



Typification of two names in the genus *Hordeum* (Poaceae, Triticeae)

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Abstract

The typification of the name *Hordeum marinum* Hudson (Poaceae) is discussed. The name is lectotypified using an original illustration from Morison's *Plantarum historiae universalis Oxoniensis*, and an epitype is also selected. The type of the name *H. gussoneanum* is also discussed, and a specimen preserved at FI is designated as second step lectotype.

Keywords: Epitype, Gramineae, lectotype, nomenclature, William Hudson

Introduction

The genus *Hordeum* Linnaeus (1753: 84) (Poaceae Barnhart, trib. Triticeae Dumortier) consists of between 30–40 grass species distributed in temperate and arid regions of the world (Brassac & Blattner 2015, Soreng *et al.* 2017, Blattner 2018). The genus includes diploid ($2n = 2x = 14$), tetraploid ($2n = 4x = 28$), and hexaploid ($2n = 6x = 42$) taxa, including cultivated barley *Hordeum vulgare* Linnaeus (1753: 84) one of the most important crop at the world, and an important crop model for a wide range of studies on genetics, biochemistry and developmental biology (Langridge 2018). According to molecular phylogenies, *Hordeum* species are cluster into four groups (Blattner 2009). One of these groups, the members of which carry the Xa genome (Wang *et al.* 1994), includes the sea barleys (Svitashev *et al.* 1994, Marillia & Scoles 1996, De Bustos & Loarce 2002, Petersen & Seberg 2003).

Sea Barley *Hordeum marinum* Hudson (1778: 57) is an annual grass widespread distributed in Europe, West and Center of Asia and Macaronesia, and nowadays is naturalized in almost all the world (Humphries 1980, Bothmer *et al.* 1989, Pujadas 2021). This taxon is tolerant of salinity and resistant to waterlogging (Mano & Takeda 1998, Garthwaite *et al.* 2005, Alamri *et al.* 2013, Broughton *et al.* 2015, Maršálová *et al.* 2016) and for this, sea barley is a potentially elite germplasm for improving the salt tolerance of cereal crops, particularly wheat (*Triticum* Linnaeus (1753: 85) species) and barley. Therefore, it is quite interesting to reveal the mechanisms behind this ecological behavior (Seckin *et al.* 2010, Huang *et al.* 2018, Huang *et al.* 2019, Medini *et al.* 2019) or obtaining viable crosses with these important crops (Colmer *et al.* 2006, Pershina *et al.* 2006, Islam *et al.* 2007, Islam & Colmer 2008, Munns *et al.* 2011).

Hordeum marinum has been generally recognized as an accepted species with two subspecies: subsp. *marinum* ($2n = 2x = 14$; see Covas 1949, Löve & Löve 1961) and subsp. *gussoneanum* (Parl.) Thellung (1907: 441) [\equiv *H. gussoneanum* Parlatores (1845: 246)] ($2n = 2x = 14$ and $2n = 4x = 28$; see Chin 1941, Löve & Löve 1961). According to Jaaska (1994), the two cytotypes of *H. gussoneanum* can be distinguish only by cross section and seed weight, but they have largely overlapping spike lengths. The diploid forms of these two subspecies (subsp. *marinum* and subsp. *gussoneanum*) coexist throughout the Mediterranean region and can be clearly distinguished by their morphology (Humphries 1980, Bothmer *et al.* 1989, Jakob *et al.* 2007, Tison *et al.* 2014, Pignatti 2018).

On the other hand, the clear morphological differences and the absence of gene flow between both diploid forms of these taxa have led several authors to regard them as separate species, i.e. *H. marinum* and *H. geniculatum* Allioni (1785: 259) (Bowden 1962, Bothmer *et al.* 1995, Jorgensen 1986, Guadagnuolo *et al.* 2001, Jakob *et al.* 2007, Blattner 2009, Carmonmedinia *et al.* 2013, Tison & Foucault 2014, Romero Zarco 2015), or even adding a third species, with *H. caudatum* Jaaska (1994: 222), for tetraploid plants (Jaaska 1994).

The purpose of this paper is to contribute to nomenclatural stability by lectotypifying two names: *Hordeum marinum* and *H. gussoneanum*. This nomenclatural act is highly recommended because this name includes many accepted synonyms and intraspecific taxa (Bothmer *et al.* 1989, IPNI 2021, WFO 2021).

Material and methods

This work is based on the examination of relevant literature and on the study of the specimens conserved at FI and K herbaria (acronyms of the herbaria consulted according to Thiers 2021). The currently accepted names in common use are set in bold italics typeface, the homotypic synonyms are indicated with the symbol ≡.

Typification of the name *Hordeum marinum*

The name *Hordeum marinum* was “neotypified” based on a specimen housed in the K herbarium at Kew Gardens, as follows: “*H. marinum* Huds. ssp. *marinum* Hudson, Fl. Angl. ed. 2: 57 (1778) [...] Neotype (selected here): Kennedy & Pyne, No. 165, Essex, in K. Note: It was not possible to locate any material at BM which could have been seen by Hudson, and it has probably been destroyed” (Bothmer *et al.* 1989: 8).

Unfortunately, the “neotypification” of *Hordeum marinum* published by Bothmer *et al.* (1989) is ineffective according to Art. 9.8 of the ICN (Turland *et al.* 2018) because there is at least one element that is part of the original material (see below). The lectotype must be selected from elements of the original material available to Hudson before *Flora Anglica* was published in 1778.

Hudson’s protologue (1778: 57) for *Hordeum marinum* consists of the *nomen specificum legitimum*. “HORDEMUM flosculis lateralibus masculis aristatis, involucrio interno florum lateralium semiovato” followed by two synonyms: 1) “Gramen secalinum palustre et maritimum” of Ray (1724: 392), and 2) “Gramen secalinum maritimum minus” of Morison (1699: 179, sect. 8, t. 6. f. 5). The common name and the ecology of this plant were cited as: “*Anglis*, sea Barley-grass” and “Habitat in pratis et pascuis”. The reference to Morison (1699: 179) provided an illustration that is original material used by Hudson to describe *H. marinum*.

There is little information about the collectors quoted by Hudson and the materials he consulted (see Fabado & Ferrer-Gallego 2021). Hudson’s original herbarium was totally destroyed by fire at his house in Panton Street (London) in 1783, caused “by the villainy of a confidential servant” (Dixon 1959). Hudson retired to Jermyn Street (London), actually near Panton Street. Consequently, there are only scattered specimens in existence, mainly those he had given away to other botanists. The LINN herbarium has the relevant collection because Hudson sometimes gave specimens of his new species to Linnaeus. Also the BM herbarium contains relevant material because the Sloane herbarium was consulted by Hudson in preparing his *Flora Anglica*, at least while he was assistant librarian at the British Museum (Anonymous 1805), as Hudson himself indicated in the introduction of his work, mentioning the herbarium of Buddle, Petiver and Plukenet, which are parts of the Sloane Herbarium (Dandy 1958).

Unfortunately, we have been unable to locate any original specimens in any herbaria that contain Hudson’s material (e.g., BM, CGE, K, OXF, UPS [Thunberg herbarium]) (see Stafleu & Cowan 1979, Bothmer *et al.* 1989, Jarvis 2007). On the other hand, there is a letter sent by William Hudson to Carl Linnaeus (Hudson 1760), which lists a total of 76 herbarium sheets, with the names of the plants and a bibliographical reference to Ray (1724). Through this information, we have been able to correlate several herbarium sheets with the names that Hudson published in his *Flora Anglica*. However, in Hudson’s letter we have not found nothing about *Hordeum marinum*.

In conclusion, the illustration published by Morison (1699: 179, sect. 8, t. 6. f. 5), is the (obligate) lectotype of *Hordeum marinum* (Fig. 1), and therefore we designate it as such. However, unfortunately the lectotype does not show the most relevant diagnostic characters (e.g., glumes of the lateral flowers heteromorphous, the upper one with a distinctly flat and widened wing) to distinguish *H. marinum* from other related species, e.g., *H. marinum* subsp. *gussoneanum* (with glumes of lateral flowers isomorphous, setaceous, the upper one sometimes flattened, but never with a conspicuously widened wing).

Consequently, for a precise identification of the name *Hordeum marinum*, an epitype has been selected according to Art. 9.9 of the ICN (Turland *et al.* 2018). The epitype selected is a complete and well-preserved specimen, it was collected in Essex (England), and is preserved at K (with barcode K000790031; see Fig. 2). This specimen shows relevant diagnostic features, and it clearly represents the traditional concept of this name (Hudson 1778) and reflects current application of *Hordeum marinum* subsp. *marinum* (see e.g., Humphries 1980, Bothmer *et al.* 1989, Tison *et al.* 2014, Pignatti 2018, Pujadas 2021).

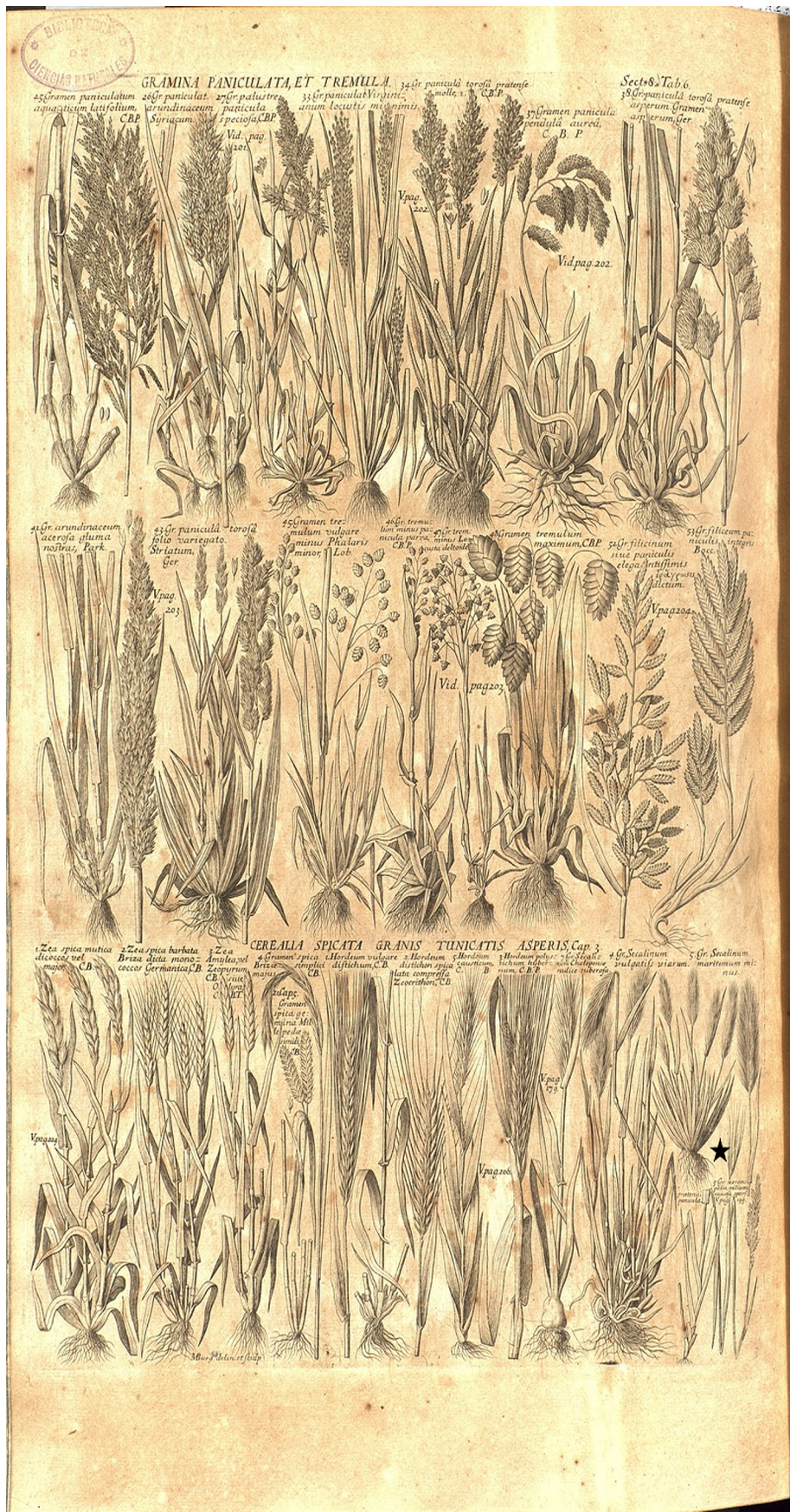


FIGURE 1. Lectotype of *Hordeum marinum* Huds., illustration of Morison (1699: sect. 8, t. 6. f. 5) “*Gramen secalinum maritimum minus*” (indicated on the plate with a star).



FIGURE 2. Epitype of *Hordeum marinum* Huds., K (barcode K000790031). Image courtesy of the herbarium K, reproduced with permission.

Hordeum marinum Hudson (1778: 57)

Lectotype (designated here):—[illustration] “Gramen secalinum maritimum minus” in Morison (1699: sect. 8, t. 6. f. 5), see Fig. 1.

Epitype (designated here):—[ENGLAND], Essex, Estuary of River Crouch, between Althorne and Burnham, sea wall, 26 June 1952, *J. Kennedy & R. Payne 165* (K, barcode K000790031), see Fig. 2.

Typification of the name *Hordeum gussoneanum*

The lectotype of the name *Hordeum gussoneanum* was designated by Bothmer *et al.* (1989: 8) from a specimen collected in Sicily, as: “Lectotype (selected here): Gussone, Sicily, in FI (holo)”.

In the FI herbarium of the Museo di Storia Naturale of the Università degli Studi di Firenze (Italy), there is housed one herbarium sheet bearing two barcodes (FI065550 and FI065551, see Fig. 3).. The specimen with barcode FI065550 is a complete and well-preserved plant, it is accompanied by a handwritten label . On the other hand, the

specimen with barcode FI065551 comprises two complete plants, both with leaves and inflorescences; this material is accompanied by a handwritten label. Additionally, the herbarium sheet bears a printed determination label: “*Hordeum marinum* Huds. ssp. *marinum* / Det. N. Jacobsen 86” (Fig. 3).

Both specimens, FI065550 and FI065551, can be identified as belonging to *H. marinum* subsp. *gussoneanum*, and could be considered as belonging to a single gathering. Therefore, the type designation of Bothmer *et al.* (1989) constitutes an effective lectotype designation, because they clearly indicate the “type element” mentioned in the Art. 7.11 (“... if the type element is clearly indicated...”) since an element can be considered as “...a single specimen or gathering...or illustration...” as indicated in the Art. 40.3 of the ICN. In this sense, it appears that the lectotype designation published by Bothmer *et al.* (1989: 8) could refer to specimen FI065550, since the locality “Sicilia” that appears annotated on the label and the “Sicily” indicated by these authors coincide. On the other hand, Bothmer *et al.* (1989: 8) mentioned “Gussone” as the author of the sheet, but the labels included in the sheet were handwritten by Parlatore. Furthermore, there is no link that can prove that these two specimens were collected by Gussone. Finally, although certainly the locality “Panormi a Mondello” indicated in the label of the specimen FI065551 belongs to Sicily, we consider that the lectotype designation of Bothmer *et al.* (1989: 8) is demonstrably ambiguous and cannot be critically identified with a particular specimen.

According to Art. 9.17 of the ICN, we select as the type of the name *Hordeum gussoneanum* only a material of these two specimens by a second-step lectotypification. For purposes of a precise selection of the lectotype, all aspects of the protologue should be considered as a basic guide (see ICN Rec. 9A.2). The Parlatore’s protologue of *Hordeum gussoneanum* (1845: 246) includes a brief diagnosis “*B. valva corollina inferior pubescente*” followed by the name “*H. [Hordeum] pubescens* Guss. fl. sic. prodr. I. p. 144”, the procedence “*La varietà b trovata presso Palermo a Mondello*” [the variety b is found near Palermo in Mondello]. This name *Hordeum gussoneanum* was mentioned in the section “*Osservazioni*” of the species “146. *Hordeum maritimum* With.” included in Parlatore’s work *Flora Palermitana...* (1845: 244–246) “*Il Gussone ha creduto di dovere riconoscere in questa pianta [Hordeum maritimum] due specie distinte nei suoi hordeum maritimum e secalinum, avuto riguardo alla spica che è in questo più delicata, le valve calicine più anguste ec. Però io stimo tali caratteri di poca importanza specifica e solo dipendenti dalla diversa natura del terreno: del resto quand’anche si volesse riguardare la varietà più gracile e con le valve calicine più anguste come una specie distinta proporrei doversi riconoscere col nome di Hordeum Gussonianum, giacchè l’hordeum secalinum di Schreber spetta al pratense e non si può quindi ad esso riferire la pianta del Gussone. L’hordeum pubescens poi di questo botánico, considerato come distinto nel pródromo della flora sicola, non è che una semplice varietà del maritimum, siccome tale l’ha infatti considerato il Gussone medesimo nella sua Synopsis*” [Gussone believed he had to recognize in this plant [*Hordeum maritimum*] two distinct species in its *hordeum maritimum* and *secalinum*, having regard to the spike which is more delicate in this, the narrower calicine valves, etc. However, I esteem these characters of little specific importance and only dependent on the different nature of the soil: after all, even if it could be possible to regard the slenderer variety with the narrower calyx valves as a distinct species, I would propose to recognize it with the name of *Hordeum Gussonianum*, since Schreber’s *Hordeum secalinum* belongs to *pratense* and therefore cannot be referred to the Gussone’s plant. The *Hordeum pubescens* of this botanist, considered as distinct in the prodromo of the Sicilian flora, is nothing more than a simple variety of the *maritimum*, as such, in fact, Gussone himself considered it in his *Synopsis*].

In conclusion, among the two relevant specimens at FI (FI065550 and FI065551), we specified the specimen FI065551 as the lectotype of the name *Hordeum marinum* subsp. *gussoneanum* because it exactly matches with the protologue. It represents the traditional concept and current use of the name (e.g. Bothmer *et al.* 1989, Tison *et al.* 2014, Pignatti 2018).

Hordeum gussoneanum Parlatore (1845: 246) [‘*gussonianum*’]

≡ *Hordeum marinum* subsp. *gussoneanum* (Parl.) Thellung (1907: 441)

Lectotype (first step designated by Bothmer *et al.* (1989: 8):—“Gussone, Sicily, in FI (holo)”.

Lectotype (second step, designated here):—[ITALY, Sicily], “Herbarium Parlatoeanum / *Hordeum maritimum* With[ering] / Parl. pit. / [*Hordeum*] *geniculatum* Guss./ in herbosis maritimis / Panormi a Mondello / Da Parlatore in [Febb. (?) illegible] 1842”, 1842, *Parlatore s.n.* (FI: barcode FI065551, two specimens) (Fig. 3).

Other original material:—[ITALY, Sicily], “Herbarium Parlatoeanum. / *Hordeum maritimum* With[ering] / Parl. pit (?) / Sicilia / Da Parlatore in / Marzo 1842”, (FI: barcode FI065550) (Fig. 3).

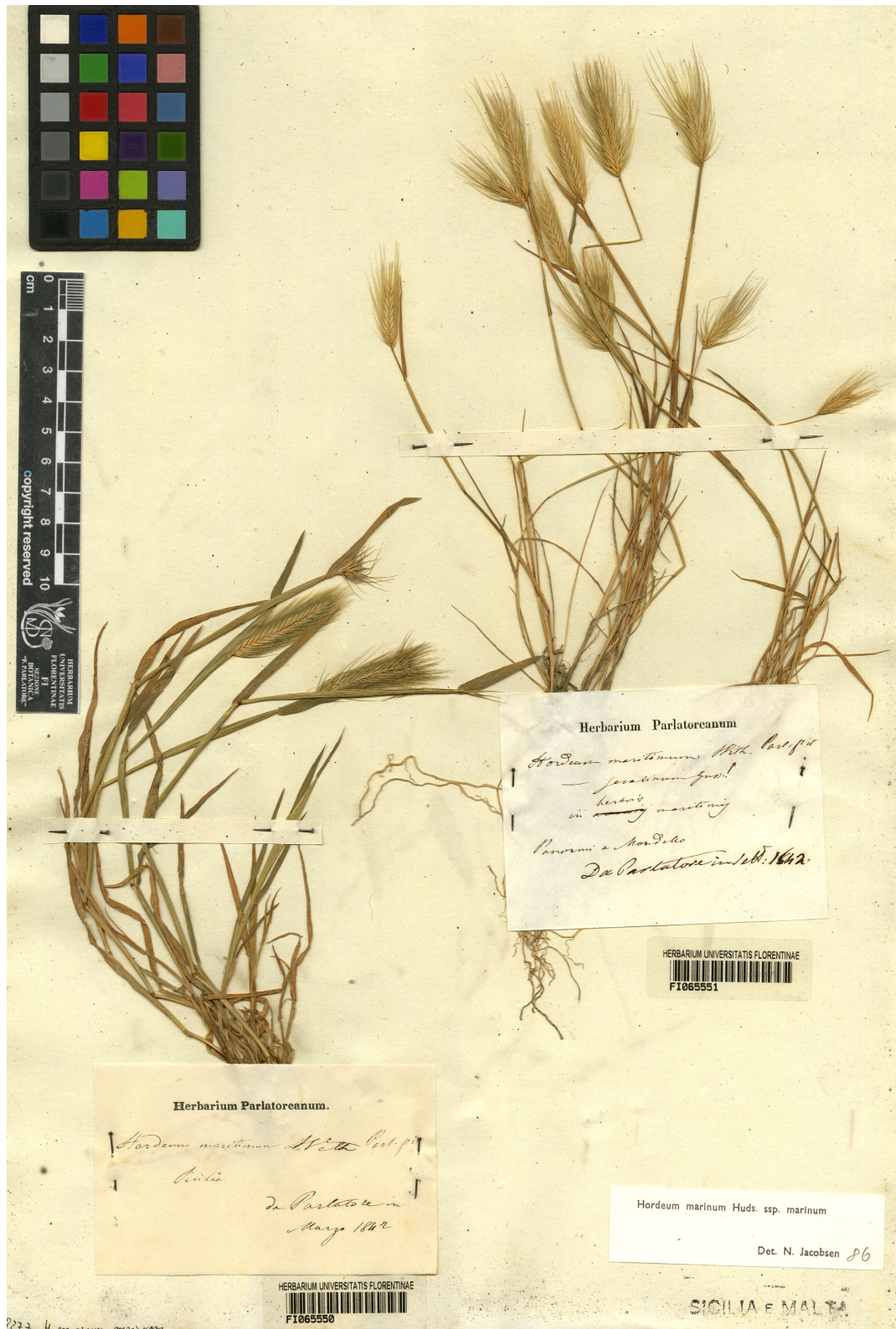


FIGURE 3. Lectotype of *Hordeum gussoneanum* Parl., FI (FI065551). Image courtesy of the herbarium FI, reproduced with permission

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