PARAJE NATURAL
Marismas del Odiel

EN

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A shared territory

SPOONBILL COLONY AT ENMEDIO ISLAND

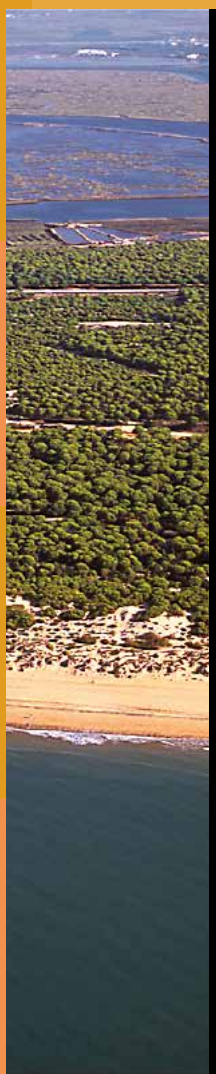
The marshes are the meeting point of the two greatest ecosystems of the planet: the land and the sea.

Both share such unique spaces, occupying them in turn, according to an order governed by cosmic forces.

BREAKWATER JUAN CARLOS I

PUNTA UMBRÍA
ISLAND OF SALTÉS

LOW TIDE



◂ *Marshland*

◂ *Mainland*

◂ *Sea*

The ecological value of marshes

Ocean nurseries · Waterfowl sanctuaries · Coastal defences

VENICE, ITALY

DANUBE DELTA. RUMANÍA.

WINDMILL IN DUTCH WETLAND

Marshes and mangroves (their equivalent in tropical and subtropical equivalents) are strategic areas for marine life and coastal security.

The benefits they provide are immense. Fisheries in the oceans depend to a large extent on their conservation, as they are breeding and nursery grounds for many commercial species. Many waterbirds use the marshes as a feeding and egg laying area.

They also serve as a natural protection for the coastline and its populations, acting as a containment barrier for storms or tsunamis.

The Odiel marshes are the largest in the Iberian Peninsula among those that are flooded by the tides. Those of Doñana, although more extensive, depend on rainfall and river flow.

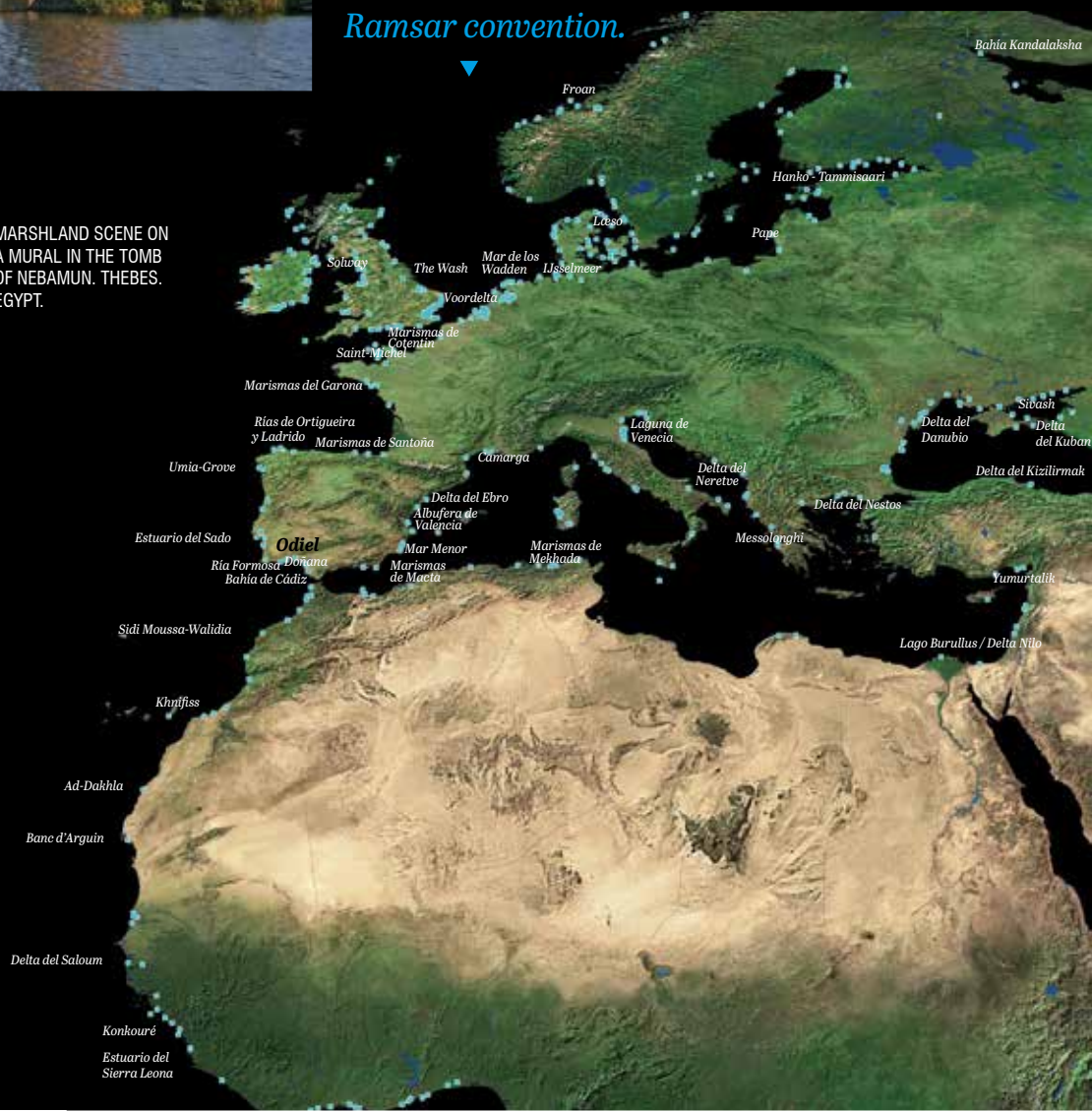
The Atlantic coast is where the main marshes of our environment are located, as its tides are more powerful than those of the Mediterranean.

MARSHLAND SCENE ON A MURAL IN THE TOMB OF NEBAMUN. THEBES. EGYPT.

BANC D'ARGUIN NATIONAL PARK. MAURITANIA

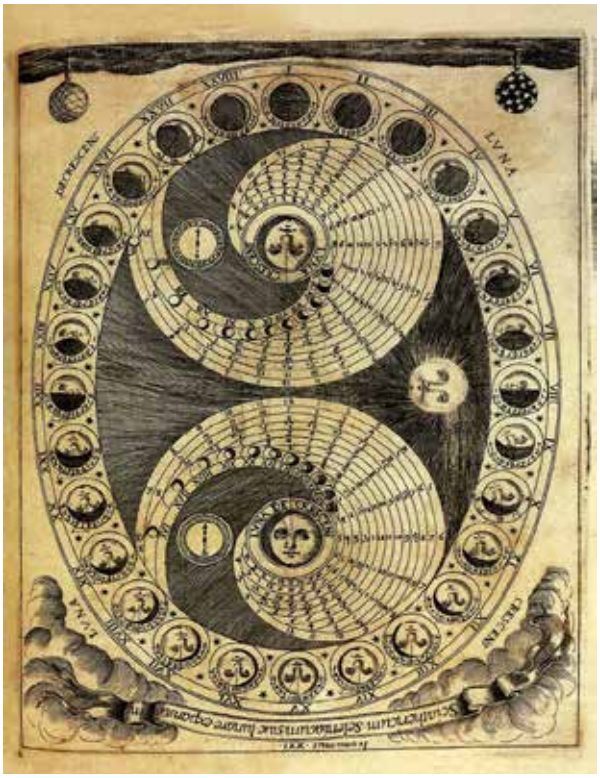
Marshes and coastal wetlands included in the Ramsar convention.

THE RAMSAR LIST INCLUDES MORE THAN 1,600 COASTAL AND INLAND WETLANDS ACROSS ALL CONTINENTS.



The beating heart of the marshes

The Earth's rotation and the gravitational force of the moon and the sun are responsible for the tides. In the Odiel marshes there are two high tides and two low tides per day.



LUNAR CYCLE BY ATHANASIUS KIRCHER, 1646. ILLUSTRATION OF THE 28 DAYS OF THE LUNAR CYCLE FROM THE ARS MAGNA LUCIS ET UMBRIAR.

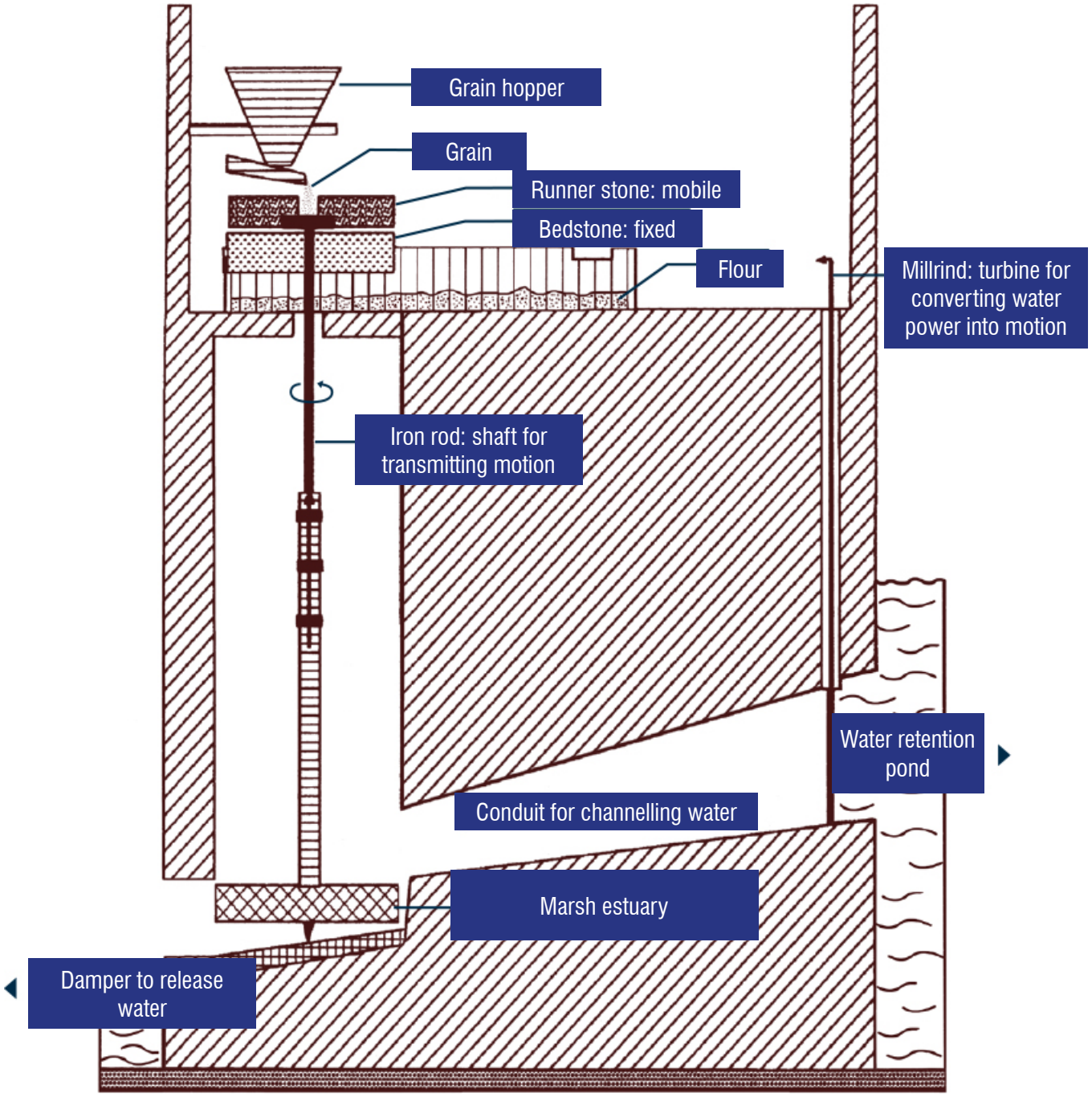
The tides set the rhythm of life in the marshes: the movement of such an immense amount of water generates energy and enables the circulation of nutrients through the complex food web linking animals, plants and micro-organisms.

Tides are a widespread coastal phenomenon, but their cycle and intensity vary significantly across the world's seas.

Since the time of the Pharaohs, different civilisations have sought to harness energy from the tides. Until recently, hundreds of tidal mills, which were gradually abandoned, lined the European Atlantic coast. However, the current interest in renewable energies opens up new perspectives for an energy source yet to be rediscovered

Operation of a tidal mill

Tidal mills use the tides as a source of energy. More than 40 tidal mills operated on the coast of Huelva. The grain is ground by the friction of a moving stone on a fixed stone. The movement is transmitted by a shaft connected to an impeller which rotates due to the action of the water dammed at high tide and released at low tide.



Towards extinction

The marshes are slowly evolving in a continuous process leading to their disappearance. In favourable areas, the coastal bottoms tend to accumulate sediments, which makes them transform first into marshes and then, when they are free from the tidal influence, into dry land, making the sea retreat.

In marshes and estuaries, the sedimentation of the materials carried by rivers is favoured by the low gradient of the coast and the encounter of tides with fresh water, factors that reduce the speed of the water. Other factors that contribute to this process is water salinity, which facilitates the aggregation of particles through the phenomenon known as flocculation, and high tide, which introduces sediments of marine origin.

Not so long ago - barely 2,000 years ago - these marshes were part of a wide bay formed by the mouths by the Tinto and Odiel rivers, who discharged here. The coastal dynamics progressively closed it off to create this site, which is still in constant evolution. The growth of the coastal arrow of Punta Umbría and the development of sandy hooks in the inner part of the estuary facilitated the appearance of part of the current marshes.

Human intervention has significantly transformed the landscape of the Odiel Marshes, especially during the second half of the 20th century. The breakwater, roads and other infrastructures have favoured sedimentation and marsh formation at an unprecedented rate.

1634

ILLUSTRATION OF THE GIBRALEÓN RIVER AND BAR IN IN THE ATLAS OF KING PLANET: THE DESCRIPTION OF SPAIN AND THE COASTS AND PORTS IN ITS KINGDOMS, BY PEDRO TEXEIRA.

1740

FRAGMENT OF SPAIN - GENERAL MAPS (1739-1743). MADE BY ORDER OF PHILIP V, UNDER THE AUSPICES OF THE MARQUESS OF ENSENADA. CARRIED OUT BY THE JESUITS CARLOS DE MARTÍNEZ AND CLAUDIO DE LA VEGA.

1866

NAUTICAL CHART. PLAN OF THE RIVERS TINTO AND ODIEL FROM ITS BAR TO THE ANCHORAGES OF PALOS AND HUELVA. DRAFTED BY THE RIVER BASIN COMMITTEE UNDER THE COMMAND OF LIEUTENANT MANUEL FERNÁNDEZ Y CORIA.

1945

NATIONAL TOPOGRAPHIC MAP. MILITARY EDITION. SHEETS 999 AND 1016.

1956

ORTHOPHOTOGRAPHY. UNITED STATES ARMY.

1999

DIGITAL ORTHOPHOTOGRAPHY. REGIONAL GOVERNMENT OF ANDALUSIA.

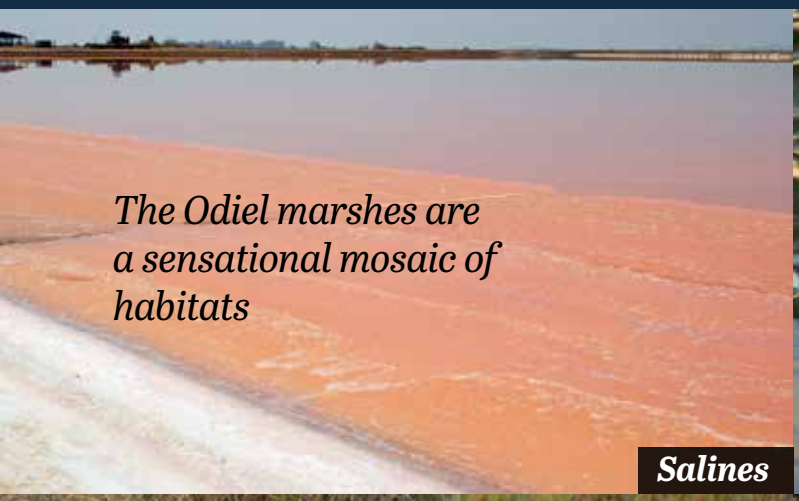
Sedimentation

Much of the earth's crust, including the seabed, has been formed by the accumulation of materials through a slow sedimentation processes. Therefore, part of the planet's long history is written in its strata or layers.

The suspended particles settle at different speeds depending on their size, shape, weight and density. Particles of a similar nature will fall to the bottom and settle faster the heavier they are.

Water agitation favours particle dispersion; on the contrary, calm waters favour their fall and deposition.

An amphibious world created by the meeting of sea and land



BANCO DEL MANTO (E-1)

EL ALMENDRAL (D-1)

MARISMAS DE LAS YEGUAS Y DEL BURRO (A-1)

ENEBRALES DE PUNTA UMBRÍA (D-2)

CALATILLA / SALINAS (C-1)

CAÑOS DE POCA AGUA Y DEL BURRILLO (B-1)

PUENTE DEL ODIEL (B-1)

Water environment

PLANKTONIC CRUSTACEAN (*Bosmina longirostris)*

In the Odiel estuary, the sea becomes calm and welcoming. Nutrients from the sea are now added to the nutrients carried by rivers. The tides are responsible for distributing them and making them available to all living things.

A multitude of tiny plants and animals form the universe of water-dwelling plankton. Although unnoticed to the naked eye, it is one of the main food sources in aquatic ecosystems. Shrimp or big-scale sand smelt feed on it, as do whales.

ZOOPLANKTON *(Euterpina acutifrons)*

PEJERREY *(Atherina presbyter)*

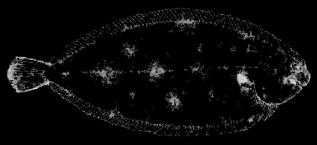
SEA LETTUCE *(Ulva lactuca)*

MARINE EELGRASS (ZOSTERA) *(Zostera noltii)*

MARINE BACTERIA

Algae such as sea lettuce, or plants such as the marine eelgrass *(Zostera)*, one of the few marine species with flowers, serve as food and shelter for a variety of fauna.

Sole is a fish adapted to life on the sea bottoms. At the sea bottom they are protected from currents and tides and hides and camouflages itself to catch small fish, crustaceans and invertebrates.



SOLE *(Solea vulgaris)*

Each organism fulfils its role in a complex interdependent system. Microscopic beings - bacteria and fungi - decompose organic remains, closing the different cycles of the imatter.

Human presence has been, and still is, a determining factor in the marshes. Exploitation of resources contained in the marshes has a significant impact on the organisms living on it. Their future depends on the management models adopted.

Water environment

The marshland landscape changes radically with the tides. The swaying of the water causes certain spaces to be alternatively be over or underwater. A constant hustle and bustle that only specialised life forms can withstand.

COCKLE *(Cerastoderma edule)*

FIDDLER CRAB *(Uca tangeri)*

MOSQUITO *(Anopheles sp.)*

Molluscs, such as the tasty cockle, and crustaceans such as the fiddler crab (whose claw is the delicacy known as boca de cangrejo), live in galleries dug into the mud.

Mosquito larvae develop in the water and are an essential food source for many birds and fish.

Marshland plants are particularly adapted to salinity. Their distribution responds to the tidal range. For example, the shrubby sea-blite grows in the low marsh, which is occasionally or permanently flooded, common cordgrass grows in the medium marsh, which is only flooded during tidal surges, and the *Limoniastrum monopetalum* grows in the high marsh, which is never flooded.

SHRUBBY SEA-BLITE
(Sarcocornia perennis subsp. perennis)

COMMON CORDGRASS
(Spartina densiflora)

The *Limoniastrum monopetalum* is also food to a the caterpillars of a unique butterfly, which is exclusive to Spanish coasts: the Malacosoma laurae.

LIMONIASTRUM CATERPILLAR
(Malacosoma laurae)

OSPREY
(Pandion haliaetus)

Birds are the maximum exponent of the rich wildlife of the Odiel marshes. Up to 300 species can be observed, distributed in every conceivable location. Waterbirds such as spoonbills, black-necked grebes, dunlins and black-tailed godwits stand out. There are also birds of prey, including the osprey which as become a symbol of the marshes.

OTTER
(Lutra lutra)

The elusive otter is an aquatic mammal and a swift swimmer that live in the marsh water.

The mainland

LARGE-FRUITED JUNIPER *(Juniperus oxycedrussubsp. macrocarpa)*

The presence of emerged soil, and its distribution among the marshes, allows the proliferation of habitats and an increase in biodiversity.

Large-fruited juniper, once abundant and now in serious danger of extinction, thrives on dunes and sandbanks: barely 25,000 specimens have been identified on the Andalusian coasts.

SEA DAFFODIL
(Pancratium maritimum)

The sea daffodil is a fundamental plant for sand stabilisation, since it grows before any other species does and helps fix the land reclaimed from the sea.

The stone pine, on the other hand, prefers inland sands that are already well established.

Stone pine
(Pinus pinea)

COMMON CHAMELEON
(Chamaeleo chamaeleon)

The chameleon is a striking reptile that lives in the thickets of the pine forest, hunting insects with its highly accurate and outsized tongue.

MEDITERRANEAN TREE FROG
(Hyla meridionalis)

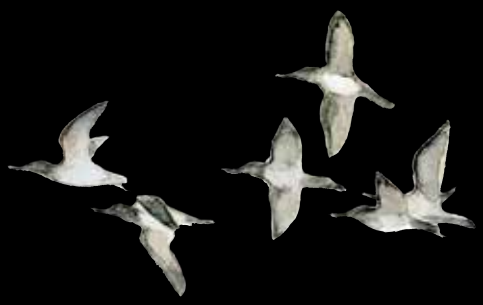
Plants such as bulrush live in freshwater ponds and lagoons, where the nocturnal Mediterranean frog croaks.

SOUTHERN CATTAIL
(Typha dominguensis)

The steppe-like stone curlew, a gregarious animal, prowls in search of insects and small invertebrates, amphibians and reptiles. At night, you can hear its fluttery song.

EURASIAN STONE-CURLEW
(Burhinus oedicnemus)

Meet the stars of the odiel marshes



Biodiversity reflects the genetic variety and variability of the living beings that inhabit a given place.

It is planet Earth's most precious treasure: some 30 million species, the product of the evolution of life over four billion years.

The destruction and transformation of natural habitats is causing widespread biodiversity loss.

More than 15,000 species now face the risk of extinction.

Marshes do not have a high degree of biodiversity, i.e. there is not a great variety of species compared to other territories; however, the existing populations are composed of a large number of individuals.

Most marine species used in cooking, such as anchovies, mackerel, sea bream, prawn, sole and sea bass, grow in marshes such as these.

Numerous living things have adapted to the different environments of this estuary, halfway between the sea and the land. Birds, for example, have different beaks specialised depending on their diets.

Humans have destroyed habitats, but have also encouraged the creation of new ones. Some species have benefited from this, such as the flamingo in the salt marshes, the little tern on the jetty or the chameleon in the pine forests.

All beings, at some point of their life cycle, serve as food for others. This is how the food web is organised, involving top predators such as osprey.

Birds are the most significant wildlife in this Natural Park. Here, they find food and shelter, as well as a place to rest when migrating and a place to breed. Ornithologists count an average of 20,000 birds per month, belonging to more than 60 species.

The Huelva marshes, including Doñana with its aviaries, are home to the largest breeding colony of spoonbills in Europe. Black-tailed godwit and dunlin are the most numerous species in the Odiel Marshes, with populations ranging from 6,000 wintering birds to up to 23,000 during migratory stopovers.

The Andalusian government, through its environmental administration, cares for the conservation of protected natural areas. Its staff carries out a fundamental mission, carrying out study, maintenance, monitoring and surveillance of the species and habitats of the Odiel Marshes.

Decomposing micro-organisms are essential because they recycle organic matter. Their activity is particularly important in such lively ecosystems as salt marshes.

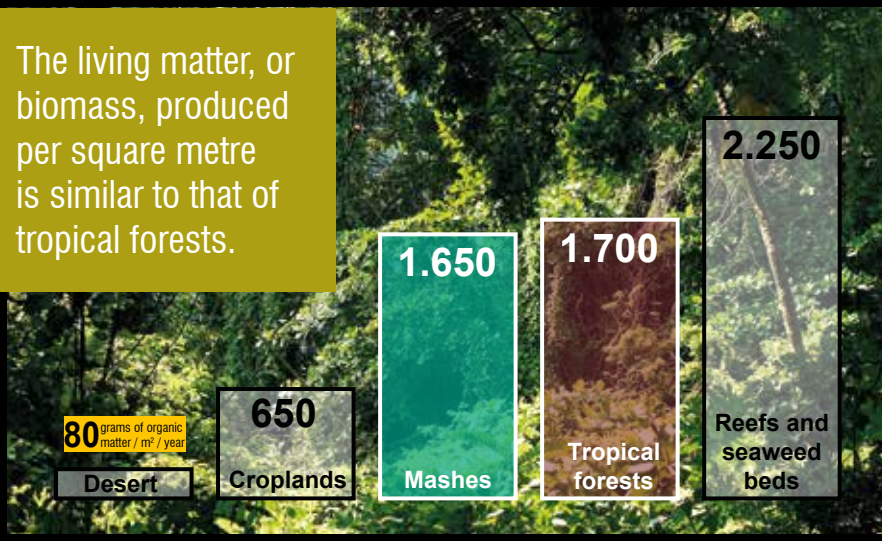
And learn how they relate to each other

Marshes are a privileged platform for life

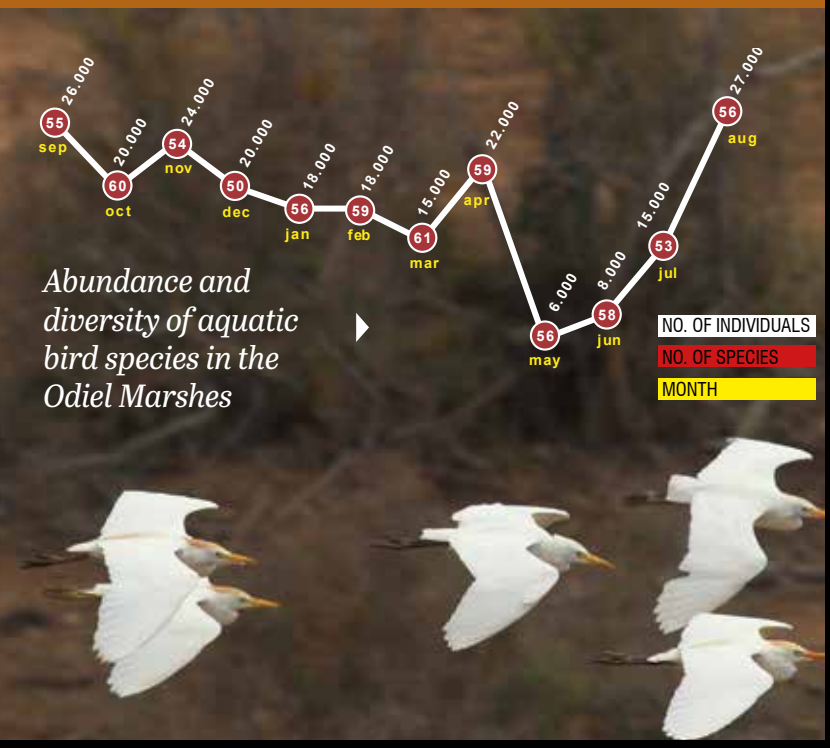
Several factors make marshes' biological productivity to be one of the highest in the planet. A temperate climate with abundant sunshine is combined with the shallow depth of the seabed, the continuous tidal action and other circumstances such as the mixture of fresh and salt water, which favours nutrient availability.

The high biological production of these marshes enables abundant life.

The living matter, or biomass, produced per square metre is similar to that of tropical forests.

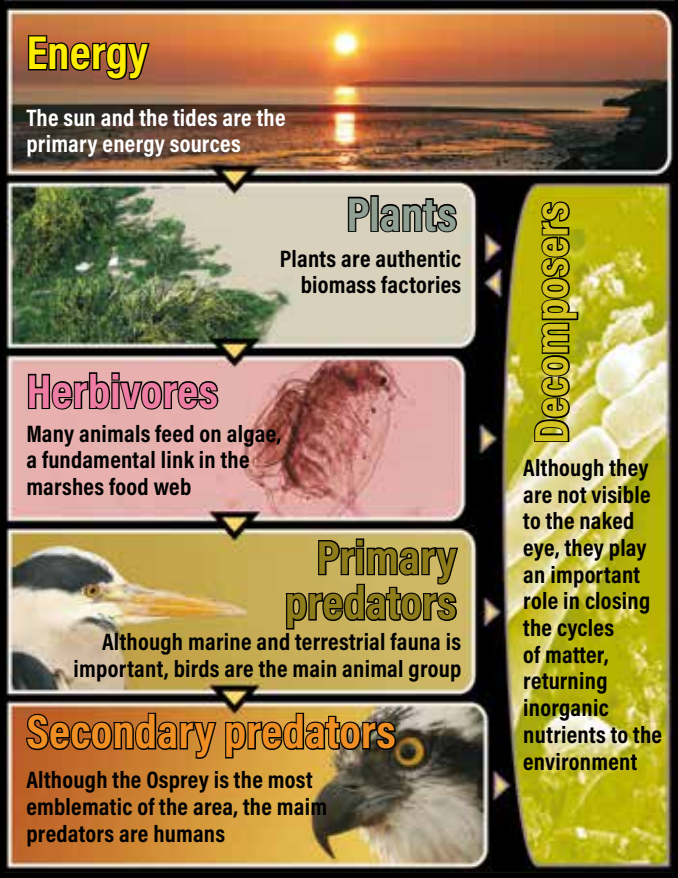


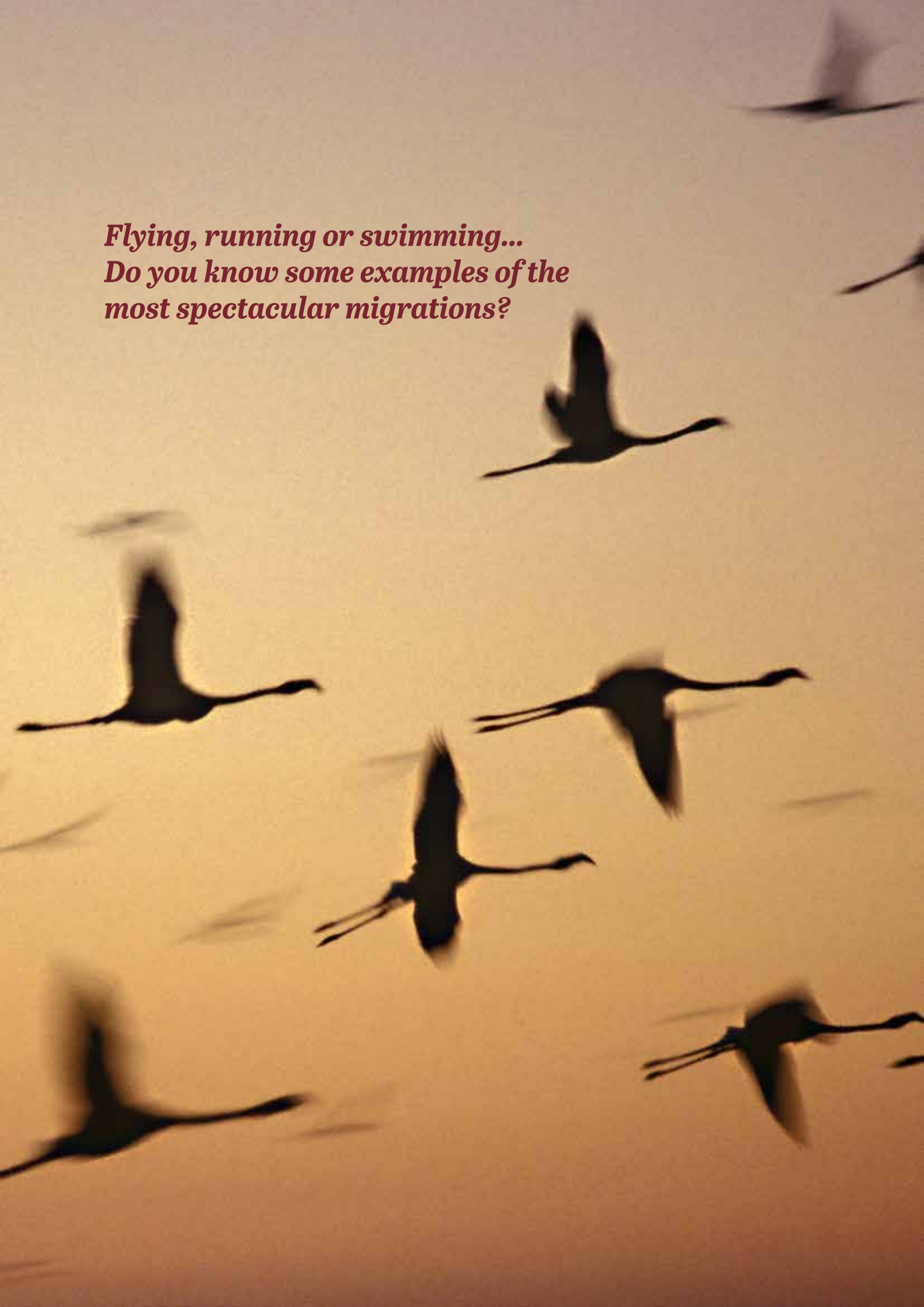
Although the number of plant and animal species is not high, their populations are numerous.



Abundance and diversity of aquatic bird species in the Odiel Marshes

The rich wildlife of the Odiel Marshes takes place in a complex mosaic of relationships between producers and consumers or between predators and prey.





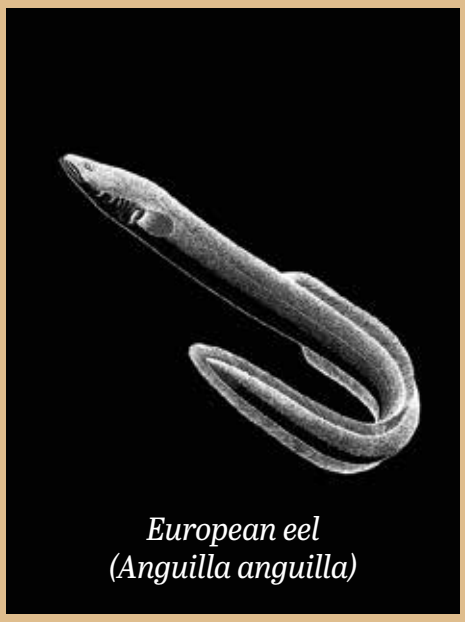
Flying, running or swimming...
Do you know some examples of the most spectacular migrations?

Fighting for survival

The lives of many animals are conditioned by migration an ancestral habit that originated at the end of the last ice age and entails long annual trips. As the ice receded northwards, new territories emerged with abundant food that could be exploited seasonally. In this way, certain bird species learnt to make round-trip between spaces with very contrasting environmental characteristics.

Which fish travels more than 10,000 kilometres?

The life cycle of **European eels** takes place in places as different as they are distant. They are born in the Sargasso Sea, where they spend the first years of their lives at considerable depths. They cross the Atlantic Ocean forming large balls that slowly drift for years. When they reach the European coasts, they disperse to embark on a new adventure, going up rivers as they go through their glass eel phase. When the time comes, they make the reverse journey that takes them back to the tropics near the American coasts, where they spawn and die.



European eel
(Anguilla anguilla)

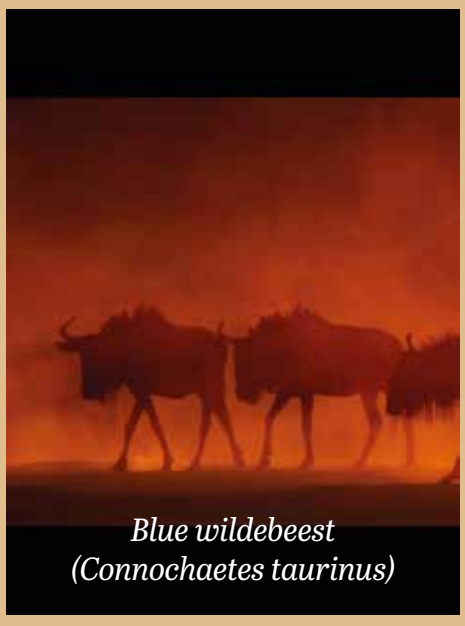
Blue whale
(Balaenoptera musculus)

Which is the largest migratory animal on Earth?

The **blue whale** is the largest animal that has ever existed on Earth. It can reach 33 metres, 190 tonnes and is 90 years old. It finds abundant food in polar waters, where it feeds on daily tons of tiny animals. To breed, it travels to the warm waters of the tropics - a journey of up to 22,000 kilometres at a cruising speed of over 10 knots (18.5 km/h).

Which large land mammal migrates in gigantic herds?

The life of 1.5 million **wildebeest** in the Serengeti-Mara (Kenya-Tanzania) is a constant pilgrimage in search of the best pastures. Every year they cover up to 3,000 kilometres in a cyclical march. Females give birth in the southernmost areas, and the calves have just a few weeks to join the great journey in huge herds, which will take them to the epic crossing of the Mara River.



Blue wildebeest
(Connochaetes taurinus)

Which migration has given rise to a remarkable fishing industry?

Atlantic bluefin tuna are huge fish (up to 800 kilos in weight) that make journeys of thousands of kilometres across the Atlantic Ocean. In spring, they gather in their thousands off the south-western coasts of the Iberian Peninsula and head out into the Mediterranean in search of their breeding grounds. During their breeding migration they travel close to the coast, forming large shoals. Traps, and other fishing devices, take advantage of this behaviour, which is repeated from generation to generation.

Atlantic bluefin tuna (Thunnus thynnus)

Monarch butterfly (Danaus plexippus)

Which insect flies from Canada to Mexico?

The annual trips of the **monarch butterflies** span several generations. They winter in the central Mexico forests, now considered sanctuaries, where more than a hundred million individuals are concentrated in a few hectares. In spring, they fly to the northern Gulf of Mexico to breed. The new generation completes the journey to the summer breeding areas in the northern United States and southern Canada. The butterflies that are born there are the ones that close the cycle, making an amazing journey of more than 4,000 kilometres.

Which tiny tropical bird makes journeys of more than 6,000 kilometres?

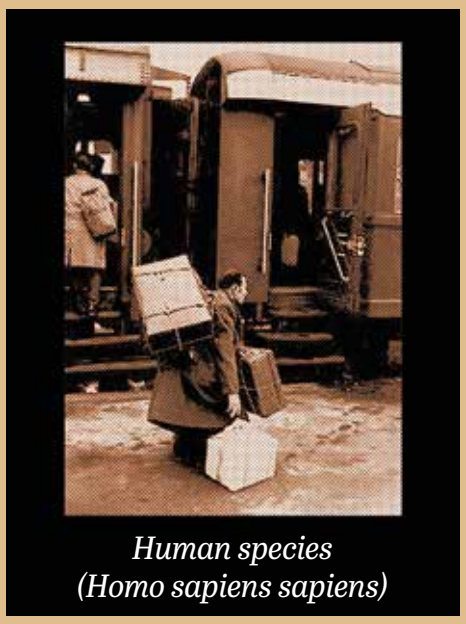
The **Rufous hummingbird** has one of the longest migratory routes relatively to their size. Weighing about 3 grams and measuring 8 centimetres in length, this small bird travels from Alaska to Mexico, covering more than 6,000 kilometres. It is also remarkable for its remarkable memory, as it tends to rest in the same places, and at the end of its journey, it even settles in the same bushes as in previous years.

Rufous hummingbird (Selasphorus rufus)

Which bird spends much of its life planning tirelessly?

The snowy **albatross** is a solitary bird, which flies over the open sea at a high speed. Its almost 4 metre wingspan is the longest of all existing birds, allowing it to reach speeds of up to 80 km/h with little effort. His life is a permanent migration. They spend most of their time at sea and can fly more than 1,000 kilometres in a single day, searching for fish, squid, octopus, etc. They live mainly in the southern hemisphere, but due to their mobility, they can occasionally be observed in almost any maritime area.

Snowy albatross (Diomedea exulans)



Human species (Homo sapiens sapiens)

Do only animals migrate?

The **human colonisation** of the planet is also a story of constant migration. At present, the drive between mass displacements is the deep inequality between countries and territories.

The Odiel marshes are a strategic spot in the migratory routes between Europe and Africa

Whether as a wintering site or as a stopover between Europe and Africa, the wetlands of the Gulf of Cádiz are a major hub in the migratory routes.

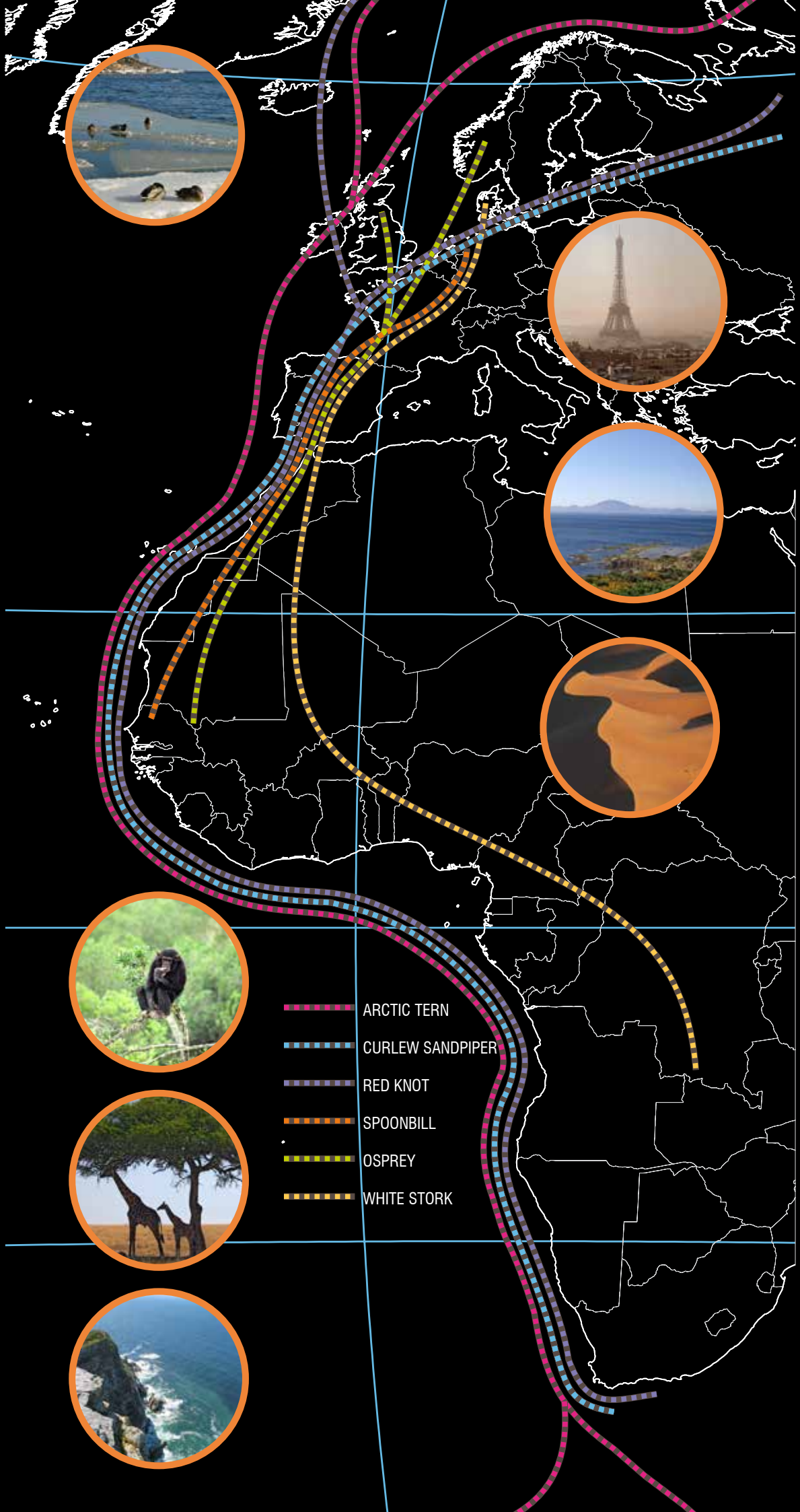
Some 5 billion migratory birds, of different species that breed in Europe or West Asia, have Africa as their main wintering destination.

Twice a year they make an intercontinental crossing full of difficulties and obstacles: winds, currents, mountain ranges or deserts among them.

The north-south direction is the most common, although not necessarily followed by all birds. Some of them head west towards the European Atlantic coasts bathed by the warm Gulf of México current.

"In the early hours it is the smallest birds - tens of thousands of Western house martins, swallows, common swifts and European bee-eaters - that move apparently following the coastline (...) Noon it's time for the large birds of prey (eagles, storks, kites); the later they pass, the further they come from. (::) it is a visual feast to watch their flocks form and break up. It seems as if they are summoning each other to overcome the terror inspired by the strong wind and the sea..."

J. Araújo. A Naturalist's Journey through Spain (1998)


ARCTIC TERN
CURLEW SANDPIPER
RED KNOT
SPOONBILL
OSPREY
WHITE STORK

Birds at flight observatory for Odiel marshes

The study of bird migrations reveals secrets about their lives and the keys to their survival

Since ancient times, humans have closely observed the flight of migratory birds. They were the bearers of good or bad omens and heralded the seasonal changes that set the agricultural work in motion.

It was not more than a hundred years ago that observation of migratory routes became a methodical and scientific activity. Nowadays, the systematic use of bird ringing or the most modern techniques with radio transmitters allow a continuous tracking of migratory processes, thus revealing the routes of life across the entire planet.

All the activities of observation and control of migrations that take place daily in the Odiel Marshes Nature Site make this place a privileged monitoring station.

Monitoring flights: observing, knowing and protecting

The history of the conservation of the Odiel Marshes already has its protagonists: since the 1970s, scientists and nature lovers began to take an interest in and study its ecosystems.

Today we know many secrets of the birds that live and visit these marshes thanks to the work of researchers and ornithologists and the generous collaboration of many people through volunteer networks.

All of them have made Odiel Marshes the main ornithological station for waders in Europe.

Each bird has its own story

Since 1997, thousands of birds have been ringed annually at Odiel Marshes. This allowed to make decisive progress in our knowledge of the migratory routes of many species, providing us with surprising data on some of their habits

Sea hawks and spoonbill are symbols of biodiversity conservation in the Odiel marshes

Osprey display both beauty and and a tremendous fishing skill.

The wintering population of ospreys in Huelva's wetlands is growing thanks to conservation programmes.

The Odiel Marshes Ornithological Station carries out various programmes for the control and defence of the wintering population of osprey.

Studies have shown, for example, that only adults defend their usual roosting spot, while juveniles may share it. Rivalry is limited, as it is possible to observe several eagles fishing in the same place.

Since 2003, a project has been underway with the aim of encouraging sea hawks to breed in areas such as the Barbate reservoir or the Odiel Marshes.

The technique used consists of rearing chicks brought from northern Europe and trying to ensure that they recognise these areas as their place of birth. This encourages them to return to nest here as adults.

Before they released, they are ringed with a device that includes a radio transmitter for monitoring, when they are old enough to complete their training on their own, before starting their migration to Africa between the end of August and mid-September.

The **spoonbill** can capture prey without seeing them, thanks to its unique beak, which is a skilful and sensitive tool.

The second largest spoonbill breeding colony in Europe is in Odiel Marshes, which is one of the main reasons for its protection as a natural area.

Since 1979, numerous studies have been carried out on the colony and some 7,000 spoonbill chicks have been ringed. It is now known that migratory movements are more complex than previously assumed, and that groups with different habits and schedules coexist.

The most frequent wintering destination is Senegal. The young, after their first trip, remain there for three or four years before returning to the Odiel Marshes to breed. West Africa is thus a kind of nursery for European spoonbills.

Spoonbills are very sociable birds and faithful to their place of birth, although there are exceptions. Some juveniles choose to explore other breeding sites.

The Odiel Marshes colony is very vulnerable during the breeding season, due to the fact that spring tides flood the nests, killing a significant part of the eggs, up to 80% in adverse years.

Monitoring and conservation of the colony includes surveillance of these episodes, and rescue of nests when necessary.

Spoonbills couples collaborate in raising chicks, but it is not known whether they are stable from one year to the next. The average lifespan of these birds is 12 years, although they can live up to 30 years.

The sea hawk

Pandion haliaetus

Historically, the last pair of ospreys, Pandion haliaetus, bred in the Iberian Peninsula in the 1980s.

In 2003, the Regional Government of Andalusia developed the project for the reintroduction of the osprey in Andalusia, in the Barbate reservoir in Cádiz and in the Odiel Marshes in Huelva. Chicks are released through haking techniques. The goal of the programme is that, once they have reached sexual maturity, they will join the Andalusian breeding population.

The Odiel Marshes Nature Site is home to the first pair of ospreys formed by specimens from the Reintroduction Programme.

After trying to breed in 2008 and succeeding in 2009, the pair consolidated in 2010 after a new breeding success, using the same artificial nest in the Odiel Marshes Natural Park.

This confirms the success of the programme carried out by the Regional Government of Andalucía, in collaboration with the CSIC (Spanish acronym for the Spanish National Research Council), in this protected area. This demonstrates that the Odiel Marshes are a viable breeding spot, as it meets all the ideal nutritional, climatological and environmental conditions. This natural site in the south of Huelva has, in this respect, lived up to expectations.

Subsequently, the presence of another two specimens from the Reintroduction Programme has been detected in the site, which in 2010 tried to breed unsuccessfully, as they were still immature. This confirms the suitability of this wetland to support a breeding population.

Osprey breeding

The nest consists of a large platform of sticks or dry branches, which grow year by year, built on trees, rocky cliffs, telephone poles or artificial platforms.

They usually reuse from year to year, and keep the same pair all their lives. On some occasions, couples may build nests close to each other, displaying semi-colonial behaviour.

This is due to the attraction of new breeders to active areas, considering them suitable for breeding, or with the aim of occupying already built nests.

Specimens reach sexual maturity at 3 years of ave. It is at this time that the nest is rebuilt or in some cases a new nest is built. Generally, the male provides the material and the female places the dry branches. Once the couple has settled in the nest, courtship begins, with nuptial flights, calls and “gifts” of fish from the male. During the rutting season, which can last up to 45 days, copulations take place one after the other. They usually lay three eggs during the month of March.

Both sexes hatch, but the female takes most of the burden. After about 38 days, the chicks will hatch and will be fed by the female with fish provided by the male. The first down is short and thick, brownish on the upper parts and cream white underneath. After 10-14 days it changes to dark grey. They start to grow feathers at 4 weeks and they take their first flight at around 50 days. Juvenile migration and dispersal occurs between 12 and 14 weeks of age.

Photograph: Héctor Garrido (EBD-CSIC)

Flamingos

Phoenicopterus roseus

Flamingos live in large groups called colonies.

This species inhabits shallow wetlands, usually saline and temporary, such as salt marshes, salt farms or saline lagoons.

The locations where flamingo breeding colonies are established are scarce because a series of factors must converge: an adequate water level, which provides a sufficient amount of food and protection for the breeding colony, and the existence of emerged lands (islands or dykes) on which they nest and lay their eggs.

In 2008, a breeding nucleus of 800 couples was installed for the first time in the industrial salt marshes of Odiel Marshes.

This breeding nucleus is consolidating year after year with a successful reproduction and an upward trend, as a viable and real alternative, especially in dry years when reproduction is not going well in other breeding nuclei in Andalusia.

Flamingo breeding

During the breeding season, groups of birds within the colony engage in courtship displays.

A predictable display sequence includes marching, head bobbing, calling and grooming. Hundreds of thousands of flamingos do this at the same time, which helps synchronise mating in the colony, so that most females lay their eggs or raise their chicks at the same time. Egg laying takes place approximately in May.

Each pair hatches a single egg per year, which is placed on a clay cone in the shape of a volcano.

Flamingos are doting parents that believe in equality and share the burden of parenting. The main laying efforts correspond to the female, but the male makes up for that spending more time incubating during the first few weeks.

Afterwards, it its again the female who spends more time sitting on the egg, while the male searches for food. The overall amount of time spent on parenting duties is similar.

Until 30-32 days of age, the chicks have a slightly greyish white down feathers on the upper part of the body, which are very woolly and short, although they cover the whole body. It is soon replaced by darker grey, before their feathers begin to grow. Their beak is then straight and does not begin to curve until they are three weeks old.

In the first days of life, both adults feed the young with a kind of liquid that they drip into their beaks. Chicks are soon able to walk and leave the nests, grouping together in so-called “nurseries”, flocks that sometimes number more than a thousand chicks.

At this time the adults bait them insistently and the chicks screech continuously. From the air, the parent bird emits a squawk that only its chick recognises. When they hear it, chicks turn around, separate from the nursery to find their parents to be fed. Sometimes, another hungry chick tries to steal the place, only to be pecked off by the adult flamingo.

The Odiel marshes in modern and contemporary history

A long road to its full appreciation and protection

VIEW OF THE HUELVA ESTUARY IN THE 1920S.

Marshes, and all wetlands in general, have been given different values throughout history.

Their beauty has sometimes been a source of artistic inspiration, but the ambition to conquer them, to transform them and make them profitable has always been present. Until very recently, the draining and reclamation of lagoons, marshes and swampy areas was considered an unmistakable sign of human progress.

It is only very recently that the social valuation of wetlands and marshlands has changed. The Ramsar initiative was a first step on an international scale. In Andalusia, wetlands played an important role in the configuration of the Network of Protected Natural Spaces.

Over time, the Odiel Marshes have shared events and processes common to other Andalusian wetlands, but, unlike many of them, they still remain a substantial part of Andalusia's natural heritage.

8.006
HABITANTES

15th century

- The island of Saltés comes under the rule of the House of Medina Sidonia.

- Christopher Columbus mentions the Saltés bar in his ship's log (1492).

16th century

- The chapter of Huelva builds the watchtower, the origin of the present-day Punta Umbría.

- The species *Spartina densiflora*, originally from South America, is introduced.
- Luis de Góngora writes Las Soledades (Solitudes). It is thought that the landscapes described in *Soledad Segunda* may be inspired by the Tinto and Odiel Marshes(1613).

17th-18th centuries

- Fishing is the dominant activity in the Odiel area.

THE ATLAS OF THE KING PLANET. 1634.

- The Duke of Medina Sidonia and the Marquis of Ayamonte plot against the Spanish Crown (1641).

19th century

- Mining activity begins in the province with important consequences for the marshland and its surroundings.

THARSIS COMPANY PAYMENTS OFFICE. ALJARAQUE.

- The Tharsis shipping dock is built (1871).
- Rio Tinto Company Limited's ore jetty is built (1874-1876).

RIO TINTO COMPANY JETTY.

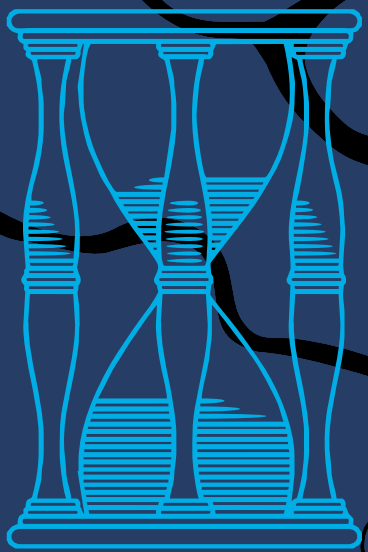
- Río Tinto Company Limited obtains concession to occupy 10 ha. next to the fishing village of Punta Umbría to build holiday homes for non-Spanish personnel (1881).

CASA DE LOS INGLESES

UNTIL VERY RECENTLY, THE MARSHES WERE SEEN AS TERRITORIES TO BE CONQUERED, CLEANED AND DRAINED FOR REASONS OF PUBLIC HEALTH OR FOR COLONISATION AND AGRICULTURAL PRODUCTION.

THE URBAN AND INDUSTRIAL GROWTH OF HUELVA AND ITS SURROUNDINGS SINCE THE 1960s HAS SURROUNDED THE MARSHLAND, THREATENING ITS FUTURE.

18.165
HABITANTES
(YEAR 1877)



THE ANDALUSIAN ATLANTIC MARSHES HAVE ALSO BEEN A SOURCE OF LITERARY INSPIRATION FOR AUTHORS SUCH AS LUIS DE GÓNGORA, JUAN RAMÓN JIMÉNEZ AND JOSÉ MANUEL CABALLERO BONALD. PERSONAL VISIONS THAT ARE ALREADY LINKED TO OUR PERCEPTION OF THE MARSHLAND.

20th century

PROJECT FOR THE DRAINING OF THE LA JANDA LAGOON IN 1829

- Law on the draining of lagoons, marshes and swampy land: The Cambó Law of 1918. In the 1920s, the tourist colonisation of the coastline of Punta Umbría began.
- In the 1920s colonization began tourist of the coast of Punta Umbría.
- The new municipality of Punta Umbría was created (1963). Until that point, it was dependent of the town of Cartaya.

PUNTA UMBRÍA 1960

- Creation of the Industrial Development Pole (1964).
- Work begins on the Outer Harbour (1965).
- First Huelva-Punta Umbría road (1965).

- Punta Umbría siphon bridge (1969).
- The Levante quay is built (1972).
- The Juan Carlos I Dam is built (1981).

ZEPA

- In accordance with Directive 79/409/EEC the marshes are classified as a Special Protection Area for Birds (SPA).

MaB

- The Odiel Marshes are declared a Biosphere Reserve within the International Network of UNESCO's MAB Programme (1983).
- Declaration of the Odiel Marshes as a Natural Site and of the Enmedio Island and the Burro Marshland as Integral Reserves (1984).
- Approval of the Master Plan for the Use and Management of the Nature Site Nature Reserves (1990).
- The Internal Regulations of the Council of the Odiel Marshes Nature Site (2002) are approved.

NATURA 2000

- The Odiel Marshes are proposed by the Autonomous Community of Andalucía as a Site of Community Importance to form part of the Natura 2000 Network.

27.548
HABITANTES
(YEAR 1990)

91.477
HABITANTES
(YEAR 1960)

176.699
HABITANTES
(YEAR 2002)

From Shaltis to Saltés

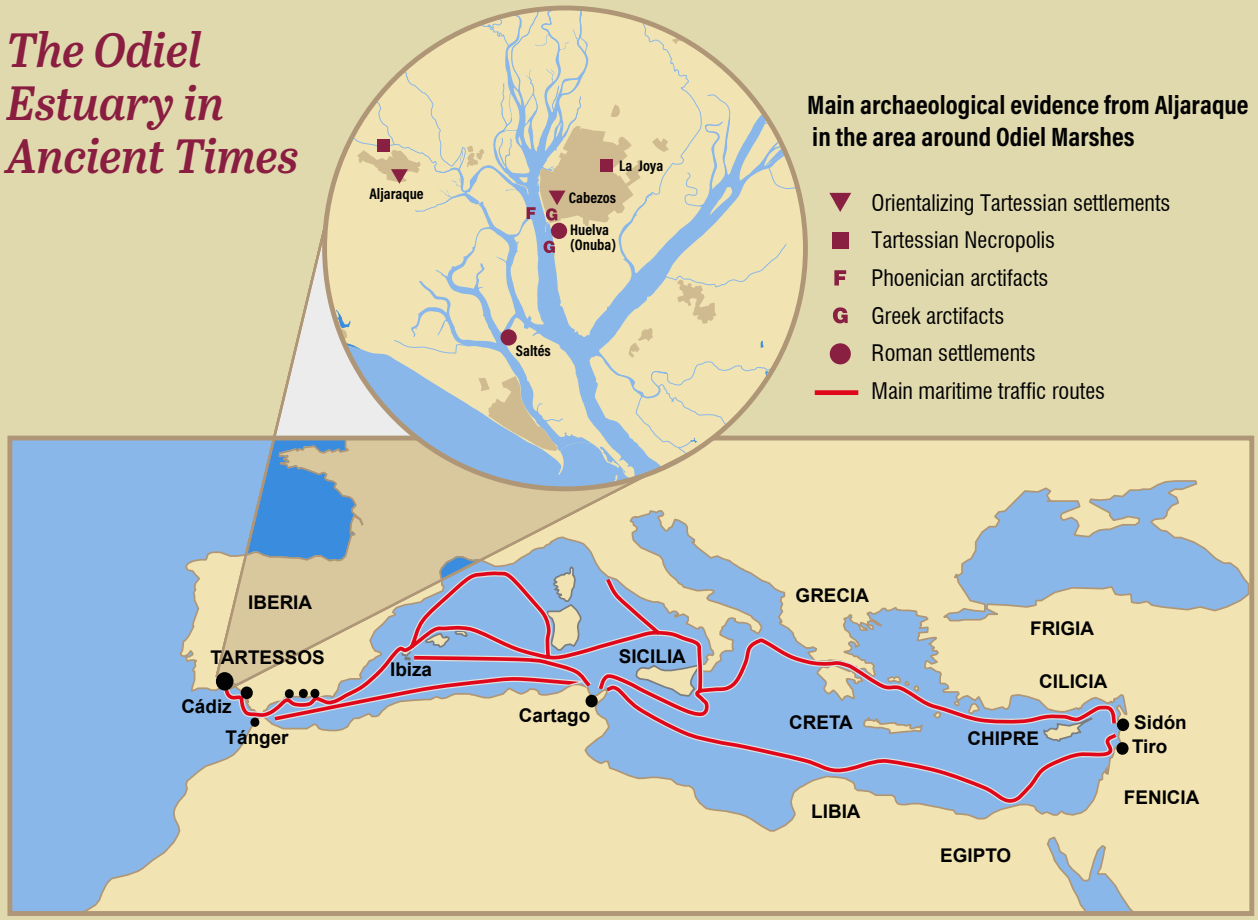
The border of Tartessos

The Huelva estuary was one of the main enclaves of the mythical kingdom of Tartessos which ruled the area between the 8th and 7th centuries BC.

"After some time, Phoenicians from Tyre crossed thestrait, and when they had sailed a distance thousand and five hundred furlongs from it, they landed on an island [Saltés?] which is close to Onoba, a city in Iberia, and on which there was a temple consecrated to Hercules. Believing that here were the Pillars of Hercules, they made to this god another sacrifice..."

Strabo, Greek geographer and historian. Geographica, Book III

The Odiel Estuary in Ancient Times



CORINTHIAN HELMET

FOUND IN THE HUELVA ESTUARY IN 1930 AND DATED TO AROUND THE 6TH CENTURY BC. ALONG WITH THE PHOENICIAN PRESENCE IN THE TARTESSIAN PERIOD, THERE ARE NUMEROUS AND NOTEWORTHY GREEK REMAINS IN THE ESTUARY AREA.

Tartessos, Phoenicians and the Mediterranean

Communications, exchanges and settlements

Between the 8th and 6th centuries BC, the splendour of Tartessos came about as a result of the contact between the indigenous peoples of the southwest of the Iberian Peninsula and the Phoenician colonisers, who founded factories along the coast, including in Cadiz. Their target arethe metals, especially silver, which are mined in abundance in the HUelva mining country.

"Therefore, the men that founded the cities took charge of the nature of the sites, and of the possibilities offered by the estuaries for navigation, which were not inferior to those of the rivers; they built cities and other smaller towns next to them, in the same way that they filled the banks of the rivers; and thus Asta [near Jerez], Nebrija [Lebrija], Onuba [Huelva] and Sonoba [towards Faro] were built"

Strabo, Greek geographer and historian.
Geographica, Book III

CARP TONGUE SWORD

DATED AROUND 850 BC, RECOVERED IN 1923 ALONG WITH A SHIPMENT OF 400 PIECES OF BRONZE WEAPONS OFF THE THARSIS QUAY, IN THE ODIEL MARSHES. NAVIGATION AND TRADE IN TARTESSOS WERE COMBINED WITH AN IMPORTANT METALLURGICAL ACTIVITY IN THE SETTLEMENTS AROUND THE ESTUARY.

The Andalusian city built on the Odiel Marshes

In the Muslim period, Saltés stood out as one of the most active port and trading cities in the west of the Iberian Peninsula.

شَلْطِيش

SALTÉS, IN ARABIC SPELLING.

"Under the rule of the House of Bakrids [the kings of the Taifa of Saltés and Huelva] was like a perpetual feast, so cheap was life and so safe were the roads"

Anonymous, 11th century

9th-10th century

Under the Umayyad emirate and caliphate, Huelva and Saltés formed one of the districts of the kura (territorial division) of Niebla.

11th-12th century

After its period as the capital of an independent kingdom, Saltés first came under the rule of the Abbadid kings of Seville and then under the rule of the Almoravids.

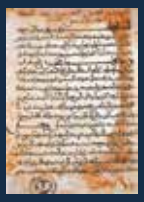
1144

Ibn Qabila of Saltés was one of the first warlords to rebel against Almoravid power in 1144. Shortly afterwards, the Almohads imposed their rule and built a citadel to ward off the Christian threat.

9th century | ***10th century*** | ***11th century*** | ***12th century*** | ***13th century***

Saltés is mentioned for the first time on the occasion of a fierce Viking raid.

844



The city of Saltés reached its political, economic and cultural peak when, together with Huelva, it became the head, of the Taifa kingdom ruled by the Bakrids between 1012 and 1052.

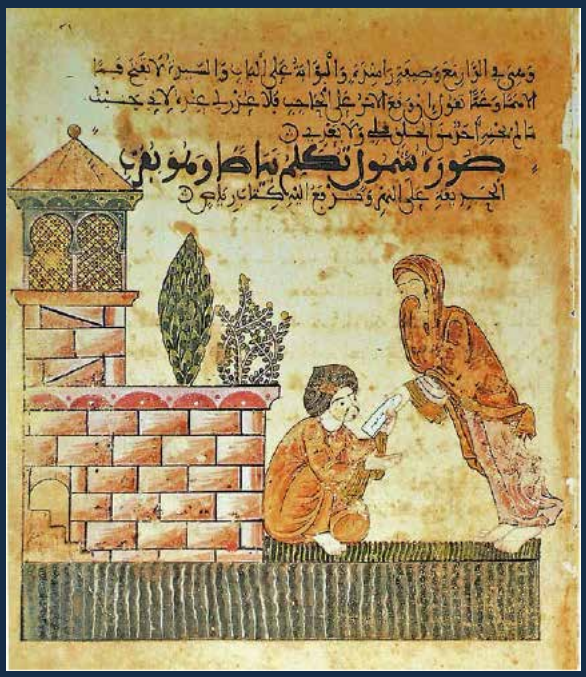
11th century

After a period of successive crises and after it was finally conquered by the Christians in 1262, the irreversible decline of the town of Saltés became evident, and by the end of the 13th century it was no more than a small fishing village.

1262

"As for the village of Saltis, it is not surrounded by walls and has no gates. Houses are gathered together and there is a market. The trade of blacksmith is practiced, an industry that is rejected elsewhere, because it is very painful, but which is very common in the sea ports, in the places where the large and heavy transport ships moor. The Madyus [the Normans] have seized this island on several occasions, and the inhabitants, whenever they heard that the Normans were coming, left the island in haste"

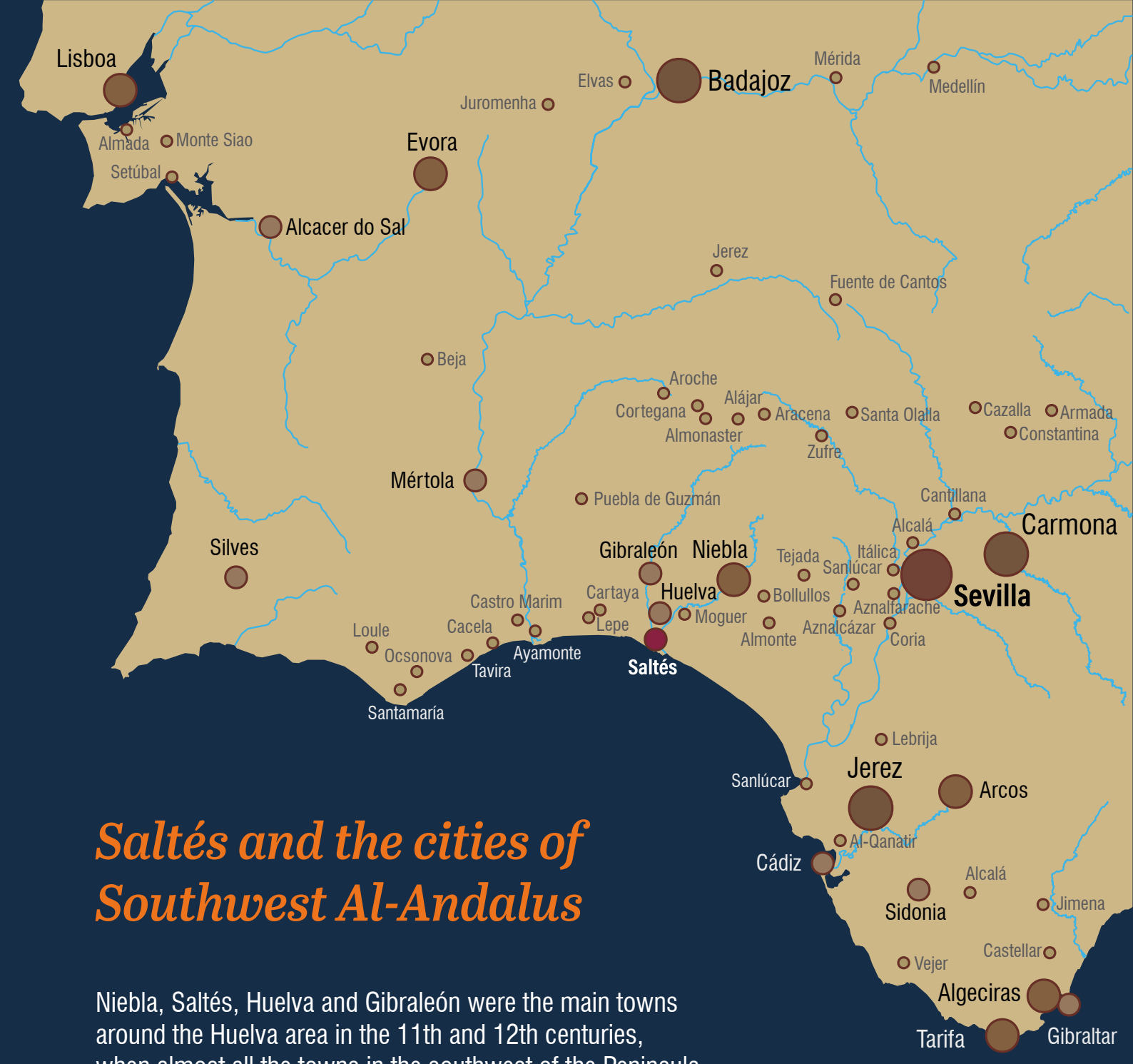
Al-Idrisi, 12th century Arab geographer



SALTÉS WAS A FULLY ANDALUSIAN TOWN, AS ITS FOUR AND A HALF CENTURIES OF EXISTENCE WERE SPENT ENTIRELY DURING MUSLIM SPAIN.

The urban complex of Saltés, in the area of El Almendral, covered some 6 hectares. Arab authors emphasise its mercantile activity and the lack of walls, as its mere isolation served as a defence. The citadel next to the houses was not built until the second half of the 13th century, under the Almohads.

The regularity of its urban layout and the gardens, wells and sewage system of its houses stand out, as well as the presence of blacksmith workshops in a sector of the town where the prevailing winds blew the fumes away. The city had a shipbuilding shipyard and held a weekly market.



Saltés and the cities of Southwest Al-Andalus

Niebla, Saltés, Huelva and Gibraleón were the main towns around the Huelva area in the 11th and 12th centuries, when almost all the towns in the southwest of the Peninsula were only medium-sized or small centres, at a considerable distance from large cities such as Seville and Córdoba, Badajoz or Jerez.

Niebla, the most important town in the coastal area of Huelva, had around 5,000 inhabitants, a figure similar to that of Évora, Lisbon or Ronda and higher than that of Silves, Cáceres or Andújar, which had around 3,000. Saltés, with a population of some 2,000, was on the same level with Gibraltar or Antequera, and was above Huelva, Gibraleón and the other towns in Huelva and the Algarve, most of which were tiny fortified villages or simple hamlets.

- Cities with more than 15,000 inhabitants
- Towns with around 5,000 inhabitants
- Villages with 1,000 to 2,000 inhabitants
- Villas, fortresses and villages Saltés and the cities of Southwest al-Andalus

Colombus' last sight of the Old World

The island of Saltés prides itself on being the last strip of land in Europe that Columbus watched before setting foot on American soil for the first time.

"We left on Friday, the 3rd day of August 1492 from the Saltés bar, at eight o'clock. We sailed under a strong wind until the sun set on our way to the Canary Islands"

Christopher Columbus, Ship's logbook

Since the late Middle Ages, the Tinto and Odiel estuaries have been a place between the land and the sea. Insecurity pushed populations inland and Huelva, Gibraleón, Palos and Moguer developed to the detriment of Saltés, which was reduced to a mere refuge for hermits around a small sanctuary run by the monks in La Rábida.

After belonging to Infanta Beatriz and to various gentlemen such as the Counts from Medinaceli, the island of Saltés becomes belong to the 15th century, along with the town from Huelva, to the House of Medina Sidonia.

When Columbus set sail from the port of Palos, Saltés was the last land on the Iberian Peninsula that he mentioned on his first voyage to the Indies. From then on, the navigation of the estuary was definitively oriented towards the Atlantic routes of the West, America, Africa and Europe. After the adventure of the Age of Discovery, the Odiel area focused on fishing and, from the 19th century onwards, on the export of minerals from Río Tinto and Tharsis. Since the mid-20th century, traffic linked to Huelva's polo industry has been prevalent.

After being included in the estates of Infanta Beatriz and to various lords such as the Counts of Medinaceli, the island of Saltés, together with the town of Huelva, became part of the estate of House of Medina Sidonia in the 15th century.

Christopher Columbus' first voyage from Palos (August 1492 - March 1493)

Trade routes with Europe (Brittany, England, Flanders) in the 14th-16th centuries

Andalusian voyages from Palos (1499-1500)

Fishing routes, trade, privateering and the slave trade in the 15th-16th centuries

...To finish

TRUE

FALSE

We would now like to check to what extent we have achieved the proposed objectives in this centre.

Here is a series of statements (some true, some false), on issues raised in the exhibition. Think of the answer and click the button to see the solution.

Tides are caused exclusively by the gravitational force of the moon.

The Odiel Marshes is made up of ecosystems of great biodiversity.

The Odiel Marshes, in addition to being a Natural Site, are a Biosphere Reserve and a Special Protection Area (SPA) for Birds.

Marshlands are very homogeneous spaces.

The Doñana and Odiel Marshes are the main wintering destination for European migratory birds.

The helmet reproduced in this exhibition is a copy of those used for protection, at the beginning of the last century, in the pruning and maintenance of pine forests.

Marshlands are areas that are slowly evolving towards their disappearance.

The Odiel Marshes integrates ecosystems of high biological productivity.

Saltés was a city of the mythical Tartessian culture.

Marshlands are naturally changing at a particularly rapid pace.

Africa is the main wintering destination for European migratory birds.

Saltés was part of the mythical Atlantis.

Junta de Andalucía

Consejería de Sostenibilidad y Medio Ambiente