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Hordeum geniculatum (Poaceae) in the NE Iberian Peninsula

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Abstract
Hordeum geniculatum (poaceae) in the ne iberian peninsula.— *Hordeum geniculatum*, native to the Iberian Peninsula, is recorded from the lower reaches of the river Ebro. This population constitutes a significant new record for Catalonia, although its presence over seventy years ago in the Maresme is testified by two herbarium sheets from Malgrat de Mar, where it is now probably extinct.

Key words: Catalonia; Ebro basin; ecology; *Hordeum*; Mediterranean; native species; taxonomy.

Resumen
Hordeum geniculatum (poaceae) en el ne de la península ibérica.— *Hordeum geniculatum*, gramínea autóctona en la Península Ibérica, se cita en el tramo bajo del río Ebro. Esta población constituye una nueva cita de importancia para Cataluña, aunque se han detectado evidencias de su antigua presencia en el Maresme en dos pliegos de herbario recolectados en Malgrat de Mar, donde hoy día es probable que se haya extinguido.

Palabras clave: Cataluña; cuenca del Ebro; ecología; especies nativas; *Hordeum*; Mediterráneo; taxonomía.

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INTRODUCTION

Hordeum geniculatum All. is an annual barley found in continental areas of the Mediterranean Region and West Asia, where it is native, and now naturalised beyond its native area in places such as California, the Southern Cone and Australia. The exact native range in the Mediterranean Basin and surrounding lands is difficult to establish, but it appears to be in expansion in some areas, particularly in Africa, and is known to be in regression in others, at the limit of its range; for example, in Slovakia (Dítě *et al*., 2012). Melderis (1985) considers this taxon to be a Euro-Siberian element, and gives its eastern limits as Central Asia, thus taking it out of the limits of what is considered the Mediterranean Region. Bor (1968), who offers a good illustration of the plant, gives an extensive list of countries and regions in his distribution notes, and considers it to be "occasional" in Iraq and "*late dispersum*" across the wider

Iranian region object of his more extensive work on the grass family.

In the Iberian Peninsula this grass is local but widespread in the interior, in particular Castilla, Aragón and Navarra, but also in Portugal and Andalusia, principally where the climate is continental, with strong temperature fluctuations and irregular rainfall mainly in the spring and autumn. The distribution can be considered sub-mediterranean, and the species is found growing both in lowlands and also at higher elevations, often near watercourses or ponds and lakes and in shallow, occasionally inundated depressions. It forms dense, often quite extensive populations, which are best observed during May and early June, flowering occurring from late April onwards in the areas closer to the Mediterranean Sea. It has also been found in the Balearic island of Mallorca (sheet BC 626199).

Taxonomic history, discrimination and ecology

The correct name at specific level has been the subject of debate. Willkomm (1893), in his *Prodromi Florae Hispanicae*, used Parlatore's name: *H. gussoneanum* Parl. (Parlatore, 1845) which was published in *Flora Palermitana*. The earlier *H. hystrix* Roth was published in *Catalecta Botanica* (Roth, 1797), and this has been the preferred binomen in the various catalogues and other publications extant in the Iberian Peninsula until fairly recently. *Flora Europaea* (Humphries, 1980) also adopted this name. The binomen *Hordeum geniculatum* All. by Allioni (1785) in *Flora Pedemontana* is anterior to this, but considered ambiguous by some; as for example, Pujadas & Hernández (1986) or Feinbrun-Dothan (1986). This ambiguity seems to have been resolved recently, and both Euro+Med (http://www.emplantbase.org/home.html) and Tropicos (https://www.tropicos.org) now consider Allioni's name to be valid.

Much confusion is evident, too, when this grass is treated at the level of subspecies. In Aragon, in the online flora (Pyke, 2005), this grass figures under the combination *H. marinum* Huds. subsp. *gussoneanum*, but citing Ascherson & Graebner as the combiners, following Bolòs & Vigo (2001), who mention the plant (which they state not to have seen) in reference to the Balearic Islands. The author citation appears to have been a slip, having been confused, I suspect, with the combination *H. maritimum* With. subsp. *gussoneanum* (Parl.) Asch. & Graebn., published in *Synopsis der mitteleuropäischen Flora* (Ascherson & Graebner, 1902), referring to this same grass. This combination based on Withering's 1776 publication (Withering, 1848) was also made by Arcangeli, in his second edition of *Flora Italiana* (Arcangeli, 1894), which predates that of Ascherson & Graebner, and should, in my mind, have priority. In California, the preferred name is the combination *H. marinum* subsp. *gussoneanum*. James Smith, in the Jepson e-flora of the Jepson Herbarium (Smith, 2012), cites the authors of the subspecies as (Parl.) Thell., and this is the case also of various references of this grass from countries in and around its native area (Sahebi *et al*., 2004; Amer *et al*., 2013), whereas Euro+Med (Valdés & Scholz, 2011) refer to this combination with the authors (Parl.) Arcang., for reasons I have not been able to clarify, but are presumably due to Thellung's (1908) publication being posterior to that supposedly published by Arcangeli (1882). Nonetheless, Arcangeli's (1882) *Flora Italiana* did not even mention subsp. *gussoneanum*, which made its appearance in the second edition of this flora (Arcangeli, 1894). Here, however, the combination is based on Withering's *Hordeum maritimum* (*q.v.*). It seems, therefore, that Thellung's combination is the most adequate, which is the preferred author in the *World Dictionary of Grasses* (Quattrocchi, 2006).

Hordeum geniculatum differs from the *H. murinum* L. complex in the non-ciliate glumes of its central spikelet. They are, at most, scabrid. The plant itself is slender, more so than *H. murinum* subsp. *leporinum* (Link) Arcang., a common, more ruderal species which can often be found in the vicinity. Its closest relative, *H. marinum*, is a very similar-looking plant, but is distinguished by the inflated or winged inner glumes of the lateral spikelets. Detail (B) in Figure 1. shows the thin glumes typical of the lateral spikelets of *H. geniculatum*. Another distinguishing feature is the longer (0.4)0.6–1(1.2) mm hairs on the lower leaf-sheaths in the case of *H. geniculatum*, which is generally a more slender and erect plant. Finally, the ecology of these two plants is slightly different, with *H. geniculatum* preferring the less saline soils of the floodplains and *H. marinum* occupying more saline habitats, and occurring not only inland but also by the sea.

H. secalinum Schreb. is a perennial grass of wet, normally non-saline meadows. There are reliable records of this grass from the Ampurdan (Empordà) in NE Catalonia, where it tolerates the somewhat saline conditions of the lower river Muga meadows, and can be found together with *Alopecurus bulbosus* Gouan, another rare grass in the Iberian Peninsula. In dry years this barley exhibits poor growth and could be mistaken for an annual species. It differs in its taller size, normally perennial behaviour, and in the narrower spike, held at some distance from the uppermost culm leaf, along with the fact that the awn of the lemma on the fertile spikelet is only about as long as the lemma itself (in *H. geniculatum* the awn is approximately twice the length of the lemma).

Opinion is divided as regards the ecology of *H. geniculatum*. Dítě *et al*. (2012) explain it in terms of halophytic-ruderal plant communities, and state that in Central Europe it prefers the solonetz soils usually associated with a low or moderate salt content, although it can be found in highly salinized soils, such as solonchaks, and thus appears in different halophytic and sub-halophytic plant communities. The grass is referred to as an obligate halophyte in Dítětová *et al*. (2016), but in various Iberian localities it is found growing in non-saline conditions and with companion species that are not halophytes, or are, at most, facultative halophytes, such as *Trifolium fragiferum* L. (*s. l.*). In the Iberian Peninsula *H. geniculatum* generally prefers the less saline soils of the riverine floodplains or wet hollows and depressions, whereas *H. marinum* occupies the more saline habitats of salt marshes and their surroundings. The latter plant is found equally in coastal and inland sites, but *H. geniculatum* appears to be rare along the coast and has a marked interior distribution. In the case of Allioni's taxon, it seems that fresh water is necessary for a part of its life-cycle, although the normally alluvial soils where it grows can dry out and become mildly saline. Talavera (1987) refers to humid meadows ("pastizales húmedos") as its habitat in Andalusia, where it grows very locally, and my own observations bear this out, despite the comment in *Flora Europaea* (Humphries, 1980) stating 'dry grassy places and disturbed ground', which hardly reflects the reality of Peninsula populations.

***Hordeum geniculatum* in Catalonia**

Hordeum geniculatum All. [*H. hystrix* Roth; *H. marinum* Huds. subsp. *gussoneanum* (Parl.) Thell.]

Spain (Tarragona), Ribera d'Ebre: Mora d'Ebre, ribera vers Sovarrec, 31T CF0152, 25 m, 15.V.2016, *S. Pyke* (BC 958302).

Although not a new record for the north-east Iberian Peninsula, this large colony of *Hordeum geniculatum* on the banks of the river Ebro above Mora d'Ebre would appear to constitute the only present-day record for Catalonia. Its presence in this locality comes as no surprise, since it occurs in large numbers further up this important waterway. In Aragonese territory it is locally very abundant along the fluvial terraces near Zaragoza, and is recorded as *H. hystrix* in the catalogue (Pyke, 2003) which covers the city and surrounding area. It also occurs further north in the lowlands of the upper Ebro Valley within Navarra and La Rioja. What is surprising is the lack of records up to now from the lower reaches of the Ebro within Catalonia. The grass was found growing on the rich alluvial soil of a flood-meadow (a level terrain subject to seasonal flooding). In some places it was so abundant that other annual species were unable to compete. *Cerastium glomeratum* Thuill., *Geranium dissectum* L., *Veronica polita* Fries, *Bromus madritensis* L., *B. diandrus* Roth and *Vulpia myuros* (L.) C. C. Gmel. were among the few other species seen among or around the population. These are ruderal species, and in this locality obvious halophytes were lacking. Closer to the town, the species was replaced by the more ruderal *H. murinum* subsp. *leporinum*, which has larger spikes and prefers drier soil conditions.

On revising the considerable volume of herbarium material in BC and BCN, two sheets (BC 634091 and BCN 79581) came to light, both from Malgrat de Mar (Barcelona); one collected by P. Montserrat on 27 June 1946 and the other, which he collected with T. Losa, from the mouth of the river Tordera on 22 May 1949. Both were determined as *H. maritimum* With. This synonym of *H. marinum* may have been used *sensu lato* by some authors (although Withering's original description clearly refers to the plant with winged glumes), but no infraspecific indication is given on these sheet labels. The plants preserved on these sheets are, in fact, *H. geniculatum*, but it is extremely unlikely

Figure 1. *Hordeum geniculatum*: aspect of culms in May, showing detail of (A) compound spikelet (triplet) and (B) one sterile lateral spikelet.

that the plant still exists in this locality today, due to the destruction of the river Tordera estuary and the almost total transformation of this coastal resort area along with its beaches in the last seventy years. The botanist Pere Montserrat (Montserrat, 1989) collected the first sample from the edges of a pool by the beach (annotated in catalan: "platja, vores d'un toll") during his valuable study of the vegetation of the Maresme area. The other one was found growing in the Tordera delta. The remaining material (of the *marinum* complex) from Catalonia all corresponded to *H. marinum*, or a couple of other taxa.

CONCLUSION

This annual barley should be searched for in similar habitats, usually close to permanent water supplies, where fresh water levels fluctuate, inundating the terrain once or twice a year. It also occurs in depressions and hollows subject to seasonal flooding. Combined with a moderate to high evapo-transpiration factor, the ground in these places suffers an increase in mineral salts during the dry season. The species may have been overlooked on occasions due to its similarity to other species, especially to *H. marinum*, and is likely to occur in other localities on river terraces of the river Ebro and its tributaries. The main danger facing its conservation would be that of river defence construction, whose consequences are not always predictable, but generally involve the disappearance of species accustomed to periodic flooding.

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