

# THE SUSTAINABLE TOURIST'S GUIDE TO THE COASTAL ENVIRONMENT

THE COASTAL BIOTOPES OF **CAVALLINO TREPORTI**



The project is  
co-funded by the European  
Union, Instrument for  
Pre-Accession Assistance



REGIONE DEL VENETO



This publication has been produced with the financial assistance of the IPA Adriatic Cross-Border Cooperation Programme. The contents of this publication are the sole responsibility of Veneto Region and can under no circumstances be regarded as reflecting the position of the IPA Adriatic Cross-Border Cooperation Programme Authorities.



The project is  
co-funded by the European  
Union, Instrument for  
Pre-Accession Assistance

# SHAPE

## SHAPING AN HOLISTIC APPROACH TO PROTECT THE ADRIATIC ENVIRONMENT: BETWEEN COAST AND SEA

SHAPE is an integral project for the Adriatic region that aims to provide a basis for the protection and sustainable development of the coastal-marine environment. The strategic objective is to develop a multi-tiered, inter-sectoral system of governance based on a holistic approach and aiming to achieve the integrated management of the natural resources, the elimination of risks and the resolution of conflict between various utilisations and various users. The coast and the sea are of strategic importance to the wellbeing and prosperity of the Adriatic countries: they represent great value in terms of both economic and environmental aspects such as, for example, commercial shipping routes, climate regulation, food production, energy sources and sites for rest and recreation.

On the other hand, the coastal and marine areas are subject to increasing pressures due to human activities (fishing, aquaculture, transportation and tourist harbours, energy production, harbour infrastructure development and tourism) which come into conflict with habitat and landscape protection requirements due to the fact that they occur side by side.

Global problems such as climate change also have a dramatic effect on the coastal and marine areas, with effects that often stretch beyond national or regional borders.

The partners involved recognise the Adriatic Sea as a single body of water (the same approach as has been adopted in the EU's marine strategy framework guidelines) due to its sensitivity and, at the same time, the increasing pressures due to human activity. In order to confront both the global and the local threats in an integrated manner, to address different issues on a marine-basin scale, to coordinate individual actions towards common objectives and to create synergy and strengthen cooperation, the SHAPE project involves six Adriatic Countries over a period of 3 years.

In line with the EU's horizontal and vertical policies, and within the strategy framework of the IPA Adriatic programme, the project is intended to promote the strengthening of the institutions' ability to conserve and manage the natural and cultural resources and to eliminate risks, thereby ensuring the rational utilisation of the Adriatic Sea and its resources so as to enable the conflicts between the various uses to be resolved.

Attention is focused on integrated coastal zone management (ICZM) and maritime space planning (MSP). The project activities promote the application and effective implementation of the ICZM Protocol in the Mediterranean, and the MSP schedule in the Adriatic region, as launched by the European Union. The project is built upon collaboration between 13 partners in 6 countries in the territorial cooperation area envisaged in the IPA Adriatic programme (Italy, Albania, Bosnia-Herzegovina, Slovenia, Croatia and Montenegro) so as to develop a joint vision and undertake multi-tiered activities involving the entire Adriatic basin. The project activities are aimed at ensuring concrete coordination between the institutions and the authorities responsible for coastal and marine management, the revamping of existing governance structures in order to have better integration and cooperation, greater involvement of the interested parties and stronger ties between the role players and the major institutions, increased public participation in the issues addressed by the project and increased public awareness by means of public workshops and effective advertising.

# CREDITS

## COORDINATION, DIRECTION AND EVALUATION ACTIVITIES

Dr. Giovanni Artico – Veneto Region: Progetto Venezia Department

Attorney Paola Noemi Furlanis, Dr. Gianluca Salogni – Veneto Region: Commissions Coordination B.U. (VAS – VINCA – NUVV)

Dr. Mauro Viti – Veneto Region: Forestry and Parks B.U.

Claudio Orazio – Town Mayor of Cavallino Treporti

## WORKING GROUP

Veneto Region: Progetto Venezia Department – Chemical Accord Management Service - Dr. Roberto Bertaggia, Eng. Maria Grazia Pusceddu, Dr. Silvia Biasi

Veneto Region: Commissions Coordination B.U. (VAS – VINCA – NUVV) - Dr. Gianluca Salogni

Veneto Region: Forestry and Parks B.U. – Dr. Mauro Viti

Cavallino Treporti Municipality – Eng. Andrea Gallimberti, Architect Gaetano Di Gregorio

Agriteco sc – Dr. Alessandro Vendramini, Dr. Roberta Rocco, Dr. Francesca Pavanello, Architect Paola Barbato,

Eng. Lovo Loris, Dr. Federico Zoccarato, Dr. Danilo Trombin, Mr. Roberto Masin,

Mr. Gianfranco Bertani, Mr. Ferruccio Panzarin

Text and photo  
(where not specified) of Agriteco sc  
Illustrations and graphics by Maurizio Ercole  
Final printing by Modulgrafica Forlivese srl  
in November 2013 for Edizioni GenesiDesign.com  
ISBN-13 978-88-896049-55-6  
ISBN-10 88-96049-55-5



# TABLE OF CONTENTS

07	INTRODUCTION
08	THE CAVALLINO TREPORTI COASTLINE
09	FORMATION AND EVOLUTION
11	ECOLOGICAL IMPORTANCE
12	THE COASTAL ENVIRONMENTS
14	THE FLORA
16	THE FAUNA
19	FACT SHEETS
19	HABITATS
23	PLANTS
27	ANIMALS
31	SUSTAINABLE UTILISATION
37	PLANT IDENTIFICATION KEY
55	SURVEY FORM
59	GLOSSARY
61	BIBLIOGRAPHY
62	NOTES

This non-fiction work makes use of the right to quote, as ratified by Article 70 of the Italian Copyright Law and Article 10 of the Berne Convention. The images published herein are merely used to illustrate certain points and remain the property of their respective authors. The authors and publishers deny any liability deriving from the use of the information contained in this publication.



PRINTED ON  
FSC PAPER



## INTRODUCTION

This publication was produced as part of the **SHAPE project – Shaping an Holistic Approach to Protect the Adriatic Environment: between coast and sea**. The main focus of this project is the Emilia Romagna Region and involves the participation of 13 partners, amongst which is the Veneto Region. It falls under Measure 2.1 of the IPA Adriatic Cross Border Cooperation (CBC) Programme – Protection and development of the coastal and marine environment. The objective of this measure is **to improve the coast, inter alia by means of the joint management of the coastal and marine environment and the common risks**.

Within the context of the SHAPE Project, a pilot programme has been started in the “Natura 2000” site known as “The Cavallino Peninsula: Coastal Biotopes” with the aim of illustrating the approach for coastal SCI and SPA areas integrated with a mode of coastal zone management consistent with the principles of ICZM Protocol.

The activities carried out in terms of the project included the following:

- focus on Art. 8 (“Protection and sustainable utilisation of coastal zones”) of the “Integrated Coastal Zone Management - ICZM” protocol, both in the “NATURA 2000” areas and the external areas involved in the Land Use Plan and the Cavallino Treporti Municipality’s Shoreline Plan;
- updating of the fact finding work that was started by CINSIA (National Inter-University Consortium for the Environmental Sciences) back in 2005, on commission for the Veneto Region, on the coastal SCI and SPA zones (mapping of habitats on 9 “Natura 2000” sites, including the one in Cavallino Treporti);
- drafting of a pilot management plan for the SCI/SPA IT3250003 site: “Cavallino Peninsula: Coastal Biotopes”.

This publication targets the objectives suggested in the ICZM Protocol, namely:

- to encourage sustainable coastal tourism that protects ecosystems, natural resources, cultural heritage and coastal landscapes;
- to promote specific types of coastal tourism, particularly cultural and rural tourism and ecotourism in accordance with the traditions of the local inhabitants;
- to sensitise people on the topic of integrated coastal zone management and to develop pertinent educational programmes, training activities and public education on this topic.



## THE CAVALLINO – TREPORTI COASTLINE

The Cavallino - Treporti area consists of a long peninsula encircled by water on three sides and stretching for about 15Km. Its northern side faces onto the Venice Lagoon while its southern side faces onto the Adriatic Sea.

Being situated between two such different environments (lagoon and sea) means that the Cavallino - Treporti peninsula displays different features in its different parts: in the northern part of the peninsula, in other words towards the lagoon, you find typical valley environments ("fishing valleys", lagoon canals, sandbanks) linked to the major waterways carrying lagoon traffic. The central part of the peninsula features cultivated fields in which mainly fruit and vegetables are grown (there are also numerous greenhouses), favoured by the presence of sandy soils. In the southern part of the peninsula (facing the sea) you find the typical sandy coastline environment with beaches and sand dunes.





## FORMATION AND EVOLUTION

The presence of two such different personalities within a single area reflects the numerous transformations - both natural and unnatural - that the area has undergone over time.

During the first century after the fall of the Roman Empire (5th Century AD), it is probable that the area where the Cavallino Treporti peninsula lies today featured a number of lagoons that formed a wetland system which stretched almost uninterruptedly from the mouth of the Po River almost all the way to Trieste.

The formation of the Cavallino peninsula only began around 1200 AD when the Piave River began to deposit sandy material suspended in its waters and thereby forming the islands of Mesole, Saccagnana and Treporti (the North-western section of the current peninsula).

In 1300 AD this area featured four lagoon-harbour mouths, namely the San Nicolò port, the Sant'Erasmus port, the Tre Porti port and the Lio Mazor port. Into the latter of these ports flowed the Lio Mazor canal, now known as the Pordelio canal.

The strip of land that emerged between the mouths of the Piave River and the Lio Mazor canal over the subsequent centuries continued to grow, thanks to the interaction between the marine currents and the ongoing delivery of sandy material by the Piave River.

In the late 1600's the mouth of the Piave River was redirected to Cortellazzo (East of Jesolo), while the Sile River was diverted into what was formerly the Piave river bed.



# THE CAVALLINO TREPORTI COASTLINE



## DIAGRAM OF THE GEOGRAPHY OF THE VENICE LAGOON IN THE 1300'S

DRAWN FROM "MORFOLOGIA STORICA DELLA  
LAGUNA DI VENEZIA - FAVERO ET AL., 1988





## ECOLOGICAL IMPORTANCE

The Cavallino Treporti coastline hosts a major natural area that forms part of the "Natura 2000" European ecological network, whose objective is to protect biodiversity.

This network consists of territorial environments designated as "Sites of Community Importance (SCI)", which, upon completion of the establishment procedures, will become "Special Areas of Conservation (SAC)", and "Special Protection Areas (SPAs)". These sites contain habitats as well as animal and vegetable species of particular importance at the European level and are specifically mentioned in Directive 92/43/CE-"Habitat" and Directive 2009/147/CE-"Birds".

This important natural coastal area (SCI/SPA "Cavallino peninsula: Coastal biotopes") consists of five sub-areas, namely (from East to West):

- "The Fossil Dunes of Vallesina" and "The Cavallino Biophenological Station"
- "Cavallino Coastline";
- "The Ca' Ballarin Pine Forest";
- "The Ca' Savio Dunes and Woods";
- "The Punta Sabbioni Dunes and Woods".



The Fossil Dunes of Vallesina



The Ca' Ballarin Pine Forest



The Ca' Savio Dunes and Woods



The Punta Sabbioni Dunes and Woods

## THE COASTLINE ENVIRONMENTS

Along the Cavallino Treporti coastline, and particularly within its ecological biotopes, there are the typical kind of sandy beach environments that characterise the North Adriatic coastline. Moving inland from the sea, you find a succession of diverse habitats, each of which is characterised by its own typical vegetation:



### 1 DRIFT LINE

Where the organic material brought in by the waves (namely seaweed, branches, ...) accumulates and decomposes; here the pioneer annual plant species establish themselves and, by stabilising the sand, begin to form the very first, modest sandy mounds.

### 2 "EMBRYONIC DUNES" BELT

Where the first small sandy undulations form. Here the vegetation consists of species with ground-hugging stems which, together with their roots, form a dense mesh that surrounds and holds the sand in place.

### 3 "WHITE DUNES" BELT

In which the dunes, which reach only a few metres in height, are still evolving and moving due to wind action; these dunes are colonised by species with substantial root systems that counteract soil erosion caused by the wind. The white dunes are continuously fed by sand from the adjacent beach brought in by the wind (particularly the winter Bora).

### 4 CONSOLIDATED DUNES BELT

In which the dunes are made up of sand that has already become consolidated and that is out of the reach of sea water. These stabilised dunes are able to host grassy vegetation and are referred to as "grey dunes" due to their colour in summer when the mosses and lichens that cover them go dry and turn grey, as well as shrubbery (consisting mainly of Juniper) or trees, in many cases of the same species as the allocthonous pine forests.

# THE CAVALLINO TREPORTI COASTLINE

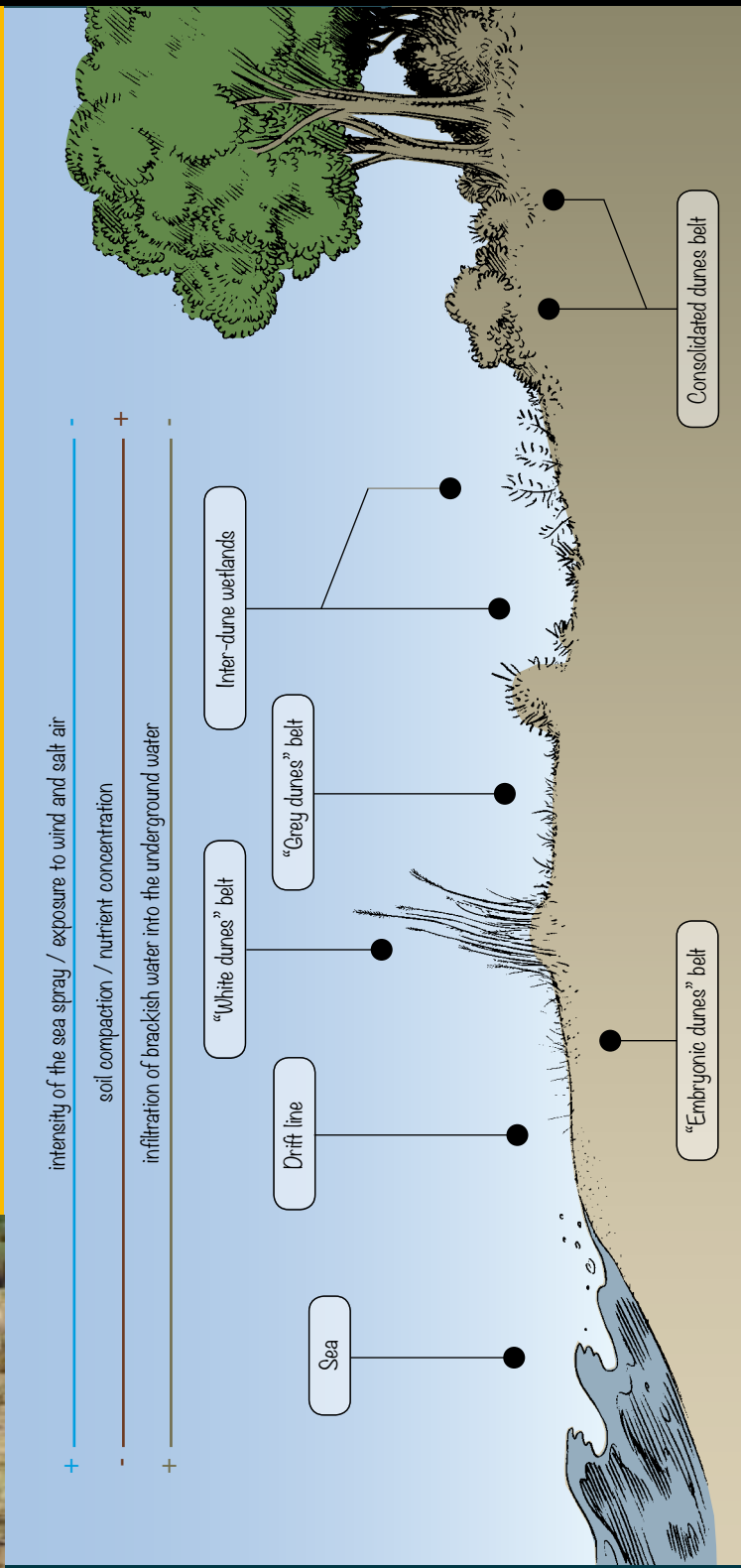




Photo of Trombin D. Heather

## THE FLORA

The flora of the Cavallino Treporti coastline stands out due to a number of peculiarities linked to the location of this area. Indeed, in this area, and generally in the nearby area of the Venice Lagoon, the Mediterranean nature of the climate (warm and dry, that generally characterises the Adriatic coast) changes temporarily, only to return on the more northerly coasts, such as the Gulf of Trieste. This change is due to the effects of the cold winds (the winter Bora) that come down from the North, from the cold waters of the alpine rivers that flow out to sea in the vicinity of the Lagoon (the Piave and Tagliamento rivers to the North and the Brenta and Adige rivers to the South), and the high level of humidity in the air.

These weather conditions enable the growth of typically alpine species such as heather (*Erica carnea*), which can be found in the area behind the dunes, or Rosemary-leaved Willow (*Salix rosmarinifolia*), which can be found in the humid lowlands behind the dunes. In these zones behind the dunes, the absence of wind and the dryness of the soil during the summer means that the temperatures rise, thus enabling the growth of species that are typical of the Eastern Steppes, which are effectively at the outer limit of their distribution here. Amongst these species, the one that stands out particularly is the American Hemp (*Trachomitum venetum*), a species that is often encountered in various environments.

## THE DUNE VEGETATION

Dune plants have to adapt to an environment that is almost totally lacking in water since the sand particles are unable to hold any humidity and can get rather hot due to the sunshine. On the more exposed dunes these plants can only survive by means of special adaptations, such as:

### THE SUCCULENCE

A number of plants that live along the beach have fleshy parts in which they store water reserves (e.g.: the shore bindweed - *Calystegia soldanella*);



Shore bindweed

## THE HAIRINESS

The leaves and stems of young plants are covered by a dense layer of hairs that protect the plant against excessive moisture loss (e.g.: coastal medick - *Medicago marina*).



Coastal medick

## THE CREEPING RHIZOMES UNDER THE SAND

The stems are protected against excessive heat by the sand clods under which they creep (e.g.: marram grass - *Ammophila littoralis*, sand couch - *Agropyron junceum*, sea holly - *Eryngium maritimum* and sea fennel - *Echinophora spinosa*).



Marram grass

## THE WAXY LEAVES

The leaves are covered in a thick protective layer of waxy material (cuticle) and have very few stomata (microscopic openings) so as to limit moisture loss due to evaporation (e.g.: Russian thistle - *Salsola kali*).



Russian thistle

## THE ANNUAL CYCLE

The plant's biological cycle (namely germination, flowering, seed maturation, dispersal and death) takes place entirely in the brief winter-spring period when the rains are more frequent and the temperature does not rise as high as the summer peaks (e.g.: striped catchfly - *Silene conica*, dune fescue - *Vulpia membranacea*, sand cat's tail *Phleum arenarium*).



Sand cat's tail

## THE FAUNA

Generally speaking the sandy coastline is not inhabited by very many vertebrate or invertebrate animal species. Like the plants, the animals that live on the dunes also have to adapt to the very specific and difficult weather conditions of the sandy coastline environments (mainly the scarcity of water and high temperatures).

Furthermore, for many vertebrate species the dunes and beaches are not very safe environments and lack easily accessible safe refuge. The situation is made even more difficult by the overcrowding of the coast during the summer period (which coincides with the breeding season for many species).

### THE INVERTEBRATES OF THE SANDY COASTLINE

The invertebrate species that live in the coastal habitats have developed a whole range of adaptations, many of which are identical to those developed by many invertebrates that live in desert environments:

- strong inclination to go underground (tunnelling) to escape the extreme heat of the sun (e.g.: the ant-lion *Myrmeleon formicarius*);
- switching from diurnal to nocturnal habits (especially during the hottest months) or lengthy periods of summer dormancy during the hottest months of the year (a sort of "summer hibernation" if you will) (e.g.: the sand-hill snail *Theba pisana*);
- daily or seasonal migration between the water's edge and the consolidated dunes in search of food or protection (e.g.: the sand hopper *Talitrus saltator*);
- development of strategies aimed at minimising contact with sand superheated by the sun, such as long, thin limbs (e.g.: the tiger beetle *Cylindera trisignata*) and fast movement or skimming flight in insects in order to better cope with the strong marine winds;
- camouflage utilising the natural colours of the environment; many consisting of tiny alternating yellow, white, grey and blackish spots that mimic the colour of the sand (e.g.: the tawny earwig *Labidura riparia*).



Ant-lion



Sand-hill snail



Sand hopper



Tiger beetle



Tawny earwig





Photo of Trombin D.

## THE VERTEBRATES OF THE SANDY COASTLINE

The vertebrates that inhabit the sandy coastline are mainly predatory and constitute a rather limited number of species, very few of which are in fact specialised.

Indeed, most of the vertebrates that inhabit the beaches and dunes belong to a species that is extremely widespread, both geographically and in terms of altitude, and that is only occasionally found in these habitats for feeding purposes, in other words while patrolling in search of food, which usually consists of the beached remains of small and large marine animals.



Green toad

As regards amphibians, the low-lying wetlands between the dunes are often inhabited by the relatively common green toad (*Bufo viridis*), which is able to reproduce even in the small fresh water pools between the dunes.

As regards reptiles, along the sandy dunes it is common to come across the Italian wall lizard (*Podarcis siculus*), which is an active daytime predator of small invertebrates both in the larval and adult stages. Still regarding reptiles, in the moist lowlands and water courses in the area behind the dunes you may encounter the European pond turtle (*Emys orbicularis*), which is particularly common in the Punta Sabbioni area.



Italian wall lizard

As regards birds, numerous species inhabit above all the coastal marshlands; these wetlands host some large bird communities that are reliant on the rich diversity of aquatic invertebrates that are able to sustain significant feeding networks.

The Cavallino Treporti peninsula forms the most North-easterly edge of the Venice Lagoon, the largest wetland in the whole of Italy and one of the most important coastal wetlands in the entire Mediterranean basin.



European pond turtle

From the point of view of complexity and richness, it is comparable to other wetlands like the Camargue, the Danube River Delta, the Po River Delta and the Gulf of Gabès, all of which are areas that play a crucial role in the life of aquatic birds.

Its close proximity to such an important stretch of wetland means that the Cavallino Treporti coastline also has its fair, albeit marginal share of aquatic birds that visit the beach and dune environments on the coastline particularly during the winter period or during the course of their migrations.

One species that actually breeds along the beaches of Cavallino Treporti is the snowy plover (*Charadrius alexandrinus*), which lays its eggs in a simple depression dug into the sand.

As regards mammals, a common inhabitant, particularly in the area behind the dunes, is the European rabbit (*Oryctolagus cuniculus*), which feeds on grasses and the buds, sprouts and roots of dune plants and shrubs. The abundance of rabbits and other herbivorous mammals (e.g.: the eastern cottontail rabbit - *Sylvilagus floridanus*), which are extremely prolific breeders, may constitute a major problem, especially for a number of particularly delicate plant species, partly due to their propensity for digging holes.



Snowy plover



European rabbit den





## THE SANDY COASTLINE HABITATS

### EMBRYONIC AND WHITE DUNES

The strip of coastline closest to the sea and up to the maximum high-tide mark is totally inhospitable for trees due to the extreme conditions encountered there, including the continuous stirring up of the sand, which sweeps away any seeds that may randomly land up there, and the alternating submersion in salt water at high-tide and hot and dry conditions at low-tide around midday.

Only above the maximum high-tide mark (**drift line**) is it possible to encounter the first pioneer plants that occupy the sand temporarily and very sparsely. By the end of summer, all that remains of this vegetation is dry remains that are then blown away by the wind or covered by the sand. Nevertheless, this band of vegetation is already sufficient to constitute an obstacle for wind-borne sand, which begins to accumulate in certain spots. The typical plant encountered in this zone is the European sea rocket (*Cakile maritima*).

Slightly further inland there is a band of plants that may even survive for many years (the **embryonic dune** band), inhabiting the sand on a permanent basis. The stems of these plants constitute an obstacle for the sand, which is deposited and forms small mounds that can sometimes reach a height of ten to twenty centimetres. Other seeds may germinate on these embryonic dunes thanks to the gap between their roots and the underlying layer of salt-water. The typical plant encountered in this zone is the sand couch (*Agropyron junceum*).



Behind the embryonic dunes lies the band of **white dunes**, the entire surface of which is almost totally covered in plants, forming a barrier for any wind-borne sand that gets deposited amongst the stems and leaves thus increasing the height of the dune. The dunes in this band are a firm fixture, even though they are still subject to the action of the wind, which at different times erodes or deposits sand. The typical plant encountered in this zone is the marram grass (*Ammophila littoralis*).





## THE CONSOLIDATED DUNES

Along the Upper Adriatic coast, the surface of the inner dunes (“consolidated dunes”) is often covered in a carpet of moss (e.g.: star moss or *Tortula ruralis*) and lichens that spreads predominantly during the winter months when the sand is moister. In summer, when the mosses dry out, these consolidated dunes turn grey in colour, which is why they are referred to as “grey dunes”. The consolidated dune belt is covered in a typical psammophyte (or “sand loving”) grassland consisting of grassland species such as salad burnet (*Sanguisorba minor*), bur medick (*Medicago minima*) and prairie Junegrass (*Koeleria macrantha*). You may also come across some species of alpine origin (for example *Erica carnea*), which are carried down into the valleys by alpine rivers (e.g.: the Piave River near Cortellazzo).

In addition to the typical species of local flora, often the consolidated dunes also play host to “alien” species, in other words species that are either intentionally or inadvertently introduced outside of their normal habitat by humans. In most cases these species prove to be invasive, in other words they propagate wildly and threaten the natural biodiversity of the habitats in which they become established (e.g.: Fragrant evening primrose - *Oenothera stucchi*).

The vegetation of the sandy coastline reaches its peak of complexity on the consolidated dunes populated by tree species. Along the Upper Adriatic coast you may well encounter endemic mixed broadleaf forests containing species such as the Manna Ash (*Fraxinus ornus*) and various types of Oak (e.g.: the White Oak - *Quercus pubescens* and the English Oak - *Quercus robur*).



## WOODED DUNES

In addition to the grassland vegetation of the “grey dunes”, the consolidated dunes may also play host to shrub and tree-like vegetation.

The natural shrubbery would normally consist of junipers which, in the case of Cavallino Treporti, are only found in small, rather restricted areas and often interspersed amongst other types of vegetation, particularly of the “grey dune” and cultivated pine variety. The Juniper is a particularly significant type of vegetation that must have historically covered a much larger surface area but has since been replaced by pine plantations.



Although the coastal forests of the Upper Adriatic generally consist of pine forests, most of them were planted by man in past decades to protect crops planted in recently reclaimed land against the negative effects of sea spray. The one exception here is the Black Austrian Pine forest in Bibione, near the mouth of the Tagliamento River, which grew spontaneously in that area.

In cultivated pine forests there is a thick layer of pine needles lying on the forest floor which, since these do not easily decompose, inhibits the growth of other species. The coastal forests of the Upper Adriatic would normally consist of mesoxerophyte broadleaf species (e.g.: the common hawthorn - *Crataegus monogyna*, the Manna Ash - *Fraxinus ornus*, the English Oak - *Quercus robur* and the White Oak - *Quercus pubescens*).





## THE INTER-DUNE WETLANDS

Rain water may collect in pools between one consolidated dune and the next and these can sometimes constitute a band of wetlands, especially in winter. The main difficulty for plants that establish themselves in these environments is linked to the possibility that their roots could potentially reach down into the underground water table, which could well be brackish given its proximity to the sea.

A plant's response to the presence of an underground brackish water table may vary: in this kind of environment you may encounter species that live exclusively in environments with low but more or less constant salinity (e.g.: the Sharp Rush or *Juncus acutus*) and species that do not live exclusively in this type of environment but are able to cope with some salinity, on condition that the level is low (e.g.: the black bogrush or *Schoenus nigricans*). This kind of halophyte (salt-loving) vegetation is found mainly in the inter-dune wetlands at Punta Sabioni where it constitutes the "Mediterranean salt meadows" habitat.



In the wet lowlands behind the dunes where the underground water is fresh rather than brackish, we find one of the most highly regarded habitats along the entire Cavallino Treporti coastline, namely the "Mediterranean tall humid herb grasslands" made up of large, hygrophyte (water loving) herbaceous plants.

Oftentimes such wetland environments are at risk of disappearing due to the invasion of shrubs, also allochthonous (not typical of the places, e.g.: the false indigo bush or *Amorpha fruticosa*), or drainage of the land to make way for farming.





## THE PLANTS OF THE SANDY COASTLINE

### THE SAND COUCH (*Agropyron junceum*)

The sand couch is the main species found in the embryonic dune belt, in other words the strip of vegetation closest to the waterline, but above the maximum high-tide mark and drift line.

The sand couch is a perennial grass that grows up to 60cm in height. It has wide blades with a hairy upper surface along the veins to limit moisture loss by evaporation. It flowers in May - June and the spike may even reach 25 centimetres in length.

This plant puts out horizontal stems that creep along the sandy surface or propagate a just few centimetres under the sand, thereby stabilising the sandy soil. Embryonic dunes up to 10-20 centimetres in height are formed by the sand that lands around the stems of this grass.





### THE EUROPEAN BEACH GRASS (*Ammophila littoralis*)

European beach grass (*Ammophila littoralis*) appears in dense, extensive clumps on the first line of dunes and this species is the main builder and stabiliser of dunes due to its deep and extensive root system. Even if it gets buried under heaps of sand driven by the wind, it still manages to put out new shoots that enable the plant to re-emerge from under the sand. This plant flowers in May-July, putting out long golden plumes. The first dunes, which can even be several metres high, constitute an effective barrier against the winds that blow inland from the sea. These dunes are normally taller than the ones behind them, on which the sand tends to be more compacted, giving them a more gentle slope (consolidated dunes). These clumps of beach grass are also very important for animal life in that they create a cool shady zone that is constantly humid. Not only is this cool humid microclimate beneficial for the plant itself, but it also provides excellent shelter from the baking summer sun for the invertebrate fauna.





## THE REEDS

Reeds are the typical types of plants found in the inter-dune wetland environments. These plants are geophytes, in other words perennial plants with an underground storage system consisting of a rhizome (underground creeping stem) and include, for example the black bogrush (*Schoenus nigricans*), the sea rush (*Juncus maritimus*) and the sharp rush (*Juncus acutus*).



Photo of Trombin D.

Unlike the dune plants that utilise mainly rainwater, these plants that live in the inter-dune lowlands utilise the underground water, which is brackish due to the close proximity to the sea. However, the salinity of this water varies markedly from season to season. The water is less salty in winter due to the abundance of rain and saltier in summer due to the scarcity of rain and high evaporation.

While the sea rush (*Juncus maritimus*) and sharp rush (*Juncus acutus*) are “forced halophytes”, in other words they grow exclusively in low but constant salinity environments, the black bogrush (*Schoenus nigricans*) is “halo-tolerant”, in other words it is able to cope with some salinity, as long as the levels are low.



## THE PINES

The coastal pine forests of Cavallino Treporti are not endemic and were planted by man in past decades to protect crops planted on recently reclaimed land against the negative effects of sea spray. This is also proven by the pine species that were used to create the plantations (the Italian stone pine - *Pinus pinea*, the cluster pine - *Pinus pinaster* and the Aleppo pine - *Pinus halepensis*), all of which are non-local species.



The Italian stone pine is a species that grows spontaneously in the southern part of the Iberian Peninsula and is only found here in Italy as a cultivated species.

Notwithstanding its common Italian name (Maritime pine), the cluster pine is an introduced species found in the Ligurian and Northern Tuscan hinterland.

The Aleppo pine is an endemic species in the hotter parts of the Italian Peninsula and the Islands and flourishes mainly in rocky environments.

While the coastal pine forests may be very valuable from a landscaping perspective, from an environmental perspective they are rather shoddy, with the sole exception being the natural forests. The extensive accumulation of pine needles on the forest floor, which do not decompose, suffocates and trivialises the undergrowth. The end result is that the pines stand alone and become a kind of monoculture. In order to return this type of forest environment to one that is more diversified and more in keeping with the natural environment (mixed oak forest), these trees must be progressively thinned out (targeted logging), thus creating clearings in which endemic shrubs and trees (typical of the area) can be planted or allowed to grow spontaneously.





## THE ANIMALS OF THE SANDY COASTLINE

### TIGER BEETLE (*Cylindera trisignata*)

The Tiger beetle is a small insect (7-10.5 mm) with green-bronze or brown coloured camouflage and branch-like shadows. It has long, thin legs and well-developed wings.

It is an active daytime predator between May and August and hunts down small crustaceans, known as sand fleas or sand hoppers, in the area along the waterline. It spends its nights under beached items such as trunks and other plant remains that have been washed ashore. Even its larvae are predatory and ambush their prey by hiding in small vertical tunnels that they dig into the sand well away from the water's edge.

Like many of the other invertebrates of the sandy coastline, Tiger beetle populations could also be very easily fragmented and destroyed by excessive human impact caused by many people walking on the beaches during the summer months, the cleaning of the beaches using machinery and the bringing in of fresh sand.





### THE SAND HILL SNAIL (*Theba pisana*)

From the very first dunes through to the most inland ones it is possible to encounter a very common land-based mollusc known as the sand hill snail (*Theba pisana*), which is referred to locally as the "bovoletto" and lives on the grasses, sometimes in groups consisting of very many individuals. During the summer, this snail goes "into estivation" (summer hibernation), closing up the opening of its shell and exposing itself to the cooling effect of the wind at the top of plants. This is a common species along the Mediterranean coastline, where it is also encountered further inland, sometimes even as far as ten kilometres or more from the sea. Along the North-western Adriatic coast, instead, it is only found on the coastal dunes.





### THE GREEN TOAD (*Bufo viridis*)

The green toad is a fairly common species in the Po Valley area and on mountainsides, occasionally even at altitudes in excess of 1,700m. It is often also encountered on the sand dunes, on the landward side of the dunes and even along the waterline on exposed beaches. It breeds between March and August in the small pools of fresh or brackish water between the dunes. On wetter, cooler days and at night-time, even in mid-summer, individuals of this species have been found wandering around the dunes, hunting down small invertebrates.

The only limitation to its presence in the coastline environment is the availability of suitable springtime breeding sites and the quality of the available water.





### THE SNOWY PLOVER (*Charadrius alexandrinus*)

The snowy plover is the most characteristic species of the Cavallino Treporti coastline. It nests in a simple depression dug into the sand, which it lines with bits of land grasses, seaweed and washed up twigs. The plover's eggs, which are very well camouflaged being brownish or greenish with black or charcoal patches and lines, are laid anytime between the end of March and June and are incubated by both parents for around three weeks. The plover feeds mainly on adult insects and larvae, crustaceans, molluscs and small beached animals.

This species is classified as endangered due to the numbers of swimmers and dogs on the beach, and oftentimes even crows and cats that, together with unusually high tides, result in the failure to breed successfully due to nest destruction, predation of eggs and young and the parents being driven off their nest.

For the safeguard of snowy plover nests, have been successfully tested forms of protection through as the placement of a fence around the nest of rope with 4 poles and signs attention or a block of iron mesh plastic with a small opening in front; the snowy plovers accept these new elements, leading to a successful nesting.



# ARE YOU A GOOD “GUARDIAN OF THE DUNES”?



## MIND THE DUNES

Use the special paths to get to the beach; leave all bicycles in the parking area. Put up beach umbrellas and lay down beach towels well away from the dunes.

## DID YOU KNOW?

That in order to prevent dune erosion, wooden WIND BARRIERS are set up on the beach to act as windbreaks and thereby favour the accumulation of sand; the new dunes that are formed in this way are then stabilised by planting species that are typical of this area and have long roots that hold the sand in place (*Ammophila littoralis*).





### DO NOT DISTURB

Do not disturb any of the animals that live on the dunes and, above all, do not go anywhere near any nests. In those areas where dogs are allowed, keep your dog on a leash.

### DID YOU KNOW?

That along the Cavallino Treporti beaches you will find the snowy plover, a bird species that nests right here on the beach from the end of March through to August; this species is currently at risk of extinction due to the disturbance caused by the presence of swimmers and dogs on the beach, which may result in the destruction of nests and eggs and the parents abandoning their young.

The entire Cavallino Treporti coastline is currently included in a plover monitoring and counting project.







## USE THE BINS!

Take all your rubbish away with you and don't throw any items or plastic bags into the water because they may be swallowed by the turtles, dolphins and whale calves, which mistake them for jellyfish and choke when they ingest them.

## DID YOU KNOW?

That the rubbish that we leave lying around takes a very long time to decompose, if at all, and therefore, as a carrier of pollutants, it releases hazardous particles, as in the case of plastics (microplastics, in other words microscopic plastic fragments) that get into the water systems and are then metabolised by the living organisms!

	tissue paper	3 months
	cigarette end	1 to 5 years
	orange and banana peels	1 to 5 years
	chewing gum	5 years
	plastic straws	20 to 30 years
	cigarette lighters	100 to 1000 years
	glass bottles	1000 years
	plastic bottles	never completely



# SUSTAINABLE UTILISATION

## SHOW SOME RESPECT FOR THE VEGETATION

Avoid trampling or removing any plant you may find on the dunes.

## DID YOU KNOW?

That trampling the dunes favours the spread of “ALIEN” species, in other words species that are not typical of this area or even of Italy as a whole (for example the evening primrose, the false indigo, etc); where this has occurred, the dunes have to be cleared of these plants in order to make way for the typical species.





## FIRE! FIRE!

Do not light fires along or near the beach; beware of cigarette butts! Should you come across the beginnings of a fire, contact the nearest authorities immediately.

## DID YOU KNOW?

That often very small careless acts can start fires that ravage the vegetation alongside the beaches.





### CHOOSE SOME OTHER SOUVENIR!

Leave the sand, the animals and the shells for the beach; tree trunks, branches, leaves and seaweed must be left where the sea dropped them. Choose some other souvenir or use the opportunity to pick up any rubbish left behind and dispose of it in the right manner!




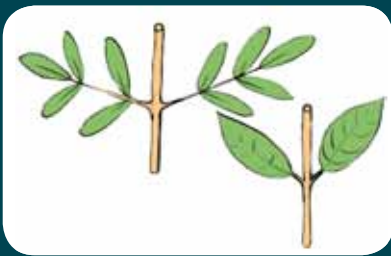

### DID YOU KNOW?

That tree trunks, branches, leaves and seaweed washed up onto the beach by the sea are an important part of the equilibrium of many beaches since they form the basis for sand removal and deposition and help to prevent beach erosion. Without these materials there is nothing to stop the waves washing right up the beach and they break more violently on the dune line, thereby eroding it away.



# PLANT IDENTIFICATION KEY

In order to identify the name of the plant that you are interested in, look closely at its characteristics and step-by step choose between the two alternatives shown on the identification key below, starting at no 1 and then moving on to the number indicated in your choice ... you will soon find out what species it is!

<p>1 Trees, creepers or bushes more than 50 cm tall</p>		<p>2</p>
<p>1 Herbaceous plants or bushes less than 50 cm tall</p>		<p>17</p>
<p>2 Scale-like leaves, 1-3mm long</p>		<p><i>Tamarix gallica</i> L. Tamarisk</p>
<p>2 Non scale-like leaves longer than 3 mm</p>		<p>3</p>
<p>3 Opposite leaves</p>		<p>4</p>
<p>3 Alternate leaves</p>		<p>6</p>



4 Compound leaves (made up of a number of totally separate leaves)



*Fraxinus ornus* L.  
Manna ash

4 Non-compound leaves



5

5 Plant with a thorn at the end of its branches. Flowers and fruit located at the stem of the leaf. The wood has an unpleasant odour (strip a piece of bark from a branch and smell it!)



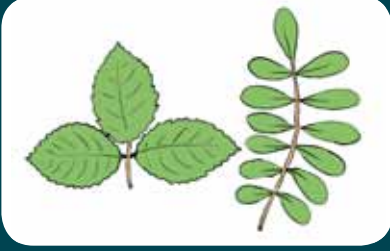
*Rhamnus cathartica* L.  
Buckthorn

5 Plant with no thorns. Flowers and fruit in corymb form. Wood without any unpleasant odour



*Cornus sanguinea* L.  
Common dog-wood

6 Compound leaves (made up of a number of totally separate leaves)



7

# IDENTIFICATION KEY

6 Non-compound leaves



8

7 Plant with thorns. Leaf edge serrated.



*Rosa canina* L.  
Dog rose

7 Plant without thorns. Leaves with unbroken edges



*Amorpha fruticosa* L.  
False indigo

8 Lobed leaves



9

8 Non-lobed leaves



11



IDENTIFICATION KEY

<p>9 Plant with thorny branches. Flowers with petals. Fleshy fruit</p>		<p><i>Crataegus monogyna</i> Jacq. Common hawthorn</p>
<p>9 Non-thorny plant. Flowers with no petals. Dry fruit</p>		<p>10</p>
<p>10 Penninerved leaves, green upper and lower surfaces. Acorn-like fruit</p>		<p><i>Quercus pubescens</i> Willd. White oak</p>
<p>10 Leaves palminnervie, green above, white-hairy below. Fruit different from an acorn</p>		<p><i>Populus alba</i> L. White poplar</p>
<p>11 Thorny plant</p>		<p>12</p>
<p>11 Plant without thorns</p>		<p>14</p>



# IDENTIFICATION KEY

**12** Leaf edge unbroken. Silver-grey leaves



*Elaeagnus angustifolia* L.  
Russian-olive

**12** Leaf edge serrated. Green leaves



**13**

**13** Greenish flowers. Leaves with arched veining. The wood has an unpleasant odour (strip a piece of bark from a branch and smell it!)



*Rhamnus cathartica* L.  
Buckthorn

**13** White or red flowers. Leaves with non-arched veining. Wood without any unpleasant odour



*Prunus spinosa* L.  
Blackthorn

**14** Leaves with no stalk or stalk less than 5mm long. Flowers with petals. Legume-type fruit



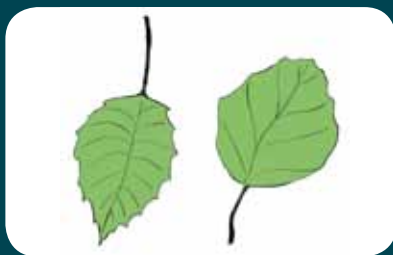
*Spartium junceum* L.  
Spanish broom





IDENTIFICATION KEY

**14** Leaves with stem longer than 5mm. Flowers without petals, capsule-type fruit



**15**

**15** Leaves smooth on both sides



*Populus nigra* L.  
Black poplar

**15** Leaves very furry, at least on the underside

**16**

**16** Leaves grey on the underside. Floral bracts with elongated prongs  
 Bract: modified leaf reduced and placed at the base of the flowers



*Populus canescens* (Aiton) Sm.  
Grey poplar

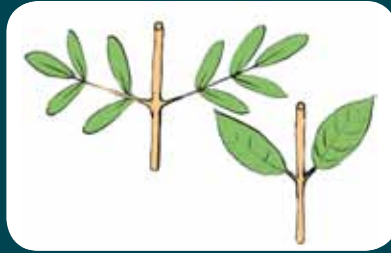
**16** Leaves white on the underside. Floral bracts with short prongs



*Populus alba* L.  
White poplar

# IDENTIFICATION KEY

17 Opposite leaves



18

17 Non-opposite leaves (alternate or verticillate)



24

18 Composite or deeply split leaves



19

18 Leaves whole



21

19 Yellowish flowers. Leaves very fragrant when rubbed between the fingers



*Ambrosia psilostachya* DC.  
Perennial ragweed





IDENTIFICATION KEY

**19** Blue-violet flowers. Leaves odourless



**20**

**20** Inferior lip of outer flowers shorter than the tube (magnifying glass!)



*Scabiosa triandra* L.  
Southern scabious

**20** Inferior lip of outer flowers longer than the tube



*Lomelosia argentea* (L.)  
Greuter & Burdet  
Silver scabious

**21** Succulent leaves ending in a sharp point. Flowers with no petals



*Salsola kali* L.  
Russian thistle

**21** Thin leaves not ending in a sharp point. Flowers with petals

**22**

# IDENTIFICATION KEY

**22** Leaves with serrated edges. Bilaterally symmetrical corolla



*Teucrium chamaedrys* L.  
Wall germander

**22** Leaves with smooth edges. Radially symmetrical corolla



**23**

**23** Pink flowers. Annual plant



*Silene conica* L.  
Striped catchfly

**23** Yellow flowers. Perennial plant, woody at the base



*Helianthemum nummularium* (L.) Mill.  
Rockrose

**24** Leaves not whole (composite or divided at least half way along the blade)



**25**





IDENTIFICATION KEY

<p><b>24</b> Leaves whole or slightly lobed</p>		<p><b>31</b></p>
<p><b>25</b> Three-lobed leaves</p>		<p><i>Medicago marina</i> L. Coastal medick</p>
<p><b>25</b> Leaves not three-lobed</p>		<p><b>26</b></p>
<p><b>26</b> Thorny or spiny plants</p>		<p><b>27</b></p>
<p><b>26</b> Plants not thorny or spiny</p>		<p><b>29</b></p>
<p><b>27</b> Lobed, non composite leaves. Thorns only on the fruit</p>		<p><i>Xanthium orientale</i> L. s.l. Cocklebur</p>
<p><b>27</b> Composite leaves with thorny edges or tips</p>		<p><b>28</b></p>

# IDENTIFICATION KEY

**28** Leaf segments flattened. Flower head-like inflorescence



*Eryngium maritimum* L.  
Sea holly

**28** Leaf segments not flattened. Umbrella-like composite inflorescence



*Echinophora spinosa* L.  
Sea fennel

**29** Leaves with strong aromatic fragrance when rubbed between the fingers, upper leaves opposite



*Ambrosia psilostachya* DC.  
Perennial ragweed

**29** Leaves without any aromatic fragrance, upper leaves alternate

**30**

**30** Pink flowers with 4 petals, not laid out in flower heads



*Cakile maritima* Scop.  
European sea rocket





IDENTIFICATION KEY

<p><b>30</b> Flowers without petals, grouped into rounded flower heads at the tips of the stems</p>		<p><i>Sanguisorba minor</i> Scop. Salad burnet</p>
<p><b>31</b> Needle-like leaves laid out in whorls</p>		<p><i>Erica carnea</i> L. Heather</p>
<p><b>31</b> Non needle-like leaves, alternate or all basal</p>		<p><b>32</b></p>
<p><b>32</b> Flat-base or heart-shaped leaves</p>		<p><b>33</b></p>
<p><b>32</b> Leaves neither flat-based nor heart-shaped</p>		<p><b>34</b></p>
<p><b>33</b> Lobed leaves. Non creeping stems</p>		<p><i>Xanthium orientale</i> L. s.l. Cocklebur</p>



# IDENTIFICATION KEY

**33** Non-lobed leaves.  
Creeping stems



*Calystegia soldanella* (L.) Roem. & Schult.  
Shore bind-weed

**34** Bright yellow flowers with petals



**35**

**34** Greenish or brownish flowers without petals



**36**

**35** Leaves narrower than 1cm. 5 Petals



*Fumana procumbens* (Dunal) Gren. & Godr.  
Fumana





IDENTIFICATION KEY

<p><b>35</b> Leaves wider than 1cm. 4 Petals</p>		<p><i>Oenothera biennis</i> L. Fragrant evening primrose</p>
<p><b>36</b> Laticiferous plant (Caution! The milky substance is an irritant for mucous membranes)</p>		<p><i>Euphorbia paralias</i> L. Sea spurge</p>
<p><b>36</b> Non-laticiferous plant</p>		<p><b>37</b></p>
<p><b>37</b> Stem leaves: more than 50, maximum length 4(-5)cm</p>		<p><i>Salsola kali</i> L. Russian thistle</p>
<p><b>37</b> Stem leaves: (if present) less than 50, usually longer than 4cm</p>		<p><b>38</b></p>
<p><b>38</b> Reed-like plants, usually taller than 1.5m</p>		<p><b>39</b></p>
<p><b>38</b> Non reed-like plants</p>		<p><b>40</b></p>

# IDENTIFICATION KEY

**39** Leaves longer than 50cm, wider than 7cm at the base. Equal or less than equal glumes (magnifying glass!)



*Arundo donax*  
L.  
Giant river reed

**39** Leaves usually shorter than 50cm, always narrower than 4cm. Unequal glumes, one markedly smaller than the other



*Phragmites australis* (Cav.)  
Trin. ex Steud.  
Common reed

GLUME: modified leaf that wraps around the base of the spikelets

**40** Leaves tipped with a sharp spine. Radially symmetrical flowers (magnifying glass!)



*Juncus acutus*  
L.  
Sharp Rush

**40** Leaves not tipped with a sharp spine. Non radially-symmetrical flowers

**41**

**41** Solid stems without enlarged nodes. Flowers with a single bract at the base (CYPERACEAE)








**42**





IDENTIFICATION KEY

<p><b>41</b> Hollow stems with enlarged nodes. Inclusive flowers between two bracts (POACEAE)</p>		<p><b>43</b></p>
<p><b>42</b> Inflorescence in the form of round flower-heads, at least the lower of which has a long peduncle</p>		<p><i>Scirpoides holoschoenus</i> (L.) Soják              Clustered club-rush</p>
<p><b>42</b> Inflorescence formed by a glomerule of ears enclosed by grassy bracts</p>		<p><i>Cyperus capitatus</i> Vand.              Capitata galingale</p>
<p><b>43</b> Raceme-like inflorescence. Plants form very dense clumps that may even be more than 1m wide</p>		<p><i>Ammophila littoralis</i> (Beauv.) Rothm.              Marram grass</p>
<p><b>43</b> Ear-like inflorescence. Plants do not form such large, dense clumps</p>		<p><b>44</b></p>

# IDENTIFICATION KEY

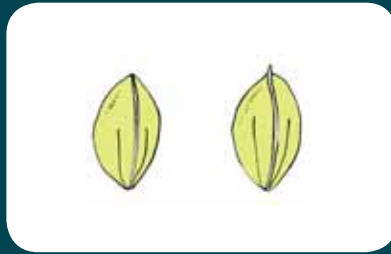
**44** Spikelets with protruding awns



**45**

**44** Spikelets without protruding awns

AWN: thin filament placed at the end of a glume of the spikelet



**47**

**45** One-sided inflorescence (all the spikelets point to one side)



*Vulpia membranacea* (L.) Link  
Dune fescue

**45** Non one-sided inflorescence

**46** Spikelets equipped with very sharp spines



**46**

*Cenchrus longispinus* (Hack.) Fernald  
Field sandbur

**46** Spikelets soft without any sharp spines



*Lagurus ovatus* L.  
Harestail grass



IDENTIFICATION KEY

**47** Spikelets alternate on opposite sides of the stem



*Agropyron junceum* (L.) Beauv.  
Sand couch

**47** Spikelets located all around the stem



**48**

**48** Annual plant without sterile shoots. Single flowered spikelets (magnifying glass!)



*Phleum arenarium* L.  
Sand cat's tail

**48** Perennial plant with sterile shoots. Two-flowered spikelets



*Koeleria macrantha* (Ledeb.) Schult.  
Prairie June-grass

**Note**

This guide is drawn from the printable version (field guide) of "The Mediterranean Garden of Eastern Venice (Bibione, VE): an interactive botanical guide" by Pier Luigi Nimis. Photography by Andrea Moro from the Life Sciences Department of the Trieste University, posted online by the "SiiT Inter-regional (Italy-Slovenia) Project" on the website:

[http://dbiodbs1.units.it/online\\_books/GiardinoMediterraneo\\_Fieldguide\\_ita/index.html#/1](http://dbiodbs1.units.it/online_books/GiardinoMediterraneo_Fieldguide_ita/index.html#/1)

# THE DUNES: VEGETATION

Place an X alongside the names of the plants that you recognise on the dunes.



**MARRAM GRASS**  
(*Ammophila littoralis*)



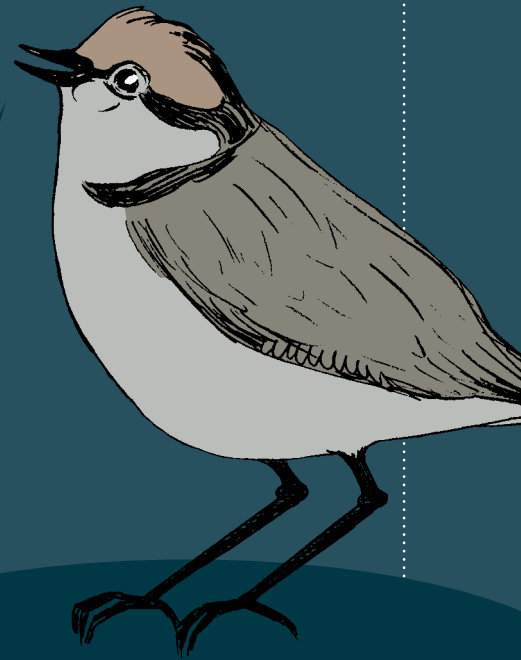
**EUROPEAN SEA ROCKET**  
(*Cakile maritima*)



**CAPITATE GALINGALE**  
(*Cyperus capitatus*)



**HARESTAIL GRASS**  
(*Lagurus ovatus*)



## THE DUNES: ANIMALS

Place an X alongside the names of the animals that you recognise on the dunes.

**SAND HOPPER**  
(*Talitrus saltator*)



**ANT-LION**  
(*Myrmeleon formicarius*)



**SAND HILL-SNAIL**  
(*Theba pisana*)



**ITALIAN WALL LIZARD**  
(*Podarcis siculus*)



SURVEY FORM





## THE DUNES: ALIEN PLANTS

Place an X alongside the names of the alien plants that you recognise (species that are not typical of this type of environment and should not be here on the dunes).



**FRAGRANT EVENING PRIMROSE**  
(*Oenothera stuechii*)



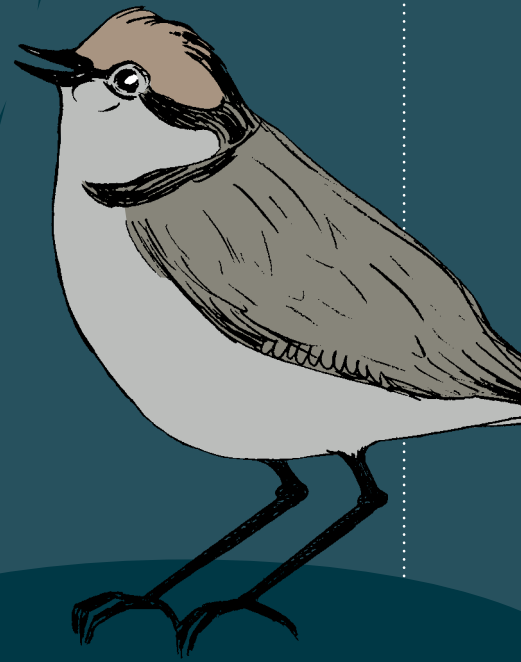
**FIELD SANDBUR**  
(*Cenchrus longispinus*)



**PERENNIAL RAGWEED**  
(*Ambrosia psilostachya*)



**FALSE INDIGO**  
(*Amorpha fruticosa*)



## LET'S EXPLORE THE BEACH AND THE DUNES

Date

How far from the waterline did you find the first plant?

Measure its height from the ground up

The aerial part of the plant has:

- flowers /  grassy stem /  stiff leaves
- hairy leaves /  fruits /  woody stem
- fleshy leaves /  thorny leaves /  thread-like leaves

You see birds?

If yes, do you recognise them? Can you describe them?

You see reptiles?

If yes, do you recognise them? Can you describe them?

You see insects and spiders?

If yes, do you recognise them? Can you describe them?

You see organic remains:

Eggs, plumage, feathers, clumps of fur, excrement?

You see tracks or prints:

Tracks, dens, nibbled plant remains?

Can you hear:

Birdsong or other animal noises?

You see inorganic remains:

Tins, plastic bottles, polystyrene objects?

Are there any man-made items or structures on the beach or the dunes?

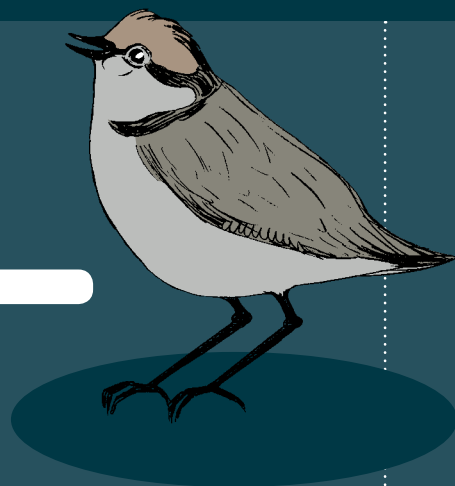
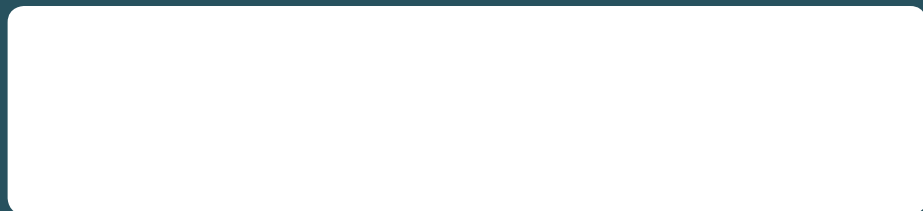
- YES /  NO

If yes, what type are they?

Do the beach and dunes "show any signs" of the summer season?

If yes, what are they?

Now try to sketch the outline of the dunes



## GLOSSARY

### ALIEN

Species not originally present in the study area to which it was introduced.

### ALLOCTHONOUS

Species found in an area that is outside of its usual distribution range and that has generally been introduced there by man or by atmospheric agents. Opposite of autocthonous.

### ANTHROPIC

Environment colonised and modified by man.

### AREAL

Range of distribution of a species.

### AUTOCTHONOUS

Animal or vegetable species that is indigenous to the area in question and that has not become modified in any way or transported naturally or by man.

### BEACH

An environment consisting of gravel or sand, specific to the shoreline, stretching from the dunes down to the water's edge.

### BIODIVERSITY

The variety of living organisms in any given environment.

### BIOLOGICAL CYCLE

For any species this consists of a combination of events and stages that take place in its members starting from a particular event and through to the repetition of that same event in its descendants (for example in the case of a plant: seed germination, flowering, fruit development, senescence and death).

### BIOTOPE

Part of an environment, generally rather small (pool, forest), inhabited by a single animal or vegetable population, or a community of living species.

### BLADE

Upper or lower surface of a leaf.

### BROADLEAF

Or "wide leaves" (as opposed to Needle leaf); all flowering and fruit bearing plants.

### BUSH

Small to medium-size woody plant (1 – 5m) with no distinctive trunk and branches sprouting at or very close to its base. It has a shrub-like appearance.

### DIURNAL

An animal that is only active during the day.

### DUNE

A sandy hill that forms on the coastline due to the accumulation of sand swept in by the wind and trapped by various plants.



## EAR

A longish, dense grouping of flowers (as in wheat).

## ECOSYSTEM

A system made up of all the animal and vegetable organisms that inhabit a particular site (biocenosis) and the prevailing environmental factors (biotope).

## GEOPHYTES

Perennial plants that survive the winter thanks to modified underground stems.

## HALOPHYTE

Organisms that tolerate highly saline environments, conditions that are usually found near the sea or brackish coastal pools.

## MESOXEROPHYTE

An organism, species or community that prefers environmental conditions with medium to low water availability and medium temperatures.

## MOSSES

Small plants with no vascular tissue (no vessels for transporting liquids) that grow in humid soils, on trees or rocks in colonies that are often very large.

## PSAMMOPHILE

Lives on the sand.

## RHIZOME

A surface or underground creeping stem that runs horizontally and develops buds on its upper surface and roots on its lower surface. Rhizomes also act as a reservoir of nutritional substances and may therefore be more or less enlarged or take on the appearance of a tuber ("potato-like").

## SANDBANK

Low, flat "islands" covered in dense halophyte vegetation that are common in the Venice Lagoon and in the lagoon channels of Cavallino Treporti.

## STEM

Part of the plant that bears leaves and flowers and links them to the roots; the stem also encloses the vessels that carry water, nutritional salts and sap.

## TROPHIC CHAIN

A sequence (chain) of the food relationships that link the various species that make up a biological community. It includes herbivores (that get the energy they require for life by eating plants and seeds), carnivorous predators (that get their energy by eating other animals), scavengers (that eat dead animals) and "detritivores" (that feed on organic debris and remains).

## VEINING

Branching of the vessels of the stalk that become thinner and run across the entire leaf to deliver water and nutritional substances.

## BIBLIOGRAPHY

AA.VV., 2002. Dune e spiagge sabbiose. Quaderni Habitat n. 4, Min. dell'Ambiente e della Tutela del territorio, Museo Friulano di Storia Naturale, Udine.

AA.VV., 2006. Progetto LIFE Natura Azioni concertate per la salvaguardia del litorale Veneto. Gestione degli habitat nei siti Natura 2000. Veneto Agricoltura, Servizio Forestale Regionale per le province di Padova, Rovigo, Treviso e Venezia.

BIONDI E., BLASI C., BURRASCANO S., CASAVECCHIA S., COPIZ R., DEL VICO E., GALDENZI D., GIGANTE D., LASEN C., SPAMPINATO G., VENANZONI R., ZIVKOVIC L., 2009. Manuale nazionale di interpretazione degli habitat della Direttiva 92/43/CEE, Società Botanica Italiana – Ministero dell'Ambiente e della Tutela del Territorio e del Mare. <http://vnr.unipg.it/habitat/index.jsp>

BONOMETTO L., 1992. Un ambiente naturale unico: le spiagge e le dune della Penisola del Cavallino. Un ambiente naturale unico, le spiagge e le dune della Penisola del Cavallino. CENA, Ripartizione Servizi Educativi, Comune di Venezia.

BONOMETTO L., CALZAVARA D., CANIGLIA G., CESARI P., 1980. I litorali sabbiosi del lungomare veneziano parte II - Lavori Soc. Ven. Sc. Nat. 4: 10-53.

BUFFA G., MION D., GAMPER U., GHIRELLI L., SBURLINO G., 2005. Valutazione della qualità e dello stato di conservazione degli ambienti litoranei: l'esempio del SIC Penisola del Cavallino: biotopi litoranei (Venezia, NE-Italia). Fitosociologia 42 (2): 3-13.

FRANCHI P., GORRERI L., MARCHETTI M., MONTI G., 2001. Funghi di ambienti dunali. Indagine negli ecosistemi dunali del Parco Naturale Migliarino San Rossore Massaciuccoli: 1-213. Grafiche 2000, Ponsacco (PI).

GIUSTI F., CASTAGNOLO L., 1982. I molluschi terrestri delle dune italiane: brevi cenni di ecologia, elenco delle specie e chiavi per il loro riconoscimento. Boll. Serv. Geol. It., 111, 199-215.

PIVA E., SCORTEGAGNA S., 1993. Flora e vegetazione del Delta del Po – Le zone Litoranee – Regione del Veneto, Segreteria per le attività produttive ed economiche del settore primario. 1-115, Arti Grafiche Padovane, Padova

## WEBOGRAPHY

Internet coastal encyclopaedia  
[http://www.coastalwiki.org:80/coastalwiki/Main\\_Page](http://www.coastalwiki.org:80/coastalwiki/Main_Page)

The Mediterranean Garden of Eastern Venice (Bibione, VE): an interactive botanical guide  
[http://dbiodbs.units.it/carso/chiavi\\_pub21?sc=578](http://dbiodbs.units.it/carso/chiavi_pub21?sc=578)

Italian manual for interpreting the habitats specified in Directive 92/43/CEE  
<http://vnr.unipg.it/habitat/index.jsp>

The SHAPE Project - Shaping an Holistic Approach to Protect the Adriatic Environment between coast and sea  
<http://www.shape-ipaproject.eu>





REGIONE DEL VENETO



This publication has been produced with the financial assistance of the IPA Adriatic Cross-Border Cooperation Programme. The contents of this publication are the sole responsibility of Veneto Region and can under no circumstances be regarded as reflecting the position of the IPA Adriatic Cross-Border Cooperation Programme Authorities.



The project is  
co-funded by the European  
Union, Instrument for  
Pre-Accession Assistance

**GENESI**EDIZIONI  
[www.genesidesign.com](http://www.genesidesign.com)

ISBN 978-88-96049-55-6



9 788896 049556

FREE COPY