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Advances to the taxonomic knowledge of *Plantago subulata* (*Plantago* sect. *Maritima*, Plantaginaceae)

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Abstract: *Plantago* sect. *Maritima* is a group of Mediterranean narrow-leaved plantains whose taxonomy and nomenclature are particularly complex and still unresolved. This work has the objective of advancing the taxonomic knowledge of this section by revising and presenting novelties for the synonymy of *P. subulata*, including the lectotypification of four names with recent usage (since 1985) within this group: *P. sarda*, *P. subulata* var. *atlantis*, *P. subulata* var. *granatensis*, and *P. subulata* var. *insularis*. Furthermore, two synonymizations are newly proposed, and the situation of two *Plantago* species names published by Nyman in 1881 in his *Conspectus Floræ Europææ* is clarified.

Key words: Mediterranean, Plantagineae, *Plantago sarda*, synonymization, typification

1. Introduction

Plantago sect. *Maritima* H.Dietr. is included in the genus *Plantago* L., subgenus *Coronopus* (Lam. & DC.) Rahn (Rahn, 1996; Rønsted et al., 2002; Hassemer et al., 2017a, 2017b). This section comprises a group of Mediterranean narrow-leaved plantains whose taxonomy and nomenclature are particularly complex, and, despite having been studied since the earliest European botanists, the classification and nomenclature of this group remains unresolved (Di Pietro and Iamónico, 2014; Hassemer et al., 2017a, 2017b; Iamónico et al., 2017). The number of species in this section accepted by botanists since 1970 varies from four to 12 (Hassemer et al., 2017b). Among recent taxonomic works that treated this section (entirely or partially) the most important are those of Moore et al. (1976), Pignatti (1982), Franco (1984), Rahn (1996), Aeschmann et al. (2004), and Pedrol (2009). All species in this section are endemic to the Mediterranean area, except for *P. maritima* L., which is widespread in Europe and parts of western and central Asia, and also in temperate areas of the New World (Moore et al., 1972; Rahn, 1996).

Plantago has an abundance of names, probably because of its study by early botanists, its global distribution, and its difficult morphology; this abundance of names is one of the reasons why the taxonomy of *Plantago* is so complex (Hassemer, 2017a, 2017b, 2018; Hassemer et al., 2017a, 2017b). In order to resolve the taxonomy of *Plantago* sect. *Maritima* it is first necessary to address the challenging

questions concerning the nomenclature of this group. This work has the objective of advancing the taxonomic knowledge of this section by revising and presenting novelties for the synonymy of *P. subulata* L., including the lectotypification of four names with recent usage (since 1985) within this group: *P. sarda* C.Presl, *P. subulata* var. *atlantis* Emb. & Maire, *P. subulata* var. *granatensis* Willk., and *P. subulata* var. *insularis* Godr. Furthermore, two synonymizations are newly proposed, and the situation of two *Plantago* species names published by Nyman in 1881 in his *Conspectus Floræ Europææ* is clarified.

2. Material and methods

I studied *Plantago* specimens kept at ASE, BHCB, C, CEN, CGMS, CIIDIR, DDMS, EAC, EFC, FI, FLOR, FT, FURB, GB, GH, HAS, HBR, HRB, HURB, IAC, ICN, K, MA, MBM, MVFA, MVJB, MVM, P, PI, RB, SGO, TANG, TEPB, TUB, UB, UESC, UFMT, UPCB, and UPS and images of specimens kept at B, BBF, BM, COI, CONC, CORD, DD, ESA, F, G, GOET, HFLA, IRAI, LE, LINN, MO, MPU, PRC, R, RO, S, SP, UC, UEC, US, and W. The nomenclature presented here follows the Melbourne Code (McNeill et al., 2012) and the recommendations of McNeill (2014).

3. Results

Plantago subulata L., Sp. Pl. : 115. 1753.

Type: Lectotype (designated by Hassemer et al., 2017a: 740) LINN-144.22!.

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= *P. acanthophylla* Decne. in DC., Prodr. 13(1): 730–731. 1852.

≡ *P. radicata* var. *acanthophylla* (Decne.) Pilg., Feddes Repert. 34: 160–161. 1933.

≡ *P. radicata* subsp. *acanthophylla* (Decne.) Franco, Nov. Fl. Portugal 2: 294, 569. 1984.

Type: SPAIN. 1815, A. Thiébaud de Berneaud s.n. (lectotype [designated by Hassemer et al., 2017b: 198], G-00149735!).

= *P. holosteum* Scop., Fl. Carniol. 2nd ed., 1: 108–109. 1772.

≡ *P. subulata* subsp. *holosteum* (Scop.) O.Bolòs & Vigo, Collect. Bot. (Barcelona) 14: 99. 1983.

Type: [illustration] ‘CORONOPVS SERPENTARIA omnium minima’ in Bauhin and Cherler (1651: 511), lectotype designated by Iamonico et al. (2017: 79). Epitype (designated by Iamonico et al., 2017: 79): SLOVENIA. Notranjska, Planinsko polje: ob cesti med gradom Hasberg in zaselkom Dolnja Planina, 450 m, 26 May 1992, Seliškar et al. s.n. (HFLA-4162!; isoeptype LJS-00899).

= *P. holosteum* f. *vestita* Pic.Serm., Webbia 6: 63. 1948.

Type: ITALY. TOSCANA: Firenze, 19 May 1935, U. Losacco s.n., specimen at the bottom of the sheet, signaled with asterisks (holotype FI-002546!).

= *P. maritima* var. *apennina* A.Terracc., Nuovo Giorn. Bot. Ital., n. ser., 1: 173–174. 1894, **syn. nov.**

Type: ITALY. LAZIO: in elatioribus Lepinis, 28 June 1852, E. Rolli s.n. (neotype [or maybe lectotype] [designated by Iamonico et al., 2017: 79], RO-39860!).

= *P. radicata* Hoffmanns. & Link, Fl. Portug. 1: 428–429, Tab. 73. 1809.

≡ *P. subulata* subsp. *radicata* (Hoffmanns. & Link) O.Bolòs & Vigo, Collect. Bot. (Barcelona) 14: 99. 1983.

Type: [illustration] Tab. 73 in von Hoffmannsegg and Link (1809), lectotype designated by Hassemer et al. (2017b: 202).

= *P. sarda* C.Presl, Abh. Königl. Böhm. Ges. Wiss. ser. 5, 3: 535. 1845.

≡ *P. subulata* var. *sarda* (C.Presl) Pilg., Feddes Repert. 34: 158–159. 1933.

≡ *P. humilis* subsp. *sarda* (C.Presl) Brullo et al., Candollea 40: 225. 1985.

Type: ITALY. SARDINIA: in monte Genargentu, July 1827, F.A. Müller s.n. (lectotype [designated here] TUB-022340! [Figure 1]; isoelectotype K-000648279!).

= *P. subulata* f. *grovesii* Bég. in Fiori and Bég., Flora Analitica d'Italia 3(1): 100. 1903.

≡ *P. subulata* var. *grovesii* (Bég.) Pilg., Feddes Repert. 34: 158. 1933.

≡ *P. holosteum* subsp. *grovesii* (Bég.) Brullo, Braun-Blanquetia 2: 31–32. 1988.

Type: ITALY. PUGLIA: Otranto, in saxosis maritimis prope Hydruntum, July 1872, H. Groves s.n. (lectotype [designated by Hassemer et al., 2017b: 202] FI-007402!).

= *P. subulata* var. *atlantis* Emb. & Maire in Maire, Bull. Soc. Hist. Nat. Afrique N. 23: 211. 1932, **syn. nov.**

≡ *P. subulata* subsp. *atlantis* (Emb. & Maire) Greuter & Burdet in Greuter & Raus, Willdenowia 12: 199. 1982.

≡ *P. humilis* subsp. *atlantis* (Emb. & Maire) Brullo et al., Candollea 40: 225. 1985.

Type: MOROCCO. Grand Atlas oriental, prairies autour des sources de la Tessaout au pied N du Mgoun, 3200 m, 7 August 1931, M.L. Emberger s.n., left specimen, annotated “oui” (lectotype [designated here] MPU-002839! [Figure 2]).

= *P. subulata* var. *granatensis* Willk. in Willk. & Lange, Prodr. Fl. Hispan. 2: 357. 1870.

– *P. granatensis* (Willk.) Nyman, Consp. Fl. Eur., 3rd part: 618. 1881, nom. inval. (Art. 36.1[c]).

≡ *P. subulata* subsp. *granatensis* (Willk.) Malag., Sinopsis Fl. Ibér. 66: 1047. 1976.

≡ *P. humilis* subsp. *granatensis* (Willk.) Brullo et al., Candollea 40: 225. 1985.

≡ *P. radicata* subsp. *granatensis* (Willk.) Rivas Mart. et al., Rivasgodaya 6: 52. 1991.

Type: SPAIN. In pratis siccis Sierra Nevada, Alt. 6200'–9000', July 1837, E. Boissier s.n. (lectotype [designated here] TUB-022341! [Figure 3]; isoelectotype FI-017190!).

= *P. subulata* var. *insularis* Godr. in Gren. & Godr., Fl. France 2(2): 725. 1852.

– *P. insularis* (Godr.) Nyman, Consp. Fl. Eur., 3rd part: 618. 1881, nom. inval. (Art. 36.1[c]).

≡ *P. humilis* subsp. *insularis* (Godr.) Kerguelen & Lambinon in Kerguelen et al., Lejeunia nouvelle série 120: 141. 1987.

Type: FRANCE. CORSICA: Paturages des hautes montagnes, Pozzi du Mt. Renoso, 2 August 1849, L. Kralik 752 (lectotype [designated here] FI-017193! [Figure 4]; isoelectotype K-000648282!).

= *P. wulfenii* Spreng., Fl. Hal. Tent.: 54–55. 1806.

≡ *P. gerardii* Schult., Oestr. Fl., 2. ed., 1: 298. 1814, nom. superfl. et illeg. (Art. 52), non *P. gerardii* Pourr., Mem. Acad. Toul. 3: 324. 1788.

≡ *P. carinata* Schrad. ex Mert. & W.D.J.Koch, Deutschl. Fl., 3. ed., 1: 810–811. 1823, nom. superfl. et illeg. (Art. 52), non *P. carinata* Moench, Methodus: 460. 1794.

Type: [illustration] Tab. 10 in von Wulfen (1787), lectotype designated by Iamonico et al. (2017: 79).

4. Discussion

4.1. *Plantago sarda* C.Presl

The protologue of *P. sarda* (Presl, 1845: 535) provided the following information on the type: “Hab. in monte Genargentu Sardiniae. fl. Jul. Collegit Müller”. The collector referred to in the protologue is Franz August Müller (1798–1871), who collected plants in Sardinia in 1827–1828. Considering that Karel Bořivoj Presl (1794–



Figure 1. Lectotype of *Plantago sarda* (F.A. Müller s.n., TUB-022340). Copyright: Universität Tübingen.

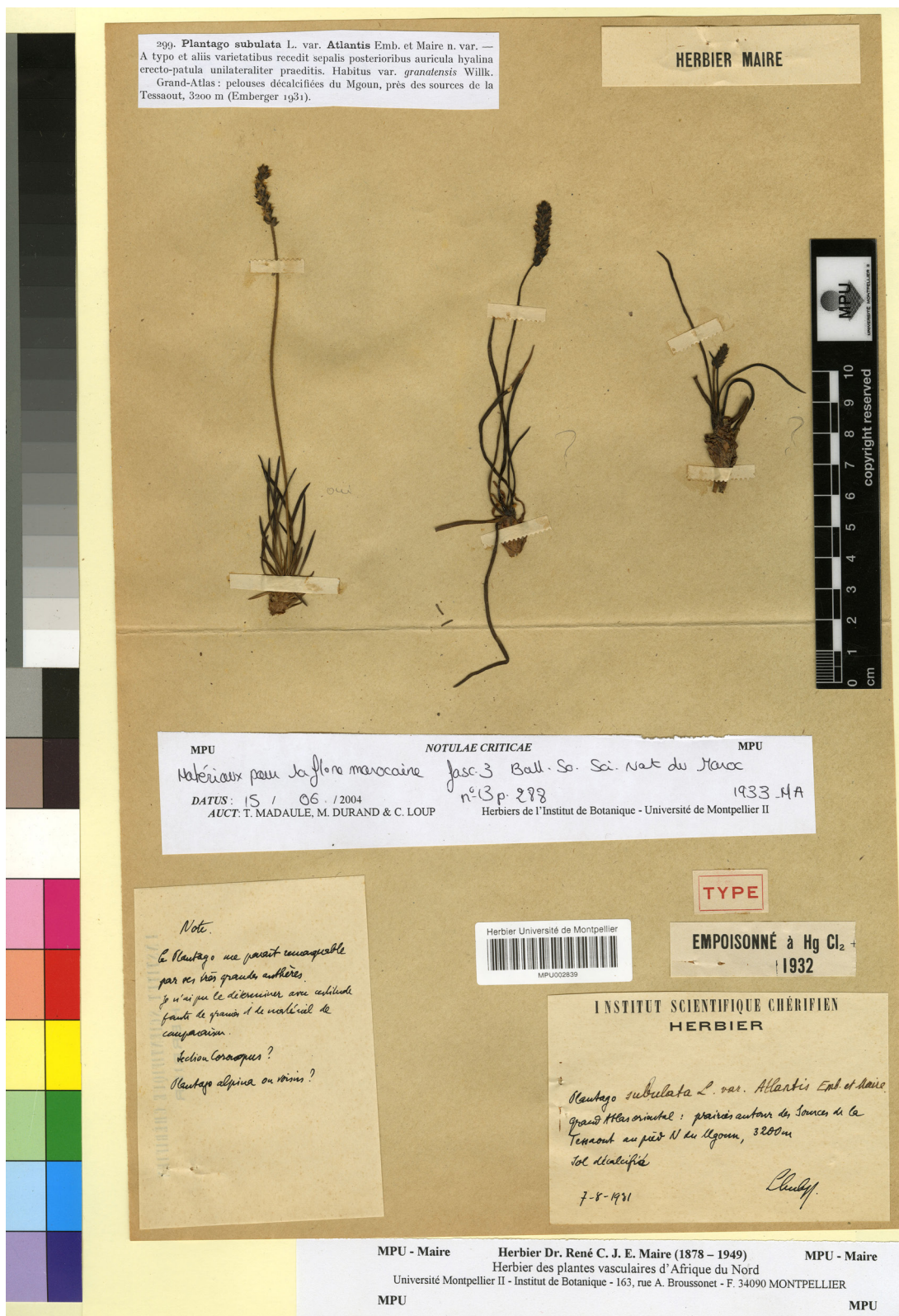


Figure 2. Lectotype of *Plantago subulata* var. *atlantis* (M.L. Emberger s.n., MPU-002839) (left specimen, annotated "oui"). Copyright: Université de Montpellier.



Figure 3. Lectotype of *Plantago subulata* var. *granatensis* (E. Boissier s.n., TUB-022341). Copyright: Universität Tübingen.

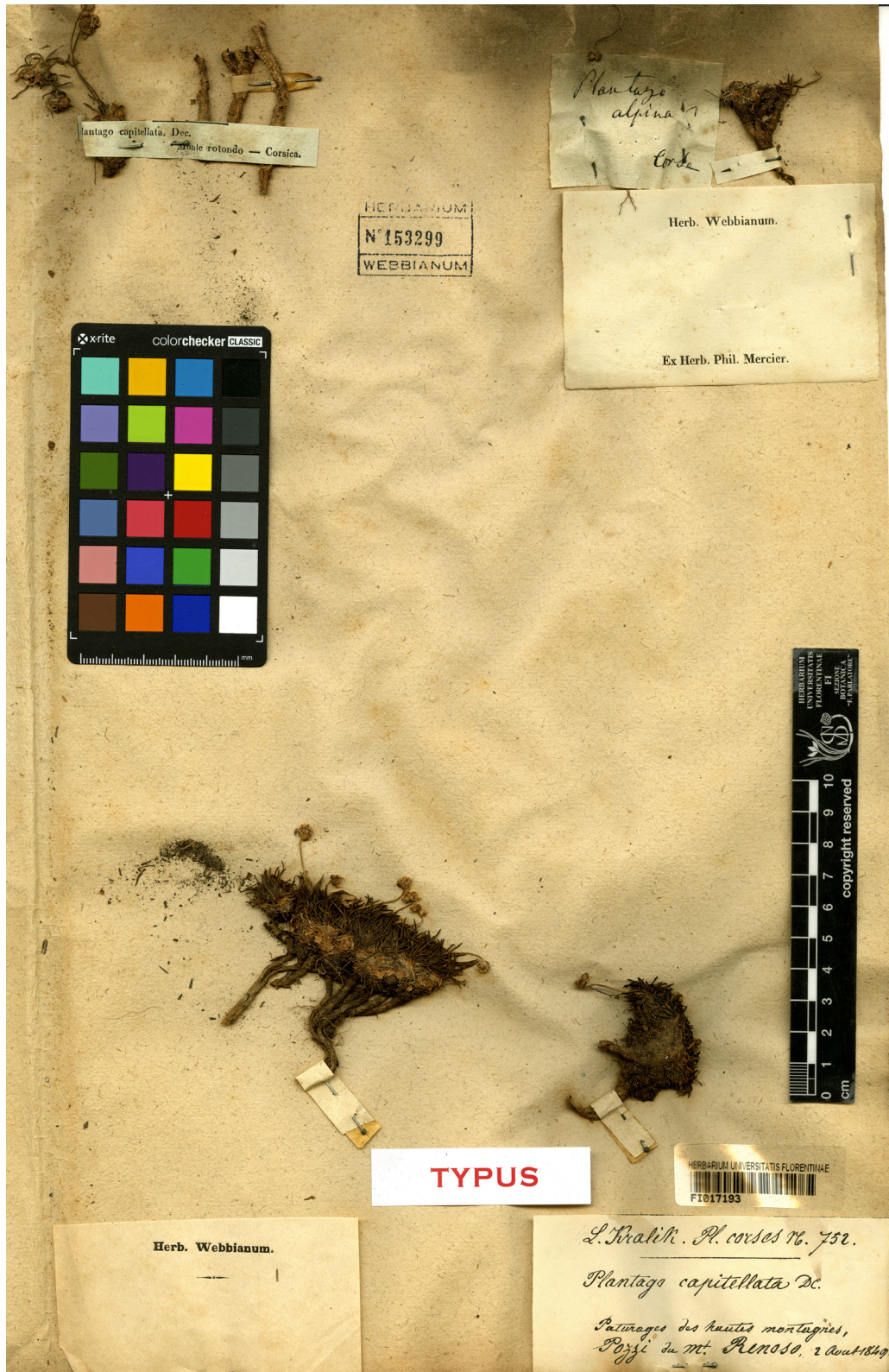


Figure 4. Lectotype of *Plantago subulata* var. *insularis* (L. Kralik 752, FI-017193) (the two plants in the lower part of the sheet). Copyright: Università di Firenze.

1852) lived and worked in Prague, a lectotype from Czech herbaria would be preferred; nevertheless, no suitable material for typification was found among Czech herbaria.

Two sheets that include original material for this name were found: K-000648279 and TUB-022340, both including the exact same label and here accepted as duplicates. Both sheets were hitherto unrecognized as original material. I designate here TUB-022340 (Figure 1), the best and most complete among the available original material, as lectotype of *P. sarda*.

The type of *P. sarda* is composed of short-leaved, multibranched specimens of *P. subulata*; specimens of this species with this morphology also occur in Corsica (see below, under *P. subulata* var. *insularis*), southern Italy (see Hassemer et al., 2017b, under *P. subulata* f. *grovesii*), and other Mediterranean areas. Therefore, I agree with the synonymization of *P. sarda* with *P. subulata* proposed by Nyman (1881), because the morphology of the type of the former name is included within the known variation of *P. subulata* (see Figure 2 in Hassemer et al., 2017a, and also Hassemer et al., 2017b). Two new combinations have been published for the basionym *P. sarda*: *P. subulata* var. *sarda* was proposed by Pilger (1933), and *P. humilis* subsp. *sarda* was proposed by Brullo et al. (1985). It should be noted that *P. sarda* was accepted in very recent works such as those of Peruzzi et al. (2015) and Bartolucci et al. (2018).

4.2. *Plantago subulata* var. *atlantis* Emb. & Maire

The protologue of *P. subulata* var. *atlantis* (Maire, 1932: 211) provided the following information on the type: “Grand Atlas: pelouses décalcifiées du Mgoun près des sources de la Tessaout, 3200 m (Emberger, 1931)”. I was able to locate a sheet at MPU (MPU-002839) that includes original material for this name. Nevertheless, the three specimens on this sheet clearly do not belong to the same species: the specimen to the left is *P. subulata*, whereas the central and right specimens are most probably *P. maritima*. In fact, a careful examination of the sheet reveals that the left specimen has an annotation “oui” (yes in French), while the other two have question marks (?), which probably indicates the specimen to which the name *P. subulata* var. *atlantis* is linked. All things considered, I designate here the left specimen (annotated “oui”) of MPU-002839 (Figure 2) as the lectotype of *P. subulata* var. *atlantis*.

The lectotype of *P. subulata* var. *atlantis* is a morphologically ordinary exemplar of *P. subulata*, not significantly differing from the lectotype of the latter (see Figure 2 in Hassemer et al., 2017a) and most of its populations. There is no mention of this synonymy in the published literature, although this has already been indicated in online material (<http://luirig.altervista.org/flora/taxa/index1.php?scientific-name=plantago+subulata>). Therefore, I formally propose the synonymization of *P. subulata* var. *atlantis* with *P.*

subulata. Two new combinations have been published for the basionym *P. subulata* var. *atlantis*: *P. subulata* subsp. *atlantis* was proposed in Greuter and Raus (1982), and *P. humilis* subsp. *atlantis* was proposed by Brullo et al. (1985).

4.3. *Plantago subulata* var. *granatensis* Willk.

The protologue of *P. subulata* var. *granatensis* (Willkomm, 1870: 357) provided the following information on the type: “in regione alpina Sierrae Nevadaee ad alt. 6–10000’ frequ. (WBB.! BSS.! WK., FK.! BOURG.! ALTH.)”. I was able to locate the following specimens that are original material for this name: one sheet of *P.B. Webb s.n.* at FI (FI-017191), annotated “in summâ Sierrâ Nevadâ. 1826–28”; two sheets of *E. Boissier s.n.*, one at FI (FI-017190) and another at TUB (TUB-022341), both annotated “in pratis siccis Sierra Nevada. Jul. 1837. Alt. 6200’–9000’”; one sheet of *H.M. Willkomm 189* at COI (COI-00043341), annotated “in Sierra Nevada. 6500–9000’. 18 Julii 1844”; one sheet of *H.M. Willkomm s.n.* at COI (COI-00043344), annotated “in Sierra Nevada. 7–9000’. 18 Julii 1844”; and one sheet of *Funk s.n.* at COI (COI-00043343), annotated “Sierra Nevada. 8–10000’. Aug. 1848”. With the exception of the material at FI, all these sheets were hitherto unrecognized as original material. The specimens on all these sheets are morphologically coherent and correspond to the same species. I designate here the best and most complete herbarium material, TUB-022341 (Figure 3), as lectotype for the name *P. subulata* var. *granatensis*. The chosen lectotype also has a duplicate (FI-017190).

Careful examination of the lectotype of *P. subulata* var. *granatensis* left it clear that this specimen belongs to *P. subulata*. For this reason, I agree with the synonymization of *P. subulata* var. *granatensis* with *P. subulata* proposed by Nyman (1881). Three new combinations have been published for the basionym *P. subulata* var. *granatensis*: *P. subulata* subsp. *granatensis* was proposed by Malagarriga Heras (1976), *P. humilis* subsp. *granatensis* was proposed by Brullo et al. (1985), and *P. radicata* subsp. *granatensis* was proposed by Rivas-Martínez et al. (1991).

Nyman (1881: 618) listed “*P. granatensis* (Willk.)” among the synonymy of *P. subulata*. Therefore, despite the indirect reference to *P. subulata* var. *granatensis*, this name was not validly published as a new combination, according to Art. 36.1(c).

4.4. *Plantago subulata* var. *insularis* Godr.

The protologue of *P. subulata* var. *insularis* (Godron, 1852: 725) provided the following information on the type: “*Soleir. exsicc. n° 3579 ! ; Kralik, exsicc. n° 752 !*” and “en Corse, Pozzi du monte Renoso, monte d’Oro, chaîne du Niolo, monte Rotundo”. I was able to locate the following specimens that are original material for this name: one sheet of *H.A. Soleirol 3579* at FI (FI-017192) annotated “*Mt. Rotundo*”, and two sheets of *L. Kralik 752*, one at FI (FI-017193) and another at K (K-000648282), both

annotated “*Paturages des hautes montagnes, Pozzi du Mt. Renoso, 2 Aout 1849*”. The specimens on these three sheets are morphologically coherent and correspond to the same species. I designate here the best and most complete herbarium material, FI-017193 (only the two plants in the lower part of the sheet belong to the gathering *L. Kralik 752*; see Figure 4), as lectotype for the name *P. subulata* var. *insularis*. The chosen lectotype also has a duplicate (K-000648282); this sheet at K was hitherto unrecognized as original material.

The morphological features of the lectotype, particularly the short leaves and densely branched stem, leave no doubt that *P. subulata* var. *insularis* is closely related to *P. sarda* (see above) and *P. subulata* f. *grovesii* (see Hassemer et al., 2017b), which are themselves synonyms of *P. subulata*. For this reason, I agree with the synonymization of *P. subulata* var. *insularis* with *P. subulata* proposed by Nyman (1881). One new combination has been published for the basionym *P. subulata* var. *insularis*: *P. humilis* subsp. *insularis*, proposed in Kerguelen et al. (1987). It should be noted that “*Plantago subulata* L. subsp. *insularis* (Gren. & Godr.) Nyman” (a name that was never validly published)

was accepted in very recent literature, such as a study by Conti et al. (2005).

Nyman (1881: 618) listed “*P. insularis* (G.G.)” among the synonymy of *P. subulata*. Therefore, despite the indirect reference to *P. subulata* var. *insularis* (“G.G.” referring to Grenier and Godron, the editors of *Flore de France*), this name was not validly published as a new combination according to Art. 36.1(c). For this reason, the later name *P. insularis* Eastw. is nonetheless legitimate; this species was described from San Nicolas Island, California (Eastwood, 1898) and is considered a synonym of *P. ovata* Forssk. (fide Dempster, 1993).

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