Discovering the Orchids of Portugal and Neighbouring Regions

Daniel Tyteca, Jean-Louis Gathoye
and AOSP, Associação de Orquídeas Silvestres - Portugal

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Colophon

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Cover picture: Serra do Caramulo Orchid (*Dactylorhiza caramulensis*)
Serra da Estrela, top of the glacial valley of River Zêzere, 13 July 2018

Pictures on page 1:
Orchis anthropophora and *Androrchis mascula*, Alto da Pedra (Seoane, Galicia), 3 June 2023

Picture on next double page: Valley of the Douro River, next to Vila Nova de Foz Côa, 12 June 2023

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QTA DAS TULHAS

Contents

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Fig. 0.1. – Pinewood on calcareous, Antanhol (Beira Litoral), 14 April 2022.

Preface

João FARMINHÃO
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With unprecedented geographical coverage and rich illustrations, this book introduces us to the remarkable diversity of wild orchids in mainland Portugal and the neighbouring territories of Spain. It is the result of the longest natural history research ever conducted in Portugal by a non-resident. There is no doubt that we are dealing with an extraordinary subject and researcher.

Before guiding us through the monographic heart of the book, which includes detailed descriptions and distribution maps for all orchid species in the territory, as well as nearly 400 photographs, including previously unpublished hybrids, Daniel TYTECA introduces the reader to the morphological, ecological and evolutionary characteristics of the largest family of flowering plants: orchids, of course. After regaling us with a presentation of the most unlikely pollination strategies, among other peculiarities of orchid biology, including a symbiotic relationship with mycorrhizal fungi, he also provides geographical overviews to help readers who are more or less familiar with the region under study. This is followed by a history of orchidology in Portugal and a discussion of the different perspectives used in orchid taxonomy. A dichotomous and exhaustive identification key precedes the presentation of each of the 17 recognized genera.

Forty-two years of passionate work are summarized not only in the valuable information presented on the 68 species of orchids recognized in Portugal, which constitute the tour de force of this work that will forever remain a reference, but also in an acute awareness of the changes in the landscape that have had a negative impact on these plants and their habitats, which are the subject of the third and final part of this book. We must therefore pay close attention to the priorities and challenges identified by Daniel TYTECA in terms of orchid conservation in Portugal, including the practical consequences of the non-recognition of certain taxa presented in this book by the botanical community, the professional class to which I belong.

We are also grateful to Daniel TYTECA for showing us the human dimension of naturalist research. This is highlighted by the network of collaborations and friendships forged over many years of field trips, of which I am proud to be a part, and which is part of a very European phenomenon, that of *orchid watching*. The day we met, during an AOSP field session, we went to see a population of *Neotinea ustulata* in São João da Pesqueira, which has probably disappeared in the meantime. With this new reference for the study of the orchid flora of Portugal and neighbouring regions, our work is made easier to do more to preserve this precious natural heritage, thus avoiding further extinctions and perhaps adding new species to the list described here. By extending this invitation to discovery, we find ourselves in the field, surrounded by orchids. Now, as we read, we could not have a better guide to prepare us for the pleasure, but also sometimes the headaches, of identifying these very special plants!

Foreword – Daniel TYTECA

Why Orchids, why Portugal – Why people ought to be involved into safeguarding orchids and their habitats – Acknowledgements.

My passion for orchids dates back to July 1970, when I stumbled upon my first orchid by chance, on the edge of a path climbing the Ardennes hillside in the town of Nassogne, in my native Belgium. It was a *Platanthera bifolia*, a unique specimen, which immediately struck me and gave me the intuition that I was in the presence of something rare and precious. The next day, still in the Belgian Ardennes, I discovered my second orchid plant, again unique, on a path bordering an acidic peat bog; it was a *Dactylorhiza maculata*. I had the same deep, visceral impression. The following year, I decided to search for orchids more methodically; my collection grew rapidly and since then my passion for orchids has never left me.

Orchids are among the oldest families of flowering plants, in the sense that they were among the first to develop, in the Cretaceous period, some 76 to 132 million years ago (see summary in WANG et al. 2024), once flowering plants appeared on land some ... 170 ... million years ago[1]. They therefore had plenty of time to develop some of the most advanced strategies to ensure their adaptation to the living world and the viability of their offspring. This was very conducive to the development of some of the most numerous forms, varieties and species within the flowering plant families: depending on the classification system, there are currently some 28,000 to 35,000 species, as a quick search on the Internet reveals. This may explain the enthusiasm for them among thousands, even millions, of enthusiasts and other researchers around the world.

One thing led to another, and as my hobbies and passions developed, along with my scientific career, I became interested in orchids in Belgium, France, Europe... and around the world, until the day my travels took me to Portugal in 1983. There are many reasons for this, which I won't go into here. The fact remains that I have spent nearly 600 days, close to 20 months, or almost two years, in this country and its immediate surroundings, devoted almost entirely to the study and observation of orchids, in all seasons and in all regions. This led me to publish a 400-page summary (TYTECA 1998). Afterwards, I resumed my work with renewed vigor, but this time developing numerous collaborations. At the same time, around 2009-2010, various Portuguese enthusiasts got together and founded the AOSP, Associação de Orquídeas Silvestres – Portugal. This association, with which I was in contact from the outset, proved to be particularly active, and new knowledge about native orchids, often sensational, began to accumulate at a rapid pace.

Fig. 0.2. – My friends Eduardo SAMPAIO FRANCO and Maria Manuela DA COSTA FARINHA (here during an excursion around Bucelas, in April 1986 - photo P. QUENTIN) were among my very first contacts in Portugal.

It was in this context that the idea, which had been in the air for a long time, emerged to write a new book on the orchids of Portugal. And while I was at it, I decided to include neighbouring regions as well! During my many trips to Portugal, I never failed to explore the border areas, since orchids do not stop at borders, and many of the processes occurring in Portugal

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[1] https://www.tela-botanica.org/2019/01/les-fleurs-seraient-bien-plus-anciennes-quon-le-pensait/.

can be explained by what is happening “beyond the Douro” or “beyond the Tejo”! This led me to make other contacts, which will be detailed in the following pages.

The initiative to write a book on the orchids of Portugal and neighbouring regions aims not only to contribute to knowledge about this family of plants, but also, and above all, to raise awareness of the need to protect them. As we shall see, orchids are far from always being a priority for botanists and other nature conservation professionals, even though, as we shall also see, many orchids are seriously endangered and there are still gaps in the knowledge needed to take them into account adequately.

Orchids are the flag bearers of our natural biotopes. Where there are orchids, it is because interactions with other components of the living world are functioning well; these components include other plants, other orchids, mycorrhizal fungi, pollinating insects, etc. I would like to paraphrase a text by Ben Jacob, author of the best-selling book “The Orchid Outlaw ,”[2] in which he describes the extraordinary efforts he must undertake to save British orchids, which are treated in a totally inadequate manner, if at all, by the legislative mechanisms supposed to protect them, often putting himself in situations and positions that are "outlaw ", that could land him in jail and force him to pay heavy fines! At the end of his journey, here is what he says:

> « *It has been a journey full of surprises, from there to here in the predawn dark. I have discovered a history of orchids stretching back over a thousand years which has shown ways in which they and humans have long been interlinked. People have prized them; studied, eaten and drunk them; collected them; assigned desires and morals to them; saved, abandoned and destroyed them. This is proof, were it needed, that we do not live in a world separate from nature. That is why wild orchids matter. They can teach us about humans, remind us about the past and warn us about what is coming.* »

May this work contribute – if possible, in compliance with the law! – to safeguarding this essential component for maintaining our biodiversity!

Fig. 0.3. – A herd of goats helps maintain an orchid area. Cesaredas, Lourinhã, Estremadura, 5 April 2016.

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[2] Ben Jacob, 2024. The Orchid Outlaw – On a Mission to Save Our Rarest Flowers. John Murray Press, London.

Acknowledgements from Daniel TYTECA

After 42 years devoted largely to studying orchids in Portugal (and elsewhere), I must express my deepest gratitude to various people, without whom this work would not have been possible! I already had the opportunity to do so once, when my 400-page article was published in 1998 in the German *Journal Europäischer Orchideen*, but since then, I have had even more encounters that have proved even more decisive.

There are constants, both before and after 1998. Starting with my family, of course, especially my wife Brigitte and my daughter Laureline; thank you for your unwavering patience and boundless support, both emotional and moral, as well as logistical, throughout these years. Thanks also to my colleague and friend Jean-Louis GATHOYE, who has contributed greatly, from 1990 to the present day, to making many of my travels in this charming corner of the continent less arduous and more fruitful. Of course, I have made some Portuguese contacts, particularly since 1985 with my dear friends and fellow orchid lovers Eduardo SAMPAIO FRANCO and Maria Manuela DA COSTA FARINHA, who have accompanied and guided me on countless field trips, sometimes leading to important discoveries.

However, it was more after the 1998 publication that contacts and friendships were formed among colleagues, orchid lovers and other orchidologists, both Portuguese and Spanish, as well as Belgian and others. Starting with Ana DELAUNAY CAPERTA, an outstanding biologist and geneticist at the Instituto Superior de Agronomia in Lisbon, a lover of orchids, and an irreplaceable companion on numerous excursions during my trips to Portugal from 1998 until recently... During this long period, our joint field observations and endless discussions were a considerable source of inspiration for me. This "contact," much more than a simple contact, led to other contacts, including Ana Sofia RÓIS, a student of Ana CAPERTA, whom we co-supervised for her final thesis on Ophrys in 2005... I swear I have never known anyone else who is such a brilliant observer of orchids: it was Sofia who introduced me to my first two pseudo-copulations of insects on *Ophrys* (in Belgium! and also in northern France).

And in the meantime, events were unfolding rapidly. From 1999 to around 2006, I had fruitful contacts and field visits in the Algarve and Alentejo with a team from the University of Évora, composed of Marízia DIAS PEREIRA, Rute CARAÇA and Cristina CARRIÇO. In addition, in 2001, my colleagues Jean-Louis GATHOYE and Nicolas DEVOS and I met a team of Galician researchers who have made significant contributions to the study of orchids in Galicia... right up to the present day! Manuel PIMENTEL, Marcos PERILLE and Elvira SAHUQUILLO, from the University of A Coruña, guided us in the field; more recently (2024!), they have notably demonstrated how apomixis is implemented in certain *Dactylorhiza* species! Finally, between 2002 and 2004, other meetings and collaborations took place with Sonia BERNARDOS and her husband Francisco AMICH, from the University of Salamanca, who, as part of Sonia's doctoral thesis, made excellent contributions to our knowledge of the orchids of Castilla y León... as well as northern Portugal. Both are authors and co-authors of numerous articles on the orchids of these regions, to which they very warmly associated me.

Other fruitful collaborations were developed at the beginning of the 21st century, involving Michael LOWE (UK), Marc WALRAVENS (Belgium), Javier BENITO AYUSO (Logroño, Spain), and finally Pamela SCRATON. The latter was a British retiree who divided her time between Portugal (Algarve) and Cyprus, and produced countless data on orchids that we were able to benefit from. We finally met her in the Algarve on March 4, 2011, for a memorable day. Sadly, we learned of her death shortly afterwards. It was also around this time that I first came into contact with Miguel PORTO, then a student, who pointed out some important natural sites to us and who would later play an important role in the Flora-On website and the Red List of Threatened Plant Species in Portugal.

It was at the end of that period, around 2006, 2007... I don't remember exactly, because I irretrievably **lost my field notebook** containing my observations and data for the period 2006-2008! A terrible disaster for any field naturalist. So it was at the end of that period, as I was saying, that I was contacted by some Portuguese people who were interested in orchids, not professionally, but as a hobby... The first were, not necessarily in that order, José MONTEIRO, Joaquim PESSOA and his partner Luísa

BORGES, all three from Coimbra, and Ivo RODRIGUES from Beja... who took me into the field to share their extensive knowledge of native orchids with me. They were followed by others, including Cassiano MONTEIRO (not the brother of the first!) and his partner Hermengarda URBANO, from Porto, Américo PEREIRA, Francisco AREIAS, João FARMINHÃO and many others... By coming together, these passionate individuals contributed to furthering our knowledge of Portugal's orchids and enabled me to make even more progress, whether by sharing their discoveries, providing a wealth of information, particularly in terms of distribution, or collaborating significantly and generously in my work, which led to several "Addenda" to the 1998 Flora of Orchids of Portugal, guiding me in the field, sometimes to very remote, unusual and difficult-to-access locations, welcoming me into their homes, supporting and encouraging me... or all of the above! In 2010, their group was formalized with the founding of the AOSP, Associação de Orquídeas Silvestres – Portugal, and they invited me to take part and speak at the first plenary meeting of their association, "À Volta das Orquídeas," in 2011, in Penela, Beira Litoral. Since then, our collaboration has continued, and it is for all these reasons that I wanted to involve them in the preparation of this important work on the orchids of Portugal and neighbouring regions.

Other fruitful encounters followed, starting with Caspar VENHUIS, a Dutch specialist in *Serapias*, who was also invited to the first "À volta das Orquídeas" meeting. Next, I must mention Luís NUNES ALBERTO, from Paderne (Algarve), who has taken me several times since 2011 to his region of the Algarve, which he knows so well, to discover several places and species in sometimes unusual situations. More recently, in 2022, various local experts contacted me and took Jean-Louis and me to places they know well: Armando FRAZÃO for the Serra da Arrábida, Luís AFONSO in the Serras de Aire e Candeeiros Natural Park, and finally Udo and Claudia SCHWARZER, German emigrants living in Aljezur, who showed us or pointed out some of the Algarve's special features, and not just in the field of orchids.

To be complete, I must mention the incredible journey that Jean-Louis and I were invited on in 2023 by Antonio RUIZ DE GOPEGUI (known as "Toño") and Laurentino GARCIA (known as "Tino"), two distinguished nature guides, assisted by an amazing guide-interpreter, Nick PETERS, in their province of Palencia, east of Castilla-y-León (strictly speaking, outside the territory covered by this book), to help us discover the secrets of their region, including the famous *Dactylorhiza cantabrica*, which we were also lucky enough to see in Galicia.

Fig. 0.4. – Your humble servant photographing *Gymnadenia conopsea* … unless it's *Gymnadenia borealis*! Alto da Pedra, Serra do Courel, Galicia, 3 July 2009 (photo Jean-Louis GATHOYE) →

About the authors …

Daniel TYTECA and Jean-Louis GATHOYE

Born in 1950, Daniel TYTECA is an engineer in applied mathematics and holds a doctorate in applied natural sciences. He has spent most of his career at the Catholic University of Louvain, where he is now Professor Emeritus. He has been a member of the Louvain School of Management and the Earth and Life Institute at UCLouvain. His teaching and research activities have focused in particular on the economic analysis of the environmental impacts of human activities, the development of mathematical indicators of the environmental efficiency of industrial activities, as well as the systematics, ecology and evolution of orchids in Europe and the Mediterranean Basin. It was in this latter capacity that he became closely interested in the orchid flora of Portugal and neighbouring regions, and that the idea arose, after more than 40 years in the field, to write a book on the subject, for which he benefited greatly from the information and knowledge provided by the AOSP, Associação de Orquídeas Silvestres – Portugal, with which he has been in contact since its creation in 2010! He is also passionate and active in the field of nature conservation.

Jean-Louis GATHOYE, a biology graduate from the University of Liège, attached to the Department of Natural and Agricultural Environment Studies (DEMNA) of the Walloon Region, has been collaborating for many years with D. TYTECA in the field of knowledge of orchids in Europe and the Mediterranean Basin, particularly in the biosystematic study of complex genera such as *Dactylorhiza*, *Orchis* (in the broad sense), *Platanthera* and *Epipactis*. In this capacity, he has participated with Daniel TYTECA in several trips to study orchids in Portugal and the Iberian Peninsula.

AOSP, Associação de Orquídeas Silvestres – Portugal – Cassiano MONTEIRO

On the initiative of a group passionate about botany, particularly the Orchidaceae family, and the natural environment, the AOSP – Associação de Orquídeas Silvestres – Portugal was created on October 18, 2010. This non-profit association is dedicated to the study, conservation and promotion of wild orchids in Portugal. The founders of the AOSP are: Luísa BORGES, José A. DA COSTA PINTO, Ivo B. RODRIGUES, Joaquim C. PESSOA, Francisco G. AREIAS, José A. MONTEIRO, Alfredo M. FRANCO, Duarte V. MARQUES and Serafim C. PESSOA.

Since then, the AOSP has promoted and organized various awareness-raising activities, field trips and studies of new sites and species across the country, thereby improving knowledge, awareness and protection of wild orchids. Every year, it offers its members a space for sharing, the “Around Orchids” meeting, with conferences, field trips and exchanges with similar associations in other countries.

The AOSP has collaborated with several researchers, institutions and other associations that promote the protection of biodiversity and natural heritage. Among its ongoing work is its partnership with the Portuguese Botanical Society to implement the “Red List of Vascular Flora of Mainland Portugal” project.

The AOSP is committed to maintaining momentum in understanding and preserving orchid habitats in Portugal.

Fig. 0.5. – *Spiranthes spiralis*, tranças de outono, → Miranda do Douro (Trás-os-Montes e Alto Douro), 13 September 2025 (photo Cassiano MONTEIRO)

1. Generalities about orchids

1.1. Orchids in the plant kingdom

When trying to classify orchids in the plant kingdom, we must first note the obvious: they are flowering plants... which in botany are called angiosperms. Within this group, orchids belong to the monocotyledons, in short monocots, a group of plants whose seedlings (young plants) have only one leaf, called a cotyledon. Monocots also have other characteristics that distinguish them from other flowering plants, notably (1) they generally have leaves with a simple structure, without lobes, with parallel veins, (2) they cannot form woody tissue (therefore, there are no trees in the strict sense within the monocots) and (3) they have trimeric flowers (3 sepals, 3 petals, 2 x 3 stamens, 3 carpels).

In the photo in Fig. 1.1 (taken in Portugal), we see three monocotyledons: from left to right, an Amaryllidaceae, the hoop-petticoat daffodil (*Narcissus bulbocodium*), an Asparagaceae, the single-leaf squill (*Scilla monophyllos*), and an orchid, the man orchid (*Orchis anthropophora*). It was really lucky to be able to photograph them side by side, because these three plant families, Asparagaceae, Amaryllidaceae and Orchidaceae, have the distinction of belonging to the same order of flowering plants, Asparagales, as shown in Fig. 1.2 (HÖRANDL et al. 2024). This figure actually represents a complete genealogy of the flowering plant world (Angiosperms), one of the first representations obtained in this form. The three families we have mentioned are indicated by red arrows: we can see that the Orchidaceae, located at the top of the Asparagales genealogy, are therefore the most primitive (those that appeared earliest), in contrast to the other two families, located at the bottom. “Primitive” does not mean “less evolved”: starting from this position, orchids have developed, in the course of evolution, some of the most remarkable forms, structures and strategies in the entire plant kingdom, which we will have the opportunity to discuss further in this book.

Fig. 1.1. – Three monocots belonging to the order of Asparagales: from left to right, *Narcissus bulbocodium*, *Scilla monophyllos* and *Orchis anthropophora*. Serra dos Candeeiros (Portugal), 28 March 2008.

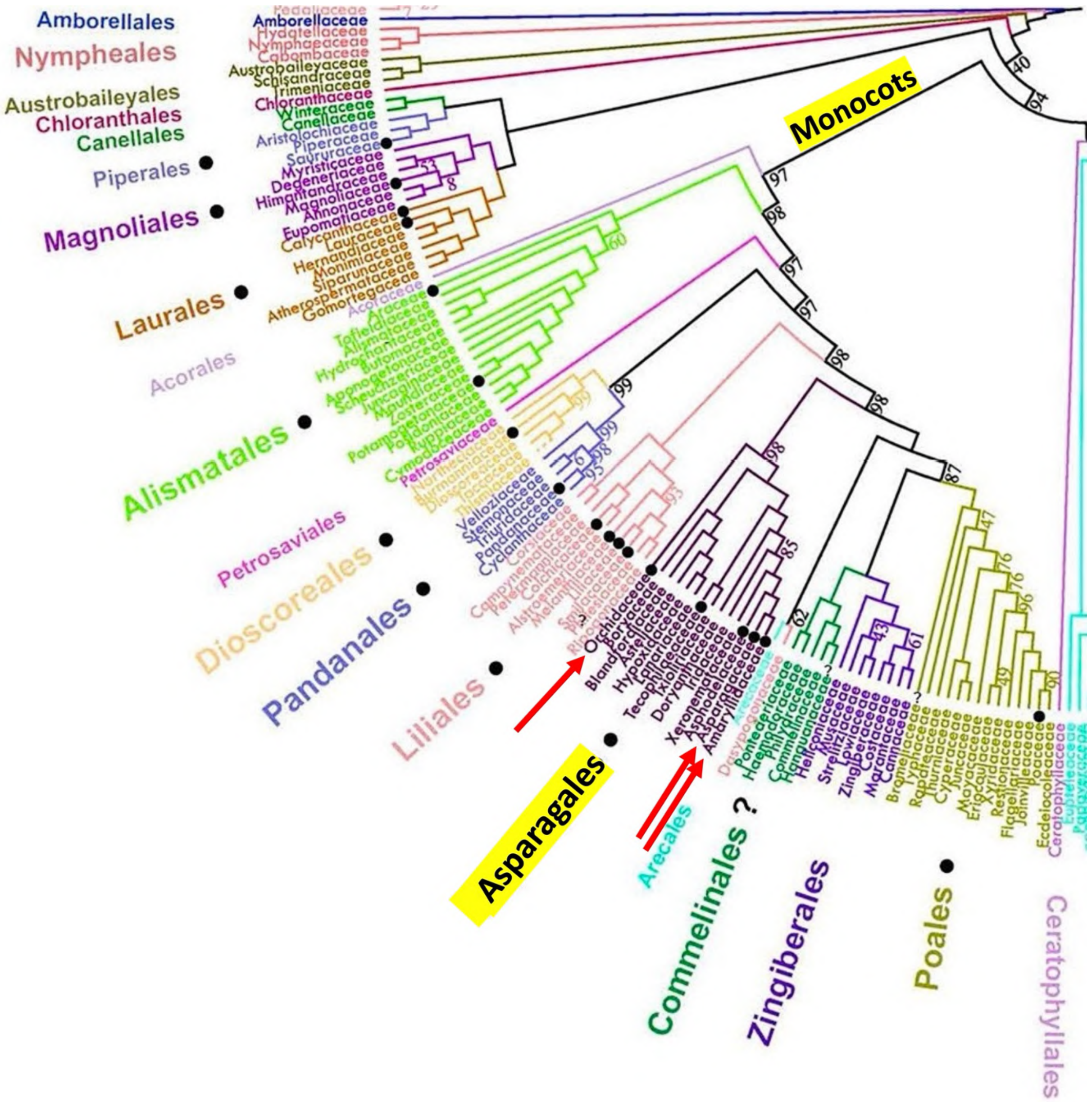


Fig. 1.2. – Taken from Figure 1 in HÖRANDL et al. (2024): Phylogeny of angiosperm families and orders. The extract shown is the lower left quarter, comprising monocotyledons [meaning that less than a quarter of flowering plant families are monocotyledons; in the figure, these range from the order Acorales to the order Poales (which includes grasses)]. The red arrows indicate the three plant families mentioned in the text. The black dots in the figure indicate the orders and families where apomixis appeared (see further in the text), which is therefore a phenomenon that may have appeared in various families throughout the phylogenetic tree of angiosperms, and is thus far from being an isolated process. The original figure comes from the article by LI et al. (2021), Open Access, with permission.

1.2. Biology of orchids

Orchids maintain close relationships with their partners in the living world, whether they are plants, fungi, or animals. As with all plant species, there is competition for available space, and since orchids are small herbaceous plants, they face competition from other herbaceous species, particularly those that tend to grow in large, dense colonies, as well as from shrub species, whose shade can hinder the growth of many orchids. Most often, orchids do not form colonies with very large numbers of individuals, and are found in small numbers or small populations.

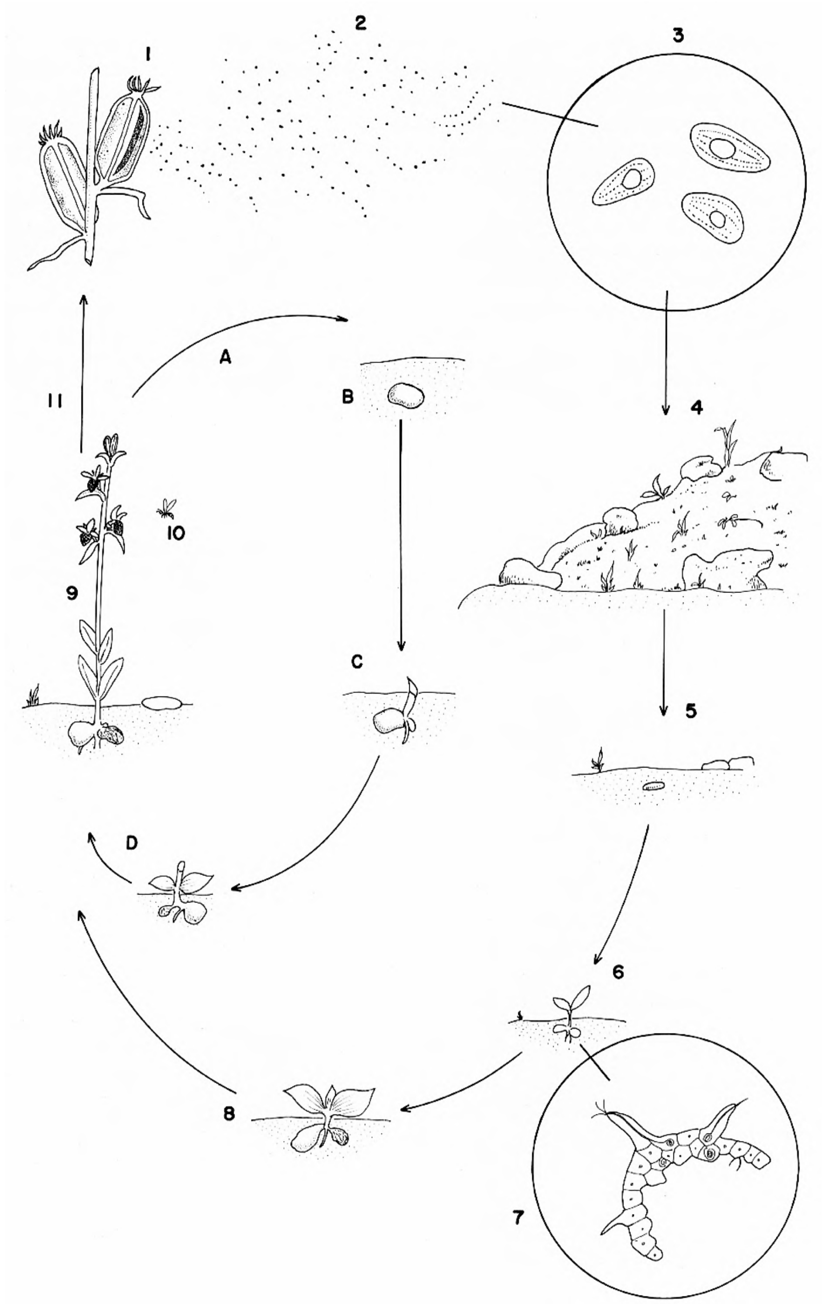


Figure 1.3. – Life cycle of a tuberous orchid plant (De Angelis & Lanzara 1987, based on Davies et al. 1983).

1 – Opening of the capsules;
2 – Release of seeds;
3 – Enlarged view of seeds;
4 – Seeds land on the ground;
5 – Germination;
6 – Seedling development;
7 – Enlarged view of the association with the mycelium;
8 – Leaf and tuber development;
9 – Mature flowering plant;
10 – Insect visit;
11 – Development of capsules and seeds;

A – Disappearance of aerial parts;
B – Survival of the new tuber;
C – Leaf development and appearance of the new tuber;
D – The cycle begins again...

Life cycle

However, it is in terms of interactions with fungi and animals that the interactions are most remarkable. To illustrate the complete life cycle, let us start with the diagram in Figure 1.3, based on an *Ophrys* plant, a tuberous orchid. The numbers indicated in the text below refer to those in Figure 1.3.

Orchid seeds are tiny, about 1/2 mm long, and are contained in large numbers in capsules after fruiting (1). The agglomeration of orchid seeds is often compared to sawdust. When the capsules are ripe, they open and release the extremely light seeds, which can be carried by the slightest breeze, sometimes over considerable distances (2). However, most of them will fall in the immediate vicinity of the mother plant.

When viewed under a powerful magnifying glass (3), these seeds appear rudimentary, with a poorly differentiated central embryo enveloped in a thin membrane composed of a network of protective cells formed from the outer integument of the ovule. These seeds, which fall to the ground (4), cannot germinate spontaneously and require the intervention of a fungus, whose mycelium filaments, present in the soil, invade the seed. This is often referred to as a symbiosis, called mycorrhiza: the fungus provides the orchid with the substances necessary for its growth (including mineral salts), while the orchid seed contains elements that stimulate the growth of fungi (vitamins – see BOURNÉRIAS & PRAT et al. 2005).

Under normal conditions (i.e., when the symbiosis is balanced, with neither partner destroying the other), the seed can germinate (5), giving rise to a seedling (6). The orchid plant can then become autonomous by getting rid of the mycorrhiza; however, most species maintain a more or less strong association throughout the orchid's life (7). It then takes several years for the seedling to develop into an adult orchid plant, with leaves and roots, capable of flowering (8).

An annual cycle then begins, which can be repeated throughout the orchid's life. The plant flowers (9) and generally needs insects to visit it (10) to ensure pollination, i.e., the deposition of pollen on the stigmas (see below). If pollination is successful, the ovary develops into a capsule containing seeds (11). Meanwhile, during annual growth, for orchid species with tubers (as shown in Fig. 1.3), the tuber of the year is depleted, but a new tuber develops, storing the nutrients needed by the plant for the following year through photosynthesis. It is in the form of this new tuber that the orchid spends the winter (B). In late fall, winter, or early spring, new leaves appear (C), the plant grows (D) to become a flowering plant again in spring or summer (9), and the cycle begins again.

The description we have just given is greatly simplified; interested readers will find more details in more comprehensive works, such as BOURNÉRIAS & PRAT et al. (2005). It should also be noted that flowering does not necessarily occur every year: the plant then spends the entire season in a vegetative state, with the leaves continuing to feed the new tuber. Furthermore, we have just described what happens with tuberous orchids; many of our species do not have tubers, but rhizomes; however, the life cycle is broadly the same.

The orchid plant

The orchids found in our regions are mainly terrestrial plants (geophytes), meaning that their permanent parts, located at the bottom of the stem, spend their entire life cycle in the soil. From this point of view, our orchids can be divided into two types: tuberous species and rhizomatous species, as mentioned in the previous section. In the identification keys, these underground parts are never used, so as not to encourage novices to dig up plants for identification purposes! The other characteristics are always more than sufficient for this purpose.

It should be noted that there are other biological forms of orchids, including the important class of epiphytes, which have no parts in the ground and include many orchids from tropical regions that grow in trees and whose aerial roots feed the plant from elements suspended in the moisture-saturated air. Some species of orchids found in our latitudes, but not in the territory covered by this book, can be related to epiphytes, namely *Liparis* and *Hammarbya*, which grow in moss or sphagnum carpets.

Apart from their underground organs, orchids in our regions have a single stem, usually with leaves (sometimes rudimentary) in the lower part and an inflorescence in the upper part. The leaves, which vary in number, may be clustered mainly just above ground level (as in *Orchis* and related genera, *Platanthera*, *Ophrys*, *Himantoglossum* and *Goodyera*), some distance from the ground (as in the case of chlorophyllous *Neottia* or *Gennaria diphylla*), or distributed along the stem (as in the case of most of our orchid genera) (see Fig. 1.4). The inflorescence, which is always simple (unbranched), takes on a multitude of forms: short or elongated, with few or many flowers, compact or loose, unilateral (with all flowers on one side) or multilateral, etc. Where applicable, the identification key takes all these different possibilities into account.

Fig. 1.4. – Different ways of carrying leaves in our orchids. From left to right: *Androrchis mascula*, most leaves carried at the base of the plant; *Gennaria diphylla*, leaves arranged in tiers above ground level; *Epipactis lusitanica*, leaves distributed evenly along the stem, up to the inflorescence; *Dactylorhiza elata*, a variant of the previous species, where the leaves decrease in size from the ground to the inflorescence (all photos taken in Portugal).

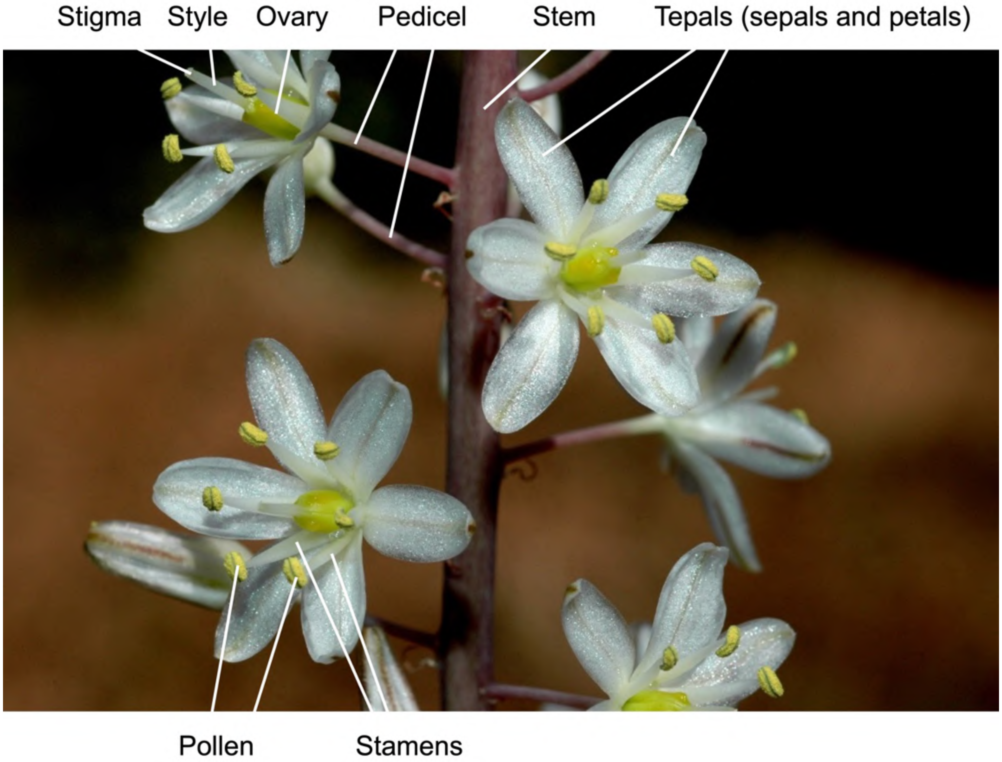


Figure 1.5. – Flowers of maritime squill, *Drimia maritima* (Asparagaceae).

The orchid flower

Let us now turn to a more detailed description of the morphology and functioning of the orchid flower. Although it is not directly related from a genealogical point of view, but still quite closely related (see the discussion in section 1.1), it is useful for educational purposes to compare the orchid flower with that of an asparagaceous plant. To this end, Figs. 1.5 to 1.9 illustrate, on the one hand, a sea squill (*Drimia maritima* – a Mediterranean asparagaceae) and, on the other, several orchid flowers.

In asparagaceae (Fig. 1.5), the flower is connected to the plant's stem by a floral pedicel. The flower is radially symmetrical, in the sense that it can be observed in relation to the center (by rotating the flower 60, 120, or 180° around its central axis, we obtain exactly the same arrangement of floral parts). The corolla is composed of three sepals and three petals, which are generally identical and can be grouped together under the name tepals. The female organ of the flower, the pistil, consists of the ovary at the base, extending into a style that ends in three stigmas. The ovary is clearly visible in the center of the flower, above the corolla; it is said to be superior. The male organs of the flower are the stamens, usually six in number, bearing pollen at their tips that is carried away by visiting insects.

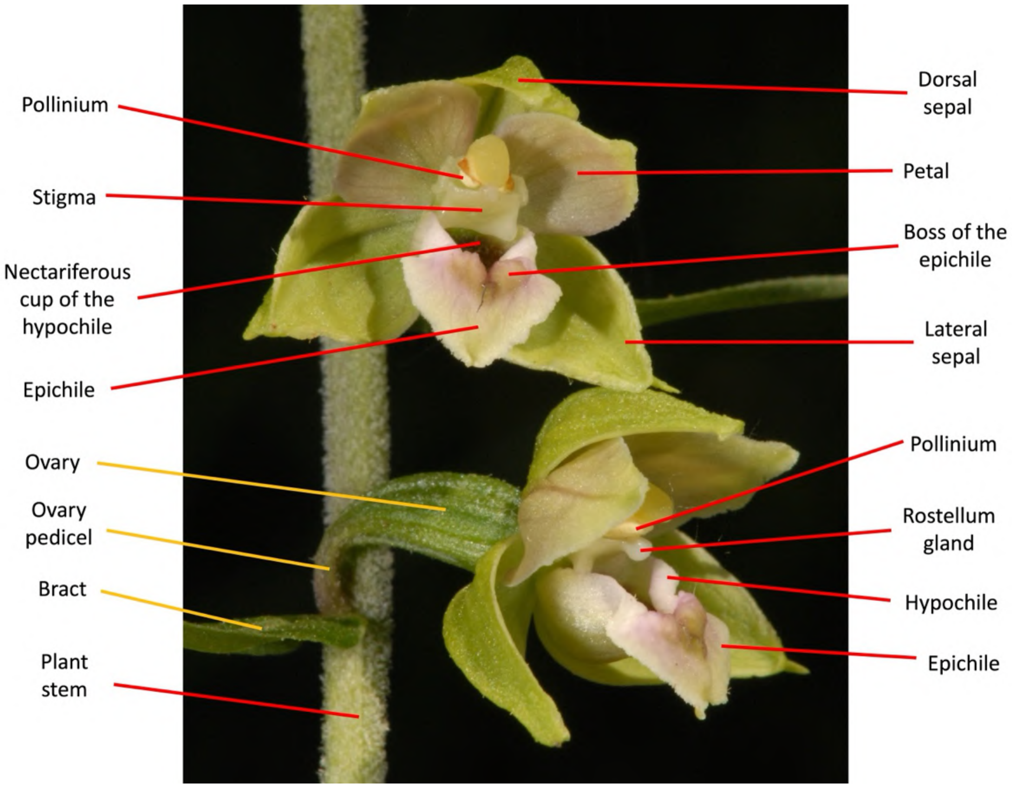


Fig. 1.6. – Flowers of *Epipactis helleborine* (Serra de Nogueira, Portugal), showing the different parts.

In orchids, symmetry is no longer radial but bilateral, in the sense that the left half of the flower is a mirror image of the right half (Figs. 1.6–1.9). The ovary is now in an inferior position: it is located behind the flower. It is sometimes extended by a pedicel that connects the flower to the stem (see Fig. 1.6); however, this pedicel is most often absent. There are always six floral parts (tepals), divided into three sepals and three petals, which are often quite distinct from each other. One of the essential characteristics of orchids is the transformation of one of the petals into a remarkable part, the **lip** or **labellum**. This is generally the part of the flower that attracts pollinating insects; to this end, it can take various forms, some examples of which are shown here. In *Epipactis* (Fig. 1.6), the labellum is subdivided into a hypochile at the base and an epichile at the top. The former is shaped like a pocket and usually contains nectar; the latter serves as a landing pad and is separated from the hypochile by a constriction. The epichile is usually decorated with variously colored ridges or bosses. In many orchids, such as *Orchis* (Figs. 1.7–1.8), the labellum extends into a spur, which is sometimes nectariferous. Another distinctive feature of orchids is that the labellum faces downwards (towards the ground) as a result of the flower tilting or the ovary or its pedicel twisting through 180°. Without this tilting or twisting, the labellum would point upwards, a position it sometimes occupies in certain species (but never in the species found in the southwest of the Iberian Peninsula).

Fig. 1.7. – Flower of the hybrid between *Androrchis provincialis* and *A. mascula* (Carvalhal, Beira Litoral, Portugal), showing the different parts.

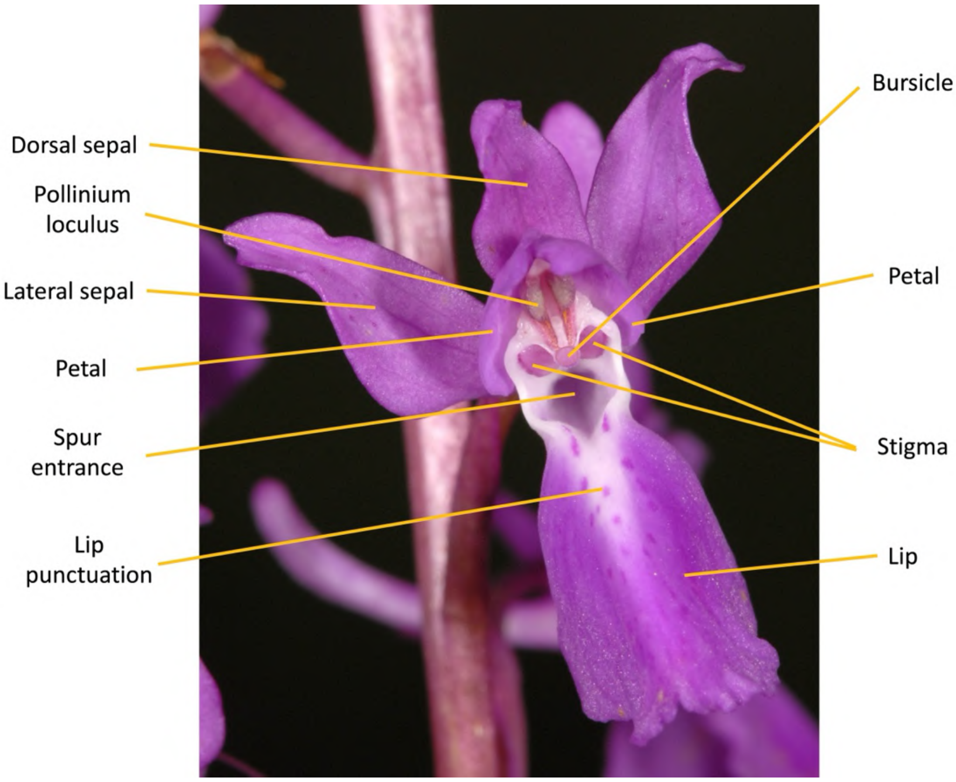


Fig. 1.8. – Flower of *Androrchis langei* (Vinhas, Trás-os-Montes, Portugal), showing the different parts.

Finally, one last essential aspect of orchids, unique to this family of plants, concerns the arrangement of the sexual organs themselves. In all species found in the southwest of the Iberian Peninsula, only one fertile stamen remains, subdivided into two or four pollen packets called pollinia; these are sessile in *Epipactis* and related species; in *Orchis* and similar species, each pollinium is extended into a caudicle (small pedicel), equipped at the base with a viscous disc that allows it to adhere to the head of the insect (see Fig. 1.9). Traces of the other stamens sometimes remain in the form of staminodes (see Fig. 1.9). Of the three original stigmas, two remain functional, usually fused together; the third stigma has changed into a special structure called the rostellum, which plays various roles depending on the species. In *Epipactis* (Fig. 1.6), it has a gland containing a viscous substance that allows the pollinia to adhere to the insect's head; in other species such as *Orchis*, the rostellum has transformed into a bursicle that protects the viscous discs located at the base of the pollinia. All of these sexual parts are merged into an organ called a column or **gynostemium**, which is unique to the orchid family.

The functioning of the flower and pollination by insects

Orchid flowers are wonderfully organized to ensure that pollination, which in most cases occurs through insects, is carried out as efficiently as possible. The general principle is simple: the insect lands on the labellum; in search of nectar (whether successful or not – see below!), or for some other reason, part of its body (usually its head or other organs) hits the rostellum (or its gland), allowing the pollinia (possibly via the caudicles) to adhere to that part of the body. When the insect lands on the labellum of another flower, the pollinia are generally in a good position to encounter the stigmas, thus ensuring the pollination of the flower.

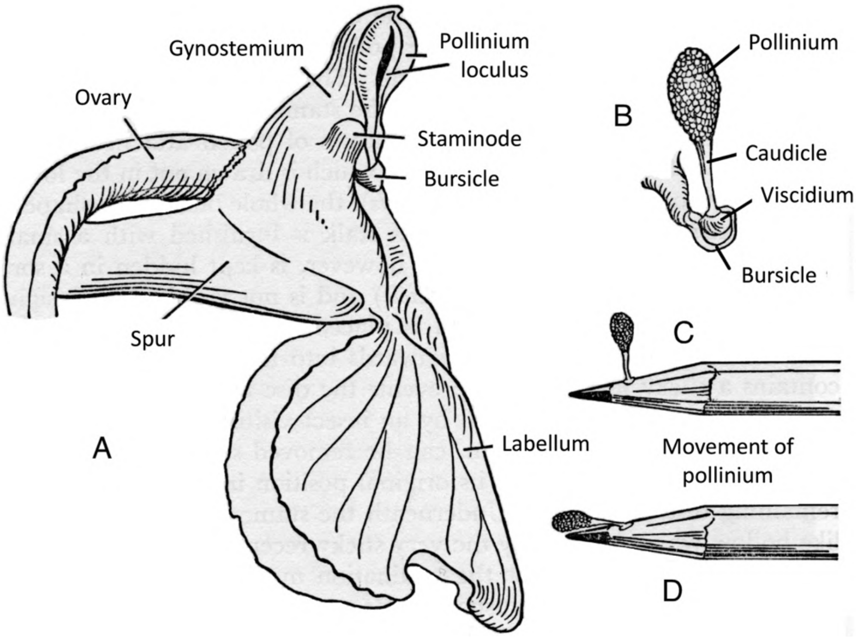


Fig. 1.9. – (A) Early purple orchid flower (*Androrchis mascula*) shown without sepals and petals. – (B) Detail of the pollinia and its parts. – (C) and (D) The "pencil test": movement of the pollinia (SUMMERHAYES 1968; B, C, D after DARWIN 1891).

Different species of orchids have all kinds of mechanisms, each more ingenious than the last, which ensure that pollen collected from one flower is deposited not only on another flower, but if possible, on a flower from another plant, so as to achieve cross-pollination, which is essential for genetic exchange between different individuals. Let's take the example of the early purple orchid (*Androrchis mascula*), which was already elucidated in the 19th century by the great biologist Darwin (1891) (Fig. 1.9). To understand what happens, we can use a pencil to replace the insect for the duration of the experiment.

By placing the pencil in front of the flower, we aim for the entrance to the spur until the tip touches the bursicle. By making a few slight movements that simulate the movements of an insect searching for nectar, we eventually expose the sticky disc; when we then remove the pencil, we see that one (or both) pollinia has (have) attached itself (themselves) to the tip (C). The pollinia thus raised cannot reach the stigmas, but after a short time (about one to a few minutes), it curves forward (D) as a result of the caudicle drying out. In this position, it is directly opposite the stigmas and therefore, when visiting another flower, ready to carry out pollination (see Fig. 1.9). The time elapsed allows the insect to visit several flowers of the same inflorescence, and when it arrives in front of another plant, the pollinia are in the "attack" position."

We have thus clarified the mechanisms of pollination to some extent, but we have not yet mentioned an aspect that is just as important, if not more so, namely the methods used to attract insects. Broadly speaking, for the regions that interest us in this book, we can say that orchids use four main categories of strategies: nectar production, food deceit, sexual deceit and nest imitation (JERSAKOVA et al. 2006). Food-based orchids offer nectar to attract insects in a fairly "traditional" way. This nectar may be contained in the hypochile (in the case of *Epipactis*) or in the spur (in the case of *Gymnadenia*, *Platanthera*, *Dactylorhiza viridis*, etc.). Among the various species that use this method of attraction, pollination is generally frequent and effective, as can be judged by the proportion of swollen ovaries, ready to release seeds, at the end of the flowering period. However, this strategy involves expending energy to produce nectar. In many other orchid species, such as most *Orchis*, *Androrchis* and *Dactylorhiza*, there is no nectar production (and therefore energy is saved), but the flowers have an appearance that resembles that of nectar-producing flowers, typically due to the presence of a spur and tags (coloured dots and lines) on the labellum. Some orchid species even mimic the shape of flowers that actually produce nectar and grow in the same locations. These feeding deception processes obviously rely on the "naivety" of insects: only the most novice are fooled, and insects are also capable of learning. However, although pollination efficiency is reduced compared to nectar-producing orchids, this food lure strategy ultimately proves profitable, due to the fact that it promotes cross-pollination, and also judging by the survival success of these species. The case of nest orchids is quite unusual and is found in the region we are interested in, in the genus *Serapias* (Fig. 1.10). These flowers have a distinctive structure in the form of a more or less deep cavity which, due to the dark red to blackish colour of the flowers, offers protection and warmth to the insects attracted to them, which in this way will carry out cross-pollination by moving from one "nest" to another.

Fig. 1.10. – This ketone, which is not very mobile and appears dazed, has probably spent some time in the *Serapias lingua* flower. Photo taken in Corfu (Greece), April 5, 2017.

The most remarkable strategy, developed mainly, but not exclusively, in orchids, is that of sexual deception (JERSÁKOVÁ et al. 2006; PEAKALL 2023). In the regions covered by this book, as well as throughout Europe and the Mediterranean Basin, one genus of orchids in particular has been able to implement this strategy on a widespread basis: the genus *Ophrys*. VEREECKEN et al. (2012) have shown that this process can also occur in certain species of the genus *Serapias*. Before describing the process in some detail, it is worth dwelling a little on the morphology of *Ophrys* (Figs. 1.11–1.12). *Ophrys* have a velvety to hairy labellum with various ornamentations, no spur, often with an appendage at the top and more or less pronounced lateral gibbosities. At the base of the labellum is a basal field, often framed by "pseudo-eyes." All these features contribute more or less directly to sexual deception, evoking in a more or less similar way the various parts of an insect's body. Thus, the velvety to hairy appearance simulates the insect's hairiness; the pseudo-eyes are supposed to represent the eyes or wing attachment points; the gibbosities, pollen brushes; the appendage, the sex of a female insect... Sometimes the petals contribute to the mimicry by evoking the antennae of the insect (as in the case of the fly orchid, see Fig. 1.13).

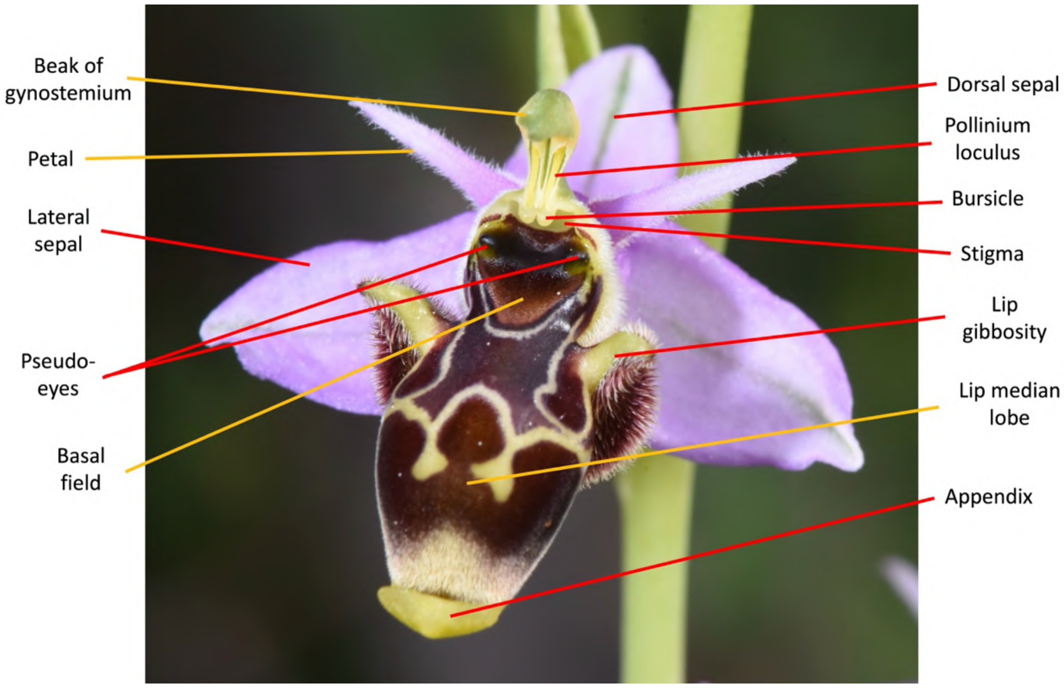


Fig. 1.11. – Flower of *Ophrys scolopax* (Alte, Algarve, Portugal), a "true" *Ophrys*, showing the different parts.

But there is one characteristic that cannot be seen, and which is more important than the others: *Ophrys* flowers emit chemical compounds, in varying quantities, whose mixture resembles the sex pheromones emitted by the females of certain insect species. In fact, *Ophrys* flowers mimic the females of these insects in order to attract males of the same species, who, believing they can smell and see a female on a plant, attempt to mate with it in a process called **pseudocopulation**. The stimulation is initially olfactory; males are attracted from varying distances by the scent; then visual and tactile stimuli come into play to complete the deception. The mechanism is so sophisticated that each species of *Ophrys* attracts only one (or a few) specific species of insect(s). These insects most often belong to the order Hymenoptera (different species of bees and solitary wasps). The system is so advanced that once fertilized, *Ophrys* flowers emit scents that mimic the substances emitted by females who, once fertilized, are no longer receptive!

As in the case of food deceit, the sexual deceit process relies on the naivety and inexperience of young male insects; and in both cases, a learning process intervenes, which explains why pollination rates are generally low, but perfectly compatible with the maintenance and evolution of the species. There are two main categories of Ophrys, depending on the position adopted by pollinating insects. There is the *Euophrys*, or "true ophrys," as seen in Figures 1.11, 1.13 and 1.14: in the latter two, we see that the male adopts what seems to us to be the most "natural" position, with its head facing the top of the flower, where its sexual organs (pollinia, stigma, etc.) are located: in this case, the pollinia stick to the male's head and are thus carried to other flowers; this is known as cephalic pseudocopulation. In the case of species belonging to *Pseudophrys*, or "false ophrys," pseudocopulation occurs in the opposite direction, with the insect's head facing downwards, towards the top of the flower; the pollinia are carried on the abdomen and pseudocopulation is abdominal; this is the case observed in Fig. 1.12.

Previously, the classification of *Ophrys* was based on this distinction between *Pseudophrys* and *Euophrys* (*Ophrys* section), but molecular phylogeny has shown that this classification does not correspond to the family tree of the *Ophrys* genus, with the *Pseudophrys* section appearing as one of the branches in the middle of the *Euophrys*. The *Euophrys* section was therefore not monophyletic and the classification became untenable. We will look at this in more detail later.

Fig. 1.12. – Flower of *Ophrys lenae* (Serra dos Candeeiros, Portugal), a *Pseudophrys*, showing the different parts.

To conclude this chapter on biology and reproduction, and for the sake of completeness, it should be mentioned that certain species of orchids, because they found themselves deprived of their pollinating insect species at some point in their evolution, had to adapt to self-pollination or self-fertilization: the pollen of these species ends up spontaneously on the stigma of the same flower, or seed production occurs without fertilization (apomixis). Of course, there is then no longer any genetic exchange, which explains why the populations of these species often consist of identical individuals, descended from a single parent, and why in some cases we see a certain degeneration linked to inbreeding, which is particularly noticeable in the flowers. In the regions that concern us, this is the case for an *Ophrys*, the bee orchid (*Ophrys apifera*), and certain *Epipactis* (*Epipactis fageticola*, *E. bugacensis*). Sometimes autogamy is only optional, as the plants can still be effectively visited by insects.

Figs. 1.13 and 1.14. – Two instances of pseudocopulation by hymenoptera on species of *Ophrys*: on the left, *Argogorytes mystaceus* on *Ophrys insectifera* (Bure, Province of Luxembourg, Belgium); on the right, *Dasyscolia ciliata* on *Ophrys speculum* (Serra de Sicó, Portugal – photo J.-L. Gathoye).

1.3. Classification and nomenclature of orchids

The vast orchid family is one of the most evolved and diverse in the plant kingdom. This does not necessarily mean that it is one of the most recent: it was estimated that *Orchidaceae* may have begun to diversify around 76 to 84 million years ago (Ma), shortly after the first monocotyledons (Ramírez et al. 2007; Pérez-Escobar et al. 2024), or even earlier, up to 132 Ma (Zhang et al. 2023). So, the first orchids may have coexisted with the dinosaurs, which became extinct around 65 million years ago, and appeared long before Hominids entered the scene (five to seven million years ago)!

The high degree of evolution of orchids reflects their tremendous adaptability to many conditions encountered in the living world, and goes hand in hand with an extraordinarily high number of species. Depending on the classification system, there are between 25,000 and 35,000 species, meaning that 7 to 10% of higher plant species (flowering plants) are orchids (Dressler 1993)! But this number may be underestimated, given the speed with which researchers are currently describing new orchid species: in Europe alone, there are certainly 20 to 30, or even 50, new species described every year! In an extrapolation, I ventured to think that we could perhaps be heading towards 100,000 species of orchids (Tyteca 2003a) ...

Of course, this all depends on how we define a species and what criteria we use to determine that we are dealing with two distinct species. According to one of the most commonly accepted definitions, a species is a "community of individuals sharing a significant number of common characteristics (morphological, anatomical, cytological, biochemical, etc.), reproducing constantly and regularly among themselves, and occupying a specific geographical area" (Bournérias & Prat et al. 2005). Nowadays, there is an increasing emphasis on evolution: a species has a history, descends from ancestral species, interacts with other living beings, and has its own destiny: extinction, conversion or division into distinct species, interbreeding with other species, etc. The analysis of molecular structure, particularly DNA, made possible by recently developed techniques, now allows us to trace the evolution of species and elucidate the relationships between different species. It is increasingly used as an aid in the development of classifications. However, precautions are essential, and it is advisable to have a range of information before establishing a classification, rather than relying on incomplete or partial information.

Currently, using these molecular techniques in particular, orchids are generally considered to be divided into five major "subfamilies," which are distinguished from each other by important characteristics. Their genealogy is shown in Fig. 1.15. It starts with the most primitive subfamily (the Apostasioideae) and moves towards the most evolved (the Epidendroideae and Orchidoideae). In our regions, only the latter two are represented, characterized among other things by the presence of a single fertile stamen (whereas there are two and three, respectively, in the Cypripedioideae—the subfamily of lady's slippers—and in the Apostasioideae). In the rest of this book, we will therefore only refer to the two most evolved subfamilies.

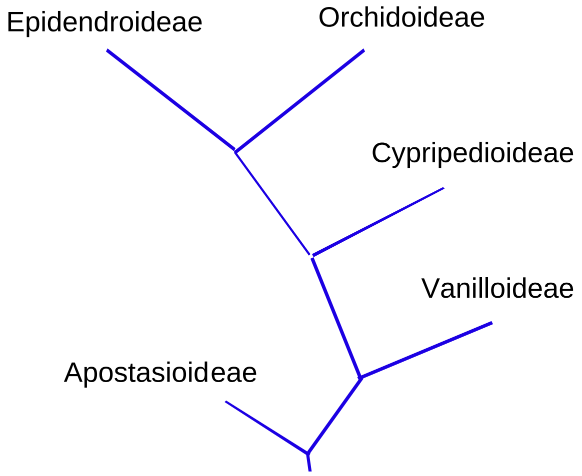


Figure 1.15. - The "tree of life" of orchids, representing the five subfamilies, from the most primitive (bottom) to the most evolved (top). According to various sources, including ZHANG et al. (2023).

Apart from subfamilies, the classification of orchids has undergone quite a few changes in recent years, at the genus and species level, following the advent of molecular analysis techniques and under the impetus of specialized research teams, one of the most active being that of the Royal Botanic Gardens, Kew, in the United Kingdom (BATEMAN et al. 1997, 2003; PRIDGEON et al. 1997, 1999, 2005). Limiting ourselves to the species of the regions considered in this book, we arrive at the classification and nomenclature shown in Table 1.1.

Table 1.1 shows the systematic options adopted in this book. While Kew's suggestions are fully adopted for the Epidendroideae, some modifications are proposed with regard to the classification of the Orchidoideae. This mainly concerns the distribution of species of the former genus *Orchis* in the broad sense, not into three generic entities (*Orchis* in the strict sense, *Anacamptis*, *Neotinea*) as recommended by Kew, but into four distinct genera (the same plus *Androrchis*). This highlights and clarifies the great heterogeneity of the genus *Orchis* sensu Kew, as already apparent in the studies by KLEIN (1989, 2004) and KRETZSCHMAR et al. (2007), and as reflected in the articles by TYTECA & KLEIN (2008, 2009), and increasingly adopted in general orchidology works (e.g., DELFORGE 2021; KREUTZ 2025; DELANNOY et al. 2026). The other differences mainly consist of distinguishing a greater number of species at the specific level in certain genera than in more conservative approaches, as is mainly the case in the genera *Dactylorhiza*, *Serapias* and especially *Ophrys*. This is quite crucial and can have significant consequences, particularly in terms of nature conservation, as we shall see later.

Table 1.1. – Systematics of orchid species in the territory under consideration (classification inspired by BATEMAN 2022).

Systematic divisions			**Species (by groups)**
Subfamily	Tribe	Genus	
Epidendroideae			
	Neottieae	*Cephalanthera*	*C. longifolia*, *C. rubra*
		Neottia	*N. nidus-avis*
			N. ovata
		Limodorum	*L. abortivum*, *L. trabutianum*
		Epipactis	*E. palustris*
			E. tremolsii, *E. lusitanica*, *E. duriensis*
			E. bugacensis
			E. fageticola
			E. helleborine
Orchidoideae			
	Cranichideae	*Spiranthes*	*S. spiralis*, *S. aestivalis*
	Orchideae	*Gennaria*	*G. diphylla*
		Pseudorchis	*P. albida*
		Platanthera	*P. bifolia*
		Gymnadenia	*G. borealis*, (*G. conopsea* ?)
		Dactylorhiza	*D. viridis*
			D. sambucina, *D. cantabrica*, *D. insularis*, *D. markusii*
			D. incarnata
			D. elata
			D. caramulensis, *D. ericetorum*, *D. irenica*
		Androrchis	*A. mascula*, *A. tenera*, *A. langei*, *A. olbiensis*
			A. provincialis, *A. pallens*
		Orchis	*O. anthropophora*, *O. italica*, *O. purpurea*
		Neotinea	*N. maculata*
			N. conica, *N. ustulata*
		Himantoglossum	*H. hircinum*, *H. robertianum*
		Anacamptis	*A. pyramidalis*
			A. laxiflora
			A. collina
			A. coriophora ssp. *martrinii*, *fragrans*
			A. papilionacea
			A. morio ssp. *morio*, *picta*, *A. champagneuxii*
		Serapias	*S. lingua*
			S. strictiflora, *S. elsae*
			S. parviflora
			S. cordigera, *S. gentilii*, *S. occidentalis*, *S. perez-chiscanoi*
		Ophrys	*O. insectifera*
			O. speculum, *O. lusitanica*
			O. bombyliflora
			O. tenthredinifera, *O. ficalhoana*
			O. fusca, *O. lupercalis*, *O. bilunulata*, *O. pintoi*
			O. dyris, *O. vasconica*, *O. lenae*, *O. algarvensis*
			O. lutea, *O. quarteirae*
			O. apifera
			O. scolopax, *O. picta*, *O. beirana*
			O. incubacea, *O. caloptera*

1.4. Orchids around the world, in Europe and in Portugal

Orchids are one of the most widespread families of plants on Earth. Although contrary to popular belief, they are not confined to the tropics, far from it! In fact, orchids have conquered virtually every habitable area on the planet, from the northernmost tip of Norway and the northern coasts of Alaska and Canada in the north, to Tierra del Fuego and Macquarie Island in the south (PÉREZ-ESCOBAR et al. 2024)! Only the great deserts of sand or ice do not harbor them. This very wide distribution, as well as the extreme diversity of forms we discussed in the previous chapter, underscores the fact that orchids are not one of the most recent plant families, as is sometimes mentioned: they have had ample "time" to invade the entire planet, adapting to almost all types of habitats and taking on the most diverse appearances in terms of size, color, shape, etc.

It is clear that the greatest diversity of orchids is found in the tropics, which are also the area of the globe with the highest biodiversity in general. However, temperate regions, including Europe, are also home to a wealth of forms, varieties, species and genera. As we have mentioned, orchids have been the subject of sustained attention, for several decades, from scientists and amateur botanists, who each year describe new species or discover known species in areas where they were previously unknown. Table 1.2 gives an idea of how knowledge has evolved: although Belgium's flora has been well known and described for a long time, such progress has been made in the last 22 years that our flora has been enriched by four species, representing an increase of 0.4% per year. In larger, less explored areas, this increase is even more spectacular, since for Europe as a whole, the number of species mentioned rose from 160 in 1982 to 436 in 2005! It is also noteworthy that during the second time interval (2005-2025), the increase is significantly lower than during the first interval (1982-2007), except for Portugal, where the increase continued at the same rate, as we will discuss later. It should also be noted that this difference in the rate of increase in the number of species during the two time periods considered may be due to a change in the views of certain authors, such that some taxa previously considered to be distinct species have been downgraded to the rank of subspecies or variety.

Table 1.2. – Changes in the number of recognized orchid species in four European territories over the 25-year period from 1982 to 2007, then over the 20-year period from 2005 to 2025. Taken from TYTECA (2003a), updated and extrapolated, notably from TYTECA & BERNARDOS (2003), BOURNÉRIAS, PRAT et al. (2005) and DELFORGE (2005), then from TYTECA et al. (2017), DELFORGE (2021), GRIEBL & PRESSER (2021), MONTEIRO et al. (2023) and DELANNOY et al. (2026).

<table>
<tr><th>Territory</th><th colspan="6">Species number
(year)</th><th>Annual trend</th></tr>
<tr><td>Belgium</td><td>43
(1983)</td><td colspan="2">45
(1986)</td><td>47
(2001)</td><td>47
(2005)</td><td>47
(2025)</td><td>0,4 – 0,0 %/an</td></tr>
<tr><td>Portugal</td><td>47
(1986)</td><td colspan="2">55
(1997)</td><td>58
(2001)</td><td>58
(2007)</td><td>67
(2023)</td><td>1,1 – 1,0 %/an</td></tr>
<tr><td>France</td><td>97
(1983)</td><td>107
(1988)</td><td>144
(1995)</td><td>162
(2000)</td><td>171
(2005)</td><td>173
(2025)</td><td>3,5 – 0,1 %/an</td></tr>
<tr><td>Europe</td><td>160
(1982)</td><td colspan="2">300
(1994)</td><td>400
(2001)</td><td>436
(2005)</td><td>515
(2021)</td><td>7,5 – 1,1 %/an</td></tr>
</table>

The different countries of Europe are not equally rich: at the continental level, as at the global level, as one moves northward from the equator, or upward in altitude, diversity decreases, as it does on islands when their size decreases or when one moves away from the continent (TRAXMANDLOVÁ et al. 2017). In Europe, therefore, the continental Mediterranean regions are richest in orchids, and the remote Atlantic islands are the poorest. All this is clearly illustrated in Fig. 1.16, where richness is expressed not in terms of number of species per unit area, but per logarithm of area, which allows for a more tangible comparison of the different values. We will return to this observation when we will consider the Portuguese territory and its surroundings in greater detail (see section 4.20 in Chapter 4).

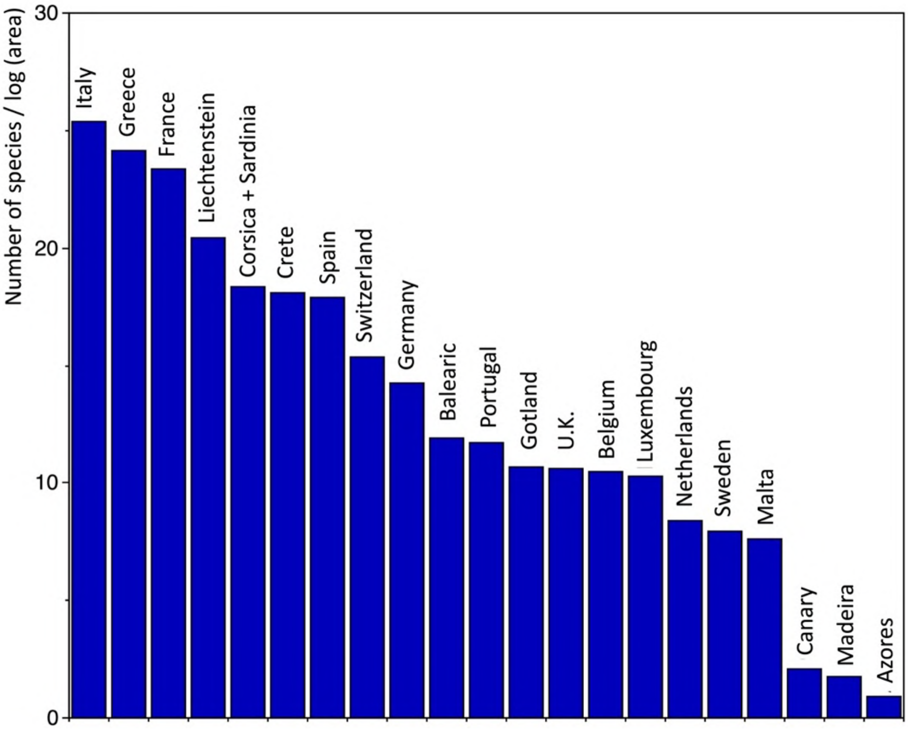
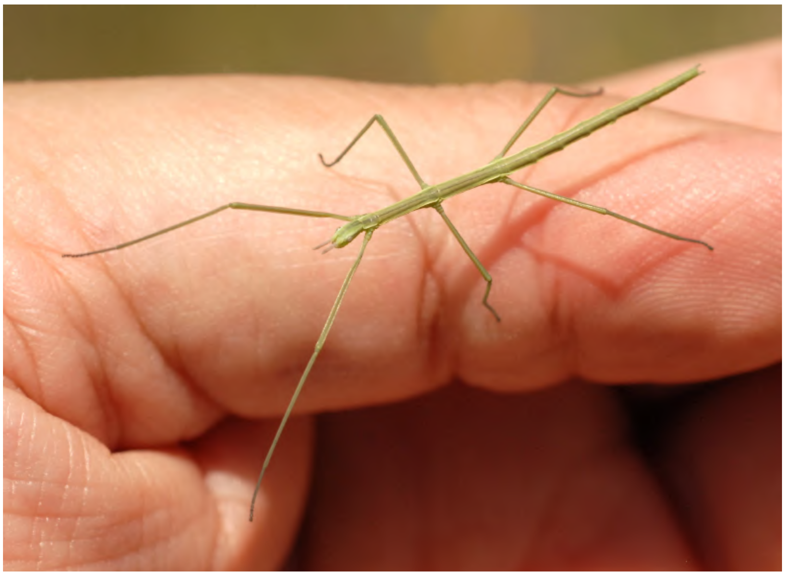


Figure 1.16. – Orchid diversity in selected European territories and Atlantic islands (Taken from Tyteca 2003a – “National” territories are continental and therefore exclude islands).

Fig. 1.17. – When traveling around Portugal (and elsewhere) in search of orchids, you are bound to encounter all kinds of insects, such as this stick insect (S. João da Pesqueira, 2011).



↑ **Fig. 2.1**. – Granite landscape near Castro Laboreiro (Minho), 6 July 2018.

↓ **Fig. 2.2**. – The limestone coast at Murtinheira (Beira Litoral), 2 April 2016.

2. General description of the territory covered (with assistance of D. Delvaux)

2.1. The territory considered

The territory covered in this book mainly encompasses Portugal, but also the immediately neighbouring regions of Spain, which form a coherent whole with Portugal, or which allow its description to be extended and completed, providing a link with regions of Europe located in a less extreme context from a climatic and biogeographical point of view. As we shall see, this will have a significant impact on the range of orchid species that can be taken into consideration.

The territory thus constituted is represented in Figure 2.3. It corresponds to the extent to which my various approaches to the Flora of Orchids of Portugal had led me (Tyteca 1998a, 1998b, 2000, 2001; Tyteca & Caperta 1999a, 1999b; Tyteca & Bernardos 2003). The inclusion of neighbouring Spanish regions takes into account various studies that have been carried out there on orchids:

- In Galicia, the comprehensive study by Cortizo & Sahuquillo (1999a, 1999b, 2006);

- In Castilla-y-León, the in-depth study conducted by S. Bernardos and colleagues, taking the province of Salamanca as its starting point but often incorporating considerations on neighbouring provinces and Portugal, as part of a study of orchids in the Douro Basin (see in particular Bernardos 2003; Bernardos & Amich 2002; Tyteca & Bernardos 2003; Bernardos et al. 2006);

- In Extremadura, the comprehensive study by Perez Chiscano et al. (1991), supplemented by additional observations (Perez Chiscano et al. 1990; Perez Chiscano & Durán Oliva 1994) and the recent summary by Vázquez (2009);

- By contrast, for Andalusia, few specific studies exist, apart from a few works on Eastern provinces, far from Portugal (e.g. Velasco Ortega 1989, on the Sierra de Grazalema). The province of Huelva was included in this study, at first based on personal observations and the work of Valdés et al. (1987), which covers the entire vascular flora of western Andalusia. Finally we could also use the information contained in Becerra Parra & Robles Domínguez' book (2009).

Fig. 2.3. – The territory covered in this work.

To set the boundaries of Fig. 2.3, we considered, somewhat arbitrarily, on the one hand, the 6°W meridian, which marks a break line in the UTM grid used in the 1998 study (TYTECA 1998), and on the other hand, the northern boundary of the Castilla y León region and its extension towards Galicia, and finally, the entire province of Huelva.

2.2. Geology and geomorphology

When discussing the Iberian Peninsula, it is important to recognise the central role played by the **Meseta**, the ancient Hercynian base in the centre of the peninsula, around which the various areas we are about to describe are organised, with a particular focus on the territory that concerns us, the west of the Iberian Peninsula. We base our description below on two works published on the Iberian Peninsula, those of LAUTENSACH (1964) and VILA VALENTI (1968). "The Meseta covers an area of approximately 210,000 km^2. The mighty Central Mountain Range [see below], which crosses it completely from north-east to south-west, or simply from east to west, divides it into two clearly separated plateaus: the northern Meseta, with an average altitude of 700 to 800 m, and the southern Meseta, which is slightly lower, at 600 to 700 m in the interior" (VILÁ VALENTÍ 1968).

To simplify matters greatly, we can consider that the Iberian Peninsula is composed of three main parts, depending on the geological materials: siliceous Iberia, calcareous Iberia and clayey Iberia. Below we quote passages from VILÁ VALENTÍ's (1968) study of the Iberian Peninsula, illustrating them with maps based on those of LAUTENSACH (1964).

"**Siliceous Iberia** encompasses all regions where materials are predominantly composed of quartz (silicic anhydride) outcrop. These are igneous formations, particularly granite and metamorphic formations (gneiss, quartzite, metamorphic schist, marble). Sedimentary rocks (greywacke, sandstone, slate) are less important. All these rocks form ancient Iberia, consisting exclusively of Palaeozoic and even Precambrian materials."

"Ultimately, this is the part of the peninsula where the massifs that have remained exposed since the Hercynian orogeny still outcrop, along with the remains of those that collapsed or were fossilised during the Alpine orogeny or later. The base of the Meseta and its north-western extension, which forms a massif stretching from Galicia to the Douro valley, belong to the first category. Overall, these rocks appear over a vast area in the west of the peninsula, covering Galicia, about two-thirds of Portugal, the western part of the northern Meseta and a wide strip of the southern Meseta."

"A few less significant areas that have been affected by relatively recent volcanism during the Neogene or Quaternary periods can also be linked to the siliceous Iberian Peninsula. Exceptionally, this area consists of modern materials that are solely eruptive in nature. This volcanism appears to be linked to faults affecting ancient bedrock. " In the territory under consideration, only the area between Sintra and Lisbon (including the Serra de Sintra) and the Serra de Monchique are affected (Fig. 2.4).

Fig. 2.4. – The Serra de Monchique, seen from the south-east (Rocha dos Soidos), 18 March 2008.

As for **calcareous Iberia**, the rocks that form it are very different from those we have seen so far. They are exclusively sedimentary formations, largely of marine origin, which were deposited during the Mesozoic era at the bottom of the channels separating the emerged massifs and in the waters of the western Tethys or eastern Atlantic. Among these rocks, which date from the Triassic to the Eocene, limestones are numerous, but there are also other sedimentary formations (conglomerates, sandstones, marls) that may occasionally dominate."

Fig. 2.5. – The Barrocal of the Algarve: Rocha da Pena, seen from Salir, 1 April 2008.

"The Iberian limestone forms three arcs in Spain. The first includes the Pre-Pyrenees, the mountains of the Basque Country and the eastern part of the Cantabrian mountain range. " The limestone outcrops observed in eastern Galicia (east of the provinces of Lugo and Ourense) can be linked to this group (Fig. 2.6). "A second zone, oriented northwest-southeast, is formed by most of the Iberian mountain range. Finally, the third limestone belt corresponds to the Subbetic mountain range. In Portugal, this zone is represented by a relatively narrow but continuous region in the Portuguese Estremadura. Another, much smaller arc appears in the Algarve", where it is known as the Barrocal (Fig. 2.5).

Fig. 2.6. – Serra do Courel, near Alto do Couto (Galicia): limestone outcrops are visible in the centre of the photo, where the vegetation is shorter. 5 June 2023.

In conclusion, limestone regions are relatively underrepresented in the part of the Iberian Peninsula that interests us (Figure 2.7), which is dominated by a siliceous zone. This obviously has an influence on the distribution and diversity of plant species, particularly orchids.

" **Clayey Iberia** also consists of sedimentary formations, but these have very different petrographic and chronological characteristics. These are materials of continental or marine origin forming the bottom of different basins or covering the bedrock of ancient massifs. Fine-grained or friable formations predominate, forming a clayey-marly complex tens and sometimes hundreds of metres thick [...] Other sedimentary rocks, such as limestone, sandstone and conglomerates, are also present [...] We also include Quaternary deposits, particularly alluvial formations, in the clayey Iberia" (see Figure 2.7).

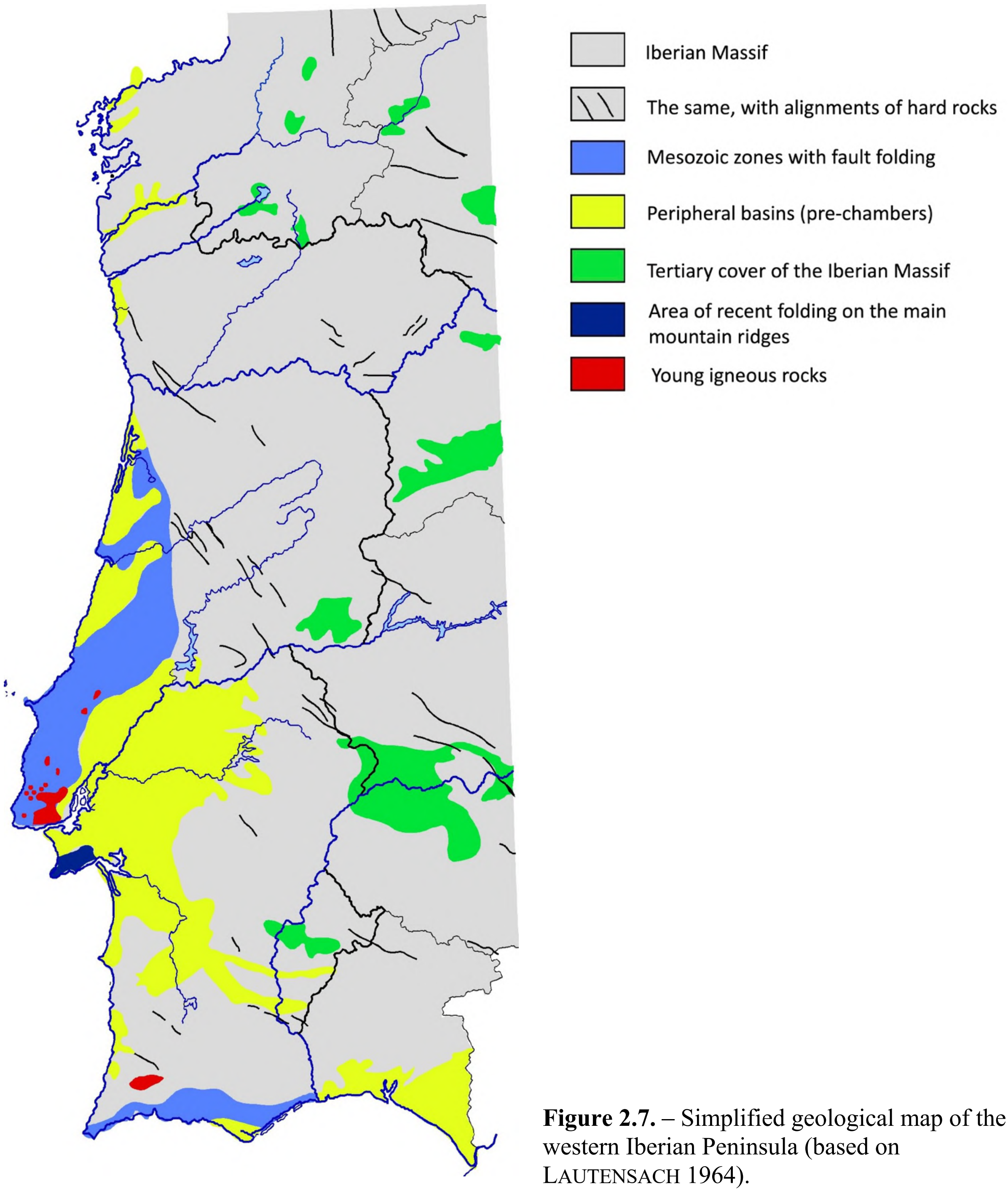


Figure 2.7. – Simplified geological map of the western Iberian Peninsula (based on LAUTENSACH 1964).

The geological foundation is very important in determining the type of vegetation that can be observed in a given location, but it is not the only factor. In addition to altitude and climate, which will be discussed later, the nature and composition of **soils** are influenced by various processes. These include the decomposition of rocks under the effect of factors such as erosion or water flow, the deposition of sediments, or the formation of surface layers from plant debris, for example in the form of humus in forests or peat in certain marshy areas. Although there is generally a good correlation between soils and the geological base (Figure 2.7), the distribution of soils sometimes shows some significant differences. Thus, although the type of soil found in limestone areas corresponds well to a limestone-rich composition, this type of soil can also be found in other regions where ancient deposits have occurred (known as relict soils), consisting of clays and marls, which give these soils characteristics similar to those of limestone regions. For example, large parts of the non-calcareous Alentejo region have soils composed of materials similar to those found in calcareous regions such as Estremadura.

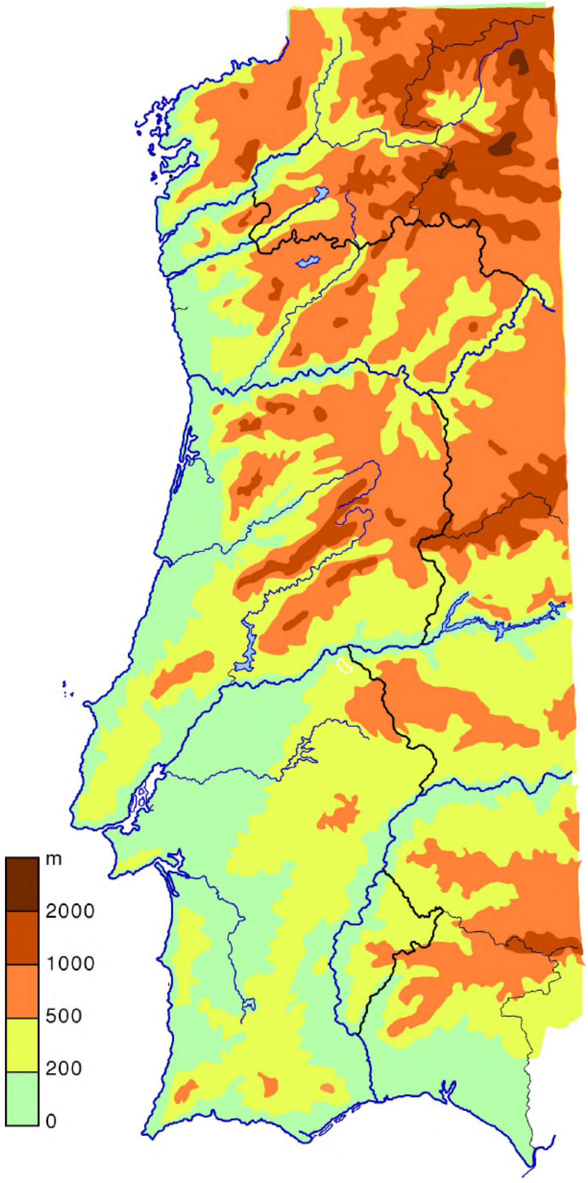


Figure 2.8. – Altitude map of the territory studied.

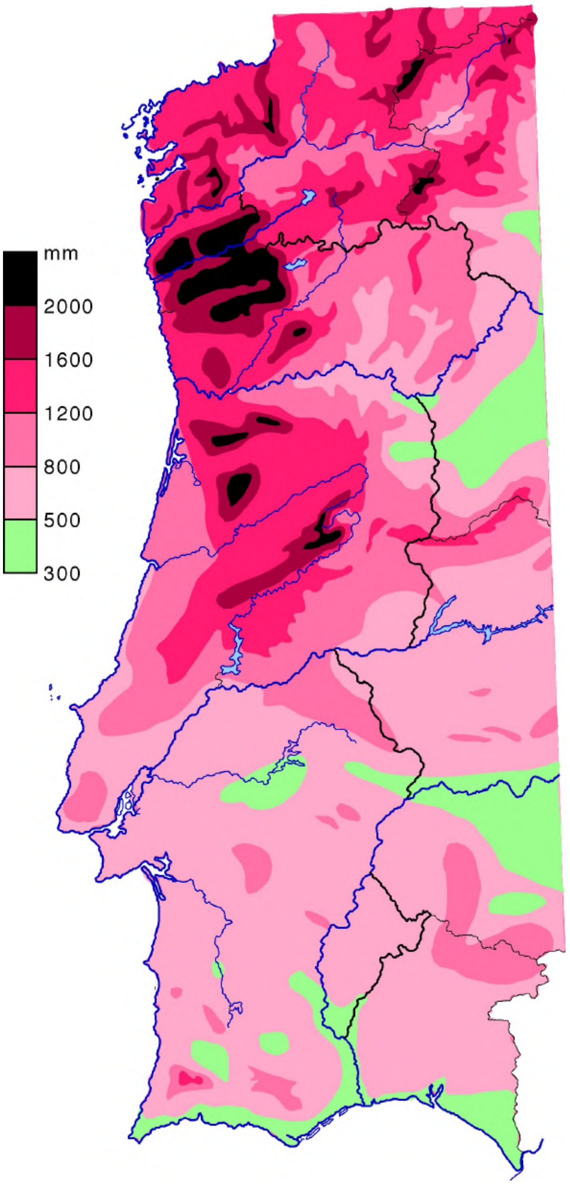


Figure 2.9. – Rainfall map for the area in question (LAUTENSACH 1964).

2.3. Altitude and climate

The altitude is generally moderate in the territory under consideration, reaching a maximum of 1,993 m in the Serra da Estrela (Beira Alta) and nearly 2,200 m in the Serra de Ancares (Galicia) and the Montes de León (Castilla y León). There are therefore relatively few environments typical of high altitudes, except in these three regions, which emerge in this part of the Iberian Meseta. The map in Figure 2.8 shows the distribution of altitudes. There is a certain gradient from the south-south-west to the north-north-east.

The climate of the territory in question is quite diverse, as in north-western Portugal (Fig. 2.9) there are regions where annual rainfall exceeds 2 metres (in Minho, particularly Serra do Gerês, and in Beira Alta, particularly Serra do Caramulo), which is as much as in the wettest regions of Europe, such as north-western Scotland or certain areas of the Alps! This will obviously have an influence on the distribution of certain orchids. Rainfall decreases rapidly towards the east and especially towards the south, to such an extent that the south of the Algarve, part of the Lower Alentejo and the south of Estremadura are sometimes considered semi-arid regions (Lautensach 1964). Temperatures are generally very pleasant, greatly moderated by the Atlantic Ocean. There is no frost near the coast; the only regions with significant snowfall are the north-east (Trás-os-Montes, eastern Galicia, Montes de León) and the highest parts of Beira Alta (Serra da Estrela, Serra do Caramulo). The climate there can be described as continental with a real winter; elsewhere, the climate is truly Mediterranean.

Synthesising these elements allows us to draw up a map of **bioclimates**, bringing together the influences of altitude, temperature and rainfall, based on characteristics that are important for understanding the distribution of species and ecosystems. Such a map is shown in Figure 2.10 for the territory we are interested in. We can see that most of the territory, about eight-tenths, falls under the ‘Mediterranean seasonal oceanic’ bioclimate ‘ (Mpo), which means that there is a “good” distribution of rainfall throughout the seasons, in principle preventing situations of severe drought, a mild winter and moderate temperature extremes thanks to the influence of the ocean. In contrast, a few very small areas of the Algarve are characterised by a ’Mediterranean xeric oceanic bioclimate, which means that there are (short) dry spells, while a small part of Extremadura has a ‘Mediterranean continental seasonal rainfall’ (Mpc) bioclimate, indicating more extreme temperatures.

The remaining two-tenths of the territory have a temperate bioclimate, and more specifically, for the most part, a ‘sub-Mediterranean oceanic temperate’ (Tocsm) climate, which reflects the influence of periods of frost and snowfall discussed above, at higher altitudes and latitudes. Finally, the coastal

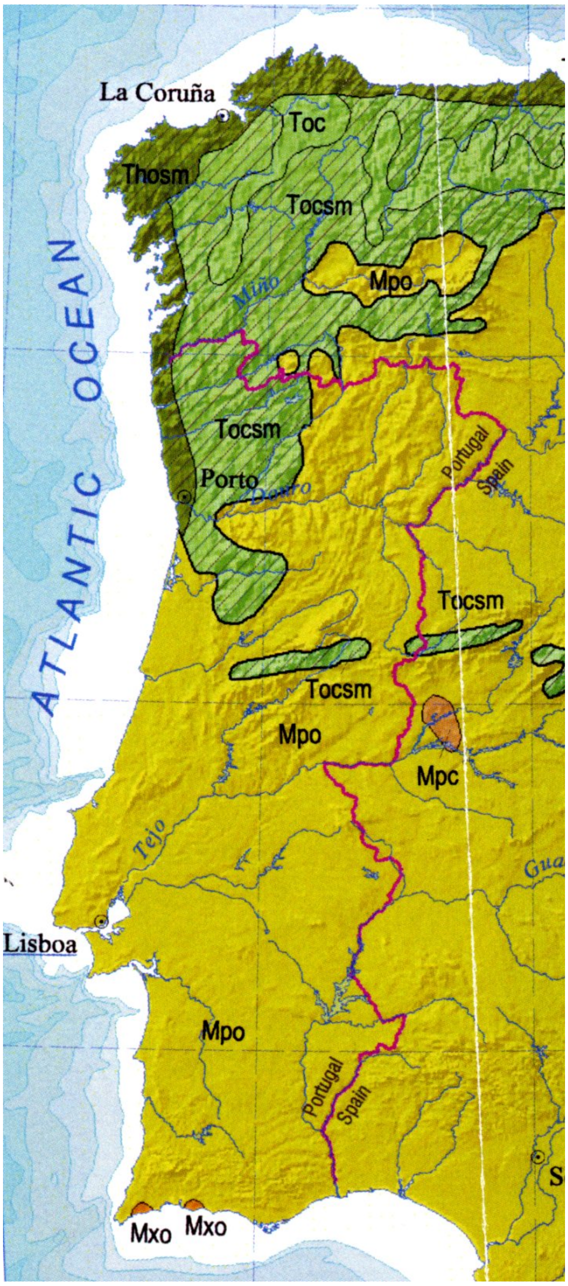


Figure 2.10. – Bioclimatic map of the territory in question (Rivas-Martínez et al. 2002).

areas in this part of the territory are characterised by a 'sub-Mediterranean hyper-oceanic temperate' (Thosm) bioclimate, indicating an even more pronounced oceanic influence.

2.4. Biogeography[3]

The combination of the factors mentioned in the previous paragraphs will determine the distribution of different species and ecosystems. As it is difficult to separate the study of vegetation from that of soils, they will be treated together in this section, following the scheme proposed by VILÁ VALENTÍ (1968), from whom we again borrow most of the quotations in the following. As we have also seen, the climatological element is predominant, leading this author to consider three divisions, similar to what he proposed for geology: humid Iberia, dry Iberia and sub-desert Iberia. Only the first two are of interest to us here; they correspond roughly to the 'temperate' and "Mediterranean" zones in the previous section.

As far as **humid Iberia** is concerned, the "tendency towards acidity is a unique characteristic not found elsewhere. Apart from the influence of the climate, we must take into account the importance of siliceous outcrops in much of humid Iberia, including central and northern Portugal – except for the Beira and Estremadura coastlines –, Galicia and half of the Cantabrian Mountain range [...] The most characteristic soil formation is that which is currently forming under deciduous trees. It is a deep, brown or dark brown soil for horizon A, with a large amount of slightly acidic humus of the mull type...".

"The climatic conditions [...] are favourable for the development of **deciduous** species familiar to the **forests** of Western Europe. Various species of oak are found here, in particular the pedunculate oak [...], *Quercus pyrenaica* [...] and *Q. petraea* [...]. Beech is another species found in the Cantabrian region, whereas it is rarely found in Galicia and northern Portugal, probably due to the relative dryness and lack of humidity in the air at certain times of the year. The predominance of one species or the other gives rise to large forests of oak or beech that can reach a certain density in their natural state. "

Fig. 2.11. – Tauzins oak wood (*Quercus pyrenaica*). Gondesende, Trás-os-Montes, 7 June 2021.

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[3] **NB**: for brevity sake, the province Trás-os-Montes e Alto Douro will be referred to as « **Trás-os-Montes** » in the sequel.

"When the siliceous nature of the soil becomes more pronounced, the Atlantic-type forest disappears. It is replaced by less demanding species that are able to adapt to a certain level of soil acidity, such as maritime pine (*Pinus pinaster* […]). These pine forests take on particular importance on the sandy soils near the coast. It should be noted that maritime pine currently plays a more important role than that for which it was intended by natural conditions. Indeed, it has been frequently used for reforestation. "

"As the horizons become more siliceous, the spontaneous vegetation changes and the trees disappear. This is the case for podzolised soils, which are highly acidic and poorly drained. This leads to the domain of various species of heather [...], accompanied by broom [...]. This fairly dense formation is similar to that known as **moorland** throughout Western Europe. "

In the transition regions between wet Iberia and dry Iberia, mixed plant formations appear, well represented "in the central part of Portugal and on the western edge of the northern Meseta [...]. The most characteristic species is the Lusitanian oak (*Quercus faginea* or *Q. lusitanica*). "

As for **dry Iberia**, the "lack of water, which becomes more acute during the dry summer, determines the evolution of the soils and the characteristics of the vegetation cover". Water circulation becomes deficient, leading to slow and irregular soil evolution. These "are shallow, with often poorly defined horizons, and the differentiation with the parent rock is not always clear. "

These climatic and pedological conditions favour **evergreen forests**, "whose appearance depends less on the contrast between seasons than in the case of the Atlantic forest [...]. In the dry zone, the holm oak (*Quercus ilex*) is the most characteristic tree. In its natural state, it would cover a large part of the Meseta, central and southern Portugal [...]".

Fig. 2.12. – Cork oak forest (*Quercus suber*). Freixo de Espada à Cinta, Trás-os-Montes, 11 June 2007.

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In some regions, "the nature of the soil may explain the predominance of cork oak (*Quercus suber* – Fig. 2.12), which is confined [...] to siliceous soils with a relatively humid and mild climate". In warmer, less humid and siliceous regions, such as sandy soils, forests of stone pines (*Pinus pinea* – Fig. 2.13) can be found.

Fig. 2.13. – Woodland of stone pines (*Pinus pinea*). Vila do Bispo, Algarve, 28 February 2007.

"In the current landscape, shrub formations cover vast areas, as in all Mediterranean countries. " The **maquis**, or **matorral** (in Castilian) or **mato** (in Portuguese) "often appears as a more or less open formation, reduced in some cases to a few sparse small shrubs". These maquis are often the result of intense degradation of the primitive forest, but in some cases may represent a spontaneous formation, particularly on siliceous soils. On the other hand, "matorral that extends over calcareous soils, enjoying a hot and dry climate, is generally much more extensive. It is a formation similar to **garrigue**[...] which owes its name to one of its most characteristic species: the kermes oak (*Quercus coccifera*; garric in Catalan). Alongside the kermes oak, we find the carob tree (*Ceratonia silica*), the mastic tree (*Pistacia lentiscus*) and the wild olive tree [...]" (Fig. 2.14).

As everywhere else, human activity has generally altered or even degraded the natural vegetation cover through the expansion of pastures and land clearing for cultivation. Various small shrubs or bushes may then dominate the vegetation, aromatic labiates (*Rosmarinus*, *Thymus*, etc.) on calcareous soils, and rockroses (particularly *Cistus ladanifer*) on siliceous soils.

Fig. 2.14. – Open garrigue with *Anacamptis papilionacea* (front left) and *Lonicera etrusca* (right). Outeiro, Beira Litoral, 6 May 2019.

Fig. 2.15. – A frequent inhabitant of garrigue and semi-open environments, Brotero's peony (*Pæonia broteri*), Rocha da Pena, Algarve, 3 March 2011.

3. Orchids of Portugal and neighbouring regions

3.1. History of orchid knowledge

In Portugal, two important works on orchids were published in 1887: those by GUIMARÃES (1887) and VEIGA (1887). By combining the inventories proposed by these two authors, we obtain the list in the first part of Table 3.1. A few comments should be made regarding this list:

- Certain species were mentioned by these authors, based on descriptions in reference works of the time, species that they clearly did not observe in their region of origin and which are most likely absent from Portugal. This is the case for *Dactylorhiza fuchsii*, *D. majalis*, *D. saccifera*, *Epipactis atrorubens*, *E. purpurata* and *Orchis longicornu* (see discussion in TYTECA 1986). In more recent works, they are no longer mentioned.

- Another species, *Dactylorhiza incarnata*, is probably absent from Portuguese territory but is present in adjacent Spanish territories (TYTECA & BERNARDOS 2003).

- A discussion of the taxa in the *Dactylorhiza maculata* group (TYTECA 1986, 1989) led to the proposal that, instead of the taxa indicated (*D. fuchsii*, *D. maculata* subsp. *elodes* and subsp. *maculata*, *D. saccifera* and *D. majalis*), only *D. ericetorum* and *D. caramulensis* should be recognised.

- On the other hand, the works of GUIMARÃES and VEIGA is 'visionary' in certain respects, since it already mentions, at species level, taxa that were subsequently forgotten but have been rehabilitated in more recent times: these are *Ophrys ficalhoana* (in GUIMARÃES' work) and *Serapias strictiflora* (in VEIGA's work). The former was recognised in Portuguese flora by TYTECA (2000) and then by DEVILLERS et al. (2003); the latter by SUNDERMANN (1980), then by TYTECA (1986, 1987) and BAUMANN & KÜNKELE (1989).

- Finally, some species have undergone taxonomic and/or nomenclatural readjustment: for example, references to *D. maculata* subsp. *elodes* should in fact refer to *D. ericetorum* (TYTECA 1989); *Orchis conica* (now named *Neotinea conica*) is the name that should be given to plants formerly referred to as *O. lactea* or *O. tridentata* (TYTECA 1985; BUTTLER 1989).

With respect to this initial list derived from the works of GUIMARÃES and VEIGA, the second part of Table 3.1 shows subsequent additions, arranged in chronological order. The additions are essentially of two types. Firstly, taxa known in other parts of Europe have been discovered in Portugal (and neighbouring regions); this is the case for most of the species listed in the table. Secondly, for some species, it was in Portugal itself (or neighbouring territories) that evidence was found that certain taxa actually comprised two (or more) distinct species; this is the case for *Ophrys lusitanica*, *O. algarvensis*, *O. quarteirae*, *O. beirana*, *Dactylorhiza caramulensis*, *Epipactis lusitanica*, *E. duriensis*, *Serapias perez-chiscanoi* and a few others.

For the sake of completeness, but without retracing historical developments, Table 3.2 lists the species absent from Portugal but present in neighbouring Spanish territories, with a few references to support this. It should be noted that only two regions are involved, located in the north and north-west of Portugal, namely Galicia and Castilla y León. It is obviously the influence of latitude and altitude that enriches the list of species, whereas the two other neighbouring Spanish regions, Extremadura and (western) Andalusia, do not have biogeographical characteristics sufficiently different from those of Portugal for additional species to be detected there. Some of the species in Table 3.2 are found very close to Portuguese territory and it is not impossible that they may one day be found there (*Androrchis tenera*), as was the case, quite recently, with *Neotinea ustulata*.

Table 3.1. – Evolution of knowledge about orchids in Portugal since 1887 (using modern nomenclature).

Species listed by Guimarães (1887) and Veiga (1887). Species marked with an asterisk (*) correspond to taxa that were subsequently reidentified differently.

- *Anacamptis champagneuxii*
- *Anacamptis coriophora* subsp. *martrinii*
- *Anacamptis coriophora* subsp. *fragrans*
- *Anacamptis laxiflora*
- *Anacamptis longicornu**
- *Anacamptis morio* subsp. *morio*
- *Anacamptis morio* subsp. *picta*
- *Anacamptis papilionacea*
- *Anacamptis pyramidalis*
- *Androrchis mascula*
- *Androrchis provincialis*
- *Cephalanthera longifolia*
- *Dactylorhiza elata*
- *Dactylorhiza fuchsii**
- *Dactylorhiza incarnata*
- *Dactylorhiza maculata* subsp. *elodes*
- *Dactylorhiza maculata* subsp. *maculata**
- *Dactylorhiza majalis**
- *Dactylorhiza markusii*
- *Dactylorhiza saccifera**
- *Epipactis atrorubens**
- *Epipactis helleborine*
- *Epipactis palustris*
- *Epipactis purpurata**
- *Gennaria diphylla*
- *Gymnadenia conopsea**
- *Himantoglossum robertianum*
- *Limodorum abortivum*
- *Neotinea conica*
- *Neotinea maculata*
- *Neottia nidus-avis*
- *Ophrys apifera*
- *Ophrys bombyliflora*
- *Ophrys ficalhoana*
- *Ophrys fusca*
- *Ophrys incubacea*
- *Ophrys lutea*
- *Ophrys picta*
- *Ophrys scolopax*
- *Ophrys speculum*
- *Ophrys tenthredinifera*
- *Orchis anthropophora*
- *Orchis italica*
- *Platanthera bifolia*
- *Serapias cordigera*
- *Serapias lingua*
- *Serapias parviflora*
- *Serapias strictiflora*
- *Spiranthes aestivalis*
- *Spiranthes spiralis*

Species reported after 1887, in chronological order of first mention (see text).

Species	**Reference**
Ophrys dyris	Cumano (1957)
Limodorum trabutianum	Ferlan (1958)
Ophrys lusitanica	Danesch (1969)
Dactylorhiza caramulensis	Vermeulen (1970)
Cephalanthera rubra	Pinto da Silva & Teles (1971)
Epipactis tremolsii	Baumann & Künkele (1977)
Epipactis lusitanica	Tyteca (1988)
Dactylorhiza insularis	Sampaio Franco in Tyteca (1989)
Orchis collina	Pinto-Gomes (1992)
Orchis langei	Tyteca (1995)
Ophrys bilunulata, *Orchis olbiensis*	Tyteca (1998)
Epipactis fageticola	Tyteca & Caperta (1999)
Serapias perez-chiscanoi	Tyteca (2000)
Ophrys lupercalis	Delforge (2001)
Ophrys algarvensis	Tyteca et al. (2003)
Epipactis duriensis	Bernardos et al. (2004)
Serapias elsae	Delforge (2004)
Ophrys quarteirae	Kreutz et al. (2007)
Serapias (*cordigera* subsp.) *gentilii*	Venhuis et al. (2007) ; Kreutz (2007)
Orchis ustulata	Anonymous (2011) ; Monteiro (2012)
Serapias occidentalis	Pessoa et al. (2011)
Ophrys vasconica	Tyteca et al. (2017)
Ophrys pintoi, *Ophrys lenae*	Lowe & Tyteca (2012)
Gymnadenia borealis	Tyteca et al. (2018)
Ophrys beirana	Tyteca et al. (2020)
Epipactis bugacensis	Monteiro et al. (2023)
Dactylorhiza irenica	Tyteca et al. (2026)

Table 3.2. – Orchid species absent from Portugal, reported in adjacent Spanish regions.

Species	**Region(s)**	**Reference(s)**
Neottia ovata	Galicia	CORTIZO & SAHUQUILLO (1999a, 2006)
Pseudorchis albida	Galicia	CORTIZO & SAHUQUILLO (1999a, 2006)
Dactylorhiza viridis	Galicia	CORTIZO & SAHUQUILLO (1999a, 2006)
Dactylorhiza sambucina	Galicia Castilla y León	CORTIZO & SAHUQUILLO (1999a, 1999b, 2006) TYTECA & BERNARDOS (2003)
Dactylorhiza cantabrica	Galicia Castilla y León	PEDERSEN (2006) ; BENITO AYUSO (2017) ; PARDO OTERO et al. (2024)
Dactylorhiza incarnata	Castilla y León	TYTECA & BERNARDOS (2003)
Androrchis tenera	Castilla y León	BERNARDOS (2003)
Androrchis pallens	Castilla y León	PUENTE GARCIA (1988)
Orchis purpurea	Galicia Castilla y León	CORTIZO & SAHUQUILLO (1999a, 2006) TYTECA & BERNARDOS (2003)
Himantoglossum hircinum	Galicia Castilla y León	CORTIZO & SAHUQUILLO (1999a, 1999b, 2006) BERNARDOS (1998) ; TYTECA & BERNARDOS (2003)
Ophrys insectifera	Castilla y León	TYTECA & BERNARDOS (2003)
Ophrys caloptera	Galicia Castilla y León	CORTIZO & SAHUQUILLO (1999a, 2006) BERNARDOS (1998) ; TYTECA & BERNARDOS (2003)

3.2. General presentation

Phylogenetic tree

Figure 3.1 shows a simplified representation of the phylogenetic, or genealogical, tree of orchids in Portugal and neighbouring regions. It is simplified in that (1) only species from the studied territory are represented, and the tree is therefore necessarily incomplete, and (2) the length of the branches is arbitrary and does not reflect the proximity or distance between species. What we want to show with this representation is, on the one hand, the division into subfamilies, tribes, genera and species, and on the other hand, the system used in this work for the classification of the different species and categories of species, taking into account their phylogenetic links and other more or less direct relationships, particularly morphological ones, governing such similarities or groupings.

Modern classification systems distinguish five subfamilies within orchids, whose genealogy can be outlined as shown in Figure 1.14 (Chapter 1). It starts with the most primitive subfamily (*Apostasioideae*) and moves towards the most evolved (*Epidendroideae* and *Orchidoideae*). In the territory under consideration, only the latter two are represented, characterised among other things by the presence of a single fertile stamen (whereas there are two and three, respectively, in the Cypripedioideae – the subfamily of lady's slippers – and in the Apostasioideae).

The conceptual phylogenetic tree in Figure 3.1, as well as the simplified representation of the subfamily tree in Figure 1.14, were established based on current knowledge of molecular phylogeny in the Orchidaceae family, as presented by PRIDGEON et al. (2001). In the subfamily *Epidendroideae*, only the tribe *Neottieae* is represented; the phylogeny of genera and species is that of PRIDGEON et al. (2005), with the insertion of *Epipactis duriensis* based on the results of BERNARDOS et al. (2004), also taking into account more recent adjustments as proposed by PRAT (2024). In the subfamily *Orchidoideae* and the tribe *Orchideae*, we based our work on the phylogeny of BATEMAN et al. (2003) and PRIDGEON et al. (2001), presented in a simplified form by KRETZSCHMAR et al. (2007) and finally adapted by TYTECA & KLEIN (2008, 2009) by adding, to the molecular analyses, points of view on the morphology and biology of the species. The phylogeny of *Ophrys* is still under investigation and takes into account preliminary results recorded by TYTECA & BAGUETTE (2017).

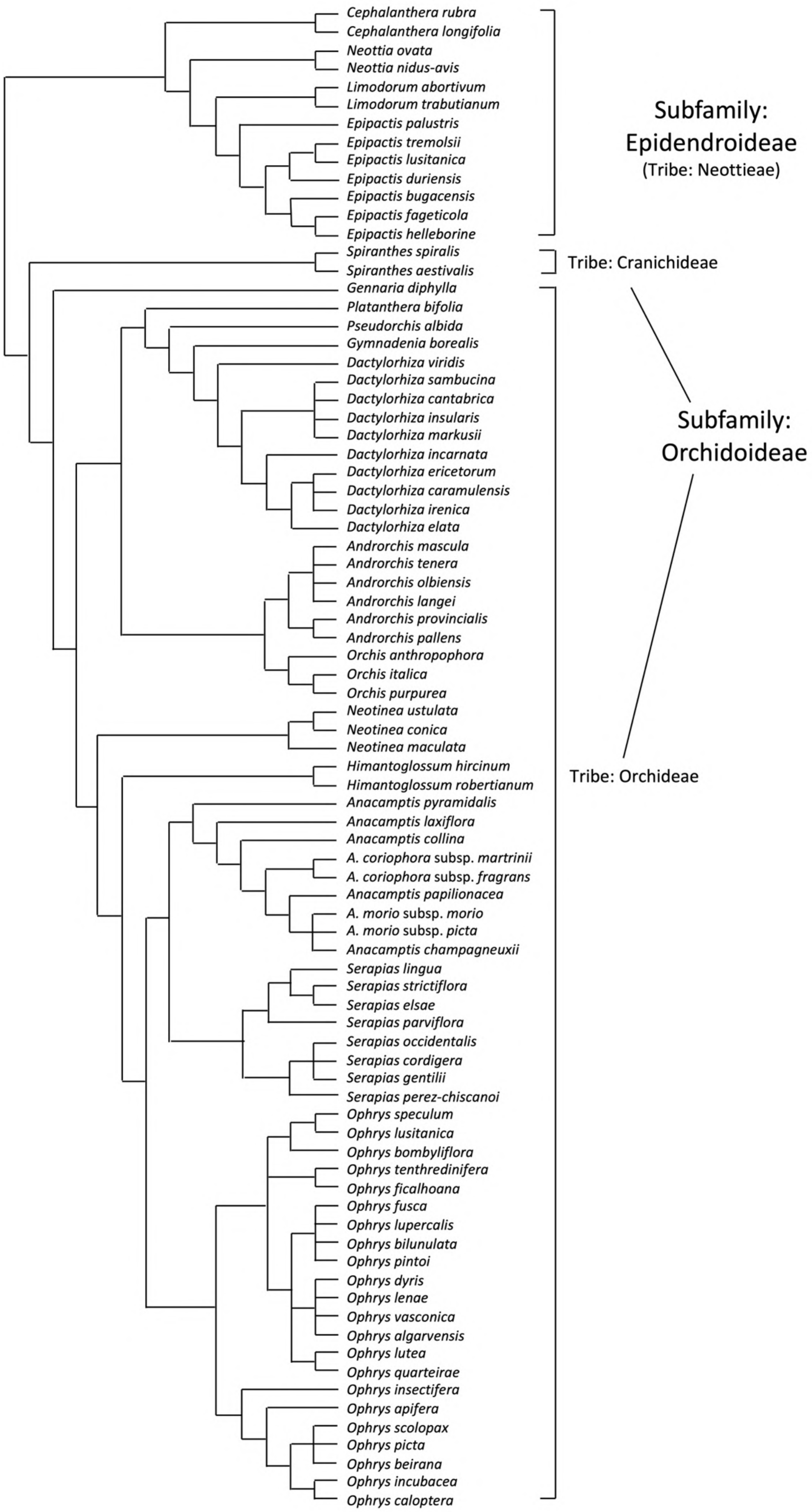


Figure 3.1. – Conceptual phylogenetic tree of orchids from Portugal and neighbouring regions.

Overview of orchid genera in Portugal and neighbouring regions – Systematic options

If we adopt the phylogeny of orchids as shown in Figure 3.1, seventeen genera are represented in the territory covered by this work. We provide some characteristics of these genera below. Note that we will often use the word '**domain**,' which refers to the study area, the territory of interest, consisting of Portugal and neighbouring regions of Spain, as described in the previous chapter. This is a translation of the (old) French word "**dition"**, still in use in modern botany.

Epidendroideae subfamily – Neottieae tribe

Unlike most Epidendroideae in tropical regions, which are epiphytes, all the species considered here are terrestrial. Neottieae are characterised by their rather leathery leaves and granular pollinia, which lack caudicules and are attached to the top of the gynostemium. The Neottieae tribe is unique in that it has a large proportion of non-chlorophyll-producing, and therefore mycoheterotrophic, species. The only three non-chlorophyll-producing species in the studied territory are Neottieae (*Neottia nidus-avis* and the two *Limodorum* species). Furthermore, autogamy is relatively widespread in this tribe (PRIDGEON et al. 2005). The underground parts consist of rhizomes or root fascicles resembling a bird's nest (*Neottia nidus-avis*).

Cephalanthera

Considered one of the most primitive genera in our flora. The flowers are campanulate, i.e. with sepals and petals more or less joined together in the shape of a bell, from which the relatively undifferentiated labellum barely emerges. The labellum is weakly divided into a hypochile (basal part) and an epichile (outer part) with yellowish ridges. The leaves are long and lanceolate, arranged in tiers along the stem, and gradually transform into bracts. The vegetative parts (stem, leaves, bracts, ovaries) may be glabrous (*C. longifolia*) or pubescent (*C. rubra*).

Neottia

Since the advent of molecular phylogenetics, this genus includes, in addition to the non-chlorophyllous *N. nidus-avis*, representatives of a genus traditionally considered distinct, *Listera* (represented in the domain by *N. ovata*). The leaves of the two species in our region are very different, reduced to brown scales in *N. nidus-avis* and broadly oval, in pairs, opposite in *N. ovata*. The flowers, which are not very colourful (brownish in *N. nidus-avis*, green in *N. ovata*), have a perianth with sepals and petals joined in a helmet and a distinctly bilobed, nectariferous labellum.

Limodorum

Species of this genus lack chlorophyll entirely or almost entirely and are therefore almost completely devoid of green colour. The entire plant is pale to dark purple; the stems are robust and have short scales instead of leaves, as well as large flowers that are more or less widely open; in one species (*L. abortivum*), these have a fairly long spur, whereas in the other species (*L. trabutianum*) it is (almost) completely absent. Some works refer to the second species as a simple variety (or subspecies) of the first; in Portugal and neighbouring regions, however, the two species are generally found in separate, autonomous populations, which sometimes coexist without hybridisation between the two; the species status is therefore more appropriate.

Epipactis

Genus represented by seven species in the domain. Flowers more or less open, with a labellum clearly divided into a hypochile, a pouch containing nectar at the base, and an epichile of varying colours and with more or less rough gibbosities or crests (or bosses). In the centre of the freshly opened flower, the rostellum gland (a small white, membranous and shiny gland) is usually clearly visible, rarely absent. The leaves are staggered along the stem and gradually transform into bracts; they are medium to large, lanceolate (*E. palustris*) to broadly oval to almost round (*E. helleborine*; *E. tremolsii*). The stem is more or less glabrous to densely pubescent. Cases of self-pollination are quite rare and occur, in the domain, in *E. bugacensis* and *E. fageticola*.

Orchidoideae subfamily

In contrast to Epidendroideae, the leaves of Orchidoideae are rather soft, extremely variable in shape and habit, and the pollinia are generally equipped with a caudicle. The underground parts are not rhizomes, but rather tubers (in Orchideae) or thickened roots (in Cranichideae).

Cranichideae tribe – genus *Spiranthes*

This tribe currently includes only the genus *Spiranthes*. There are two species, whose inflorescence consists of small white, tubular flowers arranged in a more or less distinct helical pattern. One species flowers in late spring to early summer (*S. aestivalis*); the other (*S. spiralis*) is the only orchid in the area that clearly flowers in autumn (late September to early November). The underground parts are not strictly speaking tubers, but rather thickened roots, varying in number.

Orchideae tribe

Unlike Cranichideae, the flowers of the Orchideae tribe are not arranged in a spiral and are never tubular. Their underground parts consist of tubers, usually two in number, one of which, withered and shriveled at flowering, has provided the substances necessary to feed the plant for the current year, while the other accumulates the nutrient reserves necessary for the following year's development. These tubers are often ovoid, but may be digitiform in certain genera (*Dactylorhiza*, *Gymnadenia*). In some cases (*Serapias*, *Anacamptis champagneuxii*, *Ophrys bombyliflora*, etc.), the new tuber is accompanied by a second one, with a more or less long peduncle, contributing to the vegetative growth of the plant.

Gennaria

This genus, closely related to *Habenaria* (a cosmopolitan genus including many species), ultimately comprises only two species (one for the domain), found near the coasts of the western Mediterranean Basin and Macaronesia. It is very distinctive, with two broad, cordate leaves above ground level, the first large and the second smaller just above (a single leaf when the plant does not produce flowers), small green flowers in a unilateral inflorescence and growth in often large groups.

Platanthera

This genus includes many species in North America but is represented by only six or seven species in Europe, only one of which exists in the territory of the domain. It is characterised (in our study area) by its two broadly oval basal leaves, accompanied by a few smaller leaves, as well as by its white to greenish flowers, with an oblong, undivided labellum, extended into a very long nectariferous spur. The flowers are very fragrant and are pollinated by moths (Sphingidae).

Pseudorchis

This genus, which is closely related to *Gymnadenia* and *Dactylorhiza*, with which it sometimes hybridises, includes a few species that are mainly found in mountainous areas, one of which reaches the north-west of the Iberian Peninsula. This species has small, creamy white flowers that are not very open, with a three-lobed labellum and a fairly short spur, as well as oblong basal leaves that are characteristically shiny and unspotted.

Gymnadenia

A genus very similar to *Dactylorhiza*, *Gymnadenia* has only one (or perhaps two) representative(s) in our study area. The leaves are very narrow, unspotted and arranged as in *Dactylorhiza*. In the native species (or in the two possible species), the inflorescence is elongated, the flowers are pink, small, without any markings, and have a very long nectar spur. It is still difficult at present to say whether only *G. conopsea* is present in the domain, or whether we can assume the presence of a second species, *G. borealis*, with morphology and, above all, ecology that are extremely different from those of the first species. If so, this second species may be the only one present.

Dactylorhiza

A genus with a wide Eurasian distribution, comprising numerous species, nine (or ten) of which exist in our study area; they are moderately frequent to rare due to the hygrophilous nature of most species. The leaves are distributed along the stem, gradually decreasing in size until they become bracts in the inflorescence; they are spotted in two of the species (*D. caramulensis* and *D. ericetorum*). The stem is typically grooved and more or less thick, sometimes hollow. With the exception of one species, the flowers are brightly coloured, with a non-nectariferous spur, spreading to erect lateral sepals and a labellum without spots or covered with lines, dashes and purple dots of varying intensity. In *D. viridis*, the flowers are green to reddish, the labellum is unmarked, the spur is globular, and the lateral sepals are joined in a helmet with the dorsal sepal and petals.

Androrchis

A recently described genus, including taxa from the former genus *Orchis* (in the broad sense) that are characterised by a trilobed labellum with a non-anthropomorphic (= non-human) silhouette, an ascending and fairly long spur (often longer than the ovary), spreading to erect lateral sepals, an inflorescence that is usually elongated and loose, and sometimes spotted basal leaves. Six species are present in the domain, four of which are found in Portugal. They are typically found in semi-shaded areas or on the edges of forests, more rarely in full sunlight, on calcareous to slightly acidic soils. Chromosome number 2n = 42.

Orchis

In this genus, strictly speaking, we only include taxa characterised by a four-lobed labellum with an anthropomorphic silhouette simulating the arms and legs of a humanoid, a spur curved downwards and shorter than the ovary, sepals and petals joined in a helmet, an elongated and dense inflorescence, and leaves that are never spotted, except, rarely, in *O. italica*, which has frequently wavy leaves (never in other species). See the distinction with *Neotinea* below. Three species of Orchis are recognised in the domain, two of which are fairly widespread and a third (O. purpurea) only appears at the edge of its range in Galicia and Castilla-y-León. Chromosome number 2n = 42.

Neotinea

The three species of this genus, as in *Orchis*, have sepals and petals joined in a helmet, a short spur curved downwards and an anthropomorphic labellum, but here the flowers are much smaller and the ‘arms and legs’ are quite short to very short. Chromosome number 2n = 42 or 40. *N. maculata* is a rather isolated species, differing from the other two species in its extremely small, generally self-pollinating flowers and its leaves that are frequently spotted.

Himantoglossum

A genus found mainly around the Mediterranean, including around ten species, two of which are found in the domain. The main characteristic of one of these (*H. hircinum*), which is only found in Galicia and Castilla-y-León, is the spectacular development of the labellum, with an extremely long, narrow and twisted median lobe. The rosette of basal leaves develops very early (as early as October) and is often dried out and browned at flowering time. The other species (*H. robertianum*), also found in Portugal, is, like the first, a very robust plant with large flowers, which has the particularity of starting to flower very early (as early as January).

Anacamptis

The enlarged genus *Anacamptis* was established during the reform of the former genus *Orchis*. Clearly separated from the latter phylogenetically (see Figure 3.1), *Anacamptis* also differs from the other components of the former *Orchis* in terms of chromosome number (2n = 36), which explains why it cannot hybridise with them, but can hybridise with members of the genus *Serapias* (2n = 36). Nine species and subspecies of *Anacamptis* are present in our study area, all of which are found in Portugal. Some of them have morphological characteristics similar to those of *Androrchis*, including a non-anthropomorphic labellum, a fairly long, upward-pointing spur, and an often elongated, loose inflorescence. However, this is not the case for all (sub)species. For example, the sepals and petals are joined together in a helmet shape and the spur is curved downwards in some species, as in *Orchis* s.str. Furthermore, the type species of the genus, *A. pyramidalis*, has a compact and dense inflorescence, as well as a very long, thin spur. The key word for *Anacamptis* is therefore morphological diversity, which explains why some authors want to separate this genus into five distinct genera (DELFORGE 2009), an option that we will not follow here, if only because of the numerous hybrids that the different species form between themselves.

Serapias

Comprising eight species, this genus, which is mainly distributed in the Mediterranean region with some occurrences along the Atlantic coast, is one of the most curious and original of our native orchids. Its flowers are remarkable, with the labellum deeply embedded in a cavity formed by the other parts of the perianth. It is generally agreed that this cavity is essentially a shelter where various insects can take refuge in bad weather or spend the night, thus ensuring that the pollinia are removed and deposited on the stigmas during subsequent visits. However, they may also serve as sexual lures, as suggested by the movements of male insects on the callosity at the base of the labellum of *Serapias lingua* (VEREECKEN et al. 2012). Although the flowers are generally dark red (thus enhancing the appearance of a dark cavity), the occasional use of autogamy cannot be ruled out, giving rise to certain species or varieties without red pigments, which are green or yellowish in colour.

Ophrys

A very particular adaptation to pollination by insects, involving a sexual lure, characterises this genus and differentiates it from all our other orchids (see the chapter on the biology of orchids). The flowers, with their velvety labellum of various colours and distinctive scents, bear a certain resemblance to various species of insects. Each species of *Ophrys* is adapted to pollination by one or a few very specific species of insects, on which it therefore depends for its reproduction. This is the genus with the largest number of species in Europe and the Mediterranean Basin: more than 350, or even 450 (KREUTZ 2024) have been described to date, sometimes referred to as ‘micro-species’, as opposed to ‘macro-species’, identifiable by molecular phylogeny and numbering nine! The majority of ‘micro-species’ have a very limited distribution, most often in the Mediterranean region; a few have a wider range extending northwards. Twenty-two (micro-) species have been identified for the domain, including twenty in Portugal.

3.3. Identification key for orchids of Portugal and neighbouring regions

In the remainder of this chapter, we propose a dichotomous identification key for all orchid species in our study area. Here are a few basic precautions to take when using such keys:

(1) A key is used at the level of a **population**, not an individual. It is therefore necessary to identify in the field a group of plants that are supposed to belong to a given taxonomic entity, generally a species;
(2) For the same reason, it is necessary to examine **several individuals** within a given population: the key cannot be used to identify extreme or aberrant individuals, and it is necessary to consider **averages** of individuals that are representative of the population;
(3) **All the characteristics** provided in the key must be taken into account to ensure identification under good conditions, and it is not sufficient to rely on a single characteristic if the key provides several.
(4) We are using an unillustrated key here, so it is necessary to be familiar with the essential morphological characteristics of the plants and flowers of the different genera of orchids. If necessary, refer to Figs. 1.6 to 1.11 in Chapter 1, the descriptions of the different genera and species in Chapter 4, or the glossary at the end of the book.

1 Plants with leaves reduced to scales, with dominant colour other than green 2
1' Plants with normally developped green leaves 3

2 Dominant colour of the plant: pale to dark violet .... *Limodorum* (see G)
2' Dominant colour of the plant: brown or brownish .... *Neottia* (*nidus-avis*)

3 Flower without a spur 4
3' Flower with a distinctly developed spur 10

4 Lip distinctly divided into an internal part (hypochilium) and an external, more or less spreading part (epichilium), separated by a constriction 5
4' Lip not distinctly divided in that way 7

5 Sepals united into a helmet, enclosing the very narrow petals; bracts pink, or seldom green; normal leaves in a rosette at the stem basis .... *Serapias* (see L)
5' Sepals and petals alike, spreading outwards or forming a loose bell-shaped flower; bracts green; normal leaves spread along the stem 6

6 Sepals and petals spreading outwards (exceptionally, flowers opening barely: *E. fageticola*); sepals green to purplish brown externally; hypochilium developed into a nectar pouch .... *Epipactis* (see E)
6' Sepals and petals forming a loose bell-shaped flower, completely white or pink to red; hypochilium not developed into a nectar pouch .... *Cephalanthera* (see C)

7 Flowers green with bilobed lip; two broadly ovate opposite leaves, borne well above the ground level .... *Neottia* (*ovata*)
7’ Flowers green or with different coulours; lower leaves more than two, most of them borne at the ground level 8

8 Flowers small, white (eventually with the lip greenish to yellowish at basis), arranged in a more or less helicoidal spike .... *Spiranthes* (see M)
8' Flowers coloured differently, not arranged in a helicoidal spike 9

9 Flowers yellowish, brownish to reddish green; sepals and petals united into a helmet; lip glabrous, distinctly divided into four narrow lobes, with or without a minute appendage .... *Orchis* (*anthropophora*)
9' Flowers with variable colours; sepals and petals spreading; lip hairy, entire or three-lobed, often with a well developped appendage or without appendage .... *Ophrys* (see J)

10 Spur thin and very long, much longer than the ovary 11
10' Spur shorter than, approximately as long as, or slightly longer than the ovary 13

11 Flowers always white; two main ovate leaves at the basis of the stem............... *Platanthera bifolia*
11' Flowers pink to violet, very seldom white; several linear to lanceolate leaves 12

12 Inflorescence short, dense, more or less conical; lip with two distinct guide plates at basis .... *Anacamptis* (*pyramidalis*)
12' Inflorescence long, loose, more or less cylindrical; lip without guide plates.................................... .... *Gymnadenia* cf. *borealis*

13 Flowers tiny (approximately 5 mm accross), with a short, more or less globose spur 14
13' Flowers small to large, with a medium, conical to cylindrical spur, seldom globose....................16

14 Flowers green; two cordate, unspotted leaves alternating along the stem .... *Gennaria diphylla*
14’ Flowers white to pink, sometimes with red spots; leaves lanceolate to ovate, sometimes spotted, most of them at the basis of the stem 15

15 Flowers always white to creamy white; bracts equal to or slightly longer than the ovary; leaves always unspotted ....*Pseudorchis albida*
15' Flowers pure white to pink with red spots, sometimes yellowish; bracts shorter than the ovary; leaves often spotted ....*Neotinea* (*maculata*)

16 Large, greenish to brownish violet flowers; lip with more or less undulate margins ....*Himantoglossum* (see F)
16' Small to large flowers; lip margins not undulated...17

17 Leaves distributed along the stem 18
17' Most leaves joining into a rosette at the stem base 20

18 Flowers green or reddish-brownish green; lip oblong, bifidous; spur globose ....*Dactylorhiza* (*viridis*)
18’ Flowers white, pink, lilac to violet; lip wider than long, often trilobed; spur conical to cylindrical 19

19 Bracts membranous; violet flowers with ascending spur... .... *Anacamptis* (*laxiflora*)

19' Bracts leaf-like; flowers with variable colours, spur descending, or horizontal to ascending, in the latter case the flowers are yellow .... *Dactylorhiza* (see D)

20 Lateral sepals erect or spread laterally 21
20’ Lateral sepals united with petals to form a protective helmet over the gynostemium 22

21 Lip undivided, entire; spur globose, shorter than ovary, descending...............*Anacamptis* (*collina*)
21’ Lip clearly trilobed; spur cylindrical, equal to or longer than ovary, pointing upwards.................... .... *Androrchis* (see B)

22 Lip entire to trilobed, with median lobe entire or slightly bilobed, without appendage, and with denticulate margins; spur pointing upwards or downwards..............................*Anacamptis* (see A)
22’ Lip distinctly trilobed, with median lobe more or less distinctly bilobed, often with an appendage between the median lobes, with smooth to denticulate margins; spur descending 23

23 Lip clearly quadrilobed, mostly with smooth margins (“anthropomorphic silhouette”)................... .... *Orchis* (see K)
23’ Lip trilobed to quadrilobed, mostly with denticulate margins ....*Neotinea* (see I)

A. *Anacamptis*

1 Labellum with two protruding lobes at the base; spur thin and very long, much longer than the ovary .... *A. pyramidalis*
1’ Labellum without protruding lobes; spur shorter, approximately as long, or slightly longer than the ovary 2

2 Lateral sepals spreading laterally or recurved backwards 3
2' Sepals grouped with the petals into a protecting helmet 4

3 Lip entire, red or paler, sometimes greenish; spur short, very thick, bag-like, pointing downwards; leaves in a basal rosette .... *A. collina*
3' Lip more or less distinctly lobed, pink to violet; spur long, cylindrical, pointing upwards; leaves spread along the stem .... *A. laxiflora*

4 Spur pointing upwards 5
4' Spur pointing downwards, more or less parallel with ovary 7

5 Centre of the lip generally white, without spots, or with thick purple line markings (f. *mesomelana*); plant with vegetative growth, often found in homogeneous and dense groups .... *A. champagneuxii*
5' Centre of the lip with purple spots; plant without vegetative growth, growing as isolate individuals .... (*A. morio*) 6

6 Flowers large (lip width 13.5 - 17.5 mm) .... *A. morio* subsp. *morio*
6' Flowers small (lip width 11 - 15.5 mm); inflorescence very loose .... *A. morio* subsp. *picta*

7 Sepals more or less free; lip entire, pointing forwards .... *A. papilionacea*
7’ Sepals closely tight together; lip with three entire or denticulate lobes, curved backwards .... (*A. coriophora*) 8

8 Flowers generally red to wine-red, with unpleasant scent (bug), with an often thick, inflated spur .... *A. coriophora* subsp. *martrinii*
8’ Flowers with variable colours, red, pink or greenish, with pleasant scent (fruit), with a more or less conical spur .... *A. coriophora* subsp. *fragrans*

B. *Androrchis*

1 Flowers yellow 2
1' Flowers pink to violet (rarely white) 3

2 Lip with fine brown markings; leaves usually spotted .... *A. provincialis*
2’ Lip and leaves unspotted .... *A. pallens*

3 Lip with an obvious elbowed profile; lateral sepals spreading laterally, showing their width when seen from front; inflorescence loose .... *A. langei*
3' Lip with a +/- straight profile; lateral sepals curved backwards; inflorescence more or less dense 4

4 Very small flowers; length of the lip usually less than 7 mm .... *A. tenera*
4’ Small to medium-sized flowers; length of the lip more than 7,5 mm 5

5 Plant robust or slender; leaves spotted or unspotted; fine markings toward the centre of the lip .... *A. mascula*
5' Plant more or less slender, with loose and generally few-flowered inflorescence; leaves generally unspotted; bigger markings spread over the lip .... *A. olbiensis*

C. ***Cephalanthera***

1 Flowers white; bracts (starting from the second) much reduced; ovary subglabrous ....*C. longifolia*
1' Flowers pink to red; bracts well developped; ovary pubescent .... *C. rubra*

D. ***Dactylorhiza***

1 Green or reddish to brownish green flowers; oblong, bilobed labellum; globular spur......*D. viridis*
1’ White, yellow, pink, or lilac to violet flowers; labellum wider than long, often three-lobed; conical to cylindrical spur. 2

2 Flowers mostly yellow, seldom pink or red with a yellow gorge 3
2' Flowers coloured differently, white, pink or lilac to violet....6

3 Spur descending to horizontal, longer, equal to slightly shorter than the ovary; flowers either yellow with red spots or red with a yellow gorge, seldom pink....4
3’ Spur ascending or horizontal, about equal to or shorter than the ovary; flowers yellow 5

4 Spur descending, parallel to ovary, longer than ovary; lip with red spots, either yellow or red with a yellow gorge; leaves spread, forming an angle of 56-80° with the stem....*D. sambucina*
4’ Spur descending to horizontal, about equal to shorter than the ovary; lip with red spots, generally yellow, seldom pink; leaves +/- erect, forming an angle of 23-47° with the stem.......*D. cantabrica*

5 Spur ascending; lip without spots....*D. markusii*
5' Spur ± horizontal; lip with red spots or unspotted ....*D. insularis*

6 Leaves normally unspotted; flowers pink or lilac to violet; 0 – 3 well developped upper bract-like leaves; thick stem (diameter between 3 and 6 mm under inflorescence), +/- hollow, compressible. 7
6’ Leaves usually spotted, seldom unspotted; flowers pink to lilac or whitish; 2 – 6 reduced upper bract-like leaves; thin stem (diameter between 1,5 and 4 mm under inflorescence), solid, non compressible....8

7 Flowers small (lip 6 – 8 mm wide), pink to lilac; erect leaves whose top rises above the inflorescence basis; plants small to medium (much less than 1 m).... *D. incarnata*
7’ Flowers large (lip width more than 9 mm), usually violet; leaves top does not reach the inflorescence basis; plants tall, up to 1 m....*D. elata*

8 Flowers large (lip 11.5 - 16 mm wide), with a long and thick spur (diameter at base 2.1 - 2.7 mm); leaves lanceolate, spreading; wet meadows or chestnut groves ....*D. caramulensis*
8' Flowers smaller (lip 8.5 - 12.5 mm wide), with a shorter and thin spur (diameter at base 1.3 - 1.9 mm); leaves linear, more or less erect; marshy meadows on acidic soils, bogs, *Erica tetralix* heaths....*D. ericetorum* (see also *D. irenica*)

E. ***Epipactis***

1 White, articulate lip, with yellow ridges on the epichilium and violet line drawings on the hypochilium; plant from marshy habitats.... *E. palustris*
1' Non-articulate lip; white to pink or violet epichilium with pinkish to brownish (seldom white) humps; plant from shady to open, dry habitats....2

2 Flowers slightly to widely open, self-pollinating (rostellum absent or non-functional); labellum generally white, without additional colour, rarely tinged with pink, with slightly marked gibbosities....3

2’ Flowers generally wide open, allogamous (functional rostellum), with spreading sepals; epichile white, pink or purple with pinkish to brownish gibbosities, clearly marked. 4

3 Flowers barely open, pendulous; stem almost glabrous; leaf margins strongly irregularly dentate. ..... *E. fageticola*
3' Flowers more or less open, erect; pubescent stem; more or less regular dentation on the leaf margins ..... *E. bugacensis*

4 Leaves ovate, flat, spreading; plant from shady habitats (*Quercus pyrenaica*, *Castanea sativa* ... woods), flowering late (June - July) ..... *E. helleborine*
4' Leaves ovate to almost round, often with undulate margins; plant from light shade to open habitats, flowering early (April - May) 5

5 Leaves erect (angle with the stem 15 – 40°); ovary pedicell usually without violet tinge; epichilium frequently pinkish white ..... *E. duriensis*
5’ Leaves spread (angle with the stem 35 – 70°); ovary pedicell usually with violet tinge; epichilium greenish to pale pink or violet 6

6 Five to eight short leaves (less than 6.5 cm long), greyish green, more or less assembled toward the base of the stem, ± on two opposite ranks; upper internodium long (8 - 25 % of the plant height); flowers usually with bright colour; acidic soils, typically in *Quercus suber* woods or in *Cistus* scrub ..... *E. lusitanica*
6' Six to ten larger leaves (the longest more than 5.5 cm long), olive green, arranged like a horn around the stem, distributed more or less evenly from the basis to the inflorescence, ± oriented in all directions; upper internodium short (6 - 17 % of the plant height); flowers usually with darker colours; on various soils but mainly calcareous, in open, dry, rocky conditions ..... *E. tremolsii*

F. *Himantoglossum*

1 Lip median lobe very long (≥ 3 cm) and narrow, like a twisted ribbon; flowers with unpleasant scent (male goat); late flowering (May – June) ..... *H. hircinum*
1’ Lip median lobe wider and shorter (< 3 cm); flowers with *Iris* scent; early flowering (January – March (- April)) ..... *H. robertianum*

G. *Limodorum*

1 Lip normally developed; spur long and thin ..... *L. abortivum*
1' Lip linear, not well developed; spur absent or rudimental ..... *L. trabutianum*

H. *Neotinea*

1 Very small flowers (labellum less than 5 mm long); generally self-pollinating (complete fruiting); spotted leaves (with pink to red flowers) or unspotted leaves (pale yellow flowers) ..... *N. maculata*
1’ Small flowers (labellum longer than 5 mm); allogamous plant (incomplete fruiting); leaves never spotted 2

2 Sepals with acuminate tip spreading outside of the helmet, with the same colour as the lip ..... *N. conica*
2’ Sepals rounded, forming a well united helmet, with a dark brown colour ..... *N. ustulata*

I. *Neottia*

1 Plant without chlorophyl, leaves brownish, reduced to scales ..... *N. nidus-avis*
1’ Two well developed green leaves ..... *N. ovata*

J. *Ophrys*

1 Gynostemium obtuse 2
1' Gynostemium acute 17

2 Lip distinctly three-lobed, the median lobe with a large blue shining speculum in the middle, surrounded by a heavy pubescence of brown to orange hair 3
2' Not that combination of characters 4

3 Slightly convex lip, with surrounding pubescence dark brown, with lateral lobes emerging forward; petals dark brown .... *O. speculum*
3' Strongly convex lip, with surrounding pubescence orange to light brown, with lateral lobes in a plane with the median lobe; petals brownish green .... *O. lusitanica*

4 Lip distinctly three-lobed, with bifid median lobe, blackish, with a blue glabrous zone in the middle; petals linear, very narrow, blackish .... *O. insectifera*
4’ Not that combination of characters 5

5 Lip strongly convex, brownish, with a glabrous, shining median lobe, and two hairy, long lateral lobes, projected backwards .... *O. bombyliflora*
5' Not that combination of characters 6

6 Perianth pink or lilac; all sepals spreading 7
6' Perianth green or greenish; dorsal sepal curved forward, protecting the gynostemium 8

7 Almost square-shaped lip, slightly convex, wider than long, with a wide yellow margin; plant with late flowering period (April - May) .... *O. ficalhoana*
7' Lip obviously convex, apparently longer than wide, brownish; flowers earlier (January - April) *O. tenthredinifera*

8 Lip almost flat to slightly convex, with a very large, obvious yellow margin 9
8' Lip obviously convex, without yellow margin or with a narrow yellow margin 10

9 Flowers tall (lip width ≥ 11 mm); flowers early (February – April); grows in open conditions.... *O. lutea*
9’ Flowers small (lip width ≤ 11 mm); flowers later (April – May); grows in slightly shaded, usually north-facing habitats .... *O. quarterirae*

10 Base of the lip flat in front of the stigma, without a median furrow; lip with a white, whitish or blueish *omega*-like (w-shaped) drawing close to the middle 11
10’ Base of the lip with a median furrow in front of the stigma; lip without drawing or with drawing of variable shape 12

11 Lip strongly convex starting from the base, both laterally and longitudinally; glabrous margin of the lip usually not visible, hidden by the pilosity .... *O. dyris*
11’ Lip with a flatter profile, almost flat at the base, often slightly concave in the middle of the length; glabrous margin of the lip frequently visible .... *O. algarvensis*

12 Labellum with a white, whitish or bluish omega-shaped pattern near the centre; median groove at the base of the labellum not very pronounced; distal part of the labellum densely covered with whitish hairs 13

12’ Labellum without pattern or with a pattern of a different shape, generally not whitish; median groove of the labellum clearly marked; distal part of the labellum with brownish hairs 14

13 Medium-sized labellum (less than 18 mm in length); modestly sized plant; isolated locations in the north-east of the study area............*O. vasconica*
13’ Larger labellum (length over 17 mm); more robust and taller plant; reduced distribution area, in the central-western part of the domain. ....*O. lenae*

14 Plant with few flowers (between 1 and 3 to 4 flowers); small flowers (labellum length less than 13 mm)............*O. pintoi*
14’ More flowers (between 3 and 7 flowers) ; larger flowers (labellum longer than 13 mm) 15

15 Lip with dull colours and disorderly pilosity; base of the lip often bleached; top of the lip strongly convex; very early flowering (January in the south to April in the north)............*O. lupercalis*
15’ Not that combination of characters............16

16 Large lip (more than 15 mm long), with two well developed ridges close to the base, with clear shining blue zone close to the base or the centre; yellow margin absent or narrow, seldom wide (Serra de Palmela) ....*O. fusca*
16' Medium-sized lip [less than 15 (- 17) mm long], without or with poorly developed ridges at the base, with rather dull colours, sometimes marbled; yellow margin more or less obvious............*O. bilunulata*

17 Green to brownish perianth, sometimes washed with pink; lip entire to slightly three-lobed, dark brown to blackish, with a +/- H-shaped shining drawing in the middle............18
17' Pink to lilac (seldom white or greenish) sepals; lip strongly convex and deeply three-lobed, brown with various shaped drawings 19

18 Lip gibbosities generally well developed, glabrous internally; lip drawing intense metallic blue ....*O. incubacea*
18’ Lip gibbosities absent or poorly developed; lip drawing with varied colours ....*O. caloptera*

19 Lip appendage strongly curved underneath, not visible from front; short and greenish petals............*O. apifera*
19' Lip appendage clearly pointing forward; long, lilac to purple petals............20

20 Labellum strongly distended, the width of the median lobe exceeding half its length; perianth dark red-purple in colour; petals triangular, short, less than half the length of the sepals. ....*O. beirana*
20’ Moderately rounded labellum, with the width of the median lobe approximately half its length; pink perianth, rarely purple or white; linear petals, longer than half the length of the sepals. 21

21 Medium-sized lip (more than 11 mm long), with more or less triangular lateral protuberances; petals longer than 5,5 mm ....*O. scolopax*
21' Very small lip (less than 11 mm long), with very fine, acute lateral protuberances; petals shorter than 5,5 mm ....*O. picta*

K. *Orchis*

1 Lip without a spur; flowers yellowish, brownish to reddish green; lip without markings............*O. anthropophora*
1’ Lip with a spur shorter than ovary; flowers white or pink to lilac, sometimes with a brownish helmet; lip with purple spots or hair tufts............2

2 Lip divided into four narrow lobes; flowers pale lilac to white; leaves with undulated margins, sometimes maculated............*O. italica*
2’ Lip three-lobed with bilobed median lobe; flowers white to lilac, with a brownish-purplish helmet; leaves with straight margins, never maculated............*O. purpurea*

L. *Serapias* [dichotomies 5 to 7 taken from VENHUIS & OOSTERMEIJER (2011)]

1 Basis of the lip with one, more or less round callosity; epichilium almost glabrous or slightly hairy; plant with vegetative growth, often found in dense and homogeneous groups ....*S. lingua*
1' Basis of the lip with two separate ridges or a clearly furrowed callosity; epichilium more hairy ...2

2 Epichilium very narrow (less than 6 mm wide) 3
2' Epichilium wider (more than 6 mm wide) 4

3 Epichilium usually dark red, long, oriented forwards, downwards or more seldom backwards; plant often found in dense, homogeneous groups ....*S. strictiflora*
3' Epichilium pink to red, sometimes yellowish or greenish, very short, curved backwards; plant growing as isolate individuals ....*S. parviflora*

4 Epichilium 6 to 10 mm wide ....*S. elsae*
4’ Epichilium more than 10 mm wide 5

5 Ratio epichilium width / hypochilium length between 0,6 and 1,2 .... *S. occidentalis*
5’ Ratio epichilium width / hypochilium length between 1,3 and 2,1 6

6 Hypochilium length (6-) 7 – 8 (-9) mm .... *S. perez-chiscanoi*
6’ Hypochilium length (9-) 10 – 14 (-17) mm 7

7 Epichilium wide (16-23 mm), heart-shaped, purple, with non-incurvated margins ; pollinia coherent ....*S. cordigera*
7’ Epichilium more narrow (13-20 mm), generally pale, whitish, sometimes red, frequently with margins forwards incurvated ; pollinia crumbly .... *S. gentilii*

M. *Spiranthes*

1 Centre of the lip yellow to green; flowers in an obvious helicoidal spike; leaves short, ovate, in a rosette growing beside the flowering stem; flowers in autumn.......................................*S. spiralis*
1' Centre of the lip white; helicoidal arrangement of flowers less obvious; leaves long, linear - lanceolate, at the basis of the flowering stem; flowers late spring to summer................*S. aestivalis*

3.4. Orchid habitats in Portugal and neighbouring regions

The habitats where orchids can be found in the territory under consideration are numerous and diverse. Below, we attempt to provide a brief summary, without going into too much phytosociological detail. Interested or specialised readers may consult the list of natural and semi-natural habitats in Portugal (ALVES et al. 2009) or the list of vascular plant communities on the Iberian Peninsula (RIVAS-MARTÍNEZ et al. 2002), which we have used as partial inspiration for this presentation. This is more similar to the highly concise overview provided by CORTIZO & SAHUQUILLO (2006) for the orchids of Galicia.

We have adopted the same groupings and order of presentation as in TYTECA (1998), which were partly based on the richness and abundance of orchid species. Where relevant and/or possible, we indicate the plant community classes to which the habitats reviewed can be linked, according to the classification of RIVAS-MARTÍNEZ et al. (2002), based on the BRAUN-BLANQUET method (1928), without, however, going into an in-depth description or attempting a distribution according to the different specific plant associations. With regard to this classification, it should be noted that orchid species, often indicated by these authors as characteristic of various associations, alliances or community classes, are not exclusive to them; below we attempt to mention orchids in all environments where they may appear, not only those in which they have been identified as characteristic.

3.4.1. Grasslands, garrigues, sparse woodland and olive groves on calcareous or similar soils

Unsurprisingly, the most species-rich biotopes are **garrigue scrubland and dry grasslands on calcareous** soils, which are generally maintained by extensive grazing by flocks of sheep or goats. Due to local differences in exposure, slope and grazing intensity, it is often difficult to distinguish between limestone grasslands and scrublands, the latter being characterised by a higher proportion of bushes and scrub; this is why these two types of habitats are treated together here. In addition, the latter are often located on the edge of more wooded habitats, which are discussed further on, but in areas of gradual transition the same species are often found, particularly orchids. We therefore also consider these transitional habitats here, which we will refer to as **open woodland**. Another very characteristic habitat in the territory covered, which we also include in this same category, comprises **olive groves**, often planted very sparsely, so that rich herbaceous vegetation can establish itself. Although they are often cultivated, the soil is left fallow for several years, so that the vegetation cover can recover, including orchids.

In this type of habitat, the soil is generally dry, with low water retention, and always very shallow, exposing the bedrock in many places. The vegetation is often open, dominated by grasses or low-growing, nutritious plants such as bulbus bluegrass (*Poa bulbosa*), clover or plantains. The soil is generally basic to neutral, rarely slightly acidic. From an ecological point of view, this may be one of the early stages of succession leading to the climax of holm oak (*Quercus ilex*) woodland, maintained in this herbaceous and open state by a combination of climatic conditions and frequent grazing. From a phytosociological point of view, the habitats in question mainly belong to the following classes, according to the classification of RIVAS-MARTÍNEZ et al. (2002): *Festuco-Brometea*Br.-Bl. & Tüxen ex Br.Bl., *Poetea bulbosae* Rivas Goday & Rivas-Martínez, *Lygeo-stipetea* Rivas-Martínez.

Figure 3.2. – Herd of goats in a typical Alentejo landscape. 1997.

Such habitats are mainly found in the limestone areas mentioned above, namely the Barrocal in the Algarve, large parts of Estremadura, Ribatejo, the southern part of Beira Litoral (see Fig. 2.14, section 2.4) and some mountain ranges in eastern Galicia. In some regions where the bedrock is not necessarily limestone but the substrate is still basic, the same type of habitat with its characteristic floristic composition can be found. This is the case, for example, in certain parts of the Alentejo, particularly around Reguengos de Monsaraz and the Serra de Ficalho (see Fig. 3.2 above), in part of Extremadura, and in part of Trás-os-Montes, where ultrabasic rocks outcrop (AGUIAR & MONTEIRO-HENRIQUES 2020).

Figures 3.3 – 3.6. Typical plants of the garrigue.
3.3. – Peruvian squill (*Scilla peruviana*), found in southern Portugal (Estremadura, Alentejo, Algarve), here, in Malhão, Algarve, 10 April 1992; **3.4.** – Cornucopia (*Fedia cornucopiae*), Agostos, Algarve, 3 March 2011; **3.5.** – A daphne (*Daphne gnidium*), with the rich colours of its flowers and berries in autumn, Ericeira, Estremadura, 8 October 2006; **3.6.** – An Ophrys (*Ophrys algarvensis*), in front of the dwarf palm (*Chamærops humilis*), Loulé, Algarve, 3 April 2008.

Among the typical and remarkable herbaceous species, often associated with orchids, and whose photos are scattered throughout this book, we can see a peony (*Pæonia broteroi*), a small valerianaceae from the south of the Iberian Peninsula and North Africa, the cornucopia (*Fedia cornucopiae*, Fig. 3.4), certain narcissi (including *Narcissus bulbocodium*), squills (*Scilla monophyllos*, *S. autumnalis*, as well as the misnamed *S. peruviana*, Fig. 3.3), gladioli (including *Gladiolus illyricus*), bituminous clover (*Psoralea bituminosa*), autumn squill (*Drimia maritima*), which flowers in autumn but whose leaves are clearly visible and recognisable in spring, etc. Shrubby plants and bushes include various rockroses (*Cistus albidus*, *C. monspelliensis*, etc.), thyme (including *Thymus capitatus*), daphne (*Daphne gnidium*, Fig. 3.5) and mastic (*Pistaccia lentiscus*). Among the trees and shrubs, apart from the olive tree, the most typical are the carob tree (*Ceratonia siliqua*), the fig tree (*Ficus carica*) and, in the south, the dwarf palm (*Chamærops humilis*, Fig. 3.6).

As for orchids, many species can be found in this type of habitat. It is the preferred location for many *Ophrys*; however, only some of them can be found throughout the entire region, from the Algarve to Galicia: *O. apifera* and *O. scolopax* (the latter being rare and unevenly distributed). Most other *Ophrys* species are only found in the southern part of our territory, with some, which are less demanding in terms of substrate, extending as far as neighbouring Extremadura via the Alentejo, or in the North (*O. speculum*, *O. lutea*, *O. tenthredinifera*), while others are restricted to Portugal but are found in large numbers in the Algarve, Estremadura, Ribatejo and south of Beira Litoral (*O. lusitanica*, *O. bombyliflora*, *O. picta*). The *Ophrys* species not mentioned have a smaller range and will be discussed in the monographs.

Other orchids that can frequently be seen in dry, open environments with alkaline soils include, from the start of the season in February–March, *Neotinea conica*, *Himantoglossum robertianum* and, very locally, *Androrchis olbiensis* and *Anacamptis collina*. In a second wave of flowering, which is most explosive in March–April, in addition to most of the *Ophrys* species, *Anacamptis champagneuxii*, *Androrchis mascula*, *Orchis anthropophora*, *O. italica* and, more locally, *Anac. papilionacea* and *O. purpurea* can be seen. Even later (April–May), we see *Anacamptis pyramidalis*, *A. coriophora* subsp. *fragrans* and, in the northern part of Spain, *H. hircinum*. Finally, the last and only representative of orchids in autumn (September–October) is *Spiranthes spiralis*. It should also be noted that certain *Serapias* species are found in the same habitats, especially the widespread *S. parviflora*, as well as, more occasionally, *S. lingua* and *S. strictiflora*.

Locally, in bushier areas and at the edge of woods, other species can be observed, such as *Cephalanthera longifolia, Epipactis tremolsii, Gennaria diphylla*, *Neotinea maculata* and *Limodorum abortivum*.

Finally, to be complete, in the north-eastern part of the studied territory, certain mid-altitude meadows, under a more continental climate, can be linked to the same type of habitats, which can be found in eastern Galicia and Castilla y León. In these environments, species can be observed that are either completely absent from Portugal, such as *Neottia ovata*, *Ophrys insectifera*, *Dactylorhiza sambucina* (or even *D. cantabrica*) and *D. viridis*, or that are present there but in different environments: *D. insularis*, *D. markusii* or *Neotinea ustulata*.

Evolution and threats

The open, dry environments we have just mentioned were often developed and maintained through centuries of traditional agro-pastoral activities, mainly the occasional passage of flocks of sheep or goats led by shepherds, activities that did not exhaust the soil and helped to maintain an open landscape through the regular grazing of shoots and young shrubs. Nowadays, as everywhere else in Europe and the Mediterranean basin, we are witnessing a decline in agriculture in favour of more intensive, aggressive activities (intensive grazing, cultivation, planting of vineyards), or, on the contrary, a prelude to outright abandonment, heralding a gradual return to climax forest. In other places, these habitats have been and are being destroyed outright to make way for urbanisation or the construction of new roads such as motorways.

There are numerous spectacular examples of such developments in Portugal and neighbouring regions. Over the last few decades, many areas have been subjected to uncontrolled urbanisation, especially near the coast or large cities; the change is particularly striking around Lisbon and in the Algarve. Examples of degradation linked to agricultural decline or intensification include the case of the Serra da Arrábida, where many areas of scrubland have been rapidly reforested, while other plots have been converted to intensive grazing. Therefore, even in the case of natural parks such as the Serra da Arrábida, the measures taken do not always favour the conservation of habitats as sensitive and representative as the open environments mentioned above. An example of a situation where both types of degradation have occurred is the Reguengos de Monsaraz region in the Alentejo, where, on the one hand, many biotopes have been lost following the construction of the Alqueva dam and, on the other hand, a significant number of rough pastures have been converted into productive, standardised pastures following the massive application of fertilisers.

Many species, including orchids, have therefore declined dramatically in recent years. Among the rarest are *Anacaptis papilionacea* and *Ophrys incubacea*, both of which are in a precarious situation and have suffered a significant decline in their two main areas of distribution in Portugal, the Upper Alentejo and the Serra da Arrábida, as mentioned above. Another species with an extremely limited distribution, *Gennaria diphylla*, has also seen its numbers decline dramatically as a result of urbanisation in the Lisbon-Cascais coastal area.

3.4.2. Dry grasslands and scrublands, on siliceous or non-basic soils

Habitats similar to the above also develop on non-basic or siliceous soils, where the bedrock is not limestone but rather schistose or granitic, and where the soil has an acidic reaction. These open habitats, on dry soils, have a similar origin to the open basophilic environments mentioned in the previous point: degradation of the forest to establish intensive pastures, environments unsuitable for the establishment of forests, abandoned crops, etc.

In general, these habitats are not as rich in orchids as the previous ones. Some of the species mentioned above, which are more tolerant in terms of substrate type, can be found here, such as rare *Ophrys* (*O. speculum*, *O. lutea* and more rarely *O. tenthredinifera* or *O. bombyliflora*), as well as *Anacamptis champagneuxii*, *Orchis italica*, *Androrchis mascula* and sometimes *A. langei*. On the other hand, other orchids find one of their favourite biotopes here, mainly *Serapias* (*S. lingua*, *S. strictiflora*, *S. cordigera*, *S. perez-chiscanoi*, more rarely *S. parviflora*) as well as *Anacamptis morio* subsp. *morio* and subsp. *picta*.

A typical feature of the vegetation of Portugal and neighbouring territories, especially in the south, is the large areas of **cistus heathland** established on crystalline, mainly schistose soils. These biotopes cover considerable areas in the non-calcareous parts of the Algarve and Alentejo, where they are dominated by rockrose (*Cistus ladanifer*). Although not as rich as garrigue or limestone grasslands, these habitats are still home to certain orchids that would be difficult to find together elsewhere, such as the various *Serapias*, *Anacamptis morio* and *Epipactis lusitanica*.

In some high-altitude grasslands, such as in Galicia, conditions are favourable for the presence of a few acidophilic or substrate-tolerant orchids, such as *Pseudorchis albida*, *Dactylorhiza viridis*, *D. insularis* and *D. markusii*.

From a phytosociological point of view, the classes that can be mentioned here are (RIVAS-MARTÍNEZ et al. 2002) *Stipo giganteae-Agrostietea castellanae* Rivas-Martínez, Fernández-González & Loidi, *Cisto-Lavanduletea* Br.-Bl. and, in the north and at high altitudes (Galicia), *Nardetea strictae* Rivas Goday.

Evolution and threats

What has been said about open habitats on limestone remains valid here, except that, under specific conditions of drought and substrate, certain types of habitats on siliceous soils, such as rockrose scrubland, are more stable and are unlikely to be recolonised by forest.

3.4.3. Woods and forests

Here we refer to the different types of forests that can be described as climax stages. We do not particularly emphasise any differentiation in terms of substrate type (basic or acidic), as the differences tend to blur in many cases and the factors that best explain the distribution of habitats and species are more related to climate or exposure. Forests represent the stage to which the evolution of the open environments considered in the two previous sections will most often lead, in the absence of exploitation activities such as grazing; or, conversely, their degradation, following deforestation and clearing, will lead to the establishment of such open environments.

According to the classification of RIVAS-MARTÍNEZ et al. (2002), two main classes of plant communities are concerned here: the *Querco-fagetea* Br.-Bl. & Vlieger series (temperate deciduous forests) and the *Quercetea ilicis* Br.-Bl. ex A. & O. Bolòs series (Mediterranean evergreen forests).

Depending on local climate conditions, relative humidity and altitude (see previous chapter), there will be different types of forests. In the north, which is more temperate and humid, there are mainly deciduous forests (with non-evergreen leaves), including oak forests, among which one of the most typical and orchid-rich types is the **Pyrenean oak** (*Quercus pyrenaica*) forest, which has some fine examples in Trás-os-Montes (Bragança region – see Fig. 2.11, section 2.4) and in neighbouring regions of Spain. These environments are particularly rich in more or less basiphilous species, such as the lemon balm-leaved melittis (*Melitis melissophyllum*), the martagon lily (*Lilium martagon*), the bloody cranesbill (*Geranium sanguineum*), or the more discreet dog's tooth violet (*Erythronium dens-canis*). Some species from open environments, mentioned in the previous point, can also be found here, such as Brotero's peony (*Paeonia broteroi*) and *Daphne gnidium*. There is also a certain diversity of orchids, with some fairly rare species: *Neottia nidus-avis*, *Androrchis mascula*, *A. langei*, *Dactylorhiza insularis*, *Cephalanthera longifolia*, *Epipactis helleborine*, *Neotinea maculata*, etc.

Further south, where the climate becomes more Mediterranean, oak forests can still be found, but this time with tough, evergreen leaves, mainly **holm oak** (*Quercus ilex*) forests. Some of the orchids mentioned above in the scrubland can also be found here, such as *Limodorum* (*L. abortivum*, *L. trabutianum*), *Cephalanthera longifolia* and *Epipactis tremolsii*. These same species are present when pines, mainly maritime pine (*Pinus pinaster*), take over from oaks in slightly more xeric conditions. These pine forests thrive in different

Figures 3.7 – 3.8. (Un-)usual inhabitants of our forests: on the left, the lemon balm-leaved melittis (*Melitis melissophyllum*, Chaves, 8 May 2024); above, a little less common, the bee orchid (*Ophrys apifera*), on the edge of a cork oak forest (Barão de S. João, 28 April 2024).

types of soil, both basic and acidic; in more acidic conditions, an orchid that is well suited to this type of habitat, *Neotinea maculata*, sometimes appears, as well as, very locally, *Anacamptis morio* subsp. *picta*.

A very distinctive feature, typical of this part of the Mediterranean Basin, is the forests of **cork oak** (*Quercus suber*), which grow on fairly crystalline, acidic soils (see Fig. 2.12, section 2.4). The orchids associated with these forests also form a distinctive group, as certain species already mentioned, such as *Cephalanthera longifolia*, *Limodorum abortivum* and *Neotinea maculata*, can be found here, along with others such as the Portuguese helleborine (*Epipactis lusitanica*), for which this is one of its preferred habitats.

Another very typical forest, especially in the south, is that of **stone pine** (*Pinus pinea* – Fig. 2.13, section 2.4). Here we find a very particular group of orchids, including once again *Epipactis lusitanica*, as well as *Anacamptis morio* subsp. *morio*, several *Serapias* (*S. cordigera*, *S. parviflora*, *S. strictiflora*) and, very locally and near the sea, the two-leaved gennaria (*Gennaria diphylla*).

The **chestnut** forests (*Castanea sativa*) are another remarkable habitat that we must mention here. Mainly found in the north and centre of the studied territory, they generally originate from very old plantations and for this reason are often found near villages, where they are known as *soutos* in Portugal and Galicia. Located on mostly acidic soils, they consist of large trees that are generally well spaced, and their undergrowth is still, in many cases, kept open and clear to facilitate the harvesting of chestnuts, providing a prime habitat for many herbaceous species. In many regions of the Mediterranean basin, chestnut groves are known to provide one of the richest habitats for orchids. Some of them, in Portugal and neighbouring regions, find here practically one of their only biotopes in the territory in question, as is the case for *Platanthera bifolia*, *Dactylorhiza markusii*, *Androrchis provincialis*, *Cephalanthera rubra* and *Epipactis fageticola* (the latter in more humid areas), but other orchids also abound, such as *D. insularis*, *D. caramulensis* (locally), *A. mascula*, *A. langei*, *Cephalanthera longifolia*, *Epipactis tremolsii* and *E. lusitanica*.

To conclude this overview of forests (natural or planted), we cannot overlook the vast plantations of **eucalyptus** (*Eucalyptus* sp.). As habitats for wild fauna and flora, these woods are often very poor due to the constraints they place on the environment in terms of drying out or covering the soil; in this respect, they have a similar impact to that of conifer plantations in many parts of northern Europe. Nevertheless, certain herbaceous species can survive there, including orchids, sometimes even particularly rare ones, such as *Gennaria diphylla*.

Evolution and threats

The different types of woodland we have just mentioned are, of course, victims, like other habitats, of urban expansion and infrastructure development. Another threat to them is sometimes outright abandonment: for example, some chestnut groves that have been left to their own devices tend to become overgrown very quickly and thus lose some of the characteristics that allowed many herbaceous species to survive. A very symptomatic example of a rare orchid that has suffered, and may still be suffering, from this type of degradation is the lesser butterfly orchid (*Platanthera bifolia*: see TYTECA et al. 2024).

However, the main danger throughout the Mediterranean Basin remains linked to wildfires and forest fires. Every year, in Portugal as in neighbouring regions, large areas are destroyed by fire. This primarily affects the driest forests, i.e. pine forests and eucalyptus plantations, but other types of forest are not spared. The impact is generally dramatic in human, economic and biological terms. Left to their own devices, burnt forests will always eventually regenerate, sometimes slowly, while the herbaceous vegetation cover can recover more quickly and temporarily evolve into a more open habitat, which may eventually favour certain species that thrive in full sunlight. These generalities obviously apply to orchids, which, under certain conditions, can appear in large numbers and in spectacular fashion. The impact of fires is therefore not always detrimental to everyone... However, unfortunately, some developers often take advantage of the destruction caused by fires to promote the establishment of new urban structures, or the lost forest is converted to other types of crops...

3.4.4. Cool to wet grasslands

This very general term refers to a very broad class of plant communities according to RIVAS-MARTÍNEZ et al. (2002), namely the *Molinio-Arrhenatheretea* Tüxen. Under this term we include all kinds of ‘**grasslands**’ that can take on very different appearances, with the common features of a predominance of more or less tall grasses and 100% ground cover, as opposed to the biotopes described in sections 3.4.1 and 3.4.2, which do not cover the entire ground and are often dominated by various plants (thyme, clover, rockrose, etc.), growing on generally very dry and shallow soils.

These habitats are widely distributed in the temperate zones of the globe, but mainly in Eurasia. They are characterised by the fact that they exist practically nowhere without various types of human intervention, whether in the form of more or less extensive grazing or mowing. Often, these grasslands are also favoured by various measures aimed at irrigating them and/or providing them with various minerals, or even warming them, as is typically the case with irrigation channels. These irrigation practices have declined significantly in many regions of Europe, but they are still very much present and active in the territory we are concerned with here.

‘Cool to wet’ grasslands are obviously found mainly in regions that receive high rainfall or, when rainfall is scarce or intermittent, are regularly supplied with water by natural (watercourses) or artificial (“abissage” – see Fig. 3.9-10 below) drainage. This explains why, in the area studied, they are mainly found in the north and, to a lesser extent, in the centre and south, in a temperate or moderate Mediterranean climate.

The plant composition of these grasslands is generally very rich and varied, but differs according to local conditions of altitude, slope, exposure and soil. Typically, they are found on slopes or inclines; areas with no slope will tend to evolve into marsh-type habitats (see § 3.4.5). It is therefore difficult to draw up a ‘typical’ list of plant species; but it should be noted that, for example, large populations of various species of *Rhinanthus* (*R. minor*, *R. angustifolius*) are frequently observed, as well as spectacular species such as asphodels (*Asphodelus albus* and others) and Portuguese paradise flower (*Paradisea lusitanica* – Fig. 3.11).

Figures 3.9 – 3.10. “Abissage”, as still practised in northern Portugal (Vinhais, 8 July 2009). “Abissage” is a French term involving the practice of artificial channels that follow the contour lines, allowing to bring water, minerals or even warming to the meadow vegetation.

Fig. 3-11. – Meadow in the Serra do Alvão (Vila Real, Trás-os-Montes), rich in *Asphodelus* sp. (mainly in fruit), *Paradisea lusitanica* (in flower, on the right) and *Dactylorhiza caramulensis* (in the forefront). 8 June 2007.

Fig. 3.12. – Wet grassland in Alentejo, with Peruvian squill (*Scilla peruviana*) and loose-flowered orchid (*Anacamptis laxiflora*). Amieira (Alentejo), 18 April 2009.

This richness is also found in orchids: populations often include large numbers of individuals, giving these meadows a spectacular appearance. Among the orchids, there are impressive populations of *Serapias* (mainly *S. cordigera* and *S. lingua*, and less systematically *S. parviflora* and *S. strictiflora* and some other), *Dactylorhiza* (*D. caramulensis* or *D. elata*), *Anacamptis* (*A. coriophora* subsp. *martrinii*, *A. champagneuxii*, and much more locally *A. laxiflora*).

There is a certain complementarity in the distribution of orchids. In northern Portugal, for example, the wettest areas (see precipitation map, Figure 2.7) feature meadows where *Serapias* and *Dactylorhiza caramulensis* abound. In contrast, in the north-east, where rainfall is less abundant, the latter species tends to be replaced by *Anacamptis coriophora* subsp. *martrinii* and/or *A. champagneuxii*, although it is not uncommon to find these different species growing together. The former grasslands probably correspond to the *Anthemido-Cynosuretum*, *Agrosto-Arrhenatheretum bulbosi* and *Peucedano-Juncetum acutiflori* associations studied by TELES (1970), while the latter grasslands are more closely related to *Bromo-Cynosuretum* and

Hyperico-Juncetum acutiflori (TELES 1970). This gives a further idea of the diversity of habitats that we group here under the term ‘meadows’.

Furthermore, *Dactylorhiza caramulensis* and *D. elata* are never found together, the former preferring fairly cool meadows on acidic soils, while the latter prefers more humid and alkaline conditions. On the other hand, *Anacamptis laxiflora* is mainly found in the south, very rare in Alentejo, slightly less rare in Extremadura; in these regions, *Dactylorhiza caramulensis* is no longer found at all, and *D. elata* is rare. To conclude this overview, we can mention, in certain valleys in the south (Algarve and southern Alentejo), temporarily flooded alluvial meadows with groves of oleander (*Nerium oleander*) and tamarix (*Tamarix* sp.), where *Serapias* (*S. cordigera*, *S. lingua*, *S. parviflora*, *S. strictiflora*) abound, and where the summer ladies’ tresses (*Spiranthes aestivalis*) is sometimes found.

Evolution and threats

It goes without saying that the grasslands we have just mentioned are among the most threatened habitats, mainly because their survival to this day can be explained by the ancestral pursuit of traditional agro-pastoral practices, mainly annual mowing by hand or light mechanical means, frequently associated with the establishment and maintenance of drainage channels and, more rarely, extensive grazing. It can be said that Portugal (and neighbouring regions) has been relatively spared so far, compared to some other regions of Europe; extensive and light exploitation of these habitats is still widespread in the territory studied.

Unfortunately, these practices are now in decline, giving way to either more intensive grazing practices, fertilisation to improve mowing yields, or outright abandonment. In the latter case, drainage channels quickly become clogged, vegetation cover becomes denser, scrub encroachment quickly appears, heralding the return of the forest. Alongside this harmful development, other direct and more traditional causes of degradation are appearing, linked to the destruction and fragmentation of biotopes for the establishment of urban or industrial areas, or the extension of road and motorway infrastructure.

3.4.5. Marshes and peat bogs

When water flow is reduced, either due to the appearance of natural obstacles or because the slope of the land tends to level out, the habitats described in the previous point gradually turn into marshes. The same happens when, under certain soil, slope and climate conditions, certain plants develop that have the ability to retain large amounts of water and accumulate over time (sphagnum mosses). Depending on which of these situations occurs, there are two main categories of habitats, which we will briefly discuss below.

The first situation leads to **swamps** or **alkaline marshes**, which develop mainly in plains or large valleys. These habitats belong to the *Scheuchzerio palustris-Caricetea nigrae* Tüxen class, or possibly to the large sedge carrions of the *Phragmito-Magnocaricetea* Klika (RIVAS-MARTÍNEZ et al. 2002). Unfortunately, these biotopes have become extremely rare, as they have often been destroyed by drying out or drainage for the purposes of agricultural expansion or urbanisation. They can still be found in certain estuaries (habitats unsuitable for the survival of orchids) and in a few coastal areas behind the coastline, such as around Figueira da Foz, Vagos, Nazaré (Beria Litoral), Santiago do Cacém (Alentejo), or behind the Serra da Arrábida (Estremadura). Some of the orchid species already mentioned can still be found in these habitats, such as *Dactylorhiza elata* or *Spiranthes aestivalis*; others have probably already disappeared due to the damage mentioned, such as *Epipactis palustris* or *D. incarnata*; but in the case of the latter, it is not certain that it was ever native to the Portuguese areas mentioned.

The **acidic marshes and peat bogs** with a pronounced Atlantic character have developed more at higher altitudes and in the north of the study area. They belong to the class *Oxycocco-Sphagnetea* Br.-Bl. & Tüxen ex Westhof, Dijk & Passchier (RIVAS-MARTÍNEZ et al. 2002). They are dominated by various sphagnum mosses (*Sphagnum* sp.) and by heather and other ericaceous plants (notably *Erica tetralix*); typical species such as round-leaved sundew (*Drosera rotundifolia*) are found here. Few orchids can be seen here, but this is practically the only habitat where *Dactylorhiza ericetorum* and *Gymnadenia borealis* can be found. These habitats are well represented and relatively well preserved in a few high mountain ranges in the north, such as the Serra do Gerês (Minho) and its extension into Galicia, the Serra do Xurés, the Serra de Montesinho (Trás-os-Montes) and the Serra da Estrela (Beira Alta). They are relatively unthreatened due to their location being of little interest for agriculture and urbanisation, except for more global climate changes affecting all peat bogs in Europe.

Figures 3.13 – 14 – 15. Three types of heather found in acidic peat bogs or nearby moors: from left to right, *Erica cinerea*, *E. tetralix*, *E. umbellata*. Portos, Minho, 4 July 2018.

3.4.6. River banks and beds

To be comprehensive regarding the habitats where orchids can be found, it is worth mentioning the following: in some riverbeds that dry up in summer, as well as on their banks, a particular type of vegetation develops, often on the edge of the wet alluvial meadows mentioned in § 3.4.4, or even near coastal areas. This biotope is not particularly conducive to orchids, but one species, the summer ladies' tresses (*Spiranthes aestivalis*), can be found in abundance in these locations, sometimes accompanied by one or other species of *Serapias*, as is the case in some valleys in the north of the Algarve and south of the Alentejo (Tyteca 1998b; Tyteca et al. 2018). These habitats are not particularly threatened, apart from river rectification, which is rarely practised here, and the construction of dams, which is more common, as shown by the recent examples of the Alqueva and Odeleite dams!

3.5. Flowering periods of orchids in the studied area

To illustrate the succession of orchid blooms in our study area, we have listed the different species in our domain in Table 3.3, in approximate order of appearance of the first flowers. Each of the 'half-moon' figures indicates the length of the flowering period, from the first to the last flower, quite approximatively, as these periods can vary greatly depending on the weather conditions of the current year. Furthermore, the range is greater for widely distributed species, from the Mediterranean scrublands of the south to the high mountain areas of the north (examples: *Androrchis mascula*, *Anacamptis morio* subsp. *morio*, *Serapias cordigera*, etc.). Conversely, highly localised species show a much smaller range (e.g. *Ophrys algarvensis*, *Serapias gentilii*, etc.).

Table 3.3. – Sequence of flowering periods for orchids in the domain throughout the year, from earliest to latest.

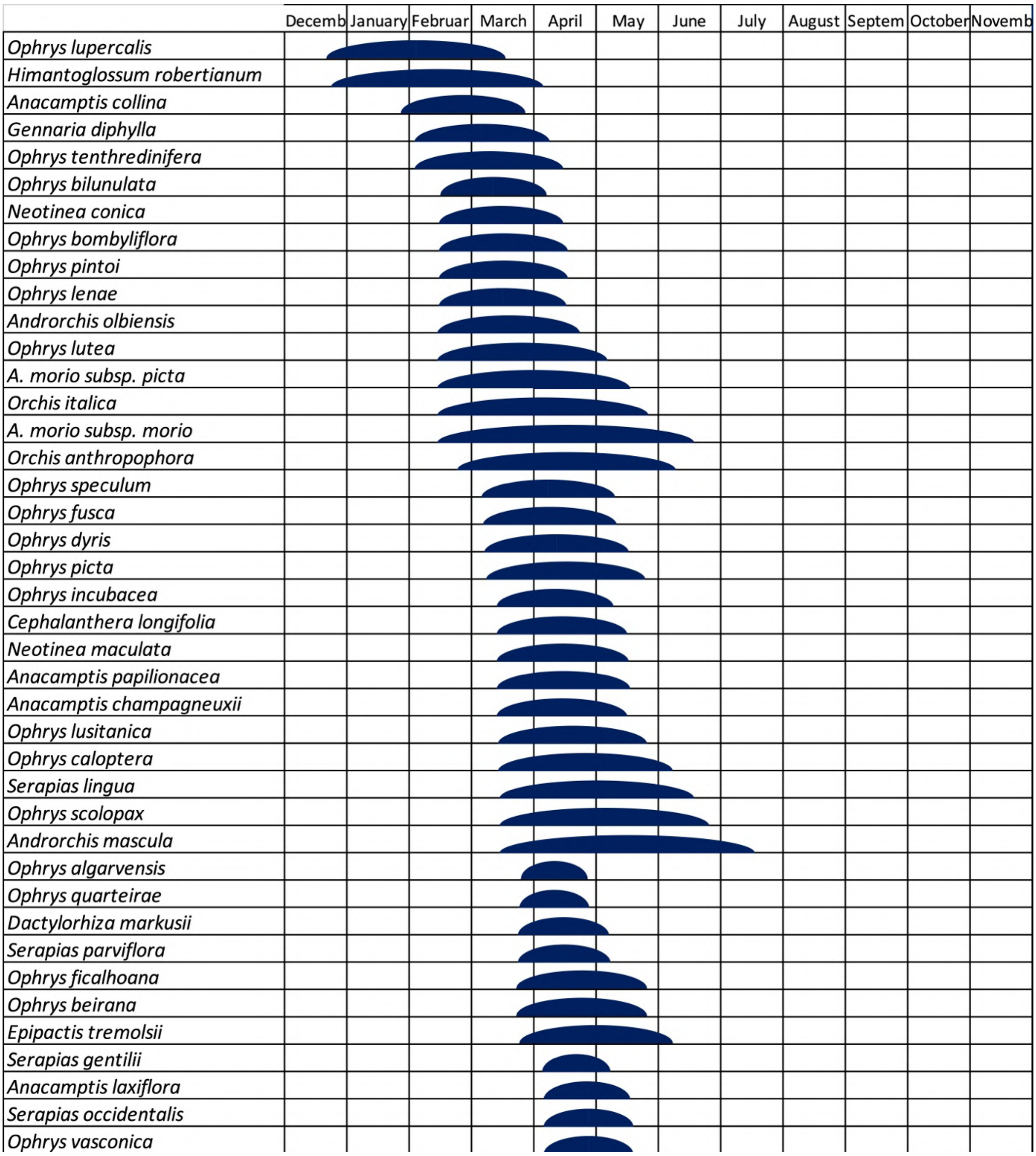
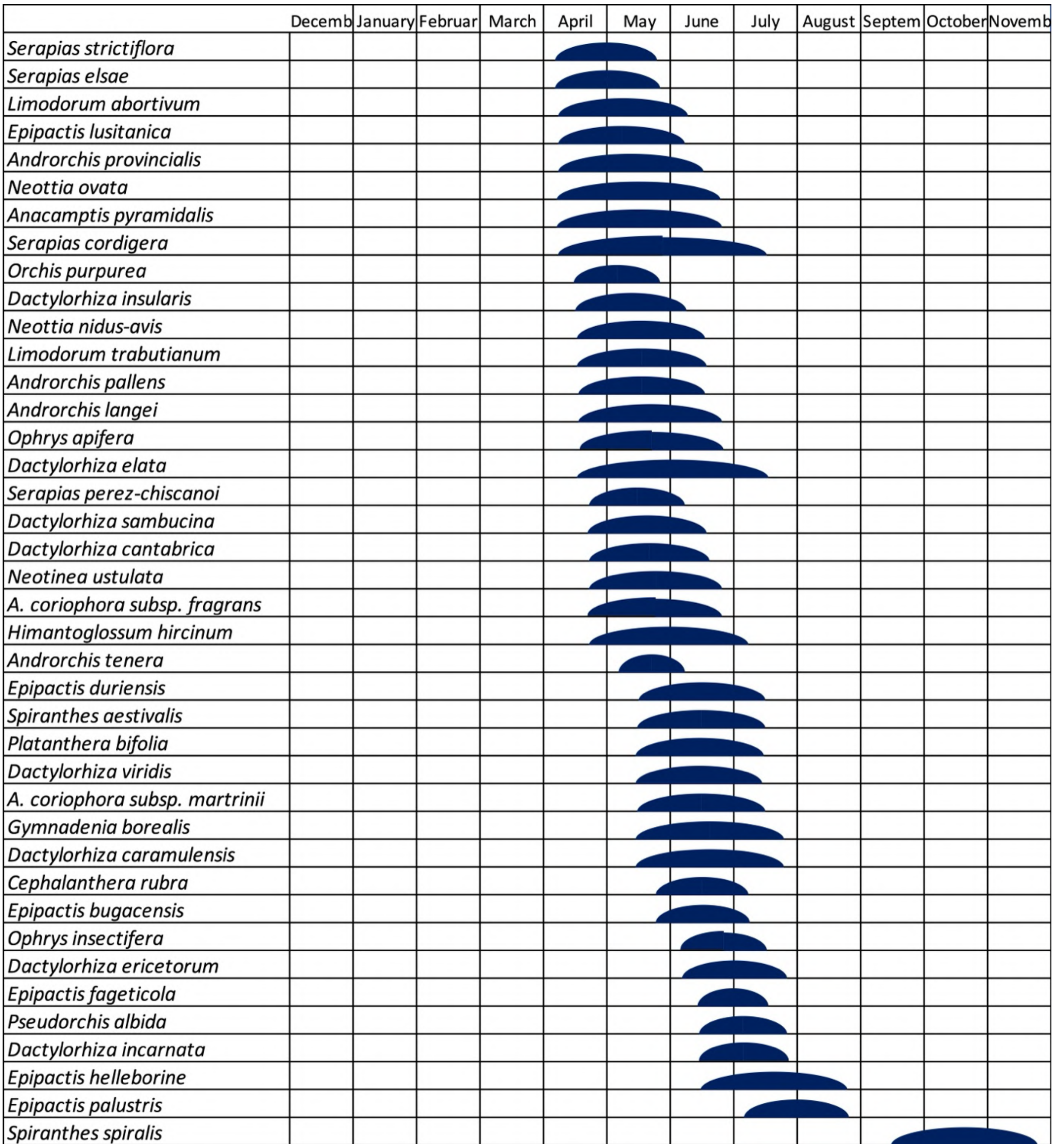


Table 3.3. – continued.



	Decemb	January	Februar	March	April	May	June	July	August	Septem	October	Novemb
Serapias strictiflora					●	●						
Serapias elsae					●	●						
Limodorum abortivum					●	●	●					
Epipactis lusitanica					●	●	●					
Androrchis provincialis					●	●	●					
Neottia ovata					●	●	●					
Anacamptis pyramidalis					●	●	●					
Serapias cordigera					●	●	●	●				
Orchis purpurea					●	●						
Dactylorhiza insularis					●	●	●					
Neottia nidus-avis					●	●	●					
Limodorum trabutianum					●	●	●					
Androrchis pallens					●	●	●					
Androrchis langei					●	●	●					
Ophrys apifera					●	●	●					
Dactylorhiza elata					●	●	●	●				
Serapias perez-chiscanoi					●	●	●					
Dactylorhiza sambucina					●	●	●					
Dactylorhiza cantabrica					●	●	●					
Neotinea ustulata					●	●	●					
A. coriophora subsp. fragrans					●	●	●					
Himantoglossum hircinum					●	●	●	●				
Androrchis tenera						●	●					
Epipactis duriensis						●	●	●				
Spiranthes aestivalis						●	●	●				
Platanthera bifolia						●	●	●				
Dactylorhiza viridis						●	●	●				
A. coriophora subsp. martrinii						●	●	●				
Gymnadenia borealis						●	●	●				
Dactylorhiza caramulensis						●	●	●				
Cephalanthera rubra						●	●	●				
Epipactis bugacensis						●	●	●				
Ophrys insectifera							●	●				
Dactylorhiza ericetorum							●	●				
Epipactis fageticola							●	●				
Pseudorchis albida							●	●				
Dactylorhiza incarnata							●	●				
Epipactis helleborine							●	●	●			
Epipactis palustris								●	●			
Spiranthes spiralis										●	●	●

4. Orchids of Portugal and neighbouring regions - Monographies

4.1. Structure of monographies

After some preliminary remarks on each of the genera covered in this book, each section of this central part presents fact sheets for the different orchid species found in the study area, in the systematic order outlined by the phylogenetic tree (Fig. 3.1 in Chapter 3). The most common scientific and vernacular names (in English, and, where available, Portuguese, Galician and Castilian[1]) are given, followed by two to five paragraphs specifying the following (some paragraphs may not always be relevant in the context discussed):

- **Description**: the essential morphological characteristics are given, in order from the vegetative parts (habit, stem, leaves) to the inflorescence and flowers (sepals, petals, labellum, spur, etc.). Where applicable, a few salient features that help to identify the species are indicated. This description is not as exhaustive and detailed as in some specialised works, the aim being to enable non-specialists to verify the accuracy of their identification. Quantified data are provided when useful, taking into account situations commonly encountered in the territory concerned.

- **Special features and forms**: here too, specific characteristics are indicated that enable the species to be clearly identified or draw attention to notable variations or peculiarities that could, in some cases, mislead novice orchidologists.

- **Biotope and ecology**: referring once again to the situation encountered in our study area, the usual habitats of the species are specified, as is the ‘normal’ flowering period. In this regard, it should be noted that some photos were taken outside this theoretical period, during years with exceptional weather conditions; the reservations expressed in the previous chapter on flowering periods should be borne in mind.

- **Distribution**: the general distribution of the species is indicated, in Europe and in the Mediterranean Basin. This provides a better understanding of the specific situation of certain species, located, for example, at the edge of their distribution range within the territory. Local distribution is also discussed.

- **Situation in the study area**: this last point covers the history of knowledge about the species in our study area, the circumstances that led to its discovery or, conversely, to its decline, as well as the general evolution of populations in the study area.

Each entry is accompanied by two, three, four or five photos of the species, sometimes more, showing certain characteristics: generally, the whole plant and a close-up of the flowers, sometimes the inflorescence, a population, or a particular aspect of the morphology. For some species, a diagram showing the pollination mechanism is included. For highly variable species, several photos showing different flowers may be included. The photos are mostly taken in the studied territory; any exceptions are noted.

To save space, photo captions were often placed on a different page from the photos themselves, sometimes up to two pages before or two pages after. This is clarified in the captions, which appear in a straw-yellow frame like this one.

Finally, a distribution map is provided, based on the map shown below in Fig. 4.1. The starting point for the data is provided by GPS coordinates recorded in the field, or sometimes, for older data, UTM (Universal Transverse Mercator) coordinates recorded on maps before the advent of GPS. This data

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[1] The ‘available’ names were taken from: Flora-On (https://flora-on.pt – Flora de Portugal interactiva) for Portuguese, CORTIZO & SAHUQUILLO (2006) for Galician, and Flora Iberica (CASTROVIEJO et al. 2005) for Castilian.

originally comes from my personal database, collected between 1983 and 2009 using the UTM system, enriched, sometimes considerably, with data collected from the literature or Portuguese herbariums, sometimes with the help of various collaborators, among whom Sonia BERNARDOS of the University of Salamanca deserves special mention (see TYTECA 1998 and TYTECA & BERNARDOS 2003 for questions of methodology). Depending on the data available, **data from before 1980 are shown in yellow** on the map (if these data are not corroborated by more recent information); **data from 1980 or more recent are shown in green**.

Since 2009 and the creation of the AOSP (Associação de Orquídeas Silvestres – Portugal), the GPS system has been used more widely and extensively by various members of the AOSP (co-authors of this study: see cover pages), who have contributed to further enriching the database, without which this work would not have been as comprehensive. Where applicable, the maps published on the Flora-On website[2] have made it possible to add one or two points to the distribution maps. These data are not always usable, as Flora-On sometimes considers taxa that we subdivide into two or three (rarely more) distinct taxa as a single species (or subspecies) (see the discussion in Chapter 5 on Flora-On and the Red List).

The boundaries of the territory covered by the attached map (Fig. 4.1), as well as the source of data for territories adjacent to Portugal, are specified in section 2.1 of chapter 2 (see p. 31).

It should also be noted that in some cases, species are presented in pairs or, more rarely, in groups of three or even four, when dealing with closely related species or subspecies, in order to facilitate comparison and identification between species.

For the sake of brevity, we will generally use the name 'Trás-os-Montes' instead of the full name, 'Trás-os-Montes e Alto Douro'.

One final note: in some cases, to introduce a remarkable or spectacular genus, species, or biotope, full-page (or half-page landscape) photographs are used as an introduction, starting below with the genus *Cephalanthera*.

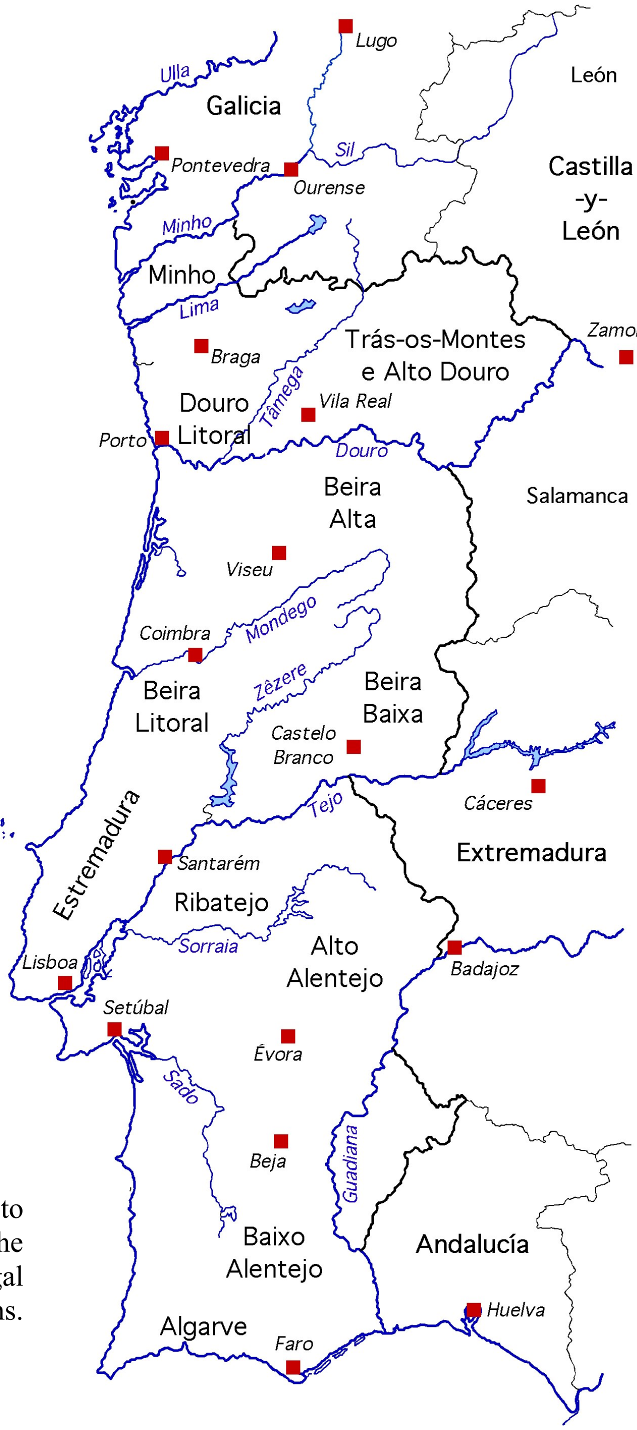

Figure 4.1. – The base map used to represent (without legends) the distribution data for orchids in Portugal and neighbouring regions.

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[2] https://flora-on.pt.

Cephalanthera rubra
Ousilhão (Trás-os-Montes),
3 June 2021

4.2. Cephalanthera

Considered one of the most primitive genera among those of the *Neottieae* tribe, *Cephalanthera* comprises around fifteen species, half of which are limited to Europe and the Mediterranean Basin. One species, mycoheterotrophic, exists in North America; a few others are distributed throughout Southeast Asia.

A particularly characteristic feature is the arrangement of the floral parts in a bell-shaped structure, with a slightly differentiated labellum, divided into a hypochile and an epichile that emerges slightly from the perianth. The labellum is extended into a spur in some eastern species, which is not the case in any of the species in the western Mediterranean Basin. The ovary is sessile and twisted. The stem has staggered leaves that decrease in size from the base to the inflorescence. Two species are present in the territory. A third has sometimes been considered native (*C. damasonium*; see BAUMANN & KÜNKELE 1982), but this has never been corroborated by any other source; its distribution appears to stop at the eastern half of the Iberian Peninsula (absent in BERNARDOS 2003 and CORTIZO & SAHUQUILLO 2006).

From an ecological point of view, *Cephalanthera* are plants of shady to semi-shady, rather dry environments; in general, they prefer calcareous soils, but this dependence is not exclusive. *Cephalanthera*, like *Epipactis*, are mixotrophic plants, meaning that they remain dependent on mycorrhizal fungi and, if necessary, can grow in shady environments where they are totally dependent on them. In extreme cases, they no longer need chlorophyll, which explains why, exceptionally, some individuals have completely depigmented foliage and therefore appear completely white (see below for *Cephalanthera longifolia*).

Cephalanthera longifolia (L.) K. Fritsch — Swoard-leaved helleborine

Heleborina branca (port.), Chaveiro branco (gal.)

Description

Plant 20 to 60 cm tall, glabrous, with four to ten lanceolate leaves, long (up to 15 cm), erect, evenly spaced up to the inflorescence; one or two lower bracts exceeding the flowers, then bracts becoming very short to almost non-existent in the inflorescence. Loose inflorescence with four to twenty fairly open, bell-shaped, pure white flowers. Labellum with clearly visible yellow ridges. Glabrous, twisted ovary.

Special features and forms

This orchid is clearly distinguished from other *Cephalanthera* species by its usually pure white flowers, long narrow leaves, very short bracts in the inflorescence, and hairless stem and ovaries. This plant does not vary greatly, although a very rare form with pale pink flowers has been observed in Galicia (var. *rosea* M.L. Perko).

Biotope and ecology

This plant grows in partial shade, more rarely in full sunlight, on calcareous or slightly acidic soils. The sword-leaved helleborine can be found in deciduous forests (oak and chestnut groves) as well as in pine forests and scrubland. It is not uncommon to see it on roadsides and embankments, where it is very visible when in bloom. Flowering occurs from late March to early May. In the territory, it grows at altitudes between 0 and 1,200 metres.

Distribution
Widespread species in Europe, up to central Norway in the north, and in the Mediterranean Basin (Near East, up to the Caucasus; North Africa). Widespread and scattered throughout the study area; more common in regions with calcareous soil.

Situation in the study area
Given its adaptability to diverse ecological conditions, the sword-leaved helleborine is not endangered.

Cephalanthera rubra (L.) L.C.M. Richard — Red helleborine

Heleborina rosada (port.), Chaveiro vermello (gal.)

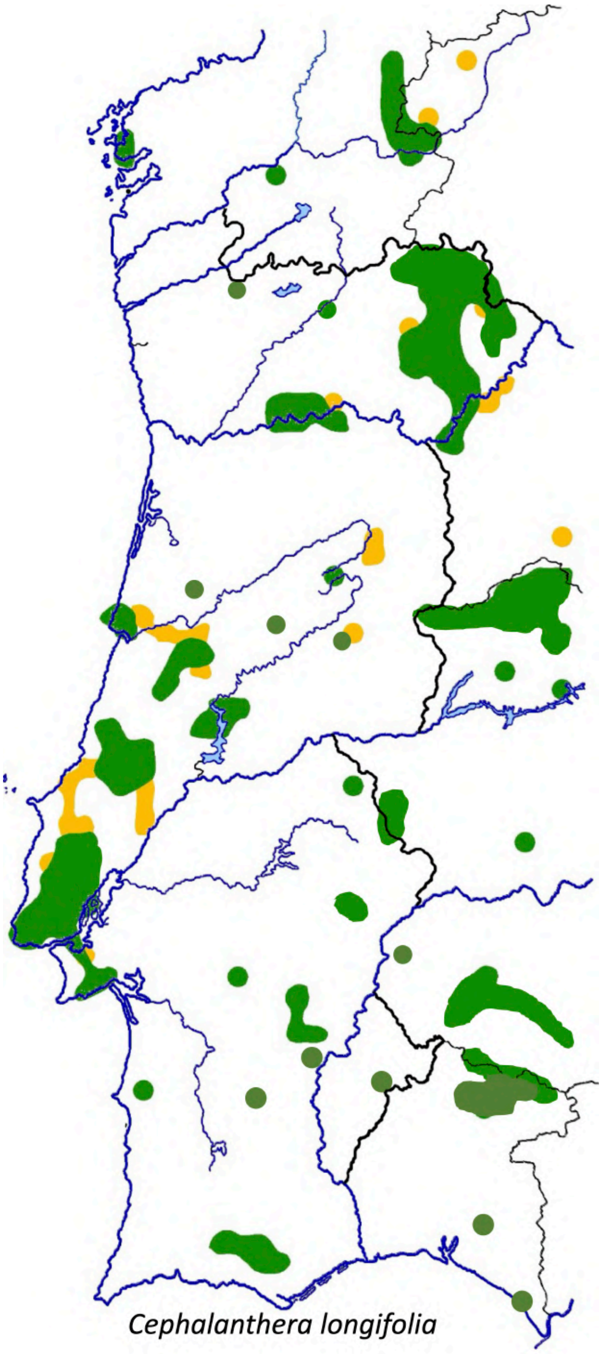
Description
A plant 20 to 60 cm tall, with a pubescent stem in the upper part, bearing three to eight lanceolate leaves, characterised by their dark green to bronze colour. Leaf-like bracts, longer than the ovary; the latter distinctly pubescent to glandular, twisted. Loose inflorescence, composed of three to ten large, more or less open, bright pink, bell-shaped flowers. Epichile paler, whitish, with rough, yellowish longitudinal ridges.

Special features and forms
Very distinctive with its bright pink flowers, stem and ovaries pubescent – glandular, and well-developed leafy bracts. A white-flowered form exists but is extremely rare; pale pink-flowered forms also occur.

Biotope and ecology
A plant of open woods, with a clear preference for calcareous soils. In the study area, it is found in chestnut groves and oak forests of *Quercus pyrenaica* or *Q. ilex*, at altitudes between 400 and 800 m. It flowers late, in May–June, much later than the other *Cephalanthera*.

Distribution
Widespread in Europe and the Mediterranean Basin, from North Africa to southern Scandinavia and from southern England to Cyprus and the Caspian Sea; range extending into Central Asia. Very rare in the west of the Iberian Peninsula: only a few locations in Trás-os-Montes, eastern Galicia and northern Extremadura are mentioned for this territory.

Situation in the study area
Its presence in Trás-os-Montes has been known for a long time and was confirmed in the 1970s (see PINTO DA SILVA & TELES 1971: Grandais and Fresulfe, near Bragança – see distribution map). More recently, the plant has been observed elsewhere in the same region, thanks to surveys conducted by the AOSP since 2010. In Galicia, the species was recorded in 1986, 1994, 1997 (CORTIZO & SAHUQUILLO 1999) and 2001 (TYTECA & BERNARDOS 2003). The species therefore appears to be rare and sparse; moreover, it is seriously threatened by the inadequate management of chestnut groves, especially in recent decades.



Next page (from top to bottom and left to right): *Cephlanthera longifolia*.

Figs. 4.2 and 4.3. – Bottom of the northern slope of Serra de São Luís, Palmela, Estremadura, 11 April 2016. The individual in Fig. 4.3 is mycoheterotrophic: the plant is completely devoid of chlorophyll and its foliage is atrophied (compare with the normally developed individual in Fig. 4.4). This individual can be seen, alongside normal individuals, at the front of Fig. 4.2.

Fig. 4.4. – Ansião, Beira Litoral, 29 March 2008.

Fig. 4.5. – Serra da Arrábida, near Palmela, Estremadura, 21 March 2008.


4.2


4.3


4.4


4.5

4.6

4.7

4.8

4.9

Cephlanthera rubra (from top to bottom and left to right):

Fig. 4.6. – Ousilhão, Trás-os-Montes, 2 June 2025.

Fig. 4.7. – Pale pink colouration; compare with the full-page photo on p. 71. Ousilhão, Trás-os-Montes, 7 June 2021.

Figs. 4.8. – Individual with very pale pink flowers, Ousilhão, Trás-os-Montes, 3 June 2021.

Fig. 4.9 (opposite). – Plate containing two plants of *Cephalanthera rubra* collected in Grandais (Trás-os-Montes) by A.R. PINTO DA SILVA & A.N. TELES on 19 June 1968 (LISE herbarium, Oeiras).

Neottia nidus-avis
Gondesende (Trás-os-Montes),
31 May 2025

4.3. Neottia

The distribution of the genus *Neottia* covers North America, the whole of Europe and much of Asia, in temperate zones with the exception of a few species that reach the tropical zone in Southeast Asia (PRIDGEON et al. 2005). In this sense, the genus *Neottia* comprises around sixty species, including those previously attributed to the genus *Listera*. This incorporation was suggested, in particular, following molecular phylogeny work which tends to indicate that the two genera are closely intertwined in a single clade (PRIDGEON et al. 2005). From this perspective, the species of the former genus *Listera* are simply photosynthetic representatives of the genus *Neottia*, which, strictly speaking, prior to this merger, included only mycoheterotrophic species.

Neottia species have bilobed labellum flowers without spurs, often with a median nectariferous groove, or with a base that is sometimes hollowed out into a pseudo-nectariferous cavity. The sepals and petals are similar and generally connivent in a helmet shape. Mycoheterotrophic species (*Neottia* in the strict sense) lack chlorophyll and are therefore not green in colour; their leaves are reduced to scales pressed against the stem. Species of the former genus *Listera* typically have two opposite leaves, carried at a certain level above the ground.

Autotrophic species (*Listera*) are found in a variety of environments, in forests or open grassy areas, but are not generally found in dry habitats. Representatives of the former genus *Neottia*, which lack chlorophyll, generally grow in forests, feeding on decomposing organic matter and with the help of fungal mycorrhizae.

In the territory covered by this work, two species reach the extreme limit of their range, due to the fact that no species of *Neottia* is truly Mediterranean.

Neottia nidus-avis (L.) L.C.M. Rich. — Bird's-nest orchid

Orquídea ninho de pássaro (port.), Nido de ave, nido de pájaro (cast.), Orquídea do niño (gal.)

Description
Plant entirely lacking chlorophyll, and therefore not green in colour; plant brownish to pale beige in all parts, glabrous to shortly pubescent, 15 to 35 cm tall. Leaves reduced to short sheaths, more or less swollen, surrounding the stem. Dense inflorescence, with 15 to 30 flowers, the lower ones often borne very low, ± distant from the inflorescence. Sepals and petals curved forward, forming a fairly loose helmet above the gynostemium. Labellum with a nectariferous cupule at the base, longer than it is wide, distinctly bilobed at the apex, with the lobes strongly curved laterally. Ovary ellipsoidal, with a twisted pedicel.

Special features and forms
This species is particularly recognisable due to its lack of green colour, linked to its mycoheterotrophic nature (a plant that does not produce its own constituent matter through photosynthesis, but lives off fungi that provide it with organic and mineral matter contained in the soil). The plant's appearance is often reminiscent of broomrape. The neottia's appearance is rather sporadic and irregular: the species can appear in mass in places where it has not been seen before, or conversely become invisible where it was present in previous years. The dried stems from the previous year, or even from two years earlier, persist for a long time and are also recognisable (as in the full-page photo on p. 77).

Biotope and ecology
Preferably basiphilic, the neottia is frequently found in more or less dense woods, typically oak forests with *Quercus pyrenaica*, where it is observed (in Portugal) alongside species such as the melittis (*Melittis melysophyllum*), the martagon lily (*Lilium martago*), …, at altitudes between 400 and 1,200 metres. It flowers from mid-May to mid-June.

Distribution
A species with a wide distribution across Eurasia, from Ireland and northern Portugal to Japan, and from southern Scandinavia to Sicily.

Situation in the study area
This species, previously known in Portugal only from Mealhada (Mata Nacional do Buçaco, not far from Coimbra), where its indigenous status is doubtful (TYTECA 1998; but confirmed presence! – see photos below), has since been discovered in several locations in Trás-os-Montes, where it is well established and not particularly threatened (TYTECA 1998b; TYTECA & BERNARDOS 2003), as well as in Beira Alta (Serra da Estrela! TYTECA et al. 2018). It also exists in eastern Galicia (CORTIZO & SAHUQUILLO 1999, 2006) and probably in Castilla y León (TYTECA & BERNARDOS 2003).

Neottia ovata Twayblade
(L.) Bluff & Fingerhuth

Hierba de dos hojas (cast.), herba das dúas follas (gal.)

Description
Rhizomatous plant, entirely green in all its parts, 20 to 60 cm tall. Stem pubescent in its upper part, with two (rarely three) large, broadly oval to almost round leaves, opposite, borne at a certain height above the ground, with clearly visible veins. Long inflorescence, bearing 20 to 80 fairly small, widely open flowers. Sepals and petals curved forward, forming a fairly loose helmet above the gynostemium. Labellum distinctly bent, with a short, more or less horizontal basal part, gutter-shaped under the gynostemium, and a long, pendulous, oblong, bifid part, covered with nectar along the median axis. Ellipsoidal ovary, long-pedicellate, pubescent.

Special features and forms
This orchid, which is unattractive at first glance due to its colouring, is one of the most characteristic of our native species, firstly because of its two large leaves, which make it impossible to confuse with any other species, and secondly because of the particular biology of its pollination. This can be summarised as follows (Figure 4.10; DARWIN 1891; SUMMERHAYES 1968). In short, when an insect, attracted by the nectar, lands on the labellum of *Neottia ovata*, its head hits a protuberance, the rostellum. The extreme sensitivity of the rostellum to the slightest contact causes a miniature explosion, which has three purposes: (1) to project pollen onto the insect's head, where it adheres thanks to a special viscous substance; (2) to frighten the insect to such an extent that it moves as far away from the plant as possible, thus preventing self-pollination; (3) finally, to raise the rostellum so as to make the stigma accessible, ready to receive pollen brought by another insect. Apart from this, the listera, or double leaf, is a fairly unchanging plant.

Biotope and ecology
While throughout its range the twayblade is fairly eclectic, in our territory it is mainly found in meadows and pastures in mountainous regions (CORTIZO & SAHUQUILLO 2006). It flowers between April and June.

Distribution

Widespread throughout Europe, as far north as Iceland and northern Scandinavia, and as far south as the Mediterranean regions. Found across much of Asia, as far north as the Altai Mountains and the Himalayas. In our territory, it is only present in a very localised region in eastern Galicia.

Situation in the study area

Located right on the edge of our territory, it is possible that the presence of the twayblade is underestimated there (CORTIZO & SAHUQUILLO 2006).

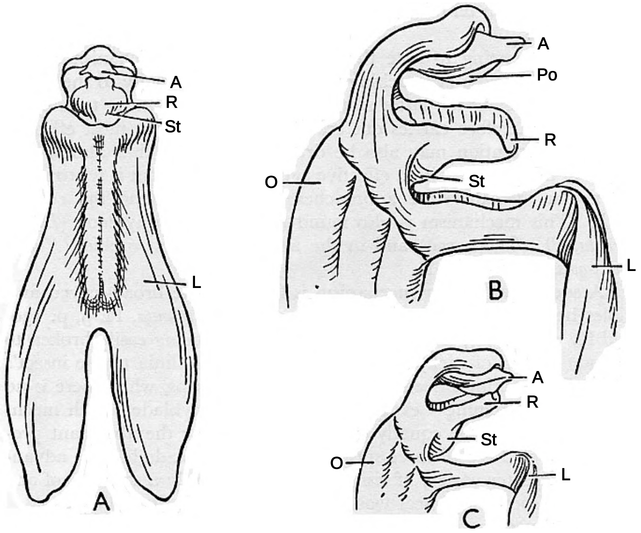


Figure 4.10. – Flower of *Neottia ovata*, showing the stages of pollination.

A – anther; L – labellum; O – ovary; Po – pollen; R – rostellum; St – stigma.

Stages of pollination: **A** – Flower from the front (without sepals and petals); **B** – Detail of profile, before the insect visits; **C** – Same, after the insect visits (see text) (SUMMERHAYES 1968).

Fig. 4.11. – Exceptional sighting of the two species of *Neottia* side by side: on the left, *N. nidus-avis*; on the right, *N. ovata*. Bure, Province of Luxembourg, Belgium, 13 May 2021.


Neottia nidus-avis


Neottia ovata

Fig. 4.12. – A creature you might encounter in areas where *Neottia nidus-avis* grows, especially near piles of dead wood, which its larvae feed on: the stag beetle (*Lucanus cervus*). Despite its menacing appearance, this male is harmless but can pinch you. Fresulfe, Trás-os-Montes, 19 June 2005.

Neottia nidus-avis (from top to bottom and left to right): **Fig. 4.13**. – Serra de Buçaco, Mealhada, Beira Litoral, 7 May 2009; **Figs. 4.14** and **4.15**. – Serra de Nogueira, Trás-os-Montes, 31 May 2008.

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Neottia ovata (from top to bottom and left to right): **Figs. 4.16** and **4.17**. – Bure, Province of Luxembourg (Belgium), 18 May 2007; **Fig. 4.18**. – Han-sur-Lesse, Province of Namur (Belgium), 13 May 2023 (compare with the diagram in Fig. 4.10!).

4.4. Limodorum

The genus *Limodorum* is exclusively European and circum-Mediterranean: its distribution extends from the Iberian Peninsula to the Caucasus, and from North Africa to Hungary and southern Belgium. It is characterised by a mycoheterotrophic lifestyle, although some authors hypothesise that it is simply parasitic (DELFORGE 2005). The plant has a very distinctive appearance: it is purplish in all its parts and the leaves are reduced to scales sheathing the stem. The stem is thick, robust and easily recognisable as soon as it emerges from the ground in the form of a particularly vigorous purple shoot. The flowers are very large, with narrow, elongated divisions. The labellum is concave (in the most common species), whitish in the centre and streaked with purple. The gynostemium is very elongated and protected by the dorsal sepal.

The biology of *Limodorum* is unusual: although the flowers are clearly designed to attract insects (bright colours, presence of a nectar spur in the main species), they only open widely under ideal conditions; very often, flowering is aborted and fertilisation is then possible by autogamy or even cleistogamy (fertilisation occurs in the closed flower). This process is probably responsible for the occurrence of degenerate forms, with less well-formed flowers that lose their original characteristics. These forms are sometimes considered to be distinct species, which explains why, depending on the views of various authors, one or two, or even up to three or four species are distinguished within the genus *Limodorum*. Here, we have opted for two species that are widespread in the western Mediterranean basin.

Limodorum species are found in dry habitats, on calcareous or crystalline soils, generally in shade or partial shade, in various types of woodland, including pine forests and certain oak forests, such as cork oak forests, *Quercus ilex* woods, more rarely *Q. pyrenaica* woods, as well as the garrigue and maquis bordering these different types of woodland. They are also frequently found on roadsides and embankments. Given their particular biology, mycoheterotrophic and frequently self-pollinating, associated with a complex root system, their appearance is extremely irregular from year to year, both in space and time.

Limodorum abortivum (L.) Swartz — Violet limodore

Limodoro, orquídea abortiva (port.), Limodoro violeta, planta hambrienta (cast.), Limodoro de esporón (gal.)

Limodorum trabutianum Battandier — Trabut's limodore

Limodoro pálido (gal.)

Description
These two species are characterised by a fairly tall, more or less robust stem, entirely purple in colour, with leaves reduced to scales sheathing the stem, and very large, slightly paler flowers, with a whitish labellum in the centre and purple streaks (see also the description of the genus). The inflorescence is elongated and loose, comprising between 4 and 25 flowers. Apart from these common features, the two species differ in a number of ways, as listed in Table 4.1.

Special features and forms
Remarkable plants, easily recognisable by their purple stems without green leaves, clearly visible as soon as they emerge from the ground, and their large flowers, which are more or less open. Another distinctive feature is their irregular appearance from year to year. *L. trabutianum* is slightly slimmer

than *L. abortivum*; distinguishing between the two species, based mainly on the floral characteristics listed in the table, is generally not a problem. Their occurrence in separate populations in the study area leads us to consider them as two separate species.

Table 4.1. – Comparative characteristics of the two species of *Limodorum*.

Characteristic	***L. abortivum***	***L. trabutianum***
Appearance	Very robust	More slender
Colour of the plant	Dark purple	Pale purple
Height	20 – 80 cm	20 – 55 cm
Form and decoration of the lip	Wide (7 – 12 mm), concave, distinctly striated with purple, articulated	Very narrow (3 – 5 mm), slightly concave to flat, sparsely decorated, not articulated
Spur	Long (14 – 25 mm), well developed, thin	Non-existent or rudimentary (0.5–3 mm)

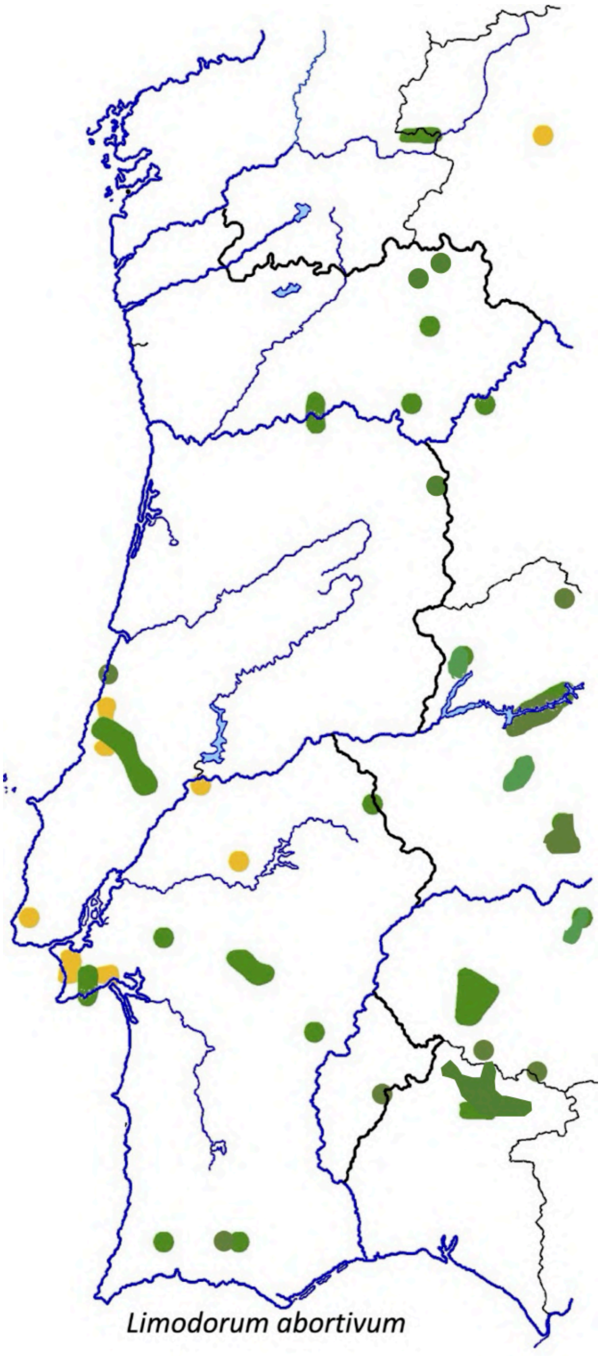
Biotope and ecology

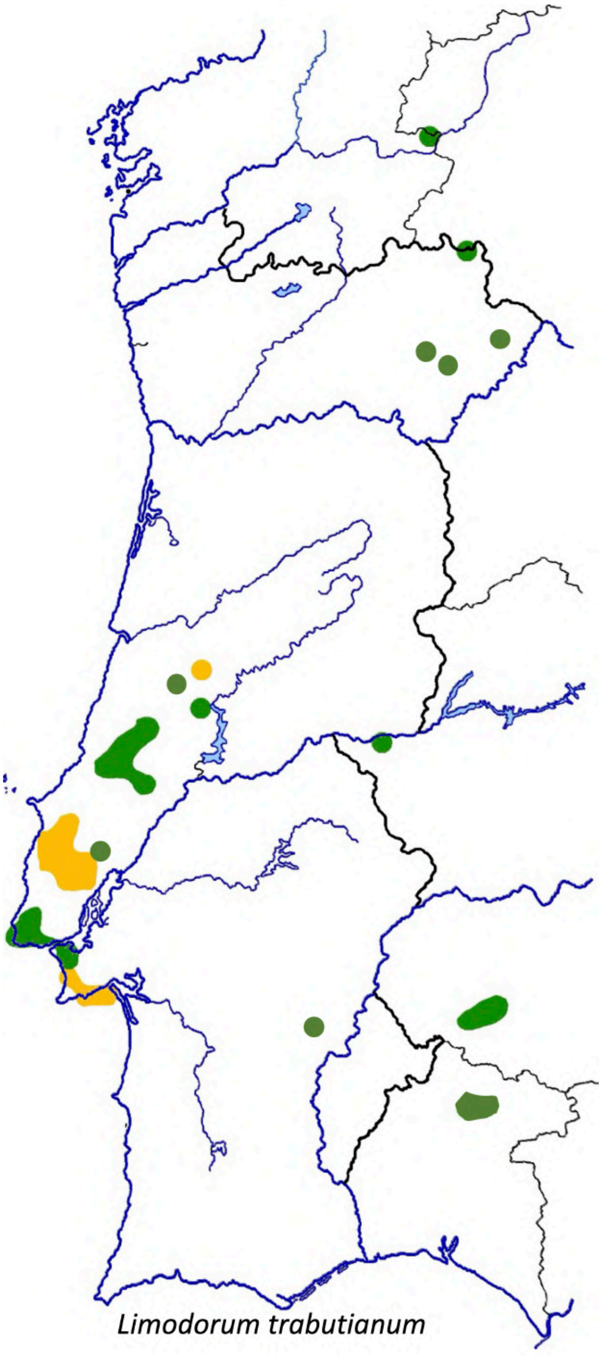
Both species have similar ecology, as described in the section on the genus. In the study area, they are found between sea level and 1,000 metres and flower between April and June.

Distribution

The general distribution given in the description of the genus corresponds to that of *L. abortivum*. Within this distribution, *L. trabutianum* has a smaller range, mainly limited to the western Mediterranean basin; it does not extend as far north (North Africa, Iberian Peninsula, south-western and southern France). *L. abortivum* is widespread throughout the study area, but is much rarer in the northern half of Portugal (a few mentions in Trás-os-Montes); *L. trabutianum* is rarer and more localised: Estremadura and Ribatejo, eastern Galicia, Extremadura, Andalusia; a few, less numerous mentions in Trás-os-Montes.

Figs. 4.19 and **4.20**. – On the left, the two limodores side by side: contrary to the description, the large one on the left is *L. trabutianum*; the small one on the right is *L. abortivum*. On the right, a group of *L. trabutianum* on a stripped road embankment. Both photos taken in Monsanto, Extremadura, left on 22 April 1992, right on 18 April 2022.





Situation in the study area

Being rather scattered and sometimes very localised, the two species of limodora are quite vulnerable and will be affected by anything that affects their habitats: land clearing for cultivation, fires, widening or excessive maintenance of roadsides, etc. However, we have observed large groups of *L. trabutianum* surviving in good condition after serious scouring of embankments (see Fig. 4.20), which shows that the root system must be strong.

Figs. 4.21 to 4.28 on the following two pages. Left column, *Limodorum abortivum*, Casais, Serra de Monchique, Algarve, 24 April 2009. Right column, *Limodorum trabutianum*, Fig. 4.25, Ansião, Beira Litoral, 1 May 2011; Figs. 4.26 and 4.28, Monsanto, Estremadura, 1 May 2009; Fig. 4.27, Praia das Maçãs, Estremadura, 26 April 2009.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Epipactis lusitanica
São Martinho das Amoreiras
(Baixo Alentejo),
27 April 2024

4.5. Epipactis

This essentially Eurasian genus is one of the most important in Europe and the Mediterranean Basin in terms of the number of (sub)species: according to classifications (and partly to territory covered), there are no fewer than 23 (KÜHN et al. 2019), 67 (DELFORGE 2016), or even 123 (KREUTZ 2024), a significant proportion of which are self-pollinating. Outside Europe, the genus's range extends from the Near East to the Far East, North Africa and Central Africa; only one species is native to North America, where another species, *E. helleborine*, of European origin, has also become naturalised (e.g. LUER 1975).

In the territory of interest to us, only seven species are present, two of which are self-pollinating. The stem is leafy, as in *Cephalanthera*; the ovary has a short, twisted pedicel. The most characteristic feature of *Epipactis* is that the labellum is clearly divided into a hypochile, a nectar-bearing pouch, and an epichile emerging from the flower. The rostellar gland is present and functional in the species of interest to us, with the exception of two (*E. fageticola* and *E. bugacensis*) which are self-pollinating. The genus *Epipactis* is particularly complex to study across its entire range, which is also the case in our territory, where the distinction between *E. helleborine*, *E. duriensis*, *E. tremolsii* and *E. lusitanica* can be quite difficult.

Epipactis are primarily species of light to shady forests, but some of the forest species also grow in scrub, clearings and grasslands. Other species prefer habitats in full sunlight, some on dry, rocky soils, others in marshy areas. Of the species found in our territory, three grow mainly in forests (*E. helleborine*, *E. lusitanica*, *E. fageticola*), two in open, dry habitats (*E. tremolsii*, *E. duriensis*), one in wetlands (*E. palustris*) and one in cool to damp environments under forest cover (*E. bugacensis*).

Preliminary remark
It is sometimes difficult to distinguish between the four species *E. helleborine*, *E. tremolsii*, *E. lusitanica* and *E. duriensis*. Preliminary results from molecular analyses (PRAT 2024) seem to indicate that there is no difference, from this point of view, between *E. lusitanica* and the forms of *E. tremolsii* found in Portugal, whereas the differences are more pronounced between these and the French forms reported for these two species. The two Portuguese taxa, as well as *E. duriensis*, also appear to be quite distinct from *E. helleborine* (at least its French forms). Further research is needed in this area.

Epipactis palustris (L.) Crantz — Marsh helleborine

Heleborina dos brejos (port.), Raíña das xunqueiras (gal.)

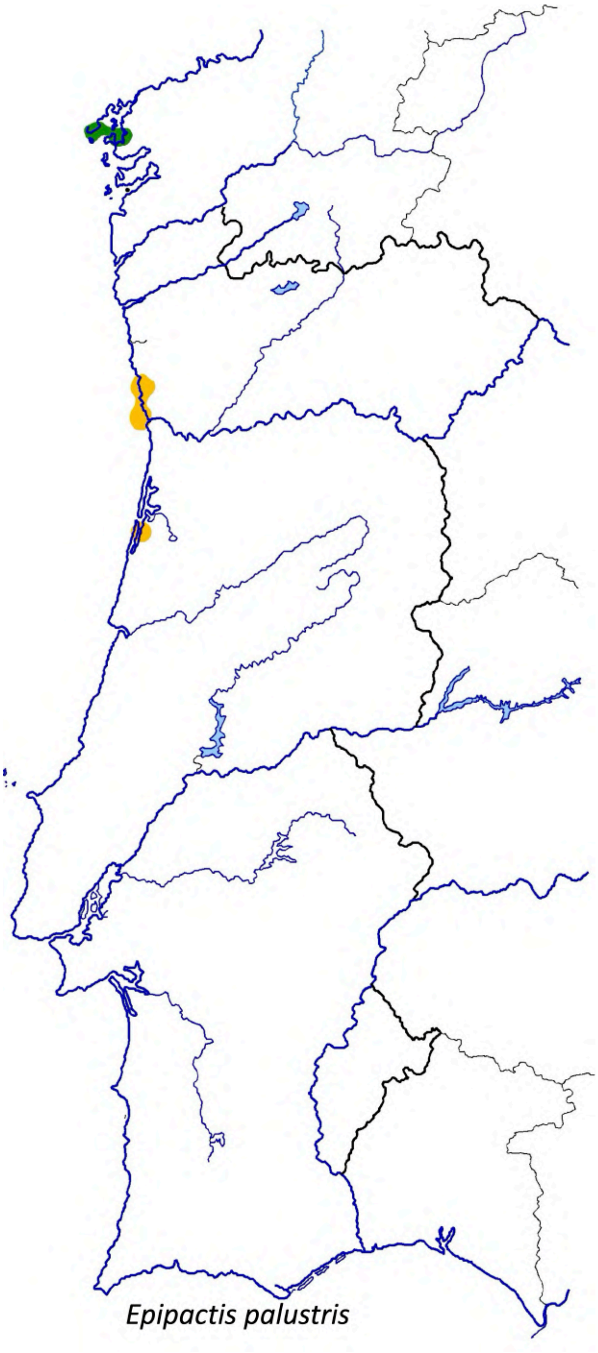
Description
Plant often forming dense colonies (vegetative reproduction), 20 to 60 cm tall. Stem densely pubescent in the upper part, green at the base and purplish at the inflorescence, with four to eight lanceolate leaves with strongly marked veins. Inflorescence of 5 to 20 fairly large flowers. Labellum strongly articulated (epichile pivoting freely relative to the hypochile). Epichile pure white, crenate, with two yellow gibbosities at the base. Hypochile white, with purple-streaked side walls, cupule marked with red to orange dots. Petals white washed with purple; sepals green washed with purple on the inside. Ovary brown, densely pubescent, pedicellate.

Special features and forms
Notable for its growth in dense colonies. The *ochroleuca* form is notable for its paler flowers in all parts, its green stem and ovary, and the absence of purple pigmentation in the hypochile, petals and sepals.

Biotope and ecology
Plant of alkaline to neutral wetlands: wet meadows, alkaline marshes, seeps, etc., in full sunlight. In the territory, only in coastal areas. Pollinated by various insects, including hymenoptera and diptera. Flowers in June–July.

Distribution
Widespread in Eurasia, from Scotland and central Scandinavia to the Mediterranean regions (absent from the extreme south); from Ireland and Galicia to Siberia and Iran. Very rare in the studied territory; probably extinct in Portugal.

Situation in the study area
The drying up of wetlands near the coast has probably led to the disappearance of this species in Portugal, where it was known to occur in the coastal area between Porto and Aveiro.



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Figs. 4.29 and **4.30**. *Epipactis palustris,* Barvaux, Province of Luxembourg, Belgium, 13 July 2007 and 19 July 2006, respectively.

Epipactis tremolsii Pau — Tremols helleborine

Heleborina vermelha (port.), Raíña de follas cinguidas (gal.)

Description

A robust plant, 30 to 70 cm tall, with 6 to 10 olive-green leaves, broadly oval to almost round, with strongly wavy edges, more or less erect to spreading, the lower ones clustered towards the base, the upper ones regularly staggered up to the inflorescence. The longest leaf is between 5 and 10 cm long. The stem is heavily pubescent at the top and reddish at the base. The inflorescence is elongated, bearing 15 to 60 fully open flowers of various colours, often with a wine-red epichile, sometimes lighter, greenish to pinkish. The ovary pedicel is tinged with purple.

Special features and forms

The most robust of the *Epipactis* species in the study area, it differs from neighbouring species in the size of its leaves (the longest measuring ≥ 5 cm) and its ecological characteristics (see below). In the north of the area, there are populations that are more difficult to identify, and distinguishing them from *E. lusitanica* and *E. helleborine* can be tricky.

Biotope and ecology

Dry locations, often on rocky ground, in sunny to slightly shaded areas. Prefers calcareous soils but is not exclusively dependent on them. Observed at altitudes between 0 and 1,000 metres across the territory. Flowers from April (sometimes late March) to early June.

Distribution

South-western Europe: Southern France, Spain, Portugal, Sardinia; North Africa. Other similar taxa take over in other parts of the Mediterranean Basin.

Situation in the study area

Widespread throughout the territory. Currently appears to be under little threat, due to its persistence in (rocky) biotopes unsuitable for agricultural use.

Epipactis lusitanica D. Tyteca — Portuguese helleborine

Heleborina lusitana (port.), Epipactis vermelha, heleborinha (port.)

Description

A slender plant, 15 to 50 cm tall, bearing 4 to 9 leaves of a characteristic greyish green colour, often distichous, oblong to oval, sometimes almost round, small (less than 6 cm long), clustered more towards the base of the stem, leaving a fairly long upper internode (between the last leaf and the inflorescence), occupying up to 20% of the plant's height. Pubescent stem. Rather loose inflorescence, bearing 5 to 25 slightly open to widely open flowers, with sepals that are greyish-green on the outside like the leaves, and a greenish-white to pinkish epichile, sometimes purplish. Pedicel of the ovary tinged with purple.

Special features and forms

It is easily distinguished from similar species by its slender appearance, relatively few flowers, and small leaves. However, more robust individuals are not uncommon, making distinction more difficult; it is important to take into account the habitat and consider the population as a whole.


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Figs. 4.31 to **4.33**. *Epipactis tremolsii*, Ansião, Beira Litoral, 1st May 2011 (4.31); Cheganças, Ribatejo, 4th May 2019 (4.32 and 33).


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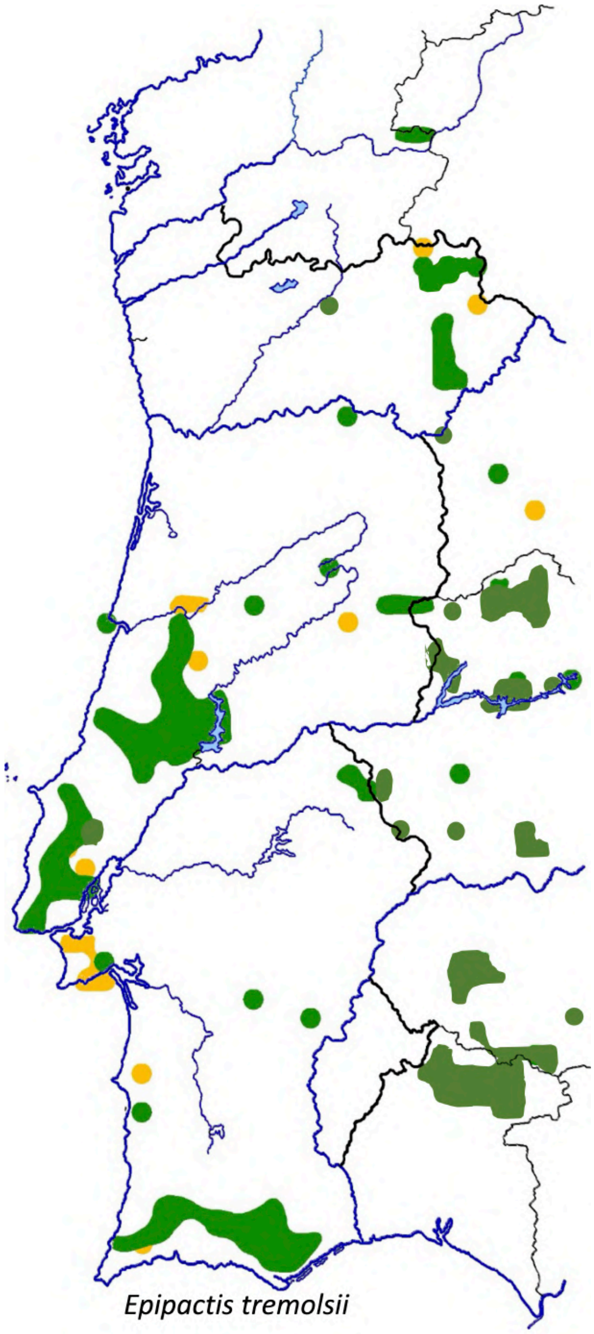
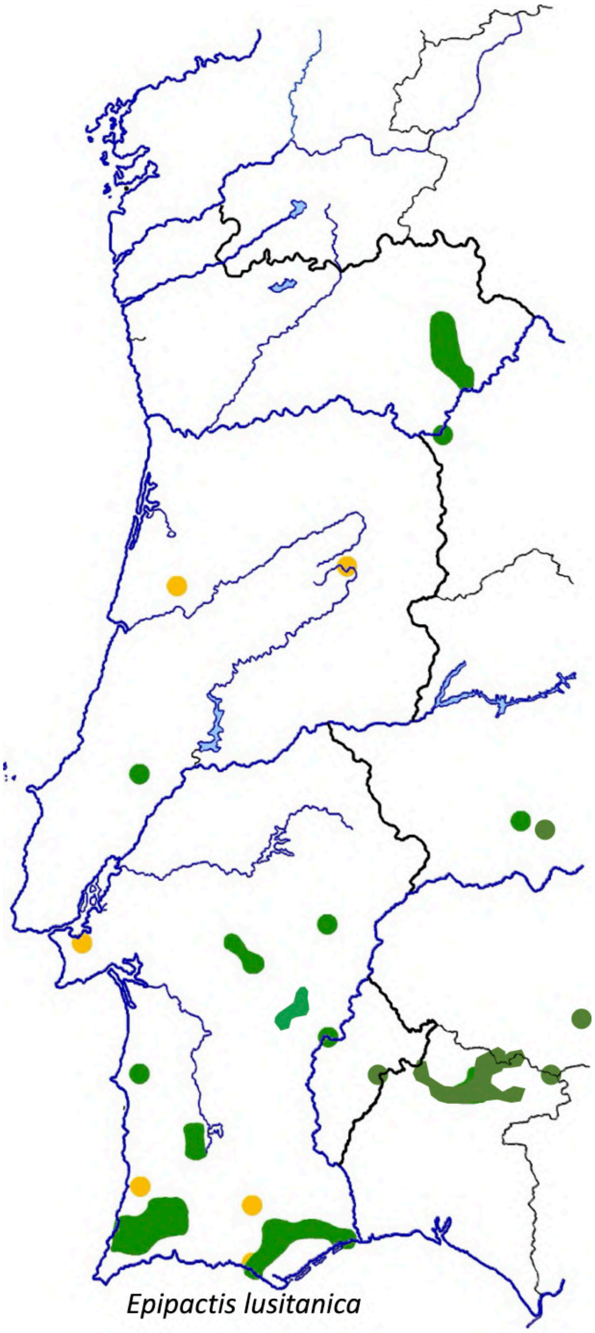
Figs. 4.34 to **4.36**. *Epipactis lusitanica*, Barão de S. João, Algarve, 3 April 2008 (4.34), 28 April 2024 (4.35); Casais, Serra de Monchique, Algarve, 27 April 2024 (4.36).





Biotope and ecology

Its ecological preferences are quite specific: the plant grows mainly on acidic, schistose, crystalline soils in shady locations. Its preferred biotope is cork oak forests, but the species can also be found in other habitats such as stone pine forests and chestnut groves. It grows at altitudes between 0 and 1,000 metres. Flowering occurs from April (exceptionally late March) to early June.

Distribution

Probably endemic to the south-west of the Iberian Peninsula. Reports from south-western France require confirmation. Widespread throughout Portugal but more common in the south (Algarve and Alentejo) and western Andalusia.

Situation in the study area

Although it is not considered to be particularly threatened due to the stability of its habitats, *E. lusitanica* could be endangered by the decline in cork oak forests and forest fires.

Epipactis duriensis Bernardos, D. Tyteca, Revuelta & Amich — Douro helleborine

Description

A robust to slender plant, 20 to 40 cm tall, bearing 6 to 10 broadly oval leaves with pointed tips, typically erect, in form of a horn, forming a slight angle with the stem, which they almost completely conceal, seen from front. The longest leaf is between 4 and 6 cm long. The inflorescence is more or less dense, bearing 10 to 35 fully open flowers, generally pale in colour, with a pinkish-white epichile, rarely darker. The ovary pedicel is short, mostly without any purple tint.

Special features and forms

Typical appearance with its upright funnel-shaped leaves, concealing the stem (plant seen in profile!), and its rather pale flowers. However, the plant can be difficult to distinguish from neighbouring species, *E. tremolsii* and *E. lusitanica*, which sometimes grow nearby. The essential distinguishing characteristics are summarised in Table 4.2 below.

Biotope and ecology

A species found in shady to semi-shady locations, or growing in full sunlight, on dry, rocky, acidic soils, under the canopy or on the edge of cork oak forests. A description and comparison of the respective ecological preferences of *E. duriensis*, *E. tremolsii* and *E. lusitanica* is provided by BERNARDOS et al. (2004).

Distribution

In Portugal, it is currently known from two locations in the north of the country; other locations have been discovered in Spain (Extremadura). The species is probably under-recorded and may be more widespread.

Situation in the study area

Currently no significant threat, except for the expansion of vineyards affecting one of the populations.

Table 4.2. – Main distinguishing characteristics of *E. duriensis* compared to *E. tremolsii* and *E. lusitanica* (according to BERNARDOS et al. 2004b).

Character	***E. tremolsii***	***E. lusitanica***	***E. duriensis***
Dimensions of the longest leaf	5 – 10 x 5 – 8 cm	3 – 6,5 x 2 – 4 cm	4 – 6 x (2,5) 3 – 4 cm
Angle of leaves to stem	35 – 55°	45 – 70°	15 – 40°
Ovary pedicel	Purple tinged	Purple tinged	Not purple tinged
Flower pedicel	3 – 4 mm	3 – 4 mm	2 – 3 mm
Colour of epichile	Variable: greenish to pink or pale purple		Generally pinkish white

Figs. 4.37 to **4.40**. – *Epipactis duriensis*, Quinta de Zom, Freixo de Espada à Cinta, Trás-os-Montes, 27 May 2008 (except 4.39: 30 May 2025), and distribution map.

Epipactis helleborine (L.) Crantz **Broad-leaved helleborine**

Heleborina comum, heleborinha (port.), Raíña das neves (gal.)

Description

Plant growing in isolated clumps or groups, 30 to 75 cm tall. Green stem, brownish at the base, densely pubescent, with numerous leaves (5 to 10), the lower ones broadly oval to almost round, borne ± horizontally, the upper ones becoming narrower and erect. Inflorescence more or less unilateral, with 15 to 60 medium-sized flowers. Epichile white to pinkish or purplish, more or less crenate, with rough brownish or pinkish gibbosities, with a distinctly backward-curving tip. Hypochile similar in colour to the epichile, often lighter, with a shiny nectar pocket and a more or less pronounced brown-black colour. Petals with the same variety of colour as the labellum; sepals green on the outside, sometimes washed with purple on the inside. Ovary green, pubescent, with a purple-washed pedicel. Entomophilous plant, with a functional rostellum and firm pollen.

Special features and forms

A particularly variable plant, both in its vegetative appearance and in its floral characteristics. In the area studied, the species is at the edge of its range and is therefore much less widespread and less variable than in other regions of Europe. Nevertheless, it can be difficult to distinguish it from neighbouring taxa (in the territory: *E. tremolsii*, *E. lusitanica*, *E. duriensis*), with which transitional forms exist (see preliminary remarks at the beginning of the chapter). In this regard, particular attention should be paid to habitat and phenology.

Biotope and ecology

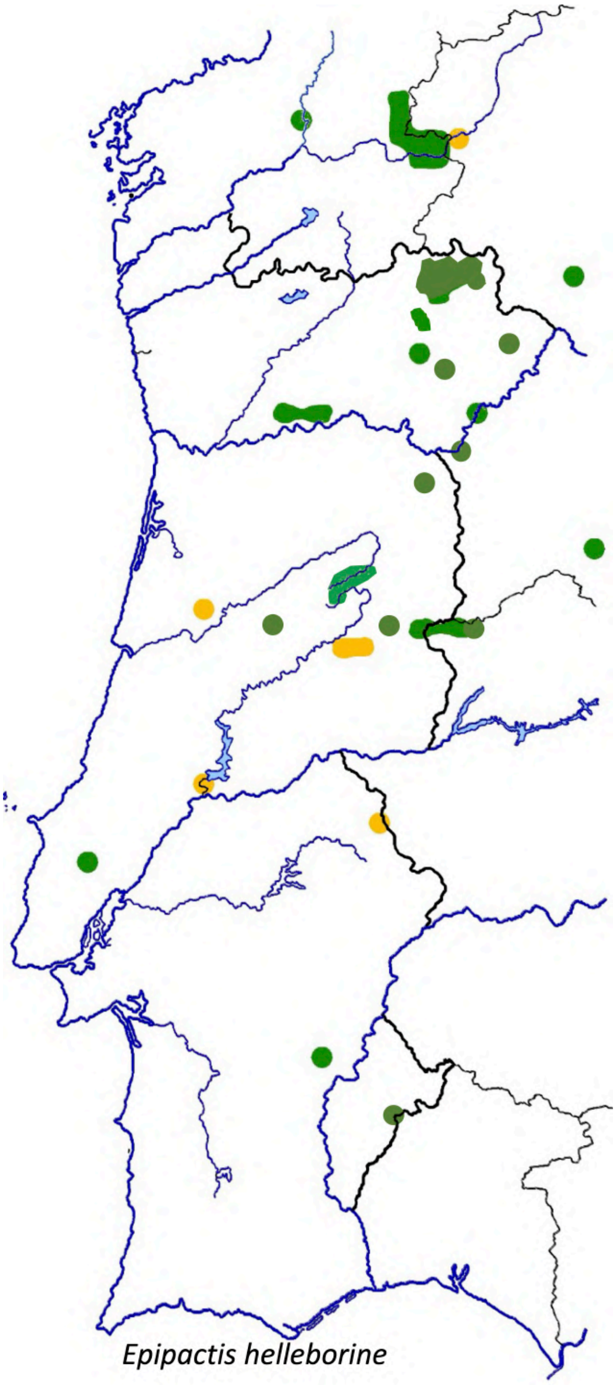
This species shows a certain eclecticism in its ecological preferences. It is most often found in lightly to heavily shaded environments, typically in oak (*Q. pyrenaica*) and chestnut groves. In the territory, it is found at altitudes between 300 and 1,200 metres. Various insects are responsible for its pollination, including Hymenoptera (wasps) and Diptera (hoverflies). It flowers in June–July, quite late compared to neighbouring taxa.

Distribution

A species widespread throughout most of Europe and Asia, from northern Scandinavia to North Africa; however, in the Mediterranean region, the boundary is unclear due to confusion with neighbouring taxa.

Situation in the study area

Seems rather rare but, due to the stability of its habitats, currently not particularly threatened. Further studies are needed to clearly distinguish this species from neighbouring species, both morphologically and geographically.



Photos on this page and the previous one: Figs. 4.41 to 4.45. *Epipactis helleborine*, Serra de Nogueira, Trás-os-Montes, 9 July 2009.

Epipactis fageticola (C.E. Hermosilla) J. Devillers-Terschuren & P. Devillers — Beech woods helleborine

Heleborina dos faiais, heleborina dos bosques (port.), Raíña das flores pendurantes (gal.)

Description

A slender to fairly robust plant, 20 to 50 cm tall, bearing 3 to 7 obovate to lanceolate leaves, spreading to ascending, less than 7 cm long, the first one positioned fairly high on the stem. Very irregular dentation on the leaf margins. Stem glabrous at the base, very slightly pubescent at the top. Inflorescence bearing 5 to 30 pendulous flowers, open to completely closed. Sepals yellowish-green to whitish on the outside, paler than the ovary. Epichile white, sometimes greenish at the edges. Rostellum gland present but non-functional; pollinia not very cohesive. Ovary glabrescent; ovary pedicel yellowish-green.

Special features and forms

One of only two self-pollinating *Epipactis* species in the territory. The rare individuals observed so far tended to have flowers that remained closed or opened very slightly. They were initially linked to *E. phyllanthes* G.E. Smith or to weak forms of *E. helleborine* (TYTECA & CAPERTA 1999); then it was proposed that these plants be considered representatives of *E. fageticola*, which was described later (GÉVAUDAN et al. 2001) and has also been reported in the Province of Salamanca (BERNARDOS & AMICH 2001).

Biotope and ecology

Very specific ecology in relation to our territory: fresh to moist substrates, in riparian forests, stream banks and ravines in beech forests, between 200 and 1500 m (GÉVAUDAN et al. 2001). The plants observed in Portugal in 1998 and between 2011 and 2018 grew mainly in chestnut groves on fairly moist soil (e.g. Serra da Estrela: TYTECA et al. 2017), and in a *Quercus pyrenaica* oak forest on a north-facing slope, on drier soil (Fresulfe; TYTECA & CAPERTA 1999).

Distribution

Iberian Peninsula, south-eastern France, Switzerland. Extremely rare in the territory: Portugal (Trás-os-Montes, Beira Alta, Beira Litoral), Galicia, Castilla y León.

Situation in the study area

Portuguese plants observed so far in small numbers, in a few rare locations.

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Captions for the photos on this page and the two previous pages (from top to bottom and left to right): **Figs. 4.46** to **4.51**. *Epipactis fageticola*. Figs. 4.46, 4.47, 4.50, 4.51: Poço do Inferno, Serra da Estrela, Manteigas, Beira Alta, 12 July 2018. Figs. 4.48, 4.49: Nunes, Vinhais, Trás-os-Montes, 9 June 2021.

Epipactis bugacensis Robatsch — Bugac helleborine

Description

Pale green stem, sometimes whitish to yellowish, without any purple tint; plant 20 to 65 cm tall, usually solitary or in groups of 2 to 4 plants, erect to somewhat flexuous, glabrous at the base and densely pubescent in the upper part. Three to ten leaves, 3 to 11 cm long and 1 to 5 cm wide, evenly spaced along the stem, spreading to erect-spreading, slightly curved downwards, oval-lanceolate, acute or acuminate, keeled, more or less firm, with flat to slightly undulate margins and regular dentation. Inflorescence 10 to 25 cm long, bearing up to 36 autogamous flowers, barely open, erect, odourless. Hypochile almost without nectar, epichile broad, flat to slightly convex, triangular-cordate, its apex reflexed ending in a small point, white to greenish, rarely washed with pink at the base, with two whitish callosities, rarely pale pink, well separated by a wide furrow and with a third slightly protruding callosity. Rostellum developed and persistent, but ineffective, pollinia pale yellowish, pulverulent at anthesis, disintegrating rapidly towards the stigma, which is not reflexed. Plant clearly autogamous. Ovary pyriform to oval, green, with a short pedicel completely green (no purple tinge).

Special features and forms

Clearly autogamous reproduction mechanism, differing little from that of *E. fageticola*. Compared to the latter, *E. bugacensis* is clearly distinguished by a set of characteristics listed in Table 4.3. It is part of a large group of plants found in similar environments throughout Europe: *E. dunensis* in Great Britain, *E. rhodanensis* in Spain, France, southern Germany and northern Italy, etc. Some authors (such as GRIEBL & PRESSER 2021) group these taxa together, which brings us back to the priority name on the European continent, *E. bugacensis*, named after the Hungarian village of Bugac.

Biotope and ecology

E. bugacensis, like *E. fageticola*, prefers cool, humid and fairly shady environments. However, while the latter is found on rugged terrain, on north-facing slopes, along streams or seeps, or even sometimes in dry areas, *E. bugacensis* is mainly found at the bottom of valleys, where permanent humidity is more guaranteed. The only Portuguese population known to date is found in a riparian vegetation environment dominated by red willow (*Salix atrocinerea*) and black poplar (*Populus nigra*), on the banks of the River Douro.

Table 4.3. – Distinguishing characteristics between *Epipactis fageticola* and *E. bugacensis*.

Character	***E. fageticola***	***E. bugacensis***
Dentation of leaf margins	Strongly irregular	Fairly regular
Pilosity of upper stem	Slightly pubescent	Densely pubescent
Arrangement of flowers in relation to stem	Hanging	Hanging to erect, perpendicular to stem

Distribution

With regard to the distribution area, it is obviously difficult to specify the distribution since only one station is known. It can be considered that this station extends westwards from the vast distribution area of *Epipactis bugacensis* in northern Spain, which includes populations previously attributed to distinct taxa, such as *E. campeadorii*, *E. hispanica*, etc. (see CASTROVIEJO et al. 2005). The population was discovered recently (MONTEIRO et al. 2023).

4.52

Situation in the study area

The only population recorded to date is dependent on the authorities' willingness to keep the banks of the Douro intact at this location and not to consider any developments such as a river beach …


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Captions for the photos on this page and the previous one (from top to bottom and left to right): **Figs. 4.52** to **4.57**. *Epipactis bugacensis*. Edge of the Douro, Almendra (Vila Nova de Foz Côa), Trás-os-Montes e Alto Douro, 8 and 11 June 2023. Photos used in MONTEIRO et al. (2023).

Spiranthes aestivalis
Lagoa da Vela (Beira Litoral),
30 June 1996

4.6. Spiranthes

The name of this genus inevitably evokes the appearance of a spiral: this is how the arrangement of the flowers is perceived, although strictly speaking this is incorrect from a mathematical point of view: it would be more accurate to refer to it as a helicoid, or at a pinch a spiroid, as a spiral refers more to a figure in a plane. In *Spiranthes*, the arrangement of flowers around the stem is thus helical. The helix can be left- or right-handed, with variable pitch; in extreme cases, it can even be infinite: the flowers are then simply arranged one above the other in the same plane (as in Fig. 4.59 below). Depending on the species, the helix may be perfect, imperfect, or even triple in some cases. In our territory, one species (*S. spiralis*) has a perfect helix; in the other (*S. aestivalis*), the helix is imperfect, in the sense that the helical arrangement is sometimes barely noticeable, due to the fact that the pitch is very small.

While two species of *Spiranthes* are present in our region, there are an estimated ‘certain number’ of species worldwide, distributed across all continents, estimated at around forty (PRIDGEON et al. 2003), with the greatest diversity observed in North America (28 species in the United States and Canada: LUER 1972, 1975). One thing all species have in common is the structure of their flowers: they are tubular, with the perianth parts joined together in a more or less open tube, from which the distal part of the labellum emerges, offering a landing pad for visiting insects. These insects, typically Hymenoptera (bees, bumblebees), visit freshly opened flowers but cannot reach the stigma due to the narrowness of the flower's opening and can only collect the pollinia, which attach firmly to the base of the proboscis. Two or three days later, the flower opens a little more, making the stigma accessible during another visit, during which an insect that has collected pollinia from other flowers (possibly from other plants) will deposit all or part of the collected pollinia on the stigma (CLAESSENS & KLEYNEN 2011). As Charles DARWIN described in his pioneering work (e.g. 2nd French edition of 1891), insects visit the flowers starting at the base of the inflorescence and moving upwards; the insect can therefore only encounter increasingly closed flowers and there can be no pollen transfer between flowers of the same inflorescence, which contributes to cross-pollination.

The two species present in the domain are distributed over a large part of the territory (see distribution maps) but are found in quite different biotopes: dry to somewhat humid heathland, in very low vegetation for the first (*S. spiralis*); alkaline to slightly acidic marshes, riverbanks, in places that are permanently supplied with water for the second (*S. aestivalis*). While hybridisation is possible in regions north of the joint range of the two species, for example in Brittany, it is not possible in Portugal and western Spain, because the former species flowers later (September–November) and the latter earlier (May–July) than in Brittany.

Spiranthes spiralis (L.) Chevallier — Autumn ladies-tresses

Espiral de outono (gal.), Trança-de-dama (port.)

Description
As an autumn-flowering plant, the autumn ladies-tresses does not show its leaves at the same time as its flowers. In Portugal, particularly in the south, the flowers bloom from late September to early November, and a little earlier as you move northwards. What you see next to the flowering plant at this time are not the leaves of the current year's plant, but those in preparation for the plant that will flower next year, so there will always be a gap between the two parts at ground level. Once flowering is complete, the leaves remain green for some time, including during winter, and wither well before the new inflorescence is produced. This inflorescence is as described in the paragraphs above. The flowers are white, with a yellow-washed labellum, and are lightly and pleasantly scented. The greyish stem is fairly densely pubescent. The leaves are short and broad, 2 to 3.5 cm long. The plant rarely exceeds 30 cm in height and bears between 6 and 25 flowers, rarely more.

Biotope and ecology

This plant always grows in full sunlight and requires short surrounding vegetation in order to thrive. It therefore favours scrubland, calcareous or slightly acidic grasslands, preferably in areas that remain relatively cool.

Distribution

Found throughout much of central and southern Europe, as well as North Africa. In Portugal and neighbouring regions, it is scattered throughout the territory, mainly at low altitudes.

Situation in the studied territory

The preservation of the autumn ladies-tresses is dependent on the continuation of extensive grazing by flocks of sheep or goats.

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Captions for the photos on this page and the next two pages.
Figs. 4.58 to **4.61** (above and the first two photos on the next page): *Spiranthes spiralis*. Fig. 4.58: plants in bud, Cabo Espichel, Estremadura, 7 October 2006. Figs. 4.59 (infinite spiral) and 4.61: Ericeira, Estremadura, 8 October 2006. Fig. 4.60: Morgado, Loulé, Algarve, 15 October 2006.
Figs. 4.62 to 4.64 (bottom of page 107 and bottom of page 108): *Spiranthes aestivalis*. Fig. 4.62: Ribeira de Odeleite, Galaxos, Algarve, 24 May 1997. Fig. 4.63: Praia dos Alteirinhos, Zambujeira do Mar, Baixo Alentejo, 9 July 2018. Fig. 4.64 (p. 108): Ribeira de Carreiros, Mértola, Baixo Alentejo, 23 May 1997.


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Spiranthes aestivalis (Poiret) L.C.M. Richard Summer ladies-tresses

Espiral de verán (gal.), Trança-de-dama (port.)

Description

Unlike the previous species, this one produces its leaves at the same time as its flowers, which bloom from May onwards and can continue until July, depending on the latitude and climate. The leaves, numbering between 3 and 6, are narrow, linear and elongated, 5 to 12 cm long and less than 1 cm wide. As with the autumn ladies-tresses, the plant is less than 30 cm tall and bears between 6 and 25 flowers, rarely more. Unlike the other *Spiranthes*, these flowers are pure white.

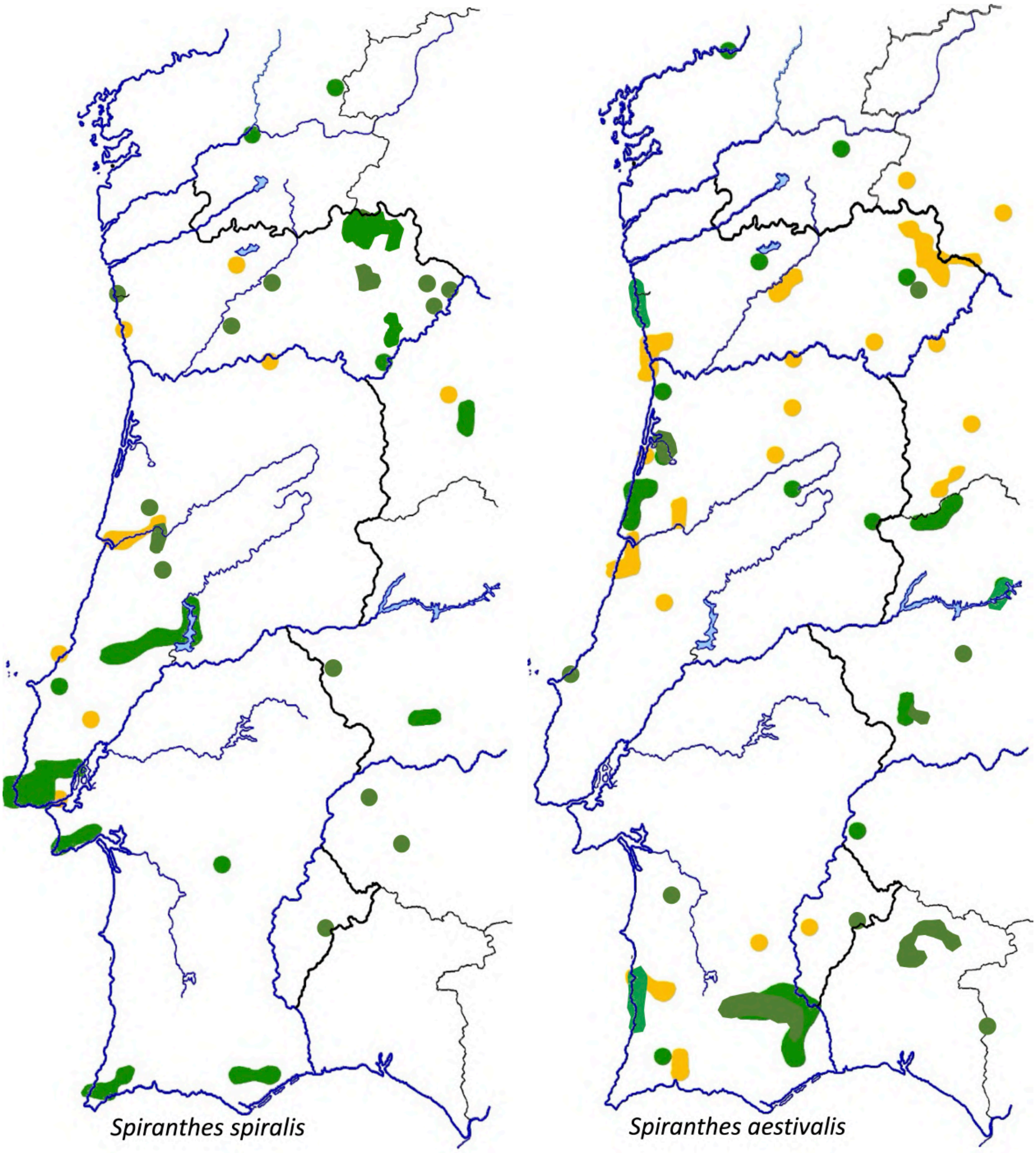
Biotope and ecology; situation in the study area

The biotopes where the summer ladies-tresses can be found are quite diverse, but they all have one thing in common: they have a permanent source of water nearby. They range from low alkaline peat bogs (with Hypnaceae, *Drosera intermedia*, *Schoenus nigricans*, *Lobelia urens*, various *Carex* species, etc.) to the often rocky banks of rivers, where it is sometimes the only plant found in crevices, and the trickles of water found near the tops of cliffs by the sea, in Alentejo and Algarve, always with endemic vegetation, or in marshy meadows not far from the Atlantic coast, such as around Aveiro. This eclecticism in its habitats allows the summer ladies-tresses to still be present throughout our territory, but it remains at the mercy of changes in these biotopes, or exposed to drying out, which can occur at any time in these “unproductive” areas. This observation should be dismissed immediately, or at least it should be, given that *Spiranthes aestivalis* is one of the only orchids in this territory to benefit from a solid protected plant status (at least in principle) guaranteed by a European regulation, the Bern Convention on the Conservation of European Wildlife and Natural Habitats (see the chapter on protection).

4.64

Distribution

The summer ladies-tresses is widespread across much of south-western Europe, from Brittany, Portugal and Galicia to Austria, northern Italy, Corsica and Sardinia. In our territory, it is rather scattered, as can be seen on the distribution map or on the Flora On website, the only exception being a significant concentration in the large valleys of south-eastern Alentejo and eastern Algarve.



Spiranthes spiralis *Spiranthes aestivalis*

4.7. Gennaria

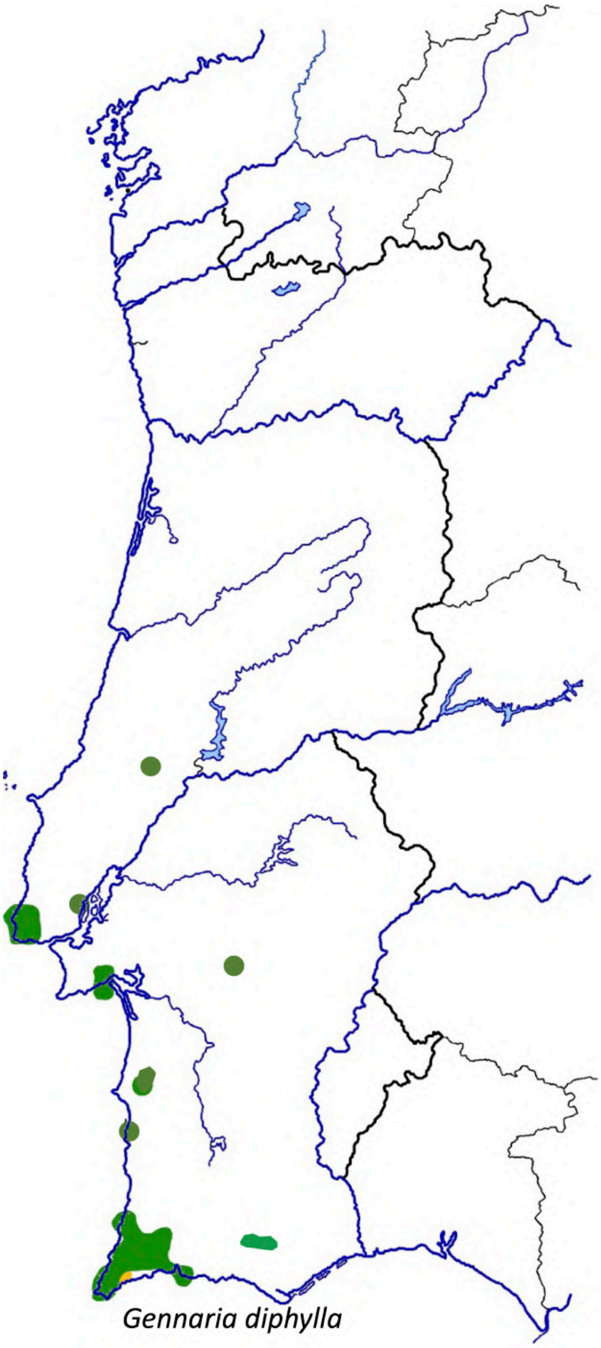
The first of the large Orchideae tribe (see Figure 3.2), and therefore in a sense 'the true orchids', the genus *Gennaria* comprises only two species. One, *G. griffithii*, grows in Asia, between Afghanistan and China, and the second, *G. diphylla*, is found along the southern and south-western coasts of the Iberian Peninsula and north-western Africa, with some presence on a few western Mediterranean shores (Algeria, Tunisia, the Balearic Islands, Corsica, Sardinia, etc.) as well as on the Macaronesian islands (Madeira, the Canary Islands). This gives the impression of a well-isolated, well-characterised genus, and this is indeed the case: the morphological aspects of the plant make it impossible to confuse it with any other orchid. In the species that interests us here, *Gennaria diphylla*, the flowering plant, 10 to 50 cm tall, invariably has two broadly oval, cordate, acuminate leaves above ground level, one large at the bottom and one small a little higher up, in an alternate position. When the plant is not flowering, it has only one leaf.

The inflorescence, which is almost unilateral, has 10 to 40 flowers. The cluster of tiny greenish flowers seems insignificant, yet when viewed with a magnifying glass, all the attributes of an orchid can be seen: a small three-lobed labellum extended by a globular spur, two spreading petals almost as long as the labellum, and three sepals that are significantly shorter. Seen from a distance, the three lobes of the labellum form a small five-pointed star with the two petals. The genus is closely related to the huge cosmopolitan genus *Habenaria*, which comprises nearly 600 species (PRIDGEON et al. 2001).

The plant often forms large populations and spectacular groups, covering almost the entire ground over a few square metres. This indicates a definite propensity for vegetative propagation, made possible by the emission of several tubers with more or less long peduncles, which will produce plants the following year. The substrate is typically calcareous and rocky, but the plant can also be found on slightly acidic, sandy soils, which are always more or less dry. The plant is rarely found in full sunlight and prefers light shade, such as that provided by pine woods or scrubland.

Gennaria diphylla (Link) Parlatore — Two-leaved gennaria

Satirião-de-duas-folhas (port.), Orquídea de dos hojas (cast.)



Photos on pp. 110–112: **Figs. 4.65 to 4.69**. *Gennaria diphylla*. Umbrella pine forest, Vila do Bispo, Algarve, 28 February 2007.

Description

See description of the genus above.

Special features and forms

The plant is extremely uniform. Non-flowering specimens bear only a single leaf.

Biotope and ecology

Described above. Flowering is very early, from mid-February to late March.

Distribution

In Portugal, *Gennaria diphylla* is found quite frequently near the Atlantic coast, from the Algarve to Extremadura (see distribution map), at low altitudes. It is found much less frequently inland, in isolated locations, at sometimes surprising altitudes, reaching up to 400 to 500 m (Rocha da Pena, Algarve). See map opposite.

Situation in the studied territory

In its locations near the Atlantic coast, the plant is still threatened by the development of housing estates and the creation of infrastructure.

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4.8. Platanthera

This genus has undergone some taxonomic changes over the last decade. Previously, two species were well known throughout Europe, *Platanthera bifolia* and *P. chlorantha*, with a few species with a smaller distribution, one (*P. algeriensis*) in North Africa and some nearby Mediterranean regions (southern Spain, France, Italy, Sardinia, Corsica), others in eastern Mediterranean regions (*P. holmboei*, etc.).

However, intermediate forms between the first two species have long been known throughout Europe and were often classified as hybrids between them (*P.* x *hybrida*), and various varieties or forms, some rather slender and others rather robust, were described for *P. bifolia*. Recent studies have attempted to add some structure to all this, sometimes leading to the updating of previously described taxa (*P. fornicata*: BUTTLER 2011; TYTECA & ESPOSITO 2017; *P. pervia*: BLEILEVENS et al. 2021) or the description of new taxa (DURKA et al. 2017; BAUM & BAUM 2017). This initially led to some confusion, with the name *P. fornicata* tending to supplant *P. bifolia* in much of Europe (e.g. GRIEBL & PRESSER 2021; DELFORGE 2021), leading to a necessary clarification, where it was shown that the name *P. bifolia* did indeed apply, at least to the Portuguese populations (TYTECA et al. 2024).

These comments serve to clarify the situation for Portugal and neighbouring regions, which are the subject of this book: we will therefore only discuss *Platanthera bifolia*. The issue of ‘intermediate *Platanthera*’ seems, at this stage, to arise only in north-eastern Spain (BLEILEVENS et al. 2021), which is far from the territory covered by this book.

The *Platanthera* we have discussed so far are all very characteristic plants, with two (rarely three) large, broadly oval leaves at the base at ground level, accompanied by a few progressively smaller leaves along the stem, a rather loose inflorescence of 10 to 40 white, whitish or pale greenish flowers, with an oblong, entire labellum and a very long nectariferous spur that attracts various families of moths (Heterocerian Lepidoptera), which are the designated pollinators.

Finally, it should be noted that *Platanthera* is a widely distributed genus of orchids, comprising around 200 species, which, in addition to Europe, includes most of Asia and North America, as well as a few more limited territories in Central America, North Africa and Oceania (PRIDGEON et al. 2001).

Platanthera bifolia (L.) L.C.M. Richard — Lesser Butterfly Orchid

Orquídea borboleta (port.), Satirion oficinal (cast.), Orquídea branca das bolboretas (gal.)

Description

There is only one species of *Platanthera* in the region. This is *P. bifolia*, a species originally discovered and described by Linnaeus in 1753, in the genus *Orchis*: *Orchis bifolia* L., and later transferred to the genus *Platanthera*. As JACOB (2024) rightly points out, the flowers of this species resemble swans or angels in flight rather than butterflies (the English common name is Lesser Butterfly Orchid; the Portuguese name is Orquídea borboleta!).

In addition to the characteristics listed in the general description of the genus, the lesser butterfly orchid is distinguished by the arrangement of its pollinia: these are closely parallel and very close to each other; the distance between the two viscidia is therefore very short (around 0.2 to 0.7 mm; between 0.5 and 4 mm in other European species of *Platanthera*). In line with this characteristic, the caudicules are very short (0.2 to 0.5 mm, compared to 0.4 to 2.2 mm in other species). The spur is also shorter than in other European *Platanthera*: less than 25 mm compared to more than 25 mm. These parameters are particularly well suited to the physical characteristics of the preferred pollinators, in this case Sphingidae (NILSSON 1993): the length of the proboscis and the adjustment of the pollinia near its base after collection correspond well to the morphological characteristics of Sphingidae.

Special features and forms

The populations found in Portugal and north-western Spain are consistent with the species type; none can be linked to any of the varieties or subspecies described for *P. bifolia*.

Habitat and ecology

P. bifolia shows a preference for acidic soils. It can be found in full sunlight, in sometimes wet meadows, but more often under more or less clear forest cover. The ideal habitat, where most of the populations of this orchid are found, is the chestnut grove. It is found in Galicia up to an altitude of 1250 m (CORTIZO & SAHUQUILLO 2006); in Portugal, the locations recorded are all between 600 and 900 m, with the exception of one, at 250 m, curiously the southernmost (TYTECA et al. 2024).

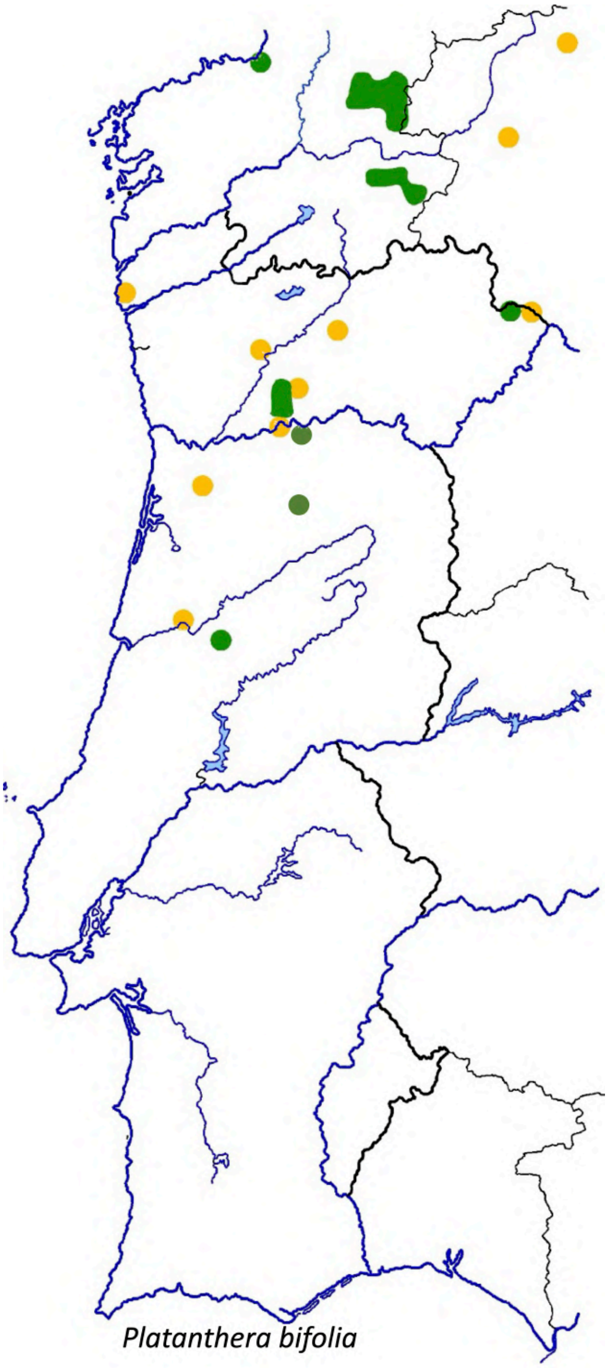
Distribution

In Portugal, there is a central core of populations between the cities of Vila Real and Viseu and two isolated populations, near Angueira in the north-east and far to the south in the Coimbra region. In recent years, the total number has been estimated at around 2,000 plants for the whole country, more than half of which are in the Armamar-Satão area (TYTECA et al. 2024). In Galicia, there are some large concentrations visible on the map (CORTIZO & SAHUQUILLO 2006); the plant appears to be rarer in Castilla y León and non-existent in the mapped areas of Extremadura and Andalusia.

Situation in the study area

Our recent study (TYTECA et al. 2024) reports several significant instances of degradation, including the destruction of chestnut groves, which will obviously only reduce the total population, putting the species in a critical situation. The Red List (CARAPETO et al. 2020) places the species in the ‘endangered’ category.

Fig. 4.70. – A biotope with *P. bifolia* in a chestnut grove, in Povoa da Serra, in the Serra do Marão, Trás-os-Montes, 8 June 2007.



Figs. 4.71 to **4.73**. – *Platanthera bifolia*. From top to bottom:

Fig. 4.71: Povoa da Serra, Serra do Marão, Trás-os-Montes, 8 June 2007.

Fig. 4.72-4.73: Sátão, Beira Alta, 7 June 2023.

↑ **Fig. 4.74**. – Chestnut grove with *Platanthera bifolia*, Passos, Armamar, Trás-os-Montes, 11 June 2023.
↓ **Fig. 4.75**. – In search of *Pseudorchis albida*, in the Serra dos Ancares, Galicia, 4 July 2009, with your servant (photo J.-L. GATHOYE).

4.9. Pseudorchis

Pseudorchis, along with *Gymnadenia*, *Nigritella* and *Dactylorhiza*, belong to the Orchideae category which have palmate tubers. Compared to these three genera, *Pseudorchis* are distinguished by their small, white, whitish or yellowish flowers with a three-lobed, unspotted labellum. They are generally mountain plants or grow in northern regions of Eurasia, reaching North America via Greenland and Newfoundland. Depending on the authors' views, the genus contains one, two or three species, one of which, *P. albida*, reaches our study area via the Cantabrian Mountains. It took a lot of patience and research to finally find one specimen in the Serra dos Ancares in July 2009 (see photo on the previous page)!

Pseudorchis albida (L.) A. & D. Löve — Small White Orchid

Orquídea das serras (gal.)

Description
The plant is small, between 10 and 35 cm tall, bearing 10 to 50 flowers, rarely more. The flowers are very small and the inflorescence is dense. The leaves, numbering 3 to 7, are narrowly oval to lanceolate, less than 2.5 cm wide. In the form found in the dition, the flowers are white to pale yellowish, slightly open, with a pleasant (honey) scent; the labellum is trilobed with a median lobe longer than the lateral ones. The spur is short (about half the length of the ovary) and slightly globular, thickened at its tip. The plant is pollinated by small insects such as small Lepidoptera or Hymenoptera; self-pollination is also possible.

Special features and forms
In the district, the plants are probably of the var. *albida*. There is a var. *tricuspis* in which the three lobes of the labellum are sub-equal, but this probably does not exist in this territory.

Biotope and ecology
Essentially acidophilic plant; in our study area, it grows in mountain ranges with crystalline rocks, in meadows and heaths on more or less acidic soils, always in full sunlight.

Distribution
The species has a wide Eurasian range and reaches its western limit on the European continent in Galicia, at the eastern end of the province of Lugo (Serra dos Ancares). Extremely rare in its Galician range, it becomes more frequent towards the east of its range.

Situation in the study area
Considered rare and threatened in its Galician range (CORTIZO & SAHUQUILLO 2006), the species should be explicitly protected there.

Fig. 4.76 - 4.77. – *Pseudorchis albida*.
From top to bottom:

Fig. 4.76: the only plant found in the Serra dos Ancares, Galicia, 4 July 2009.

Fig. 4.77: Haag Pass, Haut-Rhin, France, 23 June 2022.

4.10. Gymnadenia

We must mention a controversy regarding the taxon to be included in the territory studied, but we will discuss this below. We will begin by addressing the essential aspects of the genus *Gymnadenia*, as in other genus monographs.

The genus *Gymnadenia* in the strict sense comprises around 16 species distributed across much of Europe and a few localised regions of Asia (China, Japan, Korea, Kamchatka, Himalayas, etc.: PRIDGEON et al. 2001), but it should be noted that for a smaller territory (Europe, North Africa and the Middle East), KREUTZ (2024) already includes 13 species, while DELFORGE (2016) retains only 4 in a territory that is just a little smaller! It should be noted that the latter two figures do not include species of the genus or section *Nigritella*, whereas PRIDGEON et al. do include them.

Like *Pseudorchis*, the genus *Gymnadenia* thrives in mountainous regions and in Nordic countries, but some species are also widespread in lowland areas, without being Mediterranean species. A recent in-depth genetic study has shown that three species of *Gymnadenia* can be distinguished in the British Isles: *G. conopsea*, which is the most common and widespread species, *G. borealis* and *G. densiflora* (CAMPBELL et al. 2007). Following this publication, various studies reported the presence of *G. borealis* and/or *G. densiflora* in other territories, but without being able to provide genetic evidence proving their identity with the British taxa; therefore, formally speaking, their presence in these territories was only supported by morphological and/or ecological evidence (BATEMAN et al. 2021). However, given the evidence, we consider the presence of *G. borealis* to be highly probable in territories other than the British Isles.

Gymnadenia (in the strict sense) are slender plants, 15 to 60 (-100) cm tall, bearing 5 to 12 linear leaves, with a slender, multi-flowered inflorescence composed of 15 to 50 (-100) pale pink to dark red flowers, rarely white, with an unspotted labellum and often a very long, narrow, nectariferous spur, indicating pollination by lepidoptera. The flowers are moderately to (very) strongly scented depending on the species. They are found in diverse environments, almost always in full sunlight: often grazed lawns and meadows, on basic or slightly acidic soils (*G. conopsea*), alkaline marshes (*G. densiflora*) or acidic peat bogs and acidic heaths (*G. borealis* – the three species are given as examples of distribution in the British Isles).

Gymnadenia borealis (Druce) R.M. Bateman, Pridgeon & M.W. Chase — Heath Fragrant Orchid

Orquídea fragrante das urzes (port.), Orquídea mosquera, Orquídea mosquito, Orquídea olorosa (cast.), Lumbrín dos breixos (gal.) [vernacular names for *G. conopsea*]

Introductory remarks

We start from the assumption that there is only one taxon of *Gymnadenia* in the study area, and that this taxon is *G. borealis*, as seems to be evident from an examination of plants in Portuguese peat bogs and Galician heathlands. This contradicts the generally accepted opinion that the taxon in question is *G. conopsea*, but the plant corresponds in every respect, morphologically speaking, to the British Heath Fragrant Orchid. This view may need to be revised in light of further research, with the likely solution being that either we have only *G. borealis*, as proposed here, or we have both taxa (*G. borealis* in the peat bogs and *G. conopsea* in the heathlands).

Our view is supported by a summary examination of plants examined in a Portuguese bog and a Galician heath, both in acidic environments (TYTECA et al. 2018), and immediately relayed in the recent impressive work by K. KREUTZ (2024).

Description

Compared to other species found in neighbouring regions (*G. conopsea*, *G. odoratissima*, *G. densiflora*, etc.), *Gymnadenia borealis* is distinguished by several remarkable features: it is a rather slender plant with fewer flowers and leaves, a labellum that is longer than it is wide, oval to lanceolate lateral sepals with pointed tips, 2 mm wide and 4 to 5 mm long, ± drooping, etc. (HARRAP & HARRAP 2005). These characteristics were found in both the acidic peat bogs of northern Portugal and the acidic moors of eastern Galicia.

Biotope and ecology

The plants observed in northern Portugal grow in acidic peat bogs in the Serras de Gerês and da Peneda, at an altitude of around 1200-1300 m, alongside species typical of these areas, starting with an orchid, the heath spotted orchid (*Dactylorhiza ericetorum*), with which it can exceptionally hybridise (see photo after the section on *Dactylorhiza*), but also other plants, including heaths (*Erica tetralix*, *E. cinerea*, *E. umbellata*), tormentil (*Potentilla erecta*), slender loosestrife (*Lysimachia tenella*), European gorse (*Ulex europaeus*), round-leaved sundew (*Drosera rotundifolia*), etc. In Galicia, as in the Serra do Courel, some of these species can be found in dry acidic heathlands, such as grey heather (*E. cinerea*), which clearly indicates that we are in an acidic environment! But here, the environment borders on limestone areas occupied by calcicolous flora, where we find completely different species!

Distribution

Given the taxonomic clarification attempted here, the biotopes just described, which are home to *Gymnadenia borealis*, are found in the well-defined regions mentioned above. It is highly likely that the neighbouring species *G. conopsea*, which is more robust and rather calcicolous, can also be found in different biotopes, but the respective distribution areas still need to be studied in depth in order to re-evaluate their boundaries. It is also possible that *G. densiflora*, which has just been reported for the first time in Asturias (GONZÁLEZ-GARCÍA et al. 2025), may also be found there.

From a more general perspective, it cannot be ruled out that *G. borealis* is present in other regions of Europe and has an Atlantic distribution, just like *Dactylorhiza ericetorum*. We would therefore expect to find it – as is already the case with the latter! – along the Atlantic coast of France, linking it to the British Isles, where *G. borealis* is known to be found.

Situation in the study area

As *G. borealis* is found almost exclusively in areas that are already protected (National Park in Portugal; Serra do Courel Natural Park in Galicia), it is probably not endangered; however, as it is rare until further notice, it must be monitored for anything that could threaten the proper conservation of its biotopes.

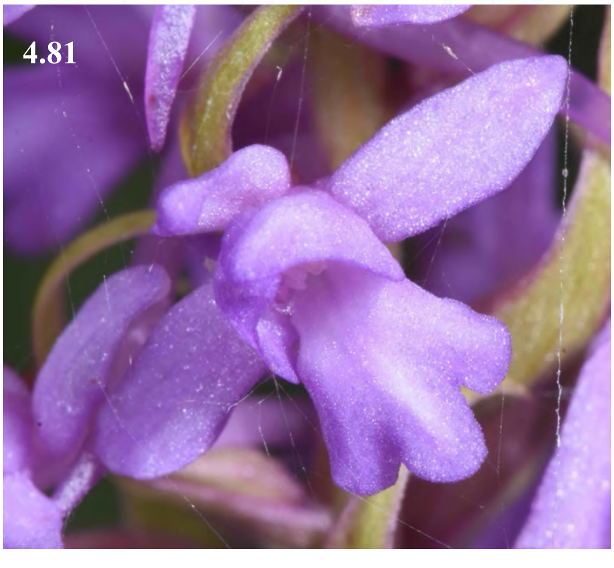
Fig. 4.78 - 4.81. – *Gymnadenia* (cf) *borealis*. On this page and the next, from top to bottom: Fig. 4.78 (opposite), 4.80, 4.81: Serra da Peneda, Minho, 5 July 2018. Fig. 4.79: Alto da Pedra, Serra do Courel, Galicia, 3 July 2009.

Gymnadenia borealis

4.79

4.80

4.81



Dactylorhiza caramulensis
Lamas de Olo, Serra de Alvão,
2 June 2021

4.11. Dactylorhiza

This genus includes numerous species in Europe, the Mediterranean Basin, Asia and as far as the Aleutian Islands. In a monograph devoted to them, AVERYANOV (1990) listed 75 species, while Karel KREUTZ (2024), for a territory (essential for the genus) comprising Europe, North Africa and the Near East, proposed 121! Along with *Ophrys*, *Epipactis* and *Serapias*, *Dactylorhiza* is one of the most complex genera in Europe to study systematically. *Dactylorhiza* can be divided into several groups, corresponding to specific morphological, ecological and genetic characteristics. The basic chromosome number of *Dactylorhiza* is 2n = 40; from this, a number of species have been formed by auto- or allopolyploidisation, as we explain briefly below.

Previously, the green-winged orchid formed a genus distinct from the genus *Dactylorhiza*, the genus *Coeloglossum*, consisting of the single species *C. viride*, which was known to hybridise easily with *Dactylorhiza*. With the advent of molecular phylogenetics, it seemed more appropriate to group *C. viride* with *Dactylorhiza* (PRIDGEON et al. 1997; BATEMAN et al. 2003), despite arguments to the contrary by some (DEVOS et al. 2006; KREUTZ 2024). The main reason for this is that, if the more primitive species *D. iberica* were to be kept within the genus *Dactylorhiza*, the latter would become paraphyletic if *C. viride* were excluded, which therefore had to be included in the ranks of *Dactylorhiza* (BATEMAN & RUDALL 2018).

The seven groups that can be distinguished (at least on a European scale, excluding Central Asia) are as follows, in order of increasing complexity:

- The *D. viridis* group, which is very distinct from the others morphologically and genetically (which does not exclude hybridisation with other groups), diploid (2n = 40), with a wide circumboreal distribution;
- The *D. iberica* group, which is highly isolated and well differentiated, also comprising a single diploid species (2n = 40), found in Eurasia;
- The *D. aristata* group, also comprising a single diploid species, found at the edges of the genus's range (Far East and Aleutian Islands);

The other groups include species distributed throughout Europe, the Mediterranean Basin and part of Asia (the Near East and Central Asia):

- The *D. sambucina* group, consisting of species growing in dry, unshaded or lightly shaded locations. Most of these species are diploid; two species, *D. insularis* and *D. cantabrica*, are triploid (2n = 60), formed by hybridisation and reproducing mainly by apomixis.
- The *D. incarnata* group, comprising diploid species growing in humid, sunny locations;
- The *D. maculata* group, comprising both diploid species (2n = 40) and tetraploid species (2n = 80) formed by autopolyploidisation of diploid species, observed in dry to humid, sunny to semi-shaded environments;
- Finally, the most complex group by far, that of *D. majalis*, formed by tetraploid (2n = 80) or polyploid (2n > 80) species, which appeared as a result of multiple allopolyploidisation processes between representatives of the two previous groups. Depending on the parent species involved and the time of hybrid formation, several lineages can be distinguished, each of which can be divided into various species according to morphological and ecological characteristics (DEVOS et al. 2006; PILLON et al. 2007).

Dactylorhiza have a more or less thick stem, along which the leaves are distributed from the base to the inflorescence, decreasing in size as they rise from the base. These leaves are often spotted, varying in shape and number depending on the group. The bracts are well developed and leaf-like. The flowers are arranged in a generally dense inflorescence, comprising between (10 -) 15 and 80 (- 100) flowers, with colours varying according to the group. With the exception of *D. viridis*, the flowers of *Dactylorhiza* lack nectar: this is a genus in which the strategy for attracting pollinating insects is based on the lure of food and the supposed resemblance between the flowers of *Dactylorhiza* and the flowers of nectar-producing species. Due to a learning process whereby insects "learn" to recognise flowers lacking nectar, the reproductive success rate is quite low, ranging from 10% to 39% (PRIDGEON et al. 2001).

Given the complexity of certain groups, the study and identification of *Dactylorhiza* can be difficult; as a general rule, it is advisable to examine several individuals from the same population (rather than basing identification on isolated individuals) and to consider all the characteristics proposed in the identification keys.

In Portugal and in the territory covered by this book, the situation is not so complex, since only nine species, belonging to five of the groups mentioned above, are observed. Table 4.4 lists some of the important characteristics of the different groups and species.

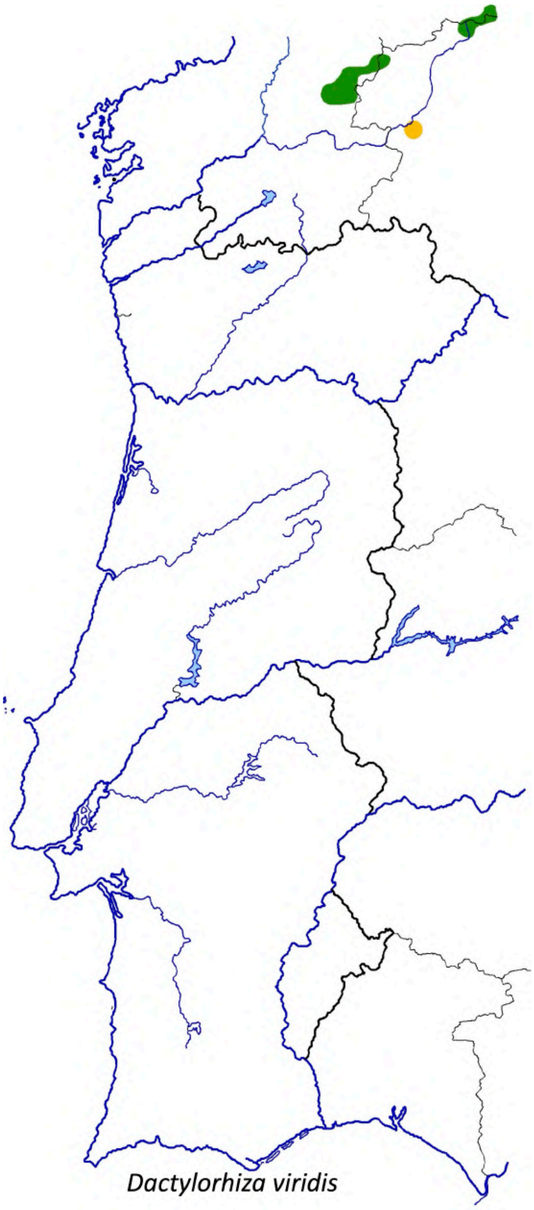
Table 4.4. – The *Dactylorhiza* groups of Portugal and neighbouring regions

Group	Species	Ploidy	Habitat	Distribution
D. viridis	*D. viridis*	2n = 40	Cool, high-altitude grasslands	Galice, León
D. sambucina	*D. sambucina* *D. markusii* *D. insularis* *D. cantabrica*	2n = 40 2n = 40 2n = 60 2n = 60	Dry grasslands, open woods	Portugal (N & centre, Alentejo; only *D. mark.* and *D. ins.*); Galicia, León, Extremadura, Andalucía
D. incarnata	*D. incarnata*	2n = 40	Wet or marshy grasslands	León (altitude)
D. maculata	*D. ericetorum* *D. caramulensis* *D. irenica*	2n = 80 2n = 80 2n = ?	Wet grasslands, peat bogs, open woods	Portugal (N & centre); Galicia, León; Extremadura (*D. irenica*)
D. majalis	*D. elata*	2n = 80	Wet or marshy grasslands	Portugal (N & centre); Galicia, León, Extremadura, Andalucía

Dactylorhiza viridis (L.) R.M. Bateman, Pridgeon & M.W. Chase Frog Orchid

Orquídea verde (gal.)

Description
The dominant colour of the plant, even when in bloom, is green, although some individuals stand out with flowers in which red tones appear particularly strong. The plant is not very tall, between 5 and 30 cm, and has 3 to 7 immaculate, oblong-oval leaves at its base. The bracts are particularly developed and emerge from the inflorescence. Unlike the other *Dactylorhiza* species described here, *D. viridis* has petals and sepals joined in a loose helmet protecting the gynostemium, and the labellum is long, oblong and narrow, only bifid (or trifid) at the apex. The spur is very short and globular; the pollinia are widely spaced. The name 'frog orchid', used in several languages, may derive from two characteristics: the labellum, which is bent backwards with its bifid tip (at the bottom of the flower), can give the impression of a leaping frog; the round, globular and shiny spur is reminiscent of the puffed cheeks of a croaking frog.



Special features and forms

The plant as described above shows little variation, and the plants of this species do not differ significantly from those found in other parts of its range.

Biotope and ecology

In the parts of the distribution area where *D. viridis* is found, it occurs as a mountain plant, growing alongside other mountain species as in the mountainous regions of Europe. There are no populations thriving in the lowlands in the distribution area, as it is found here at altitudes between 900 and 1,700 metres.

Distribution

As already mentioned above, the distribution of *D. viridis* is largely circum-boreal; it is the only species of the genus with this characteristic. In the region, it is only found in the Cantabrian Mountains and their Galician foothills.

Situation in the study area

Although located at the edge of its range in the study area (east of the province of Lugo), the green-winged orchid is not currently showing any decline and its populations in the mountains appear to be thriving. Elsewhere in its range, the species is currently experiencing a sharp decline in its lowland populations.


4.82

Figs. 4.82-4.83. *Dactylorhiza viridis*.
Puerto de Ventana, around 1,500 metres, León Province, on the border with Asturias, 7 July 2009.

Dactylorhiza viridis
Alto do Couto, Serra do Courel
(Galicia), 3 June 2023

Dactylorhiza sambucina (L.) Soó **Elder-flower orchid**

Orquídea do sabugueiro (gal.)

Description

A fairly stocky plant, between 10 and 25 cm tall, with 5 to 8 oval to oblong leaves, unspotted, spreading towards the ground (at an angle of 56 to 80° to the stem). The stem is hollow and thick, compressible. The compact inflorescence has 10 to 25 fairly large flowers. These are either yellow with a labellum bearing a few purplish spots in its center, or red with the labellum yellow at the throat, also bearing a few purplish spots; rarely do intermediate colors occur, typically salmon pink. The labellum is trilobed, with the median lobe longer than the lateral lobes, which are slightly folded back. The spur is fairly thick, longer than the ovary, and descends parallel to the ovary. Chromosome number $2n = 40$.

Special features and forms

In most of its range, the plant is found in populations where both colour forms (yellow and red) are present together. In some populations, especially on the periphery of the range, as is the case in our territory, the yellow form dominates or is even the only one present. This species should not be confused with *D. cantabrica*, described below, which completely replaces *D. sambucina* in Galicia.

Biotope and ecology

D. sambucina is, for most of its range, a mountain plant, but it also exists at low altitudes in the northern part. In our territory, it is therefore also present at altitudes between 900 and 1800 m. It favours alpine pastures and cool mountain meadows and flowers mainly in May or June, depending on the altitude.

Fig. 4.84. – *Dactylorhiza sambucina*, La Cueta, Prov. León, 22 May 2002.

Distribution

Once widespread across much of Europe, *D. sambucina* has declined or even disappeared from many lowland regions. It is only present in the northern third of the Iberian Peninsula and reaches the western limit of its range in the west of the Province of León. Absent from Portugal.

Situation in the study area

As long as its biotopes remain intact, *D. sambucina* is not threatened.


4.85


4.86

Figs. 4.85-86. Flowers of *D. sambucina* photographed in Castelluccio di Norcia (Umbria, Italy), 1987 →

Dactylorhiza cantabrica H.A. Pedersen — Cantabrian Orchid

Orquídea de Cantabria (gal.)

Description

Similar to *D. sambucina*, but a more slender plant, 10 to 20 cm tall, with 3 to 6 oval to lanceolate leaves, more or less erect (angle of 23 to 47° with the stem). The picture in Fig. 4.87 shows a typical plant habit; in Fig. 4.89, the plant is stocky, because it is just starting to flower. Flowers generally yellow, rarely pink. Spur shorter to about as long as the ovary, straight to slightly curved downwards. Chromosome number 2n = 60.

Special features and forms

The orchids of Galicia, particularly those of the Serra do Courel, have been extensively studied by local botanists, notably CORTIZO & SAHUQUILLO (1999a, 1999b, 2006) and SAHUQUILLO (2018a, 2018b), who have also contributed to enriching the systematic knowledge of a critical group of *Dactylorhiza* that we will now discuss, and which are well worth a detour.

If we had been writing at the beginning of this century, we would have mentioned, in the paragraphs above, not *Dactylorhiza cantabrica*, but rather *Dactylorhiza sambucina*. The latter species is well known and familiar to European orchidologists. Except that... in Galicia, there is no *Dactylorhiza sambucina*. Around the year 2000, some botanists, particularly those specialising in orchids, noticed that the *D. sambucina* found here had some unusual features, such as the slender appearance of the plant, with its leaves pointing upwards, as well as its short, straight spur... whereas in “true” " *D. sambucina*, the plant is short and stocky, with leaves spread out towards the ground, and the spur is long, clearly extending beyond the ovary and distinctly curved downwards. Furthermore, similar populations were also found further east, in Castilla y León, with rare pink individuals and a triploid chromosome number (2n = 60), whereas in populations of *D. sambucina* in the strict sense, individuals are generally yellow or red and the plants are diploid (2n = 40) (BERNARDOS et al. 2004). The Danish botanist H.Æ. PEDERSEN (2006) took up the matter and studied several populations, concluding that the plants of Galicia (and a little further east) constitute a distinct species, which he described as *Dactylorhiza cantabrica*, the Cantabrian dactylorhiza, which he described as tetraploid (2n = 80), reproducing by apomixis, and possibly originating from a hybridisation between *D. sambucina* and *D. insularis*. This Cantabrian dactylorhiza was subsequently found even further east, as far as the province of Palencia! (see RUIZ DE GOPEGUI et al. 2014).

That's not all: using the latest cutting-edge techniques, researchers at the University of A Coruña (Galicia), the same ones who study orchids in their region, are rapidly advancing knowledge about this group of species (PARDO OTERO et al. 2024). Thus, we learn in particular that (1) *D. cantabrica* does indeed originate from a hybridisation between the two aforementioned species; (2) the maternal parent is *D. insularis*; (3) *D. cantabrica* does indeed reproduce mainly by apomixis; (4) it is not tetraploid but triploid (2n = 60). Points 3 and 4 should, according to theory, lead to the cessation of evolution due to inbreeding: this is not the case; apomictic species can occasionally reproduce sexually, the advantage of apomixis being an improved ability to establish themselves in new territories (HÖRANDL et al. 2024).

Biotope and ecology

These are the same as for *D. sambucina*. However, *D. cantabrica* is found at slightly lower altitudes than *D. sambucina*, taking over its altitudinal distribution at elevations that are unusual for the latter.

Distribution

At present, *D. cantabrica* is known to occur in the provinces of Lugo (Galicia), León and Palencia (Castilla y León) and probably Cantabria (BENITO AYUSO 2017; KREUTZ 2024).

Situation in the study area
High-altitude grasslands and mountain pastures, which are still grazed periodically, appear to be under little threat. However, in Galicia and León, where the plant can be found at altitudes close to or below 1,000 m, the situation may become worrying due to drought, scrub encroachment on grasslands following reduced grazing, or, conversely, overgrazing. Fortunately, at least for the Galician part, the establishment of the Alto da Pedra and Alto do Couto 'Microrreservas' in the Serra do Courel should be a favourable factor.

Figs. 4.87-88. *Dactylorhiza cantabrica*, at the time when it was identified as *D. sambucina*. Alto do Couto, Folgoso do Courel, Galicia, 23 May 2001.

4.89

Figs. 4.89-90. *Dactylorhiza cantabrica*, Alto da Pedra, Serra do Courel, Galice, 1st May 2024.

4.90

Dactylorhiza insularis (Sommier) Ó. Sánchez & Herrero

Island orchid

Orquídea insular (port.), Orquídea marela de dúas pintas (gal.)

Description

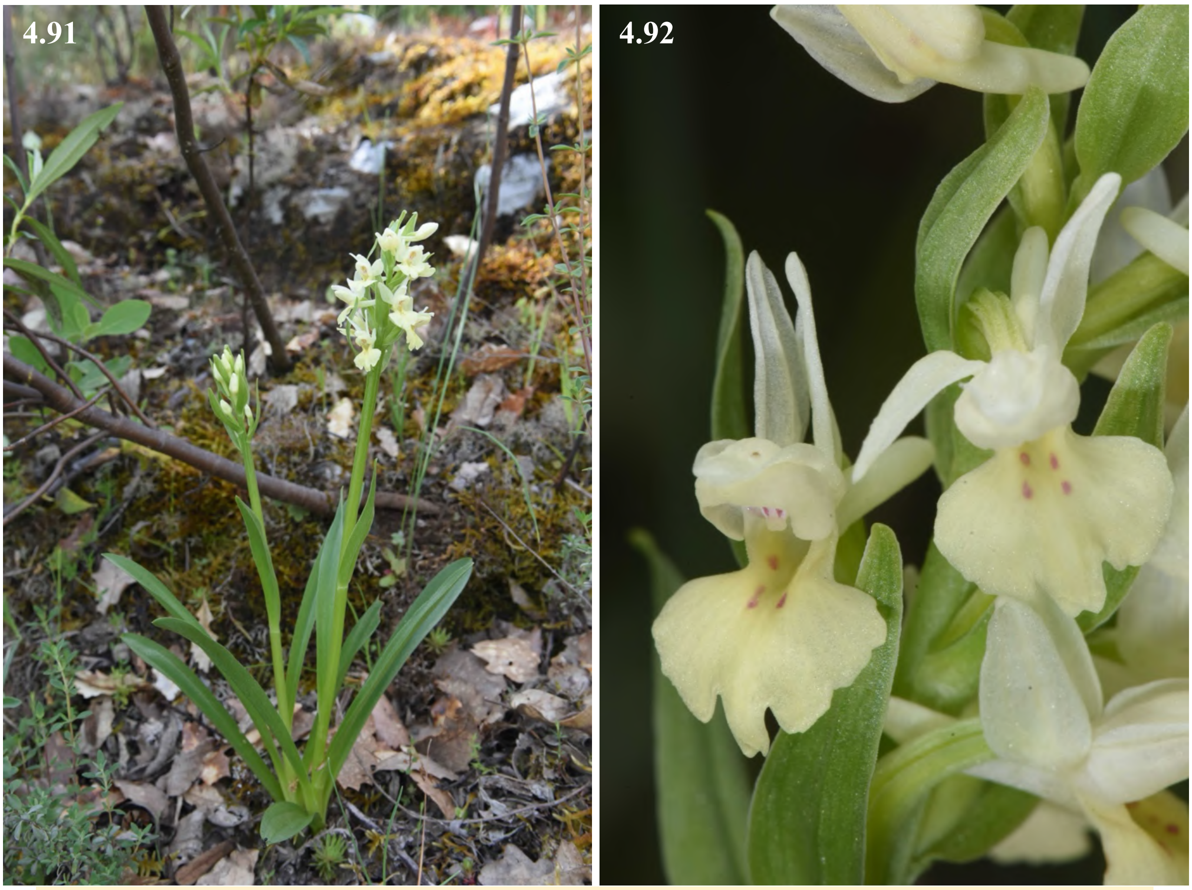
A more or less slender plant, 15 to 30 cm tall, with 6 to 8 lanceolate to linear leaves distributed along the stem, decreasing in size from the bottom of the stem to the inflorescence, without spots. Inflorescence more or less dense and elongated, with 10 to 25 yellow flowers. Labellum trilobed, with the median lobe longer than the lateral lobes, more or less flat to slightly convex, immaculate or with a few (usually two or four) red dots near the base; more rarely with a single large red spot. Cylindrical spur, more or less straight, about as long as the ovary, carried more or less horizontally. Triploid plant (2n = 60: SCRUGLI 1977; D'EMERICO et al. 1992; BERNARDOS & AMICH 2002; BERNARDOS et al. 2002).

Special features and forms

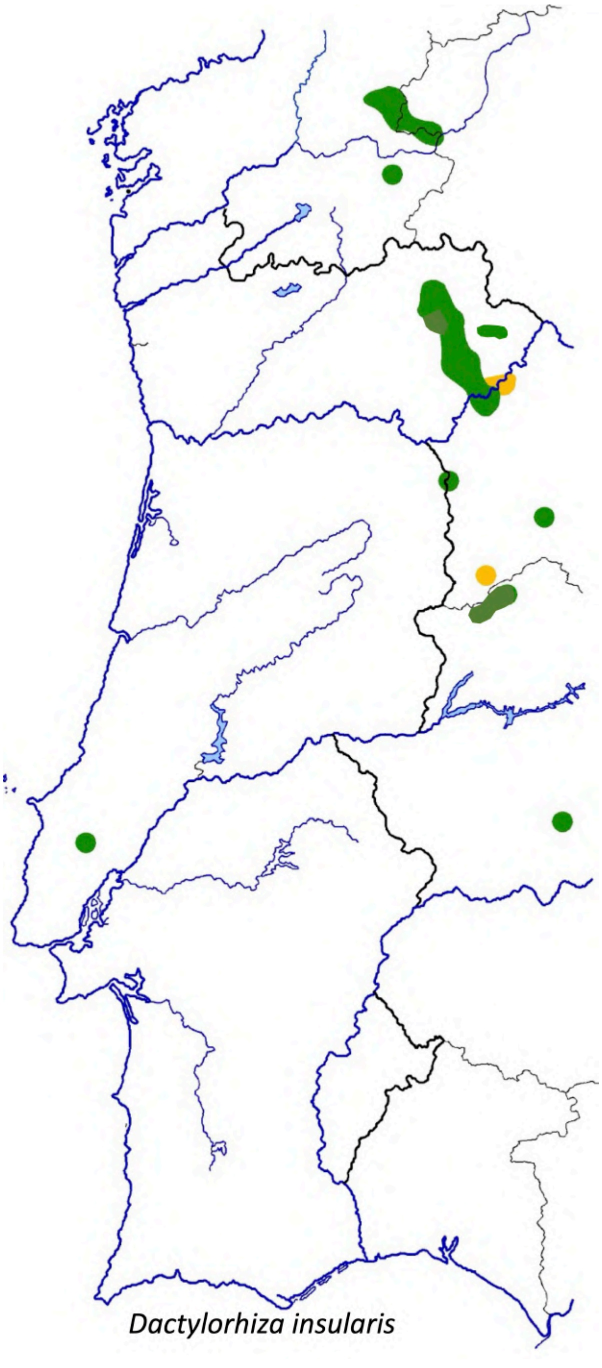
Plant varies little; individuals within the same population are often very similar to each other and variations are mainly observed from population to population. This is due to a mode of reproduction by self-pollination, through apomixis: having reached a genetic dead end (triploid plant, resulting from an asymmetric cross between two diploid species), in most cases the species can no longer resort to cross-fertilisation, but its seeds can germinate without fertilisation (BULLINI et al. 2001). More recent research shows that triploid plants can in fact occasionally resort to sexual reproduction (HÖRANDL et al. 2024).

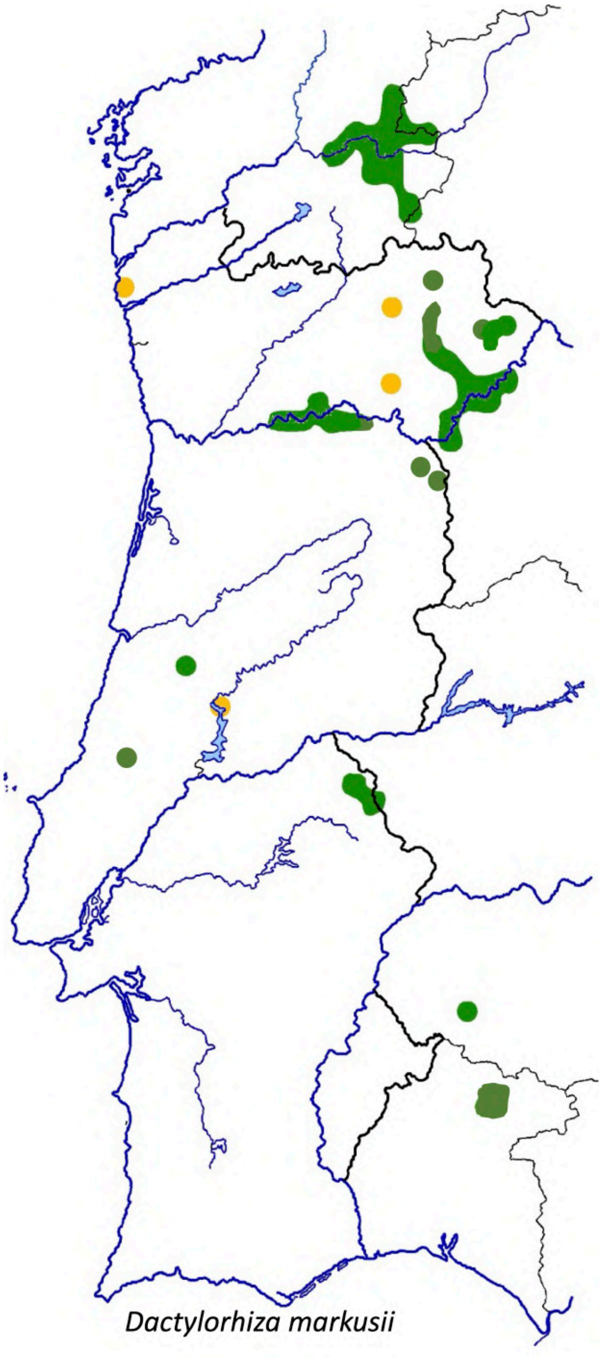
Biotope and ecology

D. insularis is generally found in open woods (oak and chestnut forests) and poor grasslands at medium to high altitudes. It flowers in April–May.



Figs. 4.91-92. *Dactylorhiza insularis*, Albufeira do Azibo, Trás-os-Montes, 9 May 2024.





Distribution

Western Mediterranean basin: extreme south-west of France, Corsica, Sardinia, very rare in mainland Italy, Spain and Portugal. Within the territory under consideration, it is found in northern and central Portugal, Galicia, León and Extremadura. Its discovery in Portugal is recent (TYTECA 1989; BERNARDOS et al. 2002) and it is extremely rare there, except for parts of Trás-os-Montes.

Situation in the study area

While the Spanish and northern Portuguese stations do not pose many problems given the relative stability of the habitats, the maintenance of the only station in central Portugal (Serra de Montejunto), which is very isolated, is quite critical and precarious, mainly due to the development of tourist and recreational activities (TYTECA 2001) and the local overpopulation of wild boar.

↑ **Fig. 4.93**. *Dactylorhiza insularis*, Alto do Couto, Serra do Courel, Galicia, 1st May 2024.

↓ **Fig. 4.94**. *Dactylorhiza markusii*, São Bento, Parque Natural das Serras de Aire & Candeeiros, Estremadura, 16 April 2022.

Dactylorhiza markusii (Tineo) H. Baumann & Künkele Markus' orchid

Orquídea sulfurosa (port.), Paxariño marelo (gal.)

Description

A stocky to slender plant with 5 to 8 linear to lanceolate leaves distributed along the stem, gradually decreasing in size towards the top of the plant. Dense, short cylindrical inflorescence composed of 15 to 25 flowers of a characteristic straw yellow colour. Trilobed labellum, without macule, with the median lobe longer than the lateral lobes, which are folded back. Ascending spur, approximately equal in length to the ovary. Chromosome number 2n = 40.

Characteristics and forms

A species with little variation, the variability being mainly in the robustness of the plants.

Biotope and ecology

A plant typically found in light woods where the soil is not too acidic: oak, chestnut and pine forests, and even arbutus (*Arbutus unedo*) woods; in the north-east of the territory, it is also found in poor grasslands. Found in plains and hills; flowers from April to May.

Distribution

Western Mediterranean basin: Spain, Portugal, Balearic Islands, Sardinia, Sicily, North Africa. In our territory, it is found in all Spanish regions; in Portugal, in the north (especially the Douro Valley) and Alto-Alentejo; rare in the Centre (see map on page 133).

Situation in the studied territory

Fairly rare and localised. Its survival is linked to that of its biotopes: the abandonment of chestnut groves and grazing in poor grasslands may threaten some of its populations.

Figs. 4.95. *Dactylorhiza markusii*, Silva, Trás-os-Montes, 27 April 2019.

Dactylorhiza incarnata (L.) Soó **Early marsh orchid**

Satirião bastardo (port.)

Description

A slender plant with a thick, compressible stem, bearing 5 to 8 lanceolate leaves, unspotted or rarely spotted, typically erect and almost parallel to the stem, with their tips extending beyond the base of the inflorescence. Dense, cylindrical inflorescence composed of 20 to 50 very small flowers (labellum width less than 9 mm), flesh-pink to lilac, with bracts frequently emerging and curving inwards. Labellum crossed by a double loop-shaped line and purplish dashes, indistinctly trilobed, with the lateral lobes slightly folded back. Spur thick, conical, more or less equal in length to the ovary, curved downwards. Chromosome number 2n = 40.

Special features and forms

In the area studied, the leaves are generally rather spread out and quite broad, the flowers are dark lilac and the lobes of the labellum are slightly bent backwards, making the plants almost resemble *D. cruenta*, a species found in the mountains of central and northern Europe.

Habitat and ecology

Wet meadows, alkaline marshes, always in areas with waterlogged soil. In the territory, it is more common in high-altitude regions, between 1200 and 1500 m. It flowers from late May to early June.

Distribution

Throughout Europe and part of Asia Minor; rare in the Mediterranean region. In Spain, it reaches the Sierra de Cuenca in the south and the western limit of its range in the Montes de León; absent from Portugal and Galicia.

Situation in the study area

Very rare in our territory (limited to the Montes de León). Throughout its range, including our region, *D. incarnata* is threatened by damage to its biotopes (drying out, drainage of wetlands).


4.96


4.97


4.98

Figs. 4.96-4.98 (this page and the previous one). *Dactylorhiza incarnata*.
Puerto de Somiedo, around 1,400 m, Province of León, on the border with Asturias, 6 July 2009.

Dactylorhiza caramulensis
Lamas de Olo, Serra de Alvão,
2 June 2021

Dactylorhiza ericetorum (E.F. Linton) Averyanov — Heath spotted orchid

Dactylorhiza caramulensis (Vermeulen) D. Tyteca — Caramulo spotted orchid

Satirião macho (port.), Dedos citrinos, palmacresta (cast.), satirión apincarado (gal.)

Description

Slender to robust plants with thin, solid (non-compressible) stems, bearing 6 to 10 spreading, linear, lanceolate to oblong leaves, almost always densely spotted on the upper surface, with small, numerous bracteiform upper leaves (between 1 and 6). Dense, compact inflorescence, conical to cylindrical in appearance at the end of flowering, composed of 20 to 60 (-80) flowers, generally pale pink or almost white to light lilac, with a more or less flat labellum, covered with more or less marked purple dashes and lines, more or less deeply trilobed. Cylindrical spur, curved downwards, shorter to as long, or even slightly longer than the ovary. Tetraploid species (2n = 80). In addition to these common characteristics, the two species can be distinguished according to the criteria in Table 4.5. In general, *D. ericetorum* is smaller than *D. caramulensis* in all its parts.

Table 4.5. – Comparative characteristics of *Dactylorhiza ericetorum* and *D. caramulensis*

Character	***D. ericetorum***	***D. caramulensis***
Width of the widest leaf	1 – 1,75 cm	1,8 – 3 cm
Labellum width	9 – 12,5 mm	11,6 – 15,6 mm
Stem thickness under inflorescence	1,8 – 3 mm	2,7 – 4,5 mm
Thickness of the spur at the entrance	1 – 1,7 mm	2 – 2,7 mm
Spur length	7,7 – 11,2 mm	10,8 – 14,5 mm
Biotope	Peat bogs, heathland, acidic marshy grasslands, woods on acidic soils	Semi-natural wet grasslands, open woods (chestnut groves)

Special features and forms

The two species discussed here are often considered to be subspecies, varieties or even simple forms of the species widely distributed in Europe, *D. maculata* (see, for example, STÅLBERG & HEDRÉN 2010). We have argued for maintaining separate species, based primarily on morphometric criteria, but also on biogeographical and ecological criteria (TYTECA & GATHOYE 2004). While *D. ericetorum* is consistent with populations found across a large area covering western Europe, *D. caramulensis* has a more distinctive appearance, being a slender and often tall and robust plant, which has led to the hypothesis of introgression of *D. maculata* s.l. by *D. elata* (VERMEULEN 1970; TYTECA & CAPERTA 1999). Its remarkable vigour led R. BATEMAN (2021) to suggest '... that *caramulensis* [and *maurusia*] are probably the named taxa that are most morphologically similar to *foliosa*', the latter (*foliosa*) being the extraordinary *Dactylorhiza* endemic to Madeira. Nothing less!

Biotope and ecology

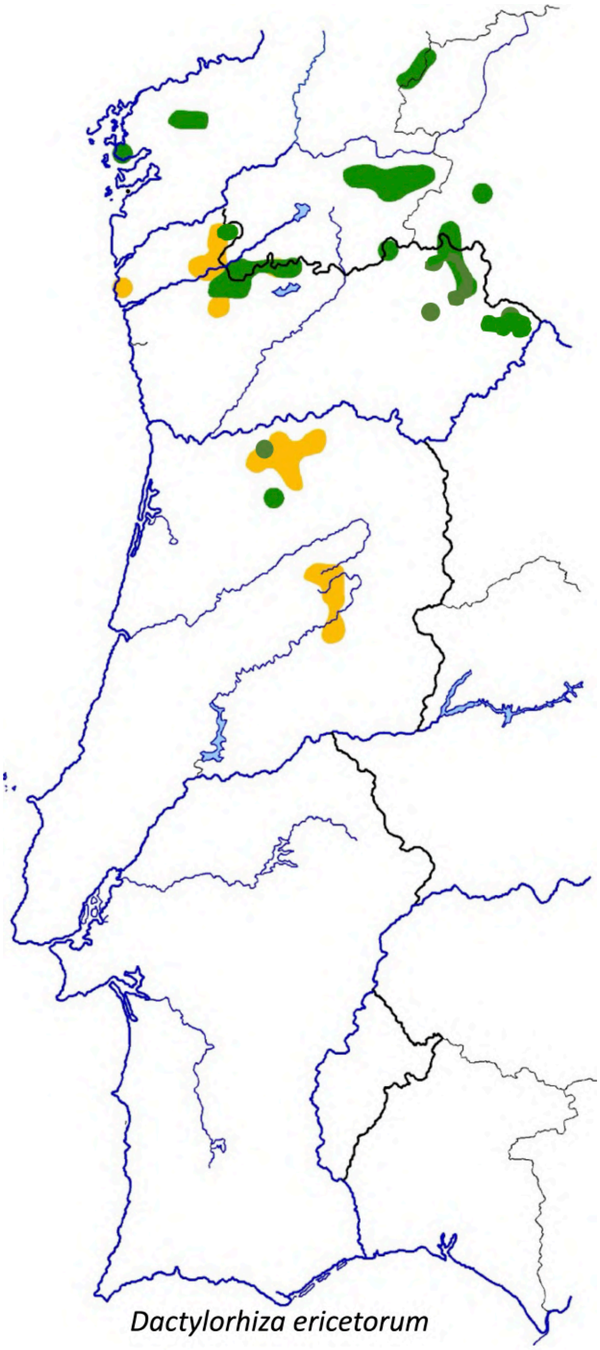
The habitats of the two species are shown in the table above. Broadly speaking, *D. ericetorum* can be considered more acidophilic and hygrophilous than *D. caramulensis*. Both grow at altitudes between 500 and 1600 m, more rarely at lower altitudes. *D. caramulensis* is the orchid that reaches the highest altitudes in Portugal (in the Serra da Estrela). Flowering takes place from the end of May to the end of July, depending on the region and habitat.

Distribution

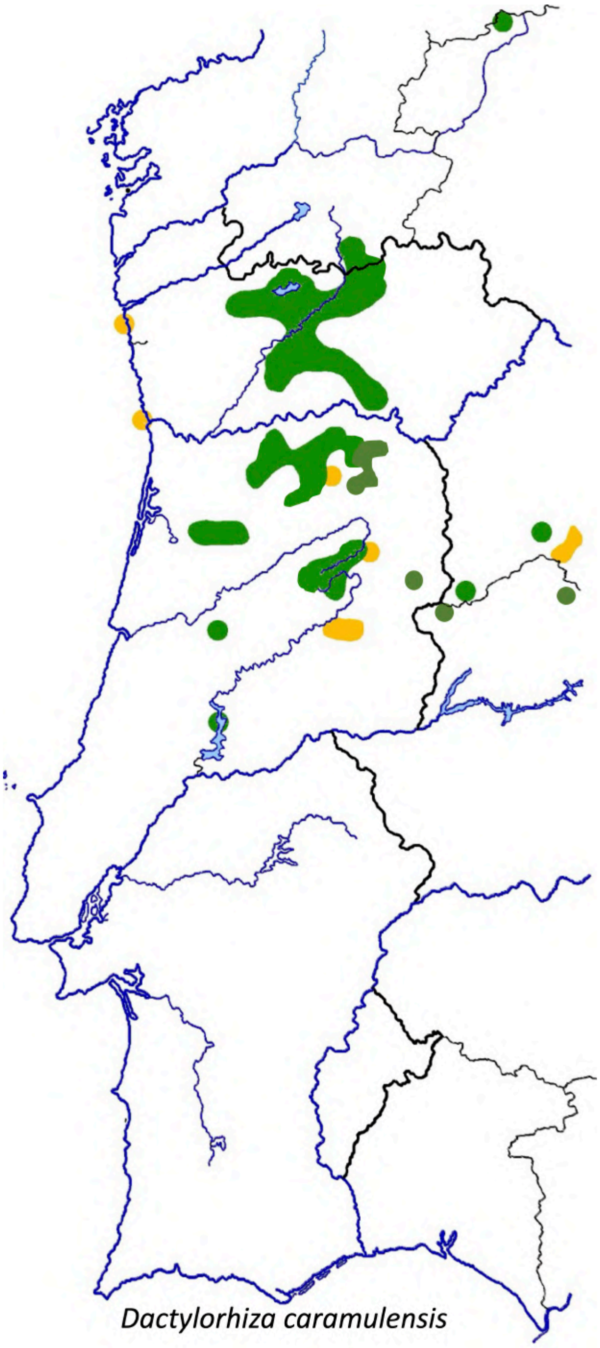
D. ericetorum is widespread throughout much of Western Europe and has a distribution typical of a species with Atlantic affinities, from northern Scotland to northern Portugal, passing through France and Spain. *D. caramulensis* has a more restricted range, covering Portugal (from the centre to the north) and much of Spain, but its range is currently poorly known and may extend to south-western France.

Situation in the study area

Still relatively widespread locally, both species are threatened by damage to their respective habitats: drainage and drying up of wetlands, abandonment of extensive grazing practices, scrub encroachment on chestnut groves, etc.



Dactylorhiza ericetorum



Dactylorhiza caramulensis

4.99

4.101

4.100

4.102

Figs. 4.99-4.100. *Dactylorhiza ericetorum*. Fig. 4.99: Serra dos Ancares, Galicia, 4 July 2009 (photo J.-L. GATHOYE). Fig. 4.100: Serra da Peneda, Minho, 4 July 2018.

Figs. 4.101-4.102. *Dactylorhiza caramulensis*. Fig. 4.101: Serra da Estrela, Beira Alta, 13 July 2018. Fig. 4.102: Lamas de Olo, Trás-os-Montes, 2 June 2021.

Fig. 4.103. *Dactylorhiza ericetorum*, Serra dos Ancares, Galicia, 4 July 2009.

Fig. 4.104. *Dactylorhiza caramulensis*, Serra da Estrela, Beira Alta, 13 July 2018.

A curious *Dactylorhiza* from the Serra de São Mamede (Alto Alentejo)

In 2021, two of us (AOSP: João FARMINHÃO and Ivo RODRIGUES) encountered an unusual plant, whose presence had been revealed to them by a ranger from the Serra de São Mamede Natural Park (Carlos FRANCO) in the Upper Alentejo. They quickly made the connection with *Dactylorhiza irenica*, a recently described taxon from the eastern Spanish province of Cáceres, on the border with Portugal, part of the Extremadura region (VÁZQUEZ 2008). Indeed, it was impossible not to find similarities with the plant as described and illustrated by its author (VÁZQUEZ 2008), not only in terms of morphology (slender plant with a thin stem and narrow leaves, fairly dark purple flowers), but also in terms of ecology (acidic peat bogs, with *Erica tetralix*, among others). The habitat was reminiscent of that of *D. ericetorum*. This identification was confirmed by VÁZQUEZ (TYTECA et al. 2026).

However, unfortunately, VÁZQUEZ (2008) linked his plant to the *D. traunsteineri* group and in particular to *D. lapponica*, which resulted in the new taxon being incorrectly classified as a subspecies of *D. traunsteineri* (KREUTZ 2011) or as a synonym of *D. majalis* subsp. *lapponica* by the Kew authorities (https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:77089449-1). We agree with BENITO (2017) and DELFORGE (2016) that the *D. traunsteineri* group is absent from the Iberian Peninsula, and we consider *D. irenica* to be part of the *D. maculata* group, due to its morphological characteristics (slender plant; thin, non-compressible stem; narrow leaves; small, bracteiform upper leaves, in significant numbers (between 1 and 4); thin, elongated, rather conical inflorescence; thin cylindrical spur, ± 2 mm in diameter at the base; etc.). The plant could appear to be a miniature, slender variant of *D. caramulensis* and, as such, could be compared to *D. ericetorum*, with which it shares its habitat, but two striking characteristics distinguish it from this species, namely its immaculate leaves and rather dark, purple flowers.

The plant was observed again in the same location in the Serra de São Mamede in 2023 (Carlos Franco), 2024 (Rui Cambraia) and finally in 2025 by ourselves (Daniel Tyteca, José Monteiro, Joaquim Pessoa and João Farminhão). We have not yet included it in this book as a distinct species in its own right, as we still need to carry out further observations, particularly morphometric ones, to confirm its identity with the taxon described by Vázquez and its distinction from *D. caramulensis* and *D. ericetorum*. In any case, it appears to be the southernmost representative of the *D. maculata* group in Portugal.

Fig. 4.105-4.107. *Dactylorhiza* cf. *irenica* from the Serra de São Mamede, Alto Alentejo, 4–7 June 2025.

Fig. 4.108. Meadow with *Dactylorhiza elata*. Paçó, Vinhais, Trás-os-Montes, 5 June 2021.

Dactylorhiza elata (Poir.) Soó **Robust marsh orchid**

Satirião bastardo (port.), satirión corpudo (gal.)

Description

A very slender to robust, tall plant (up to 1 m high) with a thick, hollow, compressible stem, bearing 5 to 10 oval-lanceolate to linear-lanceolate leaves, generally unspotted, staggered and decreasing in size along the stem. Very elongated inflorescence, up to 50 cm, fairly loose, bearing 15 to 80 flowers. Large, pink to purplish-red flowers with a 12 to 16 mm wide, three-lobed labellum, the median lobe longer than the lateral lobes, which are more or less folded back. Labellum lighter in the centre, with purplish lines and dashes. Spur thick, cylindrical and about as long as the ovary, curved downwards. Tetraploid plant (2n = 80).

Special features and forms

This species forms often spectacular stands of tall, slender, brightly coloured plants, making them visible from afar.

Biotope and ecology

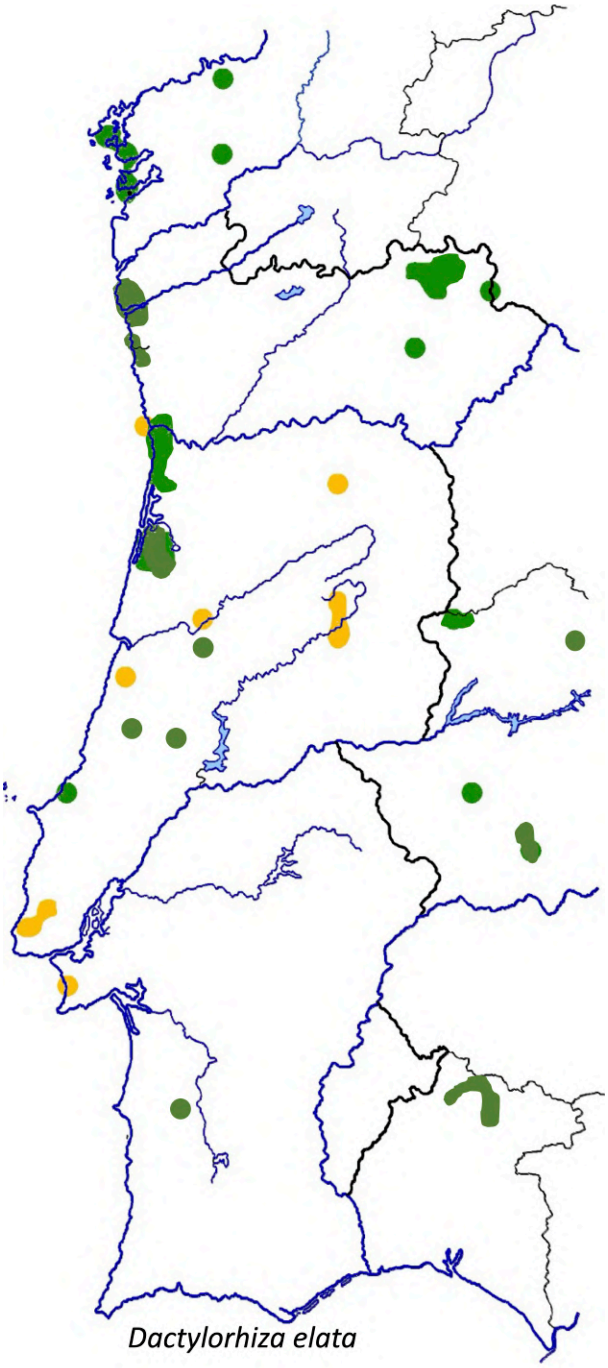
Wet meadows, alkaline marshes, reed beds, slope seepages, always in sunny locations, generally at low or medium altitudes (below 1,000 metres in the study area). Flowers in May–June.

Distribution

South-western Europe (South-western France, Corsica, Sardinia, Spain, Portugal), North Africa. Present in northern and central Portugal, Galicia, Castilla and León, Extremadura.

Situation in the study area

Quite rare and scattered throughout the territory covered; threatened by the drying up of marshes, particularly in lowland areas. In Portugal, the plant currently appears to be confined to various locations in Trás-os-Montes, in the coastal regions between Vagos and Viana do Castelo, and in a few rare locations in the Centre and Alentejo regions.



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Figs. 4.109-4.113. *Dactylorhiza elata* : all photos (including on previous page) were taken in Paçó, Vinhais, Trás-os-Montes, 5 June 2021..

Dactylorhiza hybrids

The genus *Dactylorhiza* is well known for its numerous hybrids and for its genetic fluidity, which can lead to the emergence of new species through hybridisation and allopolyploidy (AVERYANOV 1990; DEVOS et al. 2006; ECCARIUS 2016; BRANDRUD et al. 2020, etc.). Various regions of Europe are particularly prolific in this regard, including Western Europe (AVERYANOV 1990). Portugal and neighbouring territories are somewhat outside this important centre of speciation, although such processes may occur there, the most notable example being that which led to the formation of *Dactylorhiza cantabrica* (see our text and PARDO OTERO et al. 2024).

Most of the *Dactylorhiza* populations in the region are monospecific, but in the few rare cases where two *Dactylorhiza* species, or a *Dactylorhiza* species and a representative of a genetically compatible genus, are found together, hybrids also occur here. We give three examples, which are most likely to be the only possible situations in our study area: the encounter between *D. ericetorum* and *D. elata* in the Serra de Nogueira (near Bragança, Portugal), that of *D. ericetorum* with *Gymnadenia* cf. *borealis* in the Peneda-Gerês National Park (Portugal) and, in nearby Spain, that of *D. incarnata* with the same *G.* cf. *borealis* near Puerto de Somiedo.

4.114

Fig. 4.114. – *Dactylorhiza incarnata* x *Gymnadenia* cf. *borealis*, ↑ La Cueta, Castilla y León, 24 juillet 2013 (photo J. MONTEIRO).

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Figures 4.115-4.117. – *Dactylorhiza* hybrids observed in Portugal: 4.115-116, *D. elata* x *D. ericetorum*, Serra de Nogueira, Trás-os-Montes, 9 July 2009 (4.115, photo J.-L. GATHOYE); 4.117, *D. ericetorum* x *Gymnadenia* cf. *borealis*, Serra do Gerês, Terras de Bouro, Minho, 6 July 2013 (photo J. PESSOA).


Androrchis mascula
Serra dos Candeeiros,
9 March 2011

4.12. Androrchis

In 2008, a proposal was made to split the genus *Orchis* as it had been used until then, based on two important facts: in addition to significant morphological differences, no cases of hybridisation between a member of the newly described genus, *Androrchis*, and a member of the residual *Orchis* genus had ever been observed in nature (TYTECA & KLEIN 2008, 2009; TYTECA et al. 2012, 2014), whereas numerous hybridisations were known to occur between representatives of genera unanimously considered to be very different, for example *Anacamptis* (in the broad sense) and *Serapias*. This genetic distance between *Orchis* in the strict sense and *Androrchis* was subsequently confirmed, for example by the phylogenetic work of JACQUEMYN et al. (2011), INDA et al. (2012), JIN et al. (2017) and CALEVO et al. (2025), as well as by the synthesis of previous approaches by KRETZSCHMAR et al. (2007).

Nevertheless, the distinction between *Androrchis* and *Orchis* is not yet accepted in the systematics advocated by the prestigious Kew institution, as published in the work by KÜHN et al. (2019) or on the various websites associated with it, despite the fact that some of the major works specialising in the orchids of Europe and the Mediterranean basin are beginning to disseminate this distinction (e.g. DELFORGE 2021; KREUTZ 2024; DELANNOY et al. 2026). We therefore had no choice but to follow this separation in the present work. The same does not apply to the genera *Anacamptis* and *Neotinea*, for which we still conform to the Kew system.

Table 4.6 lists the essential (floral) characteristics that clearly distinguish the two genera *Androrchis* and *Orchis*, which are also illustrated in Figure 4.118.

Table 4.6. – Comparative characteristics of the genera *Androrchis* and *Orchis*.

Character \ Genus	***Androrchis***	***Orchis***
Inflorescence	More or less loose	More or less dense
Bract	Quasi-leafy; length = +/- that of the ovary	Hyaline; significantly shorter than the ovary
Petals	Oval to oblong	Linear to lanceolate
Lateral sepals	Spread out to upright	Form a helmet with the dorsal sepal and petals
Lip	Trilobed; 3 sub-equal lobes; central lobe sometimes bifid	Quadrilobed; often an appendage between the 2 central lobes; lateral lobes linear
Spur	Thick; generally long, curved upwards	Thin, shorter than the ovary, curved downwards, or non-existent

Plants of the genus *Androrchis* are generally quite slender. Their rather loose inflorescences of mostly purple flowers, rarely pink or white (yellow in *A. provincialis* and *A. pallens*, both very rare), carried proudly, lend a certain elegance to the biotope they brighten with their presence. The leaves, at least the lower ones at ground level, are often spotted with brown marks of various shapes and arrangements; however, there are also individuals without spots (and these are the norm in *A. olbiensis* and *A. pallens*). Apart from these basal leaves, a few smaller leaves are inserted higher up on the stem, which they envelop (sheathing leaves). The stem is often tinged with purple at the inflorescence (not in species with yellow flowers). In the flower, the different floral parts are arranged as shown in Table 4.6 and illustrated in Figures 4.118 and 4.119. It should be noted that the latter figure (4.119) includes all the species of *Androrchis* present in Portugal.

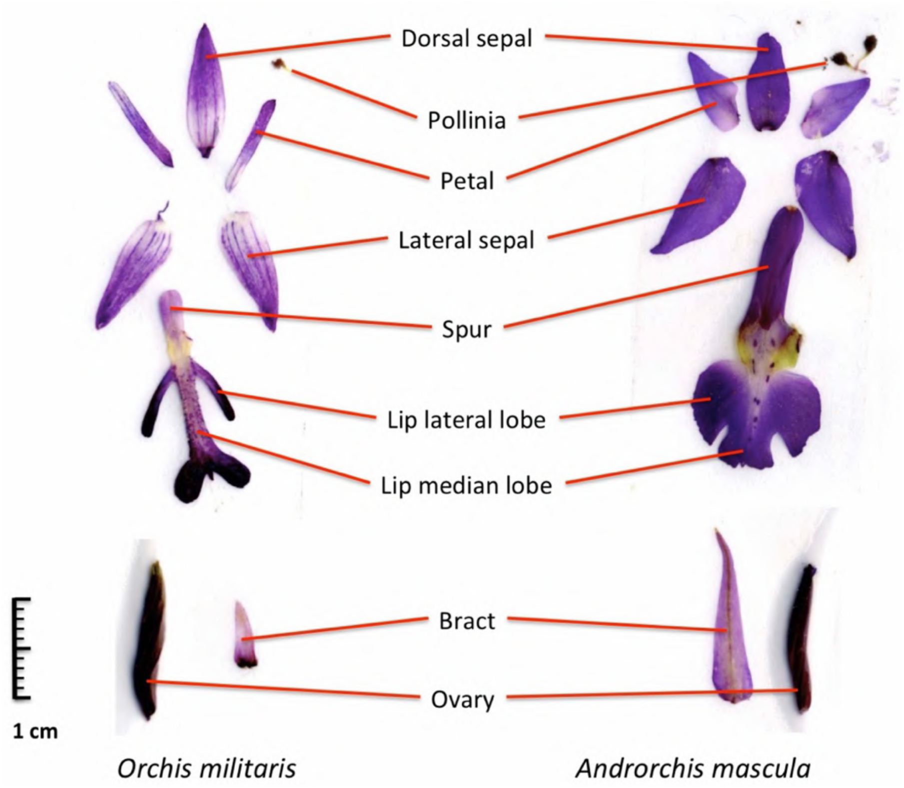


Fig. 4.118. – Comparative floral analyses of an *Orchis* (*O. militaris*, left) and an *Androrchis* (*A. mascula*, right).

Fig. 4.119. – Floral analyses of several species of *Androrchis* (from top to bottom and left to right: top, *A. langei*, *A. mascula*; bottom, *A. olbiensis*, *A. provincialis*).

There are thus four species of *Androrchis* in Portugal (*A. mascula*, *A. olbiensis*, *A. langei* and *A. provincialis*). In the area studied, there are two additional species on the Spanish side: *A. tenera*, which reaches the border, and *A. pallens*, which is very rare and whose presence in the León Mountains has yet to be confirmed.

Androrchis mascula (L.) D. Tyteca & E. Klein Early Purple Orchid

Satirião macho, salepeira-maior (port.), Cañamón, Chupaeros, Orquídea silvestre, Sangre de Cristo, Satirión macho (cast.), Satirión morado (gal.)

Description
A plant 15 to 60 cm tall, with four to eight large oblong to linear basal leaves, characterised by their shiny appearance, and two to three cauline leaves sheathing the stem. In nearly half of the individuals, the leaves have more or less rounded brownish spots, varying in diameter up to 0.5 cm, arranged fairly irregularly. Inflorescence loose to densely packed (15 to 50 flowers). Flowers purplish, rarely pink or white. Trilobed labellum with dentate lobes, the median lobe often bifid, with a white centre dotted with small purple spots, and a characteristic spur, pointing upwards, about as long as the labellum. Lateral sepals pointing almost vertically; petals and dorsal sepal joined in a protective helmet covering the gynostemium.

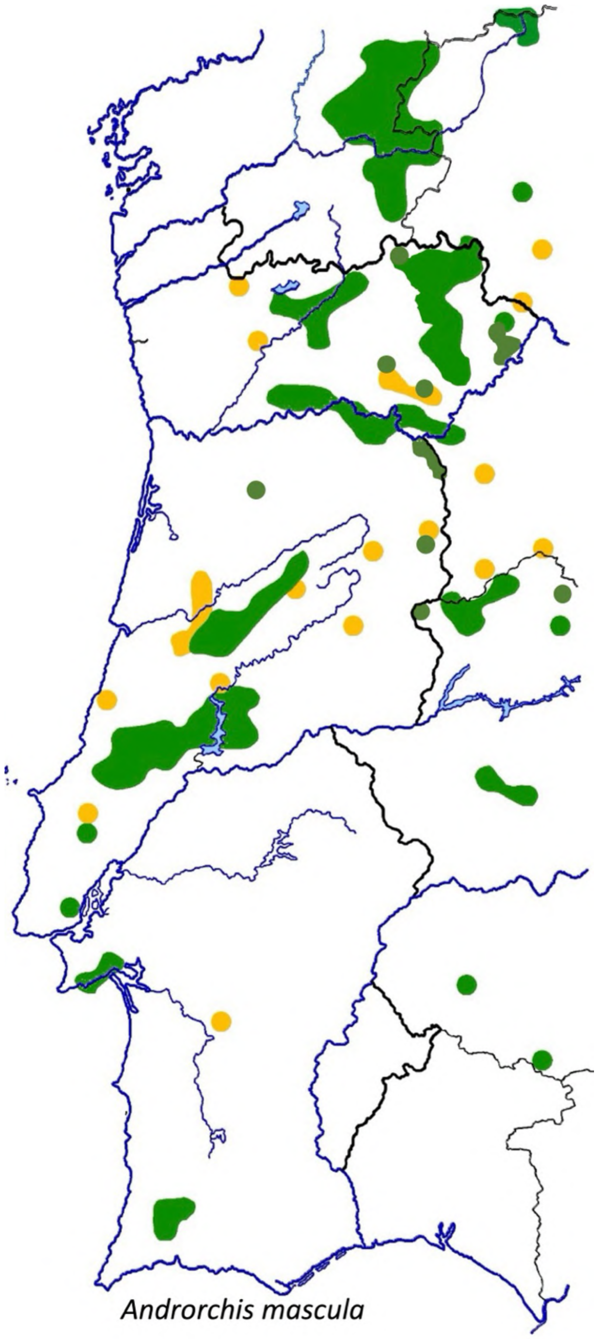
Special features and forms
In Portugal and neighbouring regions, the early purple orchid has many variants, some of which have been classified as forms, varieties, or even subspecies and, in some cases, species, including those described in the following pages. Some of the forms and varieties are illustrated here. In general, such variations can be influenced by the environment in which the plant lives, as it is quite eclectic in terms of its habitat. For example, in limestone scrublands characterised by extreme dryness, the plants will be more stocky and produce fewer flowers.

Biotope and ecology
The habitat is very varied: from garrigue and calcareous grasslands, even crystalline soil, cool to wet meadows, to oak woods, pine forests, road embankments, roadsides, etc., in the plains or at altitude. The species often forms dense colonies in these different habitats. It often flowers very early, in March-April, until June, depending on the habitat and altitude.

Distribution
The distribution map shows that the early purple orchid is widespread throughout much of the territory of the domain, and shows a certain indifference to soil type.

It is the most widespread species of *Androrchis* in the territory, as it is throughout its range, which covers much of Western Europe, becoming rarer in the east, as well as in the Near East and North Africa. At the edges of its range, it is gradually replaced by various species or subspecies (e.g. *A. pinetorum* in Turkey, Greece, including the Aegean islands, and the Balkans).

Situation in the study area
Due to its ubiquity and eclecticism, the early purple orchid does not currently appear to be threatened.



Figs. 4.120 to **4.129** (this page and the next): *Androrchis mascula*.

4.120: Ave-et-Auffe, Belgium, 3 May 2020.
4.121: Ansião, Beira Litoral, 29 March 2008.
4.122: Vinhas, Trás-os-Montes, 10 May 2009.
4.123-124: S. Candeeiros, Estremadura, 9.03.2011.
4.125 (f. *longicalcarata*): Castro Roupal, Trás-os-Montes, 30 April 2019.
4.126-127: Vega de Viejos, León, 3 May 2024.
4.128: Vinhas, Trás-os-Montes, 10 May 2009.
4.129: Vinhais, Trás-os-Montes, 28 April 2019.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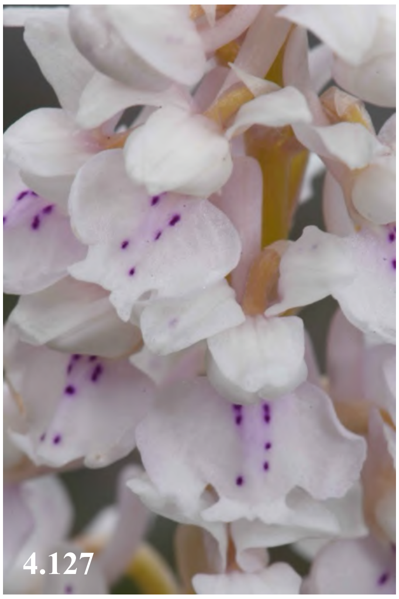
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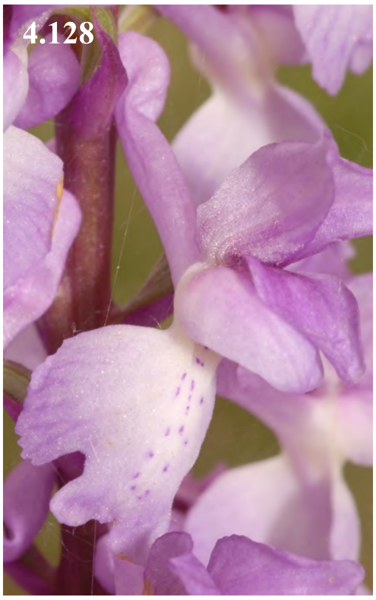
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4.129

***Androrchis tenera* (Landwehr) D. Tyteca & E. Klein**

Slender Early Purple Orchid

Having noted the enormous variability of individuals and populations within a single species, we will now review some of the forms that have justified their classification as separate species. In fact, almost all of the forms illustrated on the previous page would have deserved to be elevated to this rank! We consider the following three species, from the closest to *A. mascula* to the most distant: indeed, the last on the list (*A. langei*) has acquired sufficient originality to be firmly granted this status.

Since we are, at least for the first two species, very close to *A. mascula*, rather than proceeding with the usual detailed descriptions, we give the distinctive criteria in the form of the table below (Table 4.7).

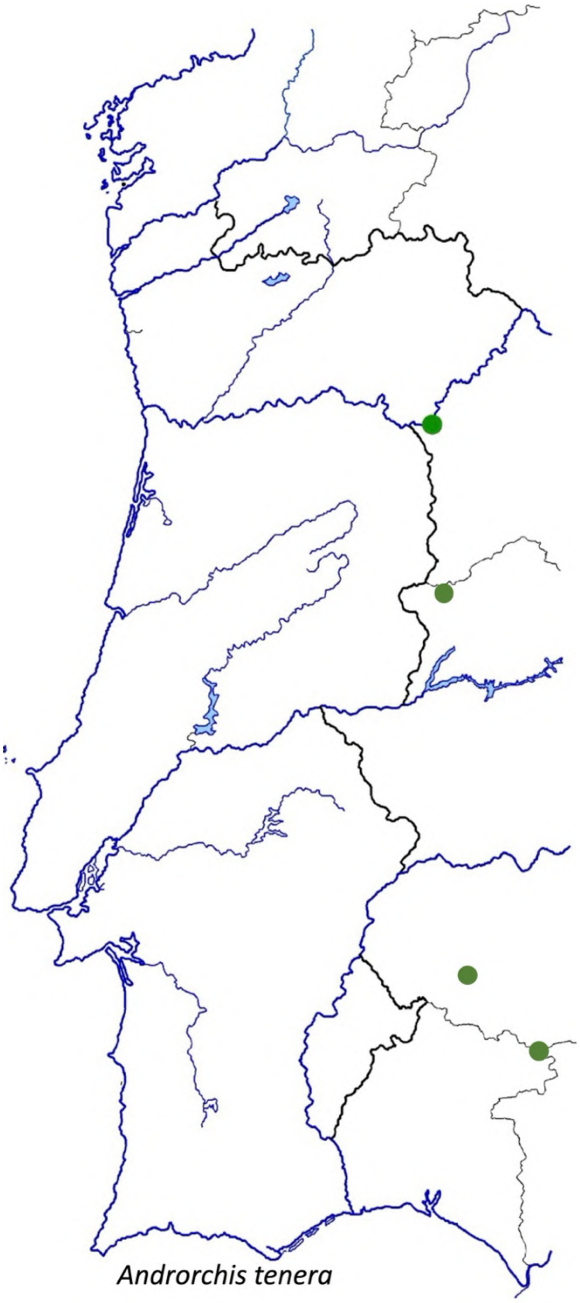
Table 4.7. – Comparative characteristics of four taxa from the *Androrchis mascula* group.

Character \ Species	***A. mascula***	***A. tenera***	***A. olbiensis***	***A. langei***
Spotted leaves	Yes (50 %)	Yes (50 %)	**No** (Portugal)	Yes (50 %)
Flowering	Early	Late	Early	**Very late**
Habit	Slender	Gracile	Gracile	Very slender
Longitudinal concavity of the lip	Slightly convex	**± Concave longitudinally**	Convex	**Strongly convex - kneeling**
Punctuation of the labellum	Highly variable	Fine and grouped to the base	**Dense and strongly marked**	Fine and grouped to the base
Size of labellum	7-14 mm x 8-17 mm	**Length 5-8 mm**	8-13 mm x 9-17 mm	8-13 mm x 9-18 mm
Lateral lobes of labellum	Flat with edges folded back	+/- flat with edges folded back	Broad and +/- spread out	Folded back
Spur	+/- straight	**Curved upwards; very short**	Curved upwards to +/- straight	Curved upwards
Spur length	11-21 mm	**7-8,5 mm**	14-19 mm	9-16 mm

Description
As can be seen in the table, *A. tenera* has a few characteristics that make it very easy to distinguish from other species in the group. The main features are (1) the flat or concave labellum, which is more or less curved upwards longitudinally (see photo), and (2) the very small labellum and spur, whose lengths fall outside the respective ranges given for the other species. The upward-curving spur is also observed in the last two species; this characteristic is therefore only discriminating in relation to *A. mascula*.

Biotope and ecology
Where the plant is found in its range in central Spain, it tends to grow in open pine woods, on the edges or in the surrounding meadows, on dry, slightly acidic calcareous soils at relatively high altitudes (between 500 and 1500 m).

Distribution
Reference works tend to indicate central or eastern Spain (Landwehr 1977; Delforge 2016; Benito Ayuso 2017; Griebl & Presser 2021; Kreutz 2024). The reason for including it in this work comes from a mention by Sonia Bernardos (2003), 'Salamanca, Saucelle, Salto de Saucelle, 155 m, 29TPF8244, *Amich & Bernardos*, 13.3.2000, SALA 105781'. This is located in Spanish territory, but very close to the Portuguese border. Three other points are located in Extremadura, not far from the border (Vázquez 2009). It is therefore possible that certain Portuguese specimens could also be linked to this species.

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4.132

Figs. 4.130 to 4.132: *Androrchis tenera*, Sierra de Segura, Andalusia, 22 May 2016.

Androrchis olbiensis (Reut. ex Gren.) D. Tyteca & E. Klein — Hyères Early Purple Orchid

Description and distribution

As can be seen in Table 4.7, the characteristics that distinguish the Hyères orchid from the male orchid are essentially qualitative. The plant is more slender, the labellum appears wider because the lateral lobes are wider and more spread out, and the punctuation of the labellum is more spread out and denser; and finally, the spur is often curved upwards. Overall, the Hyères orchid has a more elegant appearance than the early purple orchid. Figure 4.119 above gives a good idea of the differences in the labellum and the flower.

These differences are more subtle than objective, but there is at least one population where the distinction is clear: that of Rocha da Pena in the Algarve. The early purple orchid is completely absent there, and all the plants have the characteristics listed in Table 4.7 for *A. olbiensis*. Elsewhere in Portugal, the situation is more delicate; thus, in Estremadura and Beira Litoral, and even elsewhere, mention is sometimes made of *Androrchis olbiensis* (BAUMANN & KÜNKELE 1982: two-thirds of the south of the country! BENITO AYUSO 2017: Trás-os-Montes; GRIEBL & PRESSER 2021). For our part, I admit that we sometimes hesitate when faced with plants from certain populations in Estremadura or Beira Litoral, but there are always typical representatives of *A. mascula*, so that we could speak, at best, of 'transitional populations'.

Outside its Portuguese range, *Androrchis olbiensis* is rare to locally widespread in the Mediterranean parts of Spain, France, the Balearic Islands, Corsica, North Africa and a tiny part of Italy (Liguria).

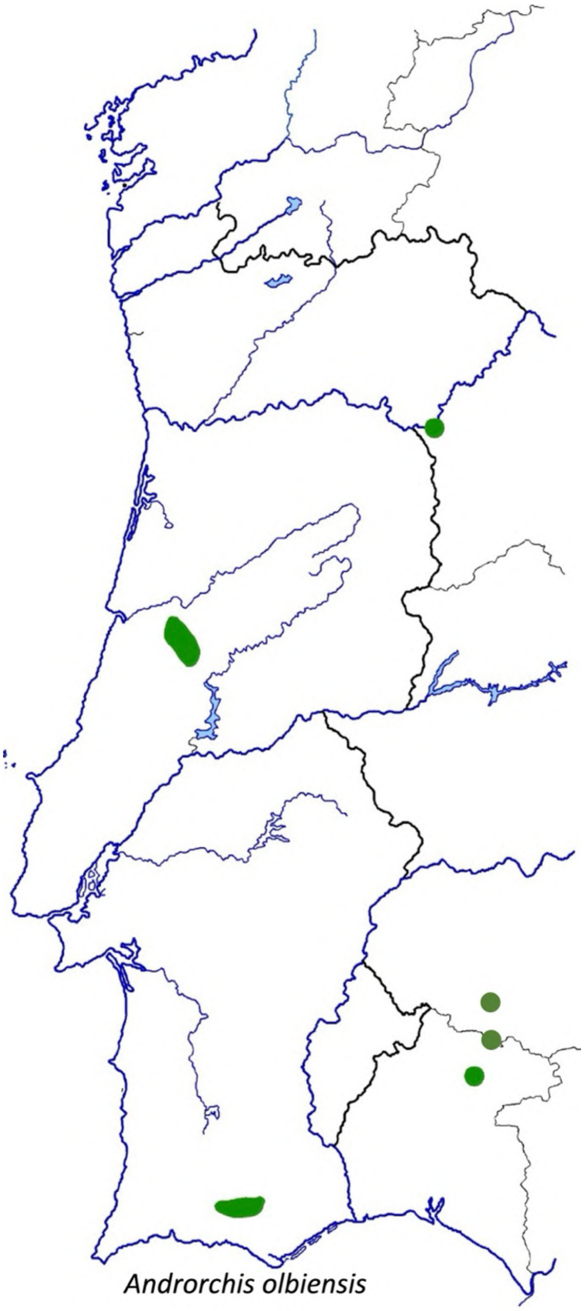
Biotope and ecology

Throughout its range, the Hyères orchid is a typical plant of the Mediterranean scrubland at all stages, from short, rocky grassland to scrubland and open forest edges.

Situation in the study area

If its distribution is indeed limited to Rocha da Pena in the Algarve, then it can be said that the days of *Androrchis olbiensis* in Portugal are numbered, due to the abandonment of grazing and overpopulation of wild boar.

Fig. 4.133. – Habitat of *A. olbiensis* (visible in the foreground, on the right) in the scrubland of Rocha da Pena, Algarve, 18 March 2008.



Figs. 4.134 to **4.136**. *Androrchis olbiensis*, Rocha da Pena, Algarve, 5 April 2022 (4.134 and 135), 1 March 2018 (4.136, left).

Androrchis langei (K. Richter) D. Tyteca & E. Klein

Lange's Early Purple Orchid

Salepeira de Lange (port.)

Description

Slender, delicate silhouette. Plant 20 to 50 cm tall, with four to eight large lanceolate basal leaves and two to three cauline leaves sheathing the stem. In nearly half of the individuals, the leaves have brownish spots of varying diameters, arranged fairly irregularly. Loose to densely packed inflorescence (10 to 50 flowers). Purplish flowers, rarely pink or white. Trilobed labellum with dentate lobes, the median lobe often bifid, with a white centre dotted with small purple spots, typically with a distinctly kneeled profile and a spur that is more or less curved upwards, about as long as the labellum. Lateral sepals erect laterally, typically facing the observer; petals and dorsal sepal joined in a protective helmet of the gynostemium.

Biotope and ecology

Preferably forest habitat (pine or oak forests), dry to cool, on siliceous or calcareous substrate, more rarely on the edge or in full sunlight; rarely in scrubland.

Distribution

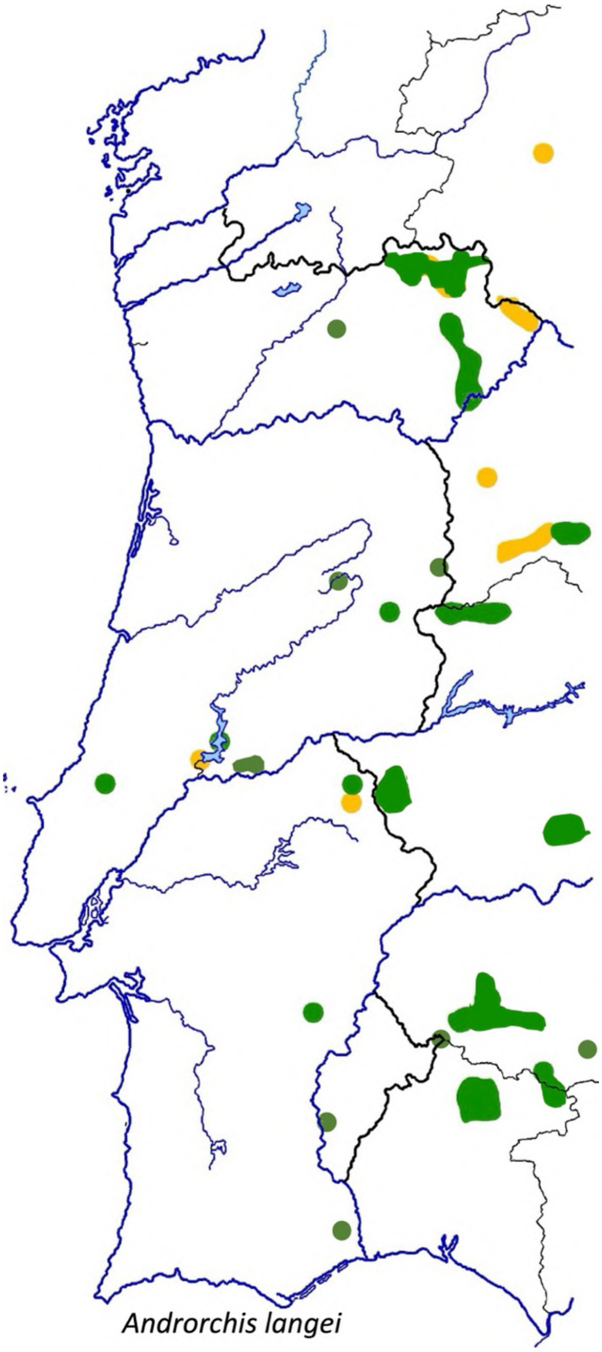
Very scattered throughout the northern two-thirds of Portugal, extending southwards to the Alto Alentejo (Portalegre); a few rare locations further south (Algarve and Baixo Alentejo). Absent from Galicia and the mapped part of Castilla y León. More common towards Trás-os-Montes, Extremadura and Andalusia. Outside the studied territory, mainly scattered throughout the Iberian Peninsula, extending very slightly beyond the Pyrenees on the French side; North Africa (Morocco).

Situation in the study area

Not particularly threatened in most of its range (forest habitat).

4.137

Figs. 4.137 to **4.140**. *Androrchis langei*. 4.137 (above, with biotope): Gondesende, Trás-os-Montes, 31 May 2025. 4.138 and 4.139 (next page): Lagarelhos, Vinhais, Trás-os-Montes, 9 June 2021. 4.140 (bottom of next page): Ousilhão, Trás-os-Montes, 2 June 2025.


Androrchis langei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Androrchis provincialis (Balbis) D. Tyteca & E. Klein

Provence Orchid

Orquídea de Provença (port.), Orquídea marela pinta (gal.)

Description

Plant 15 to 30 cm tall, with three to eight lanceolate basal leaves, heavily spotted. Loose inflorescence of 5 to 15 (-20) pale yellow to whitish flowers. Trilobed labellum with denticulate lobes, the median lobe often bifid, with small purplish dots in the centre, more or less kneeled in profile, and with a long spur (13-19 mm long) with an upward-curving tip, longer than the labellum. Lateral sepals erect laterally; petals and dorsal sepal joined in a protective helmet of the gynostemium.

Biotope and ecology

Oak woods (*Quercus ilex*) with varying degrees of clearing, chestnut groves, on crystalline soils with varying degrees of acidity.

Distribution and situation in the study area

In Portugal, *Androrchis provincialis* is currently known to occur in a few locations in the centre of the country, only one of which has a significant number of individuals, but it is highly threatened by inappropriate exploitation of the surrounding woodlands (various plantations, etc.). This population is considered critically endangered; its survival requires the creation of a protected reserve and attempts to propagate the plants through cultivation and planting in neighbouring plots (Flora-On[1]). It is likely that the population is introgressed by *A. mascula*, as shown by some plants whose yellow labellum is faintly streaked with light pink to red pigments (Fig. 4.148), or, conversely, whose purplish flower (*A. mascula*) displays characteristics typical of *A. provincialis* (curvature of the labellum and spur – Fig. 4.149).

Until at least 1988, there was a population in a chestnut grove on a north-facing slope near Chaves (two plants seen in 1988! TYTECA 1998), but despite sporadic surveys since then, the plant has not been seen there again. In eastern Galicia, there remains a significant core population (CORTIZO & SAHUQUILLO 2006); the species is moderately widespread in northern Spain (BENITO AYUSO 2017) and its range extends into the northern part of the Mediterranean Basin as far as the Caucasus; However, throughout its range, the species is considered rare, with the exception of southern France, Italy and part of the Aegean islands, where it is more common (KREUTZ 2024). It is absent from North Africa.


4.141

Figs. 4.141 to **4.149**. *A. provincialis*: opposite and on the following two pages; all photos taken in Carvalhal (Pombal), Beira Litoral, 17 April 2022.

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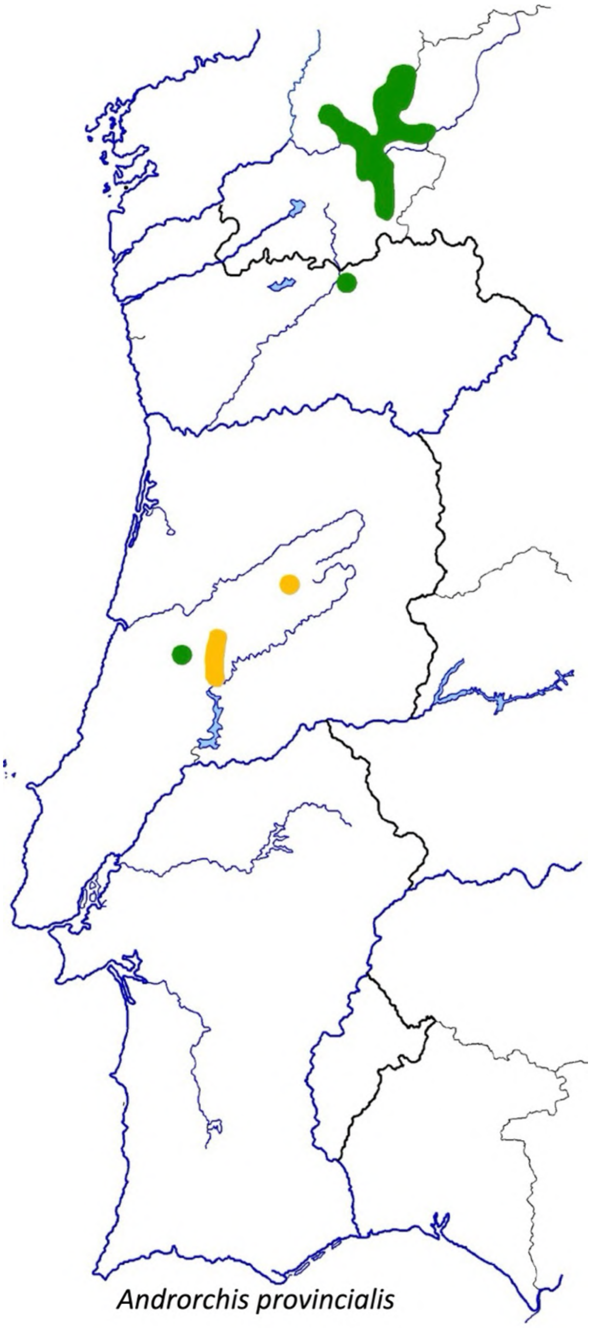
[1] https://flora-on.pt/#/1orchis+provincialis.

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Androrchis pallens (L.) D. Tyteca & E. Klein **Pale Orchid**

Description

A plant 15 to 40 cm tall, with four to six oblong to oval basal leaves, immaculate and shiny. Fairly dense inflorescence of 10 to 35 yellowish-white to pale yellow flowers. Trilobed labellum with dentate lobes, often bifid median lobe, without punctuation, bright yellow centre, slightly convex, straight longitudinal profile, and a spur slightly curved upwards, about as long as the labellum. Lateral sepals erect; petals and dorsal sepal joined in a protective helmet covering the gynostemium.

Biotope and ecology

Full sunlight to partial shade, on calcareous to slightly acidic substrate: meadows, lawns, light woods.

Distribution

Mountainous regions north of the Mediterranean, from western Spain to Georgia, extending north-eastwards to Germany. The only indication for the species in this study area comes from an old record by CARBO NADAL et al. (1977), Santa Lucía, 11.06.1973, in the west of the Province of León. This record has never been confirmed since. It is therefore possible that this indication is superfluous for the present work.

4.150

4.151

Figs. 4.150-151. The pictures illustrating this page show *Androrchis pallens*, Santa Marina de Valdeón, Province of León, 18 May 1990.

Orchis italica, O. anthropophora
and their hybrid
Bucelas, Estremadura, 25 March 2008

4.13. Orchis

We refer to the previous section (4.12. *Androrchis*) for an explanation of the split between the two genera that remained united within the former genus *Orchis*, namely *Androrchis* and *Orchis*. We now need to review the few species that have remained in the 'residual' genus *Orchis*. They have remained there because of their clear relationship to the founding species of the genus, and even to the entire Orchidaceae family, namely *Orchis militaris* Linné.

The characteristics of the genus *Orchis* are as follows (see also Table 4.6): plants that are more robust and stockier in appearance than *Androrchis*, with a denser inflorescence of flowers in a wider range of colours than *Androrchis*: light to dark lilac, brown, red, purple, green, yellow, not to mention white... The rosette of basal leaves is similar to that of *Androrchis*, but they are generally wider, more oval, oblong, shorter, and never spotted, with the exception of one species, *Orchis italica*, which exceptionally has individuals with spotted leaves, with the additional characteristic that all individuals of this species have leaves with wavy edges. The upper leaves, which are sheathing, are also present in *Orchis*. Another difference is that the green stem of *Orchis* is much less often tinged with purple than is the case with *Androrchis*.

Finally, there are significant differences in the flower (see Table 4.6): in *Orchis* the bracts are very small and hyaline; the petals are narrow and linear; the labellum is four-lobed, with the two central lobes often separated by a small appendage and the two lateral lobes carried at the base of the labellum; the spur is shorter than the ovary, always curved downwards, following the ovary, or simply non-existent. The flowers are structured as shown in Figure 4.152 below, which again includes all three species found in Portugal and the Domain: *Orchis anthropophora*, *O. italica* and *O. purpurea* (the latter absent from Portugal). Finally, unlike *Androrchis*, a feature not visible in flat floral analyses, the parts of the perianth (sepals and petals) are all joined together in a protective helmet covering the gynostemium.

Fig. 4.152. - Floral analyses of several species of *Orchis* (from top to bottom and left to right: top, *O. italica*, *O. militaris* and *O. simia*; bottom, *O. anthropophora* and *O. purpurea*).

Orchis anthropophora (L.) All. Man Orchid

Rapazinhos, Erva do homem enforcado (port.), Flor del hombre ahorcado, Hombre colgado, Hombrecillos ahorcados (cast.), Orquídea do home aforcado (gal.)

Description

Plant 10 to 40 cm tall, with five to ten leaves, the basal leaves oblong to lanceolate, spreading, and the cauline leaves narrower, enveloping the stem. Inflorescence elongated, dense and narrow, composed of 15 to 80 (-100) dull-coloured flowers, ranging from yellowish green to reddish brown. Labellum 10 to 15 mm long, pendulous, flat, elongated, deeply four-lobed, with very narrow lobes, with or without appendage, greenish-yellow to reddish-brown, with two rounded, pale, shiny calluses at the base, forming a nectariferous cupule. Petals and sepals joined into a helmet; external colour of the sepals (and therefore the helmet) light green, with clearly visible brown veins and edges. Spur absent.

Special features and forms

A fairly uniform species, with variations mainly in flower colour.

Biotope and ecology

A species characteristic of scrubland and grasslands on limestone soil, in full sunlight or in the light shade of scrub or on the edge of woods.

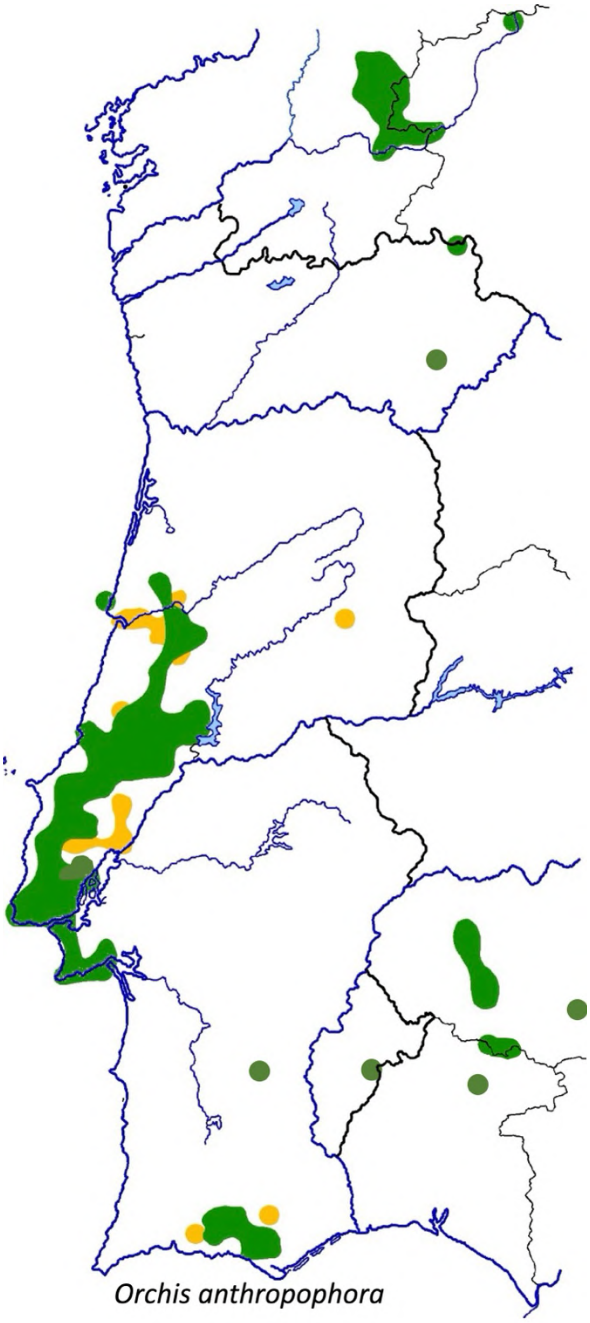
Distribution

Orchis anthropophora is found in Atlantic and Mediterranean regions, from southern England and central Germany to North Africa, and from the Atlantic coast of the Iberian Peninsula to Cyprus, including the coasts of Greece and Turkey. In the area studied, the distribution map clearly shows that the species is found in areas with calcareous or similar soils.

Situation in the study area

Being widespread in calcareous scrublands, the species is not currently threatened.

4.153



4.154

4.155

Figs. 4.153 to **4.156**. *Orchis anthropophora*.
4.153: S. de Boa Viagem, Beira Litoral, 15 April 2022.
4.154-155: Cantanhede, Beira Litoral, 2 April 2016.
4.156: Tienne des Vignes, Belgium, 18 May 2007.

Orchis italica Poiret Italian Orchid

Erva dos macaquinhos, salepeira dos macaquinhos (port.), Flor dos raparigos (gal.)

Description

A plant 20 to 50 cm tall, with five to eight oval to lanceolate leaves, spread out, with typically wavy edges, rarely spotted. Compact, short and dense inflorescence, conical to ovoid-cylindrical, composed of 15 to 60 brightly coloured flowers, pink to lilac, sometimes purple, rarely white. Labellum 12 to 20 mm long, flat, more or less forward-facing, deeply four-lobed, with narrow lobes, often with an appendage between the two middle lobes. Petals and sepals joined in a more or less loose helmet. Spur short (4 to 8 mm), curved downwards.

Biotope and ecology

Garrigues, dry to rocky grasslands, on calcareous soils, rarely crystalline, in full sunlight, rarely in shaded areas.

Distribution

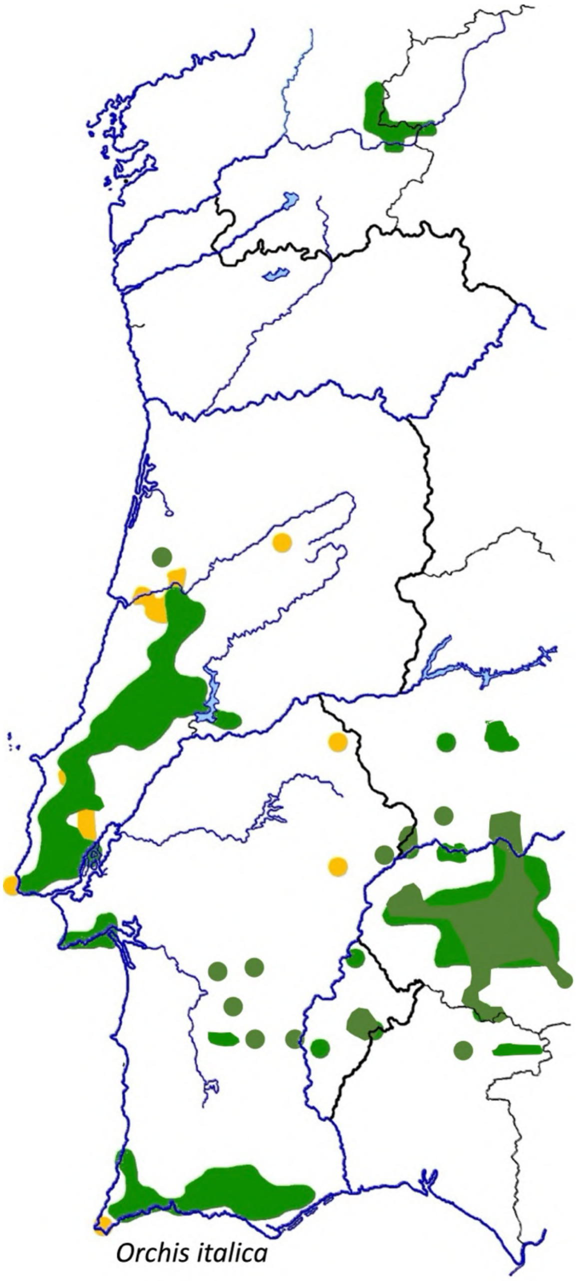
Mediterranean basin, from Galicia, Portugal, northern Maghreb, to the coasts of Turkey and the Levant; present on the Mediterranean islands with the exception of Corsica and Sardinia. In the mainland, it follows limestone areas; absent from northern Portugal, it reappears in eastern Galicia and the neighbouring part of Castilla-León.

Situation in the study area

Widely present in limestone regions, it is not currently threatened.


4.157

Figs. 4.157 to **4.160**. *Orchis italica*.
4.157 (above): Abundant population in Morgado, Algarve, 17 March 2008.
4.158, 4.160 (next page): Morgado, Loulé, Algarve, 17 March 2008.
4.159: Eiras, Coimbra, Beira Litoral, 14 April 2022.


Orchis italica

4.158

4.159

4.160

Orchis italica and *O. anthropophora*
Cantanhede, Beira Litoral
2 April 2016

Orchis hybrids

This page shows hybrids between *Orchis italica* and *O. anthropophora*. These hybrids are among the most frequently observed in Portugal. **Figs. 4.161**, **162** and **164** in Cantanhede, Beira Litoral, 02.04.2016; **Fig. 4.163** (bottom left) in Bucelas, Estremadura, 25.03.2008.


4.161


4.162


4.163


4.164

Orchis purpurea Huds. Lady Orchid

Orquídea de la dama (cast.), Orquídea púrpura grande (gal.)

Description

A robust, tall plant (up to 70–80 cm), with three to six large, oblong basal leaves, characterised by their shiny appearance, and one to two cauline leaves enveloping the stem. The inflorescence is often abundant (20 to 80 flowers, sometimes more). Large flowers with a flat, long and broad labellum (1–2 cm), usually four-lobed with a small appendage between the median lobes, which are more or less enlarged, and narrow lateral lobes; rarely with an almost entire labellum. Labellum usually white to pale pink in colour, with small tufts of purplish hairs that appear as dots from a distance; petals and sepals joined together in a helmet, characteristic dark brown-purple in colour; spur shorter than the ovary.

Special features and forms

The purple orchid is one of our most spectacular orchids. It is easily distinguished from other orchids by its imposing stature, its beautiful, characteristic shiny green leaves, which can be seen from January onwards in lawns and scrubland, and its large flowers, with a helmet whose colouring combines purple and green-brown pigments, giving it the blackish purple appearance that has earned the species its name (*purpurea*). This species is also characterised by infinite variations in flower colour, ranging from pure white to dark purple, including all shades of pink.

Biotope and ecology

It is a calcicolous species, typically occupying grasslands, pastures and edges on limestone or carbonate clays.

4.165

4.166

Distribution

This species is widespread throughout much of Europe, from the Atlantic coast to the Black Sea and from southern England and Denmark to the Mediterranean region. It barely reaches our study area in Galicia (Serra do Courel, Monforte de Lemos) and Castilla y León (near Las Médulas).

Situation in the study area

Its presence is fairly marginal in the region studied, but it is holding its own, with the particularity that in these locations it encounters *Orchis italica*, a distinctly Mediterranean species. Hybrids between the two are therefore exceptional; although already observed in Italy, they have not yet been reported in our study area.

4.167

Figs. 4.165 to **4.168**. *Orchis purpurea*.

4.165, 166 (previous page): Vilardasilva, Galicia, 10 May 2001.
4.167 (above): Bois d'Ellinchamps, Province of Luxembourg, Belgium, 12 May 2022.
4.168 (left): Han-sur-Lesse, Province of Namur, Belgium, 13 May 2023.

4.14. Neotinea

Neotinea, a genus that initially comprised only one species (*Neotinea maculata*), has been expanded to include a number of species separated from the neighbouring genus *Orchis*, following phylogenetic analyses conducted in 1997 by PRIDGEON et al. (1997) and BATEMAN et al. (1997). Although this split was necessary for reasons of phylogenetic tree consistency (the former genus *Orchis* being paraphyletic – see the position of *Neotinea* in Fig. 3.1), some researchers are sceptical about the choice made and argue that the species thus transferred constitute a distinct genus, in this case *Odontorchis* (notably KREUTZ 2024; P. DEVILLERS & J. DEVILLERS-TERSCHUREN, pers. comm.). Their choice is justified by (1) the significant morphological difference between the genera *Neotinea* and *Odontorchis*, notably the frequent presence of spotted leaves in the former; (2) the fact that *Neotinea maculata* is an almost entirely autogamous species, as opposed to *Odontorchis*, which contains only allogamous species; and finally (3) the karyological difference, with the two genera having 2n = 40 and 42 chromosomes, respectively.

In addition to the characteristics mentioned above, *Neotinea* (in the strict sense) is also distinguished by its very small flowers. The only species, *N. maculata*, also has two remarkably distinct forms, one with pale pink flowers highlighted with red, and spotted leaves, the other with yellowish-white flowers and unspotted leaves. The two forms are often found in the same population, but there are also populations consisting entirely of individuals of one form to the exclusion of the other, which has sometimes led to misidentifications, such as, for example, to cite a case encountered in Portugal, the mention of *Pseudorchis albida* in a book devoted to the Algarve site of Rocha da Pena, far from its range and in total contradiction with its ecological requirements, when in fact it was the white form of *Neotinea maculata*...

In its current sense, which we will adopt in the following, the genus *Neotinea* comprises five or six species. Its range covers much of Europe, from the Mediterranean to northern England and the Baltic States, northern North Africa, Turkey, the Levant coast, and the Caucasus, gradually disappearing as one moves towards central Asia (PRIDGEON et al. 2001; KRETZSCHMAR et al. 2007). Much of the territory studied in this book is covered by the three species found there, as we shall see in the following pages.

4.169

Figs. 4.169 to **4.173**.- *Neotinea maculata*. This page and the next two.

4.169, 4.170: Serra de São Mamede, Portalegre, Alto Alentejo, 5 April 2008 (red, spotted variant).
4.171, 4.173: Castro Vicente, Trás-os-Montes, 28 April 2019 (white, unspotted, and red, spotted variants, respectively).
4.172: two fruited inflorescences, Foia, Serra de Monchique, Algarve, 20 May 2023.

Neotinea maculata (Desf.) Stearn Dense-flowered Orchid

Neotínea maculada (port.), Carapucha pinta (gal.)

Description
Plant 8 to 20 (-25) cm tall, with three to six oval to oblong basal leaves, sometimes more or less densely spotted with spots of varying sizes (in individuals with pink flowers). Dense inflorescence, 2 to 10 cm long, with numerous, very small flowers (labellum less than 5 mm long). Flowers slightly open, with a pale pink labellum with red dashes or lines (in this case, spotted leaves) or creamy white to pale yellowish (non-spotted leaves). Sepals and petals joined in a helmet. Labellum trilobed, with the median lobe often bifid. Ovaries often swollen at flowering (self-pollination). Flowers from March to May.

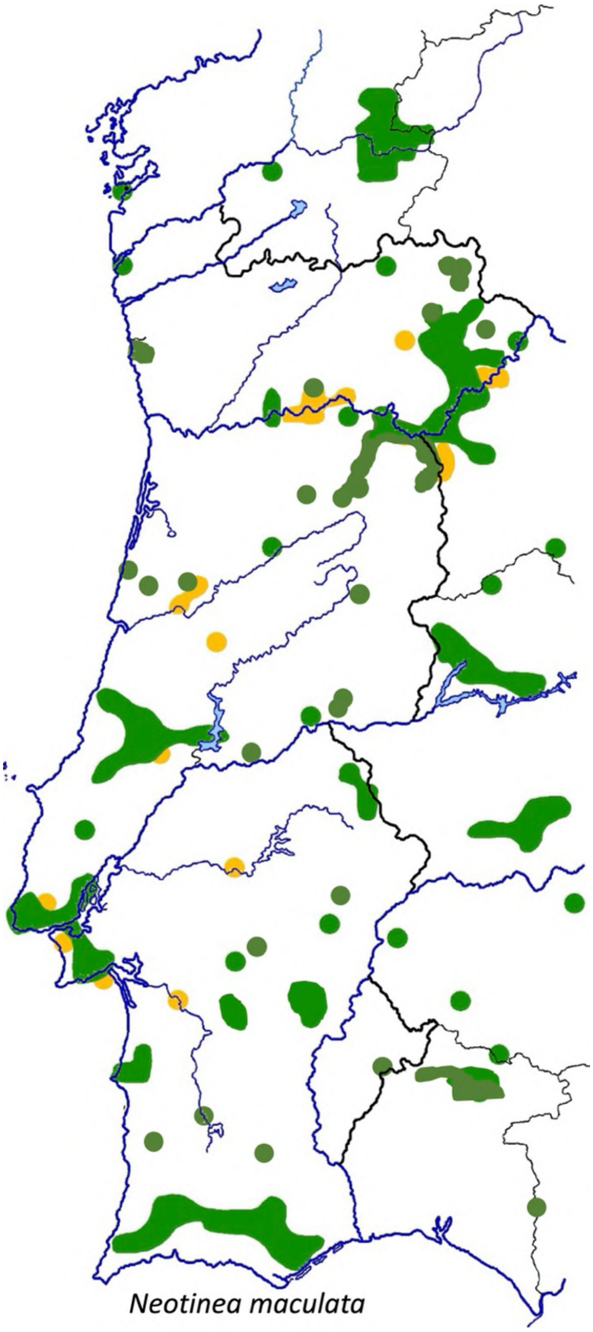
Biotope and ecology
Most often found in light shade in pine or holm oak woods, scrubland; rarely in full sunlight. Generally on more or less acidic soils, rarely alkaline, dry to rocky.

Distribution
Widespread but scattered across much of the territory covered in this book (see map). Its general distribution covers much of the Mediterranean basin: very widespread in the Iberian Peninsula, northern Maghreb, southern France, Italy, Corsica and Sardinia, scattered in Greece, the Aegean islands, the Turkish coast, Cyprus, the Levant coast, Cyrenaica, etc. Spectacular escape of the distribution area towards the north along the Atlantic coasts (France, Brittany, Ireland!).

Situation in the study area
Currently not threatened, given its frequency and ecological eclecticism.


4.170


4.171



4.172

4.173

Figs. 4.174 to **4.178**. Next two pages – *Neotinea ustulata*.
4.174, 4.175: São João da Pesqueira, Trás-os-Montes, 8 May 2011.
4.176, 4.177: Alto do Couto, Serra do Courel, Galicia, 23 May 2001.
4.178: hypochromic individual, Vega de Viejos, Prov. León, 22 May 2002.

Neotinea ustulata (L.) R.M. Bateman, Pridgeon & M.W. Chase **Burnt Orchid**

Neotínea maculada (port.), Orquídea manchada (cast.), Carapucha pinta (gal.)

Description
Very small plant (between 10 and 25 cm), with three to six oblong, bluish-green basal leaves spread out in a rosette, and one to two small cauline leaves enveloping the stem. Dense inflorescence, bearing 15 to 50 very small flowers (less than 1 cm). Concave, trilobed labellum, the median lobe itself divided into two short lobes sometimes separated by a small tooth, with a light, generally white background with a few fairly thick, well-marked purple spots, with lobes more or less curved forward. Petals and sepals joined in a helmet, characteristic dark red-brown in colour, giving the illusion, when the buds are still closed, of a "burnt" inflorescence, which gave the species its name. Short spur, shorter than the ovary.

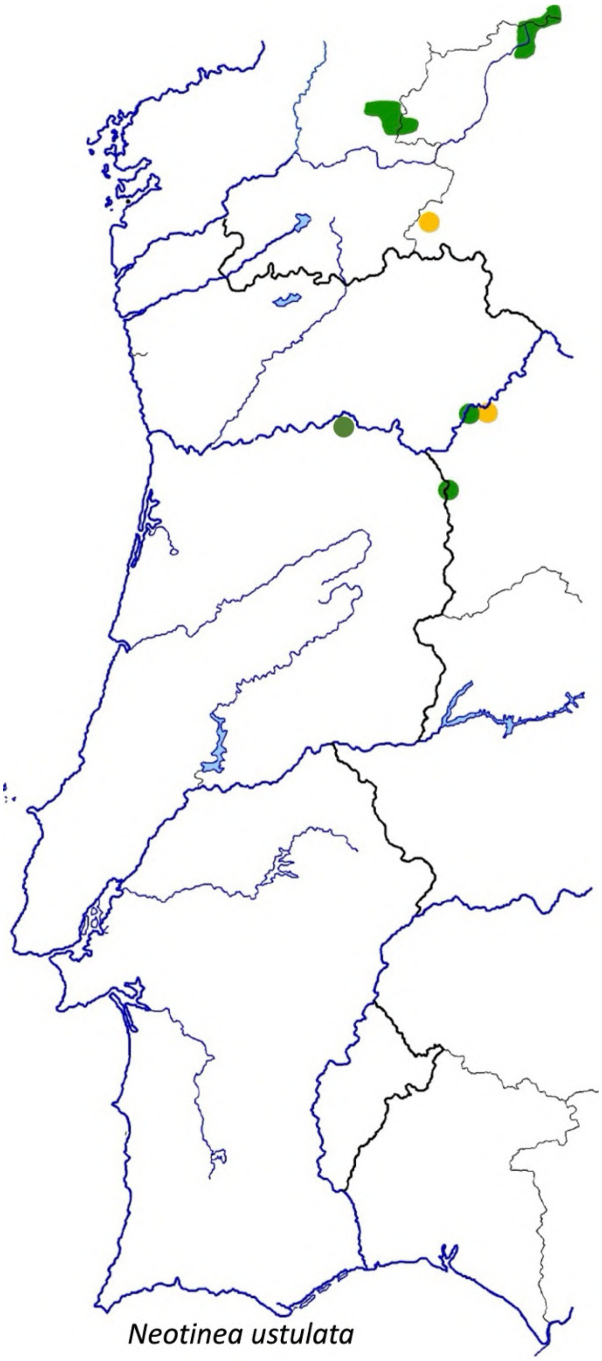
Special features and forms
This species is fairly uniform. It may resemble a "miniature" version of the lady orchid, which can have similar colour patterns. However, the considerable difference in the size of the plants and flowers leaves no doubt as to their identification.

Biotope and ecology
This species is strictly calcicolous, sometimes even preferring dolomitic soils; its small size also means that it requires extremely low vegetation for its survival. As a result, it is only found in our region in very open, sunny grasslands, scrublands and limestone meadows. It is also characterised by a marked affinity for mountainous areas, being common in high mountains; in recent decades, it has become increasingly rare in lowland areas. Between 800 and 1300 m.

Distribution
This species is widespread throughout much of Europe, from northern England and southern Scandinavia to southern Spain and Greece; from the Atlantic coast to Siberia; Caucasus. In our study area, it is extremely rare: until recently, it was known to exist in two areas in Galicia and Castilla y León, as well as two locations in the Upper Douro region, but on the Spanish side.

Situation in the study area
It was not before 2010 that the burnt orchid was found in Portugal, near São João da Pesqueira, by a member of the AOSP, José MONTEIRO, in small numbers. Its survival in this location is very precarious, given the damage to the biotope (clearing to establish intensive grazing), and attempts to intervene with the municipality and the responsible authorities have been unsuccessful. It was classified as 'critically endangered' on the Red List shortly after its discovery!

4.174


Neotinea ustulata

4.175

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Field excursion of AOSP,
São João da Pesqueira, 8 May 2011


Neotinea conica
Agostos, Algarve
25 February 2018

Neotinea conica (Willd.) R.M. Bateman — Conical Orchid

Orquídea branca (port.)

Description
Very small plant (between 8 and 25 cm), with four to seven oblong, bluish-green basal leaves spread out in a rosette. Dense, conical to ovoid inflorescence bearing 10 to 40 very small flowers (around 1 cm). Concave, trilobed labellum with denticulate lobes, generally white background, entirely covered with fairly fine purple dots, more or less marked, rarely pure white, with lobes more or less curved forward. Petals and sepals joined in a tight helmet; sepal clearly acuminate, with the tip often emerging from the helmet (hence the similarity to *N. tridentata*). Lateral sepals white to pale pink, green at the base, with clearly marked green veins on the outside. Spur short, curved downwards, shorter than or approximately equal in length to the ovary.

Special features and forms
This species varies in colour and robustness. Formerly identified as *Orchis tridentata* (= *Neotinea tridentata*), it is sometimes still considered a subspecies, but differs completely from it in several respects, such as the small size of the plant and flowers and the marked green colouring on the outer surface of the sepals. It is gradually replaced towards the east by transitional forms of *Neotinea lactea*. Very early flowering: early February to early April.

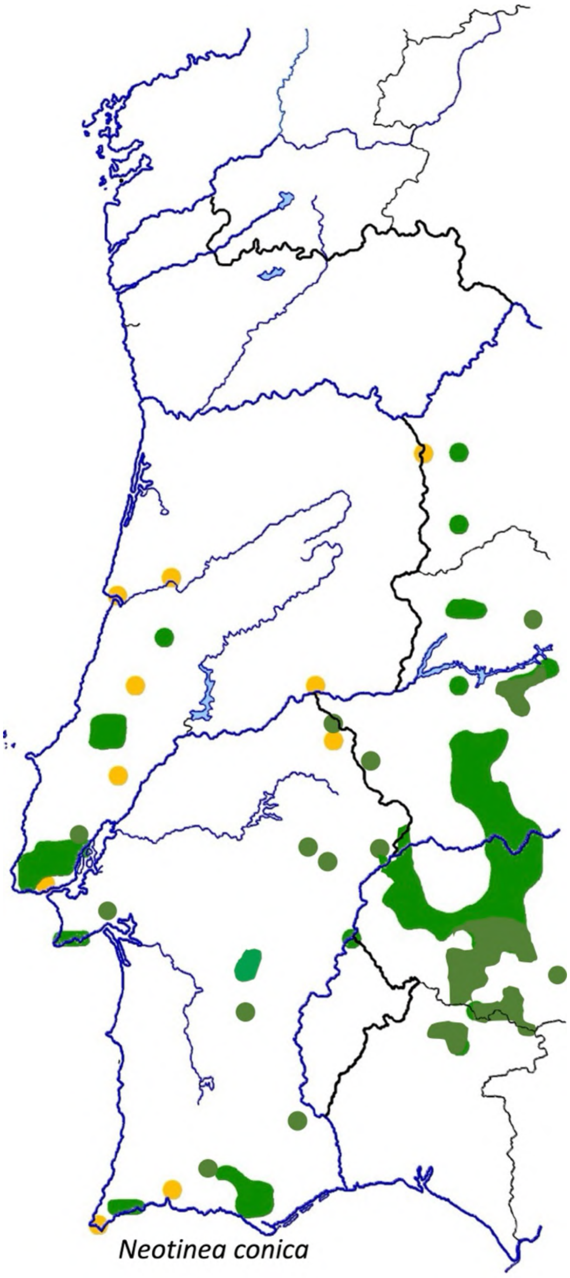
Biotope and ecology
This species is strictly calcicolous; its small size also means that it requires extremely low vegetation for its survival. As a result, it is only found in very open, sunny limestone grasslands and scrublands at low altitudes.

Distribution
A species with a restricted distribution, centred on the Iberian Peninsula, the Balearic Islands, south-western France and north-western Africa. Present in the southern two-thirds of Portugal, in Extremadura and Andalusia.

Situation in the study area
In Portugal, the fate of the species is linked to that of short-grass grasslands and scrublands, which are frequently grazed.


4.179


4.180



Figs. 4.179 to **4.183**. – *Neotinea conica*. Previous page and this one.

4.179, 4.180 (previous page), 4.182: A dos Matos, Algarve, 1 March 2018.
4.181 (above): Agostos, Algarve, 25 February 2018.
4.183 (left – albino specimen): Outeiro, Beira Litoral, 1 April 2016.

4.15. Himantoglossum

Himantoglossum is a genus comprising spectacular, large species, two of which are found in our study area. Only one of them reaches Portugal; it is one of the earliest orchids, flowering as early as January. Previously, before the advent of molecular phylogenetics, three genera of plants coexisted, all of them giants: *Himantoglossum* in the strict sense, *Barlia* and *Comperia*. We follow Pierre DELFORGE (1999), who proposed combining them into a single genus, *Himantoglossum*, in accordance with the results of phylogenetic analyses (PRIDGEON et al. 1997; BATEMAN et al. 1997). As such, this genus covers a large part of the Mediterranean basin and extends into Central Europe, ranging from England, the Iberian Peninsula and the Maghreb to the borders of Iran.

They can truly be described as giants: *Himantoglossum* plants can exceed 1 metre in height, and the flowers of some species exceed 6 centimetres in length due to the exceptional development of the lobes of the labellum. In extreme cases, the inflorescence can bear up to 200 flowers.

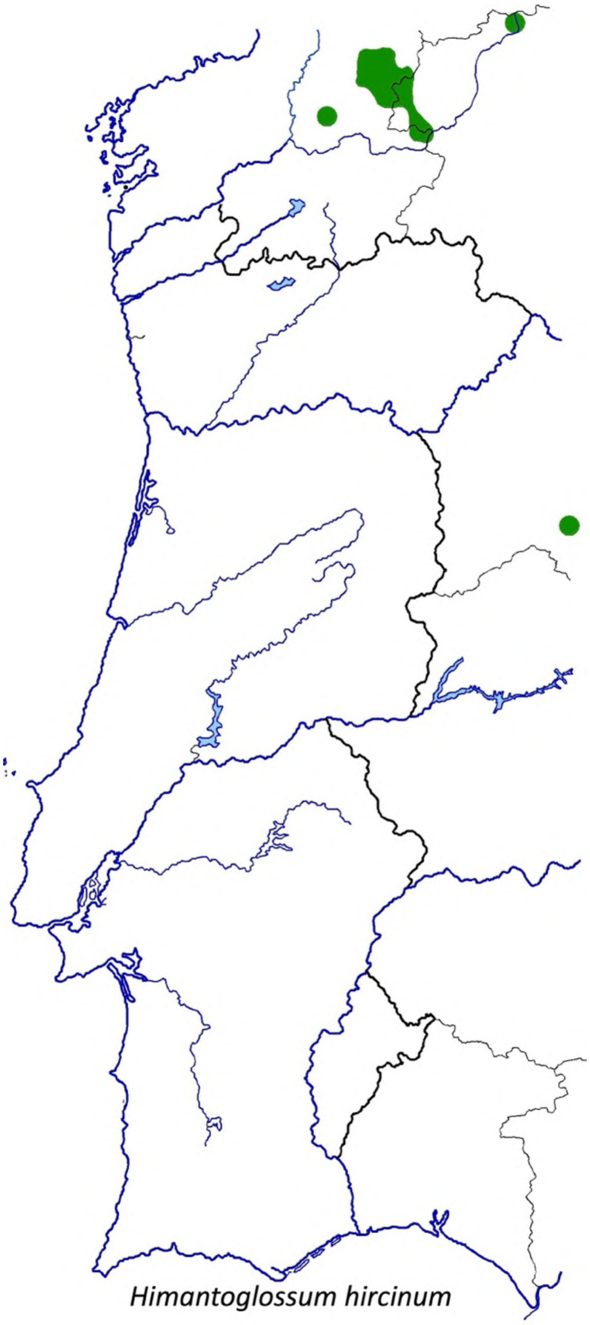
In the wild, the two species of *Himantoglossum* share the territory without overlapping: one is found in Galicia and Castilla y León (*H. hircinum*); the other is scattered throughout Extremadura and Portugal (*H. robertianum*).

Himantoglossum hircinum (L.) Sprengel Lizard Orchid

Orquídea hedionda, Orquídea barbada, Satirión barbado (cast.), Orquídea das Barbas (gal.)

Description
Often a robust, tall plant, 20 to 70 (-100) cm high, with four to six oval to oblong-lanceolate basal leaves, spread out in a rosette or upright, light greyish-green in colour, often dried out during flowering. Elongated inflorescence bearing 20 to 60 (->100) remarkable, large flowers, generally greyish to whitish in colour with reddish hues, exuding a characteristic odour (male goat). Trilobed labellum, with a very elongated median lobe (up to 6 cm), in the form of a very narrow twisted strap, bifid at its apex, spirally coiled in unopened buds, brownish to reddish for the most part but white with purple punctuation near the base. Lateral lobes of the labellum narrow, reddish-brown, strongly undulate on the outside. Sepals and petals joined into a helmet; sepals white inside, with purplish streaks. Spur globular, curved downwards, short. Ovary very long, twisted, briefly pedicellate.

4.184


Himantoglossum hircinum

Special features and forms

This species is one of the most unusual of our native orchids, both for its stately, robust habit, its pale greyish-green colour, its inflorescence with long, twisted labellums resembling streamers, and its often pronounced scent that attracts attention. The plant varies in size and robustness; the largest specimens are truly spectacular. The leaves, which are very often withered and browned during flowering, are clearly visible and develop very early in the season (as early as the previous October). Appearances are quite irregular and the abundance of flowering individuals varies greatly from year to year.

Biotope and ecology

The lizard orchid is a full-sun plant, fairly strictly calcicolous, and is therefore found mainly in limestone grasslands, scrubland or sometimes on roadside embankments. It flowers from late May to early July.

Distribution

The lizard orchid is distributed throughout the Atlantic and western Mediterranean regions, from England and central Germany to North Africa and southern Italy. In the territory under consideration, it is only present in Galicia and Castilla y León.

Situation in the study area

Despite its position at the northern edge of its range in the territory under consideration, the lizard orchid forms spectacular populations with numerous, robust individuals; it does not currently appear to be threatened.

4.185

Figs. 4.184 to **4.186**. – *Himantoglossum hircinum*.

4.184 (previous page – with *Orchis anthropophora*): Alto do Couto, Serra do Courel, Galicia, 5 June 2023.
4.185 (left): La Cueta, Province of León, 6 July 2009.
4.186 (right): Seoane do Courel, Galicia, 22 May 2001.

4.186

Himantoglossum robertianum
Rabaçal, Beira Litoral
7 March 2011

Himantoglossum robertianum (Loiseleur) P. Delforge — Giant Orchid

Salepeira grande (port.), Compañón, orquídea gigante, orquídea macho, orquidón (cast.)

Description
A very robust, tall plant, 30 to 80 (-110) cm high, with five to ten broadly oval to oblong-lanceolate leaves, the basal leaves spreading in a rosette or erect, green and glossy. Elongated inflorescence (8 to 20 cm), bearing 20 to 60 remarkable, large flowers, generally pinkish to lilac in colour, or greenish to whitish. Sepals and petals joined in a helmet, the lateral sepals more or less loose, greenish to reddish on the outside, dotted with purple on the inside. Trilobed labellum, with an elongated median lobe (13 to 20 mm), bilobed; lateral lobes ± strongly undulate on their outer edge. Labellum covered with purple spots and streaks. Globular spur, curved downwards, short. Very early flowering, from January to March (-April).

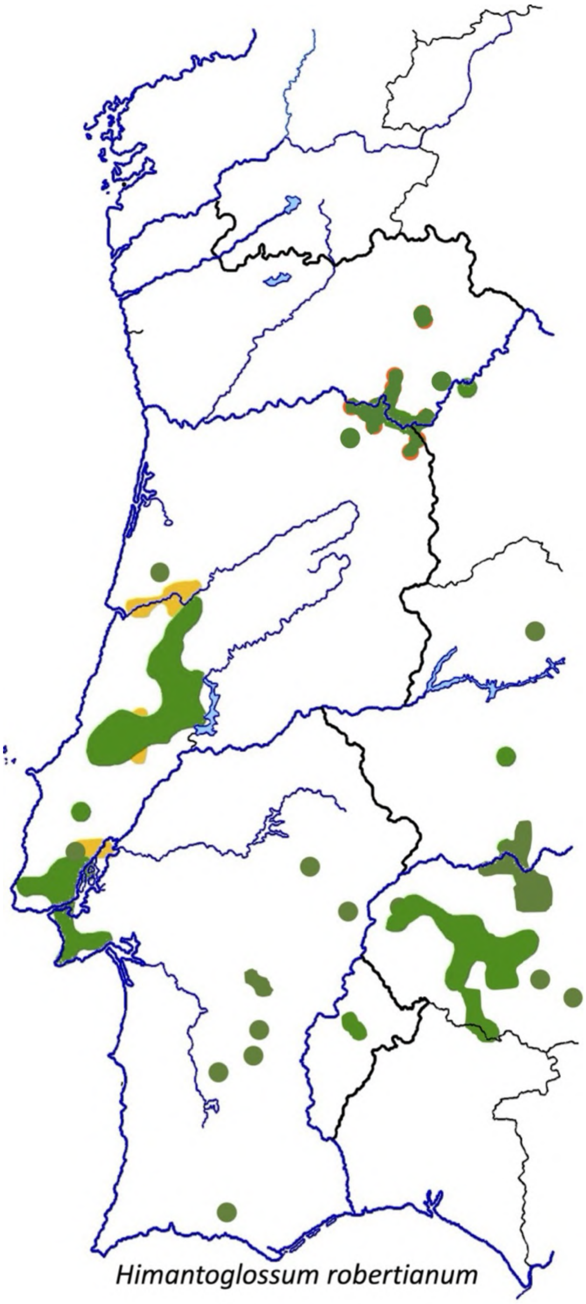
Special features and forms
Plant varies in colour, even within the same population, remarkable for its robust appearance, even when viewed from a distance.

Biotope and ecology
Basiphilous plant, common in grasslands and scrublands, generally in full sunlight, but with an irregular distribution; absent from several suitable areas: for example, virtually absent from the Algarve.

Distribution
Well represented in the limestone areas of Portugal (Estremadura and Beira Litoral) and Extremadura; rare elsewhere but present as far north as Portugal. Curiously absent from Galicia and the covered part of Castilla y León (but present further east). The general range covers the Mediterranean Basin, from Portugal and North Africa to south-western Turkey and Cyprus, and even Israel, where it appeared in 2024 (KREUTZ 2024). Shows a general tendency to spread northwards, particularly in France and even as far as Belgium, as a result of climate change.

Situation in the study area
Does not currently appear to be under threat, and is even expanding.

4.187



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Figs. 4.187 to **4.190**. *Himantoglossum robertianum*.
4.187 (previous page): Rabaçal, Beira Litoral, 7 March 2011.
4.188 to 4.190: Palmela, Estremadura, 29 January 2015.

4.16. Anacamptis

Like *Neotinea maculata*, *Anacamptis pyramidalis*, initially alone in its genus, was joined by a cohort of former members of the genus *Orchis*, following molecular phylogeny work carried out by PRIDGEON et al. (1997) and BATEMAN et al. (1997). This time, the number of species transferred was even greater, as it involved the groups of *Orchis morio*, *O. coriophora*, *O. papilionacea*, *O. collina* and *O. laxiflora*. In response to this approach, I initially described, with E. KLEIN, a new genus named *Herorchis* to include all these defectors (TYTECA & KLEIN 2008), but then abandoned it and adopted the Kew system, in which all these former *Orchis* became *Anacamptis* (TYTECA & KLEIN 2009). The reasons for this reversal were, first, strong criticism from Kew (BATEMAN 2009; SCOPECE et al. 2010) and, second, the fact that, after all, these transferred species were all genetically related since, through encounters in the wild, they ended up forming all possible and imaginable hybrids, including with *A. pyramidalis*. I was not followed in this by a number of orchidologists who, after initially maintaining the large genus *Orchis*, adopted the genus *Herorchis* (but in a restricted sense), as well as *Odontorchis* and, finally, *Androrchis* (DELFORGE 2009, 2021; KREUTZ 2024), not without proposing another new genus in passing (*Paludorchis*) or rehabilitating other formerly described genera (*Vermeulenia*, *Anteriorchis*).

All this does not simplify the systematics, since we currently have three coexisting systems, not to mention a fourth, which consists of maintaining the old genus *Orchis* in its late 20th-century meaning at all costs. Several authors have published tables to help navigate these different classifications (see, for example, SCOPECE et al. 2010; TYTECA et al. 2014), but novice orchidologists or simple orchid lovers will certainly not find it easy to navigate, at least at first. But at least now you know which system we subscribe to, which is not very different from that of Kew (apart from the recognition of the genus *Androrchis*).

Defined in this way, the enlarged genus *Anacamptis* appears at first glance to be very diverse, both morphologically and ecologically, since it includes species as distinct as the hygrophilous *A. laxiflora*, *A. coriophora* subsp. *martrinii*, *A. champagneuxii*, and the xerophiles *A. collina* and *A. papilionacea*, as well as the mesophiles *A. pyramidalis*, *A. coriophora* subsp. *fragrans* and *A. morio* (subsp. *morio* and *picta*), and the acidophile *A. coriophora* subsp. *matrinii*, the highly tolerant *A. morio* subsp. *morio*, and others, most of which are basiphilous, and a morphological diversity rarely seen in other genera, where spectacular large flowers (*A. papilionacea*) coexist with small but equally attractive ones (*A. morio*, *A. champagneuxii*; *A. pyramidalis*), species with completely spread-out perianths (*A. laxiflora*) or, conversely, strongly closed perianths (*A. coriophora*, both subspecies), etc.; Finally, there are also species with a wide European-circum-mediterranean distribution (*A. pyramidalis*, *A. coriophora* s.l.), a central European distribution (*A. morio* subsp. *morio*), or a localised circum-mediterranean distribution (*A. laxiflora*, *A. morio* subsp. *picta*, *A. champagneuxii*, *A. papilionacea*, *A. collina*).

It should also be noted that, despite the high capacity for hybridisation between species of the genus and their genetic compatibility, reflected in their proximity within the phylogenetic tree, there is some variation in chromosome numbers, with the majority having chromosome numbers of $2n = 32$, $2n = 36$ and $2n = 42$ (KRETZSCHMAR et al. 2007). This also makes the species of *Anacamptis* genetically compatible with the species of the genus *Serapias*, since hybrids between the two genera are relatively common, which also goes hand in hand with their proximity within the phylogenetic tree, as the two genera constitute sister clades (see Fig. 3.1).

Figs. 4.192 to **4.195**, 2 pages further on. *Anacamptis pyramidalis* (pink-flowered form).
4.192 and 4.194: S. Romão, Beira Litoral, 8 May 2009.
4.193 and 4.195: S. João das Lampas (N Sintra), Estremadura, 28 April 2009.

Anacamptis pyramidalis (L.) L.C.M. Rich. Pyramidal Orchid

Satirião menor, Orquídea piramidal (port.), Orquídea piramidal (cast. & gal.)

Description
Plant 15 to 40 cm tall, with four to eight linear to narrowly lanceolate basal leaves and one to two cauline leaves enveloping the stem. Very compact inflorescence, more or less conical in shape, bearing 20 to 60 fairly small, pink to purplish-red flowers. Labellum flat, deeply trilobed, wider than long, with two very characteristic protruding lamellae at the base, parallel to slightly divergent, framing the entrance to the spur. Lateral sepals spread laterally; dorsal sepal and petals more or less converging in a loose helmet. Spur very long and very thin, more or less straight to slightly arched downwards, significantly longer than the ovary.

Special features and forms
In the wild, this species is fairly uniform; the most commonly observed flower colours are pale pink or purplish red. Unlike many species in the Orchidoideae subfamily, the pollinia of Anacamptis are carried by a single retinaculum, which allows for a curious adaptation to pollination, already described by DARWIN (1891; see Fig. 4.191). When a butterfly (the designated pollinator of the pyramidal orchid, with a proboscis long enough to reach the nectar at the bottom of the spur), guided by the lamellae of the labellum, inserts its proboscis into the spur, it comes into contact with the retinaculum, which then, like a clamp, closes around the proboscis. This movement tilts the pollinia sideways, placing them in the correct position to be deposited on the stigmas, which are positioned very laterally and divergently in this species, when the butterfly visits another flower.

Biotope and ecology
The pyramidal orchid is found mainly on basic, calcareous to dolomitic soils, which are also characterised by being fairly loose or recently disturbed. As a result, the species can suddenly proliferate in unexpected places, for example after the removal of spoil, whereas its survival is more problematic in locations with more stable soil. It flowers between April and early June.

Distribution
This is a rather southern species, abundant in the Mediterranean region, but extending as far north as the British Isles and the Caspian Sea. As the map shows, the species is widespread in the limestone regions of Portugal, but rather sporadic elsewhere (Galicia, Extremadura).

Situation in the study area
The pyramidal orchid does not appear to be threatened in the study area.

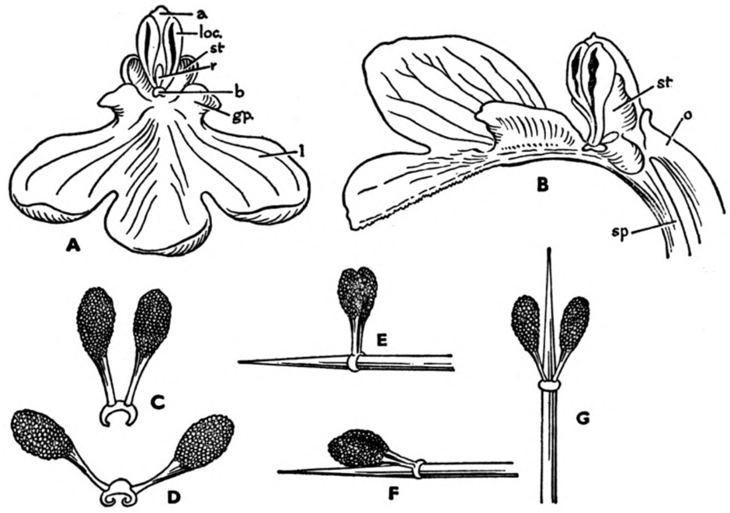
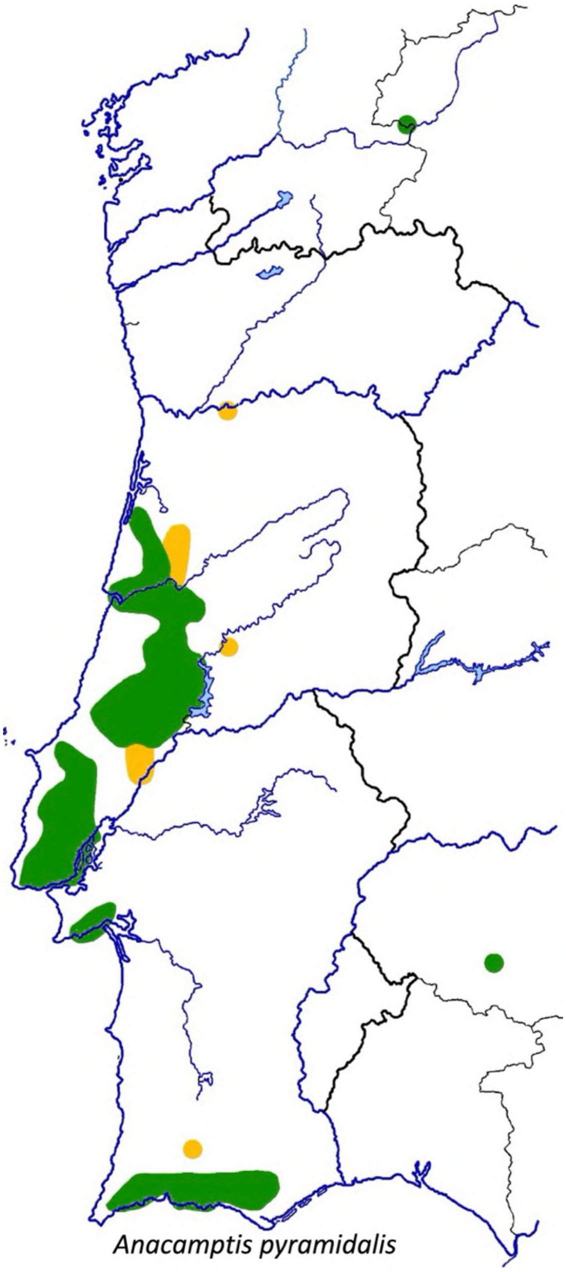


Fig. 4.191. –
Flower of *A. pyramidalis* and movement of pollinia and viscidium (SUMMERHAYES 1968, based on DARWIN 1891).
a – anther; b – bursicle; gp – lamellae (guide plates); l – lip; loc – anther loculus; r – rostellum; sp – spur; st – stigmas.
A and B – flower seen from the front and three-quarters; C – pollinia before removal; D – id after removal; E-G – test performed using a needle simulating the proboscis of the butterfly.



Anacamptis pyramidalis

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Anacamptis laxiflora (Lam.) R.M. Bateman, Pridgeon & M.W. Chase — Loose-flowered Orchid

Orquídea lassa (port.)

Description

The plant is very slender, with a tall, upright habit, growing to a height of 15 to 60 cm, and has four to eight linear to narrowly lanceolate leaves distributed along the stem. The upper part of the stem and ovaries are tinged with purple. The inflorescence is fairly loose, elongated, more or less cylindrical in shape, bearing 20 to 40 fairly large, dark purplish-red flowers. The lateral sepals are upright; the two petals are more or less convergent in a loose helmet, with the dorsal sepal slightly upright above them. Labellum deeply trilobed, lateral lobes strongly folded back, central lobe much shorter than lateral lobes, with a white area often covered with more or less marked dots and dashes. Spur straight, about as long as the ovary, erect at ± 45° upwards.


4.196

Special features and forms

A fairly constant species, distinct from other species of the genus by its leaves distributed along the stem and its elongated inflorescence, composed of very dark flowers.

Biotope and ecology

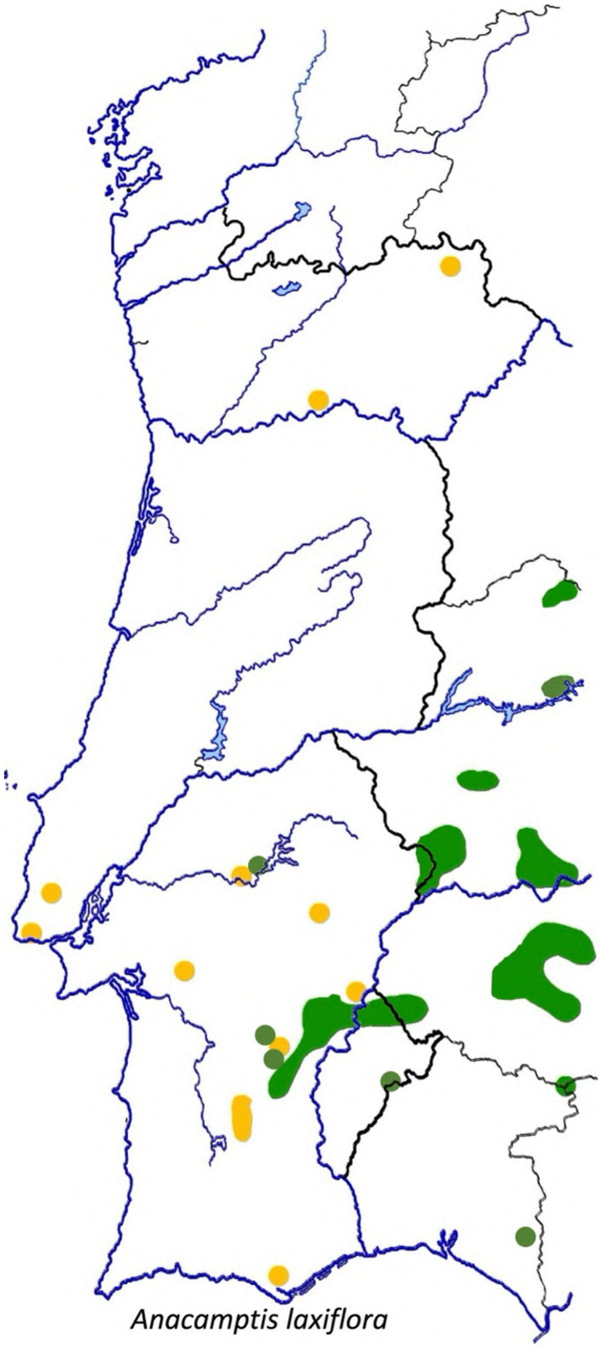
The loose-flowered orchid is found in wetlands, in valley bottom meadows or on riverbanks, on alkaline to slightly acidic soils, always in full sunlight.

Distribution

A mainly Mediterranean species, found as far north as north-western France and the Channel Islands, and as far east as the Turkish coast and Crimea, but absent from North Africa. In the study area, it is rare and scattered in Alentejo, Extremadura and Andalucía; it was once present in other regions of Portugal but has now disappeared from there.

Situation in the study area

In a precarious situation, threatened by the destruction or drying up of wetlands; IUCN category ‘endangered’.



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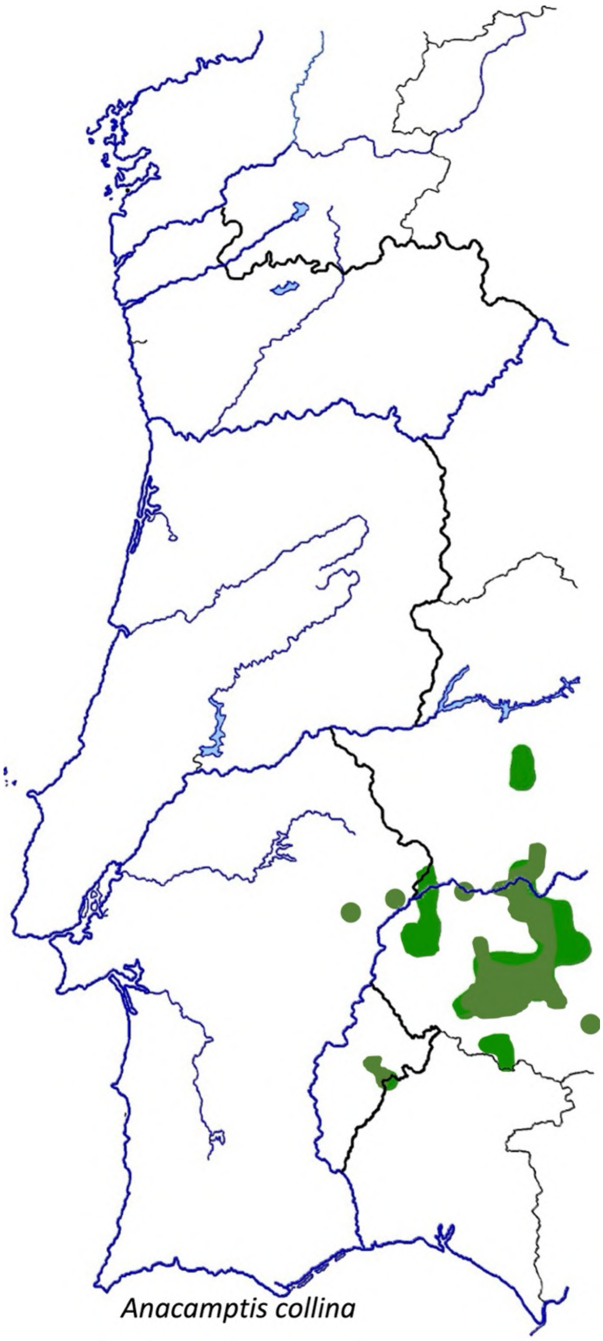
Figs. 4.196 to **4.199**. *Anacamptis laxiflora*.

4.196 (previous page), 4.197, 4.198: Amieira, Alto Alentejo, 18 April 2009.
4.199: Trigaches (Beja), Baixo Alentejo, 19 April 2009.

Anacamptis collina
Vila Verde de Ficalho, Baixo Alentejo
27 February 2018

Anacamptis collina (Banks & Sol. ex Russell) R.M. Bateman, Pridgeon & M.W. Chase   Fan-lipped Orchid

Orquídea dos outeiros (port.), Orquídea pobre, Orquidilla (cast.)



Description

The fan-lipped orchid is generally a stocky, low-growing plant; it rarely exceeds 30 (-40) cm in height, with a maximum of 15 (-20) flowers. The plant has 3 to 5 broadly oval basal leaves, spread out or pressed against the stem. The stem is generally reddish-brown in colour at the inflorescence. The flowers appear large in relation to the plant: the labellum is up to 18 mm long. The petals and dorsal sepal are joined together in a helmet, while the lateral sepals are curved and pointing upwards. The colour variations are quite distinctive in this species: the perianth parts are pale green to reddish-brown-greenish, while the labellum varies from dark reddish-purple to snow white, but its edge is always more or less tinged with green. The labellum is entire, with more or less crenate edges; its lateral lobes are curved downwards. At the base of the labellum, two faintly marked outgrowings can be seen, clearly indicating that this is an *Anacamptis*! The spur is globular, sac-shaped, always lighter in colour than the labellum: its colour ranges from white to pale pink; it is no more than 10 mm long.

Special features and forms

A rather remarkable species due to its variety of colours and its stocky, robust habit. It flowers very early, in February-March.

Biotope and ecology

The fan-lipped orchid always appears in full sunlight, in dry, rocky scrubland, on mainly chalky soil.

Distribution

A strictly Mediterranean species with a patchy distribution in southern Portugal and Spain, some areas of the Maghreb, via the Balearic Islands, southern Sardinia and Italy, Sicily, Crete and the islands and coasts of the Aegean Sea, towards Cyprus and the Levant, with a very long range extending as far as Iran (KRETZSCHMAR et al. 2007).

Situation in the study area

The species is critically endangered in Portugal, being limited to a few mountain ranges in eastern Alentejo; locally more common in Extremadura.

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Figs. 4.200 to **4.202**. *Anacamptis collina*. Serra da Adiça, Vila Verde de Ficalho, Baixo Alentejo, 27 February 2018.

4.202

Anacamptis coriophora subsp. *fragrans*
São João das Lampas (Sintra)
28 April 2009

Anacamptis coriophora (L.) R.M. Bateman, Pridgeon & M.W. Chase

subsp. *martrinii* (Timb.-Lagr.) Jacquet & Scappat. Martrin's Orchid

subsp. *fragrans* (Pollini) R.M. Bateman, Pridgeon & M.W. Chase Vanilla-scent Orchid

Erva perceveja, Erva do salepo (port.), Orquídea de esporón enchido (*martrinii*), Orquídea recendente (*fragrans*) (gal.)

Description
A fairly stocky, low-growing plant, 15 to 25 (-40) cm tall, bearing 4 to 10 leaves, the basal leaves lanceolate and narrow, erect, unspotted, the upper leaves sheathing. Inflorescence more or less dense, cylindrical, bearing 5 to 20 flowers, these varying in colour, faintly to strongly scented (see Table 4.8). Petals and sepals all convergent in a pointed helmet. Labellum 5 to 8 mm long, distinctly trilobed, thrown back, sometimes with the tip curved forward, about as long as the helmet, varying in colour, often decorated with red or brown dots or spots; median lobe pointed, distinctly longer than the lateral lobes; lateral lobes serrated to crenate. Spur of varying size and shape (see table), often lighter in colour than the labellum, even whitish. Two subspecies in the genus: see Table 4.8.

Table 4.8. – Comparison of characteristics between the subspecies *martrinii* and *fragrans.*

Character \ subsp.	***martrinii***	***fragrans***
Biotope	Cool to wet meadows, on acidic soils	Dry grasslands, garrigues, on alkaline soils
Flower scent	Unpleasant: bug; often not very fragrant	Pleasant: fruity, vanilla
Labellum colour	Dark red, brick red, seldom green	Variable: green, pink, red
Spur shape	Often swollen, wider and longer than the lip	Thin, conical, smaller than the labellum

Special features and forms
These plants are highly variable, particularly in terms of the shape and colour of the labellum and spur. We include another subspecies, subsp. carpetana, under the subspecies martrinii, following Griebl & Presser (2021), and consider that the subspecies coriophora is not present in the distribution. According to Delforge (2016), the character of spur thickness, which is extremely variable, is overrated and varies according to the shape of its opening on the labellum.

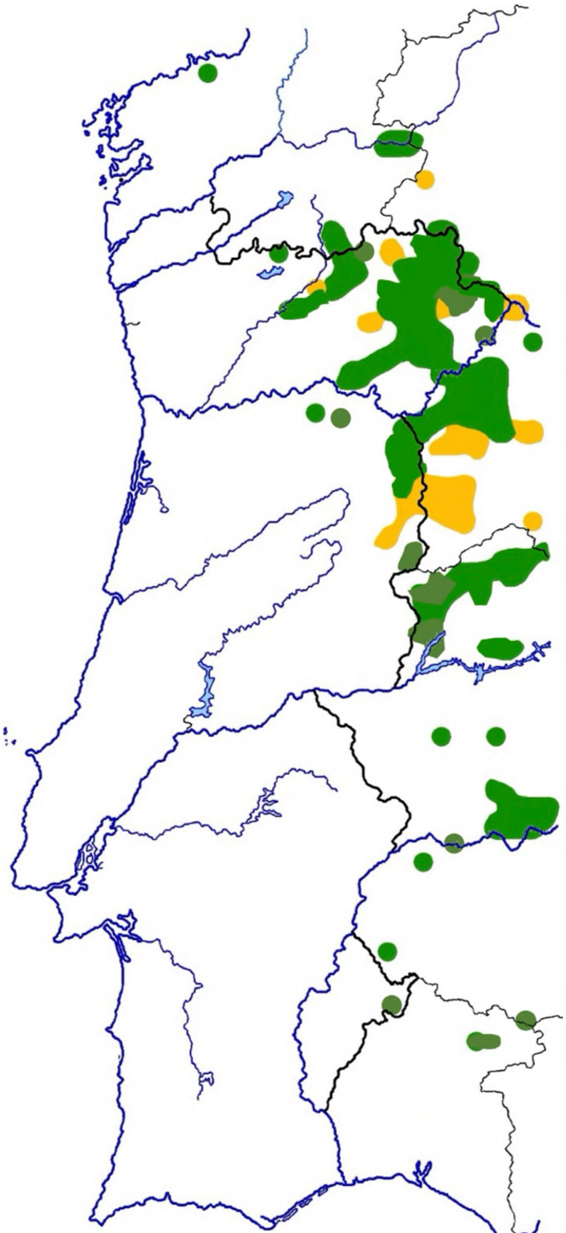
Biotope and ecology
Plants that thrive in full sunlight; meadows and grasslands that are more or less damp, depending on the subspecies (see Table 4.8).

Distribution
The species as a whole has a wide distribution across Europe and the Mediterranean region, extending as far as the Middle East (Iran) and Ukraine; to the north, it stops in central Germany and Poland (KRETZSCHMAR et al. 2007). However, its distribution has declined significantly in recent decades, and the species is more widespread around the Mediterranean, where the general range tends to be more or less the same for the two subspecies *coriophora* (including subsp. *martrinii*, which tends to dominate in the south) and *fragrans*. It is their ecological preferences that prevent them from meeting. At a more local level, in the Domain, as is the case in many other regions, the ranges of the two subspecies are quite disjointed, as shown in the distribution maps.

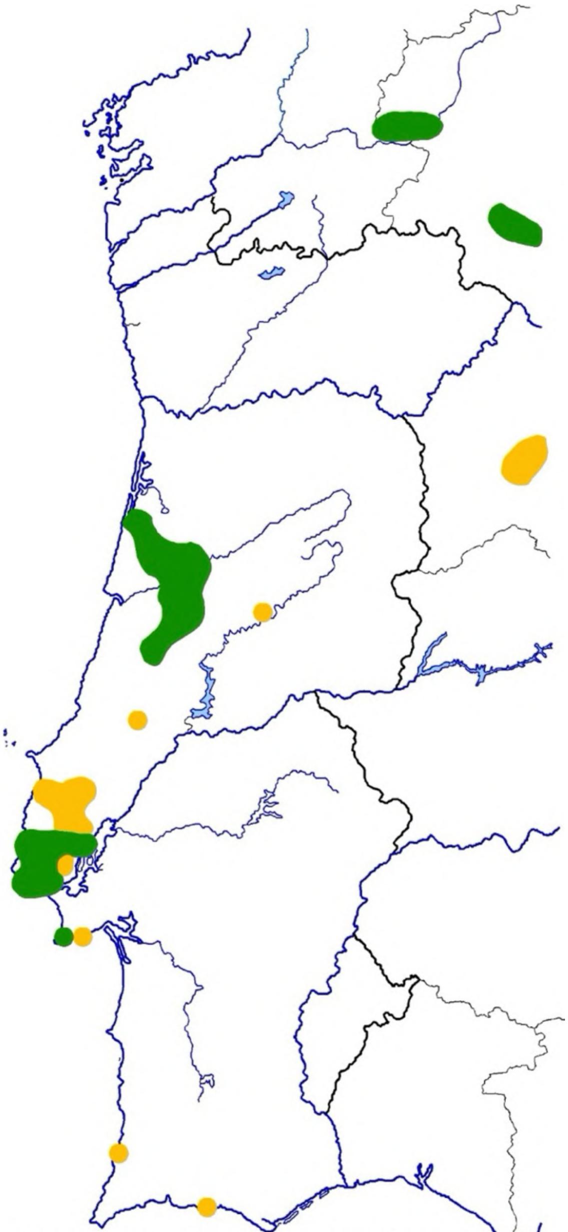
Situation in the study area

Due to changes in agricultural practices, grasslands traditionally used for fodder production are in decline, which mainly affects habitats that were previously widespread in north-eastern Portugal (Trás-os-Montes, Beira Alta: e.g. Paço – Sendim, Carrazeda de Ansiães, Vila Flor, etc.). These grasslands were once home to rich populations where at least four species of orchids could be found: in addition to *A. coriophora* subsp. *martrinii*, there were *Dactylorhiza caramulensis*, *Serapias cordigera*, *S. lingua*, and sometimes *Anacamptis champagneuxii*. It is high time to take action; this situation is fairly recent and should be reversible without too much difficulty. This observation obviously also applies to neighbouring regions in Spain, mainly in Castilla y León and Extremadura.

The situation is less critical for *A. coriophora* subsp. *fragrans*: there are still many scrublands where it can be found.



Anacamptis coriophora subsp. *martrinii*



Anacamptis coriophora subsp. *fragrans*

↓**Figs. 4.203** to **4.207**. *A. coriophora* ssp. *martrinii*
4.203, 4.205, 4.206: Bouça, Trás-os-Montes, 30 May 2008.
4.204: Angueira, Trás-os-Montes, 6 June 2021.
4.207: Paço (Sendim), Beira Alta, 9 June 2007.

↓**Figs. 4.208** to **4.211**. *A. coriophora* ssp. *fragrans*
4.208 to 4.210: São João das Lampas (north of Sintra), Estremadura, 28 April 2009.
4.211: São Romão, Beira Litoral, 2 May 2011.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Anacamptis papilionacea
Santiago do Cacém
27 March 2016

Anacamptis papilionacea (L.) R.M. Bateman, Pridgeon & M.W. Chase subsp. *grandiflora* (Boissier) Kreutz — Butterfly Orchid

Erva borboleta, Salepeira borboleta (port.), Hierba del muchacho, Lirios rojos, Orquídea mariposa (cast.)

Description

The butterfly orchid is rather slender, bearing its short inflorescence of very large flowers about 15 to 25 cm above the ground. There are 3 to 8 basal leaves, which are oblong to lanceolate in shape. In the subspecies we are concerned with here, subsp. *grandiflora*, the inflorescence is dense and bears 4 to 14 flowers. These are among the largest of the genus *Anacamptis* and perhaps of all European orchids, with the exception, of course, of the long straps of *Himantoglossum* or the large slippers of *Cypripedium*: the labellum is up to 25 mm long and 30 mm wide. The sepals and petals are arranged in a rather loose helmet; they are red and streaked with very distinct purple lines on both sides. The labellum, which is white to pale pink in colour, is densely covered with purplish lines radiating from the base towards the periphery, arranged in a fan shape. The spur is thin, shorter than the ovary and curved downwards, against the ovary.

Special features and forms

Among the subspecies of the butterfly orchid, this is the one with the largest flowers. The plant varies little: the flowers are sometimes smaller and more numerous, with denser inflorescences, tending to resemble the subsp. *papilionacea*. Exceptionally, the flowers may be entirely white; in this case, the stripes on the helmet are green.

Biotope and ecology

The plant grows in scrubland and open grasslands, sometimes under bushes, on soil that is generally calcareous or alkaline.

Distribution

All subspecies combined, the species is essentially Mediterranean, scattered throughout the Mediterranean region. It varies greatly depending on the region, so that there are at least six subspecies and/or varieties. The subspecies present in this area is distributed throughout the Iberian Peninsula, more densely in the south, in the Maghreb, the Balearic Islands, Corsica, Sardinia and Sicily, and is practically absent from Italy and further east. In our Domain, its presence is rather patchy in the southern half of Portugal, and more dense in Extremadura.

Situation in the study area

The species' biotopes are not generally under threat at present; given its highly attractive appearance, the main danger seems to be picking. Despite its rarity, the plant does not have any special IUCN status and is therefore not protected.


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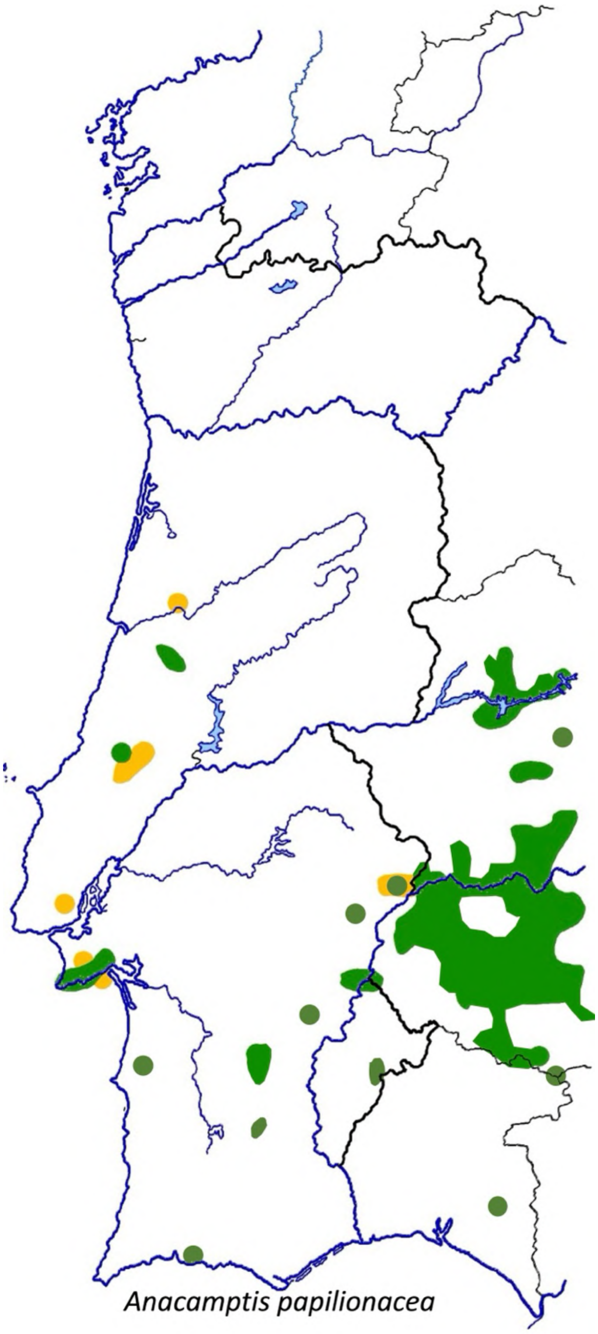


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Figs. 4.212 to **4.216**. *Anacamptis papilionacea*. 4.212, 4.214: Santiago do Cacém, Baixo Alentejo, 27 March 2016.
4.213, 4.215-216: Azeitão, Serra da Arrábida, Estremadura, 10 April 2016 (4.213), 22 March 2008 (4.215-216).

Anacamptis morio subsp. *picta*
São João da Pesqueira
10 May 2011

Anacamptis morio (L.) R.M. Bateman, Pridgeon & M.W. Chase

subsp. *morio* Green-winged Orchid

subsp. *picta* (Loisel.) P. Jacquet & Scappaticci Painted Orchid

Erva do salepo, Fatua, Testículo de cão (port.), Cojón de perro, Compañón, Compañón de perro, Satirión, Testículos de perro (cast.), Satirión encarrapuchado (gal.)

Description
A fairly small plant (10–25 (–30) cm), with four to ten linear to lanceolate basal leaves and two to four cauline leaves enveloping the stem. Loose inflorescence, few flowers (5 to 20 flowers). Flowers of various colours, most often purple, sometimes paler, even white. Labellum significantly wider than long, trilobed, with lobes more or less folded back, with a paler centre with coarse purple dots. Petals and sepals joined in a helmet, purple in colour; the veins of the sepals, clearly marked and green, give the flower a characteristic appearance. Fairly long spur (about as long as the labellum), curved upwards.

Special features and forms
Two subspecies exist in the species, often considered as distinct species. However, the subsp. *picta* is often criticised because it is poorly defined or too heterogeneous. The following comment can be found in online literature (John & Gerry's Orchids of Britain and Europe 2025[2]): 'The *A. picta* type has several distinct features which set it apart from *A. morio* but finding typical specimens is far from easy, identification often determined purely on the balance of probabilities.' Furthermore, 'the following characteristics [of *A. picta*] are normally accepted as being indicative: 1. the plant is generally shorter and more spindly than *A. morio.* 2. the inflorescence is more pyramidal and lax. 3. the lip is less recurved and gives a more spreading, fan like appearance. 4. flower colouration is usually darker and less often occurs in pale pink or white. 5. it seems far more tolerant of calcareous soils whereas *A. morio* favours neutral substrates. 6. The spur is finer and more upward pointing.' I would tend to add a seventh characteristic, on which KRETZSCHMAR et al. (2007) agree: 'in subsp. *picta*, the median lobe of the labellum is shorter than the lateral lobes; the tips of the lateral lobes are considerably longer and mark the front edge of the spread labellum, which is clearly narrower on average than in subsp. *morio*'.

Biotope and ecology
Colonies of *Anacamptis morio* are found in open habitats with low vegetation. In the UK, it is mainly found in scrubland and maquis, in cistaias, sometimes in sparse oak woods or pine forests (subsp. *morio*), and sometimes in semi-natural grasslands (subsp. *picta*).

Distribution
This species is widespread throughout much of Europe and the Mediterranean Basin. The range of the subsp. *morio* extends to Ireland, England, the Baltic States and the Balkans. The southern subspecies *picta* is much more limited: southern Iberian Peninsula and southern France (KRETZSCHMAR et al. 2007). Curiously, on a more local scale, the situation seems to be reversed: looking at the distribution maps below, subsp. *picta* is more widespread in the north (Galicia) and east (Extremadura), while in the south-west, subsp. *morio* is more common, as noted by TYTECA (1998) and reported by KRETZSCHMAR et al. (2007).

Situation in the study area
No particular threats appear to affect subsp. *morio*, which is found in a variety of habitats, whereas the situation is potentially more critical for subsp. *picta*, particularly in northern Portugal (e.g. habitat shared with *Neotinea ustulata*, see that species).

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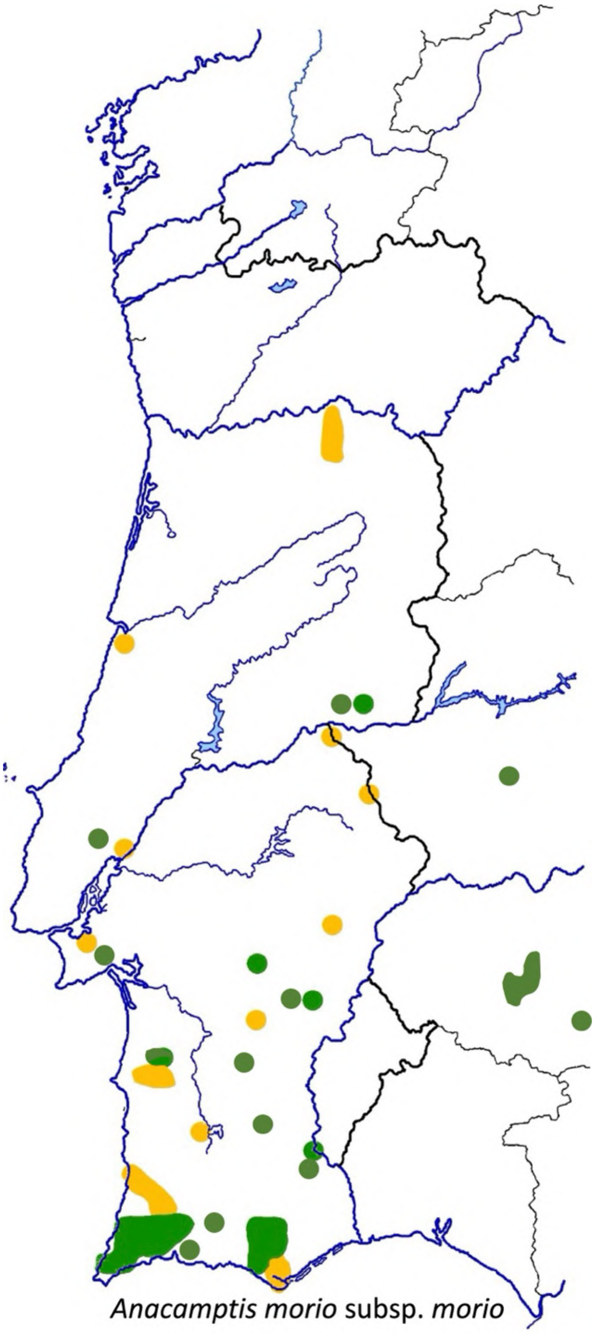
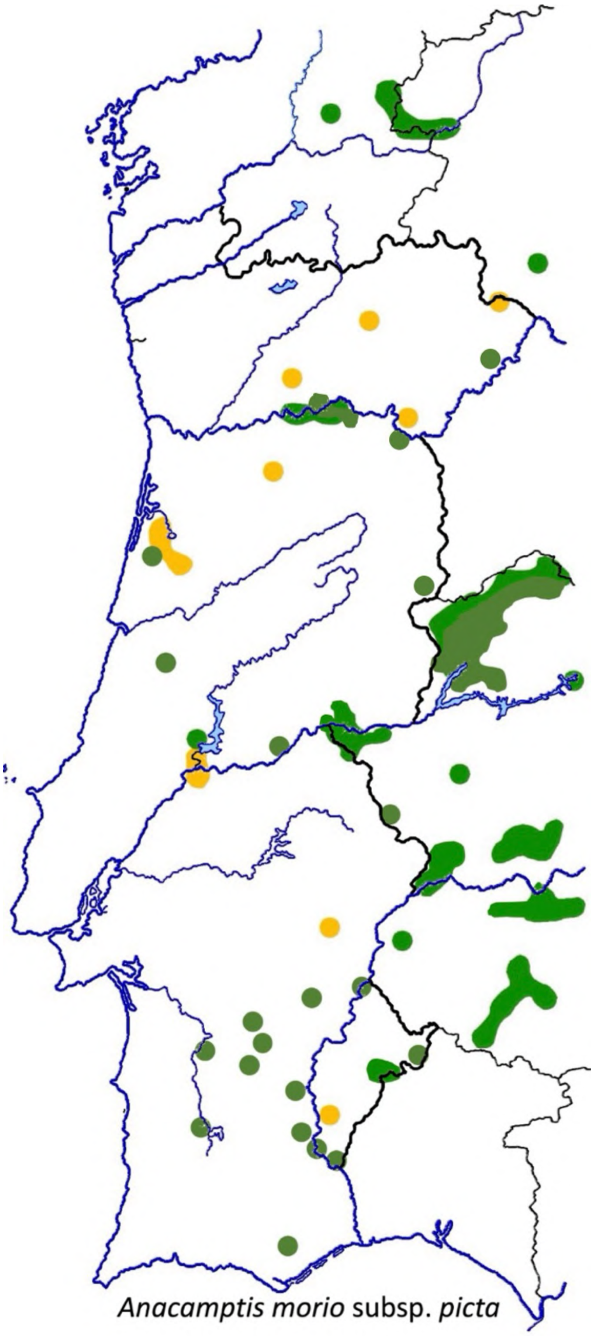
[2] http://www.orchidsofbritainandeurope.co.uk/Anacamptis%20picta.html.



Anacamptis morio subsp. *morio*



Anacamptis morio subsp. *picta*

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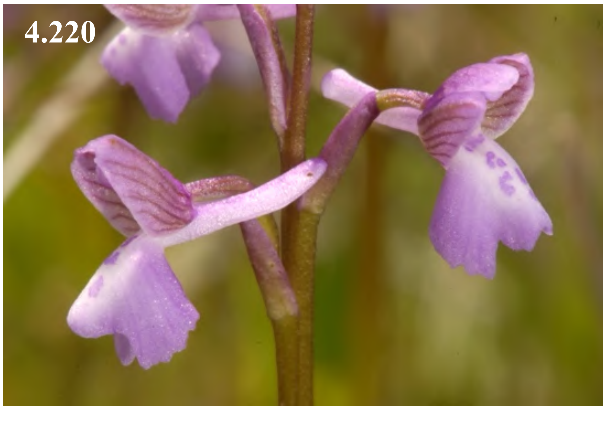

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Figs. 4.217 to **4.219**. *A. morio* subsp. *morio*. Vila do Bispo, Algarve, 19 March 2008.

4.221

4.222

Figs. 4.220 to **4.222**. *A. morio* subsp. *picta*.
4.220: S. João da Pesqueira, Trás-os-Montes, 10 May 2011.
4.221-222: Salir, Algarve, 4 March 2011.

Anacamptis champagneuxii (Barnéoud) R.M. Bateman, Pridgeon & M.W. Chase **Champagne Orchid**

Description

Very small plant (10–30 cm), usually with 2–3 tubers, the 1–2 new ones more or less long-stalked. Six to eight narrow, lanceolate leaves, the basal ones in a rosette and the two to three cauline ones enveloping the stem. Very loose inflorescence with few flowers (4 to 15 flowers). Flowers generally purple, sometimes paler. Labellum distinctly wider than long, 11 to 14 mm wide, trilobed, with lateral lobes strongly folded back, with a broad central area that is pure white or covered with more or less marked pink to purplish longitudinal spots of varying sizes. Petals and sepals joined together in a helmet, purplish in colour; sepals with clearly marked veins. Fairly long spur (about as long as the labellum), curved upwards.

Special features and forms

A fairly uniform plant, except for the central white area of the labellum, which is either immaculate (= f. *champagneuxii*, Fig. 4.226) or covered with more or less pronounced pink to purplish longitudinal spots of varying sizes [= *Anacamptis champagneuxii* f. *mesomelana* (Rchb.f. 1851) D. Tyteca, comb. nov. – basionym *Orchis morio* var. *mesomelana* Rchb.f. (1851), Figs. 4.227 and 4.228]. The two forms occur in varying proportions in different populations. Due to vegetative propagation, these populations are often very dense and abundant.

Biotope and ecology

Grasslands, meadows, scrubland, very open areas. Full sun plant. Two ecotypes appear to exist, with no apparent morphological difference: a rather dry calcareous grassland ecotype, widespread in the south (see map), and a wet meadow ecotype, on rather crystalline soils, widespread in the north.

Distribution

The general range is restricted to the Iberian Peninsula (fairly widespread) and the south of France (more scattered). In the study area, the wide distribution is evident in the southern half of Portugal and Extremadura, and more towards the north-east (Trás-os-Montes, Beira Alta, Castilla y León).

Situation in the study area

The species is more threatened in the northern part, due to the general decline of wet grasslands.


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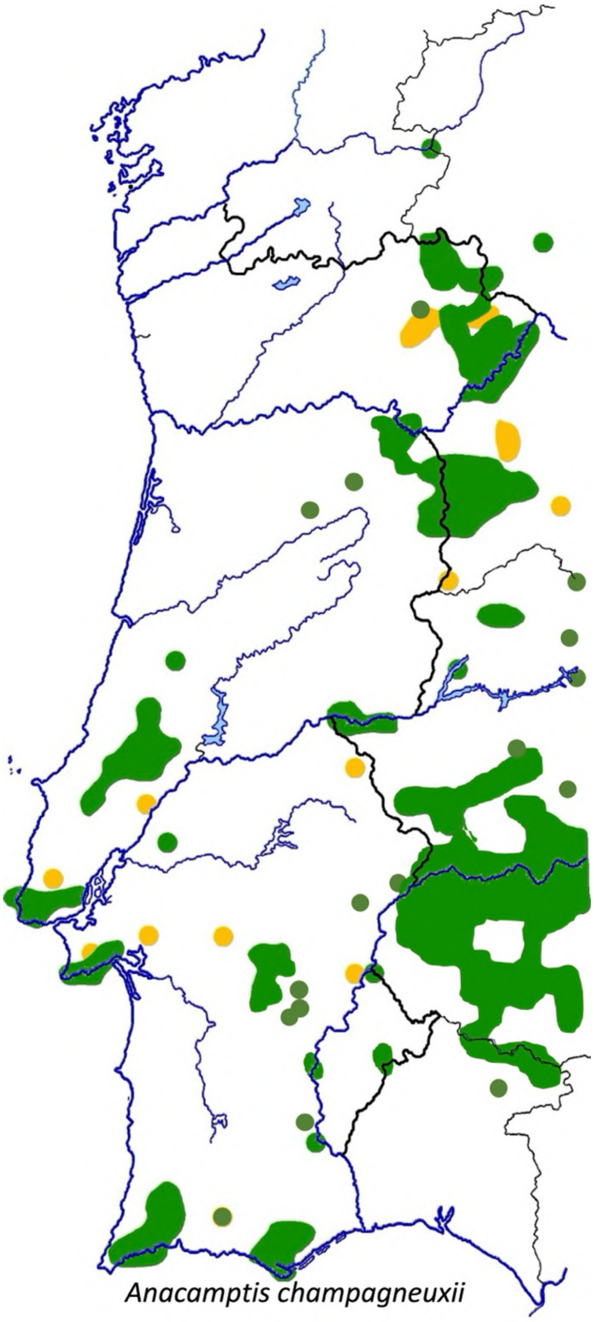

Anacamptis champagneuxii

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Figs. 4.223 to **4.228**, two previous pages. *Anacamptis champagneuxii*. 4.223-224: Albufeira do Azibo, Trás-os-Montes, 9 May 2024. 4.225: Serra dos Candeeiros, Estremadura, 28 March 2008. 4.226: Porches, Algarve, 29 March 2016. 4.227: Messines, Algarve, 30 March 2016. 4.228, Rabaçal, Beira Litoral, 1 April 2016.

Anacamptis hybrids

Figs. 4.229 to **4.236**. This page and the next: hybrids of *Anacamptis*. 4.229-230 and 4.232: *A. pyramidalis* and *A. coriophora* subsp. *fragrans* (4.229) and their hybrid (4.230, 4.232), São Romão, Beira Litoral, 13 May 2001 (4.230) and 2 May 2011 (4.229, 4.232). 4.231: the rare hybrid between *A. papilionacea* and *A. coriophora* subsp. *fragrans* – photo J. MONTEIRO, Outeiro, 18 May 2012.


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On the other hand, on this page, perhaps the most frequently observed hybrid between two *Anacamptis* in Portugal, between *A. papilionacea* and *A. champagneuxii*. Top, 4.233-234: Telhados Grandes, Porto de Mós, Estremadura, 16 April 2022; bottom, 4.235-236: Degracias, Beira Litoral, 5 May 2019.


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Serapias lingua & S. cordigera
Paço-Sendim, Beira Alta
30 May 1990

***4.17.* Serapias**

Serapias are one of the most unusual genera among our native orchids, with their very bright red flowers, comprising on the one hand a "cavity" formed by the sepals (and petals) around the base of the labellum, the hypochile, and on the other hand the outer part of the labellum, the epichile, emerging from this cavity, projecting forward, falling downward, or thrown backward. The hypochile also has, near its base, a callosity that can take on various forms depending on the species and play various roles in pollination strategies, either as a guide to properly orient potential pollinators, or sometimes even as an organ that arouses sexual excitement, as is the case with *Ophrys*, which will be the subject of the next chapter. This hypothesis arose following observation of the behaviour of certain male insects coming into contact with this callosity in *Serapias lingua* (VEREECKEN et al. 2012).

Until recently, three species of *Serapias* were known to exist in Portugal and neighbouring regions: *S. lingua*, *S. parviflora* and *S. cordigera*. A fourth species was also believed to be part of the indigenous flora, namely *S. vomeracea*, which resembled certain forms of *Serapias* with a more or less elongated epichile. This interpretation has recently been called into question, as the plants in question did not display all the characteristics of this species of *Serapias*, which is otherwise widespread in the Mediterranean basin. Thus, the Dutch botanist C. VENHUIS and his colleagues attributed different forms, previously identified as *S. vomeracea* in different locations on the Iberian Peninsula, to distinct species, one already described previously (*S. strictiflora*) and two others to taxa that they described as new, *S. occidentalis* (VENHUIS et al. 2006) and *S. cordigera* subsp. *gentilii* (VENHUIS et al. 2007), the latter being reclassified as a species by K. KREUTZ (2024). Meanwhile, P. DELFORGE (2004) had also described a new taxon, *S. elsae*, immediately at species level, close to *S. strictiflora*; while *S. perez-chiscanoi* was already known as a distinct species since 1990 (ACEDO 1990). Of the five taxa discussed above, three have been described from Portugal (*S. strictiflora*, *S. elsae*, *S. gentilii*) and also exist in Spain, while the other two (*S. occidentalis* and *S. perez-chiscanoi*) were described from Spain (Extremadura) but have also been found in Portugal (see in particular PESSOA et al. 2011).

We are therefore left with eight species: the three original ones (*S. lingua*, *S. parviflora* and *S. cordigera*), plus the five we have just mentioned. We include them all in this book, at the specific level. To aid identification, we believe it useful to reproduce here the small diagram proposed by VENHUIS et al. (2007). In addition to colour, which is essential for identification, the other characteristics shown in this figure relate to the shape and dimensions of the different parts: the width of the epichile, the dimensions and overlap of the epichile in relation to the hypochile, the position and structure of the callosity, etc. are all characteristics that should be taken into account.

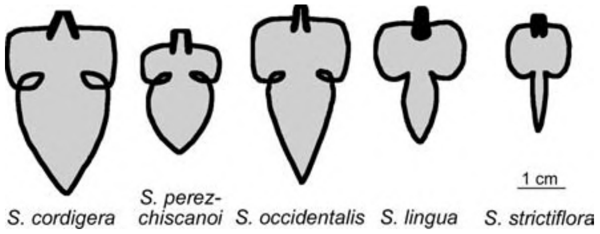


Figure 4.237. Diagram by VENHUIS et al. (2007) showing the respective shapes and dimensions of the hypochile and epichile in five species of *Serapias*.

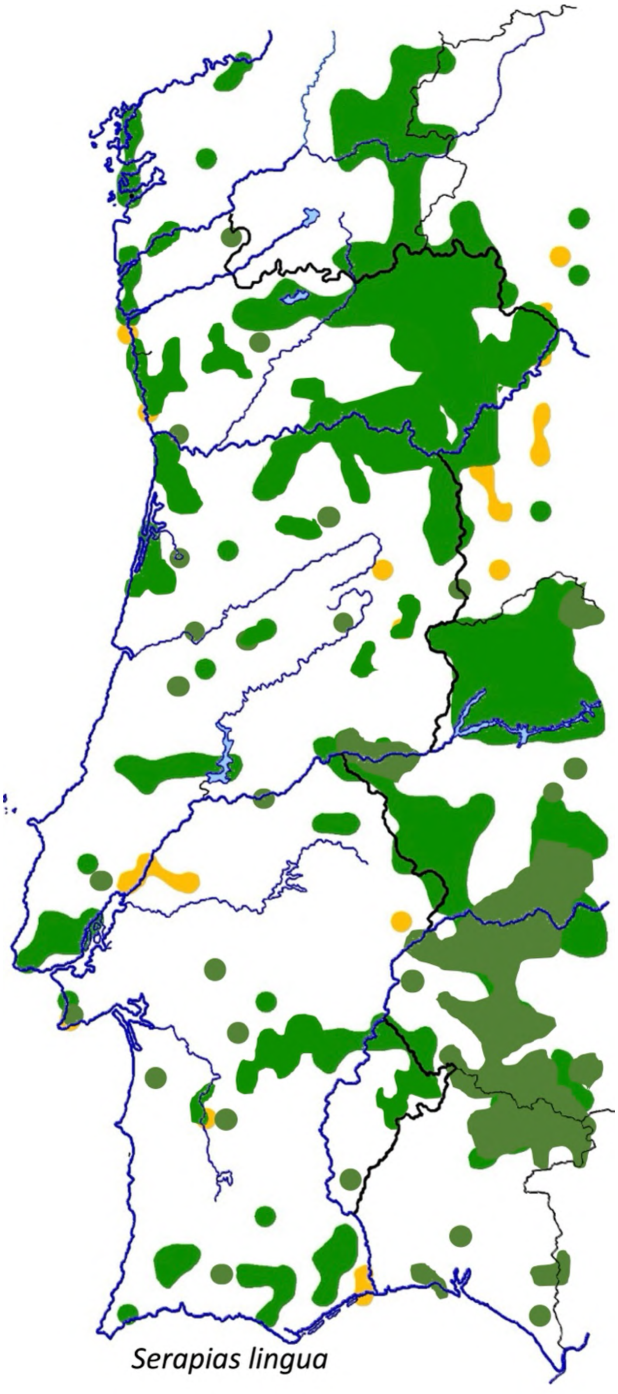
Let us conclude this introductory section by noting that the different species of *Serapias* hybridise extensively: as soon as two or more species are brought together in a given biotope, hybrids can be expected to occur. Nevertheless, postzygotic barriers are effective and crossbreeding rarely extends beyond the first generation, thus confirming the relevance of the species concept. We will give a few examples of hybrids in the following pages. Some of the past hybridisations may well have been the origin of some of the taxa we have discussed (*S. strictiflora*, *S. elsae*, *S. occidentalis*). In other cases, the origin of certain species (*S. perez-chiscanoi*, *S. gentilii*) may be found in lack of fitness linked to inbreeding.

However, hybridisation does not only occur between species of the genus *Serapias*: hybrids can also form between species of *Serapias* and species of the genus *Anacamptis*, which is made possible by the correspondence in chromosome numbers between the two genera (generally 2n = 36) and their proximity in the phylogenetic tree (Fig. 3.1 in Chapter 3: the clades of *Anacamptis* and *Serapias* are indeed sister clades). We will see an example of crossbreeding between species of these two genera, but there are most likely others in the study area.

Other aspects characterise *Serapias*: we often deal with plants growing in groups of identical plants due to vegetative reproduction (two new tubers instead of one, often pedunculated), which is particularly evident in certain species (*S. lingua*, *S. strictiflora*, *S. elsae*) and their hybrids.

Serapias lingua L. Tongue Orchid

Serapião, Erva língua (port.), Gallos, Serapias (cast.), Lengüeira (gal.)



Description
Slender plant, 10 to 40 cm tall, with four to eight linear to lanceolate basal leaves, erect to arching downwards. Loose inflorescence, with 2 to 6 flowers. Helmet (formed by the union of sepals and petals) ± horizontal, grey to purplish, veined with purple-violet. Petals with an oval base and a long tapered tip. Labellum with short, sparse hairs, especially at the base of the epichile; basal callus ellipsoidal, entire, purplish-black, very visible from the outside (Fig. 4.239), sometimes with a slight longitudinal groove towards the base. Hypochile 8-15 mm x 13-18 mm, dark purple, inserted into the helmet or with slightly emerging lateral lobes. Epichile 8-18 mm x 4-12 mm, directed forwards and more or less pendulous, rarely folded back, variable in colour: pink-light red to salmon, sometimes yellow, sometimes lighter (whitish) at the centre.

Special features and forms
This is the most characteristic and easily recognisable of our *Serapias*. The colour and shape of the epichile can vary between groups of plants or between populations; within a single group, all plants are identical due to vegetative reproduction. Groups can be large, sometimes numbering hundreds of individuals.

Biotope and ecology
The tongue serapias can grow in a wide variety of situations, always in open, sunny areas. It is found in cool to damp meadows, more rarely in dry scrubland, in ditches or embankments, roadsides, etc., in alkaline to slightly acidic soils. It is one of the most widespread orchids in the whole area.

Distribution
As shown on the map, it is one of the most widespread species in all areas of the study

territory. *S. lingua* is widespread throughout much of the Mediterranean Basin, from the Iberian Peninsula and North Africa to Crete and Rhodes in the east; it extends northwards in France as far as Brittany and has even been observed in south-east England, where it is now considered naturalised (COLE & WALLER 2020).

Situation in the study area

The tongue orchid does not appear to be threatened at present in the study area.

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Figs. 4.238 to **4.241**. *Serapias lingua*. 4.238: Torre de Moncorvo, Trás-os-Montes, 28 May 2008. 4.239 (above, top: photo showing the callosity at the base of the labellum). 4.240 (left): Tunes, Algarve, 1 April 2008. 4.241 (above, bottom): Galaxos, Algarve, 16 April 1995.

Serapias strictiflora
Tunes, Algarve
1st April 2008

Serapias strictiflora Welwitsch ex Veiga Straight-flowered Tongue Orchid

Serapias elsae P. Delforge Elsa's Tongue Orchid

Erva língua dos charcos, Serapião dos charcos (port.)

Description

In broad terms, the description of *Serapias lingua* can be applied to these two species, which probably originate from ancient hybridisations between *S. lingua* and another species, *S. parviflora*, which we will discuss shortly after. These are slender, upright plants, 10 to 40 cm tall, with four to eight linear to narrowly lanceolate leaves, often growing in dense, compact groups due to vegetative propagation. The differences are more noticeable in the floral part, as shown in the table below, which also includes the fourth species, *S. parviflora*.

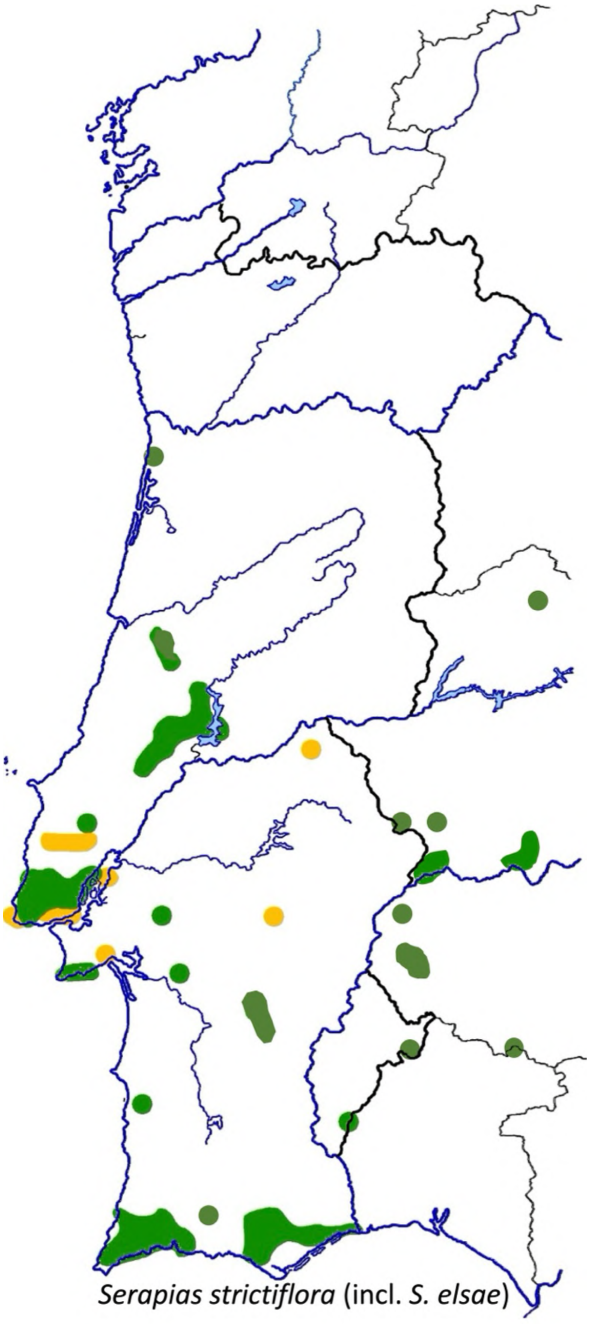
Table 4.9. – Comparative floral characteristics of four species of *Serapias*.

Charact \ Species	*S. lingua*	*S. strictiflora*	*S. elsae*	*S. parviflora*
Number of flowers	2 to 6	2 to 6	3 to 8 (-10)	3 to 8 (-12)
Petal shape	Oval base, long tapered tip	Oval base, long tapered tip	Narrow base, gradually tapering tip	Elongated teardrop shape
Hairiness of labellum	Short and sparse; towards epichile base	Light, dense and long hairiness	Whitish, dense hairiness	Whitish, sparse and short hairiness
Epichile dimension	8-18 x 4-12 mm	9-16 x 2,5-6 mm	14-21 x 6-12 mm	6-10 x 3-5 mm
Epichile port	Variable direction, most often → forward	Variable direction, most often → downwd	Generally pendant	Most often backward
Epichile colour	Generally light pink-red	Most often dark brick red	Yellowish to light ochre red	Light pink-red, sometimes yellowish
Labellum callosity	Entire, sometimes furrowed	Deeply canaliculate, with ridges	± deeply canaliculate	2 separate lamellae, slightly divergent

Special features and forms

S. strictiflora is generally considered to be a hybrid between *S. lingua* and *S. parviflora* (see discussions in SUNDERMANN 1980 – under the name "subsp. *nova*" of *S. parviflora* –; TYTECA 1987, 1998; DELFORGE 1994). This species occupies a significant area in Portugal, where in some regions it even tends to replace *S. lingua*, particularly in the Algarve (TYTECA 1998). *S. strictiflora* is nevertheless found here and there alongside the latter; I have often referred to it as 'transitional populations from *S. strictiflora* to *S. lingua*' (TYTECA 1998), but without deciding at that time in favour of another independent taxon. This step was taken by P. DELFORGE (2004) when he described *Serapias elsae*. Being intermediate between *S. lingua* and another intermediate (*S. strictiflora*), and undoubtedly still in a phase of evolution and stabilisation, it could have been risky to describe it outright as a new species, but this name now exists, and it is not unreasonable to take it into account in survey inventories. The intermediate appearance between *S. lingua* and *S. strictiflora* is more or less clear (see table), but it is therefore *a posteriori* that, for the purposes of this work, I have interpreted some of my data and photos as representative of *Serapias elsae*.

Figs. 4.242 and **4.243** (next page). *Serapias strictiflora*.
4.242: Algoz, Algarve, 29 March 2016. 4.243: Tunes, Algarve, 1 April 2008.


Serapias strictiflora (incl. *S. elsae*)

Biotope and ecology

The two taxa discussed here (*S. strictiflora* and *S. elsae*) can be expected to be found in areas suitable for both ancestral species (*S. lingua* and *S. parviflora*), which are plentiful; in general, these will be biotopes in full sunlight, more or less humid, on slightly alkaline or, more rarely, slightly acidic soils. Strictly dry habitats are not normally suitable. We are therefore dealing with meadows, grasslands and cool scrubland, sometimes on sandy soils that retain water.

Distribution

What has just been said about the biotope can also be said about distribution; in fact, the two species are sometimes found together in the same locations. Due to a lack of relevant data, I am currently unable to provide a separate distribution map for *S. elsae* compared to *S. strictiflora*. The range of *S. strictiflora*, which currently encompasses that of *S. elsae*, covers a good half of southern Portugal; outside of this, it is found in Spain, in Extremadura as shown on the map, but also outside the area considered in this work: Andalusia, Alicante, the Balearic Islands and northern North Africa (KREUTZ 2024). Similar data are available for *S. elsae*, but only for Portugal, Andalusia and Extremadura (KREUTZ 2024).

Situation in the study area

The slightly damp grasslands in the south of the Iberian Peninsula are not always in a good position given the current property boom: although still fairly common today, the habitats of the two species in question are under threat if adequate measures are not taken.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Figs. 4.244 to **4.248**. *Serapias elsae*. 4.244: Algoz, Algarve, 29 March 2016. 4.245-4.248: Foia (Serra de Monchique), Algarve, 22 April 2009.

Serapias parviflora Parlatore Small-flowered Tongue Orchid

Serapião de língua-pequena, Erva língua menor (port.), Gallos (cast.), Crista de galo miúda (gal.)

Description

S. parviflora is a familiar sight to anyone exploring the garrigue. Unlike the first three species listed, this one is most often found growing alone; vegetative reproduction is therefore not an option here. Another mechanism comes into play, that of self-pollination, ensuring effective reproduction. Small-flowered Serapias is distinctive with its 10 to 35 cm tall stems bearing, as the name suggests, up to a dozen small flowers whose colour is not as pronounced as those of the three previous species: most often pale pink to deep pink, they are also frequently yellowish to whitish, due to autogamy. The small size of the flowers is immediately striking: as indicated in the table above, S. parviflora has the smallest epichilum of the four species considered so far, and the other floral parts are also in these proportions. As the table also shows, other characteristics that distinguish it from the first three species are the less finely acuminate petals, the epichile generally curved backwards towards the stem, and the basal callosity of the hypochile clearly divided into two separate lamellae.

Special features and forms

As the plant grows in isolated individuals, we do not see the dense groups of plants that are common among the other three species. Self-pollination results in plants quickly developing seed capsules, and also in the prevalence of flowers of the same colour within a given population. Exceptionally, there may be flowers with epichilums pointing downwards or even forwards, a characteristic that is retained within the same population.

Biotope and ecology

Of the four species considered so far, *S. parviflora* is clearly the most xerophilous: it is found in dry, rocky scrubland, alongside other orchid species familiar to these areas, typically *Orchis* (*O. italica* or *O. anthropophora*) or *Ophrys*. However, the plant does not disdain cooler locations, as it is also found growing alongside *S. lingua* and/or *S. cordigera* in more humid biotopes, typically valley floor meadows.

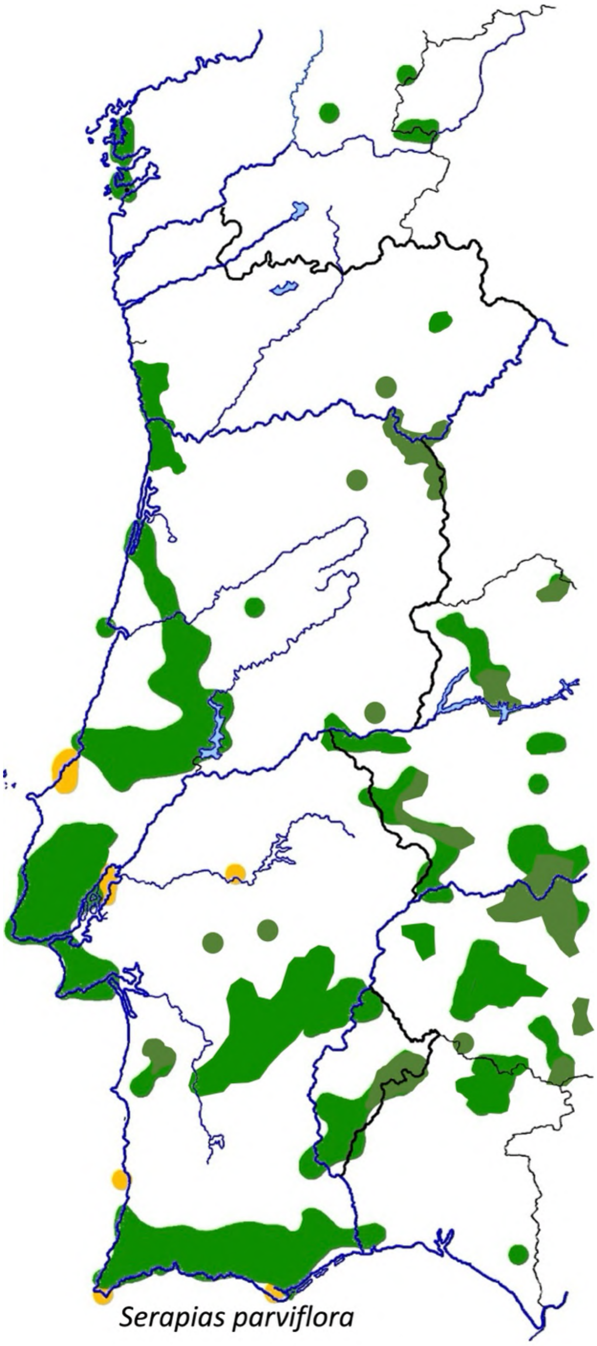
4.249

Distribution

Serapias parviflora has a similar distribution range to that of *S. lingua*: throughout the Mediterranean Basin, from the west to Cyprus via northern North Africa; in France, it extends as far north as Brittany and even south-west England (COLE & WALLER 2020); to the west, it is found in the Macaronesian Islands; however, the plant found in the Canary Islands is considered by C.A.J. KREUTZ (2024) to be a distinct taxon, *S. mascaensis*, distinguished in particular by the fact that it is allogamous. In the study area, the map clearly shows that the species is fairly widespread.

Situation in the study area

At present, the species does not appear to be threatened in the territory studied.



Figs. 4.249 to **4.252**. This page and the previous one. *Serapias parviflora*. All photos taken near Tunes railway station (Algarve), 1 April 2008.

Serapias cordigera L. Heart-flowered Tongue Orchid

Serapião de flores grandes, Erva língua maior (port.), Estrangurria, gallos (cast.), Crista de galo grande (gal.)

Description

A robust plant, 15 to 50 cm tall, growing singly or sometimes in groups, with 4 to 9 linear to lanceolate leaves. The stem is often spotted with blackish dots or dashes at the base. Inflorescence of 4 to 10 (-15) large, dark red flowers, with an epichile measuring (15-) 20 to 30 (-35) mm long by (10-) 15 to 25 mm wide, almost as wide as the spreading hypochile. Epichile reddish-brown to blackish purple, broadly cordate, with dense, long purple hairs; base of the hypochile with two divergent, blackish purple lamellae. Of all our species of *Serapias*, this is the tallest and has the largest flowers.

Special features and forms

This plant is often impressive in size and robustness, frequently forming spectacular populations due to the number of individuals (see photo below). It should not be confused with closely related taxa, derived from it by hybridisation (*S. occidentalis*), or by degeneration following evolution towards self-pollination, which is frequently observed (*S. gentilii* or *S. perez-chiscanoi*). The three species listed, which form pure populations, are also described below.

Biotope and ecology

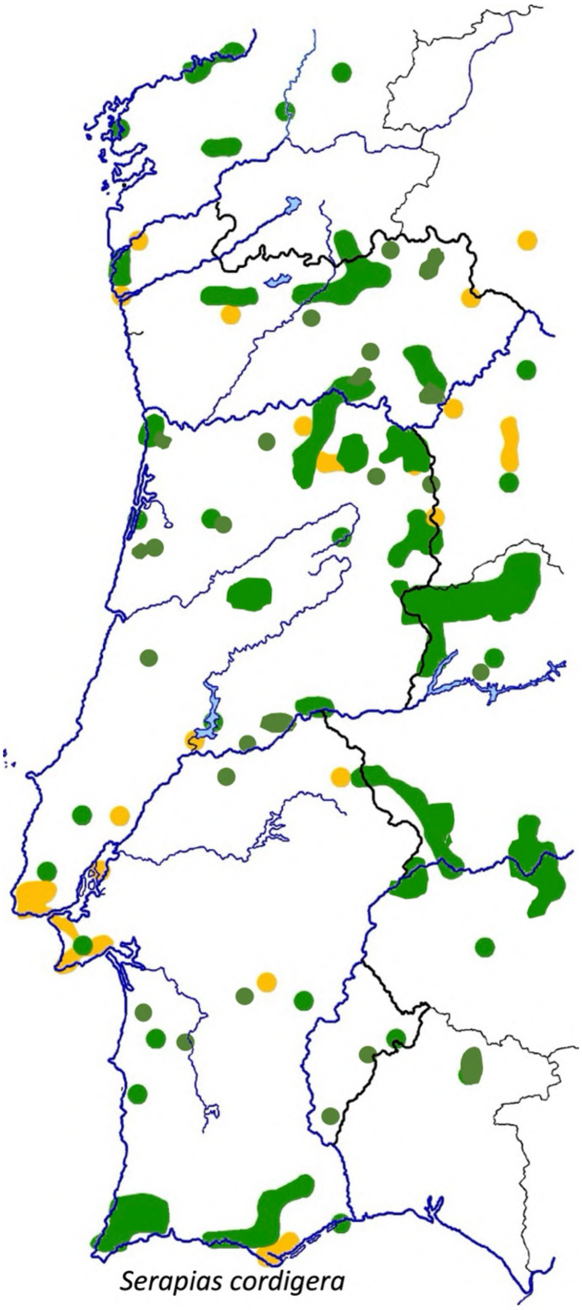
Its habitat is similar to that of other *Serapias*: meadows and grassy areas that are more or less cool to damp, scrubland; it is less common in drier locations and prefers slightly acidic soils.

Distribution

Widespread throughout the study area. Extensive distribution throughout the Mediterranean Basin: Iberian Peninsula, northern Maghreb, in France as far as Brittany; becomes rarer in the east, where it reaches Crete and western Anatolia.

4.253

Figs. 4.253 to **4.257**. *Serapias cordigera*. 4.253 (above): Vila Flor, Trás-os-Montes, 28 May 2008. Other photos on the following page: 4.254: Serra de Nogueira, Trás-os-Montes, 9 June 2007. 4.255: Decermilo, Beira Alta, 10 June 2023. 4.256-257: Sendim, Beira Alta, 9 June 2007.



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Serapias occidentalis C. & P. Venhuis Western Tongue Orchid

Description and special features; situation in the study area

The 'western serapias' is a unique species, clearly related to *Serapias cordigera*, with which it shares large dark red flowers, but with some important differences, as we shall see. It was only recently described, from Spanish Extremadura, by C. and P. VENHUIS (VENHUIS et al. 2006). This *Serapias* is thought to be the result of an ancient hybridisation between *S. cordigera* and *S. vomeracea*, the latter no longer being in contact with the hybrid descendant and, moreover, absent and distant from the territory studied in this work.

Since its description, based on observations made in the large humid valleys of Extremadura, there appears to have been considerable destruction of sites due to the intensification of agriculture and the resulting drainage operations, which has led to a definite decline in the plant's numbers. However, it has since been found in Portugal (PESSOA et al. 2011), where it is also threatened for the same reasons, but some sites still seem to be unaffected because they are located on slopes unsuitable for agriculture. As in the original Spanish localities, these sites are characterised by winter and spring humidity, which is generally favourable for *Serapias* species. Currently, there are about twenty known sites in Portugal, some of which have unfortunately already been lost (KREUTZ 2024).

The plant is not as slender and spectacular as *S. cordigera*, with a height of 10 to 40 cm. The inflorescence is loose and has only 2 to 6 fairly large flowers, similar in size to those of S. cordigera. The epichile is 15 to 28 mm long and 8 to 19 mm wide, which is significantly narrower than that of *S. cordigera*. Compared to the latter, it is clear that the epichile is narrower and less red in colour (see photos), reflecting the influence of *S. vomeracea*. The hairiness of the labellum is quite similar to that of *S. cordigera*.

Biotope and ecology

As already mentioned above, *S. occidentalis* is found in grasslands that are wet in winter and spring, which are very poor in nutrients. These habitats are called *dehesas* in Spain and *montados* in Portugal, literally meaning sparse woodland pastures.

Distribution

To our knowledge, the species does not exist outside the territories constituting the range, apart from the eastern part of Extremadura (VENHUIS et al. 2006).

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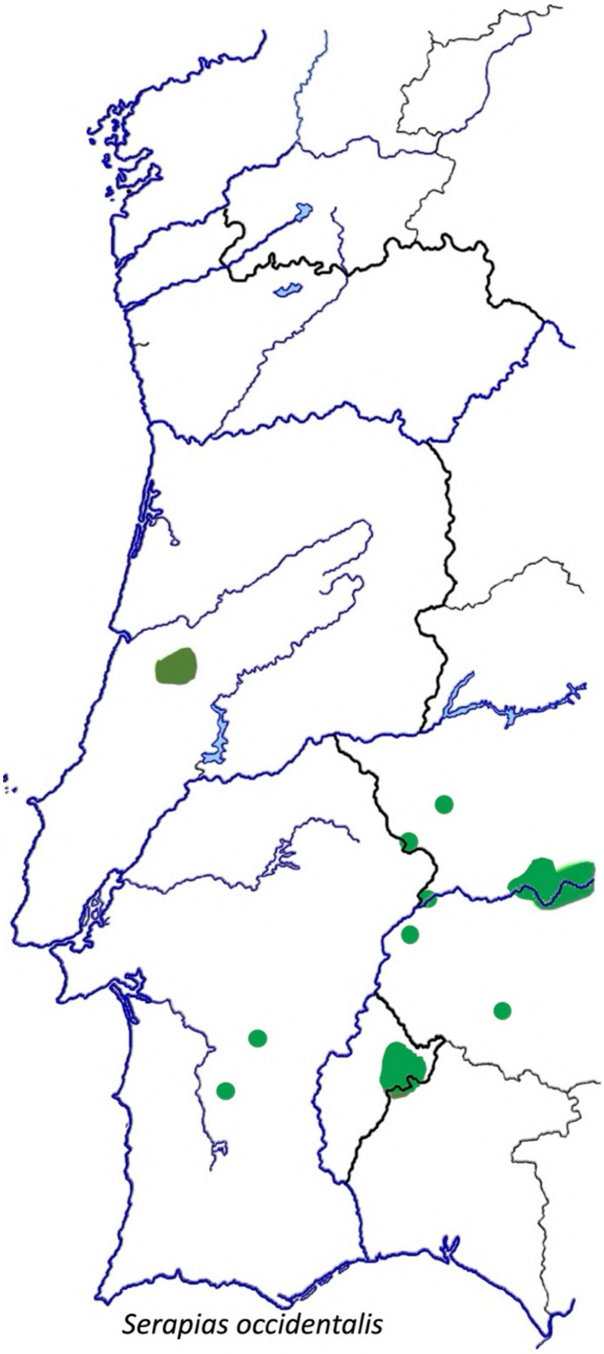
Figs. 4.258 **to** 4.262. This page and the next. *Serapias occidentalis*. Casmilo, north of Serra do Sicó, Beira Litoral, 7 May 2011.


Serapias occidentalis

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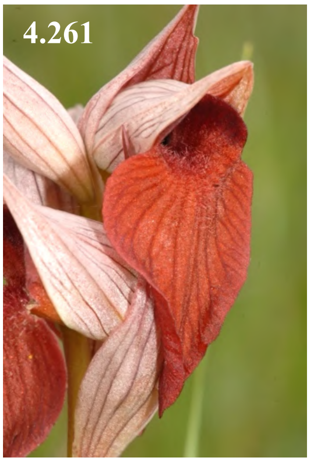

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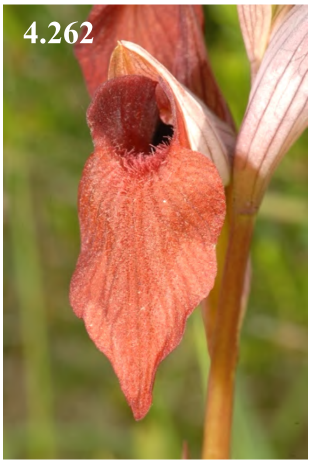

Serapias gentilii
Barranco do Velho, Algarve
23 April 2009

Serapias gentilii (C. & P. Venhuis & Kreutz) Kreutz   Gentil's Tongue Orchid

Description

A low-growing plant (10-25 cm), fairly robust, bearing 5 to 11 linear to lanceolate leaves. Dense inflorescence, bearing 3 to 11 large flowers. Hypochile 9 to 13 mm long and 16 to 24 mm wide, pink to red with two divergent lamellae, dark purple. Epichile slightly cordate, with edges often curved forward, 15 to 24 mm long and 13 to 20 mm wide, therefore narrower than in *S. cordigera*, varying in colour from whitish, yellowish to pale greenish, pink to more or less dark red, with fairly long whitish to reddish hairs, spread to half the length of the epichile.

Special features and forms; distribution

The description of this self-pollinating taxon, initially classified as a subspecies, is fairly recent (VENHUIS et al. 2007) and was inspired by the observation that Algarve populations of *S. cordigera* were often self-pollinating, with powdery pollinia falling onto the stigma (TYTECA 1998; VENHUIS et al. 2007). The plant should not be confused with *S. perez-chiscanoi*, which we present below, which is found in the same regions but rarely in the same habitats. The originality of the taxon discussed here seems sufficient to us, particularly with its highly variable flower colours, to justify the species status proposed by KREUTZ (2024). The distribution map published by VENHUIS & OOSTERMEIJER (2011) shows a distribution spanning the Algarve, Alentejo, Extremadura, Beira Litoral, i.e. a large part of Portugal, to which KREUTZ (2024) adds the province of Huelva (western Andalusia). Some of the plants we saw in Vila Flor (Trás-os-Montes, northern Portugal – see photos below) also appear to belong to this species. Below are a number of photos illustrating this still relatively unknown species.

Biotope and ecology

S. gentilii is found in habitats suitable for most *Serapias*, namely meadows that are wet in winter and spring, often at the bottom of valleys (as is the case in Galaxos or Vila Flor) or on well-watered slopes, sometimes in drier sites with large populations of rockroses (as in Barranco do Velho).

Situation in the study area

As with other biotopes harbouring *Serapias*, the situation is satisfactory as long as agricultural practices are not intensified. Drainage and the intensification of grassland practices are threats that must be taken into consideration.

4.263

Fig. 4.263 (opposite). *Serapias gentilii*, two colour variants, Barranco do Velho, Algarve, 23 April 2009.

Next page:

Figs. 4.264 to **4.268**. *Serapias gentilii*, population of Galaxos, Algarve, 16 April 1995.

Distribution map of *S. gentilii* according to VENHUIS & OOSTERMEIJER (2011).

Serapias gentilii

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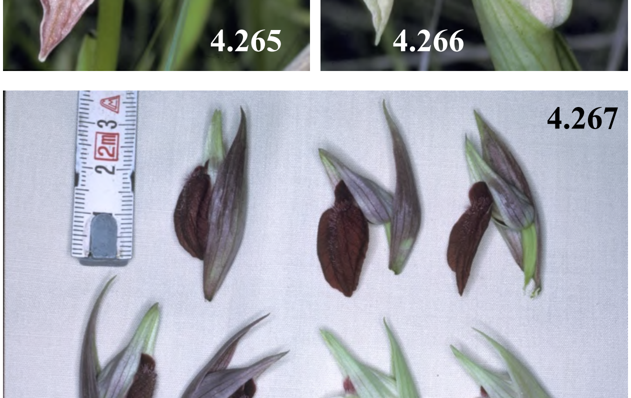

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Transitional and hybrid forms


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This page contains:

Figs. 4.269 to **4.271**. Photos taken in the population of Vila Flor, Trás-os-Montes, 28 May 2008: possibly a transition from *S. cordigera* to *S. gentilii*.

Fig. 4.272. (above). Exploded view, between the hypochile and the petals, of one of the previous flowers, showing the shape of the petals (black at the base) and the lamellar-shaped growths at the base of the hypochile.

Fig. 4.273. An example of what could be interpreted as a hybrid of *Serapias*, between *S. cordigera* and *S. lingua*, at Benafim Grande (Algarve), 1990.

Fig. 4.274 (right). An example of an intergeneric hybrid between a *Serapias* and an *Anacamptis* (*Serapias lingua* x *Anacamptis morio* subsp. *picta* (photo Ivo Rodrigues).


4.274

Serapias perez-chiscanoi, with
Pulicaria odora, Ereiras, Beira Litoral
4 May 2011

Serapias perez-chiscanoi Acedo Pérez Chiscano's Tongue Orchid

Erva língua verde, Serapião verde (port.)

Description and special features

With *Serapias perez-chiscanoi*, we go one step further than with *S. gentilii* in terms of morphological changes linked to self-pollination. The flowers are smaller in size and their colour tends to be whiter than those of the latter. *S. perez-chiscanoi* is therefore even more recognisable at first glance. It has also been described for longer, initially under the name *Serapias viridis* by the Extremaduran botanist José Luis PÉREZ CHISCANO in 1988, incorrectly as this name had already been given to another taxon; this is why another botanist, C. ACEDO, renamed it more appropriately *perez-chiscanoi* in 1990.

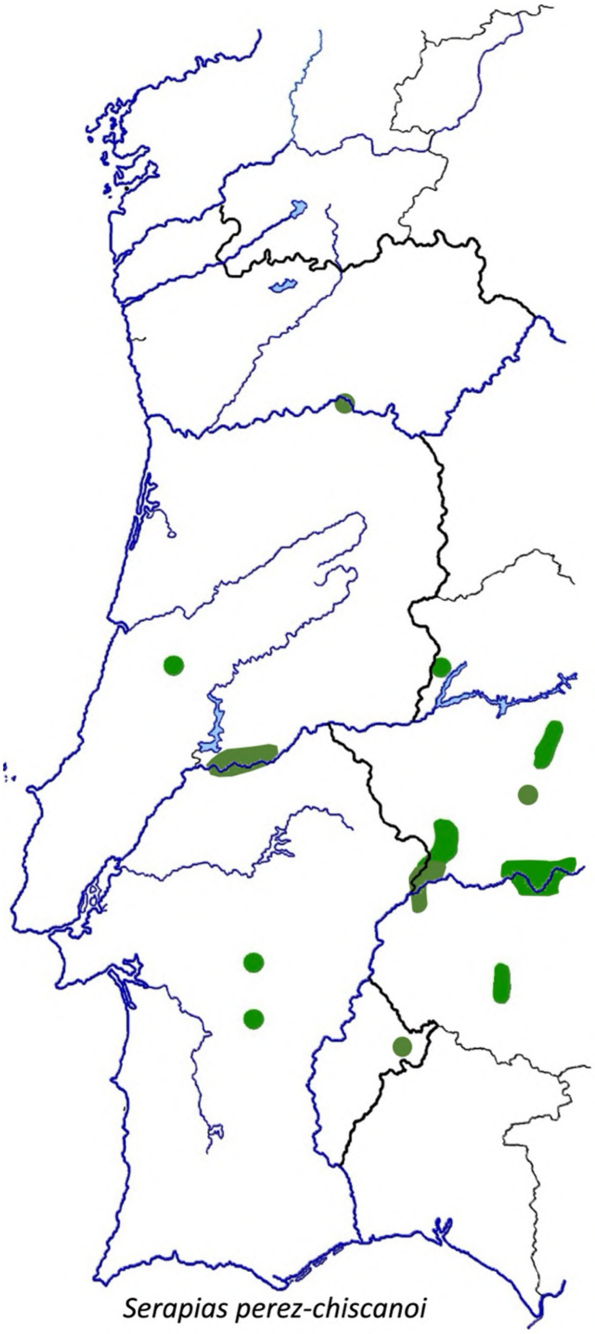
The plant is tall, between 15 and 40 cm, with 3 to 8 linear-lanceolate leaves and a rather short inflorescence, 4 to 8 cm, with 3 to 10 flowers. These are mostly whitish, rarely pink to pale red, with a striking feature being the presence of numerous black-brown dashes found on the veins throughout the plant: not only on the flowers (especially on the helmet), but also on the bracts, stem and leaves. The epichile is 1.3 to 1.9 cm long and 0.6 to 1.4 cm wide, making it significantly smaller and narrower than that of *S. gentilii* (which is 1.3 to 2 cm wide). The labellum is more or less densely covered with whitish hairs up to the middle of the epichile.

Biotope and ecology

Unlike *S. gentilii*, which frequents damp areas, this species is found in drier areas of grasslands, scrublands and garrigues, along paths, on soils that are fairly acidic to slightly alkaline.

4.275

Figs. 4.275 to **4.278**. This page and the next. *Serapias perez-chiscanoi*.
4.275 (above), 4.278: Ereiras, Beira Litoral, 4 May 2011.
4.276: Alvito, Baixo Alentejo, 19 April 2009.
4.277: São João da Pesqueira, Trás-os-Montes, 8 May 2011.



Serapias perez-chiscanoi

Distribution

S. perez-chiscanoi is much scattered in Extremadura (including the eastern part) and across much of Portugal.

Situation in the study area

Already widely dispersed, the species is becoming increasingly scarce as a result of changes (intensification) in agricultural practices.

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4.18. **Ophrys**

This genus is the only one in Europe and the Mediterranean Basin to have systematically and widely developed a process of attracting insects using sexual lures (see the chapter on biology). In this way, each species of *Ophrys* is adapted to pollination by one or a few specific species of insect, most often hymenoptera. The dependence is very strong in some species, less exclusive in others, which may allow, through natural selection, further adaptation to one or other of these insects, or possibly the selection of a new, unprecedented adaptation through hybridisation between two species of Ophrys.

However, we still need to agree on the concept of 'Ophrys species'. Although the 'Ophrys species' appear to be very different from one another, and there are significant variations within the same species, the genus is relatively homogeneous from a genetic point of view, meaning that the species hybridise very easily with one another, which, as mentioned above, is another factor in speciation. This is obviously only possible if hymenoptera (or other insects involved) 'transgress' the quasi-exclusive relationship between orchids and insects. The barrier that normally prevents cross-fertilisation is therefore pre-zygotic in *Ophrys*, whereas in many other genera, the barrier is post-zygotic, i.e. based on genetic incompatibilities, which is not the case in *Ophrys*.

This speciation, or specialisation we should say, which is still very active, through adaptations to new pollinators or hybridisations, as well as considerable variability, explains why a very large number of species have been described within the genus, significantly more than in other genera in Europe and the Mediterranean Basin. Recently, P. DELFORGE (2005, 2016) counted 250, then 353 species (divided into 29 groups) in the last two editions of his guide to 'Orchids of Europe, North Africa and the Near East'. However, this number is constantly being revised upwards as orchidologists continue to describe new species every year, so that currently, in his other guide to 'Orchids of Europe, North Africa and the Middle East', K. KREUTZ (2024) lists no fewer than 456 (a further increase of 103), which he divides into 36 groups. However, this is subject to debate on all sides: based in particular on genetic proximity, the absence of hybridisation barriers and the need to be able to assign a given individual to a species with sufficient probability (with a view to appropriate conservation measures), PEDERSEN & FAURHOLDT (2007) recognised only nineteen species (plus forty-six subspecies) and five 'partially stabilised hybrid complexes' for Europe! Twelve years later, for Europe and the Mediterranean Basin, KÜHN, PEDERSEN & CRIBB (2019) retained 21 species (plus 64 subspecies) and four hybridogenic complexes.

An in-depth analysis of the different approaches was recently proposed by BATEMAN & RUDALL (2023), who considered three levels of species: macro-species, meso-species and micro-species. We have just discussed micro-species (numbering several hundred) and meso-species (following the species concepts of PEDERSEN & FAURHOLDT or KÜHN et al., or following the group concepts of DELFORGE or KREUTZ, or even earlier, DEVILLERS & DEVILLERS-TERSCHUREN 1994 as the initiators to this concept). The concept of 'macro-species', of which nine have been identified by BATEMAN & RUDALL, is based initially on discontinuities, possibly small but reliable, in the 'barcode' regions of DNA, which are therefore more or less solid from a genetic point of view. In other words, if we wanted a species status for *Ophrys* that was objectively acceptable from a genetic perspective, we would have to stop at **these nine**! Figure 4.279 shows a cladogram that supports these nine entities, compatible with the spectacular unrooted SplitsTree network shown by BATEMAN & RUDALL (2023) as the starting point for their analysis. The nine macro-species that appear in it correspond *roughly* to what conventional systematic analysis would call **sections**, often used in classifications, such as those adopted by BOURNÉRIAS & PRAT et al. (2005 – see in particular pp. 314-315) or DELANNOY et al. (2025) for the orchids of France, Belgium and Luxembourg. These sections in turn contain varying numbers of species (meso- or micro-). These proposals are compatible with the results already obtained by DEVEY et al. (2008), and with the analysis proposed by TYTECA & BAGUETTE (2017), based on a large number of samples.

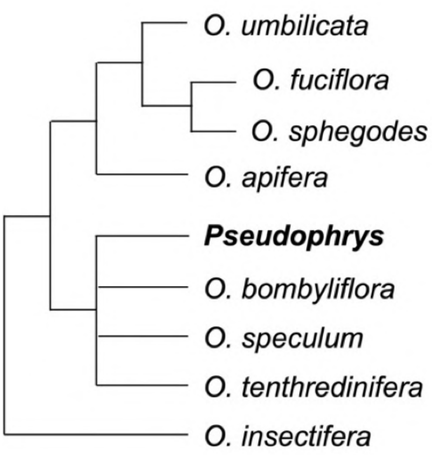


Figure 4.279. – Cladogram of *Ophrys* based on the nine macro-species according to the concept of BATEMAN & RUDALL (2023).

Scientists and field naturalists, orchid lovers, cannot conceive of stopping at nine species, but on the other hand, going down to the micro-species level may be satisfactory from a practical point of view, but does not stand up well to the genetic or even morphometric criteria that BATEMAN & RUDALL (2023) strive to satisfy in their study. This is why they attempt the meso-specific level, which may prove acceptable from a pragmatic point of view (in the sense of HENNECKE 2018), but they are not much more successful. This is why the concept of species is still subjective if we want to go below the macro-species level. But even in this hypothesis, the cladogram in Fig. 4.279 with its sections corresponding to macro-species will serve us for the classification of *Ophrys*. In this regard, one remark is in order. We note in Fig. 4.279 the particular position occupied by the section ***Pseudophrys***: 'formerly' (before molecular phylogeny), the genus *Ophrys* was subdivided into two large sections: the sections *Euophrys* ('true' *Ophrys*) and *Pseudophrys*; this division is still sometimes used in very recent works (e.g., KREUTZ 2024). It corresponds to a fundamental distinction based on the position usually occupied by insects performing pseudo-copulation (see Chapter 1, Section 1.2, Biology of Orchids, in particular Figs. 1.11, 1.12, 1.13 and 1.14). In *Euophrys* (Figs. 1.11, 1.13 and 1.14), pseudo-copulation is cephalic, in the sense that the pollinating insect (sexually deceived) presents itself head first on the labellum and carries the pollinia on its head, whereas in *Pseudophrys* (Fig. 1.12), pseudocopulation is abdominal: the acquired arrangement of the markings, colours and hairiness of the labellum causes the insect to shift position, presenting its abdomen at the base of the labellum and thus to the removal of the pollinia. This distinction was then presented as so important that it justified a preliminary division of the genus *Ophrys* into these two major sections. With molecular phylogeny, it was found that abdominal pseudo-copulation was only a hiccup (derived character) that at most justified the placement of one section (macro-species) in a particular position among the other sections.

In this book, we therefore resolutely attempt to maintain the micro-species level (an approach sometimes referred to in English as 'splitter'), as we believe that each of the entities thus retained corresponds well to the concept of the biological, or even phylogenetic, species. Of the 350 to 450 species mentioned above, 22 are currently found in the territory covered by this book, 20 of which are found in Portugal; only the Central European *O. insectifera* and the Central Mediterranean *O. caloptera* are found exclusively in Spain. Some species are endemic to Portugal (*O. pintoi*, *O. lenae* and *O. beirana*) or to Portugal and Andalusia (*O. lusitanica*, *O. algarvensis* and *O. quarteirae*); others have a fairly limited distribution, centred on the Iberian Peninsula and possibly extending to south-western France and/or North Africa: *O. ficalhoana*, *O. picta*, *O. fusca* (in the strict sense), *O. dyris* and *O. vasconica*.

While identification is not too difficult for certain well-characterised species, the same cannot be said for certain groups of species where the distinction is much more delicate. In the first category of 'easy' species, we find *Ophrys bombyliflora*, *O. insectifera* and *O. apifera*. Others are found in pairs of species that are not too difficult to separate, such as *O. speculum* / *O. lusitanica* and *O. tenthredinifera* / *O. ficalhoana*. Some pairs are a little more difficult to identify: *O. lutea* / *O. quarteirae* and *O. incubacea* / *O. caloptera*. In some cases, these may be species that are still poorly separated, or whose ranges of variation overlap significantly. In most cases, however, identification should be easier if aspects such as phenology (flowering season), size and region of observation are taken into account. The same applies to the remaining eleven species, which can be divided into three groups: (1) *O. fusca* / *O. lupercalis* / *O. bilunulata* / *O. pintoi*, (2) *O. dyris* / *O. algarvensis* / *O. lenae* / *O. vasconica* and finally (3) *O. scolopax* / *O. picta* / *O. beirana*.

By selecting these twenty-two species, we are taking into account the most recent advances in species identification and description. Not so long ago, of the twenty taxa that we now recognise in Portugal, we only selected thirteen (Tyteca 1998)! And it is entirely possible that further observation and research will lead to the description of additional species, particularly in complex groups such as the last three mentioned above. We will refer to this again in relation to Spanish species (Andalusia, Extremadura) that have been described recently but are still difficult to interpret.

Ophrys generally grow in open, sunny, dry environments that are poor in nutrients, preferably on calcareous soils. However, they can also be found in slightly different environments, on rather acidic soils, in rather hygrophilous conditions, and/or under the light cover of bushy or shrubby vegetation, or even in forests. Examples of species growing in the area of interest to us, on both slightly acidic and limestone soils, include widely distributed taxa such as *O. speculum*, *O. bombyliflora*, *O. lutea* and *O. tenthredinifera*. *Ophrys* are generally found at low altitudes, with the exception of certain taxa such as *O. insectifera*, which is more commonly found at higher altitudes in the north-eastern part of the area of interest.

The life cycle of Ophrys is entirely consistent with the situation shown in Figure 1.3 (page 16). The leaf rosettes are visible from the autumn preceding flowering; when flowering occurs, the leaves are often already withered or dried out. The lifespan of an Ophrys plant is fairly short, lasting a few years, or at most ten to fifteen years (Pridgeon et al. 2001). During this short life, a plant can flower several times. Reproduction occurs mainly by seed; vegetative propagation by division of the tubers is quite rare, with the notable exception of *O. bombyliflora*, a species in which additional tubers are often produced at the ends of stolons, which explains why it is generally found in dense groups, sometimes comprising dozens of identical individuals.

With the exception of *O. apifera*, which regularly resorts to self-pollination, the reproductive success of *Ophrys* (measured by the quantity of seeds produced) is generally quite low, as is the case for species that use a strategy of attracting insects through deceit (Tremblay et al. 2005). However, under specific conditions, where the density of individuals is not too high and pollinators are present in large numbers, the reproductive success rate can reach values of up to or even exceeding 50% (Vandewoestijne et al. 2008). As an example, for the territory considered here, we note the rates indicated in Table 4.10. Furthermore, the number of seeds per capsule in *Ophrys* can reach values of around 10,000 to 15,000, which is more than in other genera of European orchids (Pridgeon et al. 2001). Obviously, this can lead to an over-representation, in subsequent generations, of the forms that have been most successful in terms of reproduction.

Fig. 4.280. *Ophrys picta* (top) and *O. bombylifora*, Palmela, Extremadura, 20 March 2008.

Table 4.10. – Reproductive success rate (RSR – assessed by the ratio of fruiting capsules to the number of flowers) recorded in several species of *Ophrys* in Portugal.

Species	RSR (%)	Source
O. bombyliflora	21,3	NEILAND & WILCOCK (1998)
O. speculum	7,6	NEILAND & WILCOCK (1998)
O. tenthredinifera (2 pops.)	29,8 / 27,4	A.S. ROÍS, 2006, unpublished
O. bombyliflora (2 pops.)	3,2 / 4,5	D. TYTECA, 2008, unpublished
O. speculum	1,6	D. TYTECA, 2008, unpublished
O. lupercalis	5,1	D. TYTECA, 2008, unpublished

Considering all the factors mentioned (open environments linked to grazing activities, specialised dependence on a very limited number of pollinators, short lifespan, low reproductive success rate, etc.), it is clear that targeted habitat conservation measures are essential, without which populations of *Ophrys* (like other orchids and other organisms) would rapidly decline, as is unfortunately observed in the Mediterranean region and elsewhere.

Ophrys have vegetative characteristics that differ little between species: three to six oblong to oval basal leaves, often browned at flowering, one or two cauline leaves enveloping the stem, and a very loose inflorescence composed of one to twelve flowers, rarely more. The main differences lie in the shape, size, hairiness and colour of the flowers; the comments provided for the different species will therefore focus mainly on floral aspects. In principle, the identification key we have proposed (§ 3.3, chapter 3) should be sufficient to identify the taxa. However, after identification, it is advisable to check it carefully using the characteristics listed in the species description.

Fig. 4.281. – Rosettes of *Ophrys* in preparation... Palmela, Extremadura, 29 January 2015.

Fig. 4.282. *Ophrys lusitanica*, Murtinheira, Beira Litoral, 2 April 2016.

Fig. 4.283. Pseudocopulation of *Dasyscolia ciliata* on *Ophrys speculum*, Serra do Sicó, Beira Litoral, 16 April 2022 (photo Jean-Louis GATHOYE).

Ophrys speculum Link Mirror Orchid

Abelhão, erva-abelha (port.), Abejera de espejo, espejo de Venus, flor de abeja, flor del espejo (cast.)

Ophrys lusitanica (O. & E. Dannesch) H.F. Paulus & Gack Portuguese Mirror Orchid

Description

The two species discussed here are notable for their remarkable flowers, with a three-lobed labellum, without appendages, featuring a large, shiny blue spot (the 'mirror') in the centre, surrounded by a dense crown of brown to orange hairs. The base of the labellum is decorated with a network of brownish to black, prominent, shiny lines. The sepals are green and spread out, with the lateral sepals covered in brown dashes of varying intensity; the petals are small, triangular, with the tips bent backwards. Apart from these common features, the mirror orchid and its Portuguese sister species differ in a few characteristics, which are listed in Table 4.11.

Table 4.11. Comparative characteristics of *Ophrys speculum* and *O. lusitanica.*

Characteristic	***O. speculum***	***O. lusitanica***
Plant height	5 – 25 cm	15 – 50 cm
Number of flowers	2 – 8	5 – 15
Labellum	Moderately convex, broad	Strongly convex, appearing narrow
Lateral lobes of labellum	Slightly raised above labellum	In the same plane as labellum
Marginal hairiness of labellum	Dark blackish brown	Orange to light brown
Petals	Blackish brown	Light brown

Special features and forms

These two species are relatively uniform, apart from variations in colour that can extend to the absence of coloured pigments, in which case the flowers are entirely greenish to light brownish with a white mirror. However, variations in flower shape and colour are more significant in *O. lusitanica*, both in the colouring of the hairs, sepals and petals, and in the convexity of the different parts of the flower. This variability tends, at the extreme, to bring the flowers of *O. lusitanica* closer to those of *O. speculum*; hybrid forms are not uncommon, especially where the two species coexist (Algarve). Some authors consider that hybrids or transitional forms are in majority in these situations, with the "pure" form of *O. lusitanica* being rather rare (BAUMANN et al. 2004). This range of variations is also noticeable in the photos used.

Biotope and ecology

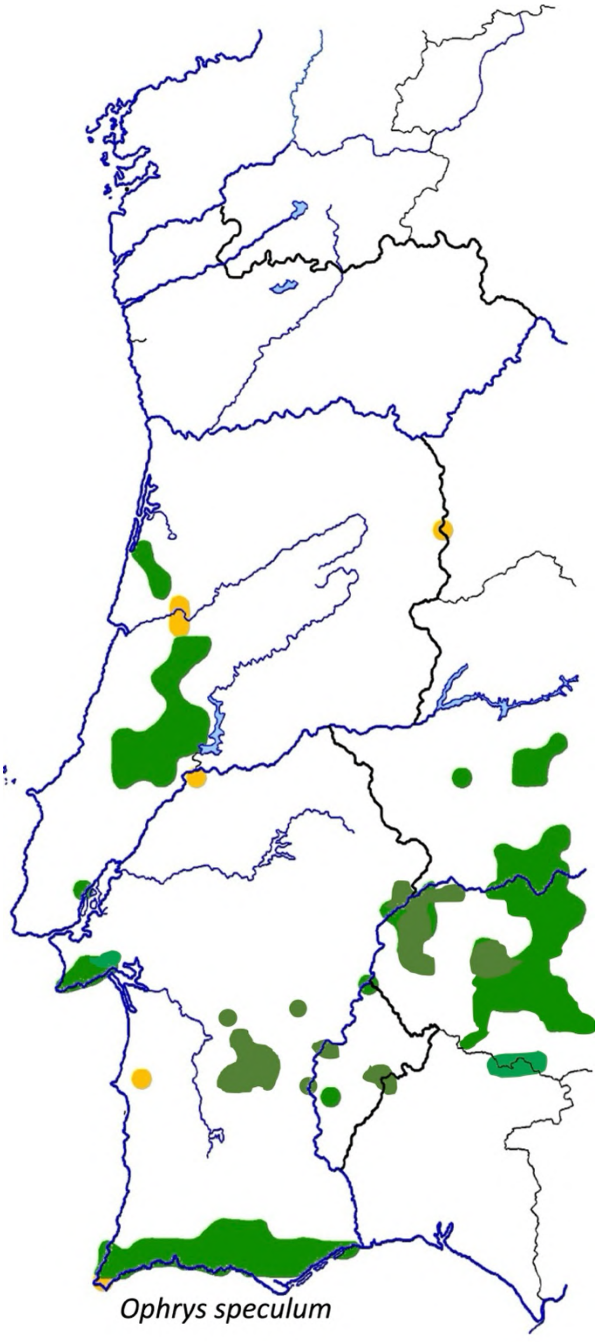
O. speculum is relatively early flowering (blooming in March–April) and thrives in sunny locations, sometimes on bare soil, in scrubland and sparse grasslands on limestone, but also in open vegetation in non-limestone regions. In addition to morphological differences from *O. lusitanica*, there are also significant ecological differences, as the latter is more strictly calcicolous and is more likely to be found in the light shade of nearby scrub, or in denser vegetation among grasses or areas of *Thymus* sp. *O. speculum* is pollinated mainly by *Dasyscolia ciliata* and its mode of attracting hymenoptera is well documented (see e.g. PAULUS 2006; PAULUS & GACK 1990); however, much less is known about the pollination of *O. lusitanica*. The frequency of hybrids between the two species suggests, however, that *O. lusitanica* attracts, at least in part, the same pollinator as *O. speculum*; however, their differentiation would indicate that *O. lusitanica* may also have a specific pollinator.

Distribution

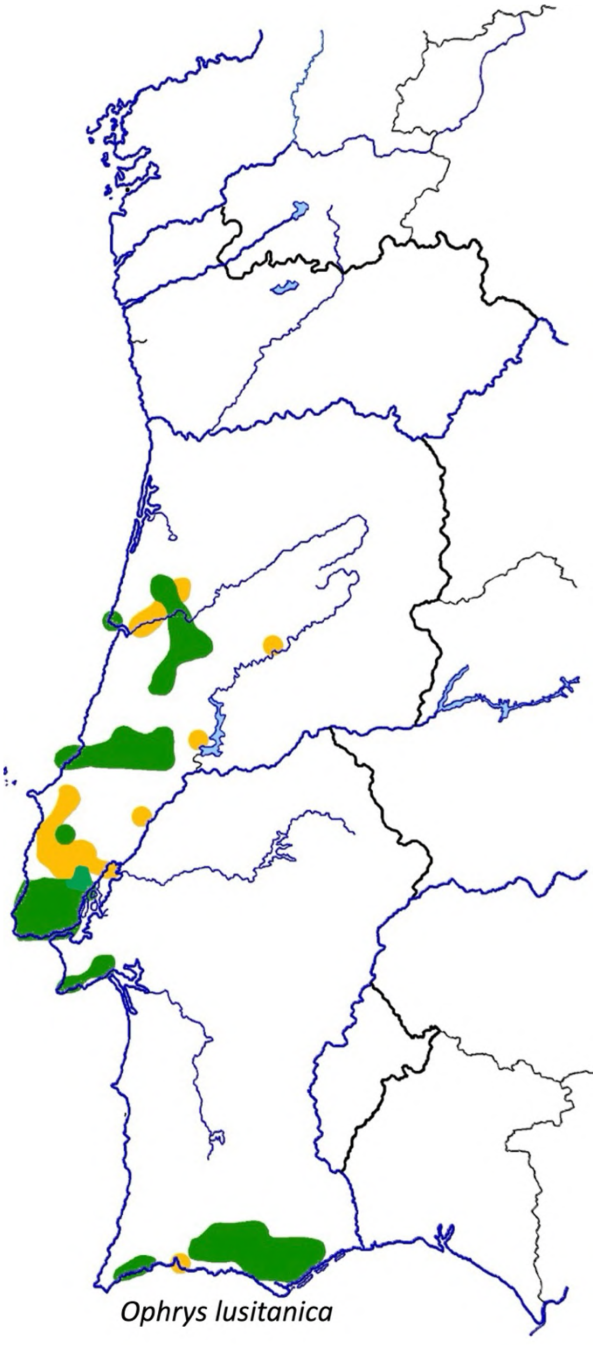
O. speculum is widespread throughout much of the Mediterranean Basin, but is rarer in the central part (southern France and mainland Italy). Some authors consider that the forms growing in the western and eastern parts of the Mediterranean Basin constitute two distinct taxa, i.e., subspecies or even species. The distribution of *O. lusitanica* is much more limited: it exists in all the limestone areas of Portugal, but outside of these areas, it is only found in a few areas of Andalusia, outside the territory covered by this work. In some parts of Portugal, the two species coexist widely (Algarve, northern Estremadura and Beira Litoral), while in other parts of the country, there is a certain degree of substitution (see maps). For example, while *O. speculum* is largely dominant or even almost exclusive in the Serra da Arrábida region, in the Lisbon region and further north the opposite is true, with *O. lusitanica* being relatively widespread and *O. speculum* rather rare.

Situation in the study area

These two species are currently not particularly threatened in the territory under consideration. It should be noted, however, that Portugal is the main territory of distribution for *O. lusitanica* and, as such, should be given special attention.



Ophrys speculum



Ophrys lusitanica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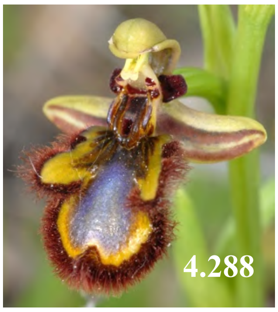
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Figs. 4.284 to **4.295**. This page and the previous one. *Ophrys speculum* (*spe*), *O. lusitanica* (*lus*) and hybrids. **spe**: 4.284 (Morgado, Loulé, Algarve, 17.03.2008), 4.286, 288 (Vila Verde de Ficalho, Baixo Alentejo, resp. 28.02.2011, 15.03 2008), 4.289 (Azeitão, S. Arrábida, Estremadura, 10.04.2016). **lus**: 4,285, 287, 291, 292 (all Bucelas, Estremadura, 25 March 2008). **spe x lus**: 4,290 (Serra de Janeanes, Beira Litoral, 3 May 2009), 4,293, 295 (Brasfemes, Beira Litoral, 14.04.2022), 4,294 (Serra de São Luís, Estremadura, 30.04.2009.

Ophrys bombylifora Link **Bumblebee Orchid**

Erva mosca (port.), Flor de abeja, hierba de la avispa, moscas (cast.)

Description

A very small plant, 5 to 25 cm tall, bearing 1 to 5 flowers, often growing in dense colonies of identical plants due to vegetative propagation (additional tubers at the end of stolons). Flowers without bright colours, with very broad, rounded sepals, pale green, closing over the labellum during fruiting, with pubescent, triangular petals, green becoming brownish at the base, with the tip curved backwards. The labellum is almost hemispherical, trilobed, about 1 cm in diameter (not spread out), brown with sometimes indistinct glabrous bluish-grey macules in the centre, with prominent ridges surrounding the basal field and the stigmatic cavity, and a strongly folded appendage under the labellum. Lateral lobes of the labellum strongly pubescent, forming the lateral gibbosities of the labellum and with pointed tips strongly bent backwards.

Special features and forms

A plant with little variation, easily recognisable by its globular brown labellums, green perianths and growth in groups.

Biotope and ecology

In open areas of scrubland and grassland, on the edge of light woods, often in dry places; however, it shows a certain preference for cooler soils. Between 0 and 400 m altitude in the territory. Flowers in March and April. Within its range, pollinated by different species of hymenoptera of the genus *Eucera*, depending on the regions investigated; no such observations in Portugal.

Distribution

Widespread throughout the Mediterranean Basin, generally near the coast, from the Iberian Peninsula and North Africa to Cyrenaica and the Aegean Sea; also in the Canary Islands. Rare in Spain; for the territory covered by this work, its range is concentrated in a few areas of Portugal where it is abundant, throughout the Algarve and in the south of Estremadura (regions of Lisbon and Serra da Arrábida). Very isolated and sporadic presence in Ribatejo, Beira Litoral and Extremadura.

Situation in the territory studied

Stable populations; no particular threats other than those indicated in the introductory section.

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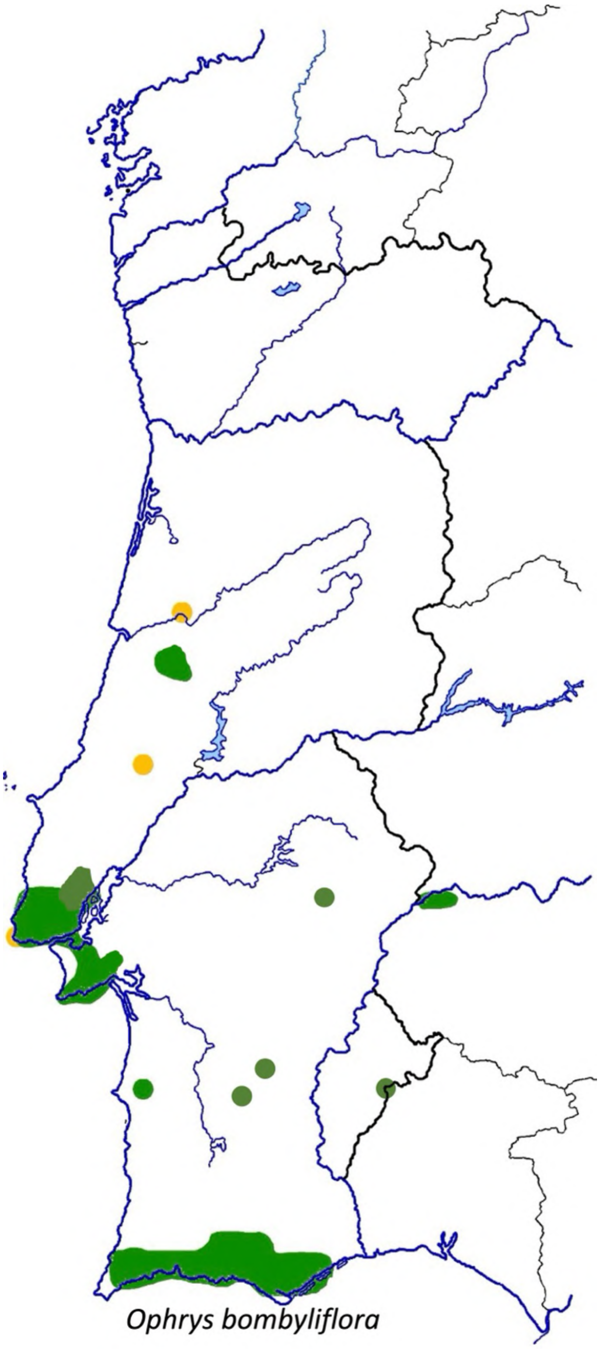


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Figs. 4.296 to **4.299**. This page and the previous one. *Ophrys bombyliflora*.
4.296, 297: Morgado, Loulé, Algarve, 17 March 2008.
4.298: Palmela, Estremadura, 11 April 2016.
4.299: Agostos, Algarve, 3 March 2011.

Ophrys tenthredinifera
Barrão de São Miguel, Algarve
2 March 2011

Ophrys tenthredinifera Willd. **Sawfly Orchid**

Erva abelhão (port.)

Ophrys ficalhoana (J.A. Guimarães) Wucherpfennig **Ficalho's Ophrys**

Description

Plants 10 to 40 cm tall, bearing 2 to 8 large, brightly coloured flowers. Sepals broad and rounded, usually pink, sometimes paler or darker; petals broad at the base, short, triangular, pubescent, the same colour as the sepals. Labellum entire, more or less convex, with two lateral gibbosities near the base; centre of the labellum brownish-brown, shortly pubescent, with a small glabrous bluish or greyish macule, bordered by a lighter or even white margin, surrounding the basal field; margin of the labellum yellow, more or less broad and more densely pubescent; labellum with an appendage pointing forwards or upwards. Basal field separated from the stigmatic cavity by a small slope extended by two ridges or two prominent, shiny black dots. Apart from these common characteristics, the two species are distinguished by the features listed in Table 4.12 (DEVILLERS et al. 2003).

Table 4.12. Comparative characteristics of *Ophrys tenthredinifera* and *O. ficalhoana*.

Characteristic	***O. tenthredinifera***	***O. ficalhoana***
Shape of labellum	Strongly convex, trapezoidal, with lower edges curved forwards	Slightly convex, ± square, with straight lower edges
Labellum appendage	Small, pointing forwards or upwards	Large, pointing upwards
Tuft of hairs above appendage	Same size as on edge	Significantly more developed than on the edge
Growths between basal field and stigmatic cavity	Two prominent, shiny black ridges	Two prominent, shiny black dots
Colour of stigmatic cavity	Reddish to greyish	Black to reddish brown
Flowering	February - April	April - May

Special features and forms

These two species are relatively similar and have only recently been recognised as separate species, although *O. ficalhoana* had already been described as such by Guimarães in 1887. However, the morphological differences are striking and the flowering periods also differ significantly. An early form of *O. tenthredinifera*, flowering as early as January in the Lisbon region, was previously distinguished as a subspecies (subsp. *guimaraesii* D. Tyteca) but deserves no more than the rank of form or variety.

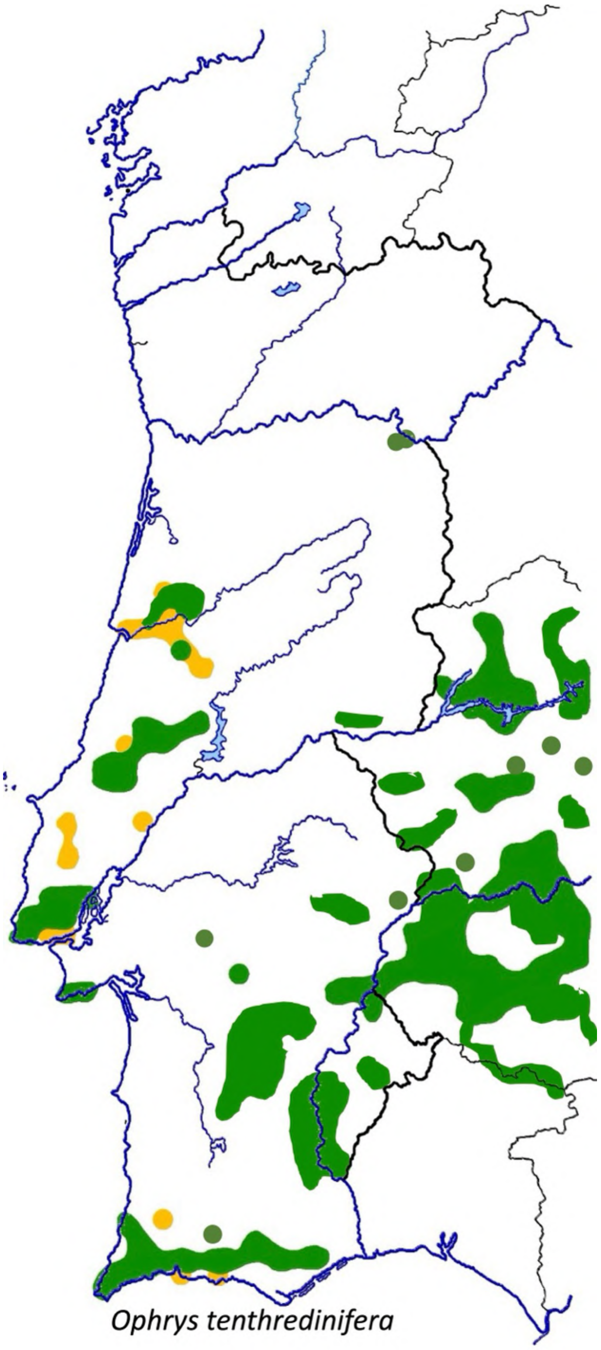
Biotope and ecology

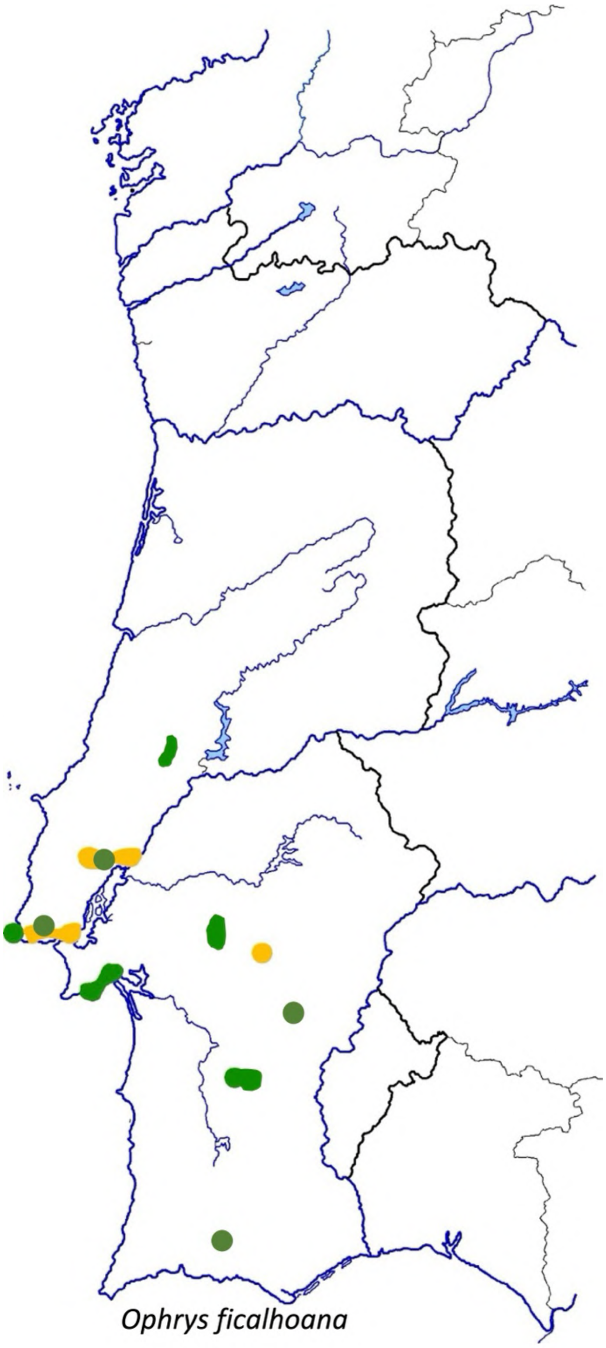
Open scrubland, grasslands, brushwood, roadside embankments, most often on calcareous soils; however, *O. tenthredinifera* is more tolerant in terms of substrate and therefore colonises larger areas. This same species is pollinated by *Eucera nigrilabris* in at least part of its range; the pollinator of *O. ficalhoana* is unknown. Both species grow at low altitudes, between 0 and 500 m. Flowering period: see table.

Distribution

Both species are found in the south-western Mediterranean basin: North Africa, the Iberian Peninsula, southern France and the Balearic Islands for *O. tenthredinifera*; the range of *O. ficalhoana* is poorly known because it is confused with the other species; it covers at least Portugal, Spain as far north as the north, and south-western France. In the territory studied, *O. tenthredinifera* is widespread in the Algarve, Alentejo, Estremadura, Ribatejo, Beira Litoral and Extremadura, and rare in Trás-os-Montes; *O. ficalhoana* has only been reliably recorded in a small part of Estremadura (Lisbon region and Serra da Arrábida) and at a few sites in the Algarve and Alentejo, but not in the Spanish part of the distribution area.

Situation in the study area
O. tenthredinifera, which is more widespread and eclectic, is not threatened; the situation is more critical for *O. ficalhoana*, of which only a few locations are known, some of which are in a precarious situation or have been destroyed by urban expansion (around Lisbon and Palmela; Algarve: São Bartolomeu de Messines).





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Figs. 4.300 to **4.305**. This page and the next. *Ophrys tenthredinifera* (left). 4.300, 301: Vila do Bispo, Algarve, 28 February 2007. 4.302: A dos Matos, Algarve, 1 March 2018. *O. ficalhoana* (right). 4.303: Cheganças, Ribatejo, 4 May 2019. 4.304: Bairro, Beira Litoral, 4 May 2019. 4.305: Sesimbra, Estremadura, 27 April 2009.

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Fig. 4.306 (above). *Ophrys pintoi*. Ansião, Beira Litoral, 7 March 2011.

Ophrys fusca Link Sombre Bee Orchid

Moscardo-maior (port.), Abejera oscura, abejita, mosca fusca, moscardo fusco (cast.)

Ophrys lupercalis J. Devillers-Terschuren & P. Devillers Lupercales Bee Orchid

Ophrys bilunulata Risso 2-Moon Shaped Ophrys

Ophrys pintoi M. Lowe & D. Tyteca Pinto da Silva's Ophrys

Description

Plants 5–10 to 30–40 cm tall, bearing 2 to 10 small to large flowers, depending on the species (see Table 4.13). Sepals green, lateral sepals spreading laterally, dorsal sepal folded back over the gynostemium; petals green to brownish green, oblong, with parallel edges that are slightly or not at all undulate. Labellum fairly elongated (longer than wide), trilobed, with a bifid median lobe, more or less strongly convex, lateral lobes more or less folded downwards; labellum with dense brownish hairs on the upper parts and a bluish-grey spot towards the centre; base of the labellum furrowed (V-shaped throat) and with more or less prominent longitudinal gibbosities giving it a certain convexity. Edges of the lateral lobes of the labellum forming an angle of (25-) 30–40 (-45)° with the longitudinal axis. Labellum with a more or less marked yellow edge, sometimes imperceptible, and more or less hidden by the convexity of the labellum. The four species recognised here are distinguished by variations from this basic description, as shown in Table 4.13.

Special features and forms

The species *Ophrys fusca* originates from Portugal (near Lisbon). While in general, the labellum of *O. fusca* is very convex and its yellow edge is insignificant and/or barely visible, certain populations (Serra do Louro, near Palmela) are notable for the frequency of very significant yellow edges and less convex labellums, but these plants grow alongside normal forms of the species, so it is probably not appropriate to separate them. *Ophrys lupercalis* is probably widespread but undoubtedly under-recognised due to its frequent confusion with *O. fusca*; it should be easily distinguished by its extreme precocity, smaller flowers, duller colours and other characteristics listed in Table 4.13. As for *O. bilunulata*, it is quite distinct but so far only known with certainty from the Algarve. It should be noted that these plants of *O. bilunulata* from the Algarve are often very small and have few flowers (sometimes only one!), which are quite small; perhaps they actually constitute a taxon distinct from the 'true' *O. bilunulata*. Finally, *O. pintoi* is a very small plant and also has small flowers, resembling miniatures of those of O. fusca (see comparative photo, Fig. 4.307), with which it sometimes grows. It resembles *O. bilunulata* in size, number and dimensions of flowers, but its labellum is significantly more convex, leaving little of the glabrous edge visible.

A word about the nomenclature used

The taxonomy and nomenclature of plants in this group are still evolving and subject to change. The only names used with certainty in the title of this section are *Ophrys fusca* and *O. pintoi*. There may still be changes to the names of the other two taxa: LOWE (2010) indicated that *O. lupercalis* is not distinct from *O. forestieri* from south-western France, whose name would therefore take precedence, but this opinion is contested, notably by DELFORGE (2021). The same author (LOWE 2010), together with two colleagues, also described a new taxon, *O. malacitana*, from the Malaga region, whose name could replace that of *O. lupercalis* in the Algarve (according to KREUTZ 2024). Here too, we are sceptical. Finally, we are sceptical about the description of *O. clarae*, a taxon supposed to replace *O. fusca* in the Extremadura region (VÁZQUEZ & RAMOS 2005), a mention also relayed by KREUTZ (2024): this would mean that the distribution of *O. fusca* would be restricted to Portugal alone!

Biotope and ecology

The four species have an ecology fairly consistent with that of most *Ophrys*: grasslands, scrublands, sparse oak forests, olive groves, generally on calcareous or similar soils, at altitudes below 600 m. The morphological differentiation is accompanied by a very clear ethological differentiation, since *O. fusca*, *O. lupercalis*, *O. bilunulata* and *O. pintoi* are pollinated by hymenoptera belonging to different genera, the first by *Colletes cunicularius* and the other three by *Andrena*, namely *A. nigroaenea* for *O. lupercalis* and *A. flavipes* for the last two *Ophrys* (Kreutz 2024; assumed for *O. pintoi*: Lowe & Tyteca 2012; confirmed by C. Monteiro). However, pollinator observations have only been made in Portugal (or adjacent territories) for *O. bilunulata* and *O. pintoi*, and there remains some controversy regarding the distribution and separation of the different taxa (see e.g. Paulus 2001).

Table 4.13. Comparative characteristics of *Ophrys fusca*, *O. lupercalis*, *O. bilunulata* and *O. pintoi*.

Characteristic	***O. fusca***	***O. lupercalis***	***O. bilunulata***	***O. pintoi***
Number of flowers	2 – 10	2 – 10	1 – 6	(1-) 2 – 4 (-5)
Labellum length	15 – 22 mm	10 – 18 mm	8,5 – 15 mm	11,5 – 13,2 mm
Two longitudinal ridges of the labellum	Very pronounced at the base	Moderately pronounced	Slightly pronounced	More or less pronounced
Labellum convexity	Quite pronounced longitudinally and laterally	Slightly pronounced, more pronounced laterally, pronounced at the apex	Slightly pronounced; edges clearly visible	Quite pronounced
Position of the lateral lobes of the labellum	Narrow sinuses: lateral lobes almost touching the labellum	Wide open sinuses: lateral lobes well apart	Wide open sinuses: lateral lobes well apart	Generally well open sinuses, lateral lobes well apart
Labellum colouration	Bright colours: shiny greyish-blue macule on the labellum	Fairly dull, macule sometimes reddish; base often discoloured (yellowish)	Fairly bright colours; macule often marbled	Base often discoloured; macule of varied colouring, with whitish to bluish edge
Labellum macula	Elongated, reaching +/- the sinus of the lateral lobes	Intermediate position	Short, not reaching the sinus of the lateral lobes	Fairly elongated, often reaching the sinus of the lateral lobes
Yellow edge of the labellum	Very faint to clearly visible	Faint to absent	Fairly distinct	Fairly thin, faint to not visible
Flowering period	March – early May	Very early: January – March	Late February – early April	Late February – early April

Distribution

The four species considered have a more or less widespread distribution in the western Mediterranean, possibly also covering North Africa in the case of *O. fusca* and *O. lupercalis*. The most widespread is probably *O. lupercalis*, whose distribution extends as far as Italy; the range of *O. fusca* probably needs to be revised, since until relatively recently, most species in the *O. fusca* complex were grouped under this single name (an approach still adopted by some authors, such as Pedersen & Faurholdt 2007; Kühn et al. 2019). In the territory studied, the distribution areas also need to be reviewed for the same reason. Overall, they cover the southern half of Portugal (Beira Litoral, Estremadura, Ribatejo, Algarve) and Extremadura. Most of these records are probably still valid for *O. fusca*, except for the Algarve; *O. lupercalis* has been recorded with certainty in the Algarve and Beira Litoral and is likely to be present in the other Portuguese regions mentioned; as for *O. bilunulata*, it can be cited with certainty for the Algarve, but it is plausible that it exists elsewhere (TYTECA 2000). Finally, *O. pintoi* remains confined to its region of description, which covers Estremadura, Beira Litoral and Ribatejo (LOWE & TYTECA 2010).

Situation in the study area

Overall, there are few specific factors affecting these four species in relation to the threats to their habitats. However, attention should be paid to particular situations, such as those of the remarkable forms of *O. fusca* (Serra do Louro) and *O. bilunulata* (Algarve), which would warrant specific conservation measures.

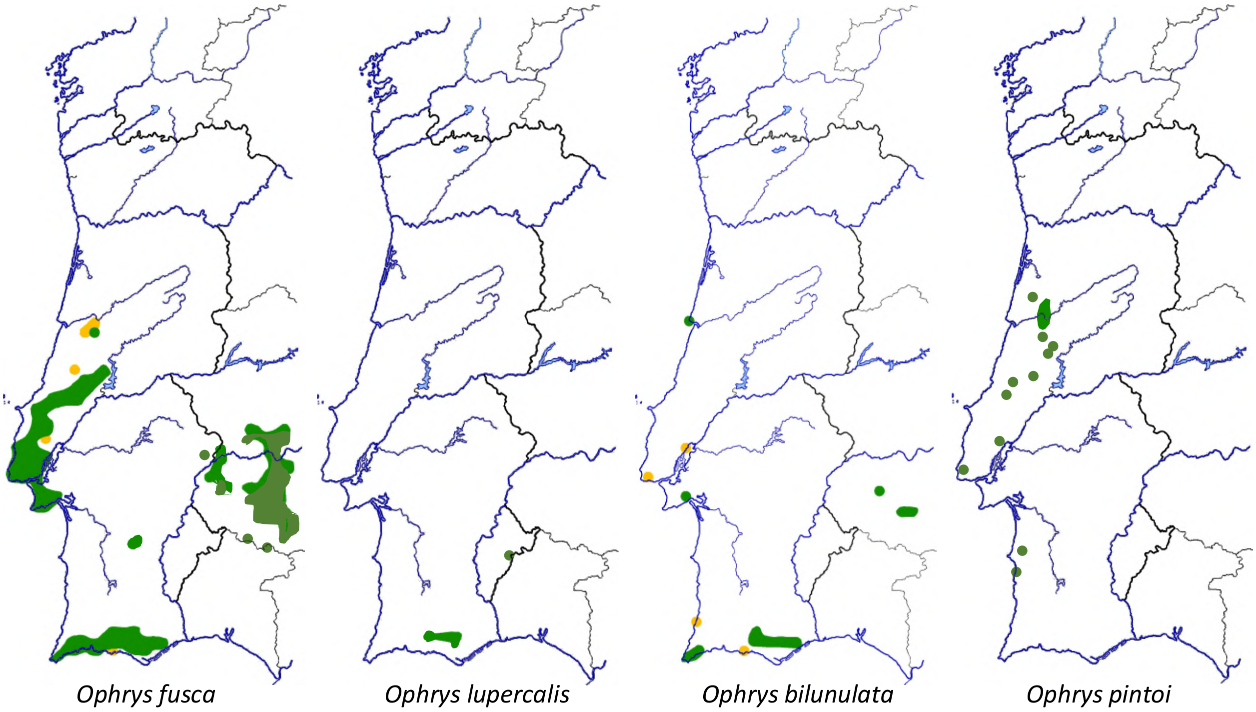

Fig. 4.307. Comparative flowers of *Ophrys fusca* (1 flower on the right) and *O. pintoi* (4 flowers on the left). The scale at the bottom is graduated in millimetres. Rabaçal, Beira Litoral, 7 March 2011.

Figs. 4.308 to **4.313**. Next page. *Ophrys fusca*. 4.308: Serra do Louro, Estremadura, 10.04.2016. 4.309: S. Brissos, Alentejo, 28.02.2011. 4.310: Pinheirinhos, Estremadura, 29.03.2022. 4.311: Cabo Espichel, Estremadura, 4 March 2018. 4.312: Rabaçal, Beira Litoral, 7 March 2011. 4.313: Serra do Louro, Estremadura, 22 March 2008.


Ophrys fusca

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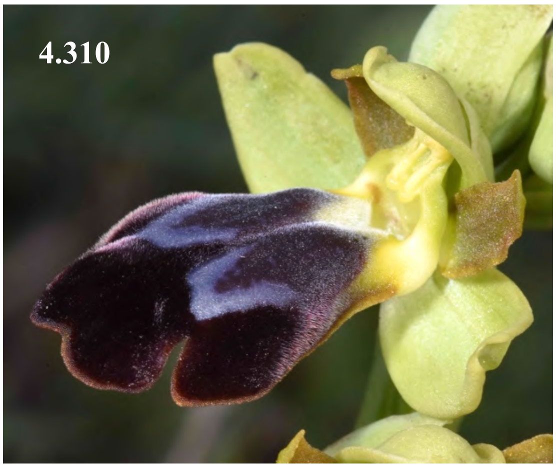
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Figs. 4.314 to **4.319**. *Ophrys lupercalis*.
4.314, 4.319: Paderne, Algarve, 24 January 2015; 4.317: idem, 26 January 2015.
4.315, 4.318: São Braz de Alportel, Algarve, 27 January 2015; 4.316: idem, 27 February 2007.

Figs. 4.320 to **4.325**, next page, *Ophrys bilunulata*.
4.320, 4.323, 4.324: Morgado, Loulé, Algarve, 1 March 2011.
4.321: Morgado, Loulé, Algarve, 17 March 2008.
4.322: Boliqueime, Algarve, 19 March 2000.
4.325: Boliqueime, Algarve, 25 February 2018.

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Figs. 4.326 to **4.331**. *Ophrys pintoi*.
4.326: Ansião, Beira Litoral, 7 March 2011.
4.328: Rabaçal, Beira Litoral, 7 March 2011.
4.327, 4.329 to 4.331: Rabaçal, Beira Litoral, 6 March 2011.

Ophrys dyris Maire — Atlas Ophrys

Ophrys lenae M. Lowe & D. Tyteca — Lena Ophrys

Ophrys vasconica (O. & E. Danesch) P. Delforge — Gascony Ophrys

Ophrys algarvensis D. Tyteca, Benito Ayuso & M. Walravens — Algarve Ophrys

Description

Plants 10 to 35 cm tall. Sepals oblong to oval, light green, lateral ones spreading laterally, median one folded back over gynostemium; petals green to brown, oblong, with more or less undulate parallel edges. Labellum deeply trilobed, with more or less pronounced longitudinal and lateral convexity, but always very convex at the apex; apex of labellum densely covered with dark hairs with whitish to silvery reflections; greyish to reddish spot clearly delimited at its apex by a glabrous white to bluish or reddish zone in the shape of a ω (omega). Other characteristics allow these four species to be distinguished and are summarised in Table 4.14.

Table 4.14. Comparative characteristics of *Ophrys dyris*, *O. lenae*, *O. vasconica* and *O. algarvensis*.

Characteristic	***O. dyris***	***O. lenae***	***O. vasconica***	***O. algarvensis***
Number of flowers	(2-) 3 – 8	3 – 8	2 – 6 (-10)	2 – 6
Length of lateral sepals	10 – 16 mm	12,5 – 13,7 mm	10 – 14 mm	14 – 16 mm
Length of petals	7,5 – 12 mm	8,8 – 9,9 mm	6 – 9 mm	9,5 – 12 mm
Angle between edges of lateral lobes and axis of labellum	40 – 65°		40 – 65°	28 – 42°
Labellum length	10 – 19 mm	17,1 – 19,4 mm	12 – 20 mm	15 – 19,5 mm
Labellum convexity	Much pronounced longitudinally (from the base) and laterally	Quite pronounced longitudinally and laterally	Moderate longitudinally (weak at the base), pronounced laterally	Moderate, very weak at the base; slight longitudinal concavity often visible in the centre
Labellum glabrous margin	Narrow; not or barely visible due to convexity	Sometimes visible	More or less visible	+/- broad; generally clearly visible
Furrow at base of labellum	Generally absent	More or less pronounced	More or less pronounced	Generally absent or very weak
Labellum lateral lobes	2 – 3 mm x 3 – 4,5 mm (short; 1.5 times wider than long)		3 – 5 mm x 2 – 4 mm (longer than wide)	3 – 4 mm x 3 – 4 mm (roughly as wide as long)

Special features and forms

The species described here are mainly distinguished from the species of the *Ophrys fusca* group by the clear, clearly visible **ω** (omega)-shaped pattern in the centre of the labellum, the ungrooved throat (except for *O. vasconica* and *O. lenae*) and the often dark (brownish) petals with wavy edges. While *O. dyris* has long been known and recorded in Portugal and Extremadura, the same cannot be said for the other three species, all three of which are reported to be hybrids between *O. fusca* and *O. dyris*, with the processes of hybridisation and subsequent speciation having occurred in separate locations, with probable adaptation to different pollinators, and therefore deserving separate names (VEREECKEN et al. 2010).

O. algarvensis has been described recently (TYTECA et al. 2003) and my opinion is that all the populations of this group growing in the Algarve belong to this species, which has not yet been found elsewhere in our study area (apart from Andalusian stations outside it). *O. lenae* was described even more recently (LOWE & TYTECA 2012); it forms large populations in central Portugal but its distribution is very localised. Contrary to what is sometimes stated in works on European orchids (DELFORGE 2016; GRIEBL & PRESSER 2021), we believe that this species forms stable, autonomous populations, distinct from the occasional hybrid *O.* x*brigittae*, and therefore deserves a separate name.

The last species, *O. vasconica*, is more problematic. It probably originates from the introgression of *O. dyris* by *O. fusca* s.l. (DELFORGE 1994; DEVILLERS & DEVILLERS-TERSHUREN 1994). Its presence in Portugal, initially considered plausible by DELFORGE (1994), was subsequently rejected (DELFORGE 2005). The controversy may stem from the fact that the hybrid between *O. dyris* and *O. fusca* has been described from Portugal (*O.* x *brigittae* H. Baumann; BAUMANN & DAFNI 1981), without it being possible to know whether this was an occasional hybrid or hybridogenic populations that could then correspond to *O. vasconica* (DEVILLERS & DEVILLERS-TERSCHUREN 1994).

Subsequently, *O. vasconica* was reported from Castilla y León by BERNARDOS (1998) and was therefore included among the orchids of Portugal and neighbouring regions (TYTECA & BERNARDOS 2003). More recently, we have been led to consider that Portuguese populations, sometimes closely related to *O. dyris* (LOPES 1981; TYTECA 1998), could belong to this taxon (Serra dos Candeeiros, pers. obs. 2008; Coimbra region, J. PESSOA, pers. comm. 2009). The situation has since been clarified, as we have included in this work both the new taxon *O. lenae*, which we have just discussed, and populations of *O. vasconica*, whose presence in north Portugal is now confirmed (TYTECA et al. 2017).

Biotope and ecology

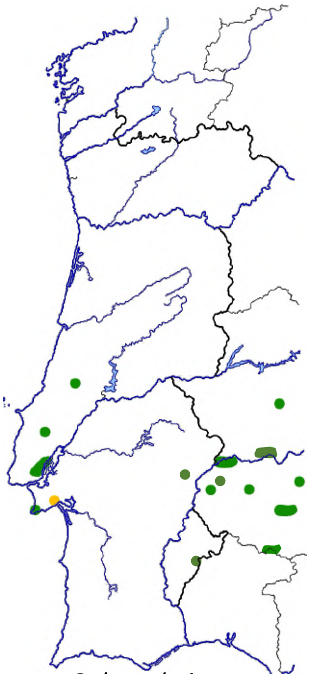
The four species considered grow in the usual habitats of most *Ophrys* (grasslands, scrubland, sparse woodland, on calcareous soils), but more often near bushes or protective plants (unlike others, such as *O. speculum* or *O. lutea*, which can be found in rocky areas). They are found at altitudes of less than 600 m. As in the case of the species of the O. fusca group, morphological and taxonomic differentiation is accompanied by adaptation to completely different pollinators: *Anthophora atroalba* for *O. dyris*, *Colletes albomaculatus* for *O. algarvensis* (PAULUS 2005; PAULUS, pers. comm. and unpublished notes, 2005), *Andrena flavipes* and *A. nigroaenea* for *O. vasconica* (PAULUS 2018). However, no pollinator has yet been identified for *O. lenae*.

Distribution

The four species have a rather limited distribution in the western Mediterranean Basin. *O. dyris* seems to be restricted to the Iberian Peninsula, the Balearic Islands and North Africa; it is rather rare in our territory, where it is found in only a few populations in Estremadura and Extremadura. It should be noted here that in the latter territory, VÁZQUEZ (2009) indicates '*O. omegaifera*' with the subspecies "*dyris*" and '*algarvensis'*, with illustrations for both showing two groups of plants that are not very typical and difficult to distinguish from each other. Until we know more, we will include the distribution of *O. omegaifera* in that of *O. dyris*. *O. algarvensis*, in the strict sense and in its recognised meaning for Portugal, is almost endemic to our territory, being limited to the Algarve (where it has several well-stocked populations) and central Andalusia (Province of Málaga). Furthermore, *O. vasconica* is reported in south-western France (where it was described), Spain and possibly the Balearic Islands; in our territory, it is likely to be very rare, being currently limited to two populations, one in Castilla y León and one in Trás-os-Montes. Finally, we discussed the situation of *O. lenae* in Ribatejo and Beira Litoral.

Situation in the study area

The preceding lines have highlighted the extreme rarity of the four species under consideration. Generally speaking, their biotopes are not directly threatened; however, in the Algarve, the rather uncontrolled urbanisation throughout the Barrocal region gives us cause to fear a bleak future for *O. algarvensis*. Active conservation measures need to be taken for all four species.



Ophrys dyris

Ophrys lenae

Ophrys vasconica

Ophrys algarvensis

Figs. 4.332 (opposite) and **4.333** to **4.338** (next page): *Ophrys dyris*.

4.332, 334, 335, 338: Serra dos Candeeiros, Estremadura, 9 March 2011.

4.333, 336, 337: Pinheirinhos, Serra da Arrábida, Estremadura, 29 March 2022.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Figs. 4.339 to **4.344** (next page): *Ophrys lenae*, Serra dos Candeeiros, Estremadura.
4.339, 342, 343: 28 March 2008.
4.340, 341, 344: 9 March 2011.


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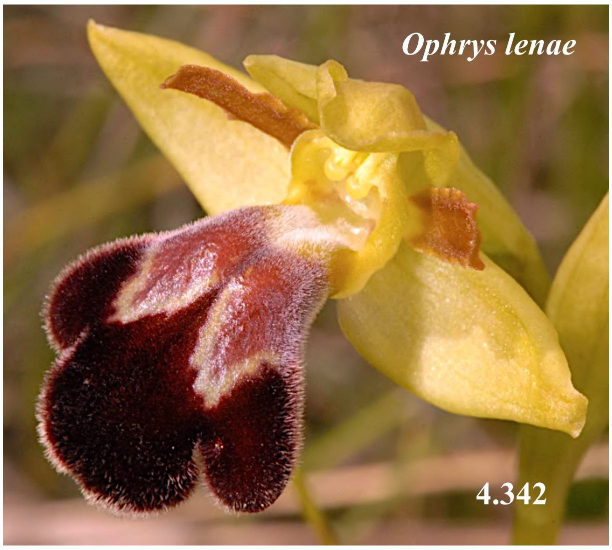

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Figs. 4.345 to **4.350**. Entire page. *Ophrys vasconica*, Campo de Víboras, Trás-os-Montes, 27 April 2019.

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Figs. 4.351 to **4.356**. *Ophrys algarvensis*.
4.351, 354, 355: Morgado, Loulé, Algarve, 6 April 2022.
4.352: São Bartolomeu de Messines, Algarve, 5 April 2022.
4.353, 356: Paderne, Algarve, 30 March 2016.

Ophrys lutea Cav. Yellow Bee Orchid

Erva-vespa (port.), Abejera amarilla, abejita amarilla, hierba de la avispa (cast.)

Ophrys quarteirae (Kreutz, M.R. Lowe & Wucherpfennig) P. Devillers & J. Devillers-Terschuren Quarteira Ophrys

Description

Plants 10 to 40 cm tall, bearing 1 to 6 (-10) flowers. Sepals yellowish green, broadly oval, lateral ones spreading laterally, dorsal one folded back over gynostemium. Petals oblong, greenish to yellowish, with parallel edges. Labellum yellow, trilobed, with bifid median lobe, decorated in its centre and at its base with a blackish-brown spot framing a glabrous bluish-grey area; labellum furrowed at its base ('V-shaped' throat). Labellum convex in its centre. The two species are distinguished by the characteristics given in Table 4.15.

Table 4.15. Comparative characteristics of *Ophrys lutea* and *O. quarteirae*.

Characteristic	***O. lutea***	***O. quarteirae***
Labellum length	12,5 – 16 mm	11 – 12,5 mm
Labellum width	11 – 15,5 mm	9,5 – 11 mm
Angle of edge relative to axis	55 – 75°	35 – 45°
Extent of macula	Stops at the sinuses	Covers a large part of the median lobe
Top of macula	No extension towards the edge	Typically extended into a 'moustache'
Yellow edge of labellum	Very wide, +/- as wide as the macula	Narrower, less than half the width of the macula
Convexity of the labellum	Pronounced at the base; edges curved forward	Not very pronounced; lateral lobes folded back
Habitat	Full sunlight, dry soil	Partial shade, north-facing slope, cool soil
Flowering	March – April	Early April – early May

Fig. 4.357. Flower of *Ophrys quarteirae* with a potential pollinator. Boliquieme, Algarve, (photo I. Rodrigues).

Special features and forms

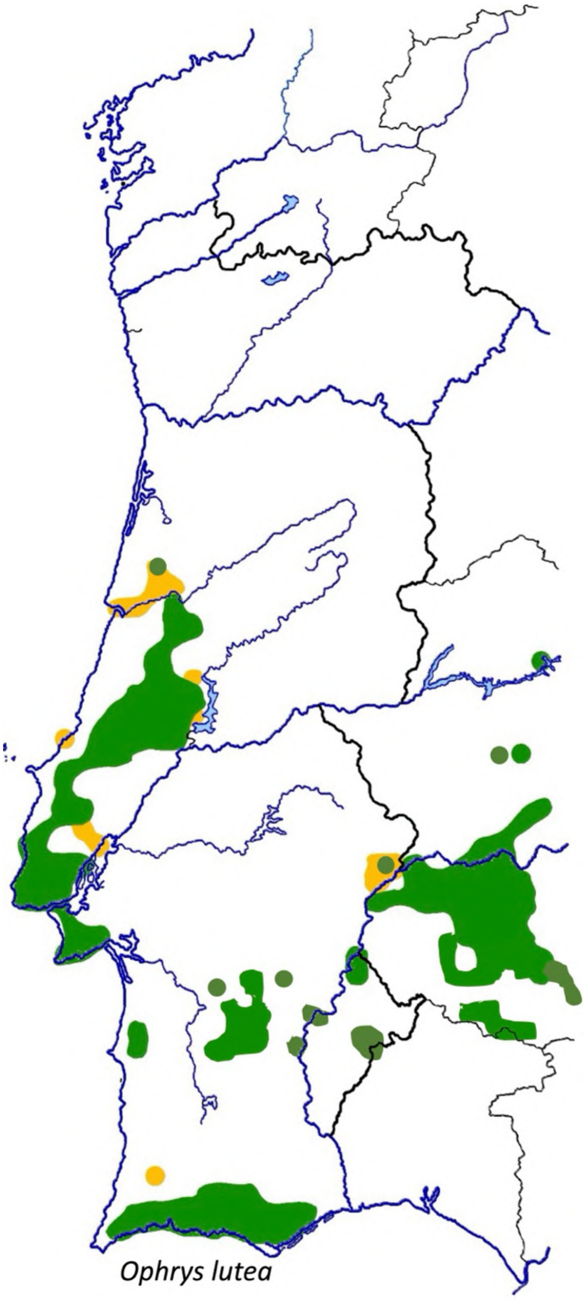
The large yellow flowers of *O. lutea* make it a very easy species to recognise. The flowers of *O. quarteirae* are clearly smaller and undoubtedly explain the occasional mention of other taxa in Portugal and southern Spain (*O. sicula*, *O. battandieri*, which are not normally found on the Iberian Peninsula), from which *O. quarteirae* is clearly distinguishable, justifying its description as a separate species. However, this has only been proposed very recently (KREUTZ et al. 2007), which is undoubtedly due to the rarity of this very localised taxon.

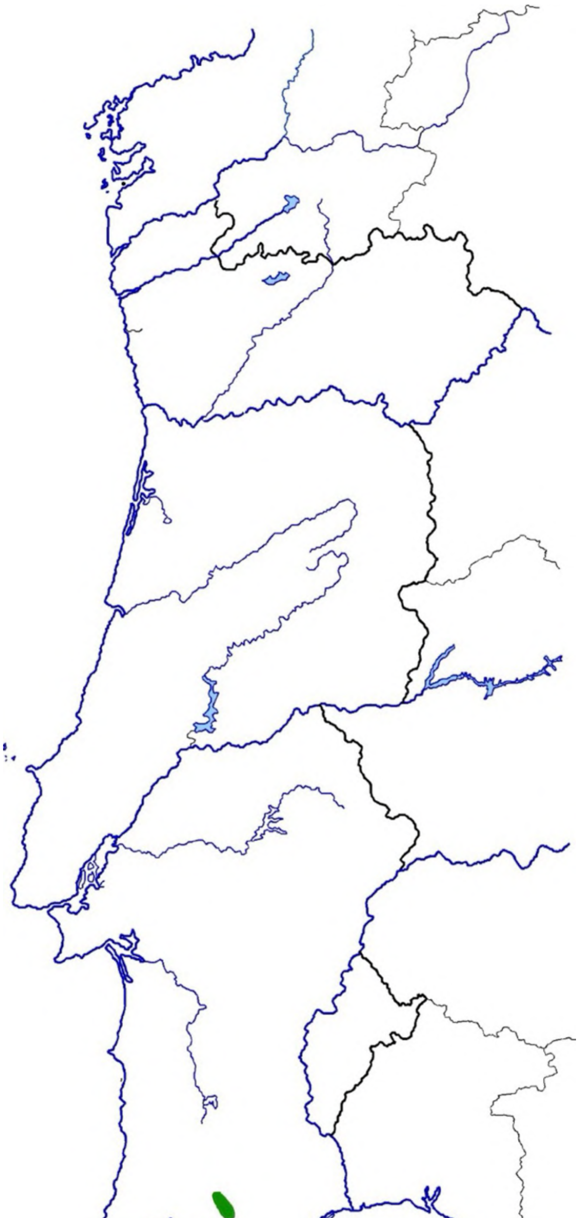
Biotope and ecology

O. lutea is found in sunny areas of scrubland, sometimes in partial shade, on calcareous or similar soils, at altitudes below 600 m. It is pollinated by hymenoptera belonging to the genus *Andrena*. *O. quarteirae*, whose pollinators are unknown, prefers cooler, semi-shaded locations, typically on north-facing slopes, near fig trees, carob trees or old walls. Portuguese sites are found below 200 m altitude.

Distribution
O. lutea is widespread in the Mediterranean Basin, from North Africa to Poitou-Charentes and eastwards to Crete, but is more abundant in the western part. In our territory, it is widespread in the southern half of Portugal (Beira Litoral, Estremadura, Ribatejo, Alentejo, Algarve) and in Extremadura. *O. quarteirae* is endemic to the south of the Iberian Peninsula; in the territory studied, only three localities are known in the centre of the Algarve; in Andalusia, it is found in the provinces of Cadiz, Malaga, Jaén and Seville, outside the territory of our domain.

Situation in the study area
While the survival of the widespread *O. lutea* requires few special measures, the maintenance of populations of *O. quarteirae*, of which fewer than 100 plants are known to exist in total in southern Portugal (KREUTZ et al. 2007), requires explicit recommendations in this region, which is increasingly subject to uncontrolled urbanisation, if not agricultural expansion.





Figs. 4.358 to **4.360** (below). *Ophrys lutea*.
4.358: Serra S. Luís, Estremadura, 30 April 2009.
4.359: Paderne, Algarve, 7 April 2022.
4.360: Morgado, Loulé, Algarve, 4 April 1990.

Figs. 4.361 to **4.363** (below). *O. quarteirae*.
4.361, 363: S. Bartolomeu de Messines, Algarve, 1 April 2008.
4.362: Boliqueime, Algarve, 19 March 2008.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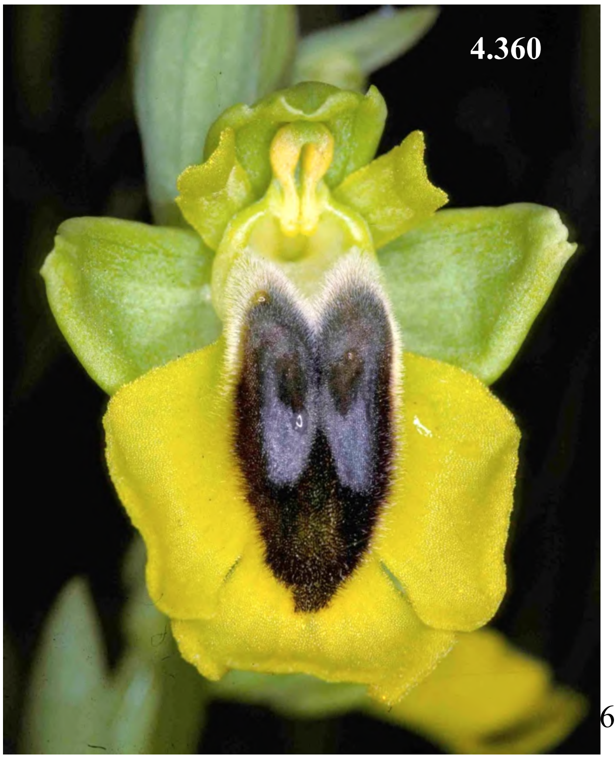
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Ophrys insectifera L. Fly Orchid

Abejita, mosquera (cast.)

Description

A plant 15 to 70 cm tall, with three to five small linear to lanceolate basal leaves, bright green in colour, and one to two cauline leaves enveloping the stem. Loose inflorescence, bearing two to ten widely open flowers, with a characteristic appearance, reminiscent of the shape of an insect. Green sepals; remarkable petals, linear, dark brown, resembling insect antennae. Velvety, convex, oblong, blackish-brown labellum with three lobes and a notched median lobe, without appendages, with a glabrous, shiny blue central spot. Reddish pollinia sac.

Special features and forms

A relatively unvaried plant. The central spot on the labellum can be very small and show some colour variation; the labellum sometimes has a more or less pronounced yellow margin. The labellums of some (rare) individuals lacking purple pigments are entirely greenish, with a whitish spot.

Biotope and ecology

The fly orchid grows in limestone grasslands, in open, sunny locations, but also thrives in more shaded areas, in light woods, but always on limestone soils. In the region, it is only found at relatively high altitudes (between 1,250 and 1,500 metres). Pollination is ensured (by pseudo-copulation) by solitary wasps of the genus *Argogorytes* (*A. mystaceus*, *A. campestris*), which can sometimes be observed for several minutes, seemingly searching for the best position for mating (Fig. 1.13). Flowering can begin around mid-May and continue until early July, depending on the year.

Distribution

This species is widespread throughout much of Western Europe, as far north as Norway; in the Mediterranean region, it is confined to higher altitudes and is not a species of the garrigue.

Situation in the study area

At the edge of its range in our territory, the fly orchid is found only in the far north-east, in the Montes de León region, in a few small, sparse populations.

Figs. 4.364 and **4.365**. Next page. *Ophrys insectifera*, Vega de los Viejos, Province of León.
4.364: 22 May 2002; 4.365: 6 July 2009.

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Fig. 4.366. *Ophrys apifera*, Esperante, Seoane do Courel, Galicia, 5 June 2023.

Ophrys apifera Huds. **Bee Orchid**

Abelha-flor, abelheira, abelhinha, erva-abelha (port.), Abejera, abejita, flor de abeja (cast.), Abelleira común (gal.)

Description

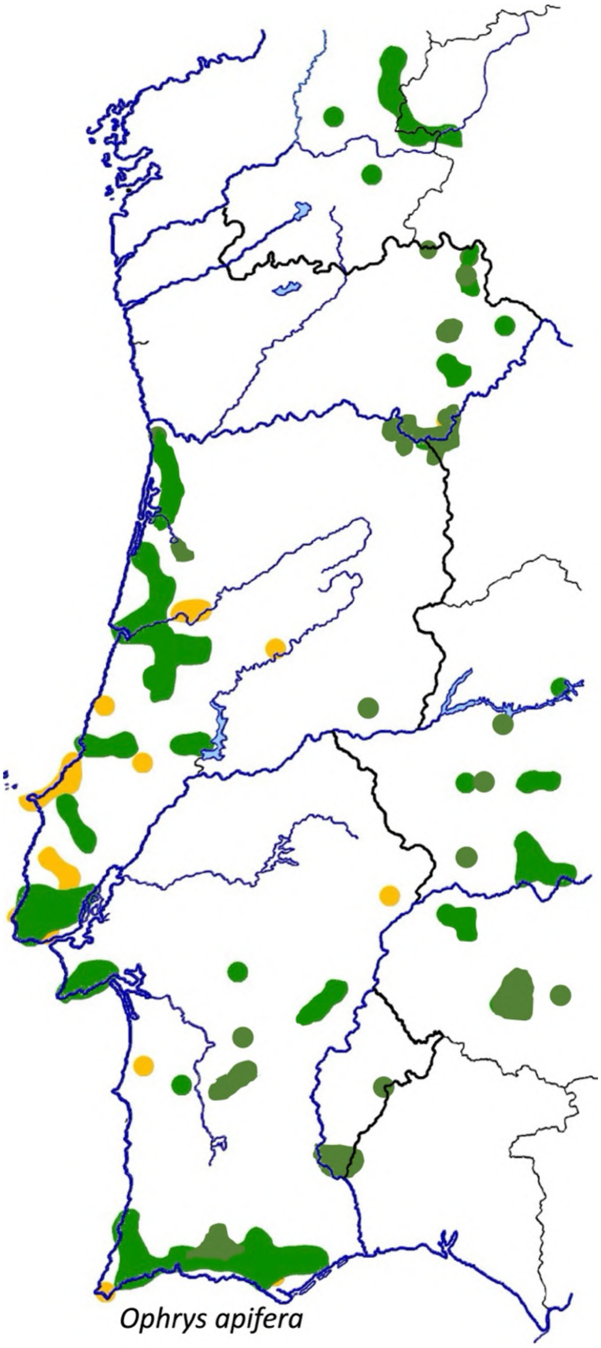
A plant 20 to 50 cm tall, with three to five oblong to lanceolate basal leaves, greyish green with strongly marked veins, and one to two cauline leaves enveloping the stem. Inflorescence bearing three to ten flowers of varying colours. Sepals white to purplish pink, elongated; petals small, oblong, greenish in colour, strongly pubescent. Labellum velvety brown, strongly convex, oblong, with a glabrous, greyish to bluish macule in the centre, irregular in shape with ramifications, framed by a white or yellowish border; this macule itself frames the reddish-brown basal field. Labellum with conspicuous pubescent lateral gibbosities; apex of labellum with a fleshy, yellowish appendage, carried behind the labellum and therefore not visible when the flower is viewed from the front. Gynostemium elongated, flexuous, ending in an elongated tip.

Special features and forms

The plant shows little variation within a given population, due to the autogamy that is the norm for this species. The pollinia are carried by fairly long, slender caudicules (Figures 4.366 and 4.368); shortly after the flower opens, the desiccation of the caudicules causes the pollinia to leave their lodges and gradually move towards the stigmas, thus ensuring self-pollination. There are various forms and varieties, linked to a more or less advanced stage of degeneration due to autogamy. An example is given here: the form in which the flower is completely devoid of coloured pigments, leaving only chlorophyll pigments, with a greenish-yellow labellum and petals and pure white sepals (Fig. 4.369).

Biotope and ecology

The bee orchid is found in scrubland and limestone grasslands, in open, sunny locations, sometimes in partial shade. The species appears in its habitats with extremely variable abundance from year to year, sometimes with long periods of eclipse that may lead one to believe it has disappeared. These irregular appearances are linked to its self-pollinating nature: as all the flowers are pollinated and bear fruit, the plant expends a great deal of energy, so that very often, after flowering, the plant remains dormant for one or two years. Flowering takes place from mid-April and can continue until June.



Distribution

It is one of the most widespread species of the genus *Ophrys*, with a distribution covering much of Europe and the Mediterranean Basin, as far north as Ireland and England. It is found scattered throughout much of our territory, in all regions of southern Portugal as well as in Trás-os-Montes, Galicia, Castile and León, and Extremadura.

Situation in the study area

Due to its late and irregular flowering, the bee orchid may appear less widespread than other *Ophrys* species, especially during the period when most orchid enthusiasts visit (in April).

Figs. 4.367 to **4.369**. *Ophrys apifera*.
4.367: Serra do Sicó, Beira Litoral, 5 May 2009.
4.368 and 369: Castelo Melhor, Trás-os-Montes, 7 May 2024.

Ophrys picta
Alvados, Serra de S. António
21 April 2022

Ophrys scolopax Cav. Woodcock Orchid

Flor-dos-pasarinhos (port.), Abejera, abejera becada (cast.), Flor da abella (gal.)

Ophrys picta Link Painted Ophrys

Ophrys beirana D. Tyteca, J. Pessoa & L. Borges Beira Ophrys

Description

Plants 15 to 40 cm tall. Inflorescence bearing three to twelve flowers of varying colours. Sepals and petals white to purplish pink; sepals oval-lanceolate; petals approximately half the length of the sepals, linear to triangular (see table), finely pubescent. Velvety brown labellum, trilobed, strongly convex (edges of the median lobe strongly folded back), oblong, with a glabrous, greyish to bluish macule in the centre, irregular in shape with ramifications, framed by a white or yellowish border; this macule itself frames the brownish basal field. Labellum with pubescent lateral gibbosities, glabrous and greenish on the inside, more or less tapered; apex of the labellum with a large, fleshy, yellowish appendage pointing forward. Gynostemium with acute apex. The differences between the three species discussed are shown in Table 4.16.

Special features and forms

The three species are very recognisable with their brightly coloured flowers, strongly convex labellum and large, forward-facing appendage. As with all *Ophrys*, there are significant variations in colour, with the extreme being the loss of purple pigments, resulting in flowers that are entirely whitish to greenish in colour. Although differentiation between the three species is in principle straightforward based on the data in Table 4.16, it can be problematic in some cases, but intermediate forms are quite rare. Some authors do not distinguish between the three taxa, but we believe that the differences are sufficiently clear to recognise three distinct species, which also appear to have distinct pollinators. *Ophrys picta* is easily recognised by its fairly small flowers with generally light-coloured perianths, very fine gibbosities and very narrow, linear petals; *O. scolopax* is quite similar but significantly larger in size; *O. beirana* stands out from the other two, notably due to its broad, ‘pot-bellied’ labellum, its light orange basal field, its dark purple-violet perianth and its short, triangular petals.

Biotope and ecology

These three species are found in grasslands, scrublands and limestone wastelands, in open, sunny locations, sometimes in partial shade (open oak forests), at altitudes below 700 m (*O. picta*) and 1000 m (*O. scolopax* and *O. beirana*). Pollination is generally carried out by male aculeate hymenoptera of the genus *Eucera*, but there is still some uncertainty as to the species. Flowering of the three species can begin in early April and continue until early June, depending on the year and latitude.

Distribution

O. scolopax is fairly widespread throughout most of the Iberian Peninsula, the south-western third of France and Liguria (Italy). Reports from other areas (North Africa, Corsica, Sardinia, eastern Mediterranean Basin) probably refer to other taxa. *O. picta* has a fairly similar range and is reported from Tunisia and Sardinia, but becomes rarer towards the north-east of the Iberian Peninsula and especially in France, where *O. scolopax* is largely dominant. In the territory studied, *O. picta* is widespread in the limestone areas of south-western Portugal (Beira Litoral, Estremadura, Ribatejo, Algarve), where *O. scolopax* is only occasional and isolated. From Beira Litoral northwards, the latter becomes the dominant species and is the only one of the two found in Galicia, Castilla y León and probably Extremadura, where its delimitation from *O. picta* needs to be reviewed. *O. beirana* has been described recently and its distribution still needs to be clarified; so far, it is limited to central Portugal, where the species is endemic.

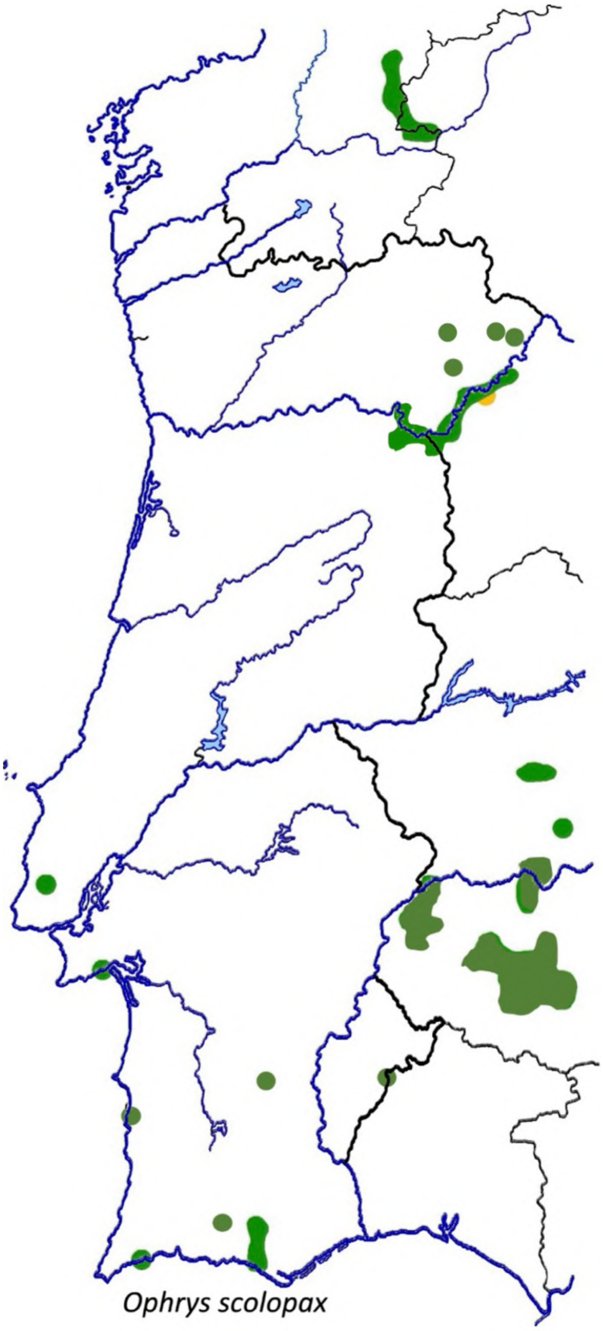
Table 4.16. Comparative characteristics of *Ophrys scolopax*, *O. picta* and *O. beirana* (table taken from Tyteca & Gathoye 2024, updated).

Characteristic	***O. scolopax***	***O. picta***	***O. beirana***
Labellum shape	Moderately rounded, narrow	Moderately rounded, narrow	Strongly rounded, broad
Ratio labellum length / median lobe width	1,6 – 2,3	1,7 – 2,3	1,3 – 1,8
Lateral sepal length (mm)	11,7 – 14,7	10,5 – 12,5	11,9 – 13,9
Petal length (mm)	5,5 – 9,0 Equal to more than ½ the length of the sepals	3,3 – 5,8 Intermediate (± ½ the length of the sepals)	3,5 – 5,8 Less than half the length of the sepals
Petal shape	Very narrow, linear	Very narrow, linear	Triangular, short
Perianth colour	Generally pink, rarely purple	Generally pink, sometimes white, rarely purple	Red – dark purple
Basal field colour	Dark brown	Dark brown	Light orange
Basal field shape	Narrow	Narrow	Wide
Labellum gibbosities	Short, ± triangular	Thin and tapered	Short, ± triangular

Situation in the study area

The populations of the three species appear to be stable and abundant where their habitats remain undisturbed. Particular attention will be paid to the persistence of *O. scolopax* in southern and northern Portugal, and even more so to that of *O. beirana*, whose range is rather limited.

Figs. 4.370 to **4.372**. *Ophrys scolopax* (next page)
4.370: Silva, Trás-os-Montes, 1 May 2019.
4.371: Castro Vicente, Trás-os-Montes, 28 April 2019.
4.372: Alte, Algarve, 30 March 2016.



Ophrys scolopax

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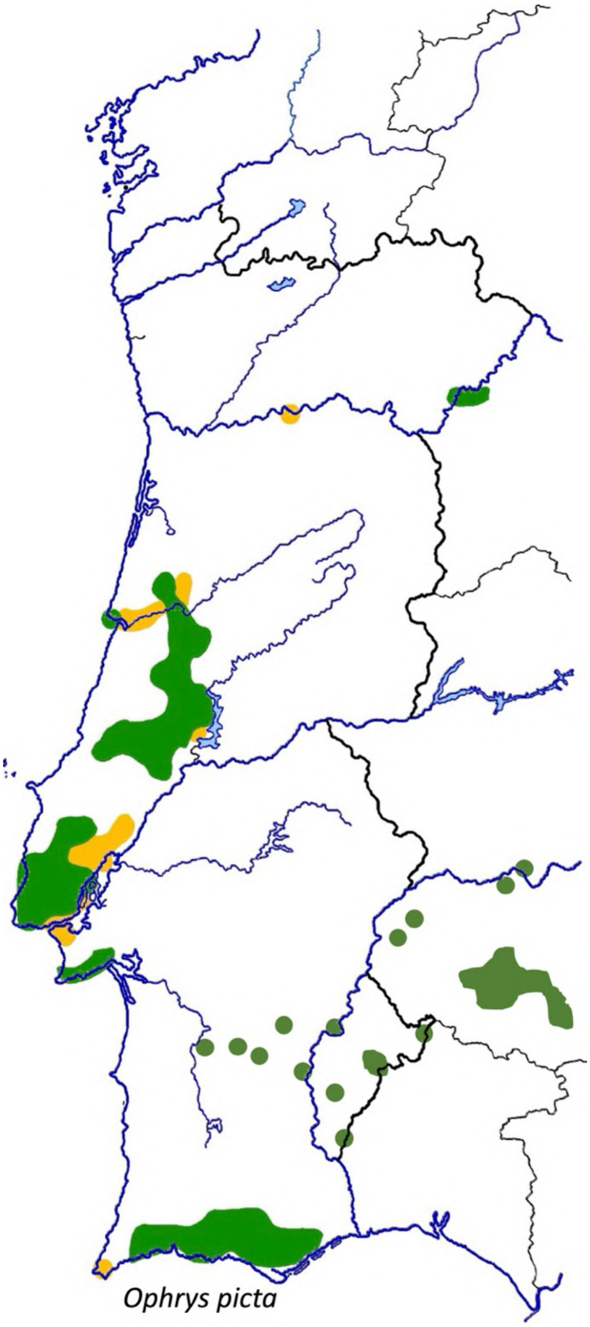
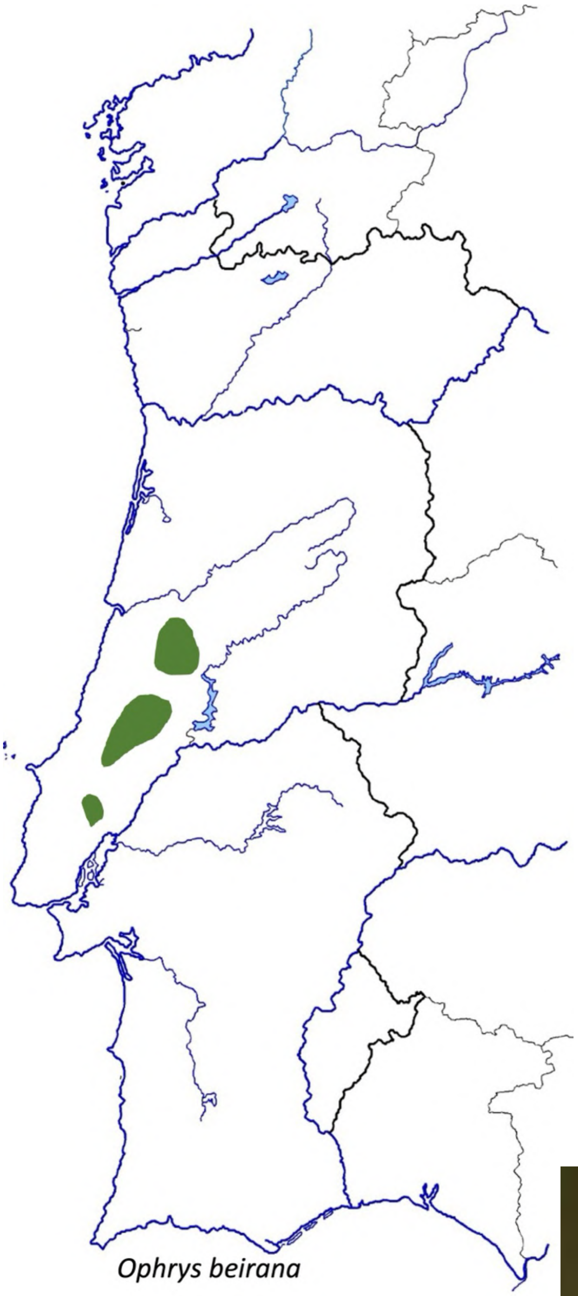


Figs. 4.373 to **4.375**. *Ophrys picta* (this page).
4.373: Serra do Sicó, Beira Litoral, 15 April 2022.
4.374: Serra do Sicó, Beira Litoral, 15 April 2022.
4.375: Morgado, Loulé, Algarve, 12 April 1995.

Figs. 4.376 to **4.378**. *Ophrys beirana* (next page).
4.376: Outeiro, Beira Litoral, 6 May 2019.
4.377: Outeiro, Beira Litoral, 6 May 2019.
4.378: Pousadas Vedras, Beira Litoral, 5 May 2019.



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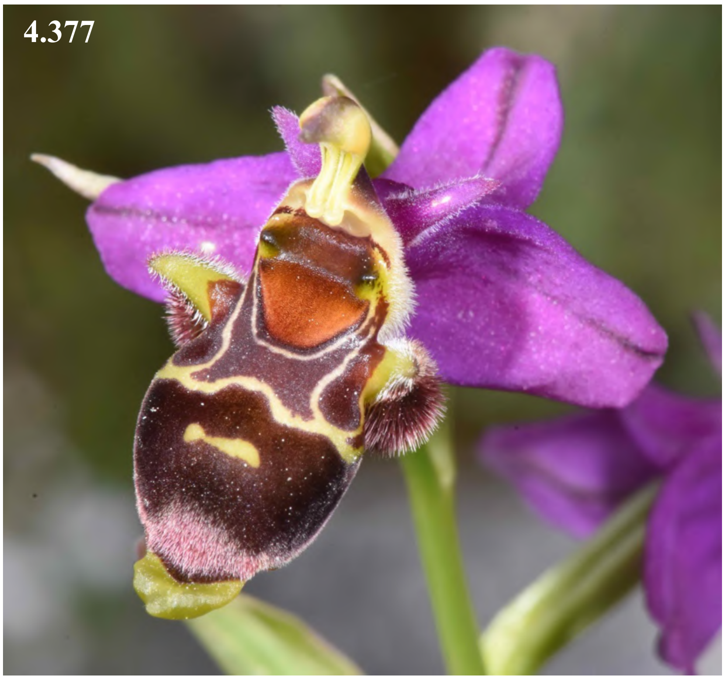


4.378

Ophrys incubacea Cav. — Black Ophrys

Preliminary remark

Vernacular names (other than English) are omitted, as there are several taxa on the Iberian Peninsula, including *O. sphegodes* and *O. incubacea*, all grouped under *O. sphegodes* in Flora Iberica (CASTROVIEJO et al. 2005). Furthermore, in the Portuguese Red List (CARAPETO et al. 2020) and on Flora-On (https://flora-on.pt), only *O. sphegodes* is listed, whereas in Portugal, it is clearly *O. incubacea* alone that is found. Given the ambiguity caused by these positions, it is impossible to know which of the two taxa (this one and the next one) the vernacular names apply to.

Description

Plant 15 to 40 cm tall, bearing 3 to 8 flowers. Sepals fairly pale green, sometimes whitish, sometimes tinged with pink or purple; petals green to brown, oblong, glabrous to finely ciliate at the edges, with straight to slightly wavy edges. Convex labellum, orbicular to elliptical, purplish-blackish brown, finely velvety in the centre, with abundant hairiness around the edge and two triangular gibbosities, hairless inside, hairy at the edges. Centre of the labellum with a large metallic blue, sometimes reddish, H-shaped or two long disjointed bars, more rarely with a more complex pattern, whose branches extend to the inner face of the gibbosities, framing the basal field. Basal field the same colour as the labellum, contrasting strongly with the white colour of the edges of the stigmatic cavity. Black or blue pseudo-eyes, sometimes with a white edge.

Special features and forms

A remarkable plant with its almost black labellums, contrasting with the bright blue colouring of the macule and white colouring of the stigma cavity. The variations, which are minor, are mainly noticeable in the shape of the macule and the size of the gibbosities.

Biotope and ecology

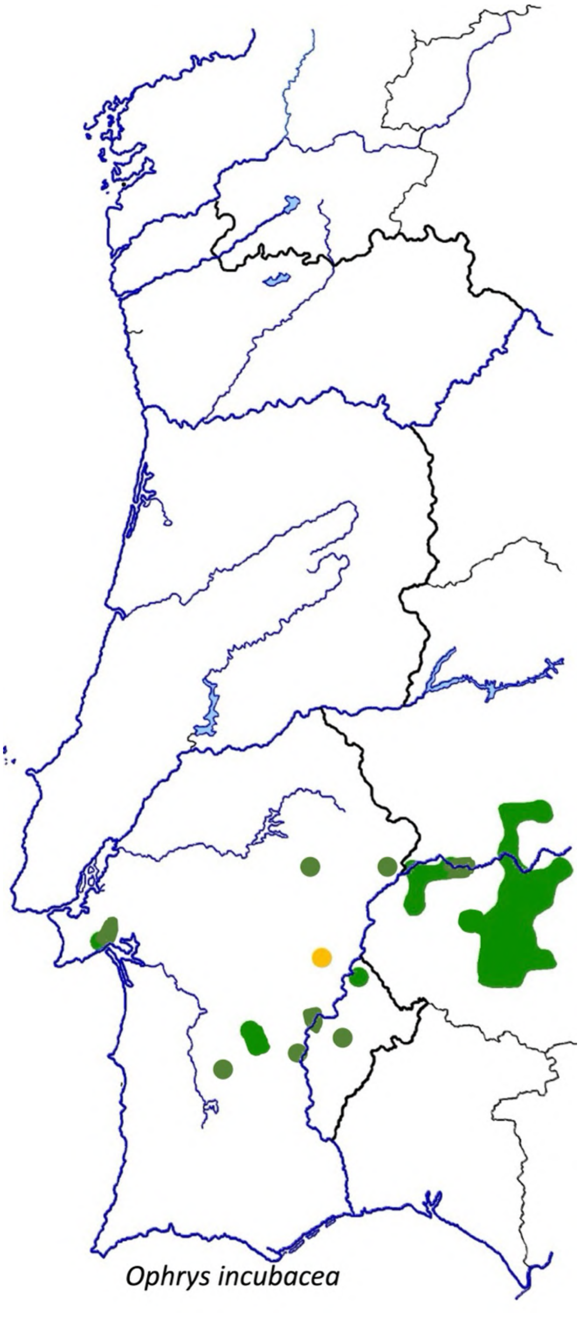
This plant grows in the usual habitats of *Ophrys*, in scrubland, grasslands, sometimes in partial shade, on calcareous or similar soils, at altitudes below 600 m. Pollinated by *Andrena morio*, it flowers in March–April.

Distribution

Western and central Mediterranean: from Portugal to Albania, north to northern Italy; absent from North Africa. In the studied territory, its main range is in Extremadura, extending towards Alentejo and southern Estremadura (Serras de Palmela and São Luis), where it is very rare.

Situation in the study area

The species is extremely rare in Portugal, where there are few sites and these are generally sparsely populated, placing the species in a precarious situation. It is currently highly threatened by changes in agricultural practices (intensification or



abandonment of grazing, fertilisation of grasslands), locally by the construction of dams (Alqueva), and has undoubtedly disappeared from some of its locations in Alentejo. It therefore deserves priority attention for conservation purposes.

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4.382

Figs. 4.379 to **4.382**. *Ophrys incubacea*. 4.379: Palmela, Estremadura, 21 March 2008. 4.380 and 381: Palmela, Estremadura, 20 March 2008. 4.382: São Brissos, Baixo Alentejo, 27 March 2016.

Ophrys caloptera J. Devillers-Terschuren & P. Devillers

Calopteran Ophrys

Description

Plant 15 to 40 cm tall, bearing 3 to 10 flowers. Sepals pale green to whitish, sometimes pink; petals green, brownish, rarely pinkish, often dark at the edges, often darker than the sepals, oblong, often with wavy edges. Convex labellum, entire, rarely trilobed, orbicular, with more or less prominent gibbosities, sometimes imperceptible, dark brown, finely velvety in the centre and more hairy around the edges, decorated in the centre with a shiny, hairless spot of various colours (blue, greyish, reddish) and shapes. Basal field and stigmatic cavity dark in colour, similar to that of the labellum; edge of the stigmatic cavity white to pale greenish.

Special features and forms

A fairly variable species, particularly in terms of the colours of the perianth, the shape of the labellum, whether or not it has gibbosities, and the shape and colour of the macule on the labellum. As a result, it is sometimes difficult to distinguish certain individuals from the neighbouring species *O. incubacea*. Adopting the population option, it is preferable to identify these individuals as the entire population and therefore as *O. caloptera*. In their recent work on Galicia, CORTIZO & SAHUQUILLO (2006) do not make the distinction and consider all Galician populations of the *O. sphegodes* complex as representatives of the single species *O. sphegodes*. We believe we can maintain the distinction, taking the option that all populations in the southern half of Galicia (the only ones considered in this work) belong to *O. caloptera*.

Biotope and ecology

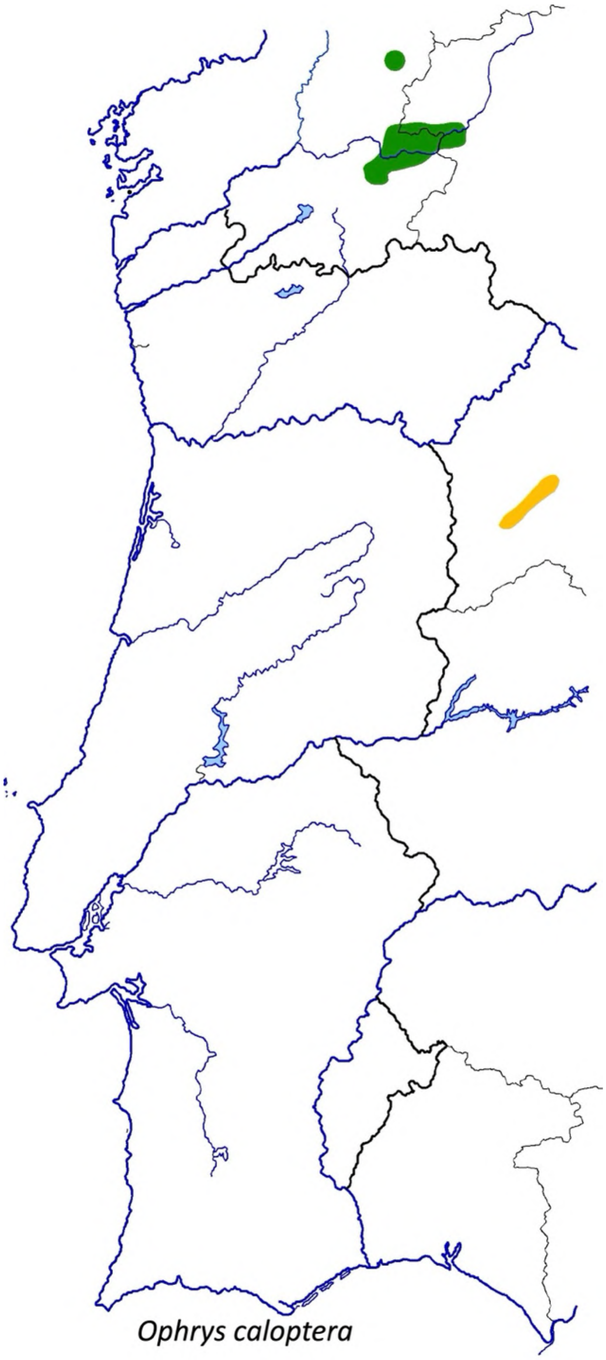
Full sunlight to partial shade, in scrubland, light woods and along paths, on generally calcareous soils, at altitudes between 300 and 1,000 metres in the area. A pollinator noted for this species is *Andrena carbonaria*, but this needs to be verified in the area studied. Flowering between April and early June.

Distribution

Fairly limited western Mediterranean range: northern Spain, south-western half of France, peninsular Italy. Reaches Galicia and Castilla y León in the west; absent from Portugal.

Situation in the study area

The Galician populations, at the edge of their range, do not currently appear to be under serious threat, but it is important to remain vigilant regarding changes in limestone grasslands and scrublands, both in this region and elsewhere.



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Figs. 4.383 to **4.386**. *Ophrys caloptera*. Vilardasilva, Galicia, 10 May 2001.

Ophrys hybrids

As we have seen, the genetic barriers between the different species of *Ophrys* are practically non-existent, which in principle makes cross-breeding between different species possible. We have also seen that Ophrys species are highly specialised in relation to their pollinators, but this does not prevent 'accidents' from occurring from time to time, when an insect unexpectedly visits a species that is not normally 'its own', or when a casual, non-specialised visiting insect comes into contact with flowers of two different species. It can also happen that subtle changes in the scent of an Ophrys species end up attracting hymenoptera for which the scents were not originally intended. These variations are common in nature, to such an extent that hybridisation becomes a factor in speciation; cases are not rare in the *Ophrys* genus.

Furthermore, as many species of *Ophrys* occupy the same habitats, it is not surprising that hybrids are found quite frequently within this genus. In the area we are concerned with, there are no known cases of hybrid swarms, and the hybrids encountered are therefore rather isolated and occasional. The following situations have been observed (in alphabetical order). It should be noted that we prefer to name hybrids simply by giving the names of their parents: a specific name is not absolutely required; we only indicate it when it exists.


4.387

Ophrys apifera* x *O. ficalhoana (*O.* x *turiana* J.E. Arnold). This rather unlikely hybrid was found by the AOSP in 2010 in Alentejo, in Montemor-o-Novo (4.387 - photo I. RODRIGUES).

Ophrys apifera* x *O. picta. Found on a single occasion, in the Serra da Arrábida, in 1986 (TYTECA 1987a).

Ophrys apifera* x *O. scolopax (*O.* x *minuticauda* Duffort). Observed during a trip in Galicia in 2023, near Seoane do Courel.

Ophrys beirana* x *O. picta. Illustrated (putatively) in TYTECA et al. (2020) and TYTECA & GATHOYE (2024).

Ophrys beirana* x *O. scolopax. This hybrid was illustrated in TYTECA & GATHOYE (2024).

Ophrys bombyliflora* x *O. picta. Among the *Ophrys* hybrids, this is the one that has been reported most often in Portugal. Since 1985, it has been reported from at least three locations in Estremadura and six in the Algarve (TYTECA 1985c, 1986e, 1987a, 1998; other more recent personal observations). There is a name for the hybrid between *O. bombyliflora* and *O. scolopax*, but given that the majority, if not all, of the hybrids concerned are in fact formed with *O. picta*, no name has been assigned to this hybrid.
← Illustrated here (4.388)

Ophrys bombyliflora* x *O. speculum (*O.* x *fernandi* Rolfe). Observed in 1989 in the Algarve by R. SOUCHE (in TYTECA 1990b).

Ophrys bombyliflora* x *O. tenthredinifera (*O.* x *sommieri* G. Camus ap. Cortesi). This hybrid was discovered in Estremadura. (TYTECA 1986d, 1987a).

Ophrys caloptera x O. scolopax. The only hybrid reported in Galicia and illustrated by CORTIZO & SAHUQUILLO (2006). We hypothesise here that all representatives of the *O. incubacea* group observed in the southern half of Galicia belong to *O. caloptera* (see monography).

Ophrys dyris x O. fusca (*O.* x *brigittae* H. Baumann). This highly plausible combination has only been mentioned once, in Extremadura (BAUMANN & DAFNI 1981). See, however, the discussion in the monography devoted to *O. vasconica*.

Ophrys dyris x O. pintoi. Unpublished hybrid (Portela Vale Espinho, Serra dos Candeeiros, 9 March 2011) →


4.389


4.390

Ophrys fusca x O. incubacea (*O.* x *braun-blanquetiana* Soó). Hybrid reported from Alentejo by ← I. RODRIGUES (4.390).

Ophrys fusca x O. lusitanica [*O.* x *conimbricensis* (O. & E. Danesch) D. Tyteca]. Described by DANESCH (1971, 1972) from Beira Litoral, this hybrid was observed again in Estremadura (Tyteca 1986d, 1987a). While the first observation indicated a predominant influence of *O. lusitanica*, *O. fusca* was dominant in the second. The nomenclatural combination takes into account the fact that *O. lusitanica* has been elevated to species rank (TYTECA 1985b).

Ophrys fusca x O. speculum (*O.* x *eliasii* Sennen ex E.G.Camus & A.Camus). Hybrid reported by Ivo RODRIGUES, in Alentejo.

Illustrated here (4.391 - I. RODRIGUES) →


4.391

Ophrys fusca x O. tenthredinifera (*O.* x sancti-leonardi O. Danesch & E. Danesch) discovered by I. RODRIGUES in São Brissos (Beja), Baixo Alentejo.


4.392

← Illustrated here (4.392 - I. RODRIGUES).


4.394

Ophrys incubacea x O. picta. This hybrid was shown to us by A. FRAZÃO in the Serra de Palmela. Illustrated here. (4.393) ↓.


4.393

Ophrys incubacea x O. speculum (*O.* x *pantaliciensis* Kohlmüller, Riech. & M.Schöbinger). Found in 2014 by the AOSP in Quintos, Beja, Baixo Alentejo.
(← photo I. RODRIGUES – 4.394)


4.395

Ophrys lusitanica x O. speculum (*O.* x *innominata* D. & B. Tyteca). Hybrid described from the Algarve in 1985 (TYTECA 1985c); considered rare at the time, it is probably less so than indicated (see the monograph on these two species).

Ophrys lutea x O. picta. Unnamed, even under the combination *O. lutea* x *O. scolopax*, this apparently rare hybrid was observed in 1990 in the Algarve (TYTECA & TYTECA 1990a). Its occurrence at a site where three other Ophrys hybrids have been observed (*O. bombyliflora* x *O. speculum*, *O. bombyliflora* x *O. picta*, *O. lutea* x *O. speculum*) is an indicator of a particularly rich biotope.
Illustrated here (4.395) →

Ophrys lutea x O. speculum (*O.* x *chobautii* G. Keller ex B. & D. Tyteca). A very rare hybrid, observed at least in 1983 in the Algarve (TYTECA & TYTECA 1983b), as well as in 2023 in the Serra da Arrábida (AOSP).

Ophrys picta x O. scolopax. Hybrid illustrated in TYTECA & GATHOYE (2024).

Ophrys picta x O. speculum. Observed in 2013 by the AOSP in Souselas, Coimbra, Beira Litoral.

Ophrys speculum x O. tenthredinifera. Discovered on several occasions by the AOSP in Atalaia, Portel, Santa Iria, Serpa (Alentejo) and Costa de Arnes, Soure, Beira Litoral.

4.19. Excluded species

In this work, we exclude certain species that have been mentioned at one time or another in the literature for the territory concerned. They fall into several categories:

- There are those indicated by GUIMARÃES (1887) and VEIGA (1887), which we have already excluded, because the taxa indicated by these authors clearly correspond to species that have since been identified differently (see § 3.1). These are *Dactylorhiza fuchsii*, *D. maculata* s.str., *D. saccifera*, *D. majalis*, *D. saccifera*, *Epipactis atrorubens*, *E. purpurata* and *Orchis* (*Anacamptis*) *longicornu*.

- The case of *Serapias vomeracea* is somewhat unusual: it was also mentioned by GUIMARÃES (1887), but at the same time, VEIGA (1887) mentioned a taxon, *S. strictiflora*, which clearly included the plants considered by GUIMARÃES to belong to *S. vomeracea*. There is no doubt that the latter is completely absent from the territories under consideration (BENITO AYUSO & TABUENCA MARRACO 2001).

- Certain species have sometimes been mentioned which clearly do not (or no longer?) form part of the orchid flora of the territory covered, because their known distribution range ends far from the territory studied here. These are *Ophrys fuciflora* and *Orchis simia*, indicated by VEIGA (1887), and *Cephalanthera damasonium*, which appears on the distribution map published by BAUMANN & KÜNKELE (1982). These species have not been mentioned since.

- Finally, certain ‘large’ species have sometimes been considered within the territory by authors who did not wish to make a finer distinction. The case of *Dactylorhiza maculata* has already been mentioned above, but it is worth emphasising given the tendency towards grouping, based on molecular analysis, suggested by STÅHLBERG & HEDRÉN (2008), among others: according to these authors and others, the species in this group that we have considered here, *D. caramulensis* and *D. ericetorum* (not ot speak of *D. irenica*), should be grouped under this name. Similarly, CORTIZO & SAHUQUILLO (2006) included under *Ophrys sphegodes* the taxa that we refer to in this work as *O. incubacea* (as in Flora-On) and *O. caloptera*.

4.20. Orchid diversity in the territory under consideration

Before moving on to a general discussion of orchid conservation, it may be worthwhile to pause and consider the current diversity and summarise the information gathered in the preceding chapters. First of all, as in any part of the world, it must be noted that orchid species are not distributed evenly across the territory in question. Many factors are responsible for this, the main ones being (1) climatic and altitudinal conditions, (2) soil conditions, (3) the type of ecosystem and accompanying vegetation, (4) the intensity and characteristics of human land use, and of course (5) the ecological preferences specific to each species. The combination of these different factors clearly shows that some regions are richer in orchids than others.

In the territory under consideration, several areas are characterised by a high diversity of orchids: from south to north, the Barrocal in the Algarve, the south of Estremadura with the Serra da Arrábida and the surroundings of Lisbon, the north of Estremadura and Ribatejo, and the south of Beira Litoral around Coimbra. All these regions have a diversity of orchids of around 20 species or more per 100 square kilometre grid (TYTECA 1998), with some sites individually hosting up to 16 or 17 species. All these areas and sites share the common characteristic of being located in regions with limestone bedrock. The diversity appears to be higher than in the neighbouring regions of Extremadura, Castilla y León, Galicia and Andalucía, despite the fact that these territories have undoubtedly been surveyed very intensively, as evidenced by the studies of PEREZ CHISCANO et al. (1991), VÁZQUEZ (2009), BERNARDOS (1998, 2003), CORTIZO & SAHUQUILLO (1999a, 1999b, 2006) and BECERRA PARRA & ROBLES DOMÍNGUEZ (2009), respectively.

However, the highest diversity per UTM square (100 km^2) observed in Portugal never exceeds 26 species per square (TYTECA 1998), which is far lower than the diversity observed in regions such as, for example, northern Attica (Greece - KÜNKELE & PAYSAN 1981), Monte Gargano (Italy - LORENZ & GEMBARDT 1987) or Sicily (KÜNKELE & LORENZ 1995). These three studies show that the maximum diversity observed is 44, 47 and 38 species per UTM square, respectively.

In fact, the overall diversity of orchids observed in Portugal and neighbouring regions is not as high as in other areas of the Mediterranean Basin. Figure 1.16 (chap. 1) illustrates this fact in a more global context: it shows that Portugal has a diversity of orchids similar to that of areas such as Great Britain, Belgium and the island of Gotland (Sweden), all of which are located at significantly more northern latitudes, and lower, sometimes significantly so, than that of mainland Spain, France, Greece and Italy, the latter being the most diverse territory in the European sample. Even when updating these data with the most recent information reported in this book (81 orchid (sub)species), taking into account a territory equivalent to 1.5 times that of Portugal, the diversity is increased to 81/log(area) = 15.76 instead of 13.70 for the Portuguese territory alone, which brings us to a diversity comparable to that of Germany or Switzerland, also located at higher latitudes.

The apparently ‘poor’ situation of the territory in question compared to regions with similar latitudes and climates calls for some comment. Although the ecosystems are very diverse, the characteristics specific to high mountains, such as in the Pyrenees or the Alps, are practically absent in the territory covered, which faces more towards the Atlantic Ocean, explaining the relatively poor variety of climates (see Figure 2.10, Chapter 2). This aspect, combined with the general circulation of winds from west to east, probably explains to a large extent why it does not benefit from many contributions from the continent and behaves almost like an island in terms of orchid dispersal (remembering that orchid seeds can be carried over long distances by the wind). Many species with a wide European and/or Mediterranean distribution, which could find suitable habitat conditions here, do not extend beyond central Spain (e.g. *Ophrys sphegodes* s.str., *Epipactis atrorubens*, *E. microphylla*, *Orchis militaris*, etc.); others are actually at the extreme limit of their range (e.g. *Orchis purpurea*, *Neotinea ustulata*, *Himantoglossum hircinum*, *Dactylorhiza viridis*, *Pseudorchis albida*, etc.). Another factor that may explain the relative ‘poverty’ of the territory in terms of orchids may be linked to the density of human occupation and activities, but this argument is weakened by the fact that Italy, for example, which has the richest variety of orchids, has a comparable human density.

Finally, the reason why Portugal and neighbouring regions are home to only a few (quasi-) endemic species may also be due to their particular western location, with the factors explained above (climate, altitude and wind circulation conditions). In fact, a third of them are only quasi-endemic, shared between Portugal and Andalusia, extending slightly beyond the territory considered here (*Ophrys lusitanica*, *O. algarvensis*, *O. quarteirae*, *Serapias elsae*); four others appear to be endemic to this territory (*Epipactis lusitanica*: Portugal and western Andalusia; *E. duriensis*: Trás-os-Montes and Extremadura; *Serapias gentilii*: Portugal and Andalusia; *S. perez-chiscanoi*: Extremadura and Alentejo); only three are endemic to Portugal alone (*Ophrys beirana*, *O. pintoi*, *O. lenae*). *Dactylorhiza caramulensis* could also be considered (quasi-) endemic, but the eastern limits of its range are still poorly known. In any case, the twelve species listed have in common that, most likely, the majority, if not all, of their populations are located within the boundaries of the territory covered in this work.

To conclude this section, we can attempt to classify the orchids of Portugal and neighbouring regions according to their phytogeographical distribution. This does not refer to the general distribution area in Europe and the Mediterranean Basin, for which reference can be made to works such as that of BUTTLER (1991), but rather to the local distribution context in the west of the Iberian Peninsula, as outlined in Table 4-17 below. Very roughly, orchids can be divided into seven categories.

- The first category concerns species that can be described as ‘ubiquitous’, more or less tolerant of the type of substrate. Five of these are widely distributed throughout Europe and the Mediterranean Basin (*Androrchis mascula*, *Cephalanthera longifolia*, *Ophrys apifera*, *Orchis anthropophora*, *Spiranthes spiralis*); seven others are found throughout the Mediterranean basin, sometimes extending northwards, mainly in Atlantic regions (*Limodorum abortivum*, *Neotinea maculata*, *Ophrys scolopax*, *Spiranthes aestivalis*, *Serapias cordigera*, *S. lingua*, *S. parviflora*); one is widespread throughout the Mediterranean Basin, with a few gaps (*Orchis italica*); two are mainly distributed in the western Mediterranean (*Epipactis tremolsii*, *Anacamptis champagneuxii*); the last two are endemic to south-western Iberia (*Epipactis lusitanica*, *Serapias perez-chiscanoi*).

- The second category includes species that are more widespread in the southern part of the territory covered; these are species that in Europe show a wide Mediterranean or southern distribution, mainly in the west (if we accept that the eastern forms of *Ophrys speculum* constitute a taxon distinct from the western forms). They are completely (or almost so) absent from the north of the territory considered here and show a clear calcicolous tendency.

- The situation is somewhat similar in the third category, but the species in this category have a more limited, even very localised distribution and are absent from large parts of the territory covered. Almost all of them, as in the previous category, have a preference for alkaline soils. Some of these species are widely distributed in the Mediterranean Basin and even throughout much of Europe (*Anacamptis pyramidalis*, *A. collina*, *A. coriophora* subsp. *fragrans*, *A. laxiflora*, *Himantoglossum robertianum*, *Ophrys bombyliflora*, *O. incubacea*). Others are found mainly in the western Mediterranean (*Gennaria diphylla*, *Anacamptis papilionacea*, represented here by its subsp. *expansa*, *Limodorum trabutianum*, *Ophrys bilunulata*, *O. dyris*, *O. ficalhoana*, *O. lupercalis*, *O. picta*, *Serapias strictiflora*, *S. elsae*, *S. occidentalis*). Three of these species are endemic to Portugal (*Ophrys beirana*, *O. pintoi*, *O. lenae*); only one is quasi-endemic (*Ophrys lusitanica*).

- In the fourth category, we include species which, in the territory under consideration, show (mainly) a distinctly southern range, three of which are (quasi-) endemic (*Ophrys algarvensis*, *O. quarteirae*, *Serapias gentilii*) and one has a limited western Mediterranean range and also has very isolated stations in the north of our territory (*Androrchis olbiensis*). The case of the fifth species is more problematic (*Anacamptis morio* subsp. *morio*), as it is a taxon with a wide European and Mediterranean distribution, present here only in the Portuguese part of the territory, and much more extensively in the south than in the northern two-thirds of the country. We discussed (TYTECA 1998) the advisability of distinguishing the Portuguese populations as a separate taxon from *Anacamptis morio* s.str., and have since left the question open. There does not seem to be any new argument for doing so; on the other hand, the distinction with subsp. *picta* seems to be maintainable.

- The fifth category covers species that are absent or very rare in southern Portugal, but sometimes present in all the Spanish regions covered. Two of them have a wide European distribution and are rather rare in truly Mediterranean areas (*Epipactis helleborine*, *Platanthera bifolia*); five have a western Mediterranean distribution, while showing ecological preferences (hygrophilous and/or montane) that set them apart from the true Mediterranean species (*Androrchis langei*, *Dactylorhiza elata*, *D. insularis*, *D. markusii*, *Anacamptis coriophora* subsp. *martrinii*); the last (*A. morio* subsp. *picta*) has a fragmented Mediterranean range, often complementary to that of subsp. *morio*.

- The Central European or Atlantic trend is more pronounced in the sixth category, which includes species found mainly, if not exclusively, in the north of the study area. The majority of these are species with a wide Central European distribution (*Cephalanthera rubra*, *Epipactis palustris*, *Gymnadenia conopsea* s.l., *Neottia nidus-avis*, *N. ovata*, *Neotinea ustulata*, *Orchis purpurea*), sometimes more restricted (*Epipactis fageticola*, *E. bugacensis*) or sometimes more southern to Mediterranean (*Androrchis provincialis*, *Himantoglossum hircinum*). One species is mainly present on the Atlantic coast of Europe (*Dactylorhiza ericetorum*); two others have a limited Mediterranean distribution (*Ophrys caloptera*, *O. vasconica*); the last three are Iberian endemics with limited distribution (*Dactylorhiza caramulensis*) to extremely limited distribution (*Androrchis tenera, Epipactis duriensis*). It should be noted that this list includes several species that are completely absent from Portugal.

- The last category includes only species absent from Portugal, which often have a significant distribution in central Europe, where they are generally well represented at high altitudes. In the territory studied, they are only found in the far north-east (in Galicia and/or Castilla y León), at altitudes above 1,000 metres, at the limit of their range.

We did not yet include *Dactylorhiza irenica* in this list, because its situation must still be clarified, with respect to its taxonomic position in the group of *D. maculata* and the real connections of the Portuguese population with the Eastern Extremaduran populations.

Table 4.17. – Classification of orchids in Portugal and neighbouring regions according to distribution types and degrees of rarity. "(X)" means very rare, marginal or extinct.

	Portugal			**Spain**			
	North	**Centre**	**South**	**Galic.**	**Cast y L**	**Extr.**	**Andal.**
1. Frequent to scattered throughout the territory							
Androrchis mascula	X	X	X	X	X	X	
Cephalanthera longifolia	X	X	X	X	X	X	X
Epipactis lusitanica	X	X	X				X
Epipactis tremolsii	X	X	X	X	X	X	
Anacamptis champagneuxii	X	X	X		X	X	X
Limodorum abortivum	X	X	X	(X)	(X)	X	X
Neotinea maculata	X	X	X	X	X	X	X
Ophrys apifera	X	X	X	X	(X)	X	X
Ophrys scolopax	X		X	X	X	X	
Orchis anthropophora	(X)	X	X	X	X		X
Orchis italica		X	X	X	(X)	X	X
Serapias cordigera	X	X	X	X	X	X	X
Serapias lingua	X	X	X	X	X	X	X
Serapias parviflora	X	X	X	X		X	X
Serapias perez-chiscanoi	X	X	(X)			X	
Spiranthes aestivalis	X	(X)	X	X	(X)	X	X
Spiranthes spiralis	X	X	X	X	X	(X)	
2. Widespread in central and southern Portugal and southern Spain							
Neotinea conica		X	X		X	X	X
Ophrys fusca		X	X			X	X
Ophrys lutea		X	X			X	X
Ophrys speculum		X	X			X	X
Ophrys tenthredinifera	(X)	X	X			X	X
3. Central and southern Portugal and southern Spain, limited distribution							
Anacamptis pyramidalis		X	X	(X)			
Gennaria diphylla		X	X				
Anacamptis collina			(X)			X	
A. coriophora subsp. *fragrans*		X		(X)	X		
Anacamptis laxiflora	(X)	(X)	X			X	
Anacamptis papilionacea		X				X	
Himantoglossum robertianum	X	X			(X)	X	
Limodorum trabutianum	(X)	X		(X)			X
Ophrys bilunulata		(X)	X				
Ophrys bombyliflora		X	X			(X)	
Ophrys dyris		X				X	X
Ophrys ficalhoana		X	(X)				
Ophrys incubacea		X	(X)			X	

Ophrys lupercalis		X	X				
Ophrys lusitanica		X	X				
Ophrys picta		X	X				
Ophrys beirana		X					
Ophrys pintoi		X					
Ophrys lenae		X					
Serapias strictiflora	(X)	X	X				
Serapias elsae		X	X			X	
Serapias occidentalis		X				X	
4. Mainly southern distribution							
Androrchis olbiensis	(X)		X				X
Anacamp. morio subsp. *morio*	(X)	(X)	X				
Ophrys algarvensis			X				
Ophrys quarteirae			X				
Serapias gentilii		X	X				X
5. Mainly found in central and northern Portugal and in Spanish regions							
Androrchis langei	X	X	(X)		X	(X)	X
Dactylorhiza elata	X	X		X		X	X
Dactylorhiza insularis	X	(X)		X	X	(X)	
Dactylorhiza markusii	X	X		X	(X)	(X)	(X)
Epipactis helleborine	X	X	(X)	X	X		
A. coriophora subsp. *matrinii*	X	(X)		X	X	X	X
Anacamp. morio subsp. *picta*	X	X		X	X	X	
Platanthera bifolia	X	(X)		X	(X)		
6. Widespread to scattered mainly in the north							
Androrchis provincialis	(X)	(X)		X			
Androrchis tenera					(X)		
Cephalanthera rubra	(X)			X			
Dactylorhiza caramulensis	X	X		X	X		
Dactylorhiza ericetorum	X	X		X	X		
Epipactis duriensis	X						
Epipactis palustris	(X)						
Epipactis fageticola	(X)			(X)			
Epipactis bugacensis	(X)						
Gymnadenia conopsea	(X)			X	(X)		
Himantoglossum hircinum				X	X		
Neottia nidus-avis	X	(X)		X	(X)		
Neottia ovata				(X)			
Neotinea ustulata	(X)			X	X		
Ophrys caloptera				X	(X)		
Ophrys vasconica	X			X			
Orchis purpurea				X	X		
7. Limited to the mountainous regions of the north-east							
Androrchis pallens					(X)		
Dactylorhiza viridis				X	X		
Dactylorhiza incarnata					X		
Dactylorhiza sambucina					X		
Dactylorhiza cantabrica				X	(X)		
Ophrys insectifera					X		
Pseudorchis albida				X			

Dactylorhiza caramulensis
& Serapias cordigera
Decermilo (Beira Alta),
10 June 2023

5. Nature protection and habitat conservation

5.1. Rarity and decline of orchids

The situation in the World and in Europe

A majority of orchid species living on the earth's surface are currently threatened with decline or even extinction (e.g. FAYE 2018; WRAITH & PICKERING 2019). There are many causes for this, and they do not only affect orchids; far from it. But orchids, with their particularly slow biological cycle and their high dependence on their partners in the animal (pollinators), plant (the species with which they grow and/or which provide them with support) and fungal (the fungi whose mycorrhizae are essential for the germination of orchid seeds) kingdoms, are undoubtedly among the first victims of this widespread decline in our natural environment, perhaps the most significant since life began on Earth (HATFIELD et al. 2025). Among the causes of decline and disappearance are:

- The growing impact of human activities (urbanisation, infrastructure, expansion of agriculture, leisure activities, etc.) on natural areas, leading to the destruction, reduction or fragmentation of habitats;

- The evolution and modification of agro-pastoral practices in many areas, often leading to intensification of farming or outright abandonment, resulting in the scarcity of semi-natural habitats, many of which are ideal biotopes for orchids;

- The excessive and increasing use of natural and synthetic fertilisers, which leads to the standardisation of environments or a disruption of natural cycles (nitrogen, water, etc.), also contributing to a disruption of natural balances;

- The excessive and increasing use of pesticides, which particularly affect pollinators: species can no longer reproduce, which is especially crucial in the case of close dependence on one or two specific pollinators;

- Climate change, at a rate that is incompatible with the adaptation or migration of species: this is particularly the case for orchids, whose biological cycle is very slow, although there is clear evidence of migration of certain species (for example, this is the case for *Himantoglossum robertianum* in France, or various *Serapias* species in France and England). The impact of climate change also causes a decoupling between the annual cycles of plants and their pollinators (ROBERTS et al. 2004);

- The massive harvesting of plants in the wild, whether for ornamental purposes, horticulture (particularly in the case of tropical species), or for the collection of salep in certain countries in the Near East, mainly Turkey;

- Particularly in tropical areas, deforestation continues at a rapid pace, resulting in the dramatic erosion of biodiversity as we know it today. Many orchids, which have very limited ranges, are certainly paying a heavy price for this irreversible change. But this is also the case in temperate regions, where forests are currently under severe pressure from overexploitation (with countless logs exported to distant countries) and recreational activities, including various "sports" such as tree climbing and off-road vehicles) and hunting (excessive feeding and maintenance of overpopulated game stocks).

- The drying up of wetlands through drainage or tree planting (poplars, oil palms, etc.).

It is currently very difficult to quantify the loss of orchid species on a global scale. The IUCN (International Union for Conservation of Nature) Red List indicates that, for 2023, 6 species are extinct, 271 species are critically endangered, 479 species are endangered, 245 species are vulnerable, etc. (IUCN Red List 2023), out of a current estimated total of more than 28,000 to 30,000 species (CHRISTENHUSZ & BYNG 2016; WANG et al. 2024), meaning that around 3.3% of species are confirmed to be extinct, endangered or vulnerable in 2023 alone.

However, it is easier to draw up a picture at national or local level. To give a first example, only one species is considered extinct in mainland France, *Anacamptis collina*; however, 10% of orchid species in the Paris region have disappeared since 1950, and many others have lost 90% or more of their population (BOURNÉRIAS & PRAT et al. 2005). For Belgium, I estimated the rate of extinction at 1.6% per decade since 1940, which is equivalent to one species disappearing every twelve years (TYTECA 2003).

The situation in Portugal and neighbouring regions

It is now necessary to examine the situation in the territory under study. With my colleague Ana CAPERTA I had ventured (TYTECA 1998; TYTECA & CAPERTA 1999) to classify orchid species according to their **perceived** degree of rarity and **perceived** vulnerability in Portugal[1], using the IUCN categories at the local level. This exercise is attempted again in Table 5.1, taking into account new observations and updates since that time, as well as the extension of the territory to regions neighbouring Portugal. This latter circumstance explains why the status of certain species has changed in relation to the previous studies mentioned: for example, *Dactylorhiza incarnata*, which was then presumed extinct, but whose indigenous status in Portugal was already considered doubtful, does indeed exist in the territory under consideration (Castilla y León). On the other hand, *Epipactis palustris* can be considered virtually extinct at present in Portugal: its last mention in this country dates back to 1961 (S. Jacinto; TYTECA 1998) and the only current indication is in the extreme north of the province of Pontevedra, in Galicia (CORTIZO & SAHUQUILLO 2006). The explanation for this lies in its extremely precarious habitat (alkaline marshes in coastal areas) in the face of increasing urbanisation.

The 'endangered' category includes species for which the number of currently known locations is extremely low, often reduced to one or two. These may be species whose general distribution is fairly or even very limited (*Androrchis tenera*, *Epipactis bugacensis*, *E. duriensis*). Furthermore, *Serapias perez-chiscanoi* and *S. occidentalis* had almost all of their locations in the studied territory; their numbers have declined dramatically in Extremadura (Spain) in recent decades, so that these species could soon be classified as 'CR'. The reason for this is the drying up of valleys for the establishment of crops (PÉREZ CHISCANO et al. 1991; VENHUIS et al. 2006; J.L. PÉREZ CHISCANO, pers. comm.). Fortunately, these two species of *Serapias* have been found more recently in Portugal, in a few locations where their survival is not yet compromised (PESSOA et al. 2011); the same is true for a species included here at the specific level, known only from Portugal, *S. gentilii* (VENHUIS & OOSTERMEIJER 2011). This is why all these species can be considered as 'EN'.

The 'vulnerable' category includes four recently described species of *Ophrys*, with a very small range and a fairly limited number of known populations (*Ophrys algarvensis*, *O. lenae*, *O. pintoi*, *O. quarteirae*) and likely to decline sharply in the coming years due to increasing pressure from urbanisation, mainly in the Algarve for the first and last species. Another species (*Androrchis pallens*) is included in this category because, although fairly widespread in Europe, it is at the extreme limit of its range here and the data on it in the study area are old and have not been recently confirmed. *Epipactis fageticola* is in a somewhat similar situation, although it was discovered more recently. Also to be considered in the 'vulnerable' category, are three species growing in wet habitats (*Anacamptis laxiflora*, *Dactylorhiza elata*, *Spiranthes aestivalis*), whose populations may still be significant in number but which are rather vulnerable due to threats to this type of habitat, either because of drainage and drying out for cultivation or urbanisation, or because of the abandonment of extensive and light

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[1] While, of course, we know that the assessment of IUCN criteria must be based on quantitative and objective data.

practices (annual mowing with ditches for drainage, ...), prior to scrub encroachment and forest establishment.

The latter circumstance (habitat in cool to wet grasslands) also applies to a number of species listed in the 'near threatened' category, but growing in regions (mountains, more rural areas) where the pressure is not as strong (*Anacamptis coriophora* subsp. *martrinii*, *Dactylorhiza caramulensis*, *D. ericetorum*, *D. incarnata*, *Pseudorchis albida*). We have also included in this category species at the edge of their range, most of whose populations, for the area we are concerned with, are found in a fairly small part of the territory (*Anacamptis collina*, *A. papilionacea*, *Androrchis provincialis*, *Cephalanthera rubra*, *Dactylorhiza cantabrica*, *D. insularis*, *D. viridis*, *Neotinea ustulata*, *Ophrys incubacea*, *O. insectifera*, *Orchis purpurea, Platanthera bifolia*). Finally, there are species whose general range is fairly limited or scattered and which have few locations in the territory studied (*Anacamptis coriophora* subsp. *martrinii*, *A. morio* subsp. *picta*, *Androrchis langei*, *A. olbiensis*, *Gennaria diphylla*, *Limodorum trabutianum*, *Ophrys beirana*, *O. dyris*, *O. ficalhoana*, *O. scolopax*, *O. vasconica*). It is clear that the majority of these species are in a precarious situation, at the mercy of changes to their relatively few habitats (see below for specific threats); several of them could have been classified under the obsolete IUCN category of 'conservation dependent'. It should be noted that some of the species in this 'near threatened' category are currently under fairly heavy pressure on part or even all of their populations in the territory, mainly in the coastal regions of Portugal (*Anacamptis papilionacea*, *Gennaria diphylla*, *Ophrys ficalhoana*, *O. incubacea*).

The species listed in the 'least concern' category are either species that are widespread in Europe and the Mediterranean Basin but have a limited distribution in the territory studied (*Anacamptis coriophora* subsp. *fragrans*, *Dactylorhiza sambucina*, *Gymnadenia conopsea* (*borealis*), *Himantoglossum hircinum*, *Neottia nidus-avis*, *N. ovata*, *Ophrys lupercalis*, *O. bilunulata*), or species that are more or less well represented in our territory, but whose range outside it is fairly limited (*Dactylorhiza markusii*, *Epipactis lusitanica*, *Ophrys caloptera*, *O. lusitanica*, *Serapias strictiflora*, *S. elsae*).

The twenty-four species not listed in the table are less of a concern in terms of their status, but they are obviously still worthy of interest in terms of nature conservation objectives. We have not included them among the priority species in Table 5.1 because they are still well represented, both in Europe and in the Mediterranean Basin, and in the territory studied in this book.

Table 5.1. - Rare, marginal, potentially extinct or (quasi-) endemic orchids in Portugal and neighbouring regions. IUCN categories (**defined at the scale of the territory considered**).

Category IUCN / Species	Characteristics explaining scarcity, marginality or risk
CR – Critically endangered (1 species)	
Epipactis palustris	Drainage of coastal marshes
EN – Endangered (6 species)	
Androrchis tenera	Endemic to Iberia with a restricted range; extreme limit of range
Epipactis bugacensis	Only one known population in the territory
Epipactis duriensis	Endemic known from two locations currently under threat
Serapias gentilii	Endemic to Portugal; very limited range; drying up of valleys
Serapias occidentalis	(Quasi-) endemic; reduced range; drying up of valleys
Serapias perez-chiscanoi	(Quasi-) endemic; reduced range; drying up of valleys
V – Vulnerable (9 species)	
Anacamptis laxiflora	Drainage of wet grasslands in Mediterranean areas
Androrchis pallens	Extreme limit of distribution range; status poorly known
Dactylorhiza elata	Drainage of grasslands and marshes in coastal areas
Epipactis fageticola	Very limited area within territory; generally sparse distribution
Ophrys algarvensis	(Quasi-) endemic; limited range; threatened by urbanisation
Ophrys lenae	Endemic to Portugal; very limited range; threatened habitats

Ophrys pintoi	Endemic to Portugal; very limited range; threatened habitats
Ophrys quarteirae	(Quasi-) endemic; limited range; threatened by urbanisation
Spiranthes aestivalis	Precarious habitats: riverbanks and riverbeds, alkaline marshes
NT – Near threatened (27 species)	
Anacamptis collina	Reduced area; extreme limit of distribution in Portugal
A. coriophora subsp. *martrinii*	Semi-natural grasslands; limited overall area
Anacamptis morio subsp. *picta*	Stations scattered throughout the territory
Anacamptis papilionacea	Small range; very rare and threatened in Portugal
Androrchis langei	Few stations in the territory; limited general area
Androrchis olbiensis	Very few stations in the territory; restricted general area
Androrchis provincialis	Reduced range; very rare in Portugal; at the edge of its range
Cephalanthera rubra	Very limited range; at the edge of its distribution area
Dactylorhiza cantabrica	Reduced range; at the edge of its distribution area
Dactylorhiza caramulensis	Semi-natural grasslands; quasi-endemic to the territory
Dactylorhiza ericetorum	Drainage of marshes and marshy meadows
Dactylorhiza incarnata	Wet grasslands; range limit
Dactylorhiza insularis	Very limited area within the territory; highly endangered P
Dactylorhiza viridis	High-altitude grasslands; distribution limit
Gennaria diphylla	Very limited area; threatened by urbanisation of coastal areas
Limodorum trabutianum	Reduced area within the territory; generally sparse area
Neotinea ustulata	Poor grasslands; at the edge of its range; critically endangered P
Ophrys beirana	Very limited range; endemic to Portugal; threatened habitats
Ophrys dyris	Very few stations in Portugal; generally sparse distribution
Ophrys ficalhoana	Very small area but probably poorly understood
Ophrys incubacea	Very limited area; highly threatened habitats in Portugal
Ophrys insectifera	Poor grasslands; extreme limit of distribution range
Ophrys scolopax	Rare due to the separation of *O. beirana*
Ophrys vasconica	Very few stations; generally sparse distribution
Orchis purpurea	Poor grasslands; at the edge of the distribution area
Platanthera bifolia	Reduced range; very rare in Portugal
Pseudorchis albida	Poor high-altitude grasslands; extreme limit of distribution
LC – Least concern (14 species)	
Anac. coriophora subsp. *fragrans*	Reduced area within the territory covered
Dactylorhiza markusii	Reduced area within the territory covered
Dactylorhiza sambucina	Poor grasslands; distribution limit
Epipactis lusitanica	(Quasi-) endemic to the territory
Gymnadenia conopsea (*borealis*)	Peat bogs and rough grasslands; at the edge of its range
Himantoglossum hircinum	At the edge of the distribution area
Neottia nidus-avis	At the edge of the distribution area
Neottia ovata	At the edge of the distribution area
Ophrys bilunulata	Distribution data to be completed, in relation to *O. fusca*
Ophrys caloptera	At the edge of its range; reduced Mediterranean area
Ophrys lupercalis	Probably very limited area within the territory; to be specified
Ophrys lusitanica	(Quasi-) endemic to the territory
Serapias strictiflora	Species very rare outside the territory covered
Serapias elsae	Species very rare outside the territory covered

5.2. Causes of scarcity and decline: habitat fragmentation and decline

Having noted the extreme rarity, fragility or marginality of most orchid species in the study area, it is necessary to investigate the causes in order to suggest, in a later section, appropriate measures for their conservation. As suggested in the previous section, alongside certain specific ecological or phytogeographical factors, the main causes of the rarity and decline of species in Portugal and Spain, as in most other countries, are the fragmentation and decline of natural habitats. Most of these causes are common to many countries throughout Europe; others are more specific to the Mediterranean regions or even to the territory under study.

To begin with the latter, the first factor specific to the territory is its particular geographical location, on the margins of the European continent, facing mainly the Atlantic Ocean. Exchanges with the rest of Europe are relatively limited, mainly due to the general circulation of winds from west to east, which explains why the regions in question behave in part like an island territory (see comments in § 4.19). We should also recall the comments on population density: relatively high in Portugal (an average of 110 inhabitants/km^2), especially in the west and north-west, it declines rapidly as soon as one crosses the border, which may partly explain why a number of species present in neighbouring Spanish regions are extremely rare or absent from Portugal. Furthermore, until recently considered one of the least developed countries in Europe, Portugal has developed spectacularly in recent years following its integration into the European Union. Unfortunately, this "development" is not always organised with sustainability in mind, resulting in the irreparable loss of wildlife habitats. Among the most spectacular manifestations of this unfortunate development are often uncontrolled urbanisation, increased traffic and road and motorway infrastructure, the expansion of crops and the intensification of agricultural practices.

Figure 5.1. – Increasing urbanisation around Lisbon (here, in Cascais) led to the disappearance of large areas of scrubland, rich in orchids, at the end of the 20th century.

Figure 5.2. – Just recently (26 April 2024), major earthworks completely disfigured a site rich in orchids north of São Bartolomeu de Messines in the Algarve.

In recent years, urbanisation has led to the destruction of large areas of natural land. The most spectacular examples are provided by the uncontrolled expansion of the conurbation around Lisbon and by tourist developments around coastal areas, mainly west of Lisbon (around Cascais – Fig. 5.1) and in the Algarve (Fig. 5.2). Unfortunately, these areas are mainly located in limestone regions, which poses a direct threat to many orchid populations. At the same time, road traffic is increasing exponentially and many new roads and motorways have been built or are under construction, mostly on dedicated sites, which obviously contributes directly to the destruction and fragmentation of habitats. Typical examples are the Trans-Algarve motorway, which is almost completely empty outside the tourist season, the CRIL motorway north-west of Lisbon, and the Lisbon-Porto motorway, for which large sections of the Serras de Aire e dos Candeeiros Natural Park have been sacrificed, creating an impassable ecological barrier. Finally, ever-larger areas are being converted to all kinds of crops, particularly eucalyptus plantations (especially in southern Alentejo and northern Algarve) and vineyards. Examples of the latter can be seen in Estremadura, north of Lisbon (e.g. around Bucelas, where vast areas of limestone soil rich in orchids have been destroyed), or in the Douro Valley, for the production of Port wine (Fig. 5.3). For example, near S. João da Pesqueira, a site listed for the rare *Dactylorhiza markusii* was destroyed in 1992. Other examples of cultivation in the study area include the Spanish part of the Guadiana Valley, near Badajoz, where large sections have been converted to agricultural land, destroying the extensive semi-natural grasslands where the endemic *Serapias perez-chiscanoi* grew.

Figure 5.3. – The planting of new vineyards across vast areas of the Douro Valley (here, near Lamego) has led to the removal of much of the natural vegetation.

Other factors are not specific to the Portuguese (or western Spanish) situation but are typical of many developments in the Mediterranean region. In general, as everywhere in Europe, changes in agro-pastoral practices have dramatic repercussions on wildlife habitats. Thus, the reduction in extensive grazing, sometimes accompanied by local overgrazing, has been observed for several decades. As a result, many semi-natural grasslands are gradually being invaded by tall grasses and scrub, or, conversely, are losing their diversity (including orchids) due to overgrazing. Examples of such changes can be seen in the Serra da Arrábida Natural Park, where, for both of these reasons, large populations of the extremely rare *Ophrys incubacea* have been lost or are in serious danger of extinction (see discussion in TYTECA 2001 and TYTECA & BERNARDOS 2003). Elsewhere, the enrichment of semi-natural grasslands has led to the decline and loss of orchid populations, such as those of *Anacamptis papilionacea*, *A. champagneuxii* and their hybrid, as well as various *Ophrys* species, in the vicinity of Reguengos de Monsaraz (Alentejo).

Changes in land use include the conversion of pastures to crops (e.g. vineyards) or semi-natural forests (e.g. chestnut groves) to pine or eucalyptus plantations. The drainage or conversion of wetlands to crops has been the cause of the dramatic decline of many orchid populations, mainly rare species, such as in the coastal region of Aveiro, where populations of *Spiranthes aestivalis* and *Epipactis palustris* have probably been lost, and where many populations of *Dactylorhiza elata* are currently at risk. An even more widespread factor of decline, of global anthropogenic origin, is particularly prevalent throughout the Mediterranean region, namely climate change, which probably explains the droughts of recent years, particularly felt in the territory studied since 1991. This leads to a very noticeable decline during dry years, and not only in wetlands.

5.3. Legislation in Portugal and Spain

International regulations and their implementation in Portugal and Spain

The legal aspects of orchid protection in Europe have been addressed by BAUMANN et al. (1995). Only a brief overview will be given in this section. In fact, legislation concerning specific orchid species in Portugal is very succinct (but will be revised shortly): until now, in Portugal there are no long lists of protected species as is the case in some countries such as France, Belgium, or even Spain, as we shall see later. The most substantial and significant part of the legislation relevant to orchids concerns national parks and nature reserves, as well as the Natura 2000 network, which will be discussed in another section.

The Washington Convention, which came into force in 1975, is also known as CITES (*Convention on International Trade in Endangered Species of Wild Fauna and Flora*)[2]. One hundred and seventy-five states are parties to the convention, including Portugal, which ratified it in 1980, and Spain, which acceded to it in 1986. Member states have agreed to control the global trade in orchids by regulating the import and export of these plants; however, each country interprets these regulations differently, leading some countries to find loopholes and others to create additional barriers. This convention has three appendices:

- Appendix I: *Trade is prohibited except by special dispensation.*
- Appendix II: *Trade is controlled.*
- Appendix III: *Trade is controlled only in certain countries.*

Ten species of orchids are listed in Appendix I; all others are covered by Appendix II. At European level, this has been implemented by Council Regulation 82/3626/EEC of 3 December 1982 on the implementation of CITES in the European Union (latest amendment: 95/558/EC) . Virtually all orchid species are included in this regulation, implying a total ban on trade for a list of 106 species. This list should be viewed with a degree of flexibility when compared to the 436 species listed in recent studies (DELFORGE 2005)! It should therefore be considered that the 106 species are 'major species' taken in a very broad sense, incorporating numerous subspecies, varieties and forms, so that virtually all are covered (see TYTECA 1998 for a brief discussion on this subject).

The first Portuguese legal text to explicitly mention orchids was published on 6 June 1992 in the *Diário da República* - I Série-A, N.° 131, Aviso n.° 74/92. This Decree-Law aims to implement the Bern Convention on the Conservation of Wildlife and Natural Habitats in Europe (signed on 19 September 1979). Appendix I of the Convention, which lists strictly protected species of flora, contains only two species of orchids native to the territory covered by this book, namely *Spiranthes aestivalis* and, curiously enough, *Orchis* (*Androrchis*) *provincialis*, in addition to certain endemic species from the Macaronesian Islands not covered in this book. This choice is very curious, given that *A. provincialis* is not particularly rare or threatened, while many other species could have been included in this list. As for *Spiranthes aestivalis*, although it is not the rarest orchid in our territory, it is one of the most threatened, mainly due to the decline of its habitats (wet to semi-wet oligotrophic grasslands and moors with very low vegetation; riverbanks and riverbeds), and therefore deserves appropriate measures to be taken that will obviously benefit the habitats affected.

In Spain, there are various regulations that protect orchid species, either at the national level or, more specifically, in the different regions and autonomous communities, under the heading "Natural Heritage and Biodiversity Law"[3]. At the national level, we can cite the Order of 17 December 1984 on the protection of endemic or threatened plant species (B.O.E. núm. 232/1984, de 27 de septiembre de 1984; pags. 28072). For the species that interest us, this law mainly concerns protection in the Balearic Islands

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[2] https://cites.org/eng/disc/text.php.

[3] https://observatorioregadio.gob.es/en/documents/law-on-natural-heritage-and-biodiversity/

and it seems that, apart from this, no species benefits from protection at national level (except for *Spiranthes aestivalis* and *Orchis provincialis*, which are covered by international legislation, and *Orchis palustris*, which is considered to be of 'national interest' but is not relevant to our territory).

More recently, the publication of a red list of threatened species of Spanish flora (MORENO, coord. 2008) recommends classifying several orchid species according to IUCN categories, namely, for the territory in question, in the 'vulnerable' category: *Dactylorhiza cantabrica* and *Serapias occidentalis*; in the 'near threatened' category: *Serapias perez-chiscanoi*; and in the 'least concern' category: *Dactylorhiza insularis* and *D. markusii*.

At the regional level, in the four regions of interest to us, the following texts can be cited:

- In Galicia, Decree 88/2007, of 19 April, regulates the Galician Catalogue of Threatened Species (D.O.G. no. 89/2007, of 9 May 2007; pp. 7409-7423).

- In Castilla y León, Decree 63/2007, of 14 June, establishing the Catalogue of Protected Flora of Castile and León and the Protection Framework known as 'Microrreserva de Flora' (B.O.C.yL. no. 119/2007, of 20 June 2007; pp. 13197-13204).

- In Extremadura, Decree 37/2001, of 6 March, regulating the Regional Catalogue of Threatened Species of Extremadura (D.O.E. no. 30/2001, of 13 March 2001; pp. 2349-2364).

- In Andalusia, Law 8/2003, of 28 October, on wild flora and fauna (B.O.J.A. no. 218/2003, of 12 November 2003; pp. 23790-23810).

These various texts enable Table 5.2 to be drawn up, showing the degree of vulnerability adopted in the four regions in question. Based on this classification, the texts include the measures recommended for species conservation, namely plans for the management, protection, conservation and recovery of habitats and, in critical cases, the reintroduction of species.

Table 5.2. – Recommended vulnerability levels for orchid species in the four Spanish regions considered in this work.

Species	**Galicia**	**Castilla y León**	**Extremadura**	**Andalucía**
Anacamptis papilionacea		Atención preferente	De interés especial	
Androrchis langei			De interés especial	
Androrchis pallens		Atención preferente		
Androrchis provincialis		Atención preferente		
Cephalanthera rubra			De interés especial	
Dactylorhiza insularis			De interés especial	
Dactylorhiza markusii		Atención preferente	Vulnerable	
Epipactis fageticola		Atención preferente		
Epipactis palustris		Atención preferente		
Epipactis tremolsii		Atención preferente		
Himantogl. robertianum		Atención preferente		
Limodorum trabutianum			Vulnerable	
Neotinea conica		Atención preferente		
Neottia nidus-avis			Vulnerable	
Ophrys insectifera		Atención preferente		
Ophrys lusitanica				Peligro de extinción
Orchis italica			De interés especial	
Pseudorchis albida		Atención preferente		
Serapias perez-chiscanoi			Peligro de extinción	
Spiranthes aestivalis	Vulnerable	Atención preferente	De interés especial	

There is a certain convergence between these lists and the list recommended for the territory under study (Table 5.1), given the characteristics of endemism and rarity at the respective local levels. While Spain has resolutely committed itself to legislation aimed at conserving its native orchids, it is regrettable that the same cannot be said for Portugal, where orchids, taken collectively, are still not considered a priority (even though other species of Portuguese flora are indeed protected), with some even claiming that they are not threatened (several personal communications to the first author)!!

The European Natura 2000 network

Two major European Directives are at the origin of the Natura 2000 network: the Birds Directive (79/409/EEC), adopted in 1979, and the Habitats Directive (92/43/EEC), adopted in 1992. They govern the establishment of two main categories of protected areas, namely 'Special Protection Areas' (SPAs) and 'Special Areas of Conservation' (SACs). In particular, the purpose of the Habitats Directive is to contribute to the preservation of biodiversity through the conservation of natural habitats (listed in Annex I of the Directive) and native flora and fauna species (listed in Annexes II and IV) considered to be threatened within the European Union. The Natura 2000 network was established according to the timeline shown in Figure 5.4. Initially scheduled for June 2004, the designation of sites was delayed. For example, the French network was not validated until 2007.

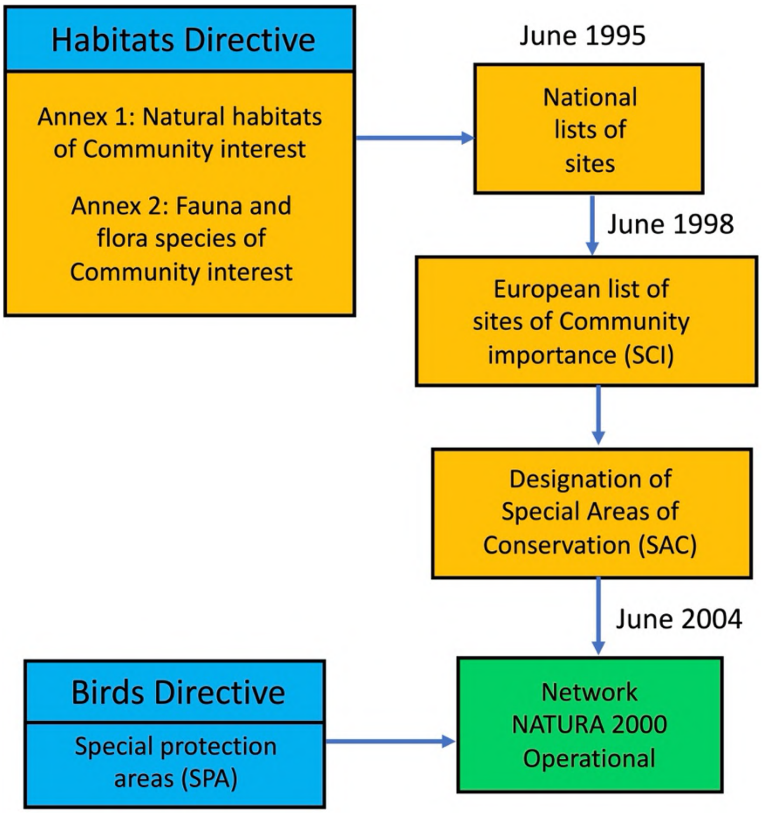

Figure 5.4. – Planned timeline and method for establishing the Natura 2000 network[4].

An update of the list of SPAs and SACs in June 2008[5] indicates that in Portugal, 50 SPAs totalling 9,334 km^2 of land (10.1% of the land area) and 94 SACs representing 16,013 km^2 of land (17.4% of the land area) have been designated. For the whole of mainland Spain, these figures rise to 565 SPAs totalling 96,632 km^2 (19.1% of the territory) and 1,434 SCIs representing 118,168 km^2 (23.4% of the territory). Portugal therefore tends to designate larger areas (averages of 187 km^2 per SPA and 170 km^2 per SAC) than Spain (171 km^2 per SPA and 82 km^2 per SAC).

To conclude this section, it should be noted that for the territory studied, *Spiranthes aestivalis* is once again the only orchid taken into account (in Annex IV).

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[4] Idem.

[5] http://ec.europa.eu/environment/nature/natura2000/barometer/index_en.htm.

National Parks, Natural Parks and Nature reserves

Long before Natura 2000 was established, various European countries created national parks and nature reserves, most of which are now part of the European network. Here we take stock of these essential tools for protecting nature and biodiversity. A map showing the location of the areas concerned and discussed below, within the territory we are concerned with (Portugal and neighbouring regions), is available on a website.[6]

Since 1971, Portugal has gradually established a network of National Parks, Natural Parks, Nature Reserves, Protected Landscape Areas, Classified Sites and Natural Monuments. They are under the authority of the Minister for the Environment, through the Instituto da Conservação da Natureza e da Biodiversidade (ICNB), and most are managed by the Serviço Nacional de Parques, Reservas e Conservação da Natureza. There are currently 44 such areas. While some of them fulfil very specific objectives, such as the protection of caves or fossil deposits, most protected areas have very diverse functions which, especially in the case of natural parks, include the protection of traditional lifestyles, craft activities and agro-pastoral practices.

There are thirteen Natural Parks (Montesinho, Litoral Norte, Alvão, Douro Internacional, Serra da Estrela, Serras de Aire e Candeeiros, Tejo Internacional, Serra de S. Mamede, Sintra – Cascais, Arrábida, SW Alentajano e Costa Vicentina, Vale do Guadiana, Ria Formosa), in addition to the unique Parque Nacional da Peneda-Gerês. These Natural Parks cover fairly large areas, ranging from 7,365 ha (Alvão) to 100,000 ha (Estrela). They generally host significant populations of orchids; two of them are well known for their diversity of orchid species (Arrábida, Aire e Candeeiros).

Nature Reserves are more focused on the protection of specific fauna and/or flora (Estuário do Tejo, Dunas de S. Jacinto, Paúl do Boquibolo, Estuário do Sado, Berlenga, Malcata). Some of them are home to orchid populations, but their conservation is never the primary objective or focus. Among the areas selected for landscape protection, two are of particular interest because of the orchids they harbour, namely the Área de Paisagem Protegida de Sintra – Cascais and the Paisagem Protegida do Sudoeste Alentejano e Costa Vicentina. Another good example of such a Protected Landscape is the Albufeira do Azibo, in Trás-os-Montes, which hosts good populations of rare orchids, including *Dactylorhiza insularis* and *Androrchis langei* (Fig. 5.5). Finally, from the point of view of orchids, one of the Classified Sites deserves special attention: the Sítio Classificado da Rocha da Pena. Although its main purpose is to protect the site from a landscape and archaeological point of view, orchid populations also benefit from it, including the rare *Androrchis olbiensis*.

Fig. 5.5. – The Albufeira do Azibo (Macedo de Cavaleiros, Trás-os-Montes), a beautiful example of Paisagem Protegida.

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[6] https://meteosierra.com/visores-cartograficos/visor-de-los-espacios-naturales-protegidos-de-espana-y-portugal/#google_vignette

In Spain, protected areas fall into categories similar to those in Portugal, namely national parks (14 in number), natural parks (155, covering 3.6 million hectares), reserves, monuments and protected landscapes. Three national parks form a territorial continuum with certain Portuguese parks (Valle del Duero/Douro; Serra do Xurés/Gerês; Tajo/Tejo Internacional). The most significant areas in terms of orchid conservation are, in Galicia, the surroundings of Rubia and the Serras do Courel and dos Ancares (to the east); in Castile and León, the Montes de León (continuing on from the previous Serras); and in Andalusia, the Sierra de Aracena y Picos de Aroche Natural Park. It should be noted that, as in Portugal, orchids are never the main objective of establishing a reserve or park, and that some particularly rare orchids (e.g. *Serapias perez-chiscanoi* and *S. occidentalis*) are only found in protected areas in exceptional cases.

Although all these initiatives deserve special support, some areas remain of particular concern, or even cause for alarm. Firstly, it is hoped that the above-mentioned objectives of the natural parks, namely the promotion of traditional habitats and landscape management, will be effectively achieved.

For example, the semi-natural grasslands of northern Portugal, which can still be found in large numbers in the Serras de Montesinho, do Alvão and da Estrela, are still managed today according to ancestral practices (no artificial enrichment with nutrients; use of gently sloping channels for both irrigation and mineral enrichment; annual mowing in July, using non-aggressive equipment, often scythes).

This has contributed to the considerable diversity of plants in these biotopes, including spectacular populations of orchids (*Anacamptis coriophora*, *Serapias lingua*, *S. cordigera*, *Dactylorhiza caramulensis*, locally *D. elata*). These meadows were the subject of an important study by Teles (1970). These extraordinary biotopes and practices are now in decline throughout Europe, sometimes due to insidious European regulations. The Portuguese authorities should be particularly careful not to lose these treasures and to effectively implement the recommendations made for the management of natural parks.

A second concern is the painful realisation that the existence of a protected area does not prevent subsequent destructive actions. In section 5.2, I mentioned two such examples, namely the construction of the Lisboa - Porto expressway through the Serras d'Aire e Candeeiros Natural Park and the uncontrolled urban development around Sintra - Cascais.

In addition to these protected areas officially created and managed by the Portuguese authorities, there are a few other specific areas that deserve attention and have been given special status under European directives. These were mentioned in the previous paragraph. Those that are currently protected are the Special Protection Areas. There are thirteen of these in Portugal. They were created mainly to protect endangered bird species. However, some of them cover areas that are also important for the protection of plants, particularly orchids. A few overlap with some of the natural parks mentioned above. We should also mention the coastal areas and estuaries of Aveiro, some of which could still be home to populations of *Spiranthes aestivalis* and, less likely, *Epipactis palustris*. Also of interest are the aforementioned Special Areas of Conservation (see Natura 2000 Network) and CORINE biotopes (sites of conservation interest), which at this stage have not yet been given any special legal status. In section 5.4 below, we will focus on sites and areas that are important for orchid conservation and make some additional suggestions on those that would deserve special conservation efforts.

The Red List of Vascular Flora of Mainland Portugal

Quite recently, an impressive work was published in Portugal, the Red List of Vascular Flora (CARAPETO et al., eds., 2020). This work reviews the entire flora, examining the status of the various native species, in order to propose a list that should be given special attention with a view to preparing guidelines and laws.

Unfortunately, this work is very much in line with what we mentioned a few paragraphs above, in comparison with Spain, and orchids still appear to be the poor relations of indigenous flora conservation, to such an extent that no species of *Ophrys* appears on the Red List! We will return to this topic later, in an epilogue to this chapter, where we will take stock of the situation for all native orchid species.

5.4. Suggestions for protection and important sites for orchid conservation in Portugal

According to 'pre-molecular' representations, orchids were rightly placed at the top of one of the branches of evolution (e.g. Dressler 1981). Their ecological requirements and behaviour are such that the places where they grow are generally locations of great biological interest. As such, they are often used as indicators of the ecological health of a biotope (e.g. Devillers et al. 1990). Consequently, natural habitats containing orchids should be given high priority on the agenda of conservationists.

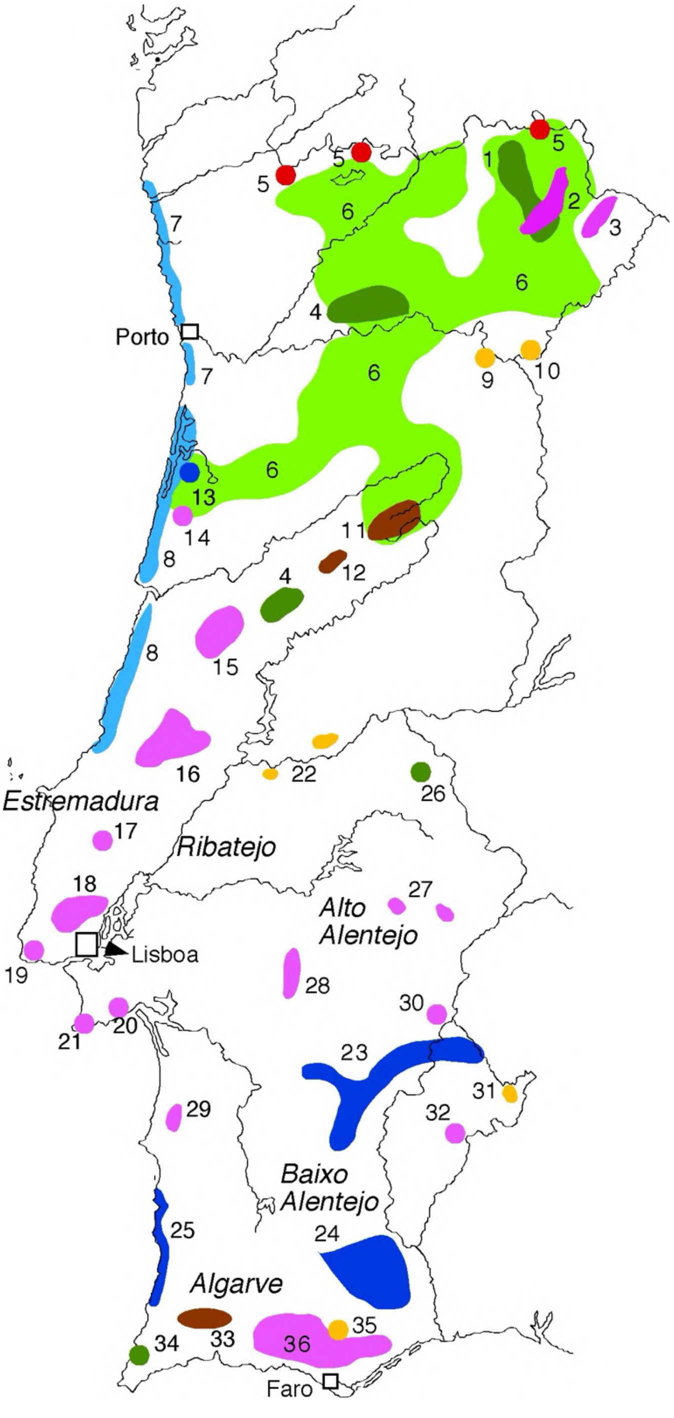

Figure 5.6. Map of Portugal showing sites and habitats important for orchid conservation. The numbers refer to those in Table 5.3. Taken and adapted from Tyteca et al. (2017).

Let's start with what already exists. In the previous section, we listed the most important protected areas for orchid conservation and nature conservation as a whole. Although this is already a very significant and valuable effort, there should be many more protected landscapes and biotopes. One important step in the "right direction" is, for example, the CORINE biotopes. Indeed, if we consider the map of nature conservation areas published by the Direcção-Geral dos Recursos Naturais of the Ministry of the Environment and Natural Resources (Atlas do Ambiente - Áreas de Conservação da Natureza, 1992), giving official status to all CORINE biotopes would contribute significantly to increasing the area of protected spaces. The ultimate idea behind the process would be to create what is known as an ecological network, in which reserves and protected areas would no longer be isolated from each other but interconnected by buffer zones and migration corridors (e.g. Meffe & Carroll 1994; Duhayon & Woué 1995).

However, even so, there are still some very important sites for orchid conservation that are not included on the list. Therefore, as a modest contribution to nature conservation in Portugal, with a slight 'orchid focus', and as a summary of the previous sections and paragraphs, we would like to submit some proposals for sites whose protection, if not already ensured, should be actively implemented in the near future. As a general rule, all localities of orchid species in categories CR, EN and V in Table 5.1 should be given official protection status. Those in category NT should also be taken into account when deciding the fate of threatened biotopes. This is particularly the case for species that are not extremely rare in Portugal but are very rare outside the country (*Dactylorhiza caramulensis*, *Epipactis lusitanica*, *Gennaria diphylla*, *Limodorum trabutianum*, *Ophrys dyris*, *O. lusitanica*, *Serapias strictiflora*, *Spiranthes aestivalis* - remember that the latter is one of only two Portuguese orchids included on the list of strictly protected species under the Bern Convention - see § 5.3). Table 5.3 lists some examples of important sites, presented as collective biotopes (by type) or isolated (by location). This table is based on TYTECA (1998), TYTECA & CAPERTA (1999) and TYTECA et al. (2017), and the sites are shown on the map in Figure 5.6. The table is certainly not exhaustive, as since 2017 we have continued to explore and inventory natural areas, sometimes making further interesting discoveries; it is therefore advisable to keep an eye on more recent publications (e.g. MONTEIRO et al. 2023; TYTECA et al. 2018, 2024).

Table 5.3. – Important habitats and sites proposed for orchid conservation in Portugal (numbers refer to Figure 5.6).

North Portugal: habitats	**Importance for orchids**	**Protection status**
1. Pyrenean oak woods (*Quercus pyrenaica*) (Bragança, Grandais, Fresulfe, Serra de Nogueira, Vinhais, Vinhas, Gondesende, …)	Unique habitat for some very rare species: *Neottia nidus-avis*, *Cephalanthera rubra*, *Epipactis fageticola*; other rare species: *Androrchis langei*, *Dactylorhiza insularis*	Parque Natural de Montesinho, partially; Natura 2000 partially
2. Calcareous areas in the north : Sto. Adrião, Castro Vicente, Gebelim, Varge	Presence of rare calcicolous species on ultrabasic rocks in the north: *Orchis anthropophora*, *Ophrys scolopax*, *Cephalanthera rubra*, *Dactylorhiza markusii*, *Limodorum trabutianum*	Sto. Adrião (Natura 2000) ; Varge (Parque Natural de Montesinho)
3. Northern grasslands: Angueira et Campo de Víboras	Unusual presence of rare species in Portugal: *Ophrys vasconica*, *Dactylorhiza insularis*, *Platanthera bifolia*	Natura 2000
4. Chestnut groves (examples: Covas do Douro, Campeã, Fornelos, Lousã)	Main habitat for some very rare species: *Androrchis provincialis*, *Dactylorhiza markusii, D. insularis*, *Platanthera bifolia*	Partially Natura 2000; in some cases in CORINE biotopes
5. Peatlands, acid bogs and moors (examples: Gerês, Larouco, Montesinho)	Unique habitats for *Dactylorhiza ericetorum*	Generally included in Natural Parks; Natura 2000
6. Semi-natural hay and grazing meadows (still numerous in Trás-os-Montes, Beira Alta, Beira Litoral)	Remarkable populations of *Dactylorhiza caramulensis*, *Anacamptis coriophora* subsp. *martrinii*, *Serapias lingua*, *S. cordigera*; locally *Neotinea ustulata*	Only partly protected; need for more protection and for management monitoring (e.g., S. João da Pesqueira)
7. Coastal areas with secondary dunes, between North of Viana do Castelo and Espinho	Habitats for *Spiranthes aestivalis*, *Dactylorhiza elata*; formerly *Epipactis palustris*	This area covers various protected areas and landscapes, as well as natural reserves
8. "Transition zones" around lakes and ponds (e.g., Lagoa da Vela)	Important habitat for *Spiranthes aestivalis*; formerly *Epipactis palustris*	Partially Natura 2000

North Portugal: sites	**Importance for orchids**	**Protection status**
9. Bank of the Douro, close to Vila Nova de Foz Côa	The only habitat of *Epipactis bugacensis* in Portugal	Natura 2000

10. Scrub at margin of cork oak wood near Freixo de Espada à Cinta	One of the only two known localities of *Epipactis duriensis* in Portugal	Included in the Parque Natural do Douro Internacional
11. Meadows, moors and marshes in upper altitudes of Serra da Estrela	Natural habitat of *Dactylorhiza caramulensis*, which is the species growing at highest altitudes in Portugal	Natural Park; Natura 2000
12. *Quercus pyrenaica* woods and chestnut groves of Serra do Açor	Populations of *Epipactis fageticola*, *E. helleborine* and *Neottia nidus-avis*	Included in Paisagem Protegida da Serra do Açor

Beira Litoral: sites	**Importance for orchids**	**Protection status**
13. Wet meadows and alkaline marshes South and East of Aveiro (Vagos, Fermentelos)	Important populations of *Dactylorhiza elata*; *Spiranthes aestivalis*	None
14. Wet to semi-wet meadows on ancient dunes near S. Romão	Numerous and plentiful Orchids: *Anacamptis pyramidalis*, *A. coriophora* subsp. *fragrans* and their hybrid, *Ophrys apifera*, *Dactylorhiza elata*	None
15. Serras de Sicó, do Rabaçal and de Alvaiázere	Numerous species from calcareous areas; oak woods (*Q. faginea*) with *Androrchis provincialis*, *Dactylorhiza markusii*; meadows with *Serapias perez-chiscanoi*, *S. occidentalis*	None

Estremadura and Ribatejo: sites	**Importance for orchids**	**Protection status**
16. Serras de Aire e Candeeiros	Numerous species from calcareous areas; locally both species of *Limodorum*	Natural Park; Natura 2000
17. Serra de Montejunto (Cadaval)	Numerous species from calcareous areas; Chestnut grove with *Dactylorhiza insularis*	Natura 2000; CORINE
18. Hinterland of Lisboa (e.g., Caneças, Bucelas, Mafra)	High diversity of species from calcareous areas; large populations; hybrids	None; seriously under threat (vineyards; urbanization, roads)
19. Arredores de Cascais	Species from calcareous habitats; *Gennaria diphylla*	Partial (paisagem protegida) but still under urbanization threat; Natura 2000
20. Serra da Arrábida (includ. Serras de S. Luís, Palmela & S. Francisco)	High diversity of species from calcareous areas; *Ophrys incubacea*, *Anacamptis papilionacea*	Natural Park; Natura 2000
21. Serra dos Pinheirinhos (Sesimbra)	Like Serra da Arrábida; *Ophrys dyris*, *Anacamptis papilionacea*	Natura 2000; CORINE
22. Belver and Tramagal, in alluvial deposits of the Tejo valley	Populations of *Androrchis langei*, *Epipactis lusitanica*, *Serapias perez-chiscanoi* and various other orchid spec.	None

Alentejo and Algarve: habitats	**Importance for orchids**	**Protection status**
23. Wet meadows in valleys of Alentejo	Some very rare species, including *Anacamptis laxiflora*, *Serapias perez-chiscanoi*	None

24. Banks and islands in valleys of medium to high flow rivers (e.g., Odeleite)	Habitats especially favourable for *Spiranthes aestivalis*, locally abundant; *Serapias* species	None
25. Litoral Alentejano in dune systems, temporary puddles, tiny brooks on cliffs	Various habitats, with (among other) *Spiranthes aestivalis*, *Epipactis lusitanica*, *Ophrys scolopax*	Included in Parque Natural do Sudoeste Alentejano e Costa Vicentina

Alentejo: sites	**Importance for orchids**	**Protection status**
26. Castelo de Vide	Chestnut groves with *Dactylorhiza markusii* and *Androrchis langei*	In a Natural Park; Natura 2000
27. Estremoz, Vila Viçosa, oak woods of *Quercus rotundifolia* and calcareous scrub	Rich orchid populations with (among other) *Anacamptis collina* and *Ophrys incubacea*	None
28. Montemor-o-Novo, in oak woods of *Quercus suber*	Rich orchid populations with (among other) *Gennaria diphylla*, *Ophrys ficalhoana* and hybrid with *O. apifera*	None
29. Santiago do Cacém, in calcareous scrub and oak woods of *Quercus faginea*	Rich orchid populations with (among other) *Epipactis lusitanica*, *Gennaria diphylla*, *Anacamptis papilionacea*	None
30. Reguengos de Monsaraz	Meadows with *Anacamptis papilionacea*, *A. champagneuxii* and their hybrid; *A. laxiflora*, *Ophrys incubacea*	None; partially destroyed by Alqueva dam
31. Barrancos, in wet meadows	Rich orchid populations with (among other) *Serapias occidentalis* and *S. perez-chiscanoi*	None
32. Serra do Ficalho (Serpa, Moura)	Almost the only Portuguese localities of *A. collina*; other species from calcareous areas	Natura 2000

Algarve: sites	**Importance for orchids**	**Protection status**
33. Serra de Monchique	Cork oak woods with important populations of *Epipactis lusitanica*; *Limodorum* abortivum; meadows with *Serapias strictiflora*	Natura 2000; CORINE
34. Castelejo (Vila do Bispo)	Parasol pine woods with *Gennaria diphylla*, *Anacamptis morio*, *Serapias* div. spp.	In a Protected Landscape; Natura 2000
35. Barranco do Velho (Loulé)	Only locality with most Portuguese species of *Serapias* (*Cistus* scrub)	Natura 2000; threatened by poor management of *Eucalyptus* plantation
36. Calcareous area of central Algarve (Barrocal – includes Rocha da Pena; Northern and Western slopes of Morgado hill)	Region of Portugal with highest diversity of calcicolous species: many *Ophrys*, including endemics (*O. algarvensis*, *O. quarteirae*); hybrids; *Androrchis olbiensis*; numerous other species in considerable populations	Natura 2000; classified site of Rocha da Pena; locally threatened by urbanisation (Messines)

As might be expected, in most cases, the creation of a protected area is only a necessary condition for conservation, which is not sufficient. Active management measures must also be taken. Generally speaking, these measures are (at least technically) easy to implement and would simply consist of continuing the traditional practices that have been in place until now. One of the best examples of this is given in § 3.4.4, namely the semi-natural grasslands of north-eastern Portugal, which have been and still are managed in the traditional way for hay harvesting, using ancestral techniques that are still in use in Portugal but have disappeared from more northern regions, such as 'abissage' (see § 3.4.4 of Chapter 3; Fig. 5.7 below). Other examples include (1) wetland management based on mowing or grazing and avoiding drainage, (2) forest management based on traditional, non-aggressive practices designed to maintain the diversity of native species and avoid the planting of exotic trees such as *Eucalyptus* sp. in monocultures, and (3) grassland or heathland management based on extensive grazing.

Fig 5.7. – A tribute to the People of Portugal.

Residents of Gondesende (Trás-os-Montes e Alto Douro) busy maintaining a drainage ditch ('fossé d'abissage'). During the AOSP field trip, 31 May 2025.

According to those interviewed, this ditch serves a dual purpose:

1. On the one hand, it channels water to the fields surrounding their homes, in order to irrigate their vegetable gardens and cornfields;
2. On the other hand, it simultaneously and in the same way drains (removes excess water) from the hay meadows, in order to dry them out, mow them and bale the hay.

"Thrive with Nature, do not compete with Her"

5.5. Epilogue: legislation as a potential cause of the scarcity or even disappearance of orchids

We saw above that Portugal had published the Red List of Threatened Species in Portugal (CARAPETO et al. 2020), an initiative that should certainly be welcomed, and which was accompanied by various initiatives aimed at raising public interest and awareness, such as the 'Planta do Ano' (Plant of the Year), the Plant of the Year, a survey conducted annually since 2022, in which the public was invited to choose the winner from among three proposed species. In 2022, 2023 and 2024, the winners were *Linaria ricardoi* (the olive tree toadflax), *Armeria rouyana* (Sado thrift) and *Linaria pseudoamethystea* (Guadiana toadflax). The total number of votes cast were 2,810, 763 and 1,315 respectively, meaning that the publicity campaign was most effective in 2022. It should be noted that the organisers chose species that were particularly attractive, and in some cases unusual for the public (there was a broomrape among the three candidates in 2024), but that no orchids were included in the selection.

Let us now turn to a much more serious issue as far as we are concerned: the sad fate of orchids on the Red List. What will be discussed below clearly reflects the perverse effects of classification where the taxonomic units used, species and subspecies, are the only ones that have received sufficient support from molecular phylogenetics. The latter discipline, whose long-awaited advent in recent decades we must obviously continue to welcome, continues to be the subject of intense and in-depth research in many universities and specialised research institutions around the world. Unfortunately, nowadays there is a tendency to consider that, from the outset, the results obtained by this very recent discipline take precedence over the countless insights gained over the preceding decades and centuries in plant morphology, individual and population biology, ethology (particularly in relation to insects), ecology, and many other disciplines. Therefore, the leading research institutions often do not recognise the many species or subspecies that meet the morphological, biological, ethological, etc. criteria that justified their designation in previous periods, or that still justify their designation based on more recent observations, in such a way that we are led to overlook taxonomic entities that constitute the bricks of global biodiversity.

This perverse effect is unfortunately well reflected in the choice of orchid taxa included in Portugal's Red List, as can be seen in Table 5.4. Without going into too much detail, here are some of the lessons that can be learned from examining the proposals in this table:

- Of the ± 68 (sub)species recognised by European orchid specialists as native to Portugal (TYTECA et al. 2017; PAULUS 2018; DELFORGE 2021; GRIEBL & PRESSER 2021; KREUTZ 2024; etc.), only 50 are recognised by the Portuguese botanists who compiled the Red List.

- Of these 50 (sub)species, only 15 are included in the Red List (NT, VU, EN, CR, RE status). By way of comparison, Wallonia has 47 (sub)species of orchids, 43 of which are fully protected (along with their habitat), while the remaining four are partially protected (but including their habitat). All these orchid (sub)species are recognised by both scientists and nature conservationists.

- No *Ophrys* species are included in the Portuguese Red List (CARAPETO et al. 2020). Of the 20 Ophrys taxa recognised by European orchid specialists, only 11 are recognised by Portuguese generalist botanists. According to orchid specialists, at least 11 Ophrys taxa (not the same 11) should be included in the Red List, of which only four (*O. bilunulata*, *O. dyris*, *O. scolopax* and *O. incubacea*) are currently recognised by generalist botanists; but even these four are not included in the Red List.

These facts, especially the last one, do not allow orchids to be considered one of the most representative, prestigious and threatened components of the living world. It must be recognised that the natural habitats that are home to orchids are always healthy ecosystems, rich in biodiversity and properly managed (which does not mean, of course, that places without orchids are uninteresting or poorly managed!). This is symptomatic, to say the least, of the lack of attention paid by nature conservation professionals to the fundamental role played by orchids in webs of life.

Applied to the subject we are dealing with in this chapter, this will have serious implications: taking the example of the *Ophrys scolopax* group, which in addition to this species also includes *O. picta* and a third recently described species, *O. beirana* (Tyteca et al. 2020; Tyteca & Gathoye 2024), from the point of view of generalist botanists, there is only one representative of this group in the vascular flora of Portugal, namely *O. scolopax* (s.l.). If all individuals of *O. picta* are treated, without distinction, with *O. scolopax* and *O. beirana*, as representatives of this group, there is of course no need for special protection measures, as *O. picta* (but only this species) is fairly common, whereas we know for certain that *O. scolopax* s.str. and *O. beirana* are rather rare and threatened in Portugal. Furthermore, until now, *O. beirana* has been listed as endemic to Portugal; if it is lost in Portugal because no special measures are taken for its conservation, then it is lost to the world and to science. Many other examples of neglected species can be cited, meaning that virtually no orchids in calcareous grasslands would be protected, even though some are certainly endangered (such as, of course, *O. scolopax* s.str., *O. beirana*, but also many others, such as *O. ficalhoana*, *O. bilunulata*, *O. dyris* s.str., *O. incubacea*, etc.), and that calcareous grasslands are considered one of the priority habitats that should receive special attention under Natura 2000 legislation (Annex I of Directive 92/43/EEC) .

Table 5.4. – List of Portuguese orchid species. Column 1 includes taxa recognised in this publication and by experts in various fields; column 3 includes taxa recognised in the Portuguese Red List and on the FloraOn website. Abbreviations: Column 2, C = common; AC = fairly common; AR = fairly rare; R = rare; RR = extremely rare. Column 4 (IUCN categories): NT = near threatened; VU = vulnerable; EN = endangered; CR = critically endangered; RE = regionally extinct. The entries in column 5 indicate the relevant regulations (see text).

Species (various authors)	Perceived rarity	Species (accepted by Flora On & Red List)	Red List Portugal	Portuguese legislation
Cephalanthera longifolia	AR	*Cephal. longifolia*	-	
Cephalanthera rubra	RR	*Cephalanthera rubra*	EN	**
Epipactis palustris	Extinct	*Epipactis palustris*	RE	**
Epipactis tremolsii	AC	*Epipactis tremolsii*	-	
Epipactis duriensis	RR			
Epipactis lusitanica	AR	*Epipactis lusitanica*	-	
Epipactis helleborine	AR	*Epipactis helleborine*	-	
Epipactis fageticola	R	*Epipactis fageticola*	EN	**
Epipactis bugacensis	RR	*Epipactis bugacensis*	-	
Neottia nidus-avis	R	*Neottia nidus-avis*	VU	**
Limodorum abortivum	AC	*Limodorum abortivum*	-	
Limodorum trabutianum	AR	*Limod. trabutianum*	-	
Spiranthes spiralis	AC	*Spiranthes spiralis*	-	
Spiranthes aestivalis	AR	*Spiranthes aestivalis*	NT	***
Gennaria diphylla	R	*Gennaria diphylla*	-	
Platanthera bifolia	RR	*Platanthera bifolia*	EN	**
Gymnadenia cf. *borealis*	RR	*Gymnad. conopsea*	EN	**
Dactylorhiza insularis	R	*Dactylorhiza insularis*	EN	**
Dactylorhiza markusii	AR	*Dactylorhiza sulphurea*	NT	**
Dactylorhiza elata	AR	*Dactylorhiza elata*	NT	**
Dactylorhiza caramulensis	AC	*Dactylorhiza maculata*	-	
Dactylorhiza ericetorum	AR			
Androrchis mascula	AC	*Orchis mascula*	-	
Androrchis olbiensis	RR			
Androrchis langei	R	*Orchis langei*	-	
Androrchis provincialis	RR	*Orchis provincialis*	CR	***
Orchis anthropophora	AC	*Aceras anthropophorum*	-	

Orchis italica	C	*Orchis italica*	-	
Neotinea maculata	AC	*Neotinea maculata*	-	
Neotinea ustulata	RR	*Orchis ustulata*	CR	**
Neotinea conica	AR	*Orchis conica*	-	
Himant. robertianum	AR	*Himant. robertianum*	-	
Anacamptis pyramidalis	AC	*Anac. pyramidalis*	-	
Anacamptis laxiflora	RR	*Orchis* (*Anac.*) *laxiflora*	EN	**
Anacamptis collina	RR	*Orchis* (*Anac.*) *collina*	CR	**
Anacamptis papilionacea	R	*Orchis papilionacea*	-	
A. corioph. ssp. *martrinii*	AR	*Orchis coriophora*	-	
A. coriophora ssp. *fragrans*	AC			
A. morio ssp. *morio*	AC	*Orchis morio*	-	
A. morio ssp. *picta*	AR			
Anacamptis champagneuxii	AC			
Serapias lingua	AC	*Serapias lingua*	-	
Serapias strictiflora	AR	*Serapias strictiflora*	-	
Serapias elsae	R			
Serapias parviflora	C	*Serapias parviflora*	-	
Serapias cordigera	AR	*Serapias cordigera*	-	
Serapias gentilii	R			
Serapias occidentalis	RR			
Serapias perez-chiscanoi	RR	*Ser. perez-chiscanoi*	EN	**
Ophrys fusca	AR	*Ophrys fusca* ssp. *fusca*	-	
Ophrys lupercalis	AR			
Ophrys bilunulata	R	*O. fusca* ssp. *bilunulata*	-	
Ophrys pintoi	R			
Ophrys dyris	R	*O. fusca* ssp. *omegaifera*	-	
Ophrys vasconica	RR			
Ophrys lenae	RR			
Ophrys algarvensis	R			
Ophrys lutea	AC	*Ophrys lutea*	-	
Ophrys quarteirae	RR			
Ophrys speculum	AC	*Ophrys speculum*	-	
Ophrys lusitanica	AR	*O. speculum* ssp. *vernixia*	-	
Ophrys bombyliflora	AC	*Ophrys bombyliflora*	-	
Ophrys tenthredinifera	AR	*Ophrys tenthredinifera*	-	
Ophrys ficalhoana	R			
Ophrys apifera	AC	*Ophrys apifera*	-	
Ophrys scolopax	R	*Ophrys scolopax*	-	
Ophrys picta	AR			
Ophrys beirana	RR			
Ophrys incubacea	RR	*Ophrys sphegodes* [sic !]	-	
Total number	**69**	**50**	**15**	

** "Regulamento (CE) n. 338/97, do Conselho, de 9 de dezembro de 1996 (Anexo B)".

*** "Diretiva 92/43/CEE (Anexo IV), Convenção de Berna (Anexo I), Regulamento (CE) n.. 338/97, do Conselho, de 9 de dezembro de 1996 (Anexo A)".

Empusa pennata
Eiras,
14 April 2022
The imp from our garrigues

Drosophyllum lusitanicum
Aljezur, Algarve
2022, 2024

A carnivorous plant found throughout the south-west of the Iberian Peninsula and northern Morocco.
You may encounter it in certain environments where various orchids grow. It grows in rather poor environments, on dry soil.

Please be respectful, do not pick it or trample on it; it is a rather rare plant!

Technical appendices

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Glossary

Acidic (adj.): Describes soil or an environment with an acidic reaction, characterised by a pH below 7.

Acidophilic (adj.): Describes a plant that prefers acidic soil or environments.

Acuminate (adj.): Ending in a narrow, evenly tapered point.

Alkaline (adj.): Describes soil or an environment with an alkaline reaction, characterised by a pH greater than 7.

Allogamous (adj.): Describes a plant species in which fertilisation occurs between two different individuals, following cross-pollination.

Allotetraploid (adj.): Refers to a taxon resulting from hybridisation between two diploid species, accompanied by a doubling of the chromosome number (example: several species of *Dactylorhiza*).

Alternate (adj.): Characterises leaves arranged alternately, in tiers, on opposite rows, along the stem of a plant.

Amendment (noun): In agriculture, refers to an operation aimed at improving the physical properties of soil, generally involving the addition of nutrients, which is harmful to the natural biocoenosis, particularly to orchids.

Anther (noun): Terminal part of the stamen, where pollen grains are formed.

Apomictic (adj.): Refers to a plant species that reproduces by seeds without fertilisation. In orchids, this phenomenon is observed in particular in certain *Dactylorhiza* and *Nigritella* species (see pp. 15, 24, 123, 129 and 132).

Apomixis (noun): Process occurring in apomictic plant species.

Autogamous (adj.): Said of a plant species in which fertilisation takes place within the same flower (by self-pollination) or between two flowers of the same individual (by geitonogamy).

Basal (adj.): Said of leaves arranged at the base of a plant's stem.

Basic (adj.): Synonymous with alkaline.

Basiphilous (adj.): Said of a plant that prefers alkaline or basic soils or environments.

Bilobed (adj.): Said of a petal or labellum divided into two lobes at its apex.

Biotope (noun): In ecology, refers to a habitat defined by relatively uniform physical and chemical characteristics. This environment is home to a range of life forms that make up the biocenosis: flora, fauna, fungi, and populations of micro-organisms, which establish relationships between themselves that are essential for the survival of the species (Wikipedia).

Bract (noun): Small leaf inserted on the stem of a plant at the same level as a flower.

Bursicle (noun): In orchids (and more particularly *Orchidoideae*), a small pocket containing viscous discs located at the base of the pollinia.

Calcicolous (adj.): Said of a species or plant association that thrives in calcareous soil environments.

Calciphile (adj.): Said of a plant that grows preferentially on calcareous soils.

Callosity (noun): A bump or bulge, usually hard in consistency.

Campanulate (adj.): Bell-shaped, like the flowers of campanula.

Caudiculum (noun): In orchids (and more particularly *Orchidoideae*), part of a pollinia, consisting of a small stalk bearing the pollen masses and ending in a viscous disc.

Caulinar (adj.): Describes leaves arranged along the stem of a plant, between the ground and the inflorescence.

Cleistogamous (adj.): Describes a flower that does not open at the time of fertilisation, and where self-fertilisation, or self-pollination, is therefore the only possibility.

Clinander (noun): In *Epipactis*, a small plate serving as a support for pollinia, overhanging the stigma and extended, where applicable, into a rostellum.

Cordate (adj.): Describes a leaf whose base is indented, resembling the shape of a heart.

Dentate (adj.): Refers to a leaf with serrated edges, i.e. small protrusions that are more or less triangular in shape.

Denticulate (adj.): Refers to a leaf edged with very small teeth.

Diploid (adj.): Refers to a cell whose chromosomes, similar in pairs, can be associated with homologous pairs. By extension, refers to a living being that carries diploid cells. In a fertilised egg, the diploid state results from the union of a set of chromosomes of maternal origin and a set of homologous chromosomes of paternal origin.

Distic (adj.): Refers to alternate leaves clearly arranged in two opposite rows.

Dition (French noun): In biology or ecology, a term commonly used to refer to a given territory that is the subject of an ongoing study. In this book, the term ‘dition’ generally refers to the territory covered by Portugal and (parts of) neighbouring Spanish regions (Fig. 2.3, p. 31 and Fig. 4.1, p. 70). In English, we may use the word “Domain” to mean the same concept as “Dition’.

Domain (noun): See just above, the concept of “Dition”.

Endemic (adj.): Said of a species whose range is limited to a specific geographical area, generally of small extent (island; particular natural zone).

Entomogamous (adj.): Characterises a plant species whose pollination requires the intervention of insects.

Epichile (noun): In certain orchids, including *Epipactis* and *Serapias*, the outer part of the labellum, serving as a landing pad for visiting insects.

Erect (adj.): Describes leaves or floral parts (sepals, petals) that point upwards.

Foliate (adj.): Characterises a bract whose shape and consistency are similar to those of a leaf (as opposed to ‘membranous’).

Geitonogamy (noun): Allogamy in which the pollen and stigma belong to the same individual. Geitonogamy is a form of autogamy since it involves two identical genotypes. However, it is similar to allogamy since it involves two different floral organs (https://floraquebeca.qc.ca/geitonogamie/).

Gibbosities (noun): In certain orchids, including *Ophrys*, growths on the labellum, usually in pairs, located laterally near its base.

Glabrous (adj.): Describes an organ that is hairless.

Glandular (adj.): Describes an organ (leaf, stem, tepals, etc.) covered with hairs ending in a small gland, usually spherical and sticky.

Gynostemium (noun): In orchids, an organ (also called a column) formed by the fusion of the male (pollinia chambers), female (stigmas) and derivative (rostellum, bursicle) parts of the flower (see also p. 21).

Helmet (noun): In certain orchids, the name given to the structure formed by the union of the sepals and petals, generally protecting the gynostemium.

Holotype (noun): In biology, refers to the type specimen used to define and describe a specific category (species or taxon of a lower rank than species) in the classification of living organisms. Thus, the specimen of *Orchis militaris* as described by Linnaeus is the holotype of the species *Orchis militaris*. This serves as the type for the genus *Orchis* and the family Orchidaceae.

Hygrophilous (adj.): Describes a plant species that prefers moist soils or environments.

Hypochile (noun): In some orchids, the basal part of the labellum, generally consisting, in *Epipactis*, of a nectariferous pocket.

Internode (noun): Along the stem of a plant, the space between the insertion points of two successive leaves.

Introgression (noun): Refers to the transfer of genes from one species to the gene pool of another species that is genetically close enough for interbreeding to occur. This gene transfer occurs through hybridisation of individuals followed by successive backcrossing with representatives of the host species (exclusively or predominantly). (Wikipedia).

Labellum (noun): In orchids, refers to the petal that is modified in shape, size, structure, hairiness and often ornamentation, sometimes extending into a spur. In our native species, it is generally oriented downwards as a result of a twist in the ovary or its pedicel.

Lanceolate (adj.): Refers to a leaf that is more or less broad, with a tip shaped like a spearhead.

Laxiflora (adj.): Refers to an orchid whose inflorescences are arranged in loose, widely spaced flowers.

Linear (adj.): Refers to a very narrow leaf with parallel edges, such as those of grasses, for example.

Macule (noun): In botanical language, refers to a spot caused by pigmentation, most often on leaves but also on other organs (labellum, petals, etc.).

Membranous (adj.): Characterises a bract (or other organ) that is thin, hyaline and often translucent.

Mixotrophic (adj.): Refers to a plant capable of feeding by autotrophy (usually through photosynthesis) as well as heterotrophy (depending on other organisms through parasitism or symbiosis). Generally, the transition from one to the other depends on changes in the habitat.

Monophyletic (adj.): Refers to a group of species comprising all the descendants of a common ancestor.

Mycoheterotrophic (adj.): Describes a plant without chlorophyll, living in association with a fungus that provides it with all the organic and mineral substances necessary for its metabolism.

Mycorrhiza (noun): A composite organ formed by the close association of soil fungus filaments with the roots of a plant.

Oblong (adj.): Refers to a leaf that is more or less broad, with a blunt tip and more or less parallel edges.

Opposite (adj.): Said of leaves arranged in pairs, inserted at the same level on either side of a plant's stem.

Oval (adj.): Refers to a leaf that is more or less broad, oval or elliptical in shape.

Pedicel (noun): A small stem connecting an organ to its support, for example between an ovary and the stem of the plant.

Perianth (noun): The reunion of sepals and petals of an orchid flower, not including the labellum.

Pollinia (noun): In orchids, a mass of pollen, extended in many species by a small stalk (caudicle) ending in a sticky disc that allows it to adhere to the body of an insect.

Pseudo-eyes (noun): In *Ophrys*, small, shiny, globular growths located at the base of the labellum, which mimic the eyes or wing attachment points of the insect species they attract.

Pseudocopulation (noun): In certain orchids, including *Ophrys*, the process by which a male insect attempts to mate with the labellum, which mimics the scent, shape, colour and hairiness of a female of the same species.

Pubescent (adj.): Describes an organ with more or less dense hairiness.

Quadrilobed (adj.): Describes a petal or labellum divided into four lobes at its tip.

Resupinate (adj.): Describes an organ (usually the labellum) or the entire flower of an orchid that is oriented downward as a result of a twist or tilt of the ovary or its pedicel, whereas the normal position is to be oriented upward. This process is very common, but not exclusive, in most orchid species.

Retinaculum (noun): Name given to the viscidium (see this name) when it is completely detachable.

Rosette (noun): A group of basal leaves on a plant, arranged at ground level in various directions.

Rostellum (noun): In orchids, an organ resulting from the transformation of a stigma and capable of playing various roles during pollination (support or sticky pouch allowing pollinia to adhere to the body of an insect).

Saprophyte (adj.): Said of a plant without chlorophyll, which draws its nourishment from decomposing organic substances contained in the soil.

Scrub encroachment (nouns): Process whereby shrubby plant species, particularly thorny bushes, take over from herbaceous vegetation following the cessation of maintenance (mowing or grazing) of a grassy plot.

Self-pollinating (adj.): Said of a plant species in which fertilisation takes place within the same flower (by self-pollination) or between two flowers of the same individual (by geitonogamy).

Self-pollination (noun): Process by which pollen (or pollinia) from a flower reaches the stigma of the same flower, thus leading to its pollination.

Spreading (adj.): Said of leaves or floral parts (sepals, petals) oriented laterally in relation to the main part (stem or flower).

Spur (noun): In certain plant species (including orchids), an outgrowth of a tepale (usually the labellum in orchids), often nectariferous, tube- or pouch-shaped.

Staminodal (points – adj.): In certain *Ophrys*, the form taken by the staminodes, reduced to small spots on the edge of the stigmatic cavity.

Staminode (noun): In orchids, a residual structure, usually rudimentary, resulting from the transformation of a stamen.

Tepal (noun): General name for the petals or sepals of a flower.

Thermophile (adj.): Said of a plant that grows preferentially in warm, sunny locations.

Trilobed (adj.): Said of a petal or labellum divided into three lobes at its apex.

Tuber (noun): Swollen underground part of the stem, filled with stored nutrients. The term ‘bulb’ is sometimes used incorrectly, but ‘tuber’ is more appropriate for orchids.

Viscidium (noun): A small, sticky piece, detachable or not, located at the base of the pollinia or pollen masses of certain orchids, allowing them to adhere to the body of an insect. A more general term for the retinaculum (see this name), as the sticky piece may be completely or only partially detachable.

Xerophilous (adj.): Said of a plant that grows preferentially in dry places.

Main nomenclatural synonyms of the taxa described in this work

Taxon	Page	Most common synonyms
Cephalanthera longifolia (L.) K.Fritsch	72	*C. ensifolia* (Murr) L.C.M. Richard
C. rubra (L.) L.C.M. Richard	73	
Neottia nidus-avis (L.) L.C.M. Richard	77	
Neottia ovata (L.) Bluff & Fingerhuth	78	*Listera ovata* (L.) R. Brown
Limodorum abortivum (L.) Swartz	83	
L. trabutianum Battandier	83	*L. abortivum* subsp. *trabutianum* (Battandier) Rouy
Epipactis palustris (L.) Crantz	89	*Helleborine palustris* (L.) Hill
E. tremolsii Pau	91	*E. helleborine* subsp. *tremolsii* (Pau) E. Klein
E. lusitanica D. Tyteca	91	*E. tremolsii* subsp. *lusitanica* (D. Tyteca) Kreutz, *E. helleborine* subsp. *lusitanica* (D. Tyteca) J.-M. Tison
Epipactis duriensis Bernardos, D. Tyteca, Revuelta & Amich	94	*E. tremolsii* var. *duriensis* (Bernardos et al.) P. Delforge
E. helleborine (L.) Crantz	96	*E. latifolia* (L.) Allioni
E. fageticola (C.E. Hermosilla) J. Devillers-Terschuren & P. Devillers	98	*E. phyllanthes* G.E. Smith var. *fageticola* C.E. Hermosilla
E. bugacensis Robatsch	100	*E. rhodanensis* Gévaudan & Robatsch
Spiranthes spiralis (L.) Chevallier	104	*S. autumnalis* L.C.M. Richard
S. aestivalis (Poiret) L.C.M. Richard	106	
Gennaria diphylla (Link) Parlatore	109	*Satyrium diphyllum* Link
Platanthera bifolia (L.) L.C.M. Richard	112	*Orchis bifolia* L.
Pseudorchis albida (L.) A. & D. Löve	115	*Leucorchis albida* (L.) E. Meyer
Gymnadenia borealis (Druce) R.M. Bateman, Pridgeon & M.W. Chase	118	*G. conopsea* (L.) R.Brown var. *borealis* (Druce) Soó
Dactylorhiza viridis (L.) R.M. Bateman, Pridgeon & M.W. Chase	123	*Coeloglossum viride* (L.) Hartman
D. sambucina (L.) Soó	126	*Orchis sambucina* L., *D. latifolia* (L.) Soó
D. cantabrica H.A. Pedersen	128	
D. insularis (Sommier) O. Sánchez & Herrero	131	*Orchis insularis* Sommier
D. markusii (Tineo) H. Baumann & Künkele	133	*Dactylorhiza sulphurea* (Link) Franco
D. inarnata (L.) Soó	135	*Orchis incarnata* L.
D. ericetorum (E.F. Linton) Averyanov	137	*D. maculata* (L.) Soó subsp. *ericetorum* (E.F. Linton) P.F. Hunt & Summerhayes
D. caramulensis (Vermeulen) D. Tyteca	137	*D. maculata* subsp. *caramulensis* Vermeulen
D. elata (Poiret) Soó	141	*D. sesquipedalis* (Willdenow) M. Lainz
Androrchis mascula (L.) D. Tyteca & E. Klein	148	*Orchis mascula* (L.) L.
A. tenera (Landwehr) D. Tyteca & E. Klein	151	*Orchis tenera* (Landwehr) Kreutz

A. olbiensis (Reut. Ex Gren.) D. Tyteca & E. Klein	153	*Orchis olbiensis* Reuter ex Grenier
A. langei (K. Richter) D. Tyteca & E. Klein	155	*Orchis langei* K. Richter, *O. hispanica* A. & C. Nieschalk
A. provincialis (Balbis) D. Tyteca & E. Klein	157	*Orchis provincialis* Balbis
A. pallens (L.) D. Tyteca & E. Klein	160	*Orchis pallens* L.
Orchis anthropophora (L.) Allioni	163	*Aceras anthropophorum* (L.) Aiton fil.
O. italica Poiret	165	
O. purpurea Hudson	169	
Neotinea maculata (Desf.) Stearn	172	*Orchis intacta* Link, *Neotinea intacta* (Link) Reichenbach fil.
N. ustulata (L.) R.M. Bateman, Pridgeon & M.W. Chase	174	*Orchis ustulata* L.
N. conica (Willd.) R.M. Bateman	176	*Orchis conica* Willdenow, *O. pusilla* D. Tyteca
Himantoglossum hircinum (L.) Sprengel	179	
H. robertianum (Loiseleur) P. Delforge	181	*Barlia robertiana* (Loiseleur) W. Greuter
Anacamptis pyramidalis (L.) L.C.M. Richard	185	*Orchis pyramidalis* L.
A. laxiflora (Lam.) R.M. Bateman, Pridgeon & M.W. Chase	187	*Orchis laxiflora* Lamarck, *Paludorchis laxiflora* (Lam.) P. Delforge
A. collina (Banks & Sol. ex Russel) R.M. Bateman, Pridgeon & M.W. Chase	189	*O. collina* Banks & Solander, *O. saccata* Tenore, *Vermeulenia collina* (Banks & Sol. ex Russel) P. Delforge
A. coriophora (L.) R.M. Bateman, Pridgeon & M.W. Chase subsp. *martrinii* (Timb.-Lagr.) Jacquet & Scappat.	192	*Orchis coriophora* (L.) subsp. *martrinii* (Timbal-Lagrave) Nyman, *Anteriorchis coriophora* (L.) E. Klein & Strack subsp. *martrinii* (Timb.-Lagr.) Jacquet, *O. martrinii* Timbal-Lagrave
Idem subsp. f*ragrans* (Pollini) R.M. Bateman, Pridgeon & M.W. Chase	192	*Anteriorchis coriophora* subsp. *fragrans* (Poll.) Jacquet, *Anteriorchis fragrans* (Poll.) Szlachetko
A. papilionacea R.M. Bateman, Pridgeon & M.W. Chase subsp. *grandiflora* (Boissier) Kreutz	197	*Orchis papilionacea* L. subsp. *grandiflora* (Boissier) Malagarriga, *Vermeulenia grandiflora* (Boissier) Kreutz
A. morio (L.) R.M. Bateman, Pridgeon & M.W. Chase subsp. *morio*	200	*Herorchis morio* (L.) D. Tyteca & E. Klein, *Orchis morio* L.
Idem subsp. *picta* (Loisel.) P. Jacquet & Scappaticci	200	*Herorchis picta* (Loiseleur) P. Delforge, *H. morio* subsp. *picta* (Loiseleur) D. Tyteca & E. Klein
A. champagneuxii (Barnéoud) R.M. Bateman, Pridgeon & M.W. Chase	204	*Herorchis champagneuxii* (Barnéoud) D. Tyteca & E. Klein
Serapias lingua L.	210	
S. strictiflora Welwitch ex Veiga	212	Nombreux: *S. stricta*, *S. mauretanica*, *S. gracilis*, … (cf KREUTZ 2024)
S. elsae P. Delforge	212	*S. strictiflora* var. *elsae* (P. Delforge) C. & P. Venhuis ex Kreutz
S. parviflora Parlatore	216	
S. cordigera L.	218	
S. occidentalis C. & P. Venhuis	220	*S. maria* F.M. Vázquez
S. gentilii (C. & P. Venhuis & Kreutz) Kreutz	222	*S. cordigera* var. l*eucoglottis* Welwitsch ex Reichenbach fil.

S. perez-chiscanoi Acedo	226	*S. viridis* Pérez Chiscano
Ophrys speculum Link	233	*Ophrys ciliata* Bivona-Bernardi
O. lusitanica (O. & E. Danesch) Paulus & Gack	233	*Ophrys vernixia* Brotero
O. bombyliflora Link	238	
O. tenthredinifera Willd.	240	*O. guimaraesii* (D. Tyteca) Kreutz
O. ficalhoana (J.A. Guimarães) Wucherpfennig	240	
O. fusca Link	245	
O. lupercalis J. Devillers-Terschuren & P. Devillers	245	
O. bilunulata Risso	245	*O. fusca* Link subsp. *bilunulata* (Risso) Aldasoro & L. Sáez
O. pintoi M. Lowe & D. Tyteca	245	
O. dyris Maire	252	*O. fusca* Link subsp. *dyris* (Maire) Soó
O. lenae M. Lowe & D. Tyteca	252	
O. vasconica (O. & E. Danesch) P. Delforge	252	
O. algarvensis D. Tyteca, Benito Ayuso & M. Walravens	252	
O. lutea Cav.	259	
O. quarteirae (Kreutz, M.R. Lowe & Wucherpfennig) P. Devillers & J. Devillers-Terschuren	259	
O. insectifera L.	262	*O. muscifera* Hudson
O. apifera Huds.	264	
O. scolopax Cav.	266	
O. picta Link	266	
O. beirana D. Tyteca, J. Pessoa & L. Borges	266	
O. incubacea Cav.	272	*Ophrys atrata* Lindley, *Ophrys sphegodes* Mill.
O. caloptera J. Devillers-Terschuren & P. Devillers	274	*Ophrys sphegodes* Mill.

Index – Orchids of Portugal and neighbouring regions

Below are references to the various taxa found in the **texts**. Other important information relating to taxa can be found in the **tables**, the most relevant of which are listed after the final index.

Orchidaceae

Other botanical families

Animals (insects)

List of tables providing information on orchid taxa