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Valuation of the populations of *Otanthus maritimus* (L.) Hoffmanns. & Link (*Compositae*) in the Llobregat delta and review of the distribution of the species in Catalonia

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Summary

Otanthus maritimus it is a species in regression on the coasts of the Iberian Peninsula. In this article, two new localities for the species are provided in the Llobregat delta and its distribution in Catalonia is revised based on bibliographical and herbarium data. It is noted that it is a very rare plant in Catalonia and that its populations require monitoring and protection.

PARAULES CLAU: *Otanthus maritimus*, distribution, Llobregat delta, Catalonia.

Abstract

Evaluation of the populations of *Otanthus maritimus* (L.) Hoffmanns. & Link (*Compose site*) in the Llobregat Delta and revision of the distribution of this species in Catalonia

Otanthus maritimus is a species in decline along the coasts of the Iberian Peninsula. In this paper, two new localities for the species in the Llobregat delta are reported and the species distribution in Catalonia from bibliographical data and herbarium sheets is reviewed. *O. maritimus* is considered a very rare plant in Catalonia and its populations require monitoring and protection.

KEY WORDS: *Otanthus maritimus*, distribution, Llobregat Delta, Catalonia.

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Valuation of the populations of *Otanthus maritimus* (L.) Hoffmanns. & Link (*Compositae*) in the Llobregat delta and review of the distribution of the species in Catalonia

Otanthus maritimus It is a species in regression on the coasts of the Iberian Peninsula. In this article,

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provide two new localities for the species in the Llobregat delta and review its distribution in Catalonia based on bibliographic and herbarium data. It is confirmed that it is a very rare plant in Catalonia and that its populations require monitoring and protection.

PALABRAS CLAVE: *Otanthus maritimus*, distribution, Llobregat delta, Catalonia.

Introduction

The Catalan coast and, by extension, the entire Mediterranean coast have historically suffered from strong anthropogenic pressure that has irreversibly damaged the flora and fauna of many localities.

The case of the beaches of the Llobregat delta is no exception. The delta coast is suffering from an endless number of urban actions that have already caused the practical disappearance of one of its typical environments: the dune ecosystems. Only a few beaches are preserved in a more or less natural state at very specific points in the municipalities of El Prat de Llobregat and Viladecans, where you can still find remnants of dune environments with psammophilous communities.

But the undoubted natural importance of the maritime sands, recognized even at the European level (European Commission DG Environment, 2003), has sensitized those responsible for the deltaic municipalities and, a few years ago, different projects have been carried out study, regeneration and rehabilitation of dune ecosystems.

In 2004, during the development of one of these studies on Remolar beach, in the municipality of Viladecans, a small population of *Otanthus maritimus* (L.) Hoffmanns. & Link consisting of 10 copies (González *et al.*, 2005).

O. maritimus is in remarkable regression to the coasts of the Iberian Peninsula (Mayoral, 1999) and has already become extinct in the Basque Country and Cantàbria (Silván & Campos, 2002). The significant loss of Atlantic and Mediterranean populations of *O. maritimus* in the Spanish State it has caused the species to be included in different protection statuses in the Balearic Islands, Murcia, Asturias and the Valencian Community.

This article aims to characterize the populations of *O. maritimus* in the Llobregat delta, review the distribution of the species in Catalonia and raise the need to establish mechanisms for its preservation.

features of *O. maritimus*

O. maritimus belongs to the family *Compose site*. It is a rhizomatous camephyte, about 50 cm high, that develops a whole series of ascending stems that bear numerous sessile leaves, with lanceolate and fleshy limbs. The whole plant is covered with a very dense and whitish hair that gives it a very characteristic and unmistakable appearance. In fact, it receives the Catalan name of *white bead* and the Spanish of *cottony*, which suggest the general appearance of the plant. The capitula, only with tubular yellow flowers, are grouped in a corymb-shaped inflorescence. Flowering occurs during the summer, but can extend well into November (Figure 1).

O. maritimus has a low viability and capacity dispersal from seed, but, on the other hand, it is very easy to take root from fragments uprooted by storms when it finds suitable conditions of stability on the beaches (Mayoral & Gómez Serrano, 2004).

It is a typical plant of the sandy beaches and characteristic of the alliance *Ammophilion australis* (Bolòs, 2001). From an ecological point of view, *O. maritimus* it is considered a very narrow species and is located, mainly, in the areas most exposed to the wind and on the dune ridges (Laguna *et al.*, 1986).

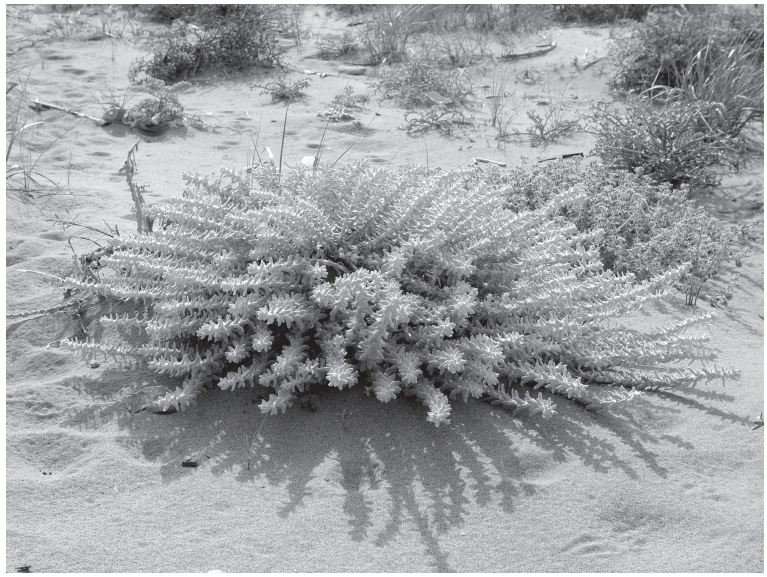

Figure 1. Copy of *Otanthus maritimus* at Remolar beach (Viladecans), 15/6/2004. Photography: Rafael del Hoyo.

Its distribution is pluriregional Holarctic. It extends all over the Mediterranean coast, from the Near East to North Africa and the Iberian Peninsula, and along the Atlantic coast, from North Africa to the south-east of Ireland (Bolòs & Vigo, 1995).

Font i Quer (1962) explains that the plant has been attributed a series of medicinal virtues that gave it a great reputation in Catalonia and Majorca, which is why it was much sought after by herbalists, to the point that its practical elimination of Catalan beaches. In this sense, within the envelope of a sample deposited at the Botanical Institute of Barcelona (BC 261386, sea sands of the bay of Alcúdia, 22-VI-1952, *law*. Palau Ferrer) there is a note that talks about the abundance of the species that existed on some of the beaches of the Balearic Islands, but that, due to its great reputation for curing certain diseases, it was collected by herbal until it is practically exhausted.

Material and methods

Following the finding of the population of *O. maritimus* on Remolar beach, and with the intention of locating and censusing other populations of the species, the entire coastline of the Llobregat delta was covered, from the Botigues de Sitges to the mouth of the river. This prospecting was done for 4 days, between the months of November and December 2004.

In the case of the specimens from El Remolar beach, measurements were taken of the dimensions (larger and smaller diameters), their distance from the sea and their topographical position. Also, the situation of the specimens was fixed with the help of a GPS and the accompanying species were noted in an approximate radius of 2 meters.

To find out the distribution of the species in Catalonia, the bibliographic references, the BDBC (Banc de Dades de la Biodiversitat de Catalunya) and the herbarium sheets were consulted

of the Botanical Institute of Barcelona and the CeDocBiV (Center for Plant Biodiversity Documentation of the University of Barcelona).

Finally, two herbalized samples were deposited in the herbaria of the Botanical Institute and the CeDocBiV, BC (s/n) and BCN 27114, respectively.

results

distribution of *Otanthus maritimus* in Catalonia

Colmeiro (1846) cites the species as *Diotis candidissima* Def. (*Athanasia Maritima* L.) in the sands of Masnou, Blanes and other unspecified places. It does not specify the origin of the citations.

Costa (1877) attributes the previous citations of Masnou and Blanes to Salvador and adds a new one to the rambla or stream of Argentona (Jover).

Cadevall (1919-1931) reiterates the citations of Salvador and Jover and adds four new ones: Sant Feliu de Guíxols, Blanes and Sant Pol (Bubani) and Salou (Llenas).

The repeated citations attributed to Salvador possibly have their origin in a single document existing at the Botanical Institute of Barcelona (BC-Salvador-2712) which has been examined with the collaboration of Dr. Neus Ibáñez. On the label, and probably written by Joan Salvador i Riera (1683-1725), the name appears *Gnaphalium maritimum*. another name, *Athanasia Maritima*, appears above the previous one, possibly added by the botanist P. Pourret (1754-1818), who reviewed the collection (Ibáñez, 2006). The written comment suggests that it must not have been a rare plant: "In maritimis de Blanes frequens et circa lo Masnou reperitur".

Montserrat (1962) cites the species as *Diotis maritima* (L.) Sm. and says that she has not been observed on the beaches of her study area di, despite the fact that several authors had repeatedly cited him.

Folch (1980) finds it at the mouth of the stream of Riudecanyes, UTM 31T CF34 (Cambrils, Baix Camp), where he considers it scarce, and at Penyals beach, UTM 31T CF24 (l'Hospitalet de l'Infant, Baix Camp), where he says that it is quite abundant. In general, the species is classified as not at all common on the beaches of the studied area.

Ballad (1993) quote *O. maritimus* al Trabucador, UTM 31T CF00 and CE09 (Ebro delta, Montsià), but as a product of a planting made in 1993 with specimens originating from Valencia.

Bolòs & Vigo (1996) consider this species to be very rare in the Catalan Countries as a whole and specify the citations of Catalonia in the counties of Tarragonès and Baix Camp.

Bolòs (1998), in addition to collecting the citations from Folch and Balada, provides two more localities in the Tarragonès region, in UTM 31T CF65 and CF44.

bowls *et al.* (2005) maintain the category of very rare (rrr) for the species and indicate a distribution in Catalonia within the central and southern Catalan territory.

In addition to the leaflet from the herbarium of the Salvador family mentioned above, other leaflets have been deposited in the herbariums of the Botanical Institute of Barcelona (BC) and CeDocBiV (BCN) *O. maritimus* collected in different parts of Catalonia: BC 75917 and BCN 11638, col. Plants of Spain by Sennen, 14-VII-1924, com *Diotis candidissima*, beach towards Vilafortuny, Salou, Tarragona, *law*. Bro. Gonzalo; BC 140425, col. Plants of Spain by Sennen, 14- VII-1924, com *Diotis candidissima*, dunes, Salou, Tarragona, *law*. Bro. Gonzalo; BCN 11643, 9-5-1976, Playa dels Penyals de l'Hospitalet de l'Infant, A. Farràs; BC 30136, Plants of Catalonia by Sennen, VII-1916, com *Diotis candidissima*, Cambrils beach, *law*. Bro. Gonzalo; BC 628205, 22-XI-1972,

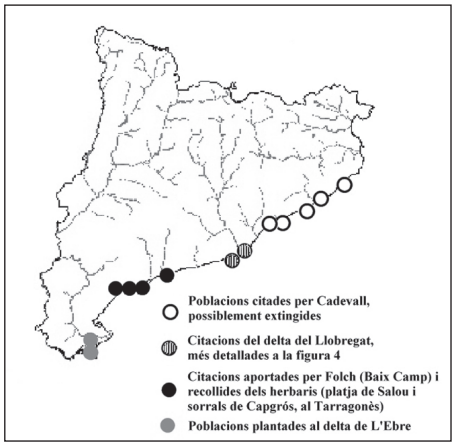

FIGURE 2. Current and historical locations of *Otanthus maritimus* in Catalonia, according to the UTM grid of 10 km on a side. (Topographic base: BDBC, December 2005)

how *Diotis maritima*, beach at the mouth of Riudecanyes, Cambrils, UTM CF34, Ramon Folch; BC 628204 and BC 628206, 12-IV-1972, as *Diotis maritima*, dunes of Penyals beach in L'Hospitalet de l'Infant, UTM CF24, Ramon Folch; BC 130091, 14-XI-1954, com *Diotis maritima*, sand dunes of Capgrós, Tarragona, A. de Bolòs.

the distribution of *O.maritime* in Catalonia is presented in figure 2.

Otanthus maritimus in the Llobregat delta

The first known reference to *O. maritimus* in the Llobregat delta is a sample herbized by JM Seguí on 14-VII-1994, in a place on the beach between the municipalities of Gavà and Castelldefels (UTM 31T DF1668).

In 2002, an important planting of the species was carried out in Castelldefels (UTM 31T DF1468, 1568 and 1668), an action that was part of a more general project carried out with the intention of recovering the pine forest and the dune system of the eastern end of the town's beach (Marian Sardà, pers. comm.). In December 2004, a total of 304 specimens were counted on Castelldefels beach.

In 2004, a population of 10 specimens was found on Remolar beach (Viladecans, UTM 31T DF2270).

The Remolar beach has a sandy substrate and is located between the mouths of the Sant Climent creek and the Remolar lake; it has a length close to 700 m and an average width of 130 m (Figure 3). During the last few years, a significant increase in the width of this beach has been observed, contrary to the beaches of the Prat de Llobregat municipality, located further north-east, which are suffering a strong regression.

Remolar Beach has traditionally been used for fun by occasional visitors.

FIGURE 3. General view of Remolar beach (Viladecans), 5/5/2005. Photography Francisco Valverde.

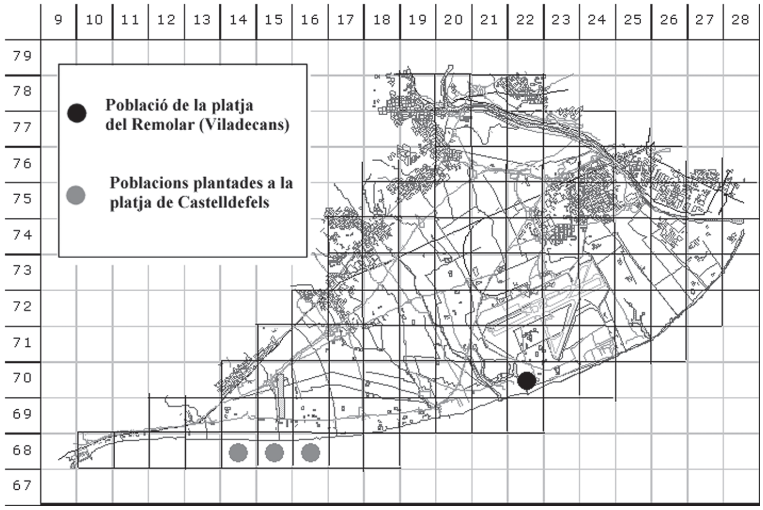

FIGURE 4. Distribution of *Otanthus maritimus* in the Llobregat delta, according to the UTM grid of 1 km side.

onal, but especially by the customers of the old Toro Bravo campsite, who have exerted strong pressure for more than three decades on the dune communities, which have reached a high level of degradation. Since March 2002 and by means of a fence, part of the beach has been protected, leaving free for the activities of bathers a strip without vegetation of about 30-40 m wide and adjacent to the sea. The closure of the campsite facilities, affected by the works on the third runway of Barcelona airport, effective since October 2002, has led to a decrease in human pressure and is facilitating regeneration of the dune profile and the psammophilous communities.

The 10 copies of *O. maritimus* that make up the population of the Remolar beach are located at the opposite end of the access area for bathers to the beach and, therefore, in an area that has supposedly received a smaller impact. Between the first specimen and the last there is a distance of 89 m. The first specimens are located 52 m from the sea, while the furthest specimen is 71 m. Plant vitality is considered good, with average dimensions of 83 × 63 cm (range: 265-25 × 175-3, n = 10). The most common accompanying plant species are *Echinophora spinosa* i *Elymus farctus*, both also characteristics of the *Ammophilion*. Three of the specimens of the Remolar are located on the dune crest and the predune; the rest are installed in the rear dune.

the distribution of *O. maritime* in the Llobregat delta is shown in figure 4 and the characteristics of the specimens from Remolar beach are summarized in table 1.

Discussion and conclusions

From the data obtained, it can be seen that *O. maritimus* it is one of the rarest and most threatened species in Catalonia.

It is likely that the presence of *O. maritimus* has been general along the sandy beaches of the Catalan coast and that, at present, only small test populations remain. Its exploitation as a medicinal plant and the degradation and loss of its natural habitats are the two main factors

TCLASSROOM1. Population control of *Otanthus maritimus* at Remolar beach (Viladecans-delta del Llobregat) carried out on 18/11/2004.

Specimen	*diameters big×small (cm)*	*Distance to sea (m)*	*Situation topographical*	*Accompanying plants*
1	65×60	71	reunion	*Echinophora spinosa*, *Elymus farctus*, *Cuscuta campestris*, *Silene niceensis*, *Maritime skin*, *Eryngium maritimum*, *Polygonum maritimum* i *Alyssum maritimum*.
2	52×45	63	reunion	*Echinophora spinosa*, *Elymus farctus*, *Cuscuta campestris*, *Silene niceensis*, *Eryngium martimum*, *Kali salt* i *Lagurus ovatus*.
3	60×60	63	reunion	*Echinophora spinosa*, *Elymus farctus*, *Cuscuta campestris*, *Silene niceensis*, *Eryngium maritimum*, *Polygonum maritimum*, *Medicago marine* i *Matthiola sinuata*.
4	25×3	63	reunion	*Echinophora spinosa*, *Elymus farctus*, *Cuscuta campestris*, *Silene niceensis* i *Eryngium maritimum*.
5	110×70	55	dune ridge	*Echinophora spinosa*, *Elymus farctus*, *Cuscuta campestris*, *Cutandia maritime*, *Kali salt*, *Medicago marine* i *Calystegia soldanella*.
6	100×100	58	reunion	*Echinophora spinosa*, *Elymus farctus*, *Maritime skin*, *Polygonum maritimum*, *Kali salt*, i *Medicago marine*.
7	65×45	63	reunion	*Echinophora spinosa*, *Elymus farctus*, *Cuscuta campestris*, *Silene niceensis*, *Maritime skin*, *Eryngium maritimum* i *Sporobolus pungens*.
8	50×40	58	reunion	*Echinophora spinosa*, *Elymus farctus*, *Silene niceensis*, *Maritime skin*, *Alyssum maritimum* i *Crucianella maritime*.
9	265×175	52	preduna	*Echinophora spinosa*, *Elymus farctus*, *Polygonum maritimum* i *Kali salt*.
10	35×35	52	preduna	*Echinophora spinosa*, *Elymus farctus* i *Polygonum maritimum*.

which are aimed at explaining the decline of the species in Catalonia.

In the Llobregat delta there are two populations, one in Castelldefels, with 304 specimens and the product of a plantation, and another in Viladecans, with 10 specimens. The sample herborized by Seguí in 1994 may correspond to a population that disappeared or was absorbed by the plantation made in Castelldefels 8 years later.

Considering that the populations mentioned north of the Llobregat river have probably disappeared, it can be said that the Llobregat delta is currently the northern limit of the distribution of the species in Catalonia.

The geographical location of the Remolar beach, further north-east with respect to the Castelldefels beach, makes it unlikely that fragments torn by a storm arrived from the introduced population, because in the Llobregat delta the dominant marine current is directed towards the southwest There isn't either no reference to a possible planting of the species on Remolar beach (Joan Ramon Lucena, pers. comm.). Therefore, it is likely that the population found on this beach has settled in a natural way. The same can be argued for the herbalized sample in 1994, collected 8 years before the aforementioned plantings made in Castelldefels.

For a few years now, Remolar beach has been growing in width; this fact has caused the population of *O. maritimus* increasingly distanced from the berm and, therefore, less exposed to storms.

Of the ten feet that make up the Remolar beach population, three are located on the dune crest and the predune, while the rest are on the back dune. This is an important difference compared to the results obtained by Mayoral (1999) and Mayoral & Gómez Serrano (2002) in the Valencian Community, where it has always been located *O. maritimus* in the exposed area of the mobile dunes and never downwind.

O. maritimus it is a plant with requirements very specific ecological ones and with little capacity for natural regeneration from seed. This makes it a very sensitive species to disturbances of anthropogenic origin. The almost exclusive destination of beaches for recreational use, together with the mechanical cleaning that entails, negatively affects any psammophilous plant, but much more so a species like this, which spreads mainly through fragmentation and in the areas closest to the sea Therefore, anthropogenic disturbances affecting dune ecosystems, coastal regression and competition with exotic species are the main factors to consider when considering the survival of the species in its natural environment.

the presence of *O. maritimus* on Remolar beach is a relevant fact considering the decline of the species in Catalonia, and it is even more so because, most likely, it is a naturally settled population. These events should involve the monitoring and immediate protection of the population.

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