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Inventory and characterization of Orchids in the region of Sidi Bel Abbès (North-West Algeria)

Abstract

El Bouhissi, M., Babali, B., Dib, T., Cherifi, K., Ait Hammou, M. & Miara, M.: Inventory and characterization of Orchids in the region of Sidi Bel Abbès (North-West Algeria). — Fl. Medit. 34: 203-218. 2024. — ISSN: 1120-4052 printed, 2240-4538 online.

This study explores the rich diversity of Algeria, with a particular focus on the Sidi Bel Abbès region, which is renowned for its floristic richness, its ecological diversity and its phytodiversity. Our research aims to identify and map orchids, which face challenges due to both climate constraints and increasing anthropozoogenic activities impacting their habitats. Between 2015 and 2022, we carried out an extensive orchid inventory, resulting in the observation, identification, and geolocation of 25 species belonging to 4 genera in the study area. Among the orchids, *Ophrys* species were the most prevalent, with a total of 17 species, including one hybrid, followed by *Anacamptis* and *Orchis*, each comprising three species. *Himantoglossum* was the least represented with only two species recorded. Detailed characterizations and ecological data were established for each species to acquire comprehensive understanding of their habitats and distributions. While some taxa demonstrated widespread distribution across the Sidi Bel Abbès region, others exhibited highly localized occurrences.

Key words: Phytodiversity, inventory, anthropozoogenic action, climatic constraints, North Africa.

Article history: Received 22 January 2024; received in revised form 22 September 2024; accepted 10 October 2024; published 10 November 2024.

Introduction

Orchids are considered the most emblematic family of species because of their beauty and the fragility of their habitats coupled with the threats that weigh on their preservation. They comprise over 25 000 species distributed across various climatic regions around the globe (Gravendeel & al. 2004). These entomophilous flowering plants represent a botanical heritage with an extraordinary diversity. Orchids are highly diversified in tropical region, while in Europe, are predominantly found in the Mediterranean region, where several genera are endemic. With the exception of the northern shore of this region, the southern one has not been subject of comprehensive and in-depth studies on the entire taxon, except some previous researches in Tunisia (Vallès & Vallès-Lombard 1988; Martin & al. 2015).

The studies devoted to the inventory of orchids in Algeria have not been reviewed since the Second World War. Some older studies have been reported by Maire (1959) and Quézel & Santa (1962). However, an exploration was conducted by Baumann in 1975, after which a publication dedicated to European species (Baumann & al. 2006) also has mentioned some rare and unknown species in Algeria. Few recent studies have been devoted to orchids of Morocco (Raynaud 1988) and Libya (Baumann & Baumann 2001), while, there are more studies regarding Tunisia (Martin 2008; El Mokni & al. 2010; Le Floc'h & al. 2010; Véla & al. 2012, 2015; El Mokni & Domina 2019). In the concern of Algeria, particularly, the northeastern part of the country, it is crucial to mention the taxonomic inventories and observations carried out by Derradji (1999), De Bélair (2000), De Bélair & Boussouak (2002), De Bélair & al. (2005), Rebbas & Véla (2008, 2013), Hadji & Rebbas (2013) and Beghami & al. (2015).

New taxon of orchids have been discovered in Algeria, or even formally described (Medjahdi & al. 2009; Rebbas & Véla 2013; Kreutz & al. 2013; Babali & al. 2013; Hadji & Rebbas 2013; Kreutz & al. 2014; Babali & al. 2018a, 2018b), while others are undoubtedly yet to be discovered. However, very few studies have been published regarding the threats weighing on the conservation status of a given species (Orsenigo & al. 2016).

The present research aims to study this family of orchids, a first work in its kind in the region of Sidi Bel Abbès, located in the West of Algeria. Some orchid species, which have been previously observed during some initial inventory works (Cherifi 2013; Ouici & al. 2015; Cherifi & al. 2017; Cherifi & al. 2021) on the flora of this region, served as the starting point for our investigation on this interesting family. The lack of works on orchids in this region, led us to undertake a research aiming to carry out the first inventory of orchids in the Sidi Bel Abbès region, to enhance our knowledge of the ecology and natural habitats hosting these taxon, to create distribution maps of the inventoried species and moreover, to identify their degradation factors for a sustainable management of natural areas hosting these taxa.

Material and methods

Study area description

Sidi Bel Abbès province is situated in a strategic position and covers approximately 15% of the territory of the Northwest region of the country. It is considered as a hub due to its privileged location, as it is crossed by the main road networks of this part of the country. Bordered from the North by the province of Oran, from the Northwest by the province of Ain témouchent, from the Northeast by the province of Mascara, from the West by the province of Tlemcen, from the East by the provinces of Mascara and Saida, from the south by the provinces of Naâma and El-Bayad, and limited from the Southeast by the province of Saida (Fig. 1). Administratively, Sidi Bel Abbès is composed of 52 municipalities among 15 districts, covering an area of 9150.63 km².

The relief can be divided into three distinct physical units. The mountainous areas cover a total area of approximately 2250.37 km², representing 24.59% of the province. They are located in the Northern part, including the Tessala and Beni Chougrane mountains, covering about 864.20 km², as well as the central part of the province with the Dhaya mountains,

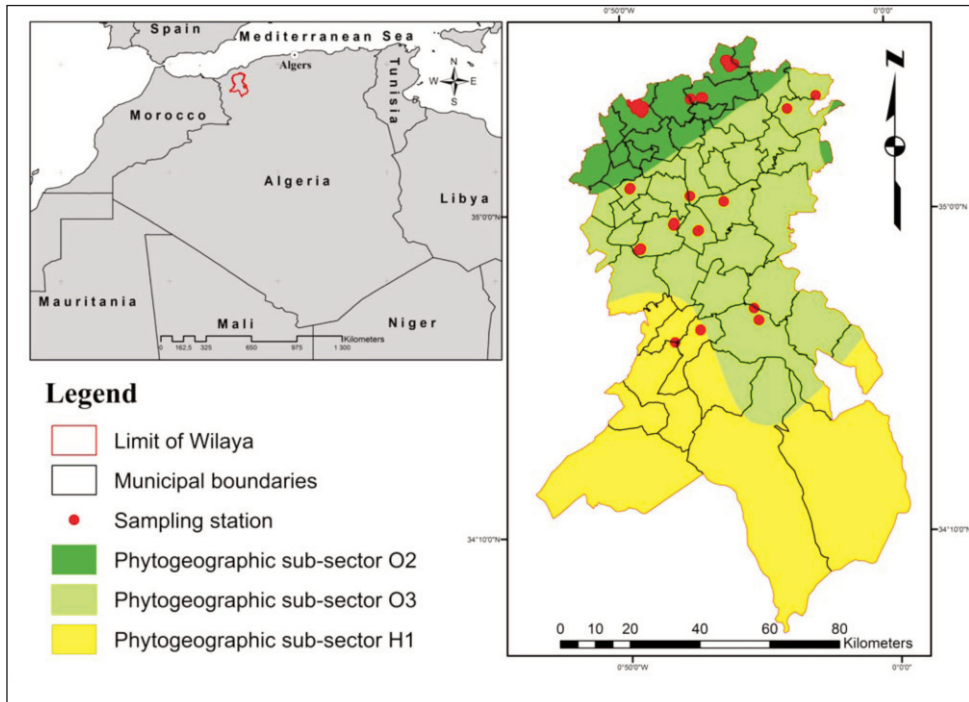


Fig. 1. Geographical location of the Sidi Bel Abbès region, the delimitation of the sub-sector of the study area and the orchids distributions stations in the Sidi Bel Abbès region.

spreading over an area of 1.386.16 km² (D.P.A.T. 2013). The plain areas cover a total area of approximately 3239.44 km², making up 35.40% of the province’s territory. They are represented by the Sidi Bel Abbès plain, covering around 2102.85 km² with altitudes ranging from 400 to 800 m, and by the high plains of Telagh, covering approximately 1136.59 km² with altitudes varying from 400 to 1000 m. From their sides, the steppe zones from the southern side of the province cover an area of 3660.82 km², which is 40% of the overall territory of the province. The altitude in these areas ranges from 1000 to 1400 m (D.P.A.T. 2013).

The climate of Sidi Bel Abbès is semi-humid, characterized by insufficient and poorly distributed interannual and seasonal precipitation, often resulting in water deficit. The precipitation average recorded for the entire region is 298.5 mm. The rainfall pattern shows annual and interannual irregularities, which can be explained by the climate’s current towards aridity. The average annual temperature at the Sidi Bel Abbès station is 16.7°C. The potential evapotranspiration is 825.5 mm, while the actual evapotranspiration is 288.64 mm (Bouasria & al. 2010).

The forested areas (forests, scrublands, and reforested areas) cover a surface of 161697 ha, corresponding to a woodland rate estimated at 17% of the province’s total area. This woodland rate is insufficient, with 105699 ha (about 65%) in the form of scrublands, prop-

er forests covering 49423 ha (about 31%), and a reforestation rate of approximately 4% with an area of 6575 hectares. In terms of their legal status, 93% of the 161.697 hectares of forest lands belong to state-owned forests (150289 ha), while 7 % are non-state-owned forest (Dahmani 2010). The forest is mainly located in the Dhaya monts that enclose 87% of the province's forested area. In terms of tree species, Aleppo pine formations are significantly dominant, lying over an area of 54123 ha; which corresponds to 97% of the forested land. The other species, with lesser importance, include Holm oak, Kermes oak, Juniper, Filaria and Lentisk.

Methodological approach

The search for orchid stations was carried out in a subjective way (Gounot 1969), using our prior knowledge of the field and sites likely to contain orchids. Field outings were conducted regularly during the spring season from 2015 to 2022, averaging two outings per week.

From phytogeographical perspective, Sidi Bel Abbès region belongs to the Mauritanian-Mediterranean domain in the Oranian sector, while the southern steppe part belongs to the Mauritanian-Steppe domain (H1). The Oranian sector was divided by Quézel and Santa (1962-1963) into three subsectors, and the study area only encompasses two sub-sectors of the Oranian coastal plains, O2 and O3 (Fig. 1).

The surveyed region for the orchid inventory mainly covers the northern part of Sidi Bel Abbès. It includes the municipalities: Ain Elberd, Ain Trid, Sidi Hamadouche Tessala, Lamtar, Sidi Ali Benyoub, Sfïsef, and Tanira. Some orchids have been found in the southern part in the area of Oued Taourira and Telagh (Fig. 1).

In total, 15 sites were visited: Ain Elberd, Sarno, Ain Trid, Mount of Tessala, Igthti, Ain Djohar, Ain Bent Soltane, Bouhriz, Tenira, Tanzara, Lamtar, Guetarnya, Taouzizine, Melkine and Dhaya.

The study period for orchids in the Sidi Bel Abbès region extended from February 2015 to May 2022. This does not exclude the possibility that other sites may host orchid species. Other stations were subject to repeated observations but without a positive presence result. Using GPS, the geographic coordinates, altitudes and field orientation were recorded for each survey, totaling 49 across 15 stations. At each station, a systematic inventory of orchid species was conducted, along with an estimation of the number of individuals for each species. To estimate the number of recorded species, an average abundance index was provided in the form of classes as follows: Class I= 1-5 individuals, Class II = 5-10 individuals, Class III = 10-50 individuals, Class IV = 51-100 Individuals and Class V > 100 individuals.

The species identification was carried out using various old and recent works, namely the flora of Maire (1960), Quézel & Santa (1962-1963) and the work of Dobignard & Chatelain in 2012.

Results and discussions

Twenty-five orchid taxa belonging to four different genera, primarily *Ophrys*, *Orchis*, *Anacamptis* and *Himantoglossum*, have been identified in the Sidi Bel Abbès region (Electronic Supplementary File 1 Table S1).

For the characterization of each species, distribution maps and ecological data are provided in figure 1 and in the ESF 1 table S2.

The various species of orchids recorded in the Sidi Bel Abbès region, along with their ecological characteristics, are presented as follows:

1. *Ophrys battandieri* E. G. Camus, P. Bergon & A. Camus

This species of orchid was only recorded in a single location in the northern part of the Sidi Bel Abbès region: Tessala. It was observed from the year 2019 to 2021. It grows in small, scattered populations of no more than 10 individuals in the maquis with *Calicotome intermedia* (L.) Lam., belonging to the subsector O2 (Fig. 1), at altitudes ranging from 421 to 5771 m. It has been reported as rare in the scrublands, pastures, and forests of the northern Algeria (Quézel & Santa 1962). Its flowering is observed from March to April (Fig. 2a).

2. *Ophrys lutea* Cav.

It is abundant in the stations located in the north and northeast of the Sidi Bel Abbès region: Tessala, Ain Elberd and Sarno. It has been observed from 2015 to 2022 and lying over the forested, pre-forested and open lands (scrublands, grasslands, etc.), belonging to the sub-sector O2 (Fig. 1). It is most often present in populations with more than 50 individuals at altitudes ranging from 414 to 1396 m. Its flowering is observed from March to April (Fig. 2b).

3. *Ophrys* × *gauthieri* Lièvre (*O. fusca* × *O. lutea*)

According to Maire (1959), Quézel & Santa (1962); this hybrid is known only in the Nador of Médéa, recently (in 2011), observed in the old cemetery of Djenane, Chemini municipality (Khellaf & al. 2021). For the first time in the western side of Algeria, there is a new distribution of this hybrid. This orchid, which appears to be rare, was observed in two locations in the north and northeast of the Sidi Bel Abbès region: Tessala and Sarno. It was investigated during two years of monitoring in 2021 and 2022, with four to five individuals per area, and it was noted that it is growing in open Pine forests and grasslands at altitudes ranging from 752 (Tessala) to 800 m (Sarno), belonging to the sub-sector O2 (Fig. 1). The flowering period of this orchid is reported from March to April (Fig. 2c).

4. *Ophrys marmorata* subsp. *marmorata* G. Foelsche & W. Foelsche

This orchid species (The marble *Ophrys*) has been observed exclusively within a single site located in the southwestern expanse of the Sidi Bel Abbès region: Ain Bent Soltane. The observations were conducted during the year 2019, and only two individuals were noted. These specimens were found flourishing within grassy habitats on cliff faces, situated at an altitude of 754 m, and are attributed to subsection O3 (Fig. 1). The period of floral display for this species spans from March to April (Fig. 2d). This particular species is known to occur in various regions of the central-east of Algeria (Rebbas & Véla 2013). As example, in Sétif region, *Ophrys marmorata* was observed at a single location (Madoui & al. 2017).

5. *Ophrys fusca* Link. subsp. *fusca*

Found within a singular site located in the northeastern expanse of the Sidi Bel Abbès region, namely Sarno; it was identified under observations throughout years 2021 and

2022. This manifestation is characterized by the presence of two individuals, noted within open habitats (grasslands, ermes, etc.) and occasionally within Aleppo pine woodlands. The ecological classification places it within subsection O2 (Fig. 1), at an altitude of 723 m. Its flowering period is observed spanning from March to April (Fig. 2e).

6. *Ophrys fusca* subsp. *maghrebiaca* Kreutz, Rebbas, Babali, Miara & Ait Hammou

This orchid is documented within the sites situated in the northeastern and southern parts of the Sidi Bel Abbès region: Tessala, Ain Elberd, Sorno, and Dhaya. The observations were conducted from 2019 to 2022, with a notable prevalence in forested, pre-forested, and Cliffside grassland areas, which fall under the subsections O2 and O3 (Fig. 1). The species is predominantly found in populations ranging from six to nine individuals at altitudes spanning from 552 to 1332 m. Its flowering period is noted from March to April (Fig. 2f). This orchid is considered as a new subspecies in Algeria, which was recently, discovered by Kreutz & al. (2013), and it is well documented in the region of Tlemcen (Babali & al. 2018b).

6.1. *Ophrys fusca* subsp. *maghrebiaca* form hypochromic

The hypochromic (pale-colored) form of *Ophrys fusca* has been observed, during years 2021 and 2022, exclusively within a unique location in the northeastern of Sidi Bel Abbès region: Sarno. This particular species is represented by two individuals within a sparse Aleppo pine forest, belonging to the subsection O2 (Fig. 1), situated at an elevation of 800 m. Hypochrome of *Ophrys fusca* subsp. *maghrebiaca* is considered as rare and it was observed for the first time in the station of Sarno. Its flowering period is noted from the March to April (Fig. 2g). It is noteworthy that this hypochrome is surrounded by the two orchid taxa: *Ophrys fusca* subsp. *fusca* and *Ophrys lutea* Cav. in the above-mentioned station.

7. *Ophrys funerea* Viv.

This species has only been observed in two distinct locations situated in the southwest and northeast of the Sidi Bel Abbès region: Ain Bent Soltane and Ain Elberd. It was observed during the years 2019 and 2020, with one individual per location. *Ophrys funerea* is growing in grasslands on cliffs at an altitude of 666 m (Ain Bent Soltane), belonging to sub-sector O3 (Fig. 1), and in a clear Aleppo Pine forest at an altitude of 639 m (Ain Elberd), belonging to sub-sector O2 (Fig. 1). Its flowering period is from March to April (Fig. 2h). However, *O. funerea* Viv. was rediscovered by Rebbas & Véla (2013), Hadji & Rebbas (2014), Kreutz & al. (2013, 2014), Rebbas & Bounar (2014), Bougaham & al. (2015), and Beghami & al. (2015).

8. *Ophrys forestieri* (Rchb. f.) Lojac. = *O. lupercalis* J. Devillers-Terschuren & P. Devillers

Ophrys forestieri is a fairly common taxon in Spain and southern France where it is the first Pseudophrys to flower in the season. This orchid species has been observed only in a single location situated in the southwest of the Sidi Bel Abbès region: Ain Bent Soltane. It was observed during the years 2020 and 2021, with only two individuals, growing in grasslands on cliffs at an altitude of 666 m, belonging to sub-sector O3 (Fig. 1). Its flowering period has been reported from March to April (Fig. 2i).

9. *Ophrys bombyliflora* Link.

This species has been observed exclusively in a single location in the northeast of the Sidi Bel Abbès region: Ain Elberd, during the years 2020, 2021, and 2022. Only six individuals were noted, growing in a sparse Aleppo Pine forest at an altitude of 656 m, belonging to sub-sector O2 (Fig. 1). Its flowering period has been reported from March to April (Fig. 3a).

10. *Ophrys speculum* Link. subsp. *speculum*

This species is widely distributed in stations located in the north and northwest of the Sidi Bel Abbès region: Tessala, Ain Elberd, Tanzara, and Lamtar, belonging to sub-sector O2, and Tenira, which belongs in their turns to sub-sector O3 (Fig. 1). It has been observed from 2015 to 2022 and is prevalent in forested, pre-forested, and open spaces (scrublands, grasslands, etc.). It is often found in populations comprising more than 25 individuals at altitudes ranging from 415 to 1330 m. Its flowering period has been noted from March to April (Fig. 3b).

11. *Ophrys scolopax* subsp. *apiformis* (Desf.) Maire & Weiller (= *O. picta* Link.)

This species has been observed in three stations located in the northwest and northeast of the Sidi Bel Abbès region: Ain Elberd, Sarno, and Lamtar, observed from 2019 to 2022, with five to six individuals per station, growing in clear Aleppo Pine forests at altitudes ranging from 655 (Ain Elberd) to 725 m (Sarno), and in an ancient cemetery at an altitude of 750 m (Lamtar), belonging to sub-sector O2 (Fig. 1). Its flowering period has been reported from March to May. According to Maire's classification (1959), three forms have been observed in the study area:

11.1. *Ophrys scolopax* subsp. *apiformis* var. *picta* f. *picta* Batt. (Fig. 3c)

Reported as common only nearby Algiers by Battandier (1886), it represents a new form for the Sidi Bel Abbès region.

11.2. *Ophrys scolopax* subsp. *apiformis* var. *honckensis* E. G. Camus. (Fig. 3d)

This taxon grows in open forests, shrublands, and pastures of plains and mountains, up to around 2000 m, in well-watered and semi-arid regions. This species represents a new addition to the flora of Algeria.

11.3. *Ophrys scolopax* subsp. *apiformis* var. *chlorosepala* Thell. (Fig. 3e)

Reported by Gauthier (Maire 1959) in the Msila forest, located in Oran and more recently it was observed in the Tlemcen region (Babali & al. 2018b), near our study area. However, this new variety has been observed in the Sidi Bel Abbès region.

12. *Ophrys tenthredinifera* Willd. subsp. *tenthredinifera*

This orchid is widely distributed in stations located in the north, northwest, northeast, and south of the present study area: Tessala, Ain Elberd, Sarno, Lamtar, Bouhriz, Melkine, Guettarnya, Ightti, observed from 2018 to 2022. It is very spread in forested, pre-forested, and maquis environments with rosemary and rockrose, grasslands, etc., belonging to sub-sectors O2 and O3 (Fig. 1). This species is often found in populations comprising five to seven individuals at altitudes ranging from 415 to 985 m. Its flowering period has been noted from March to April (Fig. 3f).

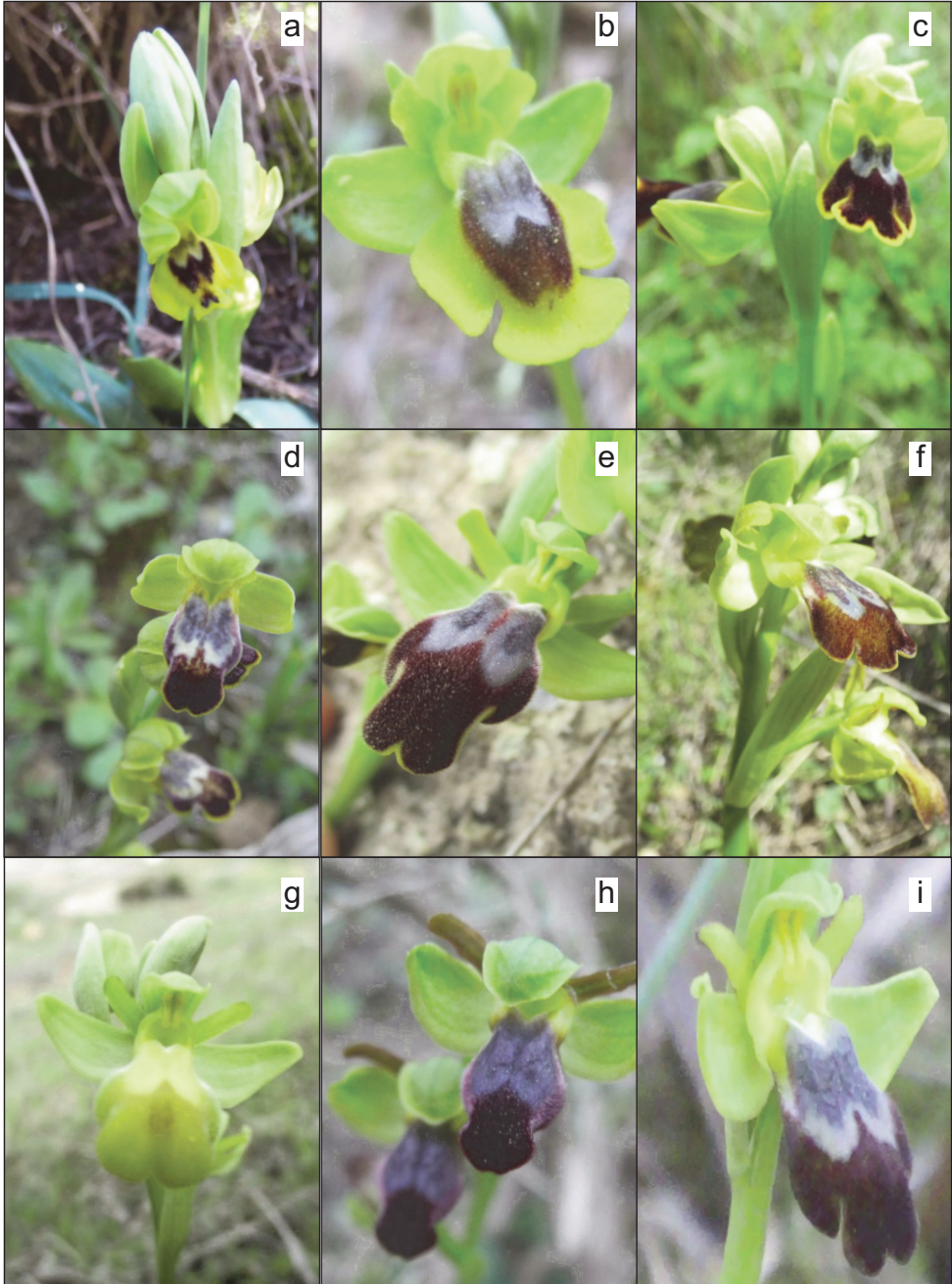


Fig. 2. a) *Ophrys battandieri* G. Camus.; b) *O. lutea* cav.; c) *O.* × *gauthieri* Lièvre; d) *O. marmorata* subsp. *marmorata* G. Foelsche & W. Foelsche; e) *O. fusca* Link subsp. *fusca*; f) *O. fusca* subsp. *maghrebiaca* Kreutz, Rebbas, Babali, Miara & Ait Hammou; g) Hypochrome d'*O. fusca* subsp. *maghrebiaca*; h) *O. funerea* Viv.; i) *O. forestieri* (Rchb. f.) Lojac.



Fig. 3. a) *Ophrys bombyliflora* Link.; b) *O. speculum* Link subsp. *speculum.*; c) *O. scolopax* subsp. *apiformis* var. *picta*; d) *O. scolopax* subsp. *apiformis* var. *honckensis*; e) *O. scolopax* subsp. *apiformis* var. *chlorosepala*; f) *O. tenthredinifera* Willd. subsp. *tenthredinifera*; g) *O. tenthredinifera* subsp. *ficvalhoana* (J.A. Guim.) M.R. Lowe & D. Tyteca; h) *O. tenthredinifera* var. *lutescens* Batt.

13. *Ophrys tenthredinifera* subsp. *ficvalhoana* (J.A. Guim.) M.R. Lowe & D. Tyteca

In the present study area, it appears that this orchid species is considered rare. Observed from 2019 to 2022, only one individual has been noted per station. Those stations are located in the northwest and south of the Sidi Bel Abbès region: Tessala, Sarno, Lamtar, and Taouzizine. This species was observed in specific locations, namely, a clear Aleppo Pine forest, an ancient cemetery, and degraded maquis, at altitudes ranging from 710 to 1000 m, belonging to sub-sector O2 (Sarno, Lamtar) and H1 (Taouzizine) (Fig. 1). Its flowering period has been noted from April to May (Fig. 3g).

14. *Ophrys tenthredinifera* var. *lutescens* Batt.

This orchid species has been observed only in a single station located in the south of the Sidi Bel Abbès region: Melkine. Those observations were conducted during the year 2022 with two (02) individuals, growing in a clear Aleppo Pine forest at an altitude of 740 m, belonging to sub-sector O2. It is considered rare and reported for the first time in the surveyed station of Melkine. Its flowering period has been noted from April to May (Fig. 3h). The var. *lutescens* was described by Battandier at Tlemcen in 1904.

15. *Himantoglossum hircinum* (L.) Spreng.

This species has been observed in a single locality situated in the northwest region of Sidi Bel Abbès: Lamtar. It has been observed from 2020 to 2022, with two individuals found in an ancient cemetery at an elevation of 825 m, belonging to the O2 sub-sector (Fig. 1). Its inflorescence is reported from April to May (Fig. 4a). In Algeria, Quézel & Santa (1962) described it as fairly rare in the regions of north Constantine, Algiers, Aurès and Oran.

16. *Himantoglossum robertianum* (Loisel.) P. Delforge.

This species has been observed in three locations in the northern and northeastern regions of Sidi Bel Abbès: Tessala, Ain elbard, and Sarno. It has been observed from 2020 to 2022, with more than 35 individuals per station. It grows in dense Maquis vegetation consisting of *Cytisus* and dwarf palm, as well as open Aleppo Pine forests and grasslands at altitudes ranging from 560 m (Tessala) to 1110 m (Ain Elbard), belonging to the O2 sub-sector (Fig. 1). Its flowering period is reported from March to April (Fig. 4b). It has been noted as common in shrublands and forests of the Tell region but rare in the high plateaus (Quézel & Santa 1962).

17. *Anacamptis collina* (Banks & Sol. ex Russell) R.M. Bateman, Pridgeon & Chase.

This species has been observed in two locations in the northwest and northeast regions of Sidi Bel Abbès: Lamtar and Sarno. It has been observed from 2020 to 2022, with five to six individuals per station. It grows in the grasslands of an ancient cemetery at an elevation of 1327 m (Lamtar) and in an open Aleppo Pine forest at an altitude of 1396 m (Sarno), both belonging to the O2 sub-sector (Fig. 1). Its flowering period is reported from March to April (Fig. 4c).

18. *Anacamptis papilionacea* subsp. *grandiflora* (Boiss.) Kreutz

This orchid found in two locations in the north and northeast regions of Sidi Bel Abbès, specifically Tessala and Ain Elberd, it has been observed from 2019 to 2022. It occupies

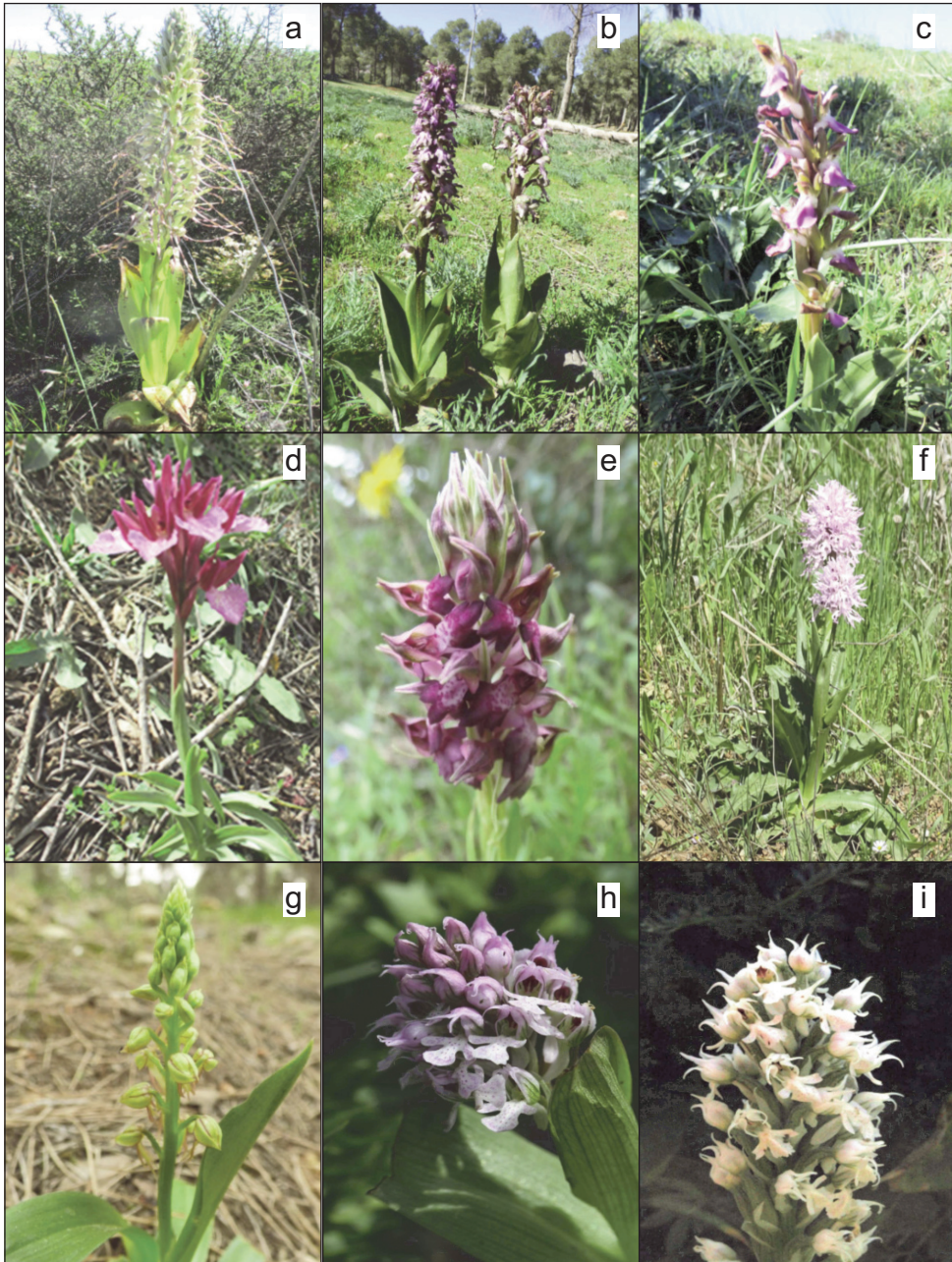


Fig. 4. a) *Himantoglossum hircinum* (L.) Spreng.; b) *H. robertianum* (Loisel.) P. Delforge.; c) *Anacamptis collina* (Banks & Sol. ex Russell) R.M. Bateman, Pridgeon & Chase; d) *A. papilionacea* subsp. *grandiflora* (Boiss.) Kreutz; e) *A. coriophora* (L.) R.M. Bateman, Pridgeon & M.W. Chase subsp. *fragens* (Poll.) G. Camus; f) *Orchis italica* Poir.; g) *O. anthropophora* (L.) All.; h-i) *Neotinea conica* (Willd.) R.M.Bateman.

various habitats, including forests, pre-forests, and open spaces such as scrublands and grasslands, all falling within the O2 sub-sector (Fig. 1). It is considered fairly rare (Quézel & Santa 1962; Babali & al. 2013). This species is present in the mentioned locations with five individuals in each of them, at altitudes ranging from 570 m (Tessala) to 462 m (Ain Elberd). Its flowering period is reported from March to April (Fig. 4d).

19. *Anacamptis coriophora* subsp. *fragens* (Poll.) G. Camus

This orchid has only been observed, during the years 2021 and 2022, in a single location in the north of the Sidi Bel Abbès region, specifically Tessala. It grows in small, scattered populations, with no more than four individuals, in Maquis vegetation dominated by *Cytisus intermedius* at an altitude of 1100 m. These observations fall within the O2 sub-sector (Fig. 1). It has been reported as common, typically found on soils with variable pH (ranging from acidic to basic), often associated with moisture and heavy soils (Babali & al. 2013). It flowers from May to June (Fig. 4e).

20. *Orchis italica* Poir.

This species has been observed, during the years 2020, 2021, and 2022, only in a single locality in the northeast region of Sidi Bel Abbès: Sarno; where, it is quite abundant, with 42 individuals. It grows in an open Aleppo Pine forest at an altitude of 755 m, within the O2 sub-sector (Fig. 1). It flowers from February to April (Fig. 4f).

21. *Orchis anthropophora* (L.) All.

This species has been observed in two localities in the north and northeast regions of Sidi Bel Abbès: Tessala and Ain Elbard. It has been observed from 2019 to 2021, with six to eight individuals per locality. It grows in dense Maquis vegetation consisting of *Cytisus intermedius* and dwarf palm, as well as in open Aleppo Pine forests, at altitudes ranging from 830 m (Tessala) to 650 m (Ain Elbard). These observations fall within the O2 sub-sector (Fig. 1). It flowers from March to April (Fig. 4g).

22. *Neotinea conica* (Willd.) R.M.Bateman

We observed this orchid in Tessala (sub-sector O2) (Fig. 1), in forested, pre-forested, and open spaces. Based on the herbarium specimen from the University of Sidi Bel Abbès, the presence of *Neotinea conica* was previously, reported in Tessala in 1987. This orchid is quite common in the Tell (Quézel & Santa 1962). However, we have documented a new variety for the Sidi Bel Abbès region: *O. lactea* var. *hanrici* (Hénon) Maire and Weiller, which is often characterized by a small tooth in the sinus. Its inflorescence is reported from March to April (Figs. 4h, 4i).

Literature reports

According to the bibliography and the work of Battandier and Trabut (1919), other orchids have been reported in the study area. We are specifically referring to three species formerly located in the Bousuit station, now referred to as Daya. These species are: *Orchis latifolia* (= *Dactylorhiza durandii* (Boiss. & Reut.) M. Lainz); *Epipactis*

latifolia (= *Epipactis tremolsii* Pau.); *Cephalanthera xiphophyllum* (= *Cephalanthera longifolia* (L.) Fritsch).

Currently, access to this area is practically impossible or restricted due to local security concerns. This situation poses one of the challenges of the scientific research and exploratory efforts aimed at inventorying and locating rare taxa in general, including these three orchids, and perhaps other orchid species.

Conclusion

This study enabled us to identify and geolocate 25 taxa across four genera in the studied region. *Ophrys* species are the most abundant in most of the sampled stations, totaling 17 species, including one hybrid: *Ophrys* × *gautieri*. This hybrid is considered rare and reported for the first time in the Sidi Bel Abbès region, as is the case with *Ophrys tenthredinifera* subsp. *spectabilis*. In the second position, we find the genus *Anacamptis* with three taxa: *Anacamptis collina*, *A. papilionacea* subsp. *grandiflora*, and *A. coriophora* subsp. *fragens*. The genus *Orchis* is represented by three species (*Orchis italica*, *O. anthropophora*, and *Neotinea conica*). *Himantoglossum* comprises only two species (*H. robertianum* and *H. hircinum*).

Some taxa show a wide distribution throughout the Sidi Bel Abbès region, with significant populations, while others are highly localized in specific biotopes. However, the inventory conducted cannot be considered exhaustive. Furthermore, explorations are planned to inventory more species, gain a better understanding of the frequency and status of different taxa in the region, especially considering that some habitats are being compromised due to prolonged periods of drought and increasing anthropogenic pressures (Cherifi & al. 2021).

The preliminary data obtained from this study open up a highly interesting research axis for this family of orchids, which is at risk of extinction due to the degrading factors affecting the territory of the Sidi Bel Abbès region. This situation calls for sustainable management and adequate protective measures to ensure the preservation of these beautiful flowers. However, sustainable management of this plant heritage necessitates tools for characterization, monitoring, and assessment of interactions with human activities.

Acknowledgments

The authors would like to thank the entire forest conservation team in the wilaya of Sidi Bel Abbès for their support during outings and field work, as well as the anonymous reviewers of this article for their relevant contribution.

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