and life forms. The remaining watercourses, of torrential seepage, dig deep verdant ravines on the rock walls, flowing into small beaches or curious hanging valleys.



Cliffs shrouded in fog in Pontal (Arrifana).



Ponta Ruiva (Vila do Bispo).

The environment in the western coastal territory is markedly Atlantic, humid and cool, but Costa Vicentina is a place of contrasts and encounters, and in its southernmost locations the Mediterranean influence, dry and warm, may be felt, dispelling the mists of the North Atlantic. This encounter results in unique ecological conditions and a remarkable biological diversity, both terrestrial and marine, which combine Mediterranean, Atlantic, and Maghrebian species in a restricted physical space.

A remarkable variety of landscapes and environments of this coastline that unfolds into high cliffs plunging directly into the ocean, pearl-coloured sands, high platforms with sand dunes, deep and moist ravines, and streams lined with lush riparian forests that flow into estuaries and marshes, makes Costa Vicentina a key territory in the national and European context, in terms of richness and biological diversity.

Many of the habitats and plants that exist here

are rare or unique to this coast and a priority in terms of nature conservation. Such is the case with the flagship endemic formations of the Sagres gum rockrose and many other species whose specific vicentian designation refers to a geographic distribution restricted to little more than the capes of Sagres and São Vicente.

The diversity of landscapes of Costa Vicentina also maintains exceptional faunal wealth. In the marine environment, the abundance of fish, shellfish and molluscs, historically not subject to intensive fishing exploitation, keep a balance with the artisanal and recreational fishing, based in little fishing ports that exist in places favoured by the protection of cliffs and rocks.

This is also one of the Sites with the highest diversity of birds in Portugal, with more than two hundred species recorded. In autumn, the coastal area is overflowed by migratory birds heading for Africa. Great soaring birds such as eagles, vultures and storks, as well as



Riparian vegetation in the Carrapateira stream.

a multitude of passerines, migrate towards warmer climates in the south.

Costa Vicentina integrates the Natural Park of Southwest Alentejo and Costa Vicentina and Natura 2000 Network (Site of Community Importance Costa Sudoeste and Special Protection Area Costa Sudoeste)*.



Artisanal fishing boat.



Cormorant, an aquatic bird that depends on the rich fish resources of the Costa Vicentina.



Cape of São Vicente.

* National list of Sites and Special Protection Areas of the Natura 2000 Network, legislated by the Habitats Directive and the Birds Directive, later transposed into Portuguese law.

Planalto Vicentino

Vicentino Plateau

The coastal strip between Odeceixe and Vila do Bispo is part of a broader geomorphological unit, the vast plateau of the southwest, bordered to the east by the coastal mountain ranges (São Luís and Espinhaço de Cão) and to the south by the limestone massif (of the Barrocal) extending from central Algarve to the Cape of São Vicente. This plateau is an old abrasion platform, flattened by the erosive action of the sea, when about two million years ago the coastline was further inland and this entire area was subject to the abrasive effect of waves and sea currents. The subsequent marine regression in the aftermath of major glaciations exposed all this territory that now mediates the terrestrial and marine environments.

With the end of the last glacial period, about eleven thousand years ago, the rise of the sea level and sea erosion again dictate the receding of the coastline, but not without leaving evidence of the ancient coastline: the sea stacks called *palheirões* in the southwest, are rocky cores that are more resistant to erosion, which over time stand out from the shoreline, becoming solitary rocks in the vastness of the ocean.



Agricultural field planted with sweet potatoes.



White Stork

The numerous and harsh *palheirões* of the Costa Vicentina are highly sought after by birds, for shelter and for nesting, with emphasis on the case of the white stork that nests, only on the Portuguese southwest, in these rocky islets beaten by the sea and wind.



One of the numerous existing *palheirões* in Costa Vicentina.

The Vicentino plateau is cloudy, cool and damp, typically with low temperature ranges, giving it an amenity cut only by the seasonally strong winds blowing from the northwest quadrant. The sands dominate this plateau that was, in a distant past, occupied by vast hygrophilous thickets of heathers and rushes, similar to those now found in Minho. Today it is mainly an agricultural area, displaying



Stauracanthus vicentinus

an interesting and well maintained mosaic of vegetable gardens, orchards and fields of grain, although it maintains extensive natural areas, colonized by coastal scrubland or punctuated by patches of pine and oak forests (cork oak and Portuguese oak) and by riparian galleries.

The native vegetation in these sandy soils diversifies according to the soil's pH: being more alkaline where consolidated dunes outcrop, colonized by calcicolous vegetation similar to that which exists in the Algarvian Barrocal, and more acid if decalcification occurred in the dune field. In the latter case, heathers arise among the rockrose thickets characteristic of the territory, where the southern heather, broom heather and the wild heather mingle with the gum rockrose, the yellow rockrose and the *Stauracanthus vicentinus* gorse, an endemism from the São Vicente area. These communities also integrate various aromatic herbs.

With the proximity to the sea, the arborescent thickets of juniper, typical of coastal paleodunes that correspond to a community of climax forests in arid environments, start to dominate. Sometimes the sea cliffs are only covered by a thin layer of loamy sands; in their more exposed locations are plants, well adapted to the harshness of the environment, some of them endemic to the Southwest, especially the genera *Limonium*, *Plantago* and *Armeria*.

Despite the Mediterranean nature of the dominant vegetation, some places where microclimates are formed, such as the moist and verdant ravines, are notorious for the presence of mountainous species, typical of wetter climates, resisting in the limits of their ecological tolerance. This is the case of the *Centaurea vicentina*, a mountain species that



Heather on the side of a ravine.



Ravine with ephemeral water course.

colonizes coastal heather and gorse here, or the faya tree, species of the subtropical rainforest of Macaronesia (laurel), a relic of distant eras believed to have survived the Pleistocene glaciation in mild forest patches such as those that exist on the Southwest Coast.



The *Limonium ovalifolium* colonizes the most exposed edges of the cliffs.

Osprey (*Pandion haliaetus*)



Currently extinct as a nesting bird, the osprey had its last stronghold as a breeding bird in Portugal in the cliffs of the southwest coast. In the early twentieth century its distribution area extended from the Leiria pine forest to the Albufeira area in various places on the Atlantic coast. The nesting population started to decrease progressively until the mid-90s. Since this time it is only present during periods of migratory passage for wintering areas in West Africa, or as a wintering bird, always in small numbers. They feed and rest mainly in coastal wetlands (estuaries, rivers, lakes, marshes, etc.) although they may move a few kilometres inland to feed on fish in dams. Currently the target of several projects of reintroduction in the Iberian Peninsula, it is believed that this emblematic bird of prey may again breed in the country in a relatively short time, as long as the factors causing their extinction are minimized - such as direct persecution, human disturbance and pollution.

The rocky cliffs are the location of choice for nesting by rupicolous birds such as the peregrine falcon, the chough, the Mediterranean shag, or the rock dove, while in the plateau's farmland, due to its dimensions and methods of traditional cultivating, steppe species can be observed, such as the little bustard, the stone-curlew and even the great bustard, usually associated with mosaics of extensive agricultural plantations of the Alentejo.



Chough, a species in decline in Portugal; one of its favourite habitats is the coastal cliffs.



Corn bunting, one of the typical birds of extensive grounds, and open fields of cereal crops and pastures.

The coastal scrub is inhabited by mammals such as the Eurasian badger, the common genet, egyptian mongoose and rabbits. In caves and crevices of the cliffs, bats take refuge, with some colonies consisting of several hundred individuals who feed on insects along cliffs, valleys with rupicolous vegetation and on agricultural and forest areas, depending on the biotope feed of each species.



Road along the Sagres plateau. Open flat areas with extensive agriculture are the typical habitat of steppe birds such as the little bustard.



Rushes near Pinhal Santo.



The stripeless tree frog is one of the amphibians that uses the temporary ponds.



Temporary pond near Vila do Bispo.

Since this part of the national territory is characterized by very high insolation and high temperatures in summer, the freshwater wetlands such as temporary ponds and small streams, many of them ephemeral, are crucial to the survival of many species of local fauna. The temporary ponds support rare communities of aquatic insects, in addition to a wide variety of amphibians, such as the stripeless tree frog or western spadefoot, and feeding sites for birds such as herons, white stork and snipe. They are also the refuge of crustaceans such as the tadpole shrimp, a species adapted to this environment and whose eggs hatch only when environmental conditions are suitable.

Activities

Hiking

Via Algarviana is a long-distance path, about 300 km, connecting Cape São Vicente to Alcoutim. This Great Route (GR13) is properly signposted and passes many valuable sites, from a natural standpoint, crossing five Natura 2000 Sites and three protected areas. More information can be obtained on the website www.vialgarviana.org

Maria Vinagre and Rogil: although lacking signposted trails, in the surrounding village of Esteveira (Maria Vinagre) there is a network of agricultural tracks and footpaths along which you can see the agricultural mosaic of the region, the dune scrub with heathers and rockrose thickets, the carved ravines and, by the sea, the cut of the coast with its cliffs and *palheiros*. In southern Rogil there is a signposted route included in the Vicentina Route (route connecting São Vicente to Santiago de Compostela), with similar characteristics. More information can be obtained on the website www.rotavicentina.com

Pontal da Carrapateira: the "Trail of Tides" is a signposted route beginning at the restaurant "O Sítio do Rio"; rising up to Pontal da Carrapateira one may attain a wide view over the mouth of the Carrapateira stream and the Bordeira beach, and also observe the vegetable communities of the cliffs. Part of this 19 km circular trail, circles the Medo do Pontal and the Medo das Angras, a complex dune system with thickets of juniper. Following this route south, in the direction of the Amado beach, you can visit the wonderful little ports of artisanal fishing of Zimbreira and Forno (housed precariously on the vertical walls of the cliffs) and an archaeological Site with remnants of an Islamic village of fishermen dating back to the twelfth century.

Donkey rides: available throughout Costa Vicentina. For more information contact the Associação Casas Brancas.

Paragliding: the Torre d'Aspa, an old watchtower from which no traces remain, is the highest point of Costa Vicentina. Its high and steep cliffs are favourable for paragliding.

Watching damselflies and dragonflies: Sagres Peninsula (Autumn) and watercourses. Information on the observation locations is available at the website <http://nsloureiro.pt/dragonflies/>



Signpost of Via Algarviana (GR13) in Sagres.



Cove of the Portinho fishing port of Forno.

Accesses

The towns of **Maria Vinagre** and **Rogil** develop along the EN 120, north of Aljezur; for accessing the routes follow the access towards the sea, looking for signs of **Rota Vicentina** (in Rogil) or signs to Esteveira (in Maria Vinagre).

Pontal da Carrapateira: from EN 268, at the north exit of the village of Carrapateira, turn towards the sea, following the signs for the Bordeira beach.

Torre d'Aspa: in Vila do Bispo, take the access to the Forest Perimeter that begins at the market, following the signs for Torre d'Aspa.

Paleodunes



Towering sand dunes "medos" in Monte Clérigo

On the plateau of Costa Vicentina, suspended on top of the cliffs or riding the sea sections, are remarkable sand dunes, locally called *medos* (pronounced "médos"). In some places, the "medos" grow very tall, forming towering dune ridges, succeeding one another throughout extensive areas covered by arborescent thickets of juniper.

In these dune formations you can see rocky outcrops of fossil dune (paleodune), meanwhile coated by more recent sands. The paleodunes witness an intense and remote wind activity, having been formed thousands of years ago under conditions of elevated temperature and rainfall. Old episodes of carbonation consolidated the dune sediments, resulting in a stiff limestone, used until recently for grindstone used for grinding grain. Currently, these rocks appear scattered in sand dunes along the Vicentino plateau and are truly terrestrial islands of a more alkaline pH than the surrounding land, diversifying the

floristic array of the sands.

The vegetation of the paleodunes is rich in botanical endemics and the tall thickets of juniper are associated with endemic species such as the *Dorycnium hirsutum* subsp. *prostratum* (sheltered under large bushes of juniper), the *Diplotaxis vicentina* and the *Thymus camphoratus* thyme. Associated with carbonated sandstones are



Thymus camphoratus

unique and rare species such as the *Avenula hackelli*, *Chaenorrhinum serpyllifolium* subsp. *lusitanicum* and the *Biscutella vicentina*, endemic species of the Southwest with very sensitive populations.

The most favourable time for observation of dune vegetation is the flowering season, spring, when the dunes assume a fabulous mosaic of colours, wherein the perfume of many herbs is intensified.



Biscutella vicentina



Dunes suspended over the cliff in Pipa beach

Sandstone in Amoreira beach



On the north bank of the Aljezur stream, an extensive dune system develops and advances inland towards the valley, colonized by species that are typical of mobile dunes, such as the marram grass. On the rocky slope on the southern bank of the river, it is lined with more stabilized sands where remarkable fossil dune formations flourish.

The hard grey rock that forms these sandstone dunes may have resulted from the cementation of calcium carbonate leached from seashells by rainwater. The lacy structure that these rocks present are due to the continuous dissolution of the rock's calcium carbonate, by the rain, making it possible to observe the deformations resulting from this erosion process, as exemplified by the caves on top of the north-facing slope.

The plant community that is typical of these consolidated dunes is similar to the vegetation of the Algarvian Barocal that colonizes limestone soils with an identical pH, where plants such as the kermes oak, the wild olive and the mastic tree arise here, in a mosaic, along with species that are typical of sand, such as the Portuguese crowberry, the prickly thrift and the everlasting flower.

The fauna of these sand dunes is similar to that found throughout the Costa Vicentina and can be observed in some of the animals that find refuge and food here, such as the rabbit and red fox.

One of the ubiquitous species that can be seen here is the ocellated lizard, the largest lacertidae in Portugal. It feeds on invertebrates such as beetles and butterflies that abound here and can also catch small lizards and small mammals.



Ocellated lizard

Activities

Hiking

Amoreira beach: despite lacking in signposted trails, it is possible to walk along the walkway that exists in the dunes of the sandy beach and then onto the mouth of the Aljezur stream. Going up the right bank of the stream, upstream, you can see both mobile dunes that extend inland from the beach, as well as the imposing rocky slope on the left bank of the stream, lined by well-vegetated and stabilized sands that fossilize the old dune system. Looking closely, you can find small caves in the upper range of the rocky outcrops.



Sandstones cut up for the extraction of millstones for grinding.

Monte Clérigo beach: there are no marked trails
- a) Park in the picnic area of the pine forest of the Monte Clérigo beach and follow on foot towards the sea, where you can walk the path that runs along the crest of the cliffs, both north (view of Monte Clérigo) and south (dune system). The high cliffs provide panoramic views of the coastline, allowing also to observe the dune formations that develop on the top of these cliffs, which become notable as you reach the Pipa beach (final section of the route);
b) Starting at the beach and walking north at low tide, it is possible, if the wave conditions so permit, to reach a recessed area of the cliff, where, besides the range of typical intertidal organisms, you can observe several attempts to cut millstones (for grinding grain) in the dune sandstones.

Accesses

Amoreira beach: from the north access to Aljezur (EN 120), heading towards Amoreira beach. The entrance to the raised walkway of the dunes is located next to the car park.

Monte Clérigo beach: from the south access to Aljezur (EN 120), heading towards Monte Clérigo. After passing the beach, follow in the direction of Arrifana – Vale da Telha. Park next to the pine forest and picnic area of Monte Clérigo.

Note: It is recommended that you walk and stand only on the existing walkways or well-marked trails, seeing as treading on dunes is a major cause of their degradation.

Reserva Biogenética de Sagres

Sagres Biogenetic Reserve



Coastal scrub with juniper and esparto grass in the Sagres Biogenetic Reserve.

The Sagres peninsula is part of the European Network of Biogenetic Reserves since 1988. This is a region with unique biogeographic characteristics, a meeting point between the sandy plateau of the southwest and the Barrocal limestone in the south.

The oceanic influence is striking: steep cliffs across the marine facies of the headlands of Sagres and São Vicente and salt-laden winds that can blow at more than 100 km/hour, make this one of the most exposed areas of Europe.

Being situated in the extreme southwest of Europe, this place designated by Strabo* as *Promontorium sacrum* (Holy Promontory) and marked as a sanctuary of pre-Roman cults, has been the subject of pilgrimages since time immemorial, surrounded by mysticism until today. It is also known worldwide as a

classic site of interest for botanical research, considering that it has unique biological and ecological conditions. Justifying this distinction is the occurrence of a unique set of plant communities marked by the crossing of Atlantic, Mediterranean and Maghrebian influences, laid out in a mosaic in the restricted geographical area of the Reserve: the rupicolous vegetation of the cliffs battered by strong salinized winds; the arborescent thickets and pre-desert bushes over limestone soils and *terra rossa*; and the communities of the paleodune fields suspended over the cliffs.

In the section of limestone cliffs and close to the sea level, outcrops a rupicolous aerohaline community dominated by species of *Limonium*, *Plantago* and *Armeria*, some of them endemic to this coast. Halonitrophile species are also common, with more requirement of nitrogen (which here comes

* Greek geographer and historian, author of Geographia (dated 23 AD), a work on the history and descriptions of peoples and places in the world, which were known to him at the time.



Astragalus vicentinus

from the waste of seabirds) such as wormleaf saltwort, sea orache and the thorny *Lycium intricatum*.

On top of the cliffs, a community of crawling weeds colonizes the lapies where the *Astragalus vicentinus* dominates - an endemic species of this coast. Further away from the marine influence, arise the endemic pre-desert scrub with the *Ulex erinaceus* and *Genista algarbiensis* gorse and the Sagres gum rockrose, and the juniper thickets and kermes oak over compact limestone.



Genista algarbiensis

In the locations where the sands cover the top of the plateau, dune junipers dominate and you can observe the endemic *Dorycnium prostratum*, *Diploaxis vicentina* and *Biscutela vicentina* associated with consolidated dunes. On the edge of the bushes arise thickets with Portuguese crowberry and the endemic formations of the Southwest, of gorse-thyme with *Thymus camphoratus* and *Stauracanthus vicentinus*.



Juniper

In the Sagres Peninsula, further inland, settles the typical Mediterranean vegetation of calcareous soils of the Barrocal in central Algarve. This community, which here includes several endemics of the vicentine area, is displayed in limestone hills that alternate with depressions filled by *terra rossa*. The landscape is marked by a succession of clear colour hills where the *Stipa tenacissima* esparto grass, accompanied by juniper, kermes oak and



Ulex erinaceus



Dwarf fan palm near the fort of St. António de Beliche

dwarf fan palm. In the depressions, where the soil is deeper, this community is home to the Algarve endemic *Bellevallia hackelli* and *Serratula monardii* subsp. *algarbiensis*; in the clearings of this dry scrub, rare and/or endangered can be found, such as the delicate violet *Viola arborescens*.

The area between Cape São Vicente and Sagres is one of the most interesting places to observe the autumn migration of birds from



Sagres gum rockrose

Curious Adaptations

These plant communities integrate plants that are well adapted, on a morphological and physiological level, to the harshness of the environment, in particular the existing wind conditions. The most obvious morphological adaptation is the shortness of shrubs, giving rise to rounded and dense thickets in the case of gorse or *Astragalus vicentinus*. Also, shrubs such as the juniper or mastic, reaching an arborescent size, develop carpeted forms here. Another adaptation is the exuberant hairy coating of plants, which protects them from the desiccating effects of wind, visible in plants such as the *Asteriscus maritimus* and the *Teucrium vicentinum*. Plants that produce aromatic oils and resins, such as the *Thymus camphoratus* and the Sagres gum rockrose, produce larger quantity of essential oils here.

In total and only in the region of Sagres – São Vicente, are eleven species of plants considered decisive for the national conservation, and a dozen more are protected under the Habitats Community Directive. The habitats defined by the communities of the cliffs with species of *Limonium* spp, phryganea of *Astragalus vicentinus*, thickets of *Juniperus* spp. and the pre-desert scrub of *Ulex erinaceus* and *Cistus palhinhae*, are protected under the Habitats Directive.

The delicate balance that characterizes this unique community also determines its vulnerability. Small changes in the environment can have serious consequences. Some of the major threats consist of the opening of trails, the circulation of motor vehicles and the collecting of specimens of rare plants.



Adaptation of vegetation to the wind, where the bushes acquire a compact, rounded shape.

Europe to Africa. Many species concentrate here, and eat and rest before resuming the rest of the migration, directly to Africa, or along the Algarve coast towards the Strait of Gibraltar. The months of September and October are particularly generous for those who enjoy birdwatching; it is not uncommon to identify more than a hundred species in one day alone. This is also one of the ideal places to see birds of prey in Portugal, for during that time one can observe anything from the most common birds, such as the booted eagle, the kestrel or the short-toed eagle, often in large numbers, to the very rare imperial eagle or golden eagle.

In addition to the seagulls, always present, the top of the cliffs is also a privileged place to observe some seabirds that, in this area, pass by relatively close to the coast, such as the gannet, razorbill, great skua and common scoter.

An interesting case is the regular presence of the jackdaw in Cape São Vicente. This is a species that nests in rocky areas and old buildings (e.g. castle walls) and uses this site to feed and nest.



Booted eagle. Nesting in forested areas, it is an abundant presence in Sagres during the autumn migration.



The kestrel is a resident raptor and common in Costa Vicentina.



Yellow-legged Gull. An abundant bird throughout the entire coast.



Western Jackdaw

Activities

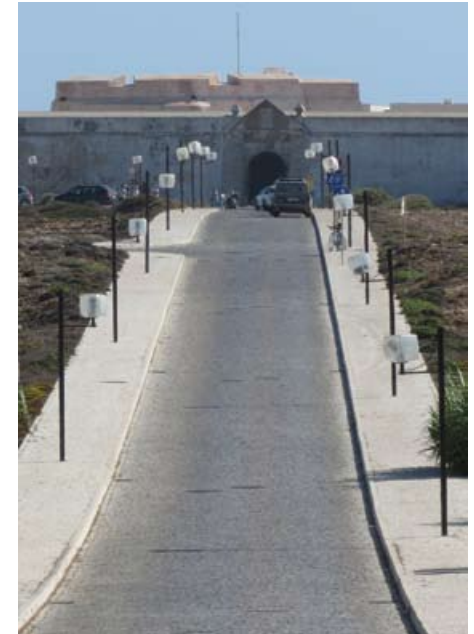
Hiking

The network of dirt tracks or footpaths in the area, allows for visiting the main spits, almost always by the sea; next to Cape São Vicente and north of the EN 268, these paths provide access to an unusual landscape in the Algarve context: open fields with arable and pasture land, sandwiched between the dune formations and temporary ponds of the Pinhal Santo (inland) and coastal thickets of the cliffs.

Telheiro beach: located immediately north of Cape São Vicente, this beach is a classic Site of geological interest, marking the passage from the light-coloured Sagres limestone to the black shales of the Southwest and showing an outcrop of the red Stoneware of Silves in angular unconformity with the shales and greywackes. Also worthy of note are the several aromatic plants that colonize the cliffs.

Sagres Fortress: there is a circular path at Ponta de Sagres, which is accessed through the Fortress, providing a panoramic view of the coastline as well as the observation of plant communities, typical of the cliffs.

Cycling: there is a signposted cycling route running through the whole of the Sagres Peninsula, along the EN 268. This cycling section is part of the Coastal Ecovia, a 214 km route linking Cape São Vicente to Vila Real de Santo António, crossing 12 counties, along the southern coast of the Algarve.



Access road to the Sagres Fortress

Observation of the autumn migration of birds.

The Sagres Birdwatching Festival, which occurs, since 2010, at the beginning of autumn, is a good opportunity to participate in activities related to birdwatching and nature conservation.



Birdwatching in Sagres



The first kilometres of the Coastal Ecovia, which starts at Cape São Vicente.

Accesses

Directions: take the EN 268 to Sagres.

Estuaries and Marine Environment

The main streams that flow in Costa Vicentina - Seixe, Aljezur and Bordeira -, form, near the mouth, lagoon-estuary systems that are associated with extensive sands and dune fields. These sands are formed both by the accumulation of sediments of continental origin, transported by the river system, and by marine sediments retrieved from the submarine sand banks by the continued action of currents, waves and coastal winds.

Being end-of-life watercourses, at the terminal section of these streams, broad floodplains are formed, resulting from the deposit of sediments that have spread there due to the water's loss of competence in transporting them to the sea. Thus, communication with the sea may become intermittent, with episodes of sedimentation emerging from the mouth, tending to establish lagoons.

Like other estuaries of the Algarve, in Seixe and Aljezur you can see evidence of ancient rice production, in beds, which were readily colonized by marshes after the abandonment of the rice cultivation.

Despite their small size, these wetlands diversify and soften the harsh landscape of Costa Vicentina, fulfilling also important ecological functions. They embody highly productive environments which also purify the water that arrive in waterways, protect the shoreline from the advance of the sea and floods, welcome spawning and breeding of fish and shellfish, and are also critical to the survival of many aquatic birds.

The lagoon-estuarine systems influence the coastal marine productivity because they allow the entry of nutrients coming from



Seixe - the Seixe stream, which in its terminal section delimits the Alentejo from the Algarve, is framed in an open and harmonious landscape, meandering in a verdant alluvium valley. The floodplain is well organized in vegetable gardens and orchards, which are gradually being replaced by patches of marsh toward the mouth. The fresh waters of the stream meet the sea on the beach of Odeceixe, skirting a wide stretch of sand that allows the formation of lagoon areas.



Aljezur - in Aljezur the stream runs in a densely cultivated valley, framed to the east by the foothills of the Serra de Monchique and to the west by the hills that house the castle and the old house of the village. The margins of the Aljezur stream and tributaries retain a compact and leafy riparian forest where alder, willows and ash trees thrive. After contouring the steep hill that separates it from the sea, the Aljezur stream spreads out into a wide valley where one hardly guesses human presence; here the marshes dominate and, closer to the mouth, the sand dunes of the Amoreira beach. It is said that this stream was navigable at the time of the Muslim invasion of the Iberian Peninsula until the Christian re-conquest by D. Sancho II in the thirteenth century, making Aljezur an important river port.



Bordeira - the Bordeira stream, one of the three with least expression, crosses the lowland areas where arable crops dominate, to which succeed the towering dune crests of Carrapateira and a wide beach. It is the water course that has greater tendency to clogging the mouth, often forming lagoons along the sands of the Bordeira beach.

land. In the context of Costa Vicentina, small streams and lagoon systems play an equally crucial role, providing space for protection, feeding and reproduction of coastal species, namely of the families of the *Sparidae* (white seabream and gilthead seabream), *Mugilidae* (mullet), *Gobiidae* and *Blenniidae* (gobies) and *Serranidae* (Atlantic goliath grouper).

The diversity of the seabed too, in areas of rock slab in mosaic with backgrounds of sand and mud, along with geographical features such as bays (Arrifana), capes (S. Vicente) and islands (Martinhal), provide a set of precious habitats for shelter, food, spawning and rearing of marine species.

The marine life in Costa Vicentina is exceptionally rich, not only for the diversity of coastal and marine environments, but also because it represents a transition zone for species with northern and southern affinities due to the confluence of three distinct water masses: the Mediterranean, the temperate Atlantic and the tropical Atlantic.

Here circulate Mediterranean, Tropical,

Subtropical and migratory big pelagic species, with greater richness in number of species than in more northerly locations of the Portuguese coast, particularly of the *Sparidae* family. Also the marine flora in this region is noteworthy with more than half of the algae described for mainland Portugal.

Despite the seemingly harsh and abrupt cut of this coastline, the small bays and coves, sea caves, sea stacks and rocky platforms in the intertidal zone, bring marine life, with all its richness and biological diversity, closer and more visible to those who enjoy diving or walking on the rocks at low tide.

Associated with this biological richness, but hardly observable from the coastline, are the marine mammals (dolphins and whales), reptiles such as the common turtle, and seabirds such as the petrel, gannets and shearwaters, as well as some pelagic fish such as the hammerhead shark and smooth hound that are often seen at the surface. Among marine mammals, the common dolphin is the most abundant in these waters and, on occasions, can be seen in large numbers since



Tide pools on the beach of Monte Clérigo

Inhabitants of the tide pools



Crab



Goby



Limpet and barnacles



Strawberry anemone



Green and red algae



Spiny starfish and rock sea urchin

it is a species with a gregarious behaviour.

Along the coast, the otter population uses the marine environment to feed, which is a rare behaviour for this species across Europe. Although dependent on adjacent freshwater wetlands, such as the streams and ravines that serve as refuge, the use of the sea as a fishing area is also an indicator of the wealth of fishery resources of the Costa Vicentina.



Common dolphin

Activities

Worth Seeing

Viewpoints on estuaries: south access to the beach of Odeceixe, south and north accesses to Amoreira beach, Pontal da Carrapateira.



Footbridge at Pontal da Carrapateira.

Surf and Bodyboard: several beaches, depending on exposure and conditions of wind and waves.

Diving: Arrifana, Baleeira (Martinhal islets).

Observation of marine life (whales and seabirds): boating in Sagres, from Porto da Baleeira.

Intertidal observation: at low tide, in areas of rocky slabs such as those on the beaches of Monte Clérigo, Amoreira and Carreagem.

Accesses

Odeceixe: from Odeceixe (EN 120), following directions to the beach.

Carreagem beach: from Rogil (EN 120), following directions to Carreagem beach.

Amoreira: from the south entrance of Aljezur (EN 120), heading towards the beach of Monte Clérigo and turning, near the beach, north towards the spit that allows observing the Amoreira beach, or from the north entrance of Aljezur (EN 120), heading towards the Amoreira beach.

Monte Clérigo: from the south entrance of Aljezur (EN 120), heading to the beach of Monte Clérigo.

Carrapateira: from EN 268, at the northern entrance to the village of Carrapateira, turn towards the sea, following the directions to the beach.



Surf lesson

South Coast



You can see the last Mediterranean riviera here and the influence of all the maritime settlements of antiquity.

Orlando Ribeiro



Turning from the Ponta de Sagres to the south, the landscape becomes brighter under the Mediterranean influence and the cliffs host the beaches that are sheltered from the energetic Atlantic waves and the strong northwest winds. The coastline tends to get lower to the east and the reliefs are carved out in progressively younger geological formations. The approximately 160 km coastline between São Vicente and Vila Real de St. António has a remarkably diversified lithology and various coastal environments. Also the human occupation along the coast is unequal: sections with sparse occupation are followed by urban centres, which are linked to sun and beach tourism, and flood plains with an industrialized agricultural production (especially citrus plantations and greenhouses). Historically, the south coast was inhabited by fishing communities of various civilizations: Phoenicians, Greeks, Carthaginians, Romans and Arabs were attracted by the favourable conditions



Arch in a limestone cliff from central *Barlavento*.

(sheltered bays and good landing ports) for trade and cultural relations.

In Sagres, and also near Figueira beach, the cliffs are clear, carved in limestone from the Jurassic Period and have a vertical profile, giving rise to impressive and erosion resistant reliefs. Between Figueira and Porto de Mós the coastline becomes softer and less steep, where the most recent marl formations of the Cretaceous Period dominate the area. The coastline presents a limited human occupation until the surrounding area of the Praia da Luz and an open landscape, gently modulated by the outline of the gullies that lead to the south and flow into small beaches of sand and round pebbles. On the bright green slopes of these gullies exuberant juniper and kermes oak scrub woods grow, sheltered by the semi-arid environment strongly felt in this territory. In contrast to the clarity of this coastline, the Rocha Negra (black rock) emerges on the Ponta das Ferrarias (Luz beach), a huge volcanic massif in a black and



Rocha Negra at the Ponta das Ferrarias.

dense colour that comes from the Serra de Monchique.

The remaining coastline of the Barlavento corresponds to a cliff coastline, carved in younger carbonate rocks of the Miocene Epoch, where earth tones and karst features dominate. These soft rocks intensively sculpted by fresh and salted water gave rise to a peculiar coast relief where sea stacks, arches, marine caves and small coves are frequent. The bays of Lagos and Armação de Pêra and the estuary of the Arade River, places where the coastline gets smooth, are dominated by sand and marshes, creating extraordinary environments in the context of this rocky and hilly coastline.

In the Sotavento, the coast is low and sandy, favourable for sediment deposition, and the landscape is distinguished by the presence of mild lagoon areas and long dune systems, colonized by scrublands and coastal pine forests that offer shelter to endemic species, some of them protected.

This coastline section became notable due to the presence of two wetlands, the Ria Formosa and the estuary of the Guadiana River, which are crucial for the biological

richness and diversity of the region as well as for the local economy. The lagoon system of the Ria Formosa is the largest wetland area in southern Portugal, forming a strategic link in the network of wetlands that connects North Europe with the Sub-Saharan Africa. On the other side, the Guadiana River forms a typical estuarine system, which is associated to a complex of channels, salt pans and salt marches that host large concentrations of avifauna species in the migratory seasons.



Dunes in Ria Formosa.



Rocha Baixinha (Albufeira). In the transition from the rocky Barlavento to the sandy Sotavento the cliffs become milder, carved out of poorly consolidated sandstone and siltstone, in which rain water digs ravines and gullies.

Coastal Wetlands



Ludo, part of the Natural Park of the Ria Formosa, covers an impressive biodiversity, being one of the most interesting places to watch aquatic birds, particularly in autumn and winter.

The Algarve region shows a group of coastal wetlands with various genesis and physiognomies, which richness contrasts, in terms of complexity and ecological importance, with the richness of the inland wetlands, mostly reservoirs and small weirs. The Mediterranean climate strongly determines these environments with an accentuated water deficit and a hydrological system of torrential flow, whereas the oceanic influence on the coastal wetlands is very important.

The flood water retention areas on the coast were historically considered as places without value, insalubrious areas, which should be recovered for agricultural or urban purposes. In the Algarve, where the coastline is very

demanded, the pressure on the wetlands has been excessive and many of them were drained, grounded and fragmented or are exploited in a way that does not allow a favourable preservation condition of the biological communities.

The acquired knowledge about these environments and an increasing effort for clarification and awareness by the scientific community has reversed this trend, showing the obvious: the transition spaces between the land and the marine environment, where fresh and salted water are mixed, constitute essential biological and ecological importance environments that are fundamental for the balance of adjacent ecosystems.

There are several high aesthetic, heritage and historic value services that are provided by these environments: depuration of river waters, flood control and coastline protection, bioclimatic adjustment, shelter for biodiversity and privileged habitat of fauna and flora, resource production, among others. Being amongst the most productive systems in terms of biomass on Earth, especially if the communication with the sea is regular, they also ensure the spawning and breeding of several fish species, crustaceans and molluscs, guaranteeing the maintenance of the food chains in the ocean.

They are naturally complex and heterogeneous ecosystems, where the mosaic organization of their structural units stands out: lagoons, water channels, sediment deposition areas and vegetation patches that are diversified according to the kind of substrate and the proximity to water. This structural diversity as well as the "edge effect" resulting from the contact between the various environments generate a biological richness and become extraordinarily attractive for the fauna.

A great diversity of aquatic ecosystems increases the value of the south coastline of the Algarve; in the Barlavento, the most expressive are the estuary of Arade and the Ria de Alvor, but equally important are the marsh Paul de Budens, the estuary of the Bensafrim stream, the Vilamoura reedbed (caniçal) (at the mouth of the Quarteira stream) and a series of small coastal lagoons, from which the Lagoa dos Salgados (in Silves), Lagoa do Almargem and the Lagoa das Dunas Douradas (both in Loulé) stand out; in the Sotavento it's the estuarine-lagoon system of the Ria Formosa which characterises the landscape, in an extent of around 60 km of coastline with its lagoons, barrier islands, sand dunes and marshes, and, near the border, the mouth of the so called big river in the South, the Guadiana.



The black-headed gull is a small common gull along the coastline.



The yellow bloomrape is an eye-catching species that parasitizes the roots of marsh plants. Flowering occurs in a short period of time in early spring.

Ria Formosa

The largest wetland of south Portugal covers almost 11,000 hectares along approximately 60 km of coastline, between Ancão (Loulé) and Manta Rota (Vila Real de Santo Antonio), forming an estuarine-lagoon system, where a large area of marshes, islets and channels is protected by robust sand belts, which form two peninsulas (Ancão and Cacela) and five barrier islands (Barreta, Culatra, Armona, Tavira and Cabanas). The bars between the islands enable communication with the sea, renewing on a daily basis 70 % of the water volume in the Ria in each tidal cycle. In the north, the Ria is cut into salt pans and ponds, sandbanks, dry land and into the mouth of the water streams that flow into it, being the Gilão River, in Tavira, the most expressive one. Because

of the torrential flow of the river and streams, the contribution of fresh water to the system is very modest and the oceanic influence is strong.

Although there is moderate urban concentration on the riverside, with Faro, Olhão and Tavira benefiting from the privileged location on the edge of this wetland, the Ria Formosa has maintained a reasonable environmental quality. Classified as Nature Reserve in the 70s, this protection status was elevated to a Natural Park in 1987 because of the increased need of regulation of tourism and urban pressure as well as due to the need of planning the surrounding territory.



View over the Ria Formosa.



The small cordgrass is an important species in these environments: it is a pioneer plant that colonizes mud banks at mean sea level, forming extensive lawns that contribute to the stabilization of sediments and open the way for the establishment of other marsh species.

The origin of the Ria Formosa

Eighteen thousand years ago, the sea level was about 120 m under the current level, leaving a large extension of the continental shelf uncovered. Large quantities of sand were accumulated along the bottom of this shelf, forming sandbanks. In the sequence of the thawing and rising of the sea level, the banks were flooded by the continental slope, forming the barrier islands, that later moved along the shelf heading the land. At the same time, and while the alluvial material was being deposited in lagoons, marshes and islets were getting shape inside the lagoon. The constant deposition of sediments increases the isolation from the marine environment and accelerates the blockage of the Ria, which will have the tendency, as it gets older and without any intervention in its natural evolution, to progressively acquire more typical terrestrial environment characteristics.

The Ria Formosa is also classified as a Wetland of International Importance (Ramsar Site*) and as Special Protection Area, and is included in the Site of Community Importance Ria Formosa-Castro Marim (Natura 2000 Network).

From the sea to the land the area is divided into beaches, dunes, mud banks, marshes, channels, sandbanks, salt pans and areas of freshwater entrance. This huge variety of habitats, organised in mosaics, and their extension, allow the diversification of biological communities. Plants and animals are distributed according to the environmental conditions: salinity gradient, immersion time in salt water, proximity to the tidal inlets, presence of the pollution hotbeds, nature of the substrate, type of vegetation cover and abundance of food resources, among others.

The high biological productivity of the Ria Formosa is reflected in all its environments,

* The Ramsar Sites are the result of an intergovernmental treaty called Convention on Wetlands, adopted in February 2nd 1971 in the Iranian city of Ramsar. This convention has the aim to ensure the conservation and rational use of wetlands at a global level.

being especially visible in the benthic communities, which can present an abundant population, as in the case of annelids like the polychaetes, and crustaceans, gastropods molluscs (limpets, whelks and sea slugs), and also bivalve molluscs. Many are commercialized, like the grooved carpet shell, the egg-shell razor or the tuberculate cocklie. These organisms live in the muddy and sandy bottom of the Ria.

The fish presence in the Ria is highly significant, as more than 140 species have already been counted. Many of these fishes come to the Ria to spawn and to breed: as the white seabream, the European seabass, the common sole, or the striped red mullet, species of high commercial value. Besides shelter and breeding, the Ria also offers protection to juvenile fish since the presence of the predators that live on the adjacent coastline is hampered by the environmental conditions at the Ria (currents, tidal effect, constant change of bottoms and physicochemical parameters).

The fishes that occur here can be species that complete their life cycle in the Ria, as the long-snouted seahorse or big-scale sand smelt, or they may be migratory fishes like the European eel, or simply use the Ria at the juvenile stage, while the adults migrate to the sea like the white seabream or the European seabass. Other fishes, as the ray, the lesser-weever or the poor-cod, occasionally enter the Ria, restricting its presence near the tidal bars.



The fiddler crab is a common species on the muddy banks of the Ria. The male crabs have one claw that is more developed than the other.



Shellfish picker. The Ria Formosa is the main source of clams consumed in Portugal.



Tuberculate cocklie



The Ria is an important natural nursery that protects some fish in their larval and juvenile state.

The strategic geographical location of the Ria Formosa has made it become an important link for the wetland network, that extends from the north of Europe until Sub-Saharan Africa. It is an important breakpoint for aquatic birds during their migration between the two continents. The avifauna is in fact one of the main attractions of this wetland, with more than 200 registered species every year and many of them with a high protection status. This biological richness results from the existing food availability and the extension and diversity of the environments that compose the wetland.

During the wintering season the lagoon and the adjacent environments offer shelter and food for thousands of aquatic birds like the flamingo, the spoonbill or the ducks, among others. Immediately after the Tagus River, this wetland is the area with the largest number of wintering waders. During the migration and wintering period, birds of prey that exploit the abundance of food resources are also found.

The Ria is also an important Site for the nesting of aquatic birds. The kentish plover and the little stern nest in the sand dunes and salt pans, while fresh and brackish water environments sustain the breeding of anatidae, herons, grebes and rails such as the purple gallinule. In the salty lagoon environment, between islets covered with marsh vegetation, the little egret and spoonbill are breded. It is also in these marshes that the white stork, one of the endangered species in Europe, feeds itself by moving from its nest, many of the stork nests are built in urban areas adjacent to the Ria, in Faro, Olhão or Tavira.

Ludo, in the extreme west of the Ria, where the S. Lourenço stream flows into it, there is a significant extension of salt pans, marshes and tidal creeks, surrounded by agricultural fields, a pine forest, a golf course, and with little human disturbance. This is perhaps the place with the greatest abundance of wintering

Purple gallinule (*Porphyrio porphyrio*)



In the 80s of the last century, Ludo was the last stronghold of the purple gallinule, a rail adapted to swamp areas with abundant aquatic vegetation, particularly the reedmace, which is one of its favourite foods. Since then, it has colonised small wetlands in the west of the Ria Formosa, because of the adoption of protection measures and the creation of new lagoons, some inserted in golf courses. Its protection status remains vulnerable due to the small population, the fragmentation of its habitat and the threats that exist on wetlands without the protection status. It is the symbol of Ria Formosa Natural Park.

aquatic birds and where almost all wintering anatidae species in Portugal can be watched, like the flamingo, the moorhen, and the grebes. The great crested grebe, the red-rested pochard, the purple gallinule and the pochard are some of the many species that nest here.

Of all the other animals that also occur in the Ria stand out the western polecat and the

Birds of Ria Formosa



Sandwich tern



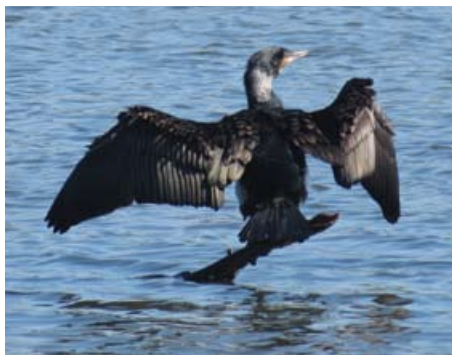
Mallard



Sanderling



Audouin's gull



Cormorant



Grey heron



European pond terrapin

otter, two mammals that are adapted to the aquatic environment and can be seen here regularly or the two species of terrapin of the domestic fauna, that can be easily seen on the bank of the streams or in the lagoons with more fresh water influence, in the Ludo area. From the two turtle species of the national fauna, the European pond terrapin is the rarest and lives in many aquatic environments together with the Mediterranean terrapin.

Activities

Sightseeing boat tours

The large lagoon area of the Ria Formosa can be visited by boat during the whole year and there is a considerable tour offer available that includes various tourist activities, from a visit to the barrier islands, water sports or sport fishing, to nature tourism with specialized guides for the observation of vegetation, aquatic birds and dolphins.

The boat tours allow to travel through the channels of the Ria and give the opportunity to appreciate privileged views over the marshes and islets with the typical vegetation of salt marshes and the associated fauna, the chance to disembark in isolated locations, to reach the barrier islands and to visit their bars. In addition to the numerous natural values that can be observed, the fishing community of Culatra and the bustle of its fishing port may be pointed out, the Hangars (the ruins of a military base built in the 1st World War) and the most southern point of the mainland Portugal - the Cape of Santa Maria (Island of Barreta).

Shipments are made from Faro (Porta Nova Dock), Olhão, Fuseta, Santa Luzia and Cabanas de Tavira.

Sailing and boating: the Ria Formosa has unique conditions for practicing water sports like sailing, canoeing or windsurfing. For more information contact the naval clubs in Faro, Olhão, Fuseta and Tavira.



The tide mill of Quinta de Marim.

Hiking

The São Lourenço walking path: a signposted trail of about 4 km (round trip) that passes through the adjacent area of the Quinta do Lago, between the marshes and the golf course, till the beach. It includes two bird observation stations; one dedicated to the fresh water lagoon of the golf course, another offers a view over the salty creeks of the Ria. This trail is part of the Ludo area has two walking options, one that goes over the silt vanes of the creeks of the Ria or the other one, through the pine forest, observing the large extension of lagoons, salt pans, marshes and the mouth of the São Lourenço stream.



Fisher port of Culatra.

Activities

Barrier Islands: the sandbanks of the islands are crossed by a network of elevated walkways and trails that allow contact with the dunes and the beach.

Environmental education

The **Quinta do Marim**, headquarter of the Ria Formosa Natural Park, has a signposted trail that passes through some typical environments of this protected area (marshes, lagoons, salt pans, pine forest) and allows panoramic views of the Ria. The trail includes a former tide mill and roman ruins for fish curing. The Environmental Education Centre of Marim (Centro de Educação Ambiental de Marim) displays some exhibitions and information about the Ria Formosa. In another building of the Quinta do Marim, there is the Centre for the Rehabilitation and Research of Wild Animals at the Ria Formosa (RIAS), dedicated to the recovery of wild animals, research and environmental education.



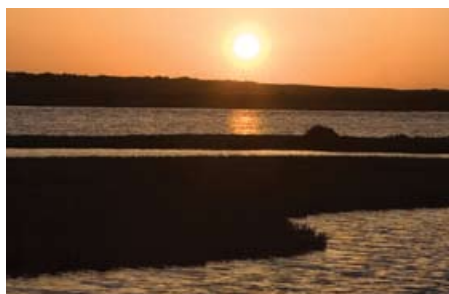
The tide mill of Quinta do Marim.

Birdwatching

Ludo and Quinta do Lago: Sites with mirrors of fresh water adjacent to the marshes and tidal creeks of the Ria that attract a great diversity of birds.

Salinas das Quatro Águas (Tavira): on the access road to the shipment docks to the Island of Tavira, active salt pans can be observed in various sea salt extraction stages. The abandoned salt pans, partially or fully colonised by marsh vegetation, are an attractive habitat for aquatic birds. Other privileged places to observe birds are the area of the **Arraial Ferreira Neto** (Tavira), **Faro beach** (barrinha) and the **Parque Ribeirinho de Faro** or even **Santa Luzia**.

Watching damselflies and dragonflies: Ludo is considered a hotspot for the observation of these insects.



Accesses

Ludo and the São Lourenço walking path: accesses through Quinta do Lago (bridge to the beach) or from Quinta do Eucalipto (road from Faro to the airport), strolling to the west on an unpaved way in the direction of Quinta do Lago.

Parque Ribeirinho de Faro: access next to the Faro dock or at the entrance of the city, next to the Municipal Theatre.

Faro beach: road access from the Faro road to the airport.

Farol and Culatra islands: access by boat from the Porta Nova docks (in Faro) or the Olhão piers.

Island of Barreta (Ilha Deserta): access by boat from the Porta Nova dock, in Faro.

Quinta do Marim: from the EN 125, around 1 km after leaving Olhão in direction to Tavira, turn right and follow the indication of Parque Natural da Ria Formosa.

Quatro Águas and Arraial Ferreira Neto: in Tavira follow the signs until the mouth of the Gilão River; on the right bank of this river (Quatro Águas) or on the left bank (Arraial Ferreira Neto / Hotel Albacora).

Santa Luzia: on the section of the EN 125, between Luz de Tavira and Tavira, follow the indications to Pedras d'El Rei. Along the Ria head east for 1 km.

Ria de Alvor



The most important estuarine-lagoon complex of the Barlavento (western Algarve), the Ria de Alvor, is nestled in the wide sandy bay of Lagos. This wetland emerges in the confluence of four waterlines, the Odiáxere and Arão streams in the west, with the source in the mountains Serra de Espinhaço de Cão, and the Farelo and Torre streams in the east that drain the south slope of the Serra de Monchique. The lagoon area with its mudflats, sand banks and marshes is protected from the action of the sea by two tongues of sand, the beach of Alvor, in the east, and the beach of Meia-Praia in the west, which support robust dune belts. The communication with the sea is established through a tidal inlet that is stabilized by jetties. The influence of the ocean is significant, not only because of the torrential flow of these streams, but also due to the reduced water flow caused by the construction of the dam of Bravura and the dyke of Penina.

The loss of flow velocity of the streams caused by the above-mentioned water-engineering constructions determines the acceleration of the silting in the lagoon. The strength of the streams flow is not sufficient to drag the sediments from the streams to the sea. It was in this context that in the 90s of the last century different works were carried out in the Ria, including a dredging project and a construction of breakwaters in order to fix the tidal bar. Unfortunately, at this time the dredged spoil was deposited over the dunes and the marshes and as a consequence the ecological value of a considerable part of the habitats in this wetland was destroyed. Over the last years the affected places were the target of different recuperation and re-naturalization actions that led to satisfactory results in the marshes as well as in the dunes.

In spite of the increased tourist and urban development, the environment of the Ria de

Alvor maintains a low density of constructions, conserving its natural potential and a good landscape quality that is essentially characterized by the shades of the water and the green patch that goes over the marshes, dunes, cliffs and the agricultural fields.

Similar to the Ria Formosa, this wetland is classified as a Wetland of International Importance (Ramsar Site, since 1996) and is also part of the National List of Sites of the Natura 2000 Network (Ria de Alvor Site). Although it is quite a small area in the scope of the Natura 2000 Network in Portugal, its intrinsic value in terms of biodiversity is consensual and also notable in terms of diversity of habitats, even if only concentrated on an area of 1.700 hectares. This area includes lagoons, dunes, tidal mudflats, marshes and salt pans, as well as the peninsulas of Quinta da Rocha and Quinta da Abicada with their scrublands, agricultural fields and pastures.

Different salty habitats may be found here with their typical formations of low, middle and high marsh, halophytic rushes, annual and perennial plants of dry wetlands and salt pans, areas with hypersaline conditions (where salt ascension by capillary is found) and transition areas for riparian habitats where the salinity attenuates. Although the vegetation of the wetland has occurred after the rice cultivation, which originally occupied large extensions of the wetland, the plants that now grow in the wetland habitats indicate an adequate maturity degree of the communities and certify their ability to recover.

The high marsh vegetation also counts on an endemic species of the Iberian Peninsula, the *Limonium ovalifolium*; in the environments of the coastal scrublands two lusitanic endemisms of restricted distribution may be observed, the delicate *Linaria algarviana* and the aromatic thyme *Thymus camphoratus*.

The human activities traditionally related to the Ria de Alvor such as fishing, cultivation



Limoniastrum monopetatum is a Mediterranean plant which distribution in Portugal is restricted to the high marsh of the Algarve.



Sharp-pointed rush, common on the coastline on salty or brackish grounds.



Sarcocornia fruticosa, common plant in the middle marsh.

and picking of molluscs (dedicated primarily to clams: carpet shell, tuberculate cockle and peppery furrow shell), confirm the high productivity of the wetland as well as its social-economic significance. Salt production was since the sixteenth century a traditional activity whose importance and intensity of exploitation has varied in the course of time. Today, a great part of the salt pans are abandoned and some have been converted into tanks where gilthead seabreams, european seabasses and common soles are cultivated.

It is an auspicious natural place for the growth of young fish and larvae of crustaceans and molluscs and the heterogeneity of this place also allows the occurrence of a huge diversity of birds. Typical species of the estuaries and the wetlands are found here, marine species, and birds related to agricultural purposes that use wide extensions (approximately one third of the area) of crop cultivations, irrigated orchards and citrus plantations, dry orchards with almond trees and fig trees and pastures.

Despite of the small dimension, this wetland presents a variety of marine and coastal species similar to the one of the Ria Formosa. The dune area is the nesting place of the little tern and the kentish plover and the crested lark, while in the lagoons and the marsh areas the waders, gulls, flamingos and egrets find their food or rest.

On the agricultural fields and pastures adjacent to the wetland, the presence of flocks of goldfinches, greenfinch, among other perching birds, is common. The little owl, the azure-winged magpie or the blackbird are found in places where humans live as well as the cattle egret that eats insects that are carried or that fly away from the cattle herd grazing here.

This is also a place with a high variety of insects where more than 500 species of moths and butterflies and 200 species of beetles



Lapwing, a wading bird that winters here and uses the meadows and agricultural fields as food source.



Ringed plover. Common in the estuaries and salt pans.



Canal and high marsh in the mouth of the Torre stream, one of the influent streams of the Ria de Alvor.

have been registered. This diversity of insects is a decoy for some bats such as the greater horseshoe bat, a species that is frequently seen searching for food over water surfaces.

Activities

Hiking

There are two signposted trails in the Ria de Alvor: **Rocha Delicada**: starts in Mexilhoeira Grande and passes through an area generally known as Quinta da Rocha. Besides the observation of different habitats of the wetland and the associated fauna, it is also possible to visit the Centre for the Study and Observation of Nature, located in Cruzinha, created by the nongovernmental environmental organisation "A Rocha".



Trail over an earth wall on the path "Rocha Delicada".

Ao Sabor da Maré: the path begins in the riparian zone of the village of Alvor and passes through the peninsula of Alvor beach, offering visitors panoramic views over the beach and the coastline as well as over the marsh and the other lagoon environments, always with the mountains of the Serra de Monchique in the background.



Wood structure (footbridges and rest area) on the route "Ao Sabor da Maré".

Worth Seeing

The landscape at the peninsula of Abicada and visiting at the same time the ruins of the Vila

Romana of Abicada, a town that had curing fish as its main activity.

Environmental education

The association "A Rocha" promotes environmental education activities related to the promotion of the natural values of the Ria. Some of the suggested activities are demonstration of bird ringing, observation and identification of birds, plants, moths and invertebrates, among others.

Journey into the past at the archaeological site of **Alcalar Megalithic Monuments**, a reception and interpretation centre that allows the visit to a village of the third millennium b.C., which was an important urban centre of a territory that included settlements from the banks of the Ria de Alvor till the foothills of Monchique. The traces found evidence the food dependency of these populations in relation to the biological resources of the lagoon environment.

Water sports

Lagoons are suitable for canoeing, sailing, windsurfing and rowing; for more information contact the Associação Desportiva e Cultural de Portimão (Portimão Association for sports and culture) or the Associação Regional de Canoagem (Algarve's Canoeing Association).

Accesses

Quinta da Rocha Peninsula: the access is made through the railway station of Mexilhoeira Grande going through the road from there heading south.

Praia de Alvor (beach): the access is made from the riparian zone of the village of Alvor following the signs to the beach.

Península da Abicada: the access is made from the road EN 125, near the town of Figueira, following the signs to Abicada.

Alcalar Megalithic Monuments: access the EN 125 about 5 km from Mexilhoeira Grande, taking the road that goes from Penina to Sr^a. de Verde.

Estuário do Arade

Arade Estuary



It is an estuary of a modest dimension that receives water from the Arade River and from the Odelouca and Boina streams. The Arade River, once navigable until Silves and historically connected to this city that was the commercial and cultural capital of the Algarve during the Arab presence, is the most important river in the South after the Guadiana River. But the Arade River as well as tributaries has a low flow, especially because of the climatic and hydrologic conditions of the region, but also due to the water retention by the dams of Funcho, Arade and Odelouca.

The west bank of the estuary is occupied by the city of Portimão that doubles its population during the summer. In the interior of the estuary there is a marina, a sewage treatment plant and also the main fishing port of the region. The urban pressure is moderate, concentrated on the last section of the estuary, while along the basin of the river and the tributaries the demographic

concentration is low and associated to tourism and agriculture.

Although the whole estuary is classified as a Wetland of International Importance (Ramsar Site) due to its complex of marshes and estuaries of great ecologic importance, the SIC Arade-Odelouca (Site of Community Importance of the Natura Network 2000) develops along the terminal sections of the Arade River and Odelouca stream, excluding the area of the mouth where human occupation is concentrated. The classification of this Site is connected with the need of recognition, protection and promotion of an interesting group of environments that vary from upstream to downstream to the point where the influence of the ocean becomes more visible.

Upstream, the very nestled valleys covered with riparian vegetation typically from the mountains dominate. As the streams head

south, the valleys become wider and gain dimension, stretching out in flood plains dotted by swamps, marshes, salty grasslands and sandbanks where agricultural areas are inserted. In its last section, this estuary forms a large marsh with hundreds of hectares surrounded by soft hills where Mediterranean scrublands grow.

On the left bank of the Arade River, the freshwater springs of Estômbar contribute to the diversification of the estuarine habitats alternating the marsh into reedbeds, freshwater lines and a temporary lagoon. These springs are located in the extreme west of the biggest aquifer of the Algarve, known as Querença –Silves and they constitute, together with the springs of Benémola (Querença), one of the most abundant outflows of this groundwater reservoir.

Eighty-eight species of fish are registered for the mouth of the Arade. Some of the most abundant are the painted goby, the big-scale sand smelt, the two-banded seabream,

the black goby, the solenette, the european pilchard and the white seabream. It is also an estuary where fish with high commercial interest is caught such as the striped red mullet, the common soles, the brill, the European seabass, the white seabream or the gilthead seabream.

In the various salt pan complexes of the estuary it is possible to observe the black-winged stilt and sometimes some flamingos. The adjacent swamps concentrate a great number of gulls and some limicola like the ringed plover, the grey plover, the whimbrel or the common sandpiper.

Some colonies of bat species with a threatened status find shelter in the vertical caves opened in limestone of the Jurassic period, located on the east bank of the Arade River. These vertical caves reveal archaeological traces of human occupation from the Palaeolithic until the medieval period; the biggest vertical cave is occupied by a shallow lake which level is influenced by the tide.



Anabranch near Sítio das Fontes.

The tide mills of Arade



Today the water springs of Estômbar are inserted in the municipal park “Parque Municipal do Sítio das Fontes”, created by the municipality of Lagoa in order to promote environmental education activities and the diffusion of the historical and cultural heritage connected to the Arade River. Next to the springs, one of the tide mills that formerly existed between Portimão and Silves was recovered, including the boiler and the miller’s house and it is possible to watch it whilst working. The traces of approximately twenty tide mills at the banks of the Arade is a proof of the importance that these hydraulic mills had for the local economy from ancient times and there is a reference to one of them in the Livro do Almoarifado de Silves (administration book of Silves, fifteenth century). These mills were constructed in the estuaries of the river on flat grounds taken advantage of the sheltered areas that allowed the blockage of the water. The two daily tides, a constant and foreseeable energy source, assured approximately four hours of grinding. Flour and other raw materials were normally transported on the streams.

Activities

Birdwatching: although without signposted trails, walking along the salt pans of Mexilhoeira da Carregação and Parchal allows the observation of water birds at the salt pane tanks and the uncovered swamps at low tide, looking for food.

Water sports and river tours: here it is possible to go sailing, canoeing or windsurfing, and also sail up the river to Silves; for more information consult the sports associations in Portimão and Lagoa, the Associação Regional de Canoagem do Algarve

(Algarve’s canoeing association), the Clube Náutico do Arade (Arade nautical club) or the Clube Naval de Portimão (naval club of Portimão).

Environmental education: the municipal park “Parque Municipal do Sítio das Fontes” offers a wide range of activities, suitable for all ages, related to the discovery of the environment and the natural values as well as the cultural heritage of the Arade River.

Watching damselflies and dragonflies: Sítio das Fontes is considered a hotspot for the observation of these insects.



Walking path at the Municipal Park Sítio das Fontes.

Accesses

Salt pans: in Mexilhoeira da Carregação, follow the road Marinhas until you find the salt pans.

Municipal Park Sítio das Fontes: in Estômbar (Lagoa), follow the inter-municipal road Estômbar-Silves in the direction of Silves until the signs of the park are visible.

Marshes, Reedbeds and Coastal Lagoons

The southern part of the Barlavento is dotted by wetlands of modest size which form an ecological corridor for many species, especially for the avifauna. In fact, these wetlands are essential for some fauna species of the Algarve because they offer a big variety of salty, brackish and freshwater environments.

Water birds, especially rails, egrets, grebes and ducks or migratory perching birds benefit from these areas as well as the otter that also needs the adjacent freshwater lagoons, although it exploits the existing resources in the Ria Formosa, in the Ria de Alvor or in the salt pan of Castro Marim.

These small wetlands develop in the final section of the torrential streams, forming plains inundated by freshwater or brackish water. According to the sedimentation state of their bars, the communication with the sea can vary between permanent, sporadic or absent and results in various environments.

From the small wetlands that occur in the southern coastline, the described wetlands can be considered as the most expressive, both because of their relative dimension and due to their natural values.



The little bittern is a small egret that lives in wetlands with abundant emergent vegetation like reed and reedmace. This is one of the species that winters in Africa, coming back in the summer to nest.

Paul de Budens

(Vila do Bispo)

Near the mouth of the river, at Boca do Rio beach, the valley where the Budens stream flows becomes wide and the water expands over the alluvial soils covered by marsh vegetation where reed, reedmace and various species of the sedge family (*Cyperaceae*) and rush family (*Juncaceae*) grow abundantly. The water in the marsh is mainly freshwater and the soft green landscape of the alluvial plain contrasts with the dark and deep tones of the xeric (adapted to dryness) maquis of the surrounded slopes. The marsh is separated from the sea by a pebble and cobble barrier that blocks the entry of salty water during a great part of the year.

Once called "Paul da Lontreira" (marsh of the otter), because of the regular presence of otters, this old rice field is, despite of its natural interest, not yet well known in biological terms. The marsh of Budens that extends approximately over 130 hectares is the nesting place for many waterbirds, like the little bittern, the purple heron or the great reed warbler. It is also a privileged place for the observation of freshwater terrapins and dragonflies. Some allotments of the marsh are actually drained to give place to cattle pastures and as a consequence the structural diversity of the wetland has increased.



Flooded area in the marsh Paul de Budens.

Foz da Ribeira de Bensafrim

Mouth of the Bensafrim Stream (Lagos)



White stork feeding in the salt pan.

This wetland covers an area of approximately 300 hectares, periodically inundated by tides and fed by the seasonal flow of the Bensafrim stream and by freshwater springs. Its hydrology was deeply intervened in the fifteenth century for agricultural use and for water desalination of the stream. The structures dedicated to the drainage and irrigation of the land are maintained until today and lately other uses changed this estuarine system. After the decrease of the agricultural activity that is now limited to little gardens and agro-forestry farming, the Lagos Marina was built and an aerodrome was established on the landfill, where the excess of the construction work of the Marina was dumped; here a sewage treatment plant was also installed.

Despite of these alterations, the marsh vegetation and the canal complex that irrigates the alluvial plain attract various birds as well as reptiles and insects, especially butterflies and dragonflies. The black-winged stilt and the exotic monarch butterfly became emblematic species of this wetland. Other species such as the stork or the little egret that reproduce in Lagos, nourish themselves in these marshes during the year.

Lagoa dos Salgados

(Silves and Albufeira)



This is a coastal lagoon, together with the lagoons of Almargem and the Dunas Douradas (in Loulé), which develop in the terminal section of the Espiche and the Vale Rabelho streams, occupying a depression of nearly 150 hectares. The communication with the sea is sporadic and is established in periods of intense precipitation breaking-up the sandy barrier that isolates the lagoon from the sea. Similar to what happened in other wetlands, part of the inundated plain was drained and used for agriculture until the mid-twentieth century. After the abandonment of these agricultural lands, a considerable area of the lagoon was filled with soil; in this case for the construction of an airfield and, later, for a golf course. The entrance of water through two sewage treatment plants changed much of the hydrological regime of the lagoon, maintaining a constant flow that, naturally, would be seasonal. Although problems of eutrophication in the lagoon had arisen, it seems that conditions have been created and established in this place for other bird species

that prefer lagoon areas, besides the limicola birds that prefer marshy areas.

Classified as an IBA* (Important Area for Birds) by Birdlife International / SPEA, Lagoa dos Salgados becomes a privileged place for the observation of aquatic avifauna in the Algarve, since it regularly shelters for more than 5,000 water birds representing more than 60 species. It is one of the most relevant Sites for the nesting of the purple gallinule, black-winged stilt or purple heron and it is the only confirmed nesting place at a national level for the ferruginous duck; a duck that has its nearest nesting site in Doñana (Andalusia). It is the wintering site for spoonbills, flamingos and, among others, for ducks and rails. This biological richness is linked to the calm environment of the lagoon, occupied by greens of a golf course and by a vast area of dry orchards that extend to the west, until the marsh of the Alcantarilha stream.

Canical de Vilamoura

(Loulé)



The Vilamoura reedbed, part of the Vilamoura Environmental Park (PAV), is perhaps the biggest continuous reedbed in the south of Portugal, with approximately 29 hectares. The reedbed develops in the final section of the Quarteira stream, in alluvial soils that were once used for agricultural farming. Still in the 70s (of the twentieth century) the Vilamoura marina was built, occupying the intertidal zone of this wetland. Despite of the urban and touristic pressure of the surroundings, the Vilamoura reedbed maintains its high biological and ecological interest, partially because of its structural heterogeneity. The remaining agricultural fields, the grassland and the drainage channels of the golf course are disposed in mosaic in the surroundings of the aquatic system and are supplemental food areas for the avifauna.

The reedbed and the lakes of Vilamoura, together with the Salgados lagoon and the lakes of Quinta do Lago and Ludo form a group of essential wetlands for the national

population of purple gallinule, finding here an important breeding core. Until a few years ago, the purple heron and the marsh harrier have nested inside the reedbed while in the artificial lakes (of the golf courses and of the PAV) other species nest, such as the little grebe, the coot, the moorhen, the cetti's warbler, the kingfisher, the mallard and the little bittern, among others. In the Quarteira stream and in the lakes European eels and grey mullets are found, prey fish appreciated by otters, egrets and the cormorant or by the occasional ospreys that pass here during the migrations.



Freshwater lake, created in the PAV.

* IBAs are areas of international importance for bird conservation on a global scale and constitute a network of areas classified by BirdLife International.

Activities

Hiking

Paul de Budens: it is possible to walk along the valley on a section of a trail called "Ecovia do Litoral" (Coastal ecovia) and then to walk up to the "Forte de Almadena" (Fort), on the top of the slope of the east bank of the stream. This fort was built in the seventeenth century in order to protect from pirate attacks the tuna traps (almadrava) that were placed along Boca do Rio.

Lagoa dos Salgados: there is a signposted path called "Percurso de interpretação da Praia Grande" (Interpretation course) that passes through agricultural fields and dunes from the marsh of Alcantarilha until Lagoa dos Salgados, going around the whole south bank and with access to the fauna and flora observation station.

Caniçal de Vilamoura: the Vilamoura Environmental Park, with a 200 hectares area, has a signposted trail that allows visitors to go to the main Sites of natural interest of this protected area. The trail uses agricultural path near the bank of the Quarteira stream and around the agricultural fields and the reedbed. The two lakes, created at the beginning of this environmental enhancement project in Vilamoura, are privileged places for the observation of fauna.



Access to the birdwatching station at the Vilamoura Environmental Park.

Birdwatching

In Paul de Budens, Ribeira de Bensafrim, Lagoa dos Salgados, Lagoa do Almargem, Lagoa das Dunas Douradas and Caniçal de Vilamoura. There are birdwatching stations in Salgados, Dunas Douradas and Vilamoura.



Cattle on a flood plain of the Budens stream.

Accesses

Paul de Budens: access through the town of Budens, in Vila do Bispo, following the directions to Boca do Rio beach.

Ribeira de Bensafrim: accesses in the east of Lagos, following the road EN 120 in the direction of Bensafrim, passing through the village of Portelas and turning to the west.

Lagoa dos Salgados and Praia Grande: accesses through the towns of Pêra (Silves) or Vale de Parra (Albufeira); following the directions to Praia Grande or Praia dos Salgados.

Caniçal de Vilamoura: in Vilamoura, access through Estrada de Albufeira (road). The entrance of the Vilamoura Environmental Park is located near the Vilamoura International School.

Lagoa do Almargem: access through Fonte Santa (Quarteira), following the directions to Praia do Cavalo Preto or Foz do Almargem.

Lagoa das Dunas Douradas: access through the touristic complex Dunas Douradas (Vale do Garrão, Loulé), following the directions to Praia das Dunas Douradas.



Dunas Douradas Lagoon.

Beaches of **Garrão**, **Ancão** and **Quinta do Lago**: accesses from Almansil, following the signs to the beaches.

Dune Systems and Pine Forests



Dune covered with prickly thistle (in flower).

The sandy coastline is selectively present in the Barlavento of the Algarve, gaining expression in the bays of Lagos and Armação de Pêra. From Ancão (Loulé), the low and sandy coast extends in a continuous way until the border, in the mouth of the Guadiana, with different landscapes and environments. Between Ancão and Manta Rota, where the sandy barriers of the Ria Formosa are rooted, the dunes stretch out until the barrier islands and get in contact with the salt pans of the lagoon environment on the land. To the east of Manta Rota, the dunes include long beaches that spread naturally to the inland giving rise to most stabilized habitats and in some cases pine woods. The coastline of the Sotavento accumulates sediments and the dunes become more robust walking towards the mouth of the Guadiana, pointing out the wide pine forest between Monte Gordo and Vila Real de Santo António.

The biological communities of these sand systems present a typical sequence due to the fast variation of the environmental conditions from the beach to the interior of the dunes and are common to the generality of the dune systems of the Portuguese coast. Some particularities of flora and fauna are exceptions, such as the Portuguese thyme, an aromatic and culinary plant that can be observed in the fixed dunes of the Ria Formosa. The tough environmental conditions of the dunes (wind, high salinity and insulation, dryness, nutrient deficiency and sand mobility) imply that only a reduced selection of organisms can colonize this environment; dune species reveal a remarkable ecological value, being unique in these habitats and presenting an extraordinary degree of specialization.

Similar in all dune systems of the Algarve, the colonization of the sand areas begins near

the high water line where the tide deposits organic material, essential for the growth of pioneer plants, like the sea rocket and the prickly saltwort. Right behind emerges the sea couch grass, a plant that forms grassland where the sand is retained. After a while other plants take over such as the cotton weed and the sand bindweed and the dune increases until it forms fore dunes (primary dunes) colonized by marram grass with long roots that structure the dune and allow its growth in height. These fore dunes are submitted to influence of the ocean and form great mobility dunes along the coastline. In the secondary dune that develops from the continental slope of the fore dune, there is more humidity and the sea influence is reduced, giving rise to plants such as sea medick, cross wort or everlasting flower which perfumes the dunes with its intense curry smell.

On the peninsulas of Alvor, Ancão and Manta Rota and on the barrier islands the succession of vegetation on the continental slope goes back to nitrophilous pioneer plants like the sea rocket, because of the contact with the marsh environment where plenty organic matter is available, then evolving to the normal vegetation of salt meadows. In other places, the dunes are evolved to more stable and complex habitats, as in the case of the white broom thickets followed by the pine woods in Vila Real de Santo António.

These transitional habitats render various services in terms of coastal protection: they function as sand reserves for beach nourishment; in storm seasons they hinder the progress of the sea to inland and avoid sand invasions by wind or water. In the estuarine-lagoon systems the well-preserved sand dunes ensure the maintenance of the lagoon area.

Between Quarteira and Faro and in Vila Real de Santo António there is a remarkable coastal pine forests over sandy or marly soils; in Faro with stone pines and in the east with maritime pines.



Marram grass



Sand bindweed



Cotton weed



Portuguese thyme

Similar to what happened to most of the forested areas in Portugal, these areas were included in the forestation effort made in the turn of the twentieth century, after a very frightened small number of forestation in the mid-nineteenth century at a national level. Traditionally used for the stabilization of coastal systems, especially sand areas, pine forests fulfil another important function, above all in the context of the high degree of human occupation in the coast of the Algarve: it is the only terrestrial environment that is able to function efficiently as an ecological island where fauna and flora species find shelter, such as the *Tuberaria major*, the *Thymus lotocephalus* or the Mediterranean chameleon.

In Faro, the pine forest of Montenegro and Ludo has a great environmental heterogeneity, occupying a more humid bioclimatic enclave and with acid soils where the stone pine dominates and is accompanied by rare species in the south coast, like the cork oak or the strawberry tree and also the maritime pine. In many places the vegetation cover under the forest is well preserved. This forest patch provides protection for the extreme west of the Ria Formosa, keeping it apart from the



PG

The *Tuberaria major*, one of the rarest species of the eastern Algarve, is considered an endangered species. The pine forest of Ludo is the most important area for this species, holding approximately 90 % of this rockrose population.



After a fire in the pine forest of Montenegro, cork-trees survive protected by the corky bark that covers the trunk.



The late crocus, a delicate and short-term plant, is one of the numerous bulbous plants that grow in the pine forest clearings.

human occupation of the Faro periphery and also keeping shelter and rest during migration season for some birds, especially birds of prey. The pine forests are also used by typical forest birds, like nuthatches, woodpeckers and tits as well as more ubiquitous species like the azure-winged magpie, the turtle dove or the collard dove.

Near the mouth of the Guadiana, the Mata

Nacional das Dunas de Vila Real de Santa António (National Dune Woods of Vila Real de Santo António) was forested at the beginning of the twentieth century with trees brought from the pine forest of Leiria aiming the protection of Vila Real de Santo António against sand invasion. This wide area of maritime pines arises in the extension of the secondary dunes and nowadays the underwood of the pine forest is a well-structured and stabilized community where



Maritime pines in the pine forest of Monte Gordo.



Mediterranean chameleon

white broom, the Portuguese crowberry and the juniper dominate.

One of the most interesting fauna species found in the Algarve is the Mediterranean chameleon. This reptile was mentioned for the first time on the Iberian Peninsula by Lineu* in the eighteenth century. The Iberian chameleon population has its origin in the Morocco populations, resulting of the natural colonization or mediated by man in the last centuries. The Mata Nacional de Vila Real de Santo António (National Dune Woods of Vila Real de Santo António) seems to be an area with the highest density of individuals and where the mimicry capacities make it even more difficult to spot a chameleon, especially on bush branches in a broom area, where the chameleon is normally found. This bush covers a significant part of the sandy soils in this area and it is also one of the most common plants on sandy soils at the North-African coast, the original habitat of the chameleon.

From the various insects that live in pine forests, the pine processionary caterpillar or pine processionary is the best known and also the most feared because of the damages caused to the pines where they build their nests and due to their scab hair that provokes



White Broom

skin, eye and respiratory allergies. In fact, this caterpillar is one of the butterfly's developing phases *Thaumetopoea pitycampa* and in the spring caterpillars leave their nests in lines to the soil (origin of its name). The main natural predators of this caterpillar are tits, like the great tit or the blue tit, two species that use cavities in old pines to build their nests.



Pine processionary



Dwarf fan tree, one of the common bush plants of the underwood of the costal pine forest.

The invasion of the chorão ice plant or hottentot fig (*Carpobrotus edullis*)



Exotic species from South Africa tolerate modestly salty soils and grows in dry and humid areas. Originally planted for ornamental purposes and with the aim to fix dunes and slopes, this herbaceous plant grows vigorously leading to the formation of single-species carpets that impede the rooting of native plants. For this reason, this plant became an important factor for the reduction of biodiversity, especially on the coast. It is possible to control it as shown by some eradication projects made on the Iberian Peninsula.

Hottentot fig invasion in the pine forest of Quinta do Lago.

* Carl von Linné (Carlos Lineu as he is called in Portuguese) was a Swedish botanist, zoologist and doctor who, among other scientific and literary works, developed a classification system of species that was the precursor of the current binomial nomenclature, normally designated by their scientific names (see the list of mentioned species).

Activities

Hiking

In the listed places a network of trails and elevated footbridges allow the observation of the biological richness of the dunes and the transition from the dune vegetation to the marsh environment (in the case of the Rias) or to the coastal scrublands and pine woods (Garrão-Ancão, Monte Gordo and Vila Real de St.º António).

Ria de Alvor: access trail to the west mole of the Ria; along this trail of approximately 1.300 m that leads to the back of the dune system you can see the open landscape of the lagoon system, surrounded by the mountains of Serra de Monchique in the north and by the peninsula of Rocha in the east. At the beach of Alvor the visitors have access to a circuit of trails and elevated footbridges along the wide dune system.

Praia Grande: the access to the Praia Grande is made through a high footbridge that goes through an extension of approximately 300 m of the dune belt. An interesting eolianite outcrop may be observed here (rock formed through sand transported by the wind and joined together by carbonate cement); it is a fossil dune with around 4.000 years that emerges in a dispersive way in the dune field.

Ria Formosa: footbridge access to the beaches of Garrão and of Ancão (path of about 200 m). Footbridges that link Quinta do Lago (Loulé) and Pedras d'El Rei complex (Tavira) with the correspondent beaches; Quinta do Lago (500 m path) and Barril (1,500 m path). To reach other beaches it is necessary to take a boat from the lagoon to get to the sand dunes of the barrier islands. Ilha Deserta stands out because of



Touristic train to access Barril beach.

the absence of heavy buildings on the island, little presence of people and the well-preserved status of biological communities.

Mata Nacional de Vila Real de Santo António: the access in front of the sea (Praia dos Três Pauzinhos) is made over a foot and cycle trail with about 1.500 m, where there also a touristic train in the summertime to cross over.

Trilho do Camaleão (Chameleon trail): 5 km signposted trail that goes through the national forest. Interesting Site to observe perching birds and the chameleons.

Accesses

Ria de Alvor (western mole): from the beach Meia Praia or from the beach of Odiáxere follow the directions to the golf course Palmares. An unpaved way gives access to a dyke over the lagoon and to the mole.

Praia de Alvor: follow the signs to the beach in the village of Alvor.

Praia Grande: from the town of Pêra, head southeast till the turning bay where the beach is signalled.

Garrão, Ancão and Quinta do Lago beaches: accesses from Almansil, following the signs to the beaches.

Ilha Deserta: boat access from the docks Cais da Porta Nova, in Faro.

Praia do Barril: road EN 125 between Luz da Tavira and Tavira, follow the signs to Pedras d'El Rei.

Praia dos Três Pauzinhos: on the EN 125, next to the sports complex of Vila Real de St.º António, follow the signs to the beach.

Trilho do Camaleão: access through the EN 125. Straight trail with exit points in the parking area of Aldeia Nova or in the Centro do Camaleão (Chameleon Centre).

Note: It is recommended to walk and stand only on the existing walkways or well-marked trails, seeing as treading on dunes is a major cause of their degradation.

Cliffs at Central Algarve



Karst features – sea stacks, arches and caves – at the Marinha beach.

The rocky coast between Porto de Mós and Olhos de Água shows an irregular cliff line carved in carbonate rocks, with an estimated age between 24 and 16 million years (Miocene Epoch). These 50 km of coastline with little coves set between the carved rock cliffs and with warm colours represent the touristic image for the promotion of Algarve beaches.

The carbonate rocks of these cliffs are vulnerable in contact with freshwater and easily carved by it, giving the name to the so called karst landscape. The term karst makes allusion to the relief resulting from the dissolution of limestone by surface and subterranean water. Due to the progressive abrasion of the rock, cracks and cavities widen

and gave origin to a complex network of wells and galleries where subterranean water streams flow on their way to the sea.

The conjunction between karstification and marine erosion results in the modelling of various rocky formations and in the common ornamental relief of this coast, where sinkholes (natural wells) are frequent, arches and caves as well as sea stacks (rocky cores more resistant against erosion that in the course of time stand out along the coastline). The result is a fascinating and winding landscape where on every step it is possible to discover curious reliefs and viewpoints with great scenic views. The diversity of geological landforms of this coastline can be appreciated during walks along the top of the cliffs, in particular in the

municipalities of Lagoa and Lagos. The sea (through boat trips) is a privileged place to observe the carved rocky walls and to get to know the sea caves where the light and colour effects are amazing.

The cliffs are environmental borders where the terrestrial influence and the maritime influence cross each other. The environmental conditions are very harsh and the organisms that live here are very well adapted to the dry, windy, and salty environment.

The vegetation on the cliffs is influenced by the proximity of the sea and changes according to degree of exposure to the sea wind. The edge of the cliffs is more exposed and is normally colonized by low scrubs, shaped by the strong salt-laden winds. These are examples of plants that are also found in salt pans, such as the sea orache. Further away from the sea influence along the cliffs of this coastal section, there is an arborescent matorral in which the juniper and the kermes oak are dominant, accompanied by common plants of the Algarvian Barrocal, such as the dwarf fan palm and the mastic tree. In the

back of the juniper thickets the Aleppo pine may be found, one of the most resistant pine trees against dryness and able to colonize the stony soils of the calcareous cliffs.

These cliffs, intensively cracked and inaccessible for predators, have ideal characteristics for bird nesting. On the Algarve coast, the kestrel and the peregrine falcon are two species that exploit the rock cavities, as one of the main preys of the peregrine falcon: the rock doves. This species is a wild variety of the doves found in urban gardens (domestic variety), very similar to these. The wild variety occupies rupicolous areas with very little human disturbance, looking for food in agricultural areas and in the nearby open fields.

Other bird species, typically coastal or marine species, also use the cliffs as it is the case of various gull species, such as the yellow-legged gull or the shag that nest here in caves and cracks.



Sinkhole and arch at the mouth of the stream that empties above the sea level. It is one of the various hanging valleys on this coast, formed by the rapidly receding of the coastline that was not accompanied by the carving of the watercourse.



Juniper and kermes oak matorral, endemic Portuguese vegetation community that colonizes limestone cliffs in the south of Cabo Mondego. It is a relic community that goes back to the dry and cold phases of the Quaternary period.

The coastline in transformation



The cliffs, rocky slopes exposed to the action of the waves are, by definition, forms under erosion and in permanent evolution. The beauty of the cliffs largely results of this mutable condition which also determines the receding of the coast and the loss of land to the sea. The protection of the natural and landscape heritage of the cliffs depends on the safeguarding of its natural genesis and evolution, or, in other words, on the erosion.

The erosion process of the cliffs happens through the occurrence of occasional landslides. Blocks and debris from landslides are accumulated at the base of the cliffs and provide temporary protection against the actions of the sea.

The debris also constitutes a potential source of sediments in order to feed the beaches. The landslides are more concentrated during the winter when the conditions of waviness and precipitation are more severe.

Activities



Rest area of the path Percurso dos Sete Vales Suspensos: Aleppo pine forest over a calcareous cliff.

Hiking

A footpath network on the top of the cliffs allows access to two sections of great scenic interest:

Ponta da Piedade (Lagos): starting from the Ponta da Piedade lighthouse in direction to Lagos (north direction) as well as to Porto de Mós (northeast direction); there are two trails with 3 km length each that offer beautiful panoramic views over the coastline.

Percurso dos Sete Vales Suspensos (Lagoa): signposted trail of approximately 10 km (roundtrip), with information panels and rest areas between Praia da Marinha and Praia de Vale de Centianes (beaches).

Worth Seeing

The landscape in the rest areas of the route Percurso dos Sete Vales Suspensos (Lagoa), from which one can appreciate unique views over the rocky headlands and various karst features, also the chance to observe the Mediterranean scrublands and the rich avifauna of this coastal area.

Diving: on the beaches of the municipalities of Lagos, Lagoa and Albufeira. There is an underwater route signposted at Praia da Marinha, accessible for free-diving (snorkelling). The guide of this underwater route can be downloaded from the websites of the Municipality of Lagoa or CCDR Algarve.

Observation of the intertidal zone: at low water, in flagstone areas at the beaches of Manuel Lourenço, Evaristo, Arrifes and Olhos d'Água.

Touristic boat trip: from Sra. da Rocha, Benagil, Carvoeiro and Lagos it is possible to travel with a boat along the coastline and observe the huge and carved rocky walls from the sea as well as the emblematic sea caves of this coast.



Former fishing boats are used as touristic transport in coastal areas.

Accesses

Farol de Lagos (Lagos Lighthouse): follow the directions to D. Ana and Camilo beaches. Once on Ponta da Piedade road, follow it until the lighthouse.

Vale de Centianes beach: from the lower area of Carvoeiro (access from Lagoa following the road signs), head east until you find signs to the beach.

Sr.a da Rocha beach: on the EN 125 turn in Porches to the south, following the signs to the beach.

Manuel Lourenço e Evaristo beaches: on the road that links the town of Guia to Galé beach, follow the signs to the beaches.


Arrifes: access from the village of S. Rafael (Sesmarias Way).

Olhos d'Água: access from Albufeira, following the road signs.

Marinha and Benagil beaches: In EN 125, near the International School of the Algarve, follow the signs to the beaches.

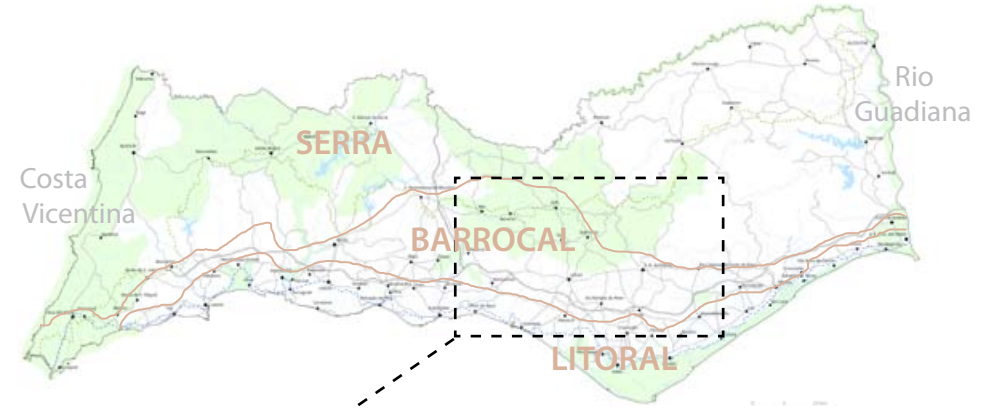
Note: caution is advised when travelling these trails and a safe distance from the edge of the cliffs and sinkholes should be respected. Also, avoid critical conditions of wind and rain.

Barrocal



The land of a people is no longer a simple fact of nature, but a portion of space of which generations are fond of, where the imprints of the most varied influences have been printed over time. An original and fruitful combination of two elements: territory and civilization.

Orlando Ribeiro



-  Natura 2000 Network
-  *via algarviana*
-  *Ecovia*
-  Barrocal

Ribeira de Quarteira (Natura 2000 Site)

Cerro da Cabeça (Natura 2000 Site)

This is a region of the Algarve set on a limestone massif that occupies central Algarve, cased between the mountains and the coastal plains. The Barrocal landscape displays a typically undulated relief: a succession of hills moulded in hard limestone of the Jurassic era develops from west to east, connecting Cape São Vicente to Castro Marim. The limestone reliefs are less than 500 m and are smooth and rounded except where the abrasive force of the torrents in the rainy season have carved scarps or hollowed deep ravines.

In the depressions between the hills, the reddish soils contrast with the light coloured limestone outcrops and green vegetation. They are predominately *terra rossa* soils resulting from the alteration of carbonate rocks (limestone, dolomites and marl), historically occupied by dry orchards. With the Serra to protect the passage of cold winds from the north, this is perhaps the region of the Algarve where the Mediterranean characteristics seem



Footpath on top of Rocha da Pena (rock) where you can see the *terra rossa* soil resulting from the meteorization of limestone.

to become more evident: mild temperatures in winter, low temperature range and severe dryness in summer. With the dry to sub-humid weather and favourable soil conditions, the Barrocal is home to rich Mediterranean floristic communities, some even exclusive to this region.

The original forests of holm tree, Portuguese oak, wild olive and narrow-leaf ash, transformed by the use that successive peoples have made of them, remain in well-preserved nuclei in the narrowest valleys and steepest slopes. It is the thickets of mastic tree, kermes oak, myrtle, strawberry tree and false olive, that accompanied the ancient forests that now dominate the landscape. In some well-preserved locations, thickets develop as the Mediterranean association of Oleo-ceratonion, where the carob tree, the wild olive and dwarf fan palm dominate.

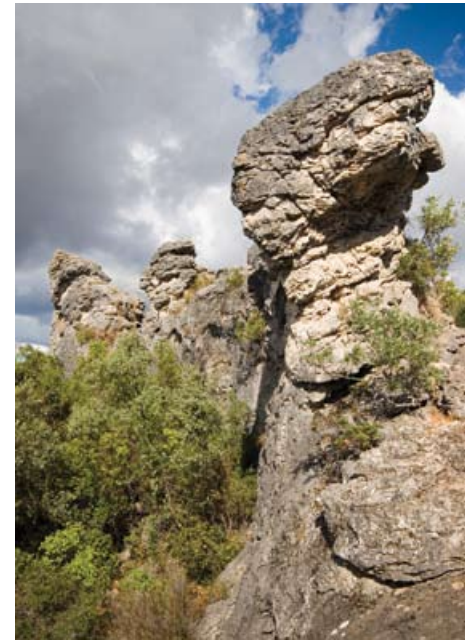
In the areas most deeply altered, the plant coating consists of rockrose, gorse and thyme, where honey and aromatic herbs abound. These communities often confine with dry orchards where carob, fig, almond and olive trees are grown, although in some valleys these cultures have given rise to irrigated crops.

One of the most characteristic aspects of the Barrocal is the existence of karst features. This territory of carbonate rocks, easily carved by rainwater, displays a landscape shaped by karst erosion, which results in fancy reliefs. Although the karst topography presented here is not as developed as in other parts of the country, you can still see several curious and diverse geological landforms and mainly in the karst territory, north of Loulé: Megalopies fields (Varejota and Malhada Velha), sinkholes and caves (Monte Figo and Rocha da Pena), dolines (Rocha da Pena) and polja (Nave do Barão and Nave dos Cordeiros), among others.

Karst features are notable in the region, in places such as Varejota/Malhada Velha and

Nave do Barão. In the first case there are Megalopies fields, larger karren forms, where reliefs such as needles, towers and arches abound, forming boulders that can reach 8 m tall, bursting from the reddish soils. The boulders of Castelão (Varejota) and those of Frade (Malhada Velha) assume fanciful shapes that defy the imagination having been baptized with names of animals and fantastic creatures (elephant, eagle, sphinx, among others), being associated with old superstitions.

Nave do Barão corresponds to a polje, a karst depression cased between well-defined sections, with underground drainage. This relief, which does indeed resemble a huge vessel (nave), stretches for 4 km in length and 500 to 1000 m in width; the flattened bottom is filled with *terra rossa* where dryland orchards grow, especially of almonds, which are worth seeing in full bloom in the month of



Megalopies in Malhada Velha (Loulé).



Polje of Nave do Barão (Loulé). Depression with about 4 km in length where the Lagoa da Nave (lagoon) is formed during the rainy season.

February. This structure is considered a blind valley, where there is no surface downstream and where the seepage of rain water runs eastwards, where small ponds are formed. In these ephemeral ponds, some amphibian communities have their best expression in Portugal.

The Barrocal is still a mainly rural region, where customs are kept connected to the natural rhythms of the land. The landscape reflects the natural and cultural wealth, with an interesting mosaic of small villages linked by rural roads, valleys with upland fields with other crops, slopes covered with dense green woods, and, here and there, the clear and capricious outcrops of limestone.

The Barrocal band between the coast and Serra do Caldeirão is included in the "Site of Barrocal Community Importance", which includes the National List of Sites of Natura 2000 Network, recognized for its uniqueness



Outcrops of limestone burst from the Mediterranean scrubland.

Karst topography

The rainwater, slightly acidic due to the content of carbon dioxide, slowly dissolves the limestone and dolomite (mainly consisting of calcium carbonate), resulting in a typical shape called karst. The water seeps through cracks in the rock, enlarging them with time and forming underground streams. The rock cavities and crevices widen with the runoff of surface and underground water, giving rise to an intricate network of natural wells (sinkholes), caves and galleries. On the surface, reliefs such as the lapies (karren) fields are common, where the rock appears much sculpted. One of the most visible characteristics in these landscapes is the aridity of the land on the surface, which contrasts with the abundant water resources of the subsoil that are only visible in occasional water sources such as those in the springs of Benémola and Paderne.



Sinkhole. Galleries that develop vertically and can communicate with other caves.



Lapies (Karrenfields).

and good state of conservation of very particular habitats, such as rupicolous calcicole communities and the existence of relic oak forests of *Quercus broteroi*, junipers, and forests dominated by carob. It is also worthy of note for sustaining reasonable populations of Portuguese endemism *Plantago algarbiensis* and *Narcissus calcicola* as well as the endemism of the eastern Algarve, the *Thymus lotocephalus*.

This Site also includes a compound of four caves that are home to a significant part of the population of bats in the Algarve, which stand out as places of hibernation and breeding for about half of the national population of the lesser mouse-eared bat.

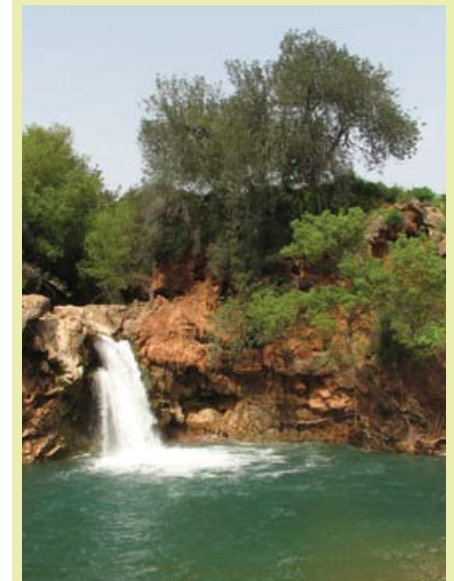


Lesser mouse-eared bat



Low wall demarcating a dry orchard. Plants of native thickets, such as mastic-tree, grow attached to these rustic walls.

Pego do Inferno



Pego do Inferno (Tavira) is a place where you can observe the various waterfalls of Asseca stream. The last and most spectacular waterfall, about three metres high, forms a pond that reflects the shades of green that surround it. Despite the legends that claim that this bottomless lagoon is linked to the sea, it appears that its deepest point is 7 m. The cascade is cut into thick tuff from the Quaternary Period, whose deposit is favoured by the impact of falling water, releasing the dissolved carbon dioxide and causing the precipitation of calcium carbonate dragged through the water along the path of the stream in limestone land.

Fonte da Benémola



Menalva stream in Autumn.

The river valley of the Menalva stream, where riparian vegetation retains its exuberance during the summer and you can hear water running throughout the year is an exception in the Algarve environment, contradicting the usual scarcity of surface water and dryness of the environment. The existence of several karst springs, also called "olhos de água" (watery eyes), ensures a constant flow of water and favours the maintenance of a moist and fresh environment even in summer.

The quality of the landscape in this location, the historical and ancestral heritage linked to water management, and the existence of environments relevant to the conservation of nature, determined, in the 90s, the classification of the Fonte da Benémola as Classified Site of the Municipality of Loulé. More recently, in 2008, the Site has earned the status of Local Protected Landscape of

the Fonte da Benémola, which covers an area of about 390 hectares that extends to the Parishes of Querença and Tôr.

The Protected Landscape is traversed by the Menalva stream, integrated in the river basin of the Quarteira stream. Fuelled by springs such as the "Olho" and the Benémola spring, one of the most plentiful of the aquifer system of Querença-Silves, this line keeps the water flow at about 60 % even during the summer.

Traces of rural infrastructure witness the complex hydraulic system that once made possible the community management of water, transported by the "levadas" (irrigation channel) to the irrigation fields. The various plots were watered on a rotating basis and it was the responsibility of the owners to open and close the floodgates of the "levadas" depending on the irrigation needs of each.

The old dams that allow the formation of bodies of water along the river are now repaired; watermills and norias are also visible, some even with their buckets, as well as the ruins of a watermill that served the neighbourhood in grinding cereals. In this area there are still remains of old lime kilns, where limestone was produced through the cooking of lime.

On the banks of the stream, a dense riparian gallery develops, where riverside trees and shrubs grow, which are uncommon in other water courses of the Algarve since the expansion of exotic giant reed has hampered the growth of native species in many locations. Willow, narrow-leaf ash, poplar, laurustine and occasionally the carob, along with bushes and shrubs that are typical of these environments in the south, the oleander and tamarisk, form a leafy corridor with some truly impenetrable stretches.



Menalva stream valley. Narrow-leaf ash, willow, tamarisk, laurustine and oleander are some of the species that form the dense riparian gallery of this protected area.

The river valley where the Menalva stream flows is narrow, cutting through the clear and stiff limestone from the Jurassic with steep slopes that can reach a gap of 100 m between the stream bed and the top of the surrounding reliefs. The dense vegetation lining the rocky slopes hides the access to the caves in an overlooking position - the caves of Salustreira.

Some trails traverse the slopes and allow you to observe the rich Mediterranean vegetation of the Barrocal, where the mastic tree, wild olive, kermes oak and strawberry tree dominate, accompanied by aromatic herbs such as the rosemary, lavender, several thymes and fennel. At the edge of the footpaths, if one is attentive, orchids and lilies may be found, humble-looking plants which compensate in sophistication and exuberance of their form and colour. The hills to the south and southwest, far from the protected landscape, are carved in older schists from the Carboniferous Period and are covered by forests of cork oak and holm trees, which makes it interesting to see the transition of these environments to the woods of the Barrocal.

The Fonte da Benémola is also a good place for birdwatching, firstly because the river has water all year round, but also because of the diversity of land use in the surrounding area where a mosaic of small farmland and areas of scrub and woodland are designed. Along the riverside, the kingfisher, the cetti's warbler and the grey wagtail nest - species that benefit from the presence of water. The water also attracts a wide variety of other birds such as warblers, blackcaps, house sparrows, woodpeckers, the jay and bee-eater. The embedded valley leads to the presence of birds of prey, eagles and owls, which are regularly sighted.

By the river and on its banks, frogs, turtles, newts, toads, small fish and various aquatic insects, form part of a very diverse ecosystem. Also worthy of note is the presence of two bat species (the lesser mouse-eared bat and the schreiber's bat) that use the caves in this protected area, benefitting from the abundance of insects. The regular presence of signs of otters is also an interesting fact that attests to the high biological interest of the Menalva stream.

The Querença-Silves aquifer

This system is the largest underground water reservoir in the Algarve, occupying an area of approximately 317 km² in the Barrocal. It develops in limestones and dolomites of the lower and middle Jurassic, through which water seeps easily, accumulating a vast underground layer of water, bordered to the north by the formation of Silves Sandstone and to the south by less permeable calcareous marl of the Upper Jurassic.

The aquifer extends from Querença to Estômbar, covering the municipalities of Loulé, Albufeira, Lagoa and Silves, with a significant number of points of aquifer recharge (sinks) and springs (resurgences). These points are extremely important for the protection of water reserves in the Algarve both in terms of volume and the quality of that water.

Springs are sites where groundwater emerges naturally to the surface. These points represent



Source at Fonte da Benémola.

discharges of natural aquifers, feeding water courses or being intercepted for human use (water spring of Benémola).

Activities

Hiking

Footpath of the Fonte da Benémola: signposted route that follows the course of the river along an extension of 4.5 km, including a place for picnicking. The source of the "Olho", the Benémola spring, the dams and the "levada" (irrigation channels), are the points of most interest along the route, which also allow a visit to a handicraft workshop where a



Access path to the banks of the stream through dryland orchards.

basket-maker works the cane, producing artefacts used in household and agricultural tasks. The layout of this route coincides with a section of the approved footpath from 7 Fontes (municipality of Loulé). Also the Via Algarviana passes along the edge of the protected landscape.

Watching damselflies and dragonflies: Fonte da Benémola is considered a hotspot for the observation of these insects.

Accesses

In Loulé, follow the EN 396 towards Barranco do Velho, then take the detour to Querença and Salir, and then to Salir/Tôr. At the intersection of access to the Tôr village, turn right, following the signs for Benémola. The dirt track to Fonte de Benémola can then be traversed on foot or by bike, in a distance of about 2 km; if necessary, this stretch can be traversed by car, taking into account that circulation is constrained near the spring and that parking space is not formalized.

Ribeira de Quarteira



View of the valley and Quarteira stream from the Paderne Castle.

The Quarteira stream flows south, in the central Algarve area, drawing the border between the Barlavento and the Sotavento on its final stretch. Its basin, which upstream includes the stream and sources of Benémola, crosses the three biophysical regions of the Algarve - the Serra, the Barrocal and the Litoral -, but it is in the Barrocal that the Quarteira stream is born, of the confluence of the Alte and Algibre streams, upstream from Paderne. With a length of about 35 km, and covering areas of reasonable human occupation, some sections of the Quarteira stream preserve a rare environmental balance and quality.

The mouth of the stream, along which develop the reeds of Vilamoura, has already been cited in the chapter "Marshes,

reedbeds and coastal lagoons", though attention is now given to the section that includes the national list of Natura 2000 Network Sites, with the designation Ribeira de Quarteira Site, near Paderne.

Surrounding Paderne, the stream runs wide through the alluvial plain, a fertile lowland which displays a mosaic of small family farms and agricultural plots where the fruit vineyards and olive groves are grown on irrigated land. The gentle slopes are occupied by the traditional dryland orchards, especially of carobs and almonds, the latter showing some signs of neglect.

The dryland orchard, or fruit forest, is a legacy of the Arab presence in the territory, presenting a structure that resembles the

dehesa where the shrub layer is absent, and the understorey usually consisting of cereal and legume crops or pastures. The cultivation of the orchards of carob, almond, fig and olive was possible after the removal of vast quantities of limestone soil, now visible in the typical light-coloured low walls demarcating the land in the Barrocal. Along these small walls remain specimens of original formats, such as the kermes oak and several rockroses. Several animals seek the dryland orchards, attracted by the availability of food, especially birds such as golden orioles, the little owl, blue tits, or the sardinian warbler, but also mammals such as the red fox, and, in abandoned orchards where native shrubs rebounded, the rabbit, the beech marten and the eurasian badger.

Further south, the stream meanders, fitting into a narrow and deep valley cut into the limestone where the Paderne castle is located in an overlooking position. The slopes exhibit a steep gradient and are covered with dense Mediterranean vegetation, exhibiting lush thickets in the moist, shady slopes facing north.

In this section of the stream, the thick cane field that tends to occupy the margins gives way to the natural vegetation of these environments, developing into a riverside gallery with tamarisk, oleander and narrow-leaved ash patches, characteristic of southern waterways. On the flood plain lies the only population of the delicate *Narcissus willkommii* known in the world, covering the margins of the stream yellow at the time of flowering. This daffodil is a rare species and endemic to the Iberian Peninsula, referenced in southern Portugal and Spain, having once been considered extinct. The Quarteira stream is currently the only place where it may be found.

Steep slopes grow bushes exclusive to the Barrocal, such as calcicole thyme/gorse fields (low scrub where aromatic herbs abound)



Green frog, one of the most common amphibians in Portugal.



Eurasian badger footprint on the bank of the stream.



The pyramidal orchid, one of the many species of orchids that are found in calcicolous Algarve. Spring is the most favourable season for observing these species.

and thermophilic kermes oak thickets with dwarf fan palm. In these habitats there are very particular species such as the Algarve endemics *Genista algarviensis*, *Centaurea occasus* and *Thymus lotocephalus*.

Rising in the scrubland and from a towering position over the Quarteira stream, the Paderne Castle is one of the seven castles represented on the flag of Portugal. It is a construction of rammed earth of the Almohads (Eleventh to Twelfth century) and its ochre-coloured ruins are one of the most significant examples of Arab military

architecture in the Iberian Peninsula. Built during the last phase of the Arab occupation, it was in prime position in relation to the ancient Roman road that skirts the hills and crosses the stream to the southwest.

During the summer season, springs such as the Amoreira or the Paderne spring allow the runoff of water in small sections and the formation of ponds that harbour species most dependent on water and humidity in the environment. Also the dams can maintain water supplies during the summer, having recently recovered the Estacada dam

Giant reed (*Arundo donax*)

The giant reed is the largest herbaceous existing in Portuguese territory. Originally from temperate and tropical Asia and Eastern Europe, it is considered an exotic species in Portugal and referenced as one of the hundred most dangerous invasive plants worldwide, for its high capacity to replace the native vegetation, occupying the habitat of the riparian species, typical of Mediterranean climates. Having been introduced as a building material for fixing embankments and putting up hedgerows on arable land, it is now widespread throughout the country.

The giant reed is probably the species with greater dispersion in streams of the Algarve, which results in serious environmental problems, especially in the aggravation of drought and floods, in the spread of forest fires, in the deterioration of the water quality and in impacts on biodiversity.

Within the control of the spread of this exotic species, several pilot projects have been conducted with positive results. The recent project "Valuing the Quarteira stream and Lowland Paderne" consisted in the experimental use of different control techniques for the giant reed in planting native vegetation, as well as rehabilitation works and valuation of the hydraulic heritage (re-profiling of the stream bed, recovery of the Estacada and Azenha do Castelo dams, and crossing a ford at Amoreira), and creating



an interpretive rural route at the Paderne floodplain. The learning resulting from these and other projects taking place in countries with Mediterranean climate should provide adequate information to mitigate the damage of the spread of the giant reed.

(upstream Paderne) and the Azenha do Castelo dam. The watermill associated with this latter dam is situated near the Paderne Castle, being a traditional grinding mill powered by the water flow of the stream, possibly of Arabic origin. The dams, the water mill and the “levada” (irrigation channel) built on the Site of the Paderne Spring, are part of the local heritage of hydraulic structures linked to the use and traditional management of water.

As is the case in other water courses of the Algarve, many animals depend on the ecological quality of the stream to survive and as a corridor through which they can move between territories. The existence of signs of otters suggests that this Site may be important for the population of this mammal in the Algarve, due to the availability of adequate food and marginal vegetation, but also as a link within the same watershed, between more coastal environments, such as the Environmental Park of Vilamoura, and places like the inside of the Benémola spring.

The Quarteira stream also presents an

interesting fish fauna, such as the occurrence of the Iberian arched-mouth nase and the calandino, two species endemic to the Iberian Peninsula that benefit from the existence of abundant aquatic vegetation.



Tamarisk and oleander on the bank of the stream.

Activities

Hiking

Paderne Castle route: this signposted route with approximately 4.5 km develops along the banks of the stream, passing through the “Azenha do Castelo” dam and the Roman Bridge (consisting of a straight board supported by three perfect arcs), also giving access to the castle. It allows for the observation of the lush riparian vegetation and calcicolous bushes of the slopes, where it is interesting to observe how the vegetation is diversified from the sunny slopes to the bleaker ones.

There are two other marked routes surrounding Paderne, as well as a network of footpaths, allowing you to traverse the Paderne floodplain from the Estacada dam on the Algibre stream, north of Paderne, or up to the hills of São Vicente, west of Paderne, or to the castle and Roman bridge, overlapping the route of the Paderne Castle. On the hill of São Vicente, near the windmill, the trails

provide access to a privileged view over the valley where you can also see the rich Mediterranean scrubland and the typical dryland orchards of the Barrocal.

Mountain Bikes

There are three signposted routes for mountain bikes, starting in the parking lot of the João Campos Stadium in Paderne. Some sections of these routes overlap with those pathways.

Accesses

In Paderne, arriving by the A 22 (exiting in Albufeira and following the direction of Ferreiras) or the N 270 (exit EN 125 towards Boliqueime), follow the signs to the castle on the west exit of the village. You can park next to the castle and near the “Açude da Azenha do Castelo”, underneath the overpass of the A 22.

Rocha da Pena



Cornice of the Rocha da Pena, south side.

The limestone massif of Rocha da Pena is a remarkable rocky outcrop of the Algarvian Barrocal reaching its highest point at 480 m altitude. It is a plateau of about 2 km in length that owes its distinctive shape to the cornice that crowns it and the southern slope cut into steep hillsides. This geo-monument imposes on the landscape, singled out from the nearby reliefs by broad valleys to the north and south, having already been considered the only truly vigorous relief of the southern Algarve.*

It lies in the transition between the Serra and the Barrocal, tracing the boundary between these two regions and, along with the Soidos Rock and the Messines Rock (located west of the Rocha da Pena) is the northernmost west-east alignment of Barrocal carbonated reliefs. The top of the plateau offers a remarkable panorama: to the south you can see the soft contours of the Barrocal towards the sea; to

the north - the wavy Serra do Caldeirão.

Along with the unique landscape and geomorphological interest, the Rocha da Pena stands out for its well-preserved Mediterranean scrubland, where you can observe emblematic species of Algarve flora, and for the abundance and diversity of the



Rocha da Pena seen from Salir.

* Feio (1951).

wildlife, particularly with regard to birds and mammals such as the bats.

The recognized interest in the Rocha da Pena, in terms of the natural values that are present and the importance of their landscape, determined the creation of Classified Site of Rocha da Pena in 1991, and more recently, in 2008, as a Protected Landscape Location, aiming to protect and maintain the physical, aesthetic, scenic and biological values of the Barrocal, promoting the sustainable economic, social and cultural development of the region in a balanced manner.

The Rocha da Pena, being carved in carbonate rocks, reveals several karst features, especially features such as lapies (karrenfields), dolines, caves and sinkholes, although they assume more modest dimensions than elsewhere in the Barrocal. Thus emerge the lapies fields (rocks that emerge from the terra rossa ground, very sculptured by rainwater and presenting various forms of corrosion), the dolines (large closed depressions with an almost circular contour) and the underground karst such as sinkholes (galleries that develop vertically and can communicate with other caves). According to a local legend, the Algar dos Mouros cave was a place of refuge after the Moorish conquest of Salir by Dom Paio Peres Correia.

The slopes of limestone are well covered with mixed forests of carob trees, wild olive and holm tree and also Portuguese oak on the north side. The limestone plateau is dominated by lush rupicolous thickets of juniper and kermes oak, where rare and endemic species like the *Narcissus calcicola* and the *Bellevalia hackelii* grow. One of the most abundant species, typical of Mediterranean scrubland, is the dwarf fan palm or dwarf palm, the only spontaneous palm in Europe, used in the manufacture of handicrafts.

On the roadsides and especially in clearings,



Mediterranean buckthorn, a common species in this maquis.



Bee-orchid, one of the several species of orchids that exist at the Rocha da Pena.



Carob pods.

aromatic plants such as lavender, rosemary, fennel, Teucrium and several thyme herbs grow. There are about 500 species of flora described in this protected landscape, some of which are endemic, e.g. Rocha da Pena is the only known location of the Portuguese endemism *Doronicum tournefortii* that lives in the woods of holm tree.

Atop the plateau, the calcicolous shrublands are home to many species of orchids of the genus *Orchis* and *Ophrys*. The most evolved plants of the vegetable kingdom look delicate and stunning at the same time to the human eye, for the sophistication of their form and colour. With a Mediterranean climate and low altitudes, the Barrocal is a prime location for the conservation of some orchids that already are becoming rare in the rest of Europe. Apart from their aesthetic value, orchids can be used as indicators of the quality of a habitat, as they only occur at sites that meet specific conditions, including the absence of pollution.

The mosaic of vegetation and topography of the Rocha da Pena allow for the existence of a wide variety of animals. Of about 120 birds inventoried for this Site, there are the forest birds and birds of prey. Species such as the bonelli's eagle, the buzzard, the kestrel and the peregrine falcon, are birds of prey that nest here or are regular visitors. At the time of migration, it is possible to see other birds of prey such as the booted-eagle, the short-toed



Andrena flavipes bee on a white-leaved rockrose.



Buzzard

eagle, the sparrowhawk and even the griffon vulture, which may show up in large flocks.

In rocky areas, with luck, you may see two shy animals of our fauna: the blue rock thrush, which nests in rocky slopes, and the garden dormouse, a small rodent mammal.

The caves and sinkholes of this Site harbour colonies of important bats such as the common schreiber's bat, a predominantly tropical species that has decreased in southern Europe, and the lesser mouse-eared bat, one of the rarest bats in Portugal. You may occasionally observe rabbits and western hedgehog that live here, but others like the wild boar or the carnivores common genet and red fox, you might only register their presence by observing footprints or droppings, characteristic of these species, for they are more active during the night-time.

Due to its location and configuration, the Rocha da Pena certainly constitutes a strategic location in the region. On top of this massif there are two stone walls, which were part of a defensive system possibly dating from the Iron Age. These structures were later used by the Moors who took refuge in the plateau of the Rock during the re-conquest of Portugal by

the Christian King Dom Afonso the 3rd, when the Salir castle was taken by Dom Paio Peres Correia.



Broteroi peony on the Rocha da Pena. This flashy species occurs in rocky dark areas of the Barrocal and in Monchique.



Walls on top of the Rocha da Pena, flanked by dense kermes oaks and juniper fields.

Activities

Hiking

At the Rocha da Pena there is a signposted route, consisting of stony paths and footpaths, which allows the visitor to learn about some important aspects of the flora, fauna, geology and heritage, as well as enjoy the breath-taking scenery. The route is circular with a length of 6.4 km.

Rock-climbing

There are about thirteen sectors defined for Rock-climbing at the Rocha da Pena, though rock-climbing is an activity discouraged during the nesting season. AMEA - Mountaineering and Climbing Association of the Algarve should be consulted for more information.

Accesses

From Loulé: follow the direction of Salir and take the EN 124 towards Alte. Exiting Salir to the left, follow the indications for the Rocha da Pena / Classified Site. Motor vehicles park at the end of the paved road, in a square with a fountain. The dirt road that goes on, leads to the village of Penina.

Cerro da Cabeça



Limestone outcrops on top of Cerro da Cabeça exhibit small calcicolous plants growing in rock crevices. The impenetrable Mediterranean thickets of the hill are dominated by the kermes oak, an oak shrub adapted to the hot dry conditions.

Cerro da Cabeça is the eastern most relief of Serra de Monte Figo, an alignment of hills with orientation parallel to the shoreline, extending over the municipalities of Olhão, Faro, Loulé and São Brás de Alportel. The highest point of Serra de Monte Figo is Cerro de São Miguel, with 410 m of altitude, the top of which, in days of clean air, you can admire the views over the coastline from Guadiana to Sagres and from the barrier islands of Ria Formosa to the Algarve Serra.

Less impressive than Cerro de S. Miguel but exclusively formed by strongly karstic carbonate rocks from the Upper Jurassic Period, the Cerro da Cabeça stands out as a geo-monument of the Barrocal due to the extent and importance of its karst features constituting the best known megalopies field in the Algarve.

A large expanse of the rocky outcrops of this hill is organized structurally usually in horizontal limestone slabs where rainwater has carved a complex lattice of cracks. These rocky fissures grow rupicolous vegetation, unique to limestone soils, including rare plants such as the gentle Mediterranean fern (*Asplenium petrarckae*) or the daffodil that is endemic of the Iberian Peninsula, the *Narcissus calcicola*. The rocky environment of karst limestone also houses important populations of orchids.

In the surrounding outcrops, vegetation is dominated by thermophile kermes oak fields where the dwarf fan palm abounds, and in some places small pockets of holm oaks woods, which once covered this territory, can be observed. In the riverbed of the small courses of torrential water that drain the hill, low galleries of oleander and tamarisk grow.

Despite its modest size (five kilometres long and almost thirteen wide), this limestone relief is considered a Site of high ecological value, endowed with considerable floristic and vegetation potential, having been included in the National List of Sites of Natura 2000 Network, with the name of Cerro da Cabeça.

On the surface of the hill you can see megalapies forms that rise through the dense Mediterranean scrub, arches, blocks, towers and carved sinks, among others. The underworld of the Cerro da Cabeça is equally stunning, with over thirty inventoried caves and sinkholes here, the best-known being the cave of Our Lady, the cave of the Moors and the caves of Ladroeira Grande and Ladroeira Pequena. Some of the sinkholes are the deepest in the Algarve, including the Maxila sinkhole (reaching 95 m), the Medusa sinkhole, João sinkhole and the Próximo sinkhole.

The karst landscape of Cerro da Cabeça offers excellent conditions of refuge to bats, with records of the presence of two species of the *Rhinolophus* genus: the mehely's horseshoe bat and the greater horseshoe bat, which here feed on flying insects, such as nocturnal butterflies, although they may also feed on the ground. Regarding amphibians, special emphasis is placed on the natterjack toad, a species that occupies different habitats, including the maquis shrubland, that breed in temporary ponds.

The ethnographic heritage of the region is part of several legends that associate the caves of this hill to enchanted moors and secret passages, some referred to by Ataíde de Oliveira. This author refers to the caves of this site as: "Also the vague voice claims that here are some enchanted Moors, who escaped from Tavira Castle when it was taken over by the great Dom Paio; just as it is said that these two caves communicate underground with the large cavern of the Abyss". The Abyss was a deep sinkhole, believed to be more

than a cave but hell itself, which is said to communicate with the Tavira castle.

Activities

Hiking

There is a network of paths and trails around the hill, making it easy to get around the east and north sides at about halfway up the hillside. A circular path of 2.5 km can be taken on the eastern slope of the hill, up the south-eastern foothills to the viewpoint and back down the slope to the northeast. About 100 m of this path are traversed in a staircase. Old lime kilns can be observed and, from high points, you can spot the sandy ridges of Ria Formosa, the low coastal plain that extends east towards Spain, and the carbonated reliefs that develop to the north.



Old lime kiln.

Speleology

The numerous caves of the hill are only accessible through speleology activities, for which you must therefore contact the Centre for Speleological and Archaeological Studies of the Algarve (CEEAA).

Accesses

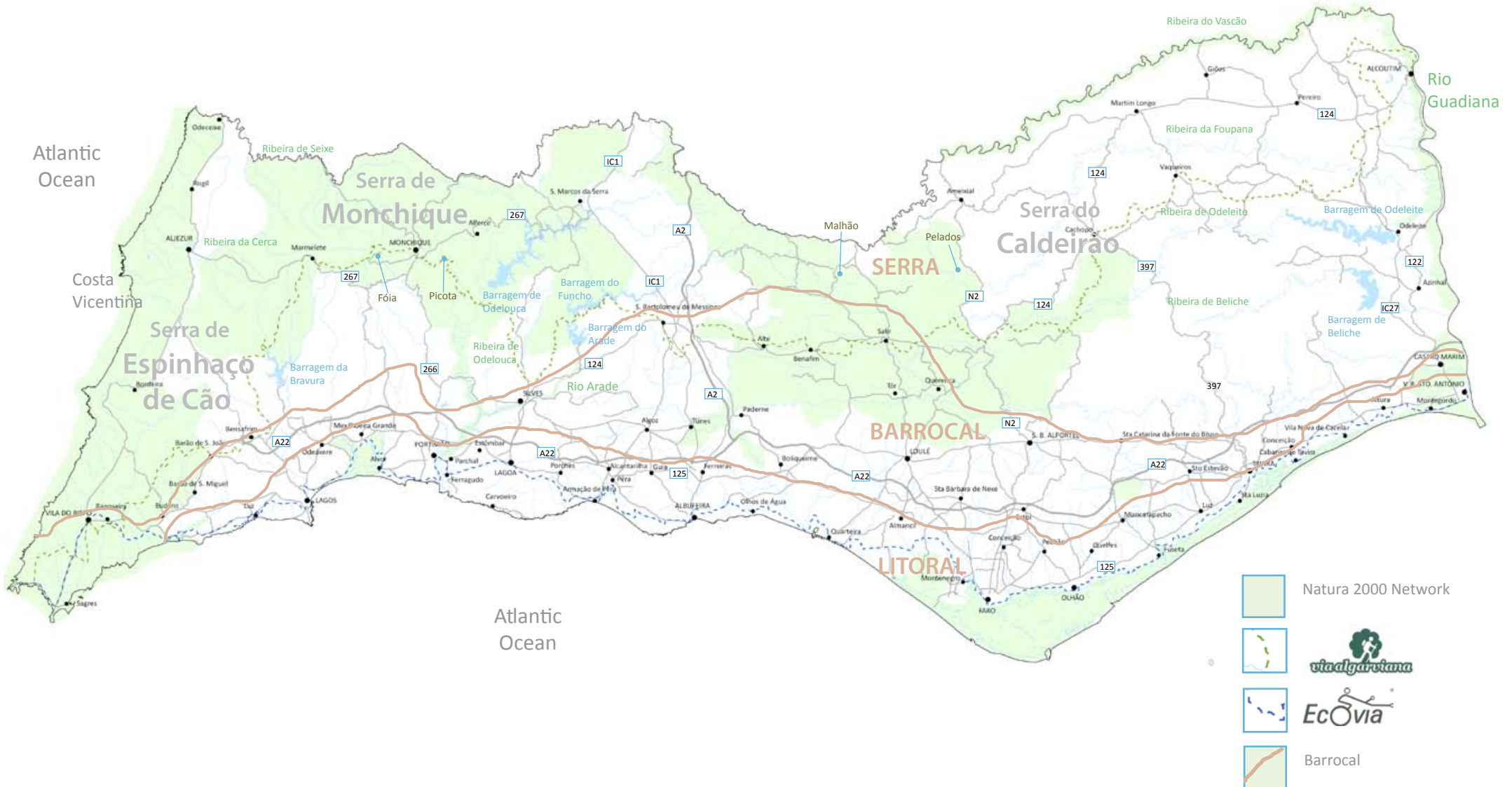
From Olhão, following the EN 398 towards Quelfes and Moncarapacho. In Moncarapacho, when leaving the town by the east, follow on to the João Feliciano Galvão street and turn left toward the hill that can be seen northeast of the village. After about 2 km, turn left, and you can start to climb the hill on foot from there.

* D'Ataíde Oliveira (1898).

Serra

*Opalescence of the air now. The wind,
Chasing the shadow, whispered...
A closing of the wings was felt. In a moment,
The forest sang.*

João Lúcio



-  Natura 2000 Network
-  *via algarviana*
-  *EcoVia*
-  Barrocal



Oak forest in the moist slopes of Serra de Espinhaço de Cão.

The mountain chain that forms the Algarve Serra develops parallel to the southern coast, forming a natural boundary between the Algarve and the Alentejo plains. Comprising three main reliefs, Espinhaço de Cão in the western rim, Monchique and Caldeirão in the central zone, the Serra shelters the lowlands of the coast and the Barrocal from the Atlantic environment and northern influences. The mountainous terrain, high and rugged, gradually attenuates southward as if forming a large open amphitheatre over the sea. The inland territory brings out the big panoramas, the vigorous reliefs and the light, more diffused by the fog that blurs the contours at a distance and softens the warm colours of the Mediterranean vegetation.

The highland reliefs seem to be rooted on the west coast, north of Cape São Vicente, rising from the ocean in high cliffs that can be imagined as foothills of the Serra de Espinhaço do Cão, a close alignment of hills oriented to the northeast-southwest, stretching from

Lagos to Bordeira. The ridges reach just over 300 m of altitude and belong to the Paleozoic Iberian Massif consisting of shale and greywacke. This massif crosses the extreme north of the Algarve territory from west of east, being only interrupted by the eruptive outbreak of Monchique, returning to its east as Serra do Caldeirão.

The Serra, of essentially forest vocation, is a wild territory of steep slopes, deep valleys and meandering accesses, where forests of cork oak and holm oak, and strawberry trees and gum rockroses. Despite the reasonable average annual rainfall (between 700 and 1200 mm, reaching up to 1400 mm in Monchique), the underground storage capacity of water in the shale and greywacke massifs is low because the terrain is not very permeable and the water infiltrates with difficulty. The shale Serra is not especially productive: the soils that result from that lithology are thin, not very fertile and very vulnerable to erosion, especially in the steepest slopes with



Fóia, the highest point of Serra de Monchique.



The donkey, as well as its crossing with the horse, a hybrid referred to in Portugal as "macho" (male) or "mula" (female), is used as a working animal in traditional agriculture. The agricultural changes in the last decades are threatening the survival of these animals domesticated by man since prehistoric times.

poor vegetation coverage. With increased availability of water and fertile soils derived from volcanic rocks, the volcanic massif of Monchique assumes a nature of exception in the context of the rest of the Algarve Serra.

Naturally prone to a certain isolation, the inland territory is now depopulated and aged as a result of the exodus of populations to the coast. Wide expanses of mountainous landscape are equally naked, with the vegetation coverage reduced to creeping and sparse scrubs, especially in the more eastern territories. Natural factors, such as the type of soil, topography and climate, contribute to this situation, which influence the vulnerability of ecosystems towards the disturbance of the ecological balance, but so does human intervention over time, towards deforestation, in particular actions that took place in the last century such as cereal campaigns or the latest plantations of production woodlands, especially single-variety plantations of eucalyptus trees.

It is at the foot of the steepest slopes, in some valleys of difficult access, and in well-preserved sections of riparian galleries, that pockets of vegetation similar to what might

have been the native forests of these highland environments can still be found. At these locations, in some luxuriant cases, the complex structure of these plant communities are observed, with the tree layer present, sometimes with monumental specimens, with undercover shrubbery and herbaceous species.

In the Serra de Espinhaço de Cão, wet and cool under the influence of the Atlantic, there are plants that rarely occur in the interior of the Algarve and, in spite of the skeletal soils and much of the mountain being occupied by eucalyptus fields, some of the more humid slopes of the hills exhibit lush woodlands that grow oaks, strawberry tree, laurustine, faya tree (a relic of laurel), heathers, lianas and ferns.

East of Espinhaço de Cão there is the huge Monchique massif that, during the Arab occupation, was considered a sacred mountain (*Munt Sâquir*). Serra de Monchique interrupts the row of reliefs carved on the Iberian Massif which stretches from Aljezur to the Guadiana river, corresponding to an eruptive outcrop of alkaline rocks (essentially syenite such as "foiaite" and "monchiquite"). The name "foiaite" derives from Fóia, the

highest peak of this Algarve Serra, with 902 m altitude. Near the summit the vegetation adopts a humble size, dominated by large boulders of volcanic origin.

After the wide valley where the Ribeira de Odelouca runs, rises the Serra do Caldeirão or Serra do Mú, the most extensive mountainous area of the Algarve. The Caldeirão (Cauldron) extends eastward to the Guadiana valley, attenuating on the wild plains of northeast Algarve; in central Algarve, north of São Bartolomeu de Messines, the Serra stretches into the Alentejo up to Almodôvar. The highest peak is located in the Algarve (Pelados 589 m, Loulé), Serra do Mú, already in Almodôvar, being the second highest point with 577 m.

Although forest management is difficult, in a region where property tends to be small and manpower scarce and expensive, extracting cork is still a key activity for the economy of mountain populations, especially in the Caldeirão. Much of the Algarve Serra has excellent natural conditions for growing cork oaks, being comparable to the Grândola and Cercal Serras in terms of potential. In other mountainous areas, such as Monchique, the forestry production dedicated to pine and eucalyptus is the most notorious. In the Serra there is also subsistence farming, the processing of products such as honey, spirits and cheese, and the breeding of goats, cattle and sheep, with indigenous breeds like the



The Algarve goat is distributed in herds in southern Portugal, predominantly in northeast Algarve.

Algarve cow or Algarve goat becoming defined over time, today being at serious risk of extinction.

Iberian lynx (*Lynx pardinus*)



Until the middle of the last century, the Algarve Serra, once a stronghold for the Iberian lynx, provided a large area with privileged conditions for this feline. Decades of plantations of exotic species, particularly eucalyptus, a higher frequency of wildfires and the scarcity of the wild rabbit (the main prey of the Iberian lynx), turned the lynx's habitat in these mountains too fragmented and inadequate to sustain a viable population. Now extinct in Portugal in terms of breeding, the species is sporadically seen near the borders with Spain, where residual breeding populations still exist.

Considered to be in serious danger of extinction, a program of salvation of this emblematic species has been developed, which consists in captive breeding and habitat restoration, aiming at the reintroduction of the lynx into the wild. The action plan for the conservation of the Iberian lynx included the creation of the National Centre for Reproduction of the Iberian lynx, near the Odelouca dam in Silves, where adult specimens brought from Spain have been reproducing successfully in recent years. It is expected that the captive breeding and hunting and forestry measures may allow the return of one of the most endangered felines in the world back to the Serra.

Serra de Monchique



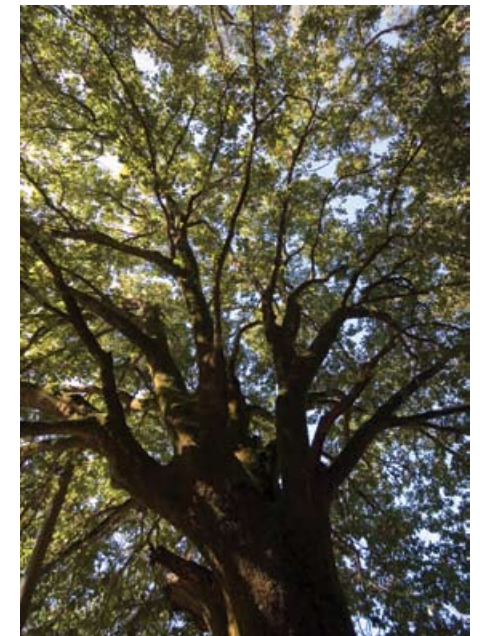
Forest cover of Serra de Monchique. The traditional landscape of oak and chestnut trees contrasts with the blue gum (in the background).

Monchique, the haziest of the Algarve Serras, is a volcanic massif that emerged some 72 million years ago in marine territory, possibly associated with the opening of the North Atlantic in the Cretaceous period. Along with the sienitic massifs of Sines and Sintra, this is one of the most important alkaline igneous intrusions in Europe. This outcrop of syenite, whose designation "monchiquite" and "foiaíte" refers to the local toponymy, exhibits two steep peaks: Fóia, with an altitude of 902 m and Picota with 774 m, separated by a broad ravine where the town of Monchique was built. From the top of Fóia, the highest viewpoint of the Algarve, the view stretches to the Alentejo coast.

Specific geological and bioclimatic conditions,

especially in the central core of the Serra where very particular habitats settled, provide exceptional character to Serra de Monchique in the Algarve context. The landscape exhibits high ridges, valleys well marked by fertile soils resulting from the weathering of volcanic rocks, numerous natural springs and lush vegetation where one may observe rare communities, at a regional and national level, if not even exclusive to Monchique.

The very specific features and natural values of the mountainous ensemble of Serra de Monchique determined the inclusion of most of the county of Monchique in the National List of Natura 2000 Network Sites, under the designation "Sítio Monchique" (Monchique Site). The Serra de Monchique is also classified as Special Protection Area for birds.



Monumental specimen of Algerian oak.

The source of water in the region is plentiful and constant, with several springs and fountains. Some hot springs with mineral and medicinal properties, the Fóia one being the main one, supply the important thermal complex of Caldas de Monchique, an ancient Roman bathhouse. Several streams, Seixe, Cerca, Odiáxere, Monchique and Boina, among others, drain the Serra de Monchique, and thanks to some springs, they maintain water running all year round.

The altitude and proximity to the ocean give Monchique a humid subtropical climate, registering here the highest rate of precipitation of the Algarve and simultaneously mild temperatures in winter and some summer freshness. Occasionally, in the colder months there is hail and, more rarely, snow on the higher peaks. These particular conditions allow for the occurrence of unique plant communities, and it is on these slopes that some elements of Atlantic flora find their most southern stronghold, though embedded in communities with frank Mediterranean expression.

The mountain communities are distributed according to the interaction between topography, proximity to the sea, soil type, wind patterns, temperature and humidity. The low and medium altitudes, especially in more exposed and dry places, dominate the Mediterranean flora, among which stand out the siliceous junipers of *Juniperus turbinata* that recur only in northeast Algarve; on higher grounds, the communities include sub-Atlantic and Mediterranean-Atlantic elements, especially at the foot of the slopes, stationed in places where more humid microclimates are formed.

The vegetation in these locations can become luxurious, exhibiting high matorral of the rare pontic rododendron, pre-forest strawberry tree and heathers, and oak woods. It is possible to see species of very restricted distribution in Portugal, such as the Algerian oak, the pontic



Cascata do Barbelote (waterfall), northern slope of the Serra.



Pontic rododendron in bloom.



Flowers and fruits of the strawberry tree.

rododendron or the faya tree (both relics of the laurel forest of the Tertiary Period), and rare trees in the South such as the chestnut. Also worthy of note is the occurrence of the Portuguese endemic *Centaurea vincentina*, a mountain plant that spreads throughout gorse and low heather towards the coastal areas to the Southwest, and the local endemic *Euphorbia monchiquensis*.

In Monchique, the exceptional conditions favour the occurrence of monumental specimens of native species such as the cork oak and the Algerian oak, and ornamental trees such as the oriental plane, the evergreen-magnolia and the Norfolk Island pine. It is surprising to see so further south, where Miguel Torga said the fruits to be within reach, these hardy and stately trees. Some of these specimens were classified as trees of public interest by the National Forestry Authority, among which the Corte Grande cork oak with a height of 19 m and 37 m in crown diameter, the Algerian oak in the Alferce road, with 24 m height and 12 m crown diameter, the Norfolk



The alder forms dense riparian forests in streams of a more constant flow.

Algerian oak (*Quercus canariensis*)



PG

Relatively abundant in the mountains of the Maghreb, its distribution in Portugal is restricted to Serra de Monchique with isolated specimens in Southwest Alentejo. It forms mixed woods along with cork oaks and other oak trees, in dark and damp hollows, often near water courses. In Serra de Monchique these woods are greatly reduced and fragmented following actions of deforestation and forest fires.



Stripless tree frog. Occurs in wetlands with abundant marginal vegetation, usually near water.

Island pine of Quinta do Aviador that reaches 40 m in height, and an avenue of oriental planes in Monchique with several specimens of about 30 m height.

As is the case with the vegetation, the topography and climate of the Serra also favour the presence of fauna differentiated from the rest of the Algarve region. One of them is the schreiber's green lizard, a species that occurs in water lines associated with plants such as pontic rododendron. The dependence of the water isolates the population of this lizard in southern Portugal (between Monchique and Serra do Cercal in Alentejo), occurring only in another mountain range in the South, the mountains of São Mamede. Another interesting reptile of the Serra de Monchique is the bedriaga's skink, an Iberian endemism that is very difficult to observe due to its elusive behaviour. The increased humidity of the mountain environment also favours the presence of some species of amphibians such as the stripless tree frog, the Iberian midwife toad and the west Iberian painted frog.

The agricultural and forestry vocation of this area is evident in the landscape. In the

valleys, the fertile and thick soils occupied by mosaics of horticultural and arable crops and fruit orchards are easily irrigated in summer with water from the springs; agrarian farms are mainly family-run and play an important role in the self-sufficiency of families. A considerable part of agricultural land is occupied by pastures for cattle and sheep. The production of honey, and strawberry tree for spirit, also has a significant weight in the local economy.

Even based on small farms, it is the forestry production that dominates the economy of the Serra. The area occupied by forest is very significant, although the once extensive patches of chestnut trees and oak trees have been largely replaced by plantations of single-variety blue gum or maritime pine. The forests of pine and blue gum production present high profitability in relation to the exploitation of the chestnut and oak forests, but especially in the case of the eucalyptus production, significant losses have been documented in terms of ecological quality of the environment and biodiversity indices.

It is in the area of Alferce, especially in the densely wooded slopes northeast of the Serra, that well preserved forests of cork oak and other oaks subsist. These lush forest patches with a dense shrub and herbaceous cover are the nesting site of bonelli's eagle and the short-toed eagle, and allow us to imagine what the Monchique mountain landscape would have been like once upon a time.

In the Fóia area, where the altitude conditions the landscape giving space to shrubland, small groves and open fields, it is easier to observe the species of passerines common to the Algarve Serra, such as the rock bunting or the chaffinch. Also the butterfly *Euphydryas desfontainii* can be found in Serra de Monchique. It is a rarity in Portugal, having been recorded only in the Algarve, especially on the banks of the streams up to 300 m altitude.



The area of Fóia presents an open landscape with rocky outcrops that provide optimal nesting conditions for the rock bunting.

Activities

Hiking

There are marked footpaths and others in the process of formalization in the area of Monchique: the **Fóia route** (7 km) is a circular and signalled route that develops around the viewpoint of Fóia; the route from Caldas de Monchique, it is worth visiting the Viewpoint of Caldas and climb up to the second highest peak of Monchique, the Picota; the **Moinhos route** (5 km) can be initiated in the picnic area of Barranco dos Pisões and covers a stretch of the ribeira de Seixe where water mills are frequent; the **route of Percurso das Árvores Monumentais** (6.6 km), starting at the Largo dos Chorões in Monchique, is a circular route that allows the observation of the notable trees of the Serra. Contact the Municipality of Monchique and nature tourism operators in the region to perform these and other alternative routes.

Mountain Biking (MTB)

The BTT Monchique mountain biking club is an association that specializes in organizing cycling and mountain biking events and can be contacted for performing mountain bike rides.

Worth Seeing

Several viewpoints in Alferce (Barreiras Brancas, Monte Velho, Barranco do Demo, Altura da Choça, Altura da Benafátima), Marmelete (Cerro do Picos) and Monchique (São Sebastião, Fóia, Picota, Fonte Santa, Caldas) allow observing the sweeping views offered by this set of mountains.

Eating outdoors

The picnic areas, formalized in iconic locations of Monchique, enjoy the cool and gloomy atmosphere provided by leafy, and sometimes secular, trees: Alferce Picnic Park, Marmelete Picnic Park, Barranco dos Pisões Picnic Park, Caldas de Monchique Picnic Park.

Relax and enjoy the medicinal properties of the waters of Serra de Monchique with spa treatments and wellness programs in the spa complex located in Caldas de Monchique.



Picnic Park of Barranco dos Pisões.

Accesses

Fóia Viewpoint: from the centre of Monchique, take the EN 266-3 following the signs for the viewpoint.

Caldas de Monchique: located on the southern slope of the Serra, 6 km from the town of Monchique, on EN 266 (road that connects Portimão to Monchique village).

Alferce: located in the northeast slope of the Serra, about 10 km from the town of Monchique, in the section of EN 267 that connects S. Marcos da Serra to Monchique.

Marmelete: located about 16 km west of the town of Monchique, in the section of EN 267 that connects Aljezur to Monchique.

Serra do Caldeirão



Mountainous relief of Serra do Caldeirão.

The Serra do Caldeirão, or Serra do Mú, occupies a large extent of the Algarve region, extending from the valley of Ribeira de Odelouca in Silves, to the border area where it softens on lower plateaus near the Guadiana valley. The reliefs are relatively modest, not reaching 600 m above sea level, but most of the mountain is above 400 m displaying a rugged landscape of rounded hills and valleys carved by rivers that are born here and roam the mountains in several directions: the Mira river to the lower Alentejo, the streams Vascão, Oeiras, Foupana, Leite and Beliche to the Guadiana River, the Arade River and Odelouca stream to the west, flowing into the Algarve Barlavento. They are characteristic of this mountainous landscape of broad valleys that resemble huge "cauldrons", surrounded by

* Pessoa (1999).

long ridges of hills.

Most water lines are of a seasonal nature, drying in summer and running in raging torrents in the rainy season. The average annual rainfall is reasonable in the higher areas of the municipality of Loulé (over 800 mm), but decreases to the east, and may be less than 500 mm in the northeast Algarve. Water availability is frankly low, since the soils of schist and greywacke of the Iberian Massif are poorly permeable, making underground infiltration and storage of water difficult.

With reduced water availability, unfertile skeletal soils and a historical isolation resulting from the topography of the Serra, Pessoa* says that in the Caldeirão the populations are "(...)

mainly mountainous, as they have to fight against the aggression of the environment, the roughness of the soil and the climate". In that which is the most unpopulated and fragile territory of the Algarve, large tracts of forests, more or less open, of cork oak and holm oak coexist with the pine and blue gum forests, the fields of grain, the rockrose patches, but also with vast areas of vegetation that are so sparse that the poor and thin soils are exposed, being extremely vulnerable to erosion.

The settlement is organized in small rural villages, the "montes" (isolated houses), possibly by Arab influence. Farming is mainly of subsistence and is concentrated along the watercourses and at the foot of the hills, dominated by fruit and vegetable crops, traditional dry orchards (mostly olive), extensive pig farming and pastures, usually near the small villages.

The territory is suitable for forestry, which is based on the cork oak for cork exploitation, a species that in the central and western sector of the Caldeirão enjoys optimal conditions of humidity, temperature and altitude for its growth. In cork oak farms it is customary to combine the harnessing of cork with the extensive cultivation of cereals or forage, resulting in a landscape like the "montado" (dehesa) which in spring is covered with colourful rugs. In some places, due to abandonment of the agro-pastoral activity, these areas have evolved into relatively dense groves of oak forests, where the native bushes now grow.

Despite the depopulation dynamics of the Serra, which occurred in the middle of the last century, traditional activities related to raw materials of the Serra - cork, mushrooms of economic value, strawberry tree, honey, cheese and aromatic, medicinal and softwood herbs -, have high profitability potential, especially considering the synergy with rural and nature tourism.

An area of approximately 50.000 acres in the western part of Serra do Caldeirão is classified as Special Protection Area and integrates the Caldeirão Site of Community Importance (National List of Sites of Natura 2000 Network), which includes the environments of the Serra territory in better state of conservation, where plant communities reveal optimal structure and density. This is an area covered by extensive cork forests, which are present on the darkest and more isolated slopes such as the woods and pre-woods of cork oak and Portuguese oak, accompanied by impenetrable thickets dominated by strawberry tree and heathers. In the sunniest slopes it is the lower scrubs, especially of rockrose, that accompany these woods.

The size of some of these woods, the balance between the various strata of vegetation and the tranquillity of the mountains, allows for the harbouring of a rich and diverse community of wildlife, with special focus on birds and mammals. More than 150 species of birds



Cork Oak trees with undercover of low shrubs.

have already been identified in the Serra do Caldeirão, most of which associated with the forest area.

The large birds of prey, such as the bonelli's eagle or eagle owl, as well as a wide variety of passerines, nest in different environments of the Serra. Among the migratory species, the

colourful bee-eaters and golden orioles stand out, which arrive here from Africa to nest in spring. Among the mammals, the Egyptian mongoose, the common genet and the wild boar are common.

The occupation of the Serra territory dates back to Neolithic times, as evidenced by

Ecological importance and uses of cork oak (*Quercus suber*)



The cork oak is a stately, leafy tree reaching up to 25 m in height and living up to 300 years. It is distributed throughout the western Mediterranean region, where there is some Atlantic influence, finding its ecological peak in the national mainland, with the exception of areas in altitude (with very low temperatures) and limestone soils.

It is a species of oak that is well adapted to the Mediterranean climate: the trunk produces a thick and ligneous bark, cork, whose main function is to protect the tree from fire. Cork is a noble raw-material with a light cellular constitution and high compressibility, which is currently used in industries as demanding as space, automobile, construction and clothing. Portugal accounts for about 55% of the world's cork production.

The ability to produce abundant cork and to resist its extraction, allows for oak production and the constitution of agro-ecology systems known as montados, a unique form of forest management. The montados play important ecological functions, providing unique ecosystems to which high levels of biodiversity are associated.

The cork oak is a forest species protected by national legislation since the Middle-Ages.



Bee-eater



Azure-winged magpie



Common partridge

the large amount of archaeological remains - tapirs, tholoi and ruins of villages - as exemplified by the Anta das Pedras Altas and the Anta da Masmorra in the area of Cachopo (Tavira), megalithic monuments of the Late Neolithic period. The interior region of the municipality of Tavira is extraordinarily rich in archaeological and historical heritage, where there are examples of the Serra architecture and ancestral way of life of the peoples: shale or whitewashed houses, community ovens, threshing floors, watermills, windmills and traditional "palheiros", circular constructions of prehistoric origin made of stone and earth, with thatched roofs or roofs made with reed from the stream.



Anta da Masmorra (Tavira).



Palheiro at Mealha (Tavira).

Activities

Hiking

In the parish of Cachopo (Tavira), the Centros de Descoberta do Mundo Rural de Casas Baixas, Feiteira e Mealha (Centres to discover the rural world) are places from which one can travel more than a dozen routes formalized in the Serra territory, where one can learn about the way of life of the local people and the rich natural and historical heritage of the region. For more information on these trails, and on six other routes in the surrounding area of Santa Catarina da Fonte do Bispo, ask the In Loco Association, headquartered in São Brás de Alportel, or download the guides of the routes from the website of the association.



White-leaved rockrose

The Municipality of Loulé provides information on six routes formalized in the area of the county, highlighting the Pé do Coelho path in Salir that allows climbing to the top of the Malhão hill, one of the highest points of the Serra do Caldeirão. In this Site, chosen for the construction of a Buddhist temple, the view opens up in all directions, offering a panoramic view of the rolling Serra and contour ridges of Monchique to the west, up to the coastal plains and the ocean. The routes guide is available on the website of the municipality.

Via Algarviana: this is a Great Pedestrian Route (GR13) that connects Alcoutim to cape São Vicente, inspired by the Trilho Moçarabe (the route taken by religious pilgrims between Mértola and cape São Vicente). The extent of this great route is about 300 km, mostly covering the Algarve Serra. There are entry points to the Via in the following mountain locations: Alcoutim, Balurcos, Furnazinhas, Vaqueiros, Cachopo, Barranco do Velho and Salir. More information can be obtained on the website www.viaalgarviana.org

Mountain Biking (MTB)

Three MTB routes are formalized, about 20 km long, with starting points in Ameixial, Salir and Cortelha. The routes guide is available on the website of the Municipality of Loulé.

Themed itineraries

The Cork Route "Rota da Cortiça" is a tourist route with defined itineraries and organized activities, with a view to disseminating the exploitation of cork, from the cork oak to the factory. It is structured into six themes: heritage, nature, rural life, tradition, innovation and knowledge, and seeks to facilitate the awareness of visitors toward the protection and valuation of the cork oak. The itinerary includes a visit to villages, rural and forest landscapes, museums and factories in the municipality of São Brás de Alportel. More information can be obtained on the website of "Rota da Cortiça", or the Municipality of São Brás de Alportel.



Cork is the most famous product from the cork oak industry, generating most of the revenue.

Accesses

The starting points for these itineraries and routes are in locations accessible via the road network in the region. Prior preparation for longer journeys is advised, especially of the Great Routes, through careful consultation of information available and the printing of maps of the routes.

Rio Arade and Ribeira de Odelouca



Riparian gallery in the Odelouca stream, with willows and narrow-leaf ash.

It is in the Algarve Serra that begin the major waterways of the region - river systems, typically of a Mediterranean nature, that flow in strong torrents in the rainy season and tend to dry out during the summer.

Arade is the largest river after the Guadiana, which, along with the Odelouca stream, is one of the longest in the Algarve. The Arade river and the Odelouca stream are born in Serra do Caldeirão and converge near Silves, in a place where there is an elevation above the river, the hill of Atalaia or Atalaia de Silves, which retains traces of a defensive construction. From this elevated location Silves may be seen, which was a strategic point in the days when the Arade was navigable upstream of that city and was also the main entry route to the Barlavento.

The Odelouca watershed is a sub-basin of the Arade, constituting one of its main tributaries; the wide valley of this stream marks the border between the mountain systems of Monchique and that of Caldeirão.

In places with low human influence, especially

in valleys moderately embedded which do not provide for the agricultural use of riparian margins, a dense and lush gallery of riverine woods flanks the mountain streams. In these woods one can frequently find narrow-leaf ash, willows, poplar, and in the more humid stretches, the alder; if water availability is low or markedly seasonal, the margins are covered with lower riparian forests dominated by species typical of more southerly environments, the tamarisk and oleander.

These complex riparian galleries are of significant ecological importance, playing a key role in water quality, control of erosion and flooding, and providing shelter to several species of flora and fauna.

The waterways that comprise the Arade and Odelouca watershed are habitat to a remarkable community of fish, crucial in preserving the genetic diversity of cyprinids such as the southwestern arched-mouth nase, exclusive to the basins of Mira and Arade, the Arade chub (endemic of the southwest basins), and the Iberian arched-mouth nase, an Iberian endemism.

Considering the urgent need for conservation of these waterways and of the organisms that depend on the aquatic environment, the end portions of Arade and Odelouca, excluding the mouth of the Arade, are classified under Natura 2000 Network, as Arade/Odelouca Community Site of Interest, which borders with the southern boundary of the Monchique Site.

Until the construction of the Odelouca dam, the section of the Ribera de Odelouca in the foothills of Monchique sported one of the most lush and well-kept Serra riverine woods of the region, including the major alder corridor of the Algarve, now submerged by the waters of the huge artificial lake. These woods of great structural complexity, rare in the region due to their vulnerability to changes in the river banks and because they integrate trees such as the alder that are not very tolerant to drought, resist now only in small pockets in the valleys of tributaries of the Ribera de Odelouca, especially in Corte Mourão and Benafátima (Silves), and also other streams that flow to the north and west of Monchique.

Following the ecological losses resulting from the construction of the dam, compensatory measures were defined, which included habitat restoration on approximately 450 acres of national scrubland on the left bank of Odelouca, aiming to benefit future populations of the Iberian lynx and bonelli's



Reservoir of the Odelouca dam.

eagle, the construction of the National Centre for Captive Breeding of the Iberian Lynx, and the rehabilitation of riparian galleries and river corridors in some sections of the watershed of the Arade River.

Activities

Hiking

Upstream of the reservoir of the Odelouca dam, south of São Marcos da Serra, follow a small section of the stream with a well-preserved riparian gallery, framed by hillsides covered with dense cork oaks. Downstream of the dam, near the town of Odelouca, some rural roads traverse the right bank of the river, where the mosaic of vegetable gardens and orchards of the lowland and the slopes of the mountains covered by dense shrubbery may be admired.

Sport fishing

In the bayous of Funcho and Arade (fed by the Arade River) and of Odelouca.

River tours and water sports

Tours, rowing and canoeing can be practiced along the Arade River and Odelouca stream. The Municipality of Portimão suggests an itinerary starting in Portimão, up the Odelouca stream (24 km round trip). More information on the river tour and other routes can be obtained in the website of the Municipality of Portimão.

Accesses

The **Odelouca stream** in São Marcos da Serra: taking the M 542 road to Alferce (Monchique), the access to the river emerges at approximately 700 m after the level crossing.

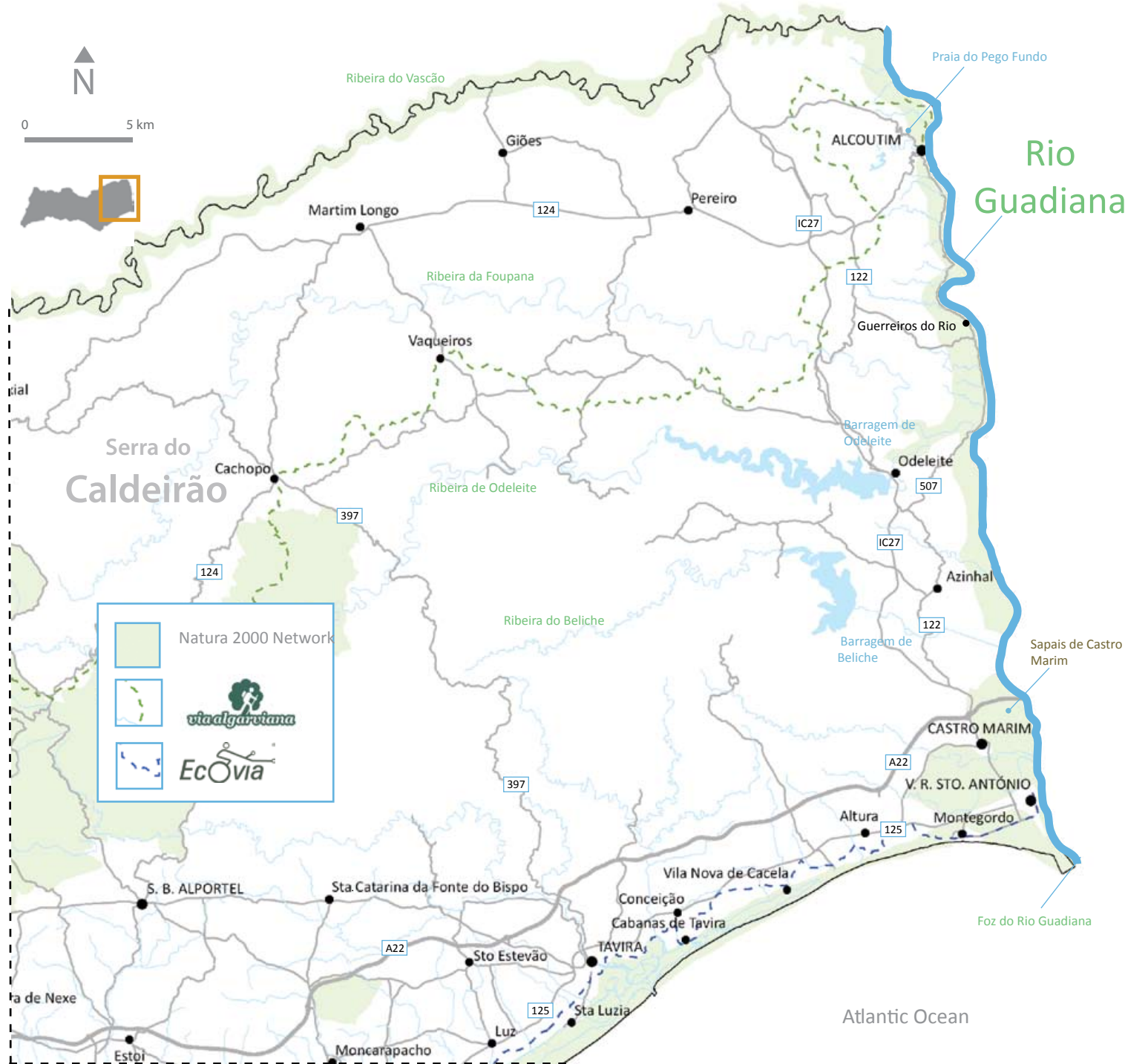
Odelouca: in Odelouca, exit through the EN 124 westbound (Monchique); after crossing the bridge over the stream, turn left onto the dirt road that leads to the right bank of the stream.

Reservoirs: Funcho and Arade are accessible from the section of EN 124 that connects São Bartolomeu de Messines to Silves; Odelouca is accessible from the EN 266 between Portimão and Monchique.

Guadiana

Even the upper end of the river believes in the ocean.

William Stafford



Surrounding the Guadiana valley, the reliefs of Serra do Caldeirão soften up forming a vast region of plateaus of a warm colour and intense smell of scrublands. Moving eastward, accompanying the growing scarcity of rain, the holm starts to replace the cork; the open landscape displays dry shades and a certain aridity in the oak "montados", in the cereal fields and in the rockrose patches, cut only by the running water called the great river of the South and streams that flow into it, where the green comes to life and life-forms abound.

The Guadiana River begins 1.700 m above sea level in the Ruidera lagoons in the Spanish region of Castile-La Mancha, a little more than 800 km from the mouth on the south coast of the Iberian Peninsula. In its terminal section it draws the border between Portugal and Spain and forms a delta (the only case in Portugal) that empties directly into the ocean. Historically there are two large arms of the river, one between Castro Marim and Ayamonte, and another to the east of Ayamonte which was gradually silted.

Still in Alentejo, near Mértola, the Guadiana runs between boulders in narrow and steep valleys, digging out shales and greywackes from the Iberian Massif. From Mértola, and through Algarve lands, the river channel gradually expands until the estuarine area, ranging between 100 m and 800 m in width, at the mouth. Conditioned by the geological substrate, the Guadiana estuary is relatively narrow compared to other estuarine environments that develop in softer sediments. It is south of Castro Marim, just 6 km from the mouth, that the water level spreads, stretching into meanders between marsh banks.

The Lower Guadiana, with about 70 km of waterways between the mouth and Mértola, was the natural route of entry of successive peoples into the southwest of the Iberian Peninsula and fundamental in the structure of the peninsular territory. Constituting

a strategic waterway, it enabled the flow of ores exploited by the Romans in the mines of São Domingos and integrated the Mediterranean-Atlantic trade routes during the Arab occupation. After the Christian conquest of the Algarve and Andalucía, the Guadiana established itself as the natural border between the Kingdoms of Spain and Portugal. The border territories were defended by military-religious orders that ran the border plazas along the river (Castro Marim, Alcoutim and Mértola).

Referred to as River Ana until the thirteenth century, the Arabs kept the name adding the word *uádi* to it, which means river, resulting in *Odiana*, just as with other rivers of the south such as Odeleite, Odemira and Odeceixe. The Spanish language transformed *uádi* into *Guadi* and the Guadiana designation was also adopted by the Portuguese border territory as from the sixteenth century, under the local Castilian influence.

The same Arabic term designates the *uedes* of the semiarid territories of Maghreb, the dry valleys where torrential rivers flow in the rainy season. Similarly, one of the most striking features of the Guadiana River and its tributaries is the irregularity of the flow; the river system is markedly seasonal and subject to significant interannual variability, with typical situations of successive dry years along with episodes of catastrophic flooding. The biological communities are well adapted to the torrential flow regime and have developed ingenious strategies to resist at times when water is scarce.

The dryness of the landscape contrasts with the life that the waters of the Guadiana and its tributaries support, making these watercourses important wildlife corridors for many terrestrial and aquatic species. Worthy of note, among other values, is the remarkable diversity of freshwater fish and migratory fish from inland waters of the Guadiana basin. The hardness of this inhospitable



The Guadiana in Guerreiros do Rio.



At the mouth, view of the Castro Marim Castle.



Juniper tree on the bank of the Foupana stream.

territory contributes to the scarce human presence and there are places where plant communities, especially the riverine forests and arborescent juniper thickets grow on siliceous cliffs, develop great structural complexity and ecological maturity. In the valleys of the tributaries of the Guadiana, the soil becomes thick and unique microclimates are formed, which allow for the conservation of oak woodlands on the slopes and more profitable agricultural uses in the floodplains.

Considering the protection of these natural values, the riverine areas of the Guadiana river and the Vascão stream, and the confluence of the Odeleite and Foupana streams, their tributaries in the Algarve region, were integrated into the Guadiana Site of Community Importance (list of Natura 2000 Network Sites) which then extends through the Alentejo to the Serpa region.

A mosaic draws on the gentle slopes surrounding the valley of the Guadiana; they are mainly rockrose patches that are interspersed with oak "montados", cereal



Plantation of stone pine.

fields, olive groves and traditional carob fields. The farming is extensive, traditional and production is done on the thin and poor soils. More recently, large tracts of land have been replanted with pine wood in an attempt to reverse the cycle of degradation and low productivity of the soil that has apparently set in, especially on sloping hillsides.

A significant extent of the territory is used for hunting, in the Hunting Reserves and tourist associations. The main game species are the rabbit, the granada hare, the red-



Wooded landscape of holm oak and pine forest, characteristic of the watershed of the Beliche stream.

The rockrose scrub



Since Neolithic times, man has been altering the mountainous landscape, converting the forested areas into agricultural and pastoral land. Secular interventions such as clearing and logging, burning and grazing, resulted in the replacement of a significant portion of the forests

of cork oak and holm oak - native to southern Europe - by shredders. The cereal campaign of the mid-twentieth century profoundly altered the existing mosaic of the forest and scrubland, for even the steepest slopes of the hills of the Algarve were cleared and logged. After the abandonment of crops that provided meagre yields, the exhausted soil was left at the mercy of erosion. The vegetation has recovered slowly, especially in the eastern sector of the Caldeirão, with large mountain expanses covered by a monochrome coating of rockroses. The gum rockrose, *Cistus ladanifer*, is one of the few species that can set in these adverse conditions, a pioneer in colonizing poor soils. With the passing of time, and with some recovery of the soil, the rockrose patches will tend to evolve to more complex scrubs, although constrained by the water scarcity in the region.

legged partridge and the wild boar. In an environment dominated by low scrub and rockrose patches, shelters are scarce, particularly for larger animals such as wild boars, who take refuge in the wooded ravines, emerging at night to feed.

Although the northeast Algarve is now quite depopulated, the Guadiana valley is an area with very ancient human presence, dating back to the nomadic communities of the Neolithic who practiced agriculture

and pastoralism, itinerant of transhumance - activities well-suited to the biophysical conditions of the region. The numerous visible megalithic monuments, seen today in the valley of the Guadiana, fulfil important functions in terms of physical and mental ordering of space in these communities. In Alcoutim there are still archaeometallurgical traces documenting the existence of metallurgical and mining activities since prehistoric times.



Flock of sheep. Grazing is still one of the traditional activities present throughout the Lower Guadiana.

Guadiana Basin



Tamujal in the middle section of the Foupana stream.

The Guadiana basin is the fourth largest in the Iberian Peninsula after the basins of Douro, Ebro and Tagus, draining an area of 66,800 km². About 17 % of the basin area, 11,580 m², is located in Portugal and has a dense hydrographical network of narrow valleys excavated into hard rocks of the Old Massif, running from north to south and extending to the geologically younger and milder lands of the sedimentary fringe of Southern Algarve. The Guadiana collects the flow of watercourses from eastern Alentejo and contiguous Spanish territory, and, in the Algarve, it drains the northern slope of the Serra do Caldeirão.

This great river of the southwest of the Iberian Peninsula crosses a territory marked by the Mediterranean influence with hot, dry summers and high insolation; relatively stringent winters in the Upper and Middle Guadiana, gradually becoming milder downstream, in the lowlands and close to the coastline.

In the watercourses of the basin, diverse riparian vegetation develops, well-suited to the irregular flow regime; they are low, shrubby or bushy galleries that grow in the dry beds, dominated by species typical of southern riparian environments: the oleander, the tamarisk and the tamujo. In places that tend to accumulate water, sometimes tall shady galleries are formed, with riverine forests where ash, willows and poplars are frequent. The highly specialized riparian vegetation of intermittent streams integrates the set of natural values that determined the classification of Guadiana Site (Natura 2000 Network).

These riparian galleries ensure important functions in terms of maintaining water quality and control of water erosion and of floods. Especially if the riverine forests remain in good condition, the complex water network also acts as an ecological corridor for organisms, allowing the movement of animal species and the spread of plant species between

fragmented habitats and distant points of the territory.

Vascão and Foupana, the two main tributaries of the Guadiana in the Algarve, provide shelter for many animals, both aquatic and terrestrial. In the summer season, the water that remains caught in these streams is a real oasis for birds and mammals and a refuge of fish, amphibians and some reptiles.

The Lower Guadiana is home to a remarkable diversity of fish; fishing, especially artisanal fishing, until the middle of the last century had great economic and social importance in this region. Species of high commercial value were then caught with high yield, especially anadromous migratory fish going to the rivers at the time of reproduction (such as the allis shad, the twait shad, and the sea lamprey), and the European eel that travels in the opposite direction when it reaches breeding age (migratory catadromous). Before, the sea lamprey went up these streams toward the spawning sites in such quantities that fishermen could catch them by hand in shallow areas.

Of the fish that remain here throughout the lifecycle, the following stand out: the barbel, the nase, the mullet and exotic species such as the largemouth black bass and the pumpkinseed. Currently extinct in Portugal, the sturgeon is an archaic-looking fish that used to migrate to the Guadiana during the breeding season, where it spawned in gravel areas.



Vascão stream



Loendral on the banks of the Odeleite stream.



Grass snake.

The streams of northeastern Algarve are home to significant populations of endemic species in the Guadiana basin, such as the jarabugo, the southern straight-mouth nase, the Iberian small-head barbel, and the Iberian arched-mouth nase, an Iberian endemism. These fish have a remarkable ability to withstand large fluctuations in the flow of streams, surviving on tiny ponds until the rainy season. Some of these endemic species are currently very vulnerable and have very fragmented populations. Changes in the natural flow regime, the construction of dams and the introduction of exotic species, have been the main reasons for their decline.

The most common amphibians are: green frog, the iberian midwife toad, common-toad and the west iberian painted frog, while among the reptiles the most common are: the tortoise and grass snake, one of the two species of water snakes that occur in Portuguese territory.

On the bank of the streams it is easy to spot the presence of wild boars through the holes they leave in the moist soil when seeking tubers and roots; in the Mediterranean woods lining the slopes of the ravines it is common to see the wildcat, red fox, rabbit and beech marten. Though in the open field of the plateaus that surround the Guadiana valley, it is the granada hare that marks a usual presence.

The riparian galleries are home to typical Mediterranean birds such as the Sardinian warbler, the buzzard, the kestrel, the red-legged partridge, the jay and the azure-winged magpie. Around here, two migratory species nest, which greatly contribute to the control of insects: the red-necked nightjars and the bee-eater, which are insectivorous birds, the first of twilight and night habits and the second of diurnal habits.

On the banks of these streams interesting insects may also be seen, particularly dragonflies, being one of the few sites where

the *Coenagrion mercuriale* and the *Oxygastra curtisii* are found.



Broad scarlet on the bank of the Foupana stream. This species has expanded its range as a result of climate change.

Otter (*Lutra lutra*)



The otter, also known as European otter, is one of the mammals of the Palearctic with greater territorial distribution. According to the International Union for the Conservation of Nature (IUCN), the species has the status of "Near Threatened" in much of the territory. Portugal is one of the few countries in Europe where the otter uses most of the water courses and has maintained a stable population, with its distribution area extending to the whole country. This mustelidae (family to which belong, for example, the beech marten and the Eurasian badger), uses also the marine environment along the southwest coast, which is a rarity for the species, due to the limited availability of suitable space, nationally and worldwide, in the face of the systematic human presence along the coastal wetlands.

Being a primarily piscivorous species, it also feeds on other animals available, such as amphibians or crustaceans, like the exotic red swamp crayfish, a species that has expanded into rivers and streams. In the Algarve, this preference for fish allows observing the otter in unexpected places like creeks of estuaries, up to harbours and marinas where food is abundant.

The sturgeon (*Acipenser sturio*)



It can reach up to 3,5 m in length and weigh 280 kg, estimating that they reproduce only from the age of twenty-five. In regions where the sturgeon is plentiful, an industry was created based on their eggs, the famous caviar. Flow changes, pollution and overfishing are some of the causes for its disappearance as a major breeder in the great river of the south.

Activities

Hiking and mountain biking (MTB) trails

The Odiana Association and the City of Alcoutim has formalized a set of routes and trails in the Lower Guadiana, with a total length of about 135 km. Worthy of note are the more than a dozen marked cycle paths and footpaths that traverse the mountains of the Guadiana valley, the typical villages of the region, and cross water courses where traces of ancient hydraulic structures are seen, as well as water mills, dams and “levadas”, many of which are now recovered. Information on these routes can be downloaded from the website of the Património do Baixo Guadiana (Lower Guadiana Heritage) (<http://www.baixoguadiana.com>) and the websites of the Municipality of Alcoutim and the Odiana Association.

Thematic tours

Six thematic tourist routes designed by the Odiana Association under the publication “Roteiro Turístico do Baixo Guadiana” (Lower Guadiana Tourist Guide), a guide to visit the most significant natural and humanized territory, in terms of culture, heritage, ecology and recreation. One of the trails includes a visit to the River Museum in the town of Guerreiros do Rio, to learn about the history of Guadiana and its people (the connection with the ore, artisanal fishing and contraband) and also observe the artisans toil live. The information on this guide is available at the website of the association.

River tours

Going up the river by boat and admire the slopes of the Guadiana valley and border villages arranged like an amphitheatre over the river; the tourist cruises depart from the Guadiana Recreational Port.

Bathing

In Alcoutim, at the Pego Fundo river beach formalized in the Cadavais stream, a tributary of the Guadiana. Also in the dams of Vascão and Foupana streams; for more information see the map of leisure activities on the website of the Odiana Association.

For **sport fishing** on the Guadiana River, refer to the tour operators that organise the river cruises.

Sailing and boating

In the Guadiana River: for this purpose, refer to the Guadiana Naval Association.

Eating Outdoors: in the Parques de Merendas

da Barragem de Vaqueiros, Bentos (Picnic Parks of the dams) (Aldeia de Bentos, Vaqueiros) and the Montinho das Laranjeiras (Alcoutim).

Watching damselflies and dragonflies: alongside the watercourses. Information on the observation locations is available at the website <http://nsloureira.pt/dragonflies/>



Signs marking the “right way” on small routes (PR).

Accesses

Guadiana Recreational Port: at Avenida da República in Vila Real de Santo António, access via the EN 125 (connecting Vila Real to Faro) or the EN 122 (which connects Vila Real to Castro Marim).

Praia Fluvial do Pego Fundo (river beach): access from Alcoutim, crossing the bridge of the Cadavais stream towards its left bank, for about 500 m.

Museo do Rio (museum) in Rio dos Guerreiros: access from the IC 27; coming from the south, following the direction of Foz de Odeleite after the Odeleite dam. In Foz de Odeleite, head north through the municipal road that follows the Portuguese bank of Guadiana to Alcoutim.



Museo do Rio (museum)

Sapais de Castro Marim

Marshes of Castro Marim

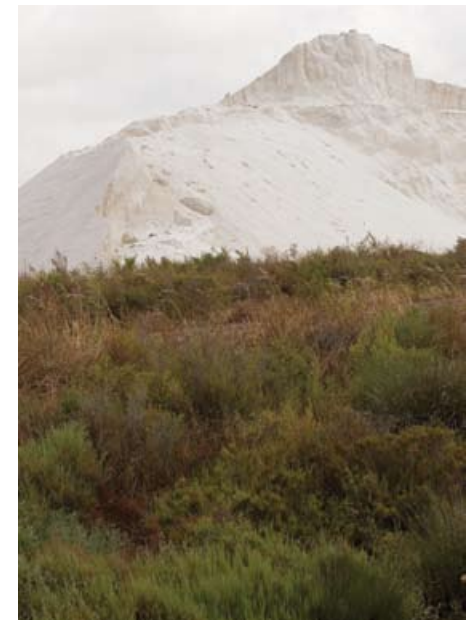


Sapal de Venta Moinhos.

for retaining water that flows to the marsh, filtering pollutants and recycling nutrients.

A broad low area of salty and marshy land extends around the hill where the castle of Castro Marim was built on the ruins of an ancient Arab fortress - a natural viewpoint that dominates the coastal plain and that in remote times was an isolated island in the middle of the Guadiana estuary.

A significant portion of this land was converted into salt pans, fishponds and pasture areas. Some marshes are now occupied by secondary marshland, especially in places drained by the Guadiana protective dikes built during the cereal campaign in the middle of the last century. After the abandonment of wheat, barley and oat cultures, the halophyte



The salt pans of Castro Marim produce excellent quality salt. One of the most exquisite products, the *flor-de-sal*, corresponds to the first extraction of the salt crystals.

To the south of Castro Marim, already in the estuarine environment, the Guadiana spreads between saltmarshes, salt meadows and estuaries. In this floodplain, flooded daily by tides and floods in the rainy season, sediment accumulates here, having been transported by the river throughout its course.

The rise in sea level, over the last 8.000 years, has favoured the clogging of estuaries by hindering the flow of the sediment load transported by rivers to the ocean, forming plains where successive layers of fine sediments are deposited, subsequently colonized by halophyte vegetation - the marshes. These are valuable and productive environments that play important roles in the control of erosion and flooding on the coast and are considered “kidneys of the land”



Grazing of cattle and production of carob as sources of income in Castro Marim.



Black winged stilt, symbol of the Nature Reserve.

vegetation re-colonized in the area while maintaining lower density and floristic diversity, possibly because they are still today areas used for grazing cattle.

The biological richness of this particular estuarine area, the ancestral resource management by its people - materialized in the traditional salt culture and artisanal fisheries - and the archaeological value of the town of Castro Marim, led to the creation of the first Nature Reserve in Portugal in 1975, the Nature Reserve of Marshland of Castro Marim and Vila Real de Santo António, with about 2.300 hectares.

The final section of the marshes of the Guadiana estuary are also classified as Wetland of International Importance (Ramsar Site) and as Special Protection Area Castro Marim, and are part of the Site of Community Importance of Ria Formosa-Castro Marim of the national list of Natura 2000 Network Sites, constituting one of the most important wetlands in the country. Displaying a mosaic of marshes, salt meadows, salt marshes, estuaries, brackish lagoons and farmland, it is home to unique species of Iberian flora and is a natural nursery of several species of fish, molluscs and crustaceans. The twenty-two species of fish recorded here are associated with the estuarine and marine environments; species of high economic value, such as the white seabream, the gilthead seabream and the european seabass, use the estuaries of the marsh as places of refuge and breeding.

But it is as a habitat for birds that Castro Marim excels, being fundamental to thousands of waterfowl that find here good nesting and wintering conditions and a strategic resting place during the long migrations between Europe and Africa.

The limicola, herons and gulls are the most represented birds, as well as ducks and coots that use the marsh estuaries. The salt marshes, one of the most prized habitats by

waterfowl in this reserve, are a nesting site for the kentish plovers, the sea swallow, the black winged stilts and the avocet, the latter with a significant local community at a national level.

Also very interesting is the persistent presence of flamingos, especially in the post-reproductive period. The flamingo remains throughout most of the year, sometimes in numerous flocks, suggesting the possibility of maybe nesting in the region, if the environmental conditions remain favourable.

The lesser short-toed lark nests in the dried marshes, being the only known community of this species in Portugal. In the surrounding agricultural areas it is common to see the red-legged partridge, the little owl and the southern grey shrike, among many others, such as the little bustard and the calandra lark, which use the dry heaths.



Flamingo

Saltwater plants

The marsh is periodically flooded by tides, according to the solar and lunar cycles: the higher areas are submerged only in floods of living waters, but the lower elevation areas can be flooded at each high tide. Marsh plants are well adapted to the salinity content of the water and in the soil, and are distributed according to their tolerance to immersion. The small cordgrass is a grassy plant that occupies the first line of the marshland close to the saltwater. Progressively, in higher altitudes, less subject to flooding by tides, species like the *Sarcocornia* and *Arthrocnemum* develop. In the salt pans it is common to find the slender-leaf iceplant, a delicate succulent plant that tints the top of slopes red. Some of these saltwater species, like the sea purslane and the sea samphire, are greatly appreciated in the gastronomy of Mediterranean countries.



Slender-leaf iceplant



Sea purslane

Activities



Beginning of the Interpretation Route, near the headquarters of the Nature Reserve.

Hiking

In the Nature Reserve of Castro Marim and Vila Real de Santo António, three hiking routes are formalized: Percurso do Cerro do Bufo, a circular trail with 10,5 km length; Percurso das Salinas Tradicionais (traditional salt pans) route, a 2 km circular trail; Percurso do Sapal de Venta Moinhos (marshland route), a 6 km linear trail. The maps of the routes can be downloaded on the website of the Instituto da



Marshland in Cerro do Bufo.

Conservação da Natureza e das Florestas (Institute for Nature Conservation and Forestry).

Mountain Biking (MTB) Routes

The routes of Cerro do Bufo and Sapal de Venta Moinhos can be travelled by bike.

Birdwatching

Along the routes of the Nature Reserve.

In **Esteiro da Carrasqueira**, north of Vila Real de Santo António. The birds can be observed from the EN 122, which connects Castro Marim to Vila Real.

Castro Marim Castle offers a panoramic view of the lagoons and salt pans from the eastern sector of the Nature Reserve.

Watching damselflies and dragonflies: Castro Marim is considered a hotspot for the observation of these insects.

Environmental Education

The Interpretation Centre at the Headquarters of the Nature Reserve of Castro Marim and Vila Real de Santo António provides technical information, publications and exhibitions on the marshes, the salt pans, birds and the Guadiana River. In the reserve area there is also a picnic area and points of nature observation.



Castro Marim Castle.

Accesses

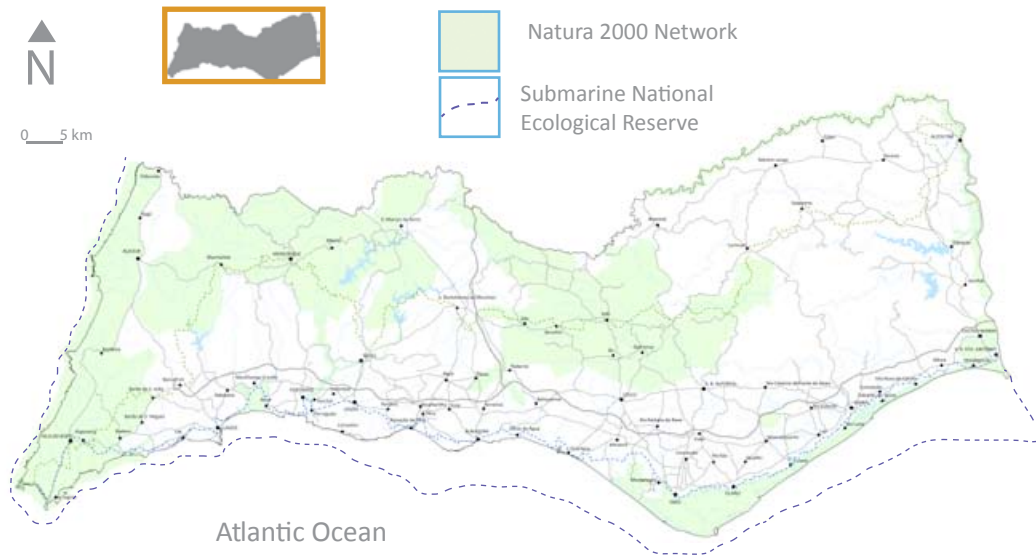
From the Via do Infante motorway (A 22), the EN 122 or the EN 125, heading toward Castro Marim (village and Nature Reserve) or Vila Real de Santo António (Esteiro da Carrasqueira).



Marine Ecosystem

*Sea
Half my soul is made of sea air.*

Sophia de Mello Breyner



So often overlooked, the marine environment is a significant and unavoidable part of the Portuguese territory and poetic imagery of its people. The Exclusive Economic Zone of Portugal, maritime zone over which the country owns the rights to exploration and conservation of all its resources, is eighteen times the land area (mainland and islands). The marine biodiversity, for many people visible only in documentaries or in fish markets, is remarkable; it is believed that more than half of all species on the planet live in the oceans, from the most archaic life forms to the most sophisticated ones; after all it was at sea that, about 3.5 billion years ago, life arose on the planet. Of the thirty-four phyla (groups of organisms) existing on Earth, thirteen are exclusively marine, such as the echinoderms (e.g. starfish) and cnidarians (e.g. jellyfish), and only two concern only terrestrial life forms.

For a long time now, the 800 km of coastline of the mainland has attracted populations



The gobies are a territorial and sedentary species that nest on small rocky recesses.

to fishing and seafood harvesting; at the end of the last glacial period, in the passage from Palaeolithic to Neolithic, man was able to move from the caves that protected him from the rough climate, to estuaries and



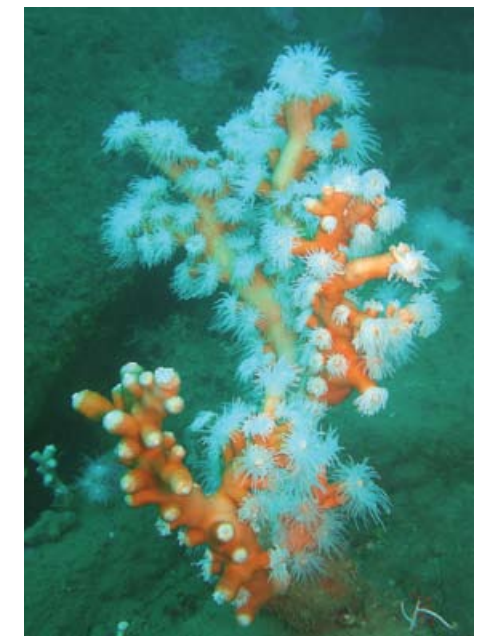
Dotted seaslug

beaches where he left numerous testimonies of his dependence on marine resources - the shell mounds of the Mesolithic. The shell mounds (deposits of shells, bones and funerary remains) document the importance of shellfish harvesting and of fishing to those communities, revealing valuable data on marine species existing at the time. Later, in Roman times, the relationship between man and marine resources became more sophisticated, having developed the industrial processing of fish with the production of canned fish and garum, so appreciated by the Romans. Along the Algarve coast there are several places with traces of ancient salting tanks: in Sagres, Salema, Boca do Rio, Lagos, Alvor, Ferragudo, Armação de Pera, Vilamoura, Vale do Lobo, São Lourenço, Marim and Cacela, among others. Other interesting traces date back to the Middle Ages and document complex activity linked to tuna traps - fishing gears that were annually set up offshore for tuna fishing, taking advantage of the migratory routes of this magnificent fish until their spawning in the Mediterranean. On land, fortifications were built to protect the tuna traps, constantly assaulted by Moorish pirates. Traces of these fortifications are still visible in Arrifana and Boca do Rio.

Nowadays, the art of artisanal fishing remains essentially on Costa Vicentina and the once abundant species are now rare in Algarve waters, especially large fish and cetaceans; at the same time, resources to be explored

emerge, such as agar-agar produced from red algae coralline or omega 3 from some fish, and water sports such as fishing, spearfishing, recreational diving and surfing, increasingly attracting practitioners.

Marine biodiversity in the Algarve coast is remarkable, which might be related to its privileged geographical situation, leaning into the Atlantic basin where the water masses of the Mediterranean, the temperate Atlantic and the tropical Atlantic, converge. In this maritime space, marine organisms with northern and southern affinities meet, some of which are at the limit of their ecological tolerance, and benefit from the highly productive waters favoured by upwelling phenomena, especially in the Algarve Barlavento and with greater intensity on Costa Vicentina. The variety of seafloors (rocky, sandy and with silts) and landforms such as sea stacks, bays, capes, lagoons and estuaries, provide suitable habitats for shelter, feeding, reproduction and



Orange coral, one of the showiest species of the Algarve coast.

growth of many different marine species.

The seafloor of Costa Vicentina is rocky, with notable points such as Ponta da Atalaia, Ponta Ruiva or Martinhal islets; the south coast is dominated by the sandy bottoms although the vast rocky complex off Albufeira somehow marks the separation between a more rocky Barlavento and an essentially sandy Sotavento, where only a few isolated rocky cores stand out (like Barrocas, Pedra da Greta or Pedra do Barril).



Ilhéu do Marinhhal, islet seen from the beach.

The marine ecosystem is still relatively unknown, even the underwater area adjacent to the shoreline, which is National Ecological Reserve ("REN") up to 30 m deep. This area represents a range of maritime coastal protection, prohibiting uses that could alter

the balance of the biophysical system and coastal dynamics. Also under national law, the territory of the Natural Park of Southwest Alentejo and Costa Vicentina covers a range of 2 nautical miles from the coastline, in its entire length, with some conditional uses in places considered essential to marine biodiversity.

Pioneering characterization efforts made so far in the underwater "REN" have revealed interesting aspects of the marine biocenoses, with special highlight to the stunning underwater scenery such as the colourful gorgonian gardens of the rocky reefs, the maerl submarine banks (calcareous algae) or the existence of red coral, intensively exploited species in the Algarve in the sixteenth century, which now presents very small populations.

The rocky areas are true oases of life and this is where the highest rates of biodiversity and density of organisms are found. The



Purple spined sea urchin

Rich waters



PG

Decisive for the biological richness of these coastal waters are the upwelling phenomena of deep waters, particularly intense around the Cape of São Vicente. The combined effect of the wind blowing parallel to the coast line and the rotation of the earth, result in the displacement of the surface layers of coastal water to the open sea, favouring the emergence of the deep, cold waters, rich in nutrients, which feed the base of the food chain, the microalgae. From the growth of phytoplankton, the rest of the food chain develops, from zooplankton to fish and other marine species that feed on plankton or fish.

structuring species of these communities are: the brown algae, the calcareous red algae, anemones, bryozoans, echinoderms such as the sea urchin and sea cucumber, gastropods and sponges. Many marine fish, benthic and cryptic species like gobies or commercially valuable demersal species such as the two-banded seabream, depend on these habitats.

In the sandy seafloor fish such as plaice and common sole subsist (flat fish well adapted to the mobile seafloors where they live). Worthy of note are, however, some areas of high ecological richness, particularly in interface areas of bedrock with fine sand and mudflats, as exemplified by the banks of black starfish in Albufeira. Apart from the reduced variety of ecological niches provided by the sands and silts, the lowest biodiversity of these areas may also be explained by the high disturbance to which they are subject, since the fishing effort is exerted primarily on this type of substrates.

Cetaceans are the group of marine mammals that can be observed in the coastal waters of

the Algarve. Although the common dolphin is the most easily observable one, the records include sightings of the harbour porpoise (the smallest cetacean of the Atlantic), the orca, the long-finned pilot whale and the striped dolphin, among others. These marine mammals feed primarily on fish and squid, although with specific preferences. Killer whales, for example, follow the migration of tuna into the Mediterranean while the common dolphin feeds mainly on sardines.

Five species of sea turtles are listed in Portuguese waters; the most common ones, the leatherback turtle and the loggerhead turtle, can be observed in the oceanic waters of the Algarve. The leatherback turtle, which inhabits these latitudes in summer and autumn, is the largest of all turtles and one of the largest reptiles, reaching 2.5 m in length and 910 kg in weight. All sea turtles spotted on the Portuguese coast nest in tropical and sub-tropical waters and the loggerhead turtle has nesting beaches relatively close, in Cape Verde.



Short-beaked common dolphin along Sagres. Being fast swimmers, they allow boats to approach, often accompanying them. They can be seen on feeding frenzies alongside other marine mammals and birds, in places with plenty of food.

Among the fish that are in Algarve waters, many have high economic value such as European pilchard, European seabass, common seabream, white bream and the gilt-head seabream, the Atlantic bluefin tuna and the angler. Some species form mobile schools, sometimes with thousands of individuals, such as the European pilchard and anchovy, while others are territorial, such as the dusky grouper or the European conger (solitary species that do not swim far from rock cavities where they live).

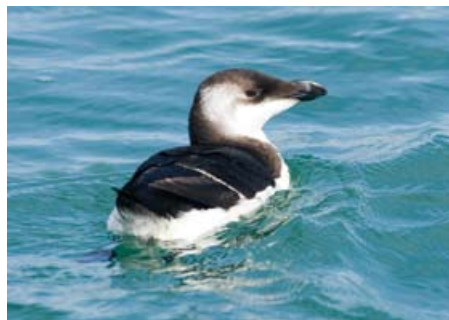


The moray is a fish of solitary and nocturnal habits that lives in rocky cavities.

Terms such as “pelagic”, “demersal”, “coastal”, “oceanic”, “benthic” and “migrator” can be applied to the characterization of the organisms present in oceans, in particular their usual place in the water column, their habits and proximity to the coast.

In marine birds sighted along the coast, the gannet and cory's shearwater are the most abundant and also more than a score of species of shearwaters, petrels, great skua, seagulls, terns, or even the rare puffin and razorbill.

Around some groups of animals greatly appreciated in gastronomy, such as crustaceans (e.g. crabs, barnacles, shrimp, lobster) or shellfish (e.g. mussels, clams, oysters, squid, octopus), the arts of harvesting and peculiar lifestyles developed, which marked the identity of the local communities; that is the case of the harvesting of barnacles



Razorbill



Gannet

Seagrass Beds



Seagrass bed of *Cymodocea nodosa*.

Considered by some experts as the most vulnerable ecosystem at risk in the Portuguese coast, the seagrass beds are underwater communities of marine herbs that may occupy large areas on sandy or muddy bottoms, up to 70 m deep. Being photosynthetic beings, they require appropriate conditions that allow the penetration of light into the water column, being very sensitive to changes in water transparency.

They are now more common in the sheltered waters of estuaries, *rias* and coastal lagoons, with only four small settlements known in the Algarve coastal waters, off the coast of Albufeira and Lagoa. It is thought that in the past these plants may have formed extensive marine meadows in the coastal area, especially south of the Tagus, which have been disappearing due to the intensification of fishing with “ganchorra”, a trawl gear to catch bivalves particularly harmful to communities living in the seabed.

In Portugal the seagrass beds are formed by three species: *Zostera marina*, *Zostera noltii*

and *Cymodocea nodosa*, rhizomatous aquatic plants that have evolved from terrestrial ancestors, for over 100 million years. They have roots, stems, leaves and produce flower, fruit and seeds, belonging to the group of angiosperms (flowering plants), thus differing from algae, equally autotrophic beings but simpler than the plants.

The seagrass beds provide numerous services in the coastal area, highlighting, among others, the stability of sandy bottoms, the dissipation of energy from waves and currents, and the prevention of phenomena of eutrophication in estuaries and beaches, functioning as biological filters that absorb nutrients from the water. They are one of the most productive systems of the biosphere and have a high ecological value, harbouring a high diversity of marine invertebrates and providing an ideal habitat (as maternity and nursery) for the recruitment of many fish species. These swaying meadows harbour larvae and juveniles of white seabream, two-handed seabream, ray, stingray and common torpedo, among others. The long leaves of the seagrass beds support the communities of cuttlefish

and whelks, and are used as places of hiding and ambush by large invertebrate predators like the octopus. Populations of emblematic species in coastal waters, such as seahorses, also depend on this ecosystem.

Despite the legal protections given to infra-coastal communities of *Cymodocea nodosa* under the Habitats Directive (Natura 2000 Network), there has been a regression in the areas of distribution of these seagrass beds, the most common threats being water pollution, dredging, the art of trawling for bivalves, the disorderly anchoring of vessels and seafood harvesting in seagrass meadows in the lagoon areas.

Activities

Observation of marine flora and fauna

The seagrass beds of *Zostera noltii* (the dwarf eelgrass, a species that forms communities in the shallower, intertidal zone) can be observed in the Ria Alvor and the Ria Formosa, at low tide. It is recommended to avoid trampling the seagrass beds and caution needs to be taken in relation to the plucking of seagrass and seafood harvesting that can cause serious damage to these meadows. See the website <http://www.pradariasmarinhas.com> to find geographic information about some of these seagrass beds.

In **Praia da Marinha** (beach in Lagoa), in the central sector of the beach, there is a route that allows underwater snorkelling in one of the rare seagrass beds (*Cymodocea nodosa*) in coastal Algarve. The course has an average duration of 30 minutes, a length of about 150 m, and the maximum depth reached is 3 m. The guide of this underwater route can be downloaded from the website of the Municipality of Lagoa or CCDR Algarve.

Adopt a seagrass bed: collaboration in this innovative program initiated by the Centre for Marine Sciences, University of the Algarve, whose goal is to create opportunities for citizen involvement in the monitoring and protection of seagrass. For more information see the website <http://www.pradariasmarinhas.com>



Long-snouted seahorse. These small fish are ovoviviparous and have the peculiarity of the male being the one that incubates the eggs deposited by the female in a pouch at the base of the tail.



Ria Formosa. In shallow waters, patches of seagrass beds of *Zostera noltii* may be seen.

Accesses

Praia da Marinha: in the EN 125, near the International School of the Algarve, follow the signs to the beach.

Leixão da Gaivota



View of the "leixão" from the Caneiros beach.

From the lighthouse of Ponta do Altar (at the mouth of Arade River) or from the Caneiros beach, there is a rocky islet that emerges from the sea at no more than 200 m from the beach. This is Leixão da Gaivota, one of numerous sea stacks of the rocky coastline of Lagoa. Sea stacks are rocky nuclei most resistant to erosion which, over time, remain standing along the coastline as it recedes.

Leixão da Gaivota, carved in the carbonate rocks in warm colours of the Miocene Epoch, displays steep slopes 23 m high at the highest point and flattened top with a humble area, not reaching 50 m at its widest point. Despite the modest size, this sea cliff is resting place and shelter for gulls, cormorants and rock doves. It is also considered as one of the most important breeding areas for herons in the Algarve, with a nesting colony of little egret and cattle egret, which, on top of the "Leixão" do not suffer significant human disturbance.

This colony of herons, which came to house about 5 % of the population of egret in breeding season (a species that is threatened in most of its European distribution area), led to the classification of Leixão da Gaivota as IBA* (Important Area for Birds) and as a Special Protection Area (SPA) under the Birds Directive of the Natura 2000 Network. Leixão da Gaivota



Little egret

* IBAs are areas of international importance for bird conservation on a global scale and constitute a network of areas classified by BirdLife International.

is the smallest area in Portugal, classified as IBA and SPA.

The herons of this colony are nonetheless vulnerable to changes in their feeding areas, especially the little egret that feeds on the estuary of Arade River, on the banks of the river and marshes. Wetlands, such as the estuary of the Arade or the Ria de Alvor, have lost feeding areas for waterfowl as a result of urban development and tourism in the Algarve coast. The Heron feeds in agricultural fields and pastures in the surrounding area.

The rock walls of the “leixões” are also important habitats for marine organisms of the intertidal and subtidal, such as barnacles, limpets, mussels, shrimps, crabs and many species of colourful gobies. In



Cattle egret

Leixão da Gaivota, the area of low platform and immersed vertical walls exhibit very diverse marine communities. With luck, while snorkelling around this “Leixão” one may observe schools of big-scale sand smelt and sparidae such as the two-banded seabream, annular seabream and the white seabream.



White seabream

Activities

Hiking

There is a network of trails on top of the cliffs between Ponta do Altar and Afurada Beach (an extensive sandy beach immediately east of the Caneiros beach, accessible only by sea), offering a distance of about 3.5 km (roundtrip) between these two locations. This route allows access to places of high scenic interest, with privileged views of Leixão da Gaivota and of the rocky walls of the cliffs where the continuous work of marine erosion may be seen. Among the curious karst features, typical of these environments, sea caves, arches, sinkholes, and of course the sea stack, may be seen from this location. Caution is advised when travelling these trails and a safe distance from the edge of the cliffs and sinkholes should be respected. Also, avoid critical conditions of wind and rain.

Birdwatching: from the top of the cliffs at Ponta do Altar or at the Caneiros beach.

Free-diving: around the sea stack from the Caneiros beach. There are about 550 m between reaching and circumventing the sea stack and returning to the beach, with an estimated average duration of 1 hour for diving. It is advisable to dive only in the absence of undulation; please avoid climbing the slabs of the sea stack during the bird nesting season, between May and July.

Accesses

Leixão da Gaivota: access from Ferragudo, following the M 530 towards the south to Ponta do Altar, or to the Caneiros beach following the signs to the beach.

List of Species

Flora

alcar-dos-algarves - *Tuberaria major*
alder - *Alnus glutinosa*
Alepo pine - *Pinus halepensis*
Algerian oak - *Quercus canariensis*
almond tree - *Prunus dulcis*
black-berry - *Rubus ulmifolius*
blue gum - *Eucalyptus globulus*
broom heather - *Erica scoparia*
Broteroi peony - *Paeonia broteroi*
carob tree - *Ceratonia siliqua*
chestnut tree - *Castanea sativa*
cork oak - *Quercus suber*
cotton weed - *Otanthus maritimus*
cross wort - *Crucianella maritima*
dwarf eelgrass - *Zoostera noltii*
dwarf fan palm - *Chamaerops humilis*
esparto grass - *Stipa tenacissima*
everlasting flower - *Helichrysum italicum*
false olive - *Phillyrea angustifolia*
faya tree - *Myrica faya*
fennel - *Foeniculum vulgare*
fig tree - *Ficus carica*
giant reed - *Arundo donax*
gum rockrose - *Cistus ladanifer*
holm tree - *Quercus rotundifolia*
hottentot fig - *Carpobrotus edulis*
juniper - *Juniperus turbinata*
kermes oak - *Quercus coccifera*
late crocus - *Crocus serotinus*
laurustine - *Viburnum tinus*
lavender - *Lavandula* spp.
maritime pine - *Pinus pinaster*
marram grass - *Ammophila arenaria*
mastic tree - *Pistacia lentiscus*
Mediterranean buckthorn - *Rhamnus alaternus*
myrtle - *Myrtus communis*
narrow-leaf ash - *Fraxinus angustifolia*
Norfolk Island pine - *Araucaria heterophylla*
oleander - *Nerium oleander*
olive tree - *Olea europaea* var. *europaea*
oriental plane - *Platanus orientalis*
pontic rododendron - *Rhododendron ponticum*
poplar - *Populus* spp.
Portuguese crowberry - *Corema album*
Portuguese oak - *Quercus faginea*
Portuguese thyme - *Thymus carnosus*
prickly saltwort - *Salsola kali*

prickly thrift - *Armeria pungens*
pyramidal orchid - *Anacamptis pyramidalis*
reed - *Phragmites australis*
reedmace; cattail - *Typha* spp.
rosemary - *Rosmarinus officinalis*
Sagres gum rockrose - *Cistus palhinhae*
sand couch grass - *Elymus farctus*
sea bindweed - *Calystegia soldanella*
sea daffodil - *Pancratium maritimum*
sea medick - *Medicago marina*
sea orache - *Atriplex halimus*
sea purslane - *Atriplex portulacoides*
sea rocket - *Cackile maritima*
sea samphire - *Salicornia* spp.
sharp-pointed rush - *Juncus acutus*
slender-leaf iceplant - *Mesembryanthemum nodiflorum*
small cordgrass - *Spartina maritima*
southern heather - *Erica australis*
southern magnolia - *Magnolia grandiflora*
stone pine - *Pinus pinea*
strawberry tree - *Arbutus unedo*
tamarisk - *Tamarix africana*
tamujo - *Fluggea tinctoria*
tomilho-cabeçudo - *Thymus lotocephalus*
tomilho-do-mar - *Thymus camphoratus*
white broom - *Retama monosperma*
white-leaved rockrose - *Cistus albidus*
wild heather - *Calluna vulgaris*
wild olive - *Olea europaea* var. *sylvestris*



PG

willow - *Salix* spp.
wormleaf saltwort - *Salsola vermiculata*
yellow broomrape - *Cistanche phelypaea*
yellow rockrose - *Halimium halimifolium*

Fauna

Algerian mouse - *Mus spretus*
allis shad - *Alosa alosa*

annular seabream - *Diplodus annularis*
 Arade chub - *Squalius aradensis*
 Atlantic bluefin tuna - *Thunnus thynnus*
 audouin's gull - *Larus audouinii*
 avocet - *Recurvirostra avosetta*
 azure-winged magpie - *Cyanopica cyana*
 barnacle - *Chthamalus* spp.
 bedriaga's skink - *Chalcides bedriagai*
 beech marten - *Martes foina*
 bee-eater - *Merops apiaster*
 big-scale sand smelt - *Atherina boyeri*
 black goby - *Gobius niger*
 blackbellied angler - *Lophius budegassa*
 blackbird - *Turdus merula*
 black-headed gull - *Larus ridibundus*
 black-winged stilt - *Himantopus himantopus*
 blue rock thrush - *Monticola solitarius*
 blue tit - *Parus caeruleus*
 bonelli's eagle - *Hieraetus fasciatus*
 booted eagle - *Hieraetus pennatus*
 brill - *Scophthalmus rhombus*
 broad scarlet - *Crocothemis erythraea*
 buzzard - *Buteo buteo*
 calandino - *Squalidus alburnoides*
 calandra lark - *Melanocorypha calandra*
 cattle egret - *Bubulcus ibis*
 cetti's warbler - *Cettia cetti*
 chaffinch - *Fringilla coelebs*
 chough - *Pyrrhocorax pyrrhocorax*
 collared dove - *Streptopelia decaocto*
 common genet - *Genetta genetta*
 common octopus - *Octopus vulgaris*
 common sandpiper - *Actitis hypoleucos*
 common scoter - *Melanitta nigra*
 common seabream - *Pagrus pagrus*
 common sole - *Solea senegalensis*
 common spiny lobster - *Palinurus elephas*
 common toad - *Bufo bufo*
 coot - *Fulica atra*



cormorant - *Phalacrocorax carbo*

cory's shearwater - *Calonectris diomedea*
 crested lark - *Galerida cristata*
 cucumber - *Holothuria* spp.
 cuttlefish - *Sepia officinalis*
 dotted seaslug - *Discodoris atromaculata*
 dusky grouper - *Epinephelus marginatus*
 eagle owl - *Bubo bubo*
 egg-shell razor - *Solen marginatus*
 Egyptian mongoose - *Herpestes ichneumon*
 Eurasian badger - *Meles meles*
 European anchovy - *Engraulis encrasicolus*
 European conger - *Conger conger*
 European eel - *Anguilla anguilla*
 European pilchard - *Sardina pilchardus*
 European pond terrapin - *Emys orbicularis*
 European seabass - *Dicentrarchus labrax*
 false coral - *Alcyonium coralloides*
 ferruginous duck - *Aythya nyroca*
 flamingo - *Phoenicopterus ruber*
 gannet - *Morus bassanus*
 garden dormouse - *Eliomys quercinus*
 gilthead seabream - *Sparus aurata*
 glossy ibis - *Plegadis falcinellus*
 golden eagle - *Aquila chrysaetos*
 golden oriole - *Oriolus oriolus*
 goldfinch - *Carduelis carduelis*
 granada hare - *Lepus granatensis*
 grass snake - *Natrix natrix*
 great bustard - *Otis tarda*
 great crested grebe - *Podiceps cristatus*
 great reed warbler - *Acrocephalus arundinaceus*
 great skua - *Stercorarius skua*
 great tit - *Parus major*
 greater horseshoe bat - *Rhinolophus ferrumequinum*
 greater pipefish - *Syngnathus acus*
 greater white-toothed shrew - *Crociodura russula*
 green frog - *Rana perezi*
 greenfinch - *Carduelis chloris*
 grey heron - *Ardea cinerea*
 grey plover - *Pluvialis squatarola*
 grey wagtail - *Motacilla cinerea*
 grooved carpet shell - *Ruditapes decussatus*
 hammerhead shark - *Sphyma* spp.
 harbour porpoise - *Phocoena phocoena*
 hoopoe - *Upupa epops*
 house sparrow - *Passer domesticus*
 Iberian arched-mouth nose - *Chondrostoma lemmingii*
 Iberian lynx - *Lynx pardinus*
 Iberian midwife toad - *Alytes cisternasii*
 Iberian small-head barbel - *Barbus microcephalus*
 jackdaw - *Corvus monedula*
 jarabugo - *Anaeypris hispanica*

jay - *Garrulus glandarius*
 kentish plover - *Charadrius alexandrinus*
 kestrel - *Falco tinnunculus*
 killer whale - *Orcinus orca*
 kingfisher - *Alcedo atthis*
 ladder snake - *Elaphe scalaris*
 lapwing - *Vanellus vanellus*
 large psammodomus - *Psammodomus algirus*
 largemouth black bass - *Micropterus salmoides*
 leatherback turtle - *Dermochelys coriacea*
 lesser mouse-eared bat - *Myotis blythii*
 lesser short-toed lark - *Calandrella rufescens*
 lesser weever - *Echiichthys vipera*
 limpet - *Patella* spp.
 little bittern - *Ixobrychus minutus*
 little bustard - *Tetrax tetrax*
 little egret - *Egretta garzetta*
 little owl - *Athene noctua*
 little stern - *Sterna albifrons*
 loggerhead turtle - *Caretta caretta*
 long-finned pilot whale - *Globicephala melas*
 long-snouted seahorse - *Hippocampus guttulatus*
 mallard - *Anas platyrhynchos*
 marsh harrier - *Circus aeruginosus*
 Mediterranean chameleon - *Chamaeleo chamaeleon*
 mehely's horseshoe bat - *Rhinolophus mehelyi*
 monarch butterfly - *Danaus plexippus*
 moorhen - *Gallinula chloropus*
 moreia - *Muraena helena*
 mussel - *Mytilus galloprovincialis*
 natterjack toad - *Bufo calamita*
 nuthatch - *Sitta europaea*
 ocellated lizard - *Lacerta lepida*
 osprey - *Pandion haliaetus*
 otter - *Lutra lutra*
 painted goby - *Pomatoschistus pictus*
 peppery furrow shell - *Scrobicularia plana*
 peregrine falcon - *Falco peregrinus*
 pine processionary - *Thaumetopoea pityocampa*
 pochard - *Aythya ferina*
 poor cod - *Trachurus trachurus*
 Portuguese arched-mouth nose - *Chondrostoma lusitanicum*
 puffin - *Fratercula artica*
 pumpkinseed - *Lepomis gibbosus*
 purple gallinule - *Porphyrio porphyrio*
 purple heron - *Ardea purpurea*
 purple spined sea urchin - *Sphaerechinus granularis*
 rabbit - *Oryctolagus cuniculus*
 ray - *Raja* spp.
 razorbill - *Alca torda*
 red fox - *Vulpes vulpes*
 red swamp crayfish - *Procambarus clarkii*

red-crested pochard - *Netta rufina*
 red-legged partridge - *Alectoris rufa*
 red-necked nightjar - *Caprimulgus ruficollis*
 ringed plover - *Charadrius hiaticula*
 rock bunting - *Emberiza cia*
 rock dove - *Columbia livia*
 rock goose barnacle - *Pollicipes pollicipes*
 rock sea urchin - *Paracentrotus lividus*
 sanderling - *Calidris alba*
 Sardinian warbler - *Sylvia melanocephala*
 schreiber's bat - *Miniopterus schreibersii*
 schreiber's green lizard - *Lacerta schreiberi*
 sea lamprey - *Petromyzon marinus*
 shag - *Phalacrocorax aristotelis*
 short-beaked common dolphin - *Delphinus delphis*
 short-toed eagle - *Circaetus gallicus*
 silver scabbardfish - *Lepidopus caudatus*
 smooth hound - *Mustelus mustelus*
 snipe - *Gallinago gallinago*
 solenette - *Buglossidium luteum*
 Southern grey shrike - *Lanius meridionalis*
 Southern straight-mouth nose - *Chondrostoma willkommii*
 Spanish imperial eagle - *Aquila adalberti*
 Spanish mole - *Talpa occidentalis*
 Spanish terrapin - *Mauremys leprosa*
 sparrowhawk - *Accipiter nisus*
 spiny starfish - *Marthasterias glacialis*
 spoonbill - *Platalea leucorodia*
 stone-curlew - *Burhinus oedicnemus*
 strawberry anemone - *Actinia equina*
 striped dolphin - *Stenella coeruleoalba*
 striped red mullet - *Mullus surmuletus*
 stripeless tree frog - *Hyla meridionalis*
 sturgeon - *Acipenser sturio*
 Southwestern arched-mouth nose - *Chondrostoma almakai*
 tadpole shrimp - *Triops cancriformis*
 tree coral - *Dendrophyllia ramea*
 tuberculate cocklie - *Acanthocardia tuberculata*
 turtle dove - *Streptopelia turtur*
 twait shad - *Alosa fallax*
 two-banded seabream - *Diplodus vulgaris*
 West iberian painted frog - *Discoglossus galganoi*
 Western hedgehog - *Erinaceus europaeus*
 Western polecat - *Mustela putorius*
 Western spadefoot - *Pelobates cultripes*
 whimbrel - *Numenius phaeopus*
 white seabream - *Diplodus sargus*
 white stork - *Ciconia ciconia*
 wild boar - *Sus scrofa*
 wryneck - *Jynx torquilla*
 yellow-legged gull - *Larus cachinnans*

Glossary

Aero-haline (vegetation) - plants adapted to salinized winds.

Alluvion - related to solid material dragged by the waterways and deposited on the banks and floodplains (alluvial plains).

Anadromous - animal that lives in the sea and ascends the rivers in the breeding season.

Angular unconformity (geology) - Absence of parallelism between adjacent geological strata, resulting from tectonic phenomena that bended and wrinkled rocks older than the rocks that they overlap.

Arable, crops - annual crops such as wheat, barley, corn, rye, sunflower or peas.

Arenite - sedimentary rock consisting of sand-sized particles joined together by carbonate or siliceous cement.

Autochthonous - organism that is in its natural area.

Autotrophic - living being capable of producing organic compounds from minerals using an external power source.

Benthic - marine organisms living associated with the substrate, in close inter-dependence.

Calicolous - plant growing in calcareous soils.

Carbonated rocks - basic rocks (pH > 7) consisting essentially of carbonates; are very vulnerable to contact with rain water which tends to cause dissolution and corrosion of the rock.

Catadromous - animal that grows until adulthood in the rivers and that reproduces at sea.

Cistaceae - refers to a family of mostly shrubby plants, which include rockrose species.

Clearing - deforestation of land parcels for agricultural purposes.

Climax community - community of living beings,

in the final stage of ecological succession, which is considered to be in perfect balance with the environment.

Continental shelf - shallow submarine platform located on the shores of a continent.

Cryptic - organism exhibiting territorial behavior and ability to camouflage, spending much of its time hiding, especially in rock cavities.

Dehesa (Montado) - land forested by cork oaks and holm trees with simultaneous agriculture or grazing in the understory.

Demersal - organism which lives in the water column, closer to the sea bottom.

Doline - rounded karst depression, wider than deep.

Dolomite - sedimentary rock composed of calcium carbonate and magnesium.

Downstream - to the side of the mouth of a watercourse.

Dry orchard - crops that do not need watering.

Endemic - living being exclusive of a given region; the word is used in a narrower sense than native.

Erosion - the phenomenon of change and modeling of terrestrial relief, resulting from the activity of physical (wind, water, ice) and biological (living beings) agents.

Eruptive rock (magmatic; igneous) - volcanic rock formed by cooling magma.

Eutrophication - the process which consists in increasing the amount of nutrients in water, especially nitrogen and phosphorous, with negative effects on the ecosystem and water quality.

Exotic - said to be something that comes from the outside, i.e., not originated from that region.

Free diving - diving performed without the aid of underwater breathing apparatus. Also called snorkeling.

Garum - a sauce made of fish, salt and aromatic plants, used as a luxury condiment during the Roman Empire.

Geological landform - rocky relief resulting from erosion by physical (wind, rain) and biological (living beings) agents.

Greywacke - detrital sedimentary rock with a siliceous matrix.

Halophilous - plants adapted to saline conditions.

Hygrophilous - living being who lives in wetlands.

Iberian Massif - geomorphological unit that occupies the central and western part of the Iberian Peninsula, consisting mainly of granite, schist and quartzite ridges, whose origins date back to the Paleozoic.

Intertidal - coastal strip covered by tidal range between high tides and low tides occurring at the equinox.

Iron Age - the third and final phase of the Metal Age (Prehistory) in which the bronze is replaced by iron in the manufacture of utensils; began in approximately 1.200 b.C.

Karst - relief originated in limestone areas, produced by the dissolution of carbonate rocks including limestone and dolomite.

Lacertids - part of the family of squamata reptiles to which, for example, lizards belong.

Lapies (karrenfield) - limestone relief which appears intensely weathered and carved due to the erosive action of water.

Laurel forest - subtropical rainforest from Macaronesia.

Limestone - sedimentary rock mainly composed of calcium carbonate.

Limicola - generic name of birds belonging to the sub-order *Charadrii* typically associated with wetlands as sanderlings, sandpipers, plovers, etc.

Macaronesia - biogeographic region that encompasses the volcanic archipelagos of the Azores, Cape Verde, Canary Islands and Madeira.

Maghreb - the northwestern region of the African continent.

Maquial (maquis) - Vegetable community, in the form of dense shrubland, common in Mediterranean areas.

Marine regression - retreat of the sea in relation to the continents and decrease on the mean level of the sea. It may occur due to glaciation or by an elevation of the land. In contrast, marine transgression is when the sea level rises over the continents due to the melting of polar ice or to subsidence of some regions.

Marlstone - sedimentary rock composed of a mixture of clay and limestone.

Marshland - alluvial land periodically flooded by tides and colonized by halophilous vegetation. These plant communities are distributed according to the daily period of floods by tides and could be distinguished into low marsh, medium marsh and high marsh.

Mesolithic - Prehistory Period on the transition from the Paleolithic to the Neolithic.

Mimicry - the ability of some animals to get the color of their environment.

Neolithic - the period of prehistory characterized by profound changes in human society (agriculture and pastoralism). It occurred between 5.000 and 2.000 b.C.

Nesting - concerning the reproductive period of certain animals such as birds, involving the action of building the nest.

Nitrophilous - plant growing in soil with high organic matter content (nitrogen).

Palaearctic - zoogeographical region that includes Europe, North Africa, much part of Arabia and Asia on the north of the Himalayas (northern sector of

the Old World).

Paleodune (= fossil dune) - dune formed by consolidated sands witnessing the action of the sea in ancient geological periods.

Paleolithic - Period of prehistory until 10.000 b.C..

Palustrine - related to standing water sites (no current) as reedbeds, marshes and bogs.

Passerine - usually small-sized bird which comprises the most common species like the house sparrow, blackbird, etc.

Pelagic - organism that lives and feeds exclusively in the water column.

Perennial - plant whose aerial structures are renewed annually, maintaining the underground structure.

Pioneer species - species that initially colonizes a new area not occupied by other species, usually beginning the chain of ecological succession.

Polje - Serbo-Croat word that designates a large karst depression, with a flattened bottom. Having clay soils, waterproofed, creates a temporary lake during the rainy season.

Rails – bird that belongs to the *Rallidae* family comprising a number of species associated with wetlands such as the coot or the common moorhen.

Riparian - living beings of watercourses.

Rupicolous - living being from rocky soils.

Sclerophyllous - plant adapted to the dryness of the area that displays small leathery leaves.

Shale - metamorphic rock that is arranged in parallel layers, resulting in a slite-like laminar appearance.

Silves Sandstone - detrital rocks (sandstones and reddish color clays) from the Triassic Period; it is a formation which outcrops between the shales and limestone crags of inland territory.

Sinkhole - natural well formed in limestone regions, establishing communication between the surface and the underground galleries.

South - refers to southern Portugal.

Sparidae - family of finfish well represented in the Portuguese marine fauna (e.g. nace, white seabream, gilthead seabream, common seabream).

Subtidal - coastal strip below the limit of low tides occurring at the equinox; always remains covered by seawater.

Summer (*Estio*) - hot and dry season.

Syenite - igneous rock formed from the crystallization of magma.

Temporary pond - ponds characteristic of areas in which there is an alternation between the annual dry phase (dry months) and flooded phase (rainy season).

Terra rossa - residual soil in calcareous and dolomitic areas, of red-brown color.

Ubiquitous - living being present in the entire territory.

Underground aquifer - underground deposit of natural water.

Undergrowth (= understory) - low-growing plants that occur in the lower stratum of tree canopy in a wood or forest.

Upstream - to the side of the source of a watercourse.

Legal framework for environmental protection

REN (National Ecological Reserve) - national geographical area determined by the Government that constitutes an important territory planning instrument aiming at the exploitation of resources and the use of the territory, preserving the ecological balance and biophysical structure of regions.

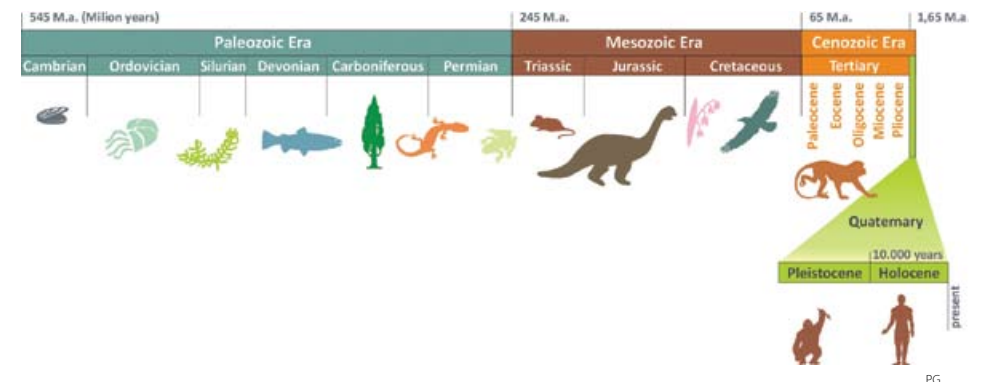
Biogenetic Reserve - protected area with a legal status and characterized by one or more habitats, biocenoses or typical ecosystems that are unique, endangered or rare. The European Network of Biogenetic Reserves was founded in 1976 by the Council of Europe based on the Berne Convention.

Natura 2000 Network - European ecological network formed by former SCI and Special Areas of Conservation (Habitats Directive) and by Special Protection Areas (Birds Directive), aiming the protection of biodiversity in the European Union territory (protection of endangered ecosystems, habitats and wild species or characteristic of certain regions).

SPA (Special Protection Area for birds) - national protected area of community importance, part of the Natura 2000 Framework, defined in accordance with the Bird Directive.

SCI (Site of Community Interest) - national protected area of community importance, part of the Natura 2000 Framework, considered relevant for the conservation of habitats and species which are characteristic of a European biogeographical region in accordance with the Habitats Directive.

Geologic time scale



Bibliography

- Afonso, M.L.R. & McMurtrie, M. (1991). *Plantas do Algarve*. Serviço Nacional de Parques Reservas e Conservação da Natureza, Lisboa.
- Afonso-Dias, M., Pinto, J., Carvalho, A. & Muzavor, S. (2001). *As Artes de Pesca do Baixo Guadiana*. Universidade do Algarve, Faro.
- Almeida, N.F., Almeida, P.F., Gonçalves, H., Sequeira, F., Teixeira, J. & Almeida, F.F. (2001). *Guia FAPAS - Anfíbios e Répteis de Portugal*. FAPAS, Porto.
- Alveirinho Dias, J. M. (1988). *Aspectos geológicos do Litoral Algarvio*. Geonovas Lisboa, vol. 10: 113-128.
- Bingre, P., Aguiar, C., Espírito-Santo, D., Arsénio, P. & Monteiro-Henriques, T. (2007). *Guia de árvores e arbustos de Portugal Continental*. Jornal Público, Fundação Luso-Americana para o Desenvolvimento, Liga para a Protecção da Natureza, Lisboa.
- Cabral, F.C. & Telles, G. R. (1999). *A Árvore em Portugal*. Assírio & Alvim, Lisboa.
- Catry, P., Matias, R., Elias, G. & Costa, H. (2010). *Aves de Portugal*. Assírio & Alvim, Lisboa.
- Costa, L. T., Nunes, M., Geraldés, P. & Costa, H. (2003). *Zonas Importantes para as Aves em Portugal*. Sociedade Portuguesa para o Estudo das Aves. Lisboa.
- D'Athaide Oliveira, F. X. (1898). *As Mouras Encantadas e os encantamentos no Algarve com algumas notas elucidativas*. Typographia Burocrática.
- Deusdado, A.S. et al (2002). *Guia de percursos naturais: Portugal Pé-ante-pé*. 2.ª Ed., Bertrand Editora e Forum Ambiente, Lisboa.
- Duarte, I.M. (2008). *Estudo da regeneração da paisagem após o fogo de 2004, na Serra do Caldeirão*. Mestrado em Gestão e Conservação da Natureza. Instituto Superior D. Afonso III, Loulé.
- Equipa Atlas (2008). *Atlas das Aves Nidificantes em Portugal (1999-2005)*. Instituto da Conservação da Natureza e da Biodiversidade, Sociedade Portuguesa para o Estudo das Aves, Parque Natural da Madeira e Secretaria Regional do Ambiente e do Mar. Assírio & Alvim, Lisboa.
- Farinha, J. C. (coord.) (2000). *Percursos, Paisagens & Habitats de Portugal*. Instituto da Conservação da Natureza. Assírio & Alvim, Lisboa.
- Feio, M. (1951). *A evolução do relevo do Baixo Alentejo e Algarve*. Comum. S.G.P. Tomo XXXII (2ª parte). Serviços Geológicos de Portugal.
- Ferreira, V. (2011). *Guia de Campo - Fauna e Flora Marinha de Portugal*. Ed. Planeta Vivo, Leça da Palmeira.
- Galopim de Carvalho, A.M. (2004). *Guadiana antes de Alqueva*. www.triplov.org (consultado em outubro de 2012).
- Gonçalves, J.M.S. (2010). *Biodiversidade piscícola no baixo estuário do Rio Arade*. CCMar e Universidade do Algarve, Faro.
- Gonçalves, J.M.S. et al. (2007, 2008, 2010). *Cartografia e caracterização das biocenoses marinhas da Reserva Ecológica Nacional Submarina entre a barra nova do Ancão e a Ponta da Piedade*. Relatórios Finais. CCDR Algarve e ARH Algarve. Universidade do Algarve, CCMAR, Faro.
- Gonçalves, J.M.S. & Silva, J.A. (2000). *Costa Sudoeste: Macrofauna Marinha*. Ed. do Parque Natural do Sudoeste Alentejano e Costa Vicentina, Odemira.
- Heitlinger, P. (2011). *Megalitismo: Um guia para o Mesolítico e Neolítico em Portugal*. Arqueo.org – Edições de Arqueologia.
- Lavinas, C. (2004). *Reserva Natural do Sapal de Castro Marim e Vila Real de Santo António, uma contribuição para a sua gestão*. Instituto da Conservação da Natureza (ICN) - Centro de Zonas Húmidas.
- Hydroprojecto (2008). *Plano de Ordenamento do Parque Natural do Sudoeste Alentejano e Costa Vicentina*. Estudos de base, Vol. III. ICNB, I.P. (Instituto da Conservação da Natureza e da Biodiversidade), Lisboa.
- ICN (2005). *Revisão do Plano de Ordenamento do Parque Natural da Ria Formosa*. Estudos de Caracterização. ICN (Instituto da Conservação da Natureza), Lisboa.
- Lavinas, C. (2004). *Reserva Natural do Sapal de Castro Marim e Vila Real de Santo António, uma contribuição para a sua gestão*. Instituto da Conservação da Natureza (ICN) - Centro de Zonas Húmidas.
- Lopes, F. (2006). *Rocha da Pena (Loulé, Algarve): ao encontro da geodiversidade*. <http://rochadapena.no.sapo.pt> (consultado em outubro de 2012).
- Loureiro, A., Ferrand de Almeida, N., Carretero, M.A. & Paulo, O.S. (eds.) (2010). *Atlas dos Anfíbios e Répteis de Portugal*. Instituto da Conservação da Natureza e da Biodiversidade, Lisboa.
- Mabberley D.J. & Placito, P.J. (1993). *Algarve plants and landscape*. Passing tradition and ecological change. Oxford University Press, New York.
- Maravalhas, E. (ed.) (2003). *As Borboletas de Portugal*. Vento Norte, Porto.
- Marques, M.G.M. (coord.), (1999). *O Algarve da Antiguidade aos nossos dias*. Ed. Colibri, Lisboa.
- Mathias, M. L. (coord.), (2000). *Guia dos Mamíferos Terrestres de Portugal Continental, Açores e Madeira*. Instituto da Conservação da Natureza, Lisboa.
- Ministro, J. (2012). *Guia de Observação de Aves no Algarve*. Turismo do Algarve, Faro.
- Mullarney, K., Svensson, L., Zetterström, D. & Grant, P. J. (2003). *Guia de Aves*. Assírio & Alvim, Lisboa.
- Pena, A. & Cabral, J. (1996). *Roteiros da Natureza - Algarve*. Temas e Debates.
- Pessoa, F. (1999). *Algarve, paisagens e espaços naturais*. Comissão de Coordenação da Região do Algarve, Faro.
- Pinto Gomes, C. J. & Paiva Ferreira, R.J.P. (2005). *Flora e Vegetação do Barrocal Algarvio (Tavira-Portimão)*. Comissão de Coordenação e Desenvolvimento Regional do Algarve, Faro.
- Ramalho, M.M., Dias, J.A., Moura, D., Boski, T. & Manuppella, G. (2003). *Carta Geológica Simplificada do Parque Natural da Ria Formosa, Reserva Natural do Sapal de Castro Marim e Vila Real de Santo António e Região Envolvente*. Instituto Geológico e Mineiro / Instituto da Conservação da Natureza.
- Ribeiro, O., Lautensach, H. & Daveau, S. (1991). *Geografia de Portugal, I, A Posição geográfica e o território*. João Sá da Costa, Lisboa.
- Saldanha, L. (1995). *Fauna Submarina Atlântica*. Publicações Europa-América, Lisboa.
- Santos, M.N. & Erzini, K. (eds) (2007). *Catálogo de espécies de peixes de interesse comercial da costa sul atlântica da Península Ibérica*. Projecto Gestpesca II, Manual 1. Junta de Andalucía.
- Teilhard de Chardin, P. (1997). *O Lugar do Homem na Natureza*. Instituto Piaget, Lisboa.
- THR (2006). *10 produtos estratégicos para o desenvolvimento do turismo em Portugal – Turismo de Natureza*. Turismo de Portugal, I.P., Lisboa.
- Varela Gomes, R. (2002). *Silves (Xelb), uma cidade do Al-Andaluz: Território e Cultura*. Trabalhos de arqueologia (23). Instituto Português de Arqueologia, Lisboa.

Contacts

municipalities

Albufeira

Rua do Município
8200-863 Albufeira
Tel.: 289 599 500
Fax: 289 599 511
geral@cm-albufeira.pt
www.cm-albufeira.pt

Alcoutim

Rua do Município, 12
89700-066 Alcoutim
Tel.: 281 540 500
Fax: 281 546 363
cmalcoutim@hotmail.com
www.cm-alcoutim.pt

Aljezur

Rua Capitão Salgueiro Maia
8670-005 Aljezur
Tel.: 282 990 010
Fax: 282 990 011
cm.aljezur@mail.telepac.pt
www.cm-aljezur.pt

Castro Marim

Rua Dr. José Alves Moreira, 10
8950-138 Castro Marim
Tel.: 281 510 740
Fax: 281 510 743
cmcmarim@mail.telepac.pt
www.cm-castromarim.pt

Faro

Rua do Município, 13
8000-398 Faro
Tel.: 289 870 870
Fax: 289 802 326
geral@cm-faro.pt
www.cm-faro.pt

Lagoa

Largo do Município
8401-851 Lagoa
Tel.: 282 380 400
Fax: 282 380 444
expediente@cm-lagoa.pt
www.cm-lagoa.pt

Lagos

Praça Gil Eanes
8600-668 Lagos
Tel.: 282 771 700
Fax: 282 769 317
cmlagos@mail.telepac.pt
www.cm-lagos.pt

Loulé

Praça da República
8100-951 Loulé
Tel.: 289 400 600
Fax: 289 415 557
presidente@cm-loule.pt
www.cm-loule.pt

Monchique

Travessa da Portela, 2
8550-470 Monchique
Tel.: 282 910 200
Fax: 282 910 299
geral@cm-monchique.pt
www.cm-monchique.pt

Olhão

Largo Sebastião Martins Mestre
8700-349 Olhão
Tel.: 289 700 100
Fax: 289 700 111
cmolhao@mail.sitepac.pt
www.cm-olhao.pt

Portimão

Praça 1.º de Maio
8500-962 Portimão
Tel.: 282 470 700
Fax: 282 470 792
geral@cm-portimao.pt
www.cm-portimao.pt

São Brás de Alportel

Rua Gago Coutinho
8150-151 São Brás de Alportel
Tel.: 289 840 000
Fax: 289 842 455
gidi@cm-sbras.pt
www.cm-sbras.pt

Silves

Paços do Município
8300-117 Silves
Tel.: 282 440 800
Fax: 282 440 854
presidente@cm-silves.pt
www.cm-silves.pt

Tavira

Praça da República
8800-951 Tavira
Tel.: 281 320 500
Fax: 281 322 888
câmara@cm-tavira.pt
www.cm-tavira.pt

Vila do Bispo

Largo do Município
8650-407 Vila do Bispo
Tel.: 282 630 600
Fax: 282 639 208
cmvb.gap@clix.pt
www.cm-viladobispo.pt

Vila Real de Santo António

Praça Marquês de Pombal
8900-231 Vila Real de Santo
António
Tel.: 281 510 001/2
Fax: 281 510 003
cmvrsa@mail.telepac.pt
www.cm-vrsa.pt

other organisations

Agência Portuguesa de Ambiente, IP - ARH do Algarve

Rua do Alportel, nº 10 – 2º
8000-293 Faro
Tel.: 289 889 000
Fax: 289 889 099
arhalg_geral@apambiente.pt
www.apambiente.pt

Almargem - Associação de defesa do património cultural e ambiental do Algarve
Rua de São Domingos, nº 65,
Apartado 251
8100 Loulé
Tel.: 289 412 959
Fax: 289 414 104
E-mail: almargem@mail.telepac.pt
www.almargem.org

Associação Casas Brancas

Travessa do Botequim, nº 6
7630-185 Odemira
Tel/Fax: 283 327 669
www.casasbrancas.pt

Associação IN LOCO

Sítio da Campina / Av. da Liberdade - Apartado 101
8150-101 S. Brás de Alportel
Tel.: 289 840 860
Fax: 289 840 879 /78
E-mail: inloco@mail.telepac.pt
www.in-loco.pt

A ROCHA – Centro de estudos “Cruzinha”

Quinta da Rocha - Apartado 41
8501-903 Mexilhoeira Grande
Tel.: / Fax: 282 968 380
E-mail: portugal@arocha.org
www.arocha.org

Comissão de Coordenação e Desenvolvimento Regional do Algarve

Sede: Praça da Liberdade, 2
8000-164 Faro
Tel.: 289 895 200
Fax: 289 807 623
E-mail: geral@ccdr-alg.pt
www.ccrd-alg.pt

Departamento da Conservação da Natureza e Florestas do Algarve

Braciais – Patação – Apartado 282
8001-904 Faro
Tel.: 289 870 718
Fax: 289 822 284
www.icnfp.pt

Instituto da Conservação da Natureza e das Florestas (ICNF)

Rua de Santa Marta, 55
1169-230 Lisboa
Tel.: 21 3507900
Fax: 21 3507984
E-mail: icnfp@icnfp.pt
www.icnfp.pt

Odiana - Associação para o desenvolvimento do baixo Guadiana

Rua 25 de Abril, nº 1, Apartado 21
8950-909 Castro Marim
Tel.: 281 531 171
Fax: 281 531 080
E-mail: odiana@mail.telepac.pt
www.odiana.pt

Parque Natural da Ria Formosa

Centro de Educação Ambiental de Marim – Quelfes
8700-201 Olhão
Tel.: 289 700 210
Fax: 289 700 219
E-mail: pnrf@icnfp.pt
www.icnfp.pt

Parque Natural do Sudoeste Alentejano e Costa Vicentina

Sede: Rua Serpa Pinto, 327630
-174 Odemira
Tel.: 283 322 735
Fax: 283 322 830
E-mail: pnsacv@icnfp.pt
www.icnfp.pt
Delegação: Rua João Mendes
Dias, 46-A
8670-086 Aljezur
Tel.: 282 998 673
Fax: 282 998 531

Reserva Natural do Sapal de Castro Marim e Vila Real de Santo António

Sede: Sapal de Venta Moinhos,
Apartado 7
8950-138 Castro Marim
Tel.: 281 510 680
Fax: 281 531 257
E-mail: rnscm@icnfp.pt
www.icnfp.pt

RIAS - Centro de Recuperação e Investigação de Animais Selvagens
Centro de Educação Ambiental de Marim - Quelfes
8700-201 Olhão
Tel.: 927 659 313
E-mail: rias.aldeia@gmail.com

SPEA - Sociedade Portuguesa para o Estudo das Aves
Av. João Crisóstomo, nº 18, 4.º Dto.
1000-179 Lisboa
Tel.: 213 220 430
Fax: 213 220 439
E-mail: spea@spea.pt
www.spea.pt

Vicentina - Associação para o Desenvolvimento do Sudoeste
Rua Direita, nº 13
8600-069 Bensafrim
Tel.: 282 680 120
Fax: 282 680 129
E-mail: vicentina@vicentina.org
www.vicentina.org

tourist information offices

Aeroporto Internacional de Faro

Aeroporto Internacional de Faro
8001-701 Faro
Tel.: 289 818 582
turismo.aeroporto@turismodoalgarve.pt

Albufeira

Rua 5 de Outubro
8200-109 Albufeira
Tel.: 289 585 279
turismo.albufeira@turismodoalgarve.pt

Alcoutim

Rua 1.º de Maio
8970-059 Alcoutim
Tel.: 281 546 179
turismo.alcoutim@turismodoalgarve.pt

Aljezur

Rua 25 de Abril, n.º 62
8670-054 Aljezur
Tel.: 282 998 229
turismo.aljezur@turismoalgarve.pt

Alvor

Rua Dr. Afonso Costa, n.º 51
8500-016 Alvor
Tel.: 282 457 540
turismo.alvor@turismoalgarve.pt

Armação de Pêra

Avenida Marginal
8365 Armação de Pêra
Tel.: 282 312 145
turismo.armacaodepera@turismoalgarve.pt

Carvoeiro

Praia do Carvoeiro
8400-517 Lagoa
Tel.: 282 357 728
turismo.carvoeiro@turismoalgarve.pt

Castro Marim

Rua José Alves Moreira n.º 2 – 4
8950-138 Castro Marim
Tel.: 281 531 232
turismo.castromarim@turismoalgarve.pt

Faro

Rua da Misericórdia, n.º 8 – 11
8000-269 Faro
Tel.: 289 803 604
turismo.faro@turismoalgarve.pt

Lagos

Praça Gil Eanes (Antigos Paços do Concelho)
8600 Lagos
Tel.: 282 763 031
turismo.lagos@turismoalgarve.pt

Loulé

Avenida 25 de Abril, n.º 9
8100-506 Loulé
Tel.: 289 463 900
turismo.loule@turismoalgarve.pt

Monchique

Largo S. Sebastião
8550 Monchique
Tel.: 282 911 189
turismo.monchique@turismoalgarve.pt

Monte Gordo

Avenida Marginal
8900 Monte Gordo
Tel.: 281 544 495
turismo.montegordo@turismoalgarve.pt

Olhão

Largo Sebastião Martins Mestre,
n.º 8 A
8700-349 Olhão
Tel.: 289 713 936
turismo.olhao@turismoalgarve.pt

Ponte Internacional do Guadiana

A22 – Monte Francisco
8950-206 Castro Marim
Tel.: 281 531 800
turismo.guadiana@turismoalgarve.pt

Praia da Rocha

Avenida Tomás Cabreira
8500-802 Praia da Rocha
Tel.: 282 419 132
turismo.praiadarocha@turismoalgarve.pt

Quarteira

Praça do Mar
8125 Quarteira
Tel.: 289 389 209
turismo.quarteira@turismoalgarve.pt

Sagres

Rua Comandante Matoso
8650-357 Sagres
Tel.: 282 624 873
turismo.sagres@turismoalgarve.pt

São Brás de Alportel

Largo de São Sebastião, n.º 23
8150-107 São Brás de Alportel
Tel.: 289 843 165
turismo.saobras@turismoalgarve.pt

Silves

E. N. 124 (Parque das Merendas)
8300 Silves
Tel.: 289 098 927
turismo.silves@turismoalgarve.pt

Tavira

Praça da República, n.º 5
8800 Tavira
Tel.: 281 322 511
turismo.tavira@turismoalgarve.pt

municipal tourist information offices

Albufeira

Estrada de Santa Eulália
8200 Albufeira
Tel.: 289 515 973
posto.turismo@cm-albufeira.pt

Estrada Nacional 395 (entrada da cidade)
8200 Albufeira
Tel.: 289 599 502
posto.turismo2@cm-albufeira.pt

Almancil

Rua de Vale Formoso
8135 Almancil
Tel.: 289 392 659

Alte

Estrada da Ponte, n.º 17
8100 Alte
Tel.: 289 478 666

Portimão

Rua 5 de Outubro, n.º 10, 1.º
8500-581 Portimão
Tel.: 282 430 110
Fax: 282 430 115
geral@turismodeportimao.pt

Querença

Largo da Igreja
8100 - 495 Querença
Tel.: 289 422 495

Salir

Centro Interpretativo de Arqueologia
8100-202 Salir
Tel.: 289 489 137

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(Algarve Tourism Board)
turismoalgarve@turismoalgarve.pt
www.turismoalgarve.pt
www.visitalgarve.pt

Registered Office: Av. 5 de Outubro, 18
8000-076 Faro, Algarve, Portugal
Telefone: 289 800 400
Fax: 289 800 489

Coordination

Marketing Department
marketing@turismoalgarve.pt

Texts

Paula Gaspar
João Eduardo Pinto (fauna)

Photography

João Eduardo Pinto
Paula Gaspar - pp. 15 top, pp. 21 top, pp. 24 *Genista* sp. and *Ulex* sp.
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João Eduardo Pinto (JP)
Paula Gaspar (PG)

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João Eduardo Pinto

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