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Current nomenclature and systematics of *Capsella* Medik. with lectotypifications: towards solving the puzzle

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Abstract: The taxonomic history of *Capsella* Medik., one of the genera with the highest phenotypic plasticity, and thus the highest synonym number relative to the recognized species number, was reviewed. The current systematics of the genus was discussed and the exact number of taxa was determined. In light of the molecular and nomenclatural data, it was decided that the genus was represented around the world by five species and one hybrid. Considering the molecular studies that have been conducted over the 30 years it was concluded that the species of this genus are typical examples of the concept of cryptic species. The classification and nomenclature of such genetically different, morphologically similar species should be one of the most current discussion topics of modern systematic science. *Capsella* is one of the best examples to examine this situation; hence, this feature was discussed herein. It was decided that *C. thracica* and *C.* × *abortiva* are conspecific and the correct naming should be *C. abortiva* (pro hybr.). Lectotype assignments were performed for the names of 5 taxa, mainly *C. rubella*, *C.* × *abortiva*, and *C. thracica*. Also, the missing type specimen of the Turkish endemic *C. lycia* was found, the lectotype was assigned and it was determined to be a synonym of *C. bursa-pastoris*. Various errors in the type sample references, especially in the holotype of *C. grandiflora*, were thus corrected. Their distribution around the world was checked and then corrected, and an identification key is given for the taxa of the genus.

Key words: *Capsella*, lectotypification, cryptic species, ICBN, nomenclature

1. Introduction

Capsella s.l. Medikus (1792: 85) is a genus of Eurasian origin, which is very common all over the world, and has very high intraspecific morphological variations and interspecific similarities. It has many synonyms due to its intraspecific morphological variations caused by its prevalence and hence, ecological adaptability. The actual number of species has always been disputed: According to variations in its leaves and fruit, in the early 20th century, Almquist named almost 200 (1907, 1921, 1923) and Shull (1909, 1929) named almost 20 specific and infraspecific taxa. However, there are some researchers, such as Svensson (1984) and Al-Shehbaz (1986), who have argued that, the leaf, petal, or fruit morphologies that were determined by researchers like Almquist and Shull are not stable, as they are dysfunctional in determining specific boundaries; hence, the genus is monotypic and even widely accepted species, such as *C. grandiflora* and *C. rubella*, should be evaluated as synonyms of *C. bursa-pastoris*.

Molecular studies conducted in recent years have contributed to understanding the evolution of both the genus and the family, and new approaches have been developed on the tribal classification of the genus and the average number of species. The phylogeny studies of Beilstein et al. (2006), Al-Shehbaz (2006), and Franzke et al. (2009) agreed that *Capsella* was in the tribe Camelineae, through which it was more closely related to *Arabidopsis thaliana*, than via the morphological approach, which located *Capsella* within the tribe Lepidieae based on its angustiseptate/latiseptate fruit distinction (Hayek, 1911; Schulz, 1936; Janchen, 1942). Although they cannot reveal an exact number of species, it is also possible to summarize species numbers via molecular studies to attain a more accurate species concept that is based on the ploidy, genetic content, mating system, divergence time of the clades, and embiology and ecological adaptations (Hurka et al., 1989; Hurka, 1990; Hurka and Düring, 1994; Hurka and Neuffer, 1997; Neuffer and Hurka, 1999; Neuffer and Hoffrogge, 2000; Ceplitis et al., 2005; Paetsch et al., 2006; Slotte et al., 2006; Foxe et al., 2009; Guo et al., 2009; Neuffer, 2011; Theißen, 2011; Hurka et al., 2012; Slotte et al., 2012; Neuffer & Paetsch, 2013; Slotte et al., 2013; Neuffer et al., 2014; Žerdoner Čalasan et al., 2021). The number of specific and/or infraspecific taxa that has

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been widely accepted for *Capsella* today varies between 5 (Warwick et al., 2006; Koch et al., 2012, Kiefer et al., 2014; Koch et al., 2018), 8 (POWO[1]), 9 (WFO[2]) and 10 (TPL[3]). In addition to these, there are also species whose status has not yet been confirmed, which were mentioned as 'ambiguous' or 'unresolved' in each resource.

Despite numerous studies that have aimed at clarifying the systematics of the genus, many taxa, e.g., *C. rubella*, do not have a holotype or an assigned lectotype. This is an important deficiency. This is because, in taxa whose morphological distinction is clear, it can be trusted that sampling from any population represents the taxon, but it is difficult to perform sampling to represent the taxon correctly in species such as *Capsella*, whose morphological boundaries are quite uncertain due to intraspecific variations and interspecific similarities. Knowing the type sample allows at least sampling from the type locality, thus ensuring that the taxon is represented by correct sampling. For this reason, it is very important to find holotypes, or if there are none, to assign lectotypes (or other types), especially in species such as *Capsella*, where the morphological distinction of the taxa is very difficult.

In this study, it was aimed to assign lectotypes to the names of those *Capsella* species that do not currently have a type assignment and confirm the number of taxa in the genus.

2. Material and methods

All *Capsella* names in digital sources, such as the International Plant Names Index (IPNI[4]), BrassiBase[5], World Flora Online (WFO), Plants of the World Online (POWO), The Plant List (TPL), and eFloras[6] were reviewed. The literature that they published, as well as other old and new publications regarding *Capsella* were searched from sources such as The Biodiversity Heritage Library[7], Internet Archive[8], HathiTrust Digital Library[9], JSTOR Global Plants[10], Gallica[11] and Google Books[12], Biblioteca Digital[13] Publications and various flora not available in online resources (Busch, 1939; Hedge, 1965; Hedge and Rechinger, 1968; Hedge et al., 1980; Chater, 1993; Tan, 2002), were examined in the herbarium libraries where they were found or requested and sent. Moreover, herbaria G, W, WU, HUB, ANK, and GAZI were visited and virtual herbaria of BM, E, KEW, P, MPU, LU, LI, GOET, GH, HO, and LW (some via JSTOR) were searched for *Capsella* samples. Possible herbaria hosting the samples of the researchers were searched to find as much as possible via the studies of Stafleu and Cowan, 1981; Stafleu and Mennega, 1992. The lectotypes of names of taxa without holotypes are designated following the Shenzhen Code (Turland et al., 2018).

3. Results and discussion

The systematic history of *Capsella* is also the history of the species concept. Due to its extraordinarily diverse leaf and fruit morphology, between the 18th and 20th centuries, via the morphospecies approach, almost every individual that appeared to be different from another other was named as a different specific or infraspecific taxa. As a result, more than 250 synonyms of *C. bursa-pastoris* have emerged (IPNI, 2021).

In the 20th and 21st centuries, cytological and molecular studies came to the forefront, the biotypes and cytotypes of the genus were better understood, the number of accepted species decreased, and considering the important role of ploidy in sympatric speciation, the sibling-species or cryptic species approach stood out. However, there are still uncertainties in the systematics of the genus, since genetic differences are not reflected in morphology to the same extent.

In light of the molecular, embryological, morphological, and biogeographical data demonstrated by studies that gained speed in the late 20th century, and of the samples examined within the research conducted herein, it can be said that the genus *Capsella* consists of five cryptic species and one hybrid, which are different based on

[1] POWO (2021) Plants of the World Online [online]. Website http://powo.science.kew.org/taxon/331460-2 [accessed 10 January 2021].

[2] WFO (2021) World Flora Online [online]. Website http://worldfloraonline.org/taxon/wfo-4000006621 [accessed 10 January 2021].

[3] TPL (2021) The Plant List, 2010. Version 1. Published on the Internet [online]. Website http://www.theplantlist.org [accessed 10 January 2021].

[4] IPNI (2021). International Plant Names Index [online]. Website http://www.ipni.org [accessed 10 January 2021].

[5] BrassiBase (2021) [online]. Website http://www.brassibase.cos.uni-heidelberg.de [accessed 10 January 2021].

[6] efloras (2021) [online]. Website http://www.efloras.org [accessed 10 January 2021].

[7] Biodiversity Heritage Library (2021) [online]. Website http://www.biodiversitylibrary.org [accessed 10 January 2021].

[8] Internet Archive (2021) [online]. Website http://www.archive.org [accessed 10 January 2021].

[9] Hathitrust Digital Library (2021) [online]. Website http://www.hathitrust.org [accessed 10 January 2021].

[10] JSTOR Global Plants (2021) [online]. Website http://www. https://plants.jstor.org/ [accessed 10 January 2021].

[11] Gallica (2021) [online]. Website http://www.gallica.bnf.fr [accessed 10 January 2021].

[12] Google Books (2021) [online]. Website http://www.books.google.com [accessed 10 January 2021].

[13] Biblioteca Digital (2021) [online]. Website https://bibdigital.rjb.csic.es/ [accessed 10 January 2021].

their cytogenetic and molecular aspects, as well as in terms of their fertilization patterns, even though they are morphologically quite similar.

These taxa comprise: diploid and selfincompatible *C. grandiflora*, diploid and selfcompatible *C. orientalis*, diploid and selfcompatible *C. rubella*, and tetraploid and selfcompatible *C. bursa-pastoris* (Paetsch et al. 2006; Hurka et al., 2012; Neuffer et al., 2014). *Capsella bursa-pastoris* is an autopolyploid species of multiple origins (Neuffer et al., 2014). In the phylogeny trees, *C. rubella* and *C. grandiflora*, could be distinctly distinguished from *C. bursa-pastoris* by the formation of a monophyletic branch that separated at least 100,000–300,000 years ago (Guo et al., 2009; Slotte et al., 2013; Douglas et al., 2015; Žerdoner Čalasan et al., 2021). Selffertilizing *C. rubella* separated from its outbreeding ancestor, *C. grandiflora*, about 200,000–26,000 years ago (Foxe et al., 2009; Guo et al., 2009; Woźniak et al., 2020; Žerdoner Čalasan et al., 2021). Furthermore, selffertilizing *C. orientalis* evolved from an ancestor similar to *C. grandiflora* about 2000 years ago (Hurka et al., 2012; Žerdoner Čalasan et al., 2021). Among these 4 species, there is a distinct reproductive isolation due to both breeding preferences and chromosome imbalances in the crosses. When *C. rubella* and *C. bursa-pastoris* overcame this reproductive isolation, they produced a hybrid called *C. x gracilis*. In addition, *C. abortiva* (pro hybr.) (= *C. thracica*), which emerged as a result of allopolyploid hybridization from *C. grandiflora* and *C. bursa-pastoris*, is also the 5th species of *Capsella*. These taxa also have characteristic biogeographical distribution areas determined by molecular supported population studies. *C. bursa-pastoris* is a cosmopolitan species. In contrast, *C. rubella* is a Mediterranean species, which is distributed in the eastern, western, northern, and southern Mediterranean (Guo et al., 2009; Neuffer et al., 2014); *C. orientalis* is a steppe plant of eastern Europe (Russia and Ukraine), north Kazakhstan, southwestern Siberia, northwestern Mongolia, and northwestern China (German and Ebel, 2009; German et al, 2012; Neuffer et al., 2014). *C. grandiflora* is found in and around Greece (Boissier; 1843; Neuffer et al., 2014); *C. abortiva* is distributed in Bulgaria (Neuffer et al., 2014) and in Thrace Region of Turkey (this study) and *C.* x *gracilis* is found in Mediterranean (within the range of *C. rubella*, where its populations coincide with those of *C. bursa-pastoris*).

In fact, the presence of morphologically very similar cytotypes with different ploidy levels, different amounts of DNA, and different fertilization preferences is a common situation (ranging from 30% to 70%) within all Angiospermae, especially in Poaceae. Polyploidy occurs as both intraspecific autopolyploidy or as an allopolyploidy caused by interspecific hybridization. It has been known for many years that such cytotypes are main evolutionary forces. (Stebbins, 1950; Averett, 1980; De Wet, 1980; Masterson, 1994; Ramsey and Schemske, 1998; Otto and Whitton, 2000; Peckert and Chrtek, 2006; Soltis et al., 2007; Briggs & Walters, 2016). In Brassicaceae, morphologically equivalent intraspecific cytotypes that arise as a result of polyploidy are also common. Moreover, hybridizations and introgressions between these cytotypes are frequently observed (Bleeker, 2003; Koch and Bernhardt, 2004; Marhold and Lihová, 2006). The genera *Rorippa* (Bleeker and Hurka 2001; Bleeker and Matthies, 2005), *Cardamine* (Lihová and Marhold, 2006; Marhold et al., 2009), *Boechera* (Koch et al., 2003), *Erysimum* (Czarna et al., 2016) and *Capsella* itself (Hurka and Neuffer, 1997; Foxe et al., 2009; Slotte et al., 2013; Douglas et al., 2015) have been studied extensively in this respect. However, there have been very few studies conducted that have formally named these morphologically equivalent but cytologically and molecularly different cryptic species (Abdelaziz et al., 2011). In fact, under what conditions genetic differences will indicate different taxa and under which conditions they should be named formally is one of the current questions of systematic science (Soltis et al., 2007) and the genus *Capsella* appears to be a very good laboratory in which the answers to this question can be sought. Although morphological boundaries are often confused, auxiliary characters, such as reproductive preferences, ploidy levels, and distribution on the earth, which were mentioned in the paragraph above, help to distinguish and formally name species.

Characters such as the petal length, sepal color, and concave or flatness of the silicle apex have been used in the identification keys of *Capsella* species in various floras. Although the red color of the sepals is a feature observed in *C. rubella*, red coloration in the petals and/or in the silicles may be observed in *C. bursa-pastoris* sepals as a result of an increase in the accumulation of anthocyanin compounds due to factors such as the pH value of the soil. Anthocyanin pigments are extremely unstable compounds that are affected by factors such as the pH of the soil, temperature, and light (Zhang and Jing, 2020). Therefore, the red coloration that has been used in the identification keys in some flora (Hedge, 1965; Chater 1993) has low taxonomic value. The tip of the silicle is generally slightly rounder in *C. rubella* when compared to other species, the base is sharply tapered, and the edges are concave. However, these characters are not suitable for use in identification keys, as they are not measurable characters and can sometimes be seen in *C. bursa-pastoris* as well. Petal sizes are relatively distinctive characters that make species different from each other, and are directly related to the degree of ploidy and fertilization preferences (outcrossing or selfing). In the evolutionary process, the change from outbreeding to selfing causes changes in flower physiology

and morphology, mainly resulting in reduced flower size and opening (Sicard et al., 2011; Woźniak et al., 2020). The petals of *C. grandiflora*, which is a selfincompatible species, and therefore should attract pollinators, are large and showy (3–5 × 2.5–3 mm). *C. grandiflora* is the easiest species of the genus to distinguish by its showy petals. In the other 3 species, the petal sizes or other morphological characters often overlap. In *C. orientalis* and *C. rubella*, which are selfcompatible and therefore do not require pollinators, the petals are smaller when compared to *C. grandiflora*. *C. orientalis* is distinguished by the difference in color tone, which is obvious when its populations coincide with *C. bursa-pastoris* (bright white in *C. bursa-pastoris*, off white-yellowish in *C. orientalis*, photographs obtained from Dmitry German). However, it was not possible to distinguish this tone difference in the herbarium samples. When the herbarium specimens were examined closely, it could be understanding that this difference in tone is due to the fact that *C. orientalis* has smaller petals when compared to *C. bursa-pastoris*. The tetraploid *C. bursa-pastoris* comes after *C. grandiflora* in terms of petal size. The petals measure 1.5–3 × 0.8–1.5 mm. In the diploid *C. orientalis* and *C. rubella*, the petals are well reduced and are 1.5–2.0 (2.5) × 0.6–1 and 0.7–1.7 × 0.5–0.8 mm, respectively. In fact, *C. rubella* and *C. orientalis* are 2 very interesting examples that may allow us to understand convergent evolution. In 2 distant regions of the world (as mentioned above, in the Mediterranean and high central Asian steppes, respectively), they emerged independently but evolved almost identical flower characters related with the same selfing character and ploidy level (Woźniak et al., 2020). Even the petal sizes, which are the most suitable character to be used in identification keys, intersect with each other, as can be understood from the measurements given herein; hence they result in situations that make morphological diagnosis impossible. There have been studies showing that the petal length is a character that is easily affected by temperature, so that the petal area is a more distinctive character than the petal length (Neuffer and Paetsch, 2013). The petal area is not a practical character that can be used in identification keys, but instead, a more distinctive character set can be created by evaluating the petal width along with the petal length.

3.1. Nomenclature

Capsella Medik., Pflanzen-Gatt.: 85 (1792), [*nom. cons.*] Conserved at the International Botanical Congress of Vienna-1905, Briquet, 1912 (see also, Turland 2018 and ICBN[14] web site).

Type species: *Capsella bursa-pastoris* (L.) Medik. Pflanzen-Gatt.: 85 (1792). [*typ. cons.*] (bas.: *Thlaspi bursa-pastoris* L. 1753).

Syn.: *Bursa-pastoris* Tourn. ex Rupp., Fl. Jen., ed.3: 87 (1745), [*nom. inval.*]; *Bursa-pastoris* Ség., Pl. Veron. 3:166 (1754), [*nom.rej.*]. *Bursa* Boehm., Def. Gen. Ed. 3. 225 (1760); *Bursa* Weber ex F.H. Wigg., Prim. Fl. Holsat. 47 (1780), [*nom. illeg.*]; *Nasturtium* Roth. Tent. Fl. German. 1:281 (1788) [*nom. illeg.* non Miller 1754; non R. Brown 1812]. *Marsypocarpus* Neck., Elem. III, 91 (1790) [*nom. inval.*]. *Rodschiedia* P. G. Gaertn, B. Mey. & Scherbius, Oekon Techn. Fl. Wetterau 2: 413–435 (1800) [*nom. illeg.*].

3.1.1. *C. bursa-pastoris* (L.) Medik. Pflanzen-Gatt.: 85 (1792).

Lectotype (bas.): *Thlaspi bursa-pastoris* L Sp. Pl. 2:647 (1753). LINN 825.15 [digital image!] < "http://linnean-online.org/7477/" accessed: 14.iv.2019>. Designated by Fawcett & Rendle (1914).

Syn.: Important synonyms are below. Other synonyms are given in the Appendix:

=*Capsella* apetala Opiz 1821: Spe mutant of *Capsella bursa-pastoris*. This mutation causes the petals to develop into stamens, the flower is without petals, but with 10 stamens instead of 6. These mutants have helped to understand the genetic mechanisms of floral evolution, and are still present (Hintz et al., 2006; Nutt et al., 2006; Theißen, G., 2006; Neuffer et al., 2020).

=*Capsella heegeri* Solms Bot. Zeit. 58: 167 (1900). t.VII. This plant, which is distinguished from *C. bursa-pastoris* by its ellipsoid fruit, is another mutant of *C. bursa-pastoris*, and it has been understood via the hybridization studies conducted by the geneticists at the beginning of the 20th century, especially by Shull. Its population in nature disappeared shortly after it was found, but it was taken into culture for a while and examined genetically. It is an important taxon in terms of genetic studies, as it plays a role in understanding alleles effective in the morphology of Brassicaceae fruit. A sample from the cultivation studies of Solms: Germany, Landau, B 10 0241407 [digital image !].

https://ww2.bgbm.org/Herbarium/specimen.cfm?Barcode=B100241407

=*Capsella hispida* Hobkirk, 1869. Extreme and interesting samples of *C. bursa-pastoris* with very dense indumentum. The indumentum is quite variable in *Capsella bursa-pastoris*, both in frequency and in composition. Therefore, it cannot be said that it is a different species from *C. bursa-pastoris* based on the indumentum alone; however, although on first impression it appears that it is conspecific with *C. bursa-pastoris*, it is believed that further studies, especially molecular, should be conducted to confirm its status. Hobkirk, referred to 2 samples that have been housed at K in the protologue: 'Colonel Chesney's expedition to the Euphrates, No. 43.

[14] ICBN (2022). International Code of Botanical Nomenclature [online]. Website https://naturalhistory2.si.edu/botany/codes-proposals/display_new.cfm [accessed 8 March 2022].

Port William. March 1836. On the Mesopotamian side. Gardens' and 'Bagdad. April 1862. Dr Schlafi.' He did not choose a holotype within them. There is a 'Type specimen!' note on both. Hence,

Lectotype (**designated here**): 'Colonel Chesney's expedition to the Euphrates, No. 43. Port William. March 1836. On the Mesopotamian side. Gardens' K000484352 [digital image !] coded sample.

=*Capsella lycia* Stapf, in Denkschr. Akad. Wien II. (1886) 362.

Lectotype (**designated here**): Turkey, Lycia, Minara (present name, Fethiye Pınara). W**U 0107071! http://jacq.org/detail.php?ID=1521134**

In Flora of Turkey, Hedge (1965) mentioned *C. lycia* Stapf under the heading "species imperfectly know", and stated that he did not see the type, so he was unable to confirm its taxonomic status. The type sample was found in WU, the lectotype assignment was performed, and it was determined that it is a synonym of *C. bursa-pastoris*.

Otto Stapf did not cite any type in the protologue. He traveled to Lycia in 1882, accompanied by anthropologist Felix von Luschan, and they collected most of the plants together. The label of the WU 0107071 coded sample contains the names of both, and the handwritten notes of Stapf, which state '*Capsella grandiflora* Bory et Chaub. (=C. Lycia)n)). Lycia, Minara, Stapf et Luschhan', along with additional notes about its difference from *C. bursa-pastoris* and from *C. grandiflora*, as explained in the protologue as well. Details of the vegetative parts, i.e. the leaves, stem branching, pedicel length, and indumentum, were compatible with the protologue. Stapf emphasized both in his notes on the sample and in the protologue that the taxon was different from other species in that the apex of the silicle was rounded (not emarginate or retuse). In fact, a rounded apex is an ordinary character that can often be observed in the ovaries and immature silicles of *C. bursa-pastoris*. Judging by the notes on it, and by the similarities with the protologue, this example is undoubtedly a type sample. Although other herbaria were searched, no other type was encountered. However, it is doubtful that this is the only type and that the protologue is based solely on this (hence, whether it should be a holotype or a lectotype), because Stapf gave the length of the sepals as 2.5 mm and the length of the petals as 4.5 × 3 mm. However, in this sample, the sepals are at most 1.5 mm and the petals are at most 2.5 mm long. It is unclear if Stapf had examined another sample (or samples that may have belonged to another species) or if the dimensions given in the protologue were a measurement error. A petal size of 4.5 × 3 mm is indeed a petal size that belongs to *C. grandiflora*. However, there are no such long petals in this *C. lycia* sample, nor does the *C. grandiflora* taxon exist in Anatolia, as has been explained in detail below, under the heading of *C. grandiflora*. In the herbaria, it was noticed that there was confusion in cataloging the taxa of which Stapf was the author, because the collector was not Stapf, but Luschan, whose name was not mentioned in the protologues. This *C. lycia* specimen was not cataloged by this name, nor was it registered among the specimens deposited by Stapf. However, it was found when the collection deposited by Luschan was searched (after reading about the expeditions by Stapf and learning that he had collected plants with Luschan). Considering the contradiction (or measurement error?) between this sample and the protologue, and considering that there was a cataloging problem in the collections of Luschan and Stapf, the possibility that there might be another syntype (or syntypes), that may have been lost, must be considered; hence, it is believed that this sample should be a lectotype rather than the holotype (Art. 9.1. Note 1, Turland et al., 2018).

3.1.1.1. *Capsella studies* and synonyms of E.B. Almquist and G.C. Druce:

Although all of the *Capsella* taxa named by Almquist[15] are synonyms of *C. bursa-pastoris* (and a few of *C. rubella* and *C. grandiflora*), they are very valuable because they can show all of the variations that can be seen in *C. bursa-pastoris* with definitions and illustrations. In fact, Almquist did not gather his collections in the field. He named the plants that he cultivated by sowing *C. bursa-pastoris* seeds that were sent from different countries of Europe, as infraspecific categories of *C. bursa-pastoris* according to their variations (Almquist, 1907). Almquist mentioned these names as species, varieties, and sometimes, as forms of *Capsella bursa-pastoris* in his works. For example, in Almquist, 1907, he listed them as: "List of species, forms and varieties negotiated," but did not specify which taxa was in which rank. In the introduction of Almquist, 1921, when he mentioned the plants that he named, he used both of the terms 'species' and 'forms', but again without specifying which taxa was in which rank. From his expression, it was understood that he approached the concept of species from a horticultural perspective, not from a taxonomic perspective, and used the concept of species in terms of a horticultural variety. This approach continued both in 1907 and in his later publications. Therefore, it would be more correct to accept the ranks of Almquist's taxa as unranked infraspecific taxa rather than the species, as mentioned in the IPNI. According to Art.37.3, these unranked names were validly published, since they were published before January 1, 1953 (Turland et al., 2018), but are still synonymous.

[15] Although it is abbreviated as Almq in the IPNI, he abbreviated his name as E. At. in his publications. The usual, common abbreviation was chosen herein to avoid confusion in the article, but it is noted that the abbreviation E. At. also represents Almquist.

The descriptions and figures in the works of Almquist were examined within the scope of the research herein. There are 53 *Capsella bursa-pastoris* taxa named by Almquist in the BM, which were also examined (according to Stafleu and Mennega 1992, *Capsella* samples of Almquist should be in B, BM, OXF, and S herbaria, but no sample could be found that belonged to Almquist in the catalogs of other herbaria outside of the BM). Except for the synonyms given herein under *C. rubella* and *C. grandiflora*, all are synonyms of *C. bursa-pastoris*. However, *C. bursa-pastoris* is a species that cannot be divided into formal infraspecific taxa, because intra-specific variations do not constitute distinct populations. It is possible to find individuals with very different variations within the same population. For this reason, it is a correct decision to accept all of the infraspecific taxa of Almquist as synonyms of *C. bursa-pastoris*.

Druce, raised some of the taxa of Almquist into the species category under *Bursa*, considering that *Bursa* was the correct name for the genus according to the priority rule (whereas *Capsella* was conserved at the 1905 Vienna Congress).

The synonyms and references of both Almquist and Druce are given in Appendix. The links to the publications cited herein, including the protologues, are given in the references section.

3.1.1.2. Shull's Capsella studies and synonyms

Shull (1909) repeated the cultivation studies of Almquist, showed that Mendelian inheritance was effective in determining leaf morphology with his crosses, and named 4 unranked infraspecific *C. bursa-pastoris* taxa based on 4 main rosette leaf types (heteris, rhomboidea, simplex, and tenuis). This observation was confirmed by later researchers with the addition of information that there are additional genes responsible for the modifications and also that environmental conditions pronounced the modifications. (Neuffer, 1989; Hurka and Neuffer, 1997). Leaf morphology is not a useful taxonomic character, as it shows wide variation within the species.

The names given by Shull are listed in Appendix. These names are referred to as varieties in the IPNI, but in fact, like Almquist, Shull did not specify a precise infraspecific rank. In his article "*Bursa bursa-pastoris* and *Bursa heegeri*: Biotypes and hybrids", he referred to the names that he gave as 'elementary species or biotypes'. As with the names given by Almquist, according to Art.37.3, these names were validly published, since they were published before January 1, 1953 (Turland et al., 2018); however, the work by Shull was actually a continuation of the work by Almquist. He combined 5 to 10 names by Almquist under of each of his taxa. Therefore, he violated the priority rule for the second time (Almquist had already neglected it once by giving names to individuals, all of whom were biotypes of *C. bursa-pastoris*). In this respect, the 1909 dated nomenclatures by Shull were also nom. illeg., as were the names given by Almquist.

3.1.1.3 Description of *C. bursa-pastoris*

Simple or branched, 5–60 cm tall herbaceous annual, simple hairs and 3–5 branched hairs densely or sparsely coexist. Basal leaves rosette-forming. Basal leaf length 1–12 × 0.5–4 cm, entire, toothed, pinnatifid, pinnatipartite, pinnatisect, lyrate, runcinate or mix of these forms (see below: heteris, tenuis, rhomboidea, and simplex leaf types). Stem leaves, sessile, semiamplexicaule, or auriculate, sagittate, lanceolate, oblong or linear 1–6 × 0.3–2 cm, entire or toothed.

Racemes lax, many flowered, ebracteate. Sepals green, rarely reddish, ovate to oblong, 1–2 × 0.8–1 mm. Petals white 1.5–3 × 0.8–1.5 mm. Sometimes lacking. Petals at least 0.4 mm longer than the sepals. Stamens 6, tetradynamous: longs: 1.3–2 mm, shorts: 1–1.7 mm. They are close to or shorter than petals. Ovary ovoid or triangular. Fruit stalk 5–17 mm, diffuse or ascending at right angle. Fruit, dehiscent, angustiseptate silicle, 5–9 × 3–9 mm, flat, obdeltoid to obcordate, length more than width. Style 0.2–0.7 mm included or exserted from apical notch.. Seeds 5–17 in each loculus, mucilagous when wet.

Habitat: Fields, roadsides, distributed areas.

Distribution: Worldwide.

The general habitus, leaf, and indumentum features of *Capsella bursa-pastoris*, in short, are vegetative characters that are common to all species of the genus. The organs of Capsella species that show the highest level of variation are the leaves. All researchers interested in the genus have attempted to make a classification by taking leaf variations into account. The 4 main leaf types that Almquist (1907, 1921, 1923) suggested, and Shull (1909) simplified and reduced to 4, and were later followed by Aksoy (1999) are comprised heteris, tenuis, rhomboidei, and simplex. However, in *C. bursa-pastoris*, different levels of fragmentation, which are their intermediate forms, can be found both in different individuals and even on the same individual. The degree of leaf fragmentation and sinus depth may also vary depending on the light and temperature, and therefore the season. As Almquist (1923) observed, the depth of the sinus is less in the leaves that develop in summer, and there are more entire. According to what Shull (1909) observed and stated in his cultivation experiments, the remaining entire leaves, showing weak development and not disintegrating, can also be seen in shaded plants. Although it is not possible to determine definite boundaries, in general, the leaf fragmentation in *C. grandiflora* and *C. orientalis* is slightly less than in other species, and simplex-type leaves are seen predominantly in these 2 species. Whereas in *C. rubella*, more fragmentation is present. It was observed that there are more heteris- and tenuis-type leaves in this species.

Shull (1909) described 4 main *Capsella* leaf forms perfectly as:

"Heteris: Leaves divided to the midrib, the terminal lobe being usually separated from the nearest lateral lobes by deep, clean-cut incisions. The lateral lobes consist essentially of 2 features: An elongated, attenuate portion, which I call the "primary lobe" and a more or less rounded or angular portion, which forms a "secondary lobe" in the distal axil of the primary lobe" (Figure 1).

Tenuis-type leaves differ from the heteris-type by relatively shallow sinuses that do not extend (or rarely extend) to the midrib and by not having a rounded "secondary lobe" on the lateral lobes. All of the lateral lobes are more slender than in the heteris-type, and are elongated and acute (Figure 1).

Rhomboidea-type leaves have less divided, rounded lateral lobes with sinuses extending to the midrib. When growing in unfavorable conditions (i.e. in the shade), incisions do not develop and leaves become entire (Figure 2).

Simplex-type leaves are similar to the tenuis-type, in that the sinuses never reach the midrib, but differ by rounded or triangular (not acute) lobes. This type of leaf can be entire as well (Figure 3).

3.1.2. Capsella rubella Reuter, Compt.-Rend. Trav. Soc. Haller. 2: 18 (1854).

Lectotype (**designated here**): G00414318 ! coded sample. France: Gaillard, Mai 1853 (Figures 4A and 4B) The specimens that Reuter mentioned in the protologue that he collected from Gaillard and Montbrillant in 1853 are in the

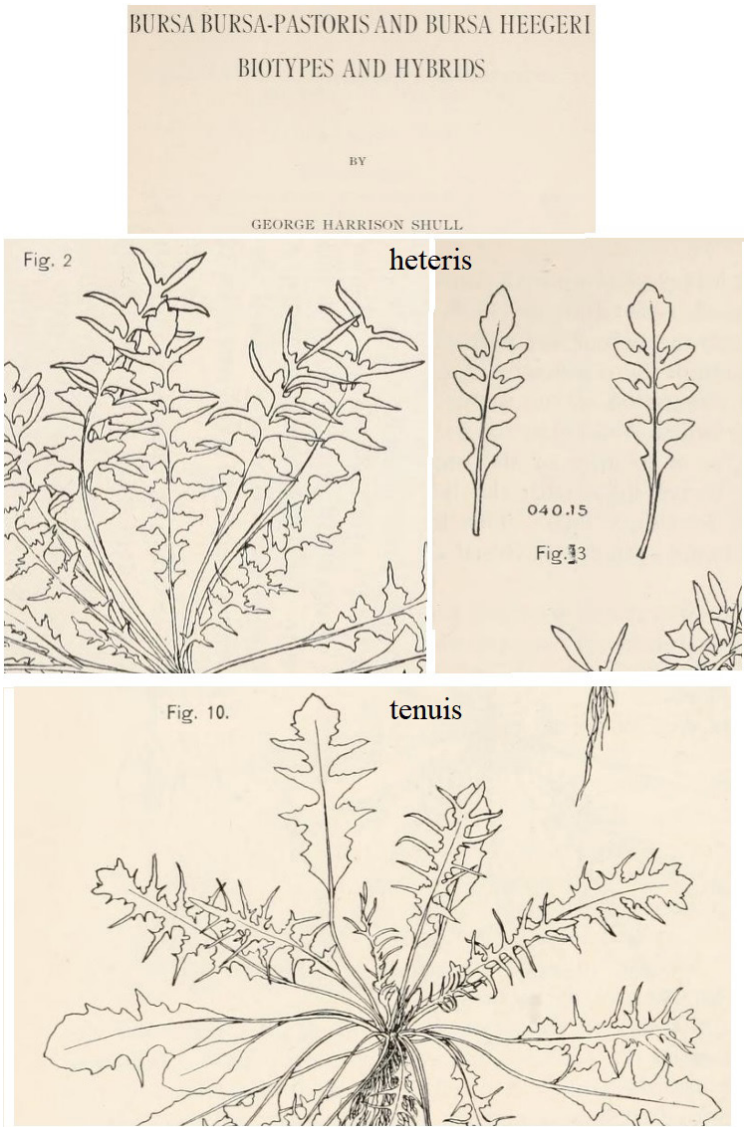

Figure 1. Heteris- and tenuis-type leaves from Shull (1909).

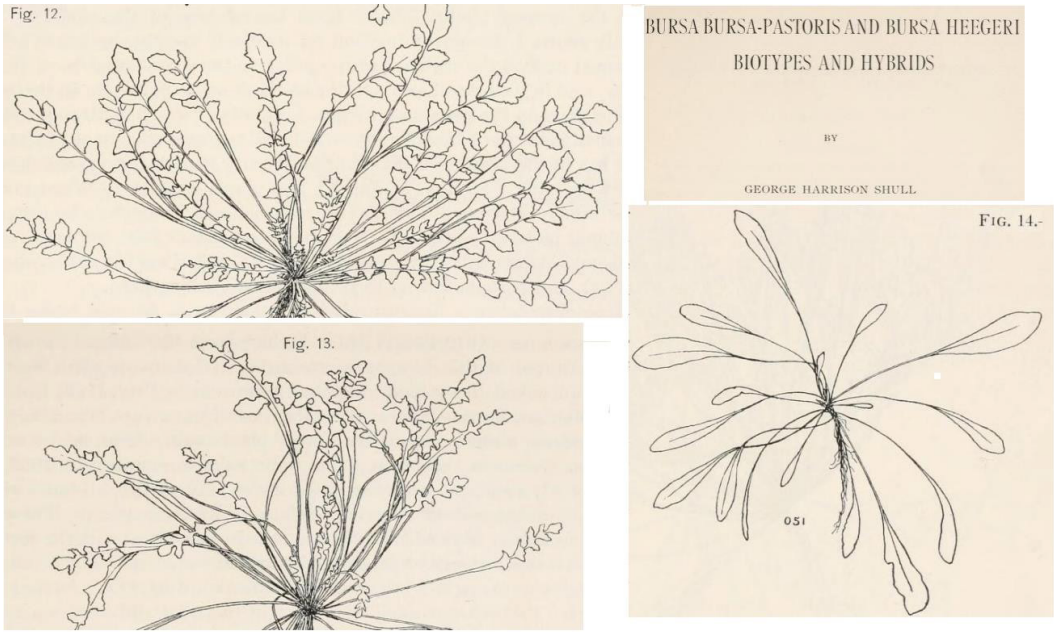

Figure 2. Rhomboidea-type leaves from Shull (1909).

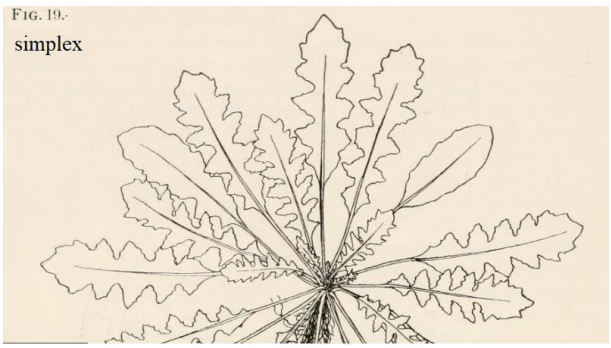

Figure 3. Simplex-type leaves from Shull (1909).

Geneva Herbarium. The Gaillard sample is housed under the G00414318 ! code and the Montbrillant sample is with the G00414317 ! code. Reuter explained the collection on which the species was based as: "We first observed this species with MM Muret and Fauconnet at the end of April 1853 near the church in Confignon. Later, I collected it from Gaillard and Montbrillant near Geneva". He probably did not take samples from the plants he observed in Confignon. There are no samples that have been collected from this locality in herbaria. He did not select a holotype among the Gaillard or Montbrillant samples. According to Art.9.7. Note 5. (Turland et al., 2018), when no holotype is designated, there will also be no paratypes and all of the cited specimens will be syntypes. Hence, although the collection localities are different, both the Gaillard and Montbrillant specimens are syntypes. There are already herbarium-type labels with handwritten 'syn' prefix (by ambiguous writer) on both. From these 2 syntypes, the Gaillard sample numbered G00414318 was chosen as a lectotype, as it carries exactly the same description in the protologue, with the handwriting of Reuter on it. There are JE 00002466 ! coded samples in the Jena Herbarium that were collected from Gaillard and kept under the title of 'probable type'! However, this sample is dated 1854 and there are samples collected from the same date in the Herbaria of Vienna (W no: 22651!) and Geneva (G00361618!) as well. Reuter, who was the curator of the Geneva Herbarium at that time, probably collected them from this locality, which is very close to the Herbarium, both in 1853 and 1854. However, the plants he used when publishing the species are in the 1853 collection, as he stated in the protologue. For this reason, the G, JE, and W samples dated 1854 are not syntypes.

Syn.: *Thlaspi rubellum* (Reut.) Billot 1858. Annotations à la Flore de France et d'Allemagne 124.

Capsella rubescens Personnat 1861. Bulletin de la Société Botanique de France 7: 511.

Capsella bursa-pastoris subsp. *rubella* (Reut.) Hobkirk 1869 Bulletin de la Société Royale de Botanique de Belgique 8: 455

Crucifera rubella (Reut.) E.H.L. Krause. 1902. Deutschlands Flora oder Botanisches Taschenbuch ed. 2, 6: 145.

Capsella bursa-pastoris [unranked] *rubella* (Reut.) E.B.Almq 1907 Acta Horti Berg. 4(6): 15, fig. 6 and 7

Bursa rubella (Reut.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(5): 864 (1926).

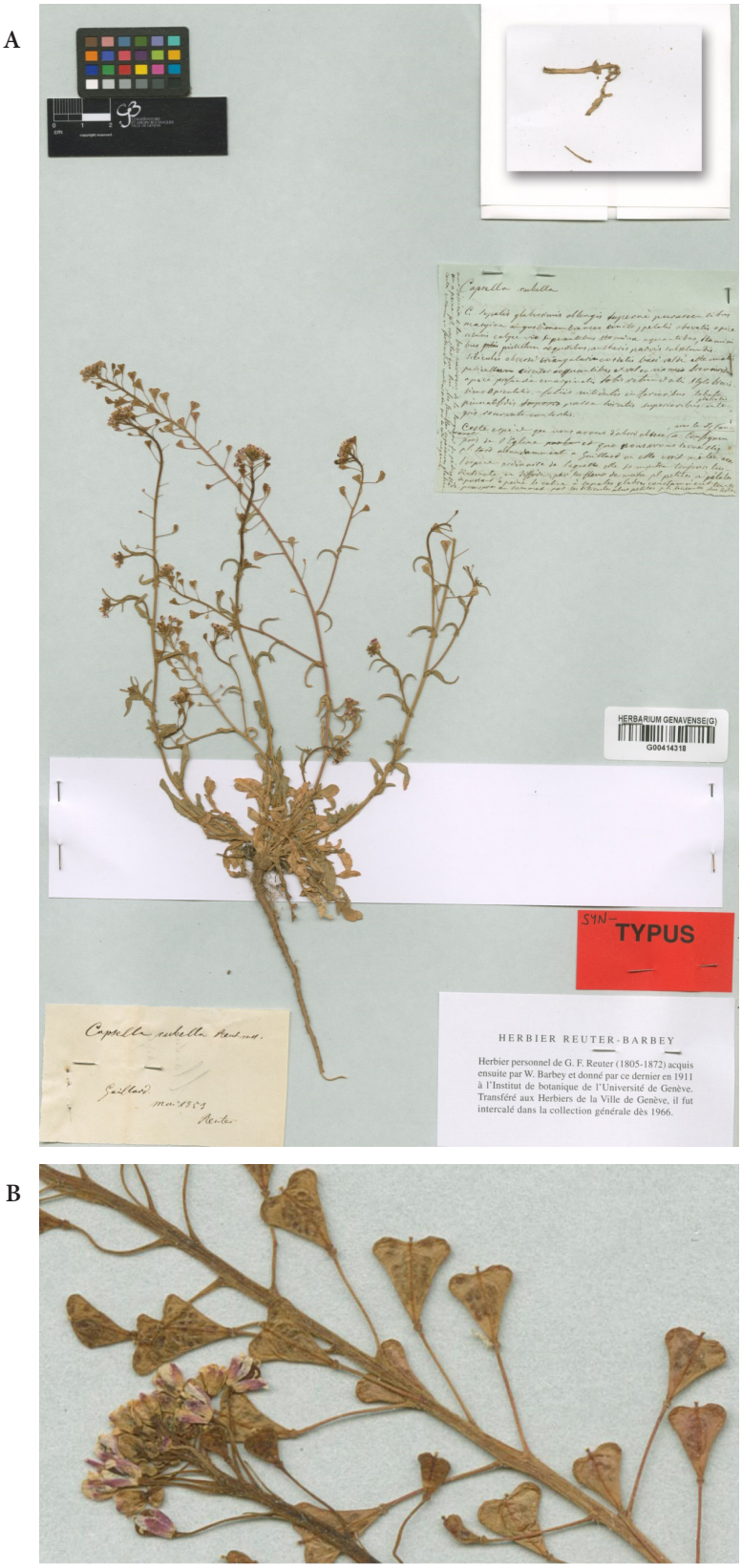

Figure 4. A. Lectotype of C. rubella G00414318. France: Gaillard, Mai 1853. B. Details from the lectotype.

3.1.2.1. Description of *C. rubella*

Vegetative organs as such *C. bursa-pastoris*. It differs from *C. bursa-pastoris* by its flower and silicle features. Sepals generally red, oblong, 0.7–1.3 × 0.5–0.9 mm. Petals white, 0.7–1.7 × 0.5–0.8 mm. Petals the same height as the sepals, or up to 0.4 mm longer. Stamens, long: 0.8–1.2, short: 0.5–0.8 mm. Ovary ovoid or triangular. Fruit stalk 4–10 mm, diffuse or ascending at right angle. Silicle wingless, 3–6 × 3–5 mm, flat, obdeltoid. The bottom is narrowed. The top is round, concave, notch slightly indented. Style 0.3–0.5 mm. Seeds 8–11 in each loculus, mucilagous when wet.

Habitat: Fields road sides.

Distribution: Mediterranean, Europe, North Africa, Anatolia.

3.1.3. Capsella grandiflora (Fauché & Chaub.) Boiss. Diagn. Pl. Orient. ser. 1: 76 (1843).

Holotype (bas.): *Thlaspi grandiflorum* Fauché & Chaub. Nouv. Fl. Pélop. (1838), 41. pl. XXIV. fig. 3 !

Chaubard (1838) mistakenly referred to pl. XXXVIII fig. 3. In the protologue. Boissier repeated this error. However, the drawing of *Thlaspi grandiflorum* is in pl.XXIV. fig.3 and there is a *T. grandiflorum* caption underneath it without any doubt (Figure 5). In pl.XXXVIII, there is the name and figure of *Nephrodium pallidum* Bory.

Syn: *Bursa grandiflora* (Fauché & Chaub.) Kuntze Revis. Gen. Pl. 1: 20 (1891).

Capsella bursa-pastoris [unranked] *grandiflora* (Boiss) E.B.Almq. 1907 Acta Horti Berg. 4(6): 20, fig. 13.

Bursa grandiflora (Fauché & Chaub.) Shull, Proc. Int. Congr. Pl. Sci. Ithaca 852 (1929).

3.1.3.1. Description of *C. grandiflora*

Vegetative organs as those of *C. bursa-pastoris*. Simplex-type is more common in leaves. Less divided, often entire. Indumentum sparse. Sepals light green, with broad white membranous margin, glabrous to very sparsely pubescent, ovate, 1–2 × 0.9–1.2 mm. Petals, broadly obovate, entire or slightly undulate at apex, 3–5 × 2.5–3 mm. Petals at least 2 mm longer than sepals. Stamens shorter than petals, long: ca. 2.3 mm, short: ca. 2 mm. Fruit stalk 10–20 mm, diffuse at right angle or ascending, prominent. Silicle wingless, 5–7 × 4–6 mm, flat, triangular-obcordate, slightly or deeply emarginate. Length always exceeds width. Style 0.3–0.8 mm. Seeds 8–12 in each loculus, mucilagous when wet.

At sources like the POWO, Güner et al. (2012), or Bizimbitkiler (Mutlu, 2012), it appears that the species exists in Turkey. However, no sample representing this taxon that was collected from Turkey or from localities adjacent to Turkey, such as eastern Greece or the Aegean Islands, could be found in the visited herbaria. The cause for the misconception that it is distributed in Turkey is probably its confusion with *C. lycia*. As it is understood from the notes on the lectotype of *C. lycia*, Stapf identified this sample as *C. grandiflora* first. Then, he published it as a new taxon, *C. lycia*. *C. grandiflora* is a species that has been identified from southwestern Greece. Its natural distribution is from southwestern Greece to the western Balkans and northern Italy, namely, along the coasts of the Ionian Sea. It has no natural distribution along the Aegean Sea sides, or in Anatolia.

Habitat: Fields, road sides.

Distribution: Along the coasts of the Ionian Sea. Greece, Albania, Italy.

3.1.4. Capsella orientalis Klokov, Bull. Soc. Nat. Woronesh. I. 122 (1922)

Lectotype : KW007073 [photo !] Designated by Ilyinska (2002).

Syn.: *Capsella bursa-pastoris* subsp. *orientalis* (Klokov) Tzvelev 2000.

3.1.4.1. Description of *C. orientalis*

Vegetative organs as in *C. bursa-pastoris*. Sepals light- or yellowish-green, 1–1.5 mm. Petals white, obovate, entire 1.5–2.0(2.5) × 0.6–1 mm. Petals masked by sepals so that flowers appear yellowish in the field. Stamens shorter than petals. Fruit stalk 5–10 mm. Silicle wingless, 5–6 × 4–4.5 mm, flat, triangular-obcordate, deeply emarginate. Style 0.25 mm.

Habitat: Steppe.

Distribution: Eastern Europe, Altai territory, southern Trans-Urals, Kazakhstan, and northwestern China (German and Ebel, 2009) (German et al., 2012).

3.1.5. Capsella ×gracilis Gren 1857. Mém. Soc. Emul. Doubs III, 2: 403.

Capsella bursa-pastoris* × *Capsella rubella

Holotype: P/ MNHN-P-P04023511 "Port de la Joliette, Juin 1856, herb. Grenier (unnumbered sample) [photo !] (Figures 6A and 6B).

Grenier (1857), when listing the exotic flora of the surroundings of Marseille, described *C. gracilis* as a species similar to *C. rubella*, but did not specify a geographical origin or a type. Grenier defined *C. gracilis* as a hybrid of *C. bursa-pastoris* and *C. rubella* in Grenier, 1865, but again did not specify a particular type. Auquier and Sérusiaux (1978) identified the specimen dated 1856 in herbarium P, belonging to Grenier and bearing the name of *C. gracilis*, as the holotype of the example, since it is the only specimen that can be a type specimen.

Syn.: *Bursa gracilis* (Gren) Druce 1918, Rep. Bot. Soc. Exch. Club Brit. Isles 5(1): 16.

Capsella bursa-pastoris subsp. *gracilis* (Gren.) O. Bolòs & Vigo 1974 Butl. Inst. Catalana Hist. Nat., Secc. Bot. 38 (1): 77.

3.1.5.1. Description of *C.* × *gracilis*

It is found at the intersection of *C. bursa-pastoris* and *C. rubella* populations. It is a sterile hybrid of the two. Vegetative organs are like those of *C. bursa-pastoris*. It differs from *C. bursa-pastoris* by its flower, fruit stem, and

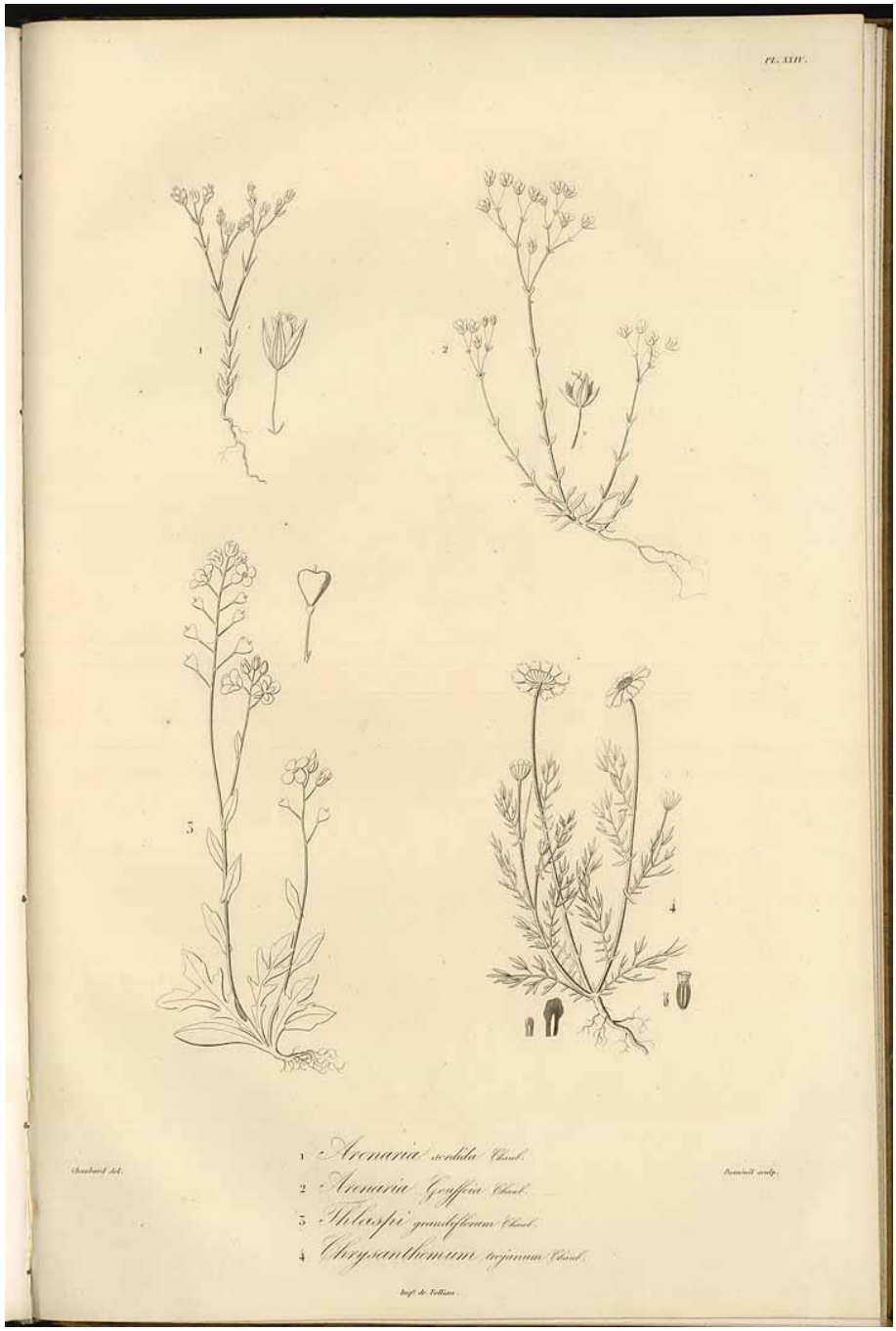

Figure 5. Holotype of *Capsella grandiflora*, bas. ≡ Thlaspi grandiflorum Fauché & Chaubard Nouv. Fl. Pélop. , 1838 pl. XXIV. fig. 3.

silicle features. Sepals green or reddish, oblong, 1–1.5 × 0.6–0.9 mm. Petals white 1.3–2.5 × 0.7–1.3 mm. Petals at least 0.3 mm longer than the sepals. Stamens 1–1.5 mm, anthers ovoid. Ovary ovoid or triangular. Fruit stalk 3–7 mm, diffuse at right angle or ascending. Silicle sterile, wingless, 1–3 × 1–3 mm, flat, obcordate, width and length equal, Stigma, 03–0.5 mm. Septum 0.7–2.5 × 0.5–1 mm. Seedless. Rarely, in some branches, there may be fertile silicles with few seeds, similar to C. rubella silicles.

Habitat: Fields, road sides.

Distribution: Mediterranean, Europe, North Africa, Anatolia. Where *C. bursa-pastoris* and *C. rubella* intersect.

3.1.6. Taxonomic situation of *C. thracica* and its synonym: *C.* × *abortiva*

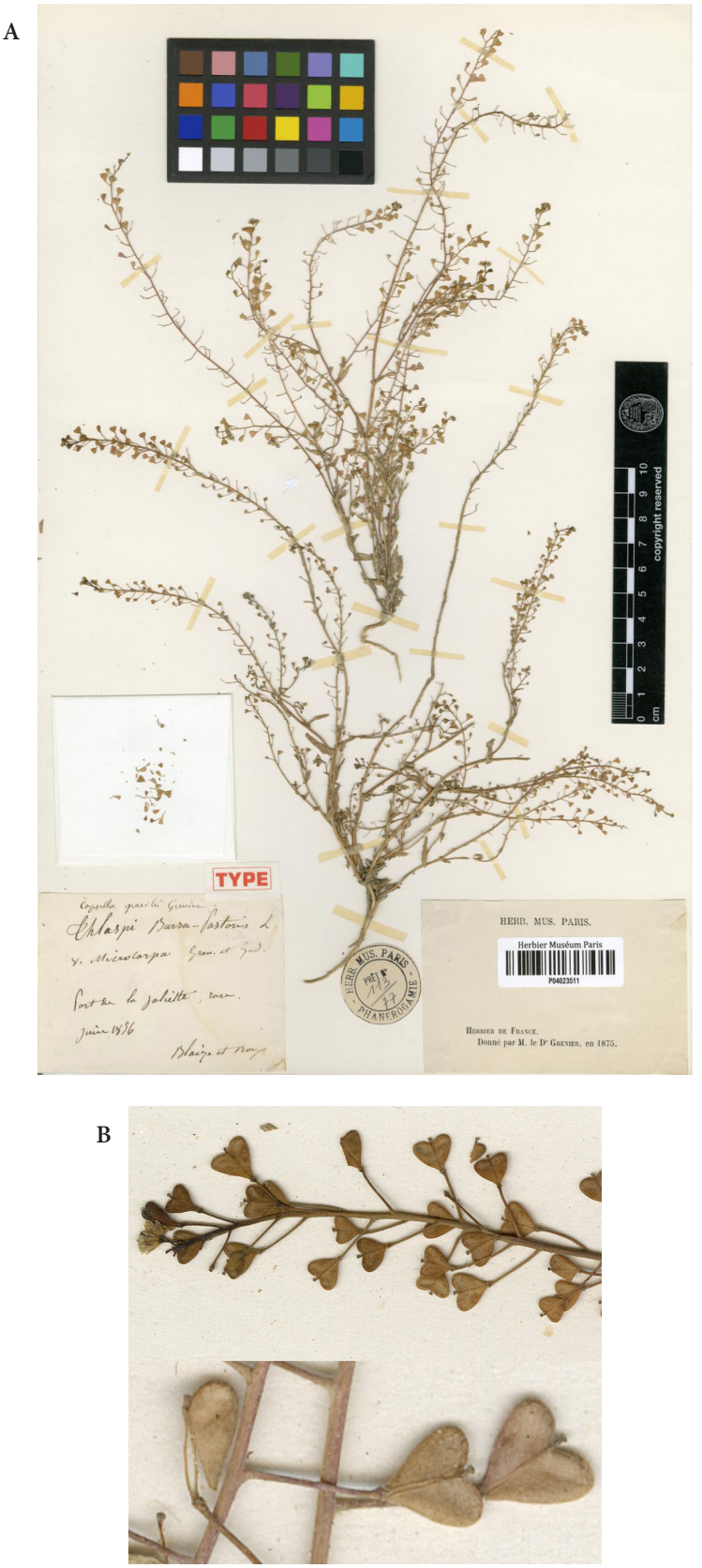

Figure 6. A. Holotype of *C.* x *gracilis* P/ MNHN-P-P04023511 "Port de la Joliette, Juin 1856, herb. Grenier. B. Details from the holotype.

Molecular phylogeny studies have shown that the tetraploid *C. thracica* Velen. 1894 taxon, which is endemic to Bulgaria, emerged as a result of allopolyploid hybridization between *C. bursa-pastoris* and *C. grandiflora* (Hurka et al., 2012; Neuffer et al., 2014).

When the samples of *C. thracica* were examined herein, it was seen that this taxon corresponds morphologically with *Capsella* × *abortiva* Haussk n 1893, which was defined from Greece by Haussknecht about a year before the publication of *C. thracica* (Figure 7 A and B). Moreover, Haussknecht was able to say that this taxon is a *C. bursa-pastoris* x *C. grandiflora* hybrid, based on population observations, and published the taxon as a hybrid, years before modern molecular studies. Haussknecht stated that while some were seedy, some silicles did not contain seeds in the samples that he collected and deemed the "abortiva" epithet suitable for the taxon. There was a similar situation in the type samples of *C. thracica* as well. Some silicles were fertile, some were small and unproductive, such as the *C. bursa-pastoris* x *C. rubella* hybrid *C. gracilis*. (Figures 6A and 6B).

Hence, C. × *abortiva* and C. *thracica* are conspecific. However here, the following question arises:

Is hybridization still occurring with *C. bursa-pastoris* and *C. grandiflora*? Is *C.* ×*abortiva* / C. *thracica*, a sterile or (semisterile) unstable, typical hybrid, such as *C.* ×*gracilis*, or is it an ancient hybrid that is a stabilized product of hybridization between the species? Acording to most recent molecular clock studies (Žerdoner Čalasan et al., 2021) the answer is the second option and according to Article H.3.3 Note 1., it should be called a species, not a nothospecies. Yet even then, according to the priority rule, it cannot be named *C. thracica*, it must be *C. abortiva* (according to Article H.10.1. Note 1, Article 50 and Art. 3.3.2. as well, Turland et al., 2018). Distribution characteristics also prove that *C. abortiva* have already speciated: The distribution of *C. abortiva* / *C. thracica* does not show a typical hybrid zone characteristic like *C.* × *gracilis*. There are herbarium samples[16] belonging to this taxon from a narrow region from Bulgaria to Istanbul (Balkans-Thrace). In these regions, *C. bursa-pastoris* occurs, but the problem is that in these regions there is no evidence about the existence (such as a herbarium specimen or a publication) of the other parent species, *C. grandiflora*. According to the available evidence, *C. grandiflora* is a species that is found around the Ionian Sea. No herbarium specimens were encountered from the Aegean Sea sides or from Thrace. This situation points that, *C. abortiva* is not a new hybrid, it is a fertile species that has formed as a result of allopolyploid speciation, but has completed its speciation and has its own distribution boundaries.

***Capsella abortiva* Haussk n., Mitth. Thüring. Bot. Vereins iii. et iv. 116 (1893).**

Lectotype (**designated here**) (Figure 7A): Lectotype was chosen among the specimens determined as syntypes in the JE herbarium by J. Müller. Among these syntypes, whose collection dates (1885) and collection localities (Korona) are compatible with the protolog, the JE00005948 [digital image !] coded sample that bears the *C. abortiva* name written by Haussknecht's own handwriting and the information that it is a hybrid of *C. bursa-pastoris*-*C. grandiflora* was chosen as the lectotype. JE00005947, 2 samples on the JE00005949, JE00005950 JE00005951 and JE00005952 [digital image !] are isolectotypes.

Syn.: =*Capsella thracica* Velen., in: Sitzungsber. Königl. Böhm. Ges. Wiss., Math.-Naturwiss. Cl. 1893 (37); 11. 1894. (On the first page of the volume for 1893, the year of the publication was stated as 1894: (https://www.biodiversitylibrary.org/item/110403#page/9/mode/1up). Therefore, the 1893 dated *C. abortiva* has priority over C. *thracica*.).

C. thracica has 4 syntypes in the PRC, all of which are registered as holotypes. Velenovský did not specify a holotype in the protologue, so a lectotype designation is required. There is a Ancev's !Lektotipes! label on all of the samples. It was not possible to find any typification publication of Ancev. Hence, the right one was chosen from the samples on the herbarium sheet with the code PRC 451195 [digital image!].

Lectotype (designated here) (Figure 7B): Velenovsky 5.1893. Bulgaria. In graminosis supra vicum Tekir non procul a fontibus calidis' PRC 451195 [digital image!]

Isolectotypes: PRC 451196; PRC 451197; PRC451198 [digital images!].

There is a JE 00002701 [digital image !] coded sample in JE that is registered as an isotype with 'typified by J. Müller' note. It is not believed to be an isotype (or syntype), it may become paratype because the collectors (Bornmüeller ex Velenovsky) and labels are different from the syntypes.

3.1.6.1. Description of *C. abortiva*

Vegetative organs as in *C. grandiflora*. Simplex-type is more common in the leaves. Less divided, often entire. Indumentum very sparse. Sepals light green as in *C. grandiflora*, with broad white membranous margin, glabrous to very sparsely pubescent. Ovate, 1–1.5 × 0.5–0.8 mm. Petals, obovate, entire and slightly longer than in *C. bursa-pastoris* (close to the length of that in *C. grandiflora*), 2–3,5 × 0.8–2 mm. Petals up to 2 mm longer than sepals. Stamens shorter than petals, as long as sepals. Fruit stalk 6–10 cm, diffuse at right angle or ascending, prominent. Silicle wingless, flat, triangular-obcordate, young fruit can be scarlet. There are 2 types of fruit: fertile and sterile. In

[16] Specimens that mentioned below, under the C. x abortiva and C. thracica captions Also: Turkey. İstanbul Yeniköy in territorio legationis Austriae in ruderalis, 19. VI., K.H.Rechinger-60754 (W!)

Figure 7. Details from the lectotypes of A (left): *C.* x *abortiva*, B (Right): *C. thracica*.

sterile ones, length and width are equal, apex rounded, notch not deep ca. 3 × 3 mm. In fertile ones, length is more than width 5–7 × 4–4.5. Style 0.4–1 mm.

Habitat: Fields, road sides.

Distribution: Bulgaria and Thracia Region of Turkey.

4. Conclusion

As a result of this study:

1. The number of accepted taxa in the world has been discussed and it has been concluded that the genus is represented by 5 species and 1 hybrid in the world.

2. Lectotypes were assigned to the names of 5 taxa: *C. rubella*, *C.* ×*abortiva*, *C. thracica*, *C. lycia*, *C. hispida.*

Capsella species are typical examples of the cryptic species concept, whose morphological boundaries are indistinct, but differ from each other from a molecular aspect, as well as the ploidy level, reproduction preferences, distribution borders, and/or habitats. These nonmorphological characters allow us to distinguish and formally name species without looking at their molecular differences. It should be borne in mind that since it is difficult to distinguish these cryptic species morphologically, it is always possible to add new species to the list from different parts of the world as a result of new molecular, ecological, and/or cytological studies.

4.1. Identification key to *Capsella* taxa

1. All silicles fertile, bearing seeds
2. Petals 3–5 × 2.5–3 mm. ..... ***C. grandiflora***
2. Petals 0.7–3 mm.
3. Petals 1.5–3.0 mm long. 0.8–1.5 mm in the widest part. Petals at least 0.4 mm longer then the sepals. Petals not masked by green or purplish sepals. ***C. bursa-pastoris***
3. Petals 0.7–2.0(2.5) mm
4. Petals 1.5–2.0(2.5) mm long, 0.6–1 mm in the widest part. Masked by light- or yellowish-green sepals, so that flowers in vivo appear off white-yellowish. ***C. orientalis***
4. Petals 0.7–1.7 mm long, 0.5–0.8 mm in the widest part, almost equal to the sepals or longer to maximum 0.4 mm, sepals scarlet. ***C. rubella***
1. Most or some of the silicles are sterile, without seeds.
5. Almost all of the silicles are sterile, equal in width and length. *C.* x ***gracilis***
5. Silicles heteromorphic. The width of the infertile ones is equal to their length, the length of the fertile ones is more than the width. *C.* ***abortiva***

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Appendix

Synonyms of *Capsella bursa-pastoris*. All of the mentioned types have been examined

Names publoished by E. B. Almquist, 1907, 1921 and 1923[1]:

1. *Capsella bursa-pastoris* [unranked] *batavorum* E.B.Almq Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 197, t. 5, fig. b (1921). Syntypes: BM000582839 and BM000582840 E.B. Almq. 31
2. *Capsella bursa-pastoris* [unranked] *semirubella* E.B.Almq. Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 204, Fig.5.e (1921). Type: BM000582821 EB. Almq. 95
3. *Capsella bursa-pastoris* [unranked] *rhenana* E.B.Almq. Acta Horti Berg. 4(6): 71, fig. 59. 1907. Syntypes: BM000582860, BM000582861 and BM001134569 E.B. Almq.81
4. *Capsella bursa-pastoris* [unranked] *bremensis* Acta Horti Berg. 4(6):34. 1907.Syntypes: BM000582847 and BM000582848. E.B.Almq. Almquist 98
5. *Capsella bursa-pastoris* [unranked] *trevirorum* E.B.Almq. Acta Horti Berg. 4(6):76. Syntype: BM000582857. E.B. Almq. 79
6. *Capsella bursa-pastoris* [unranked] *mediterranea* E.B.Almq. Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 196, Fig 5.a (1921). Syntypes: BM000582817 and BM000582818. E.B. Almq. 314
7. *Capsella bursa-pastoris* [unranked] *belgica* E.B.Almq. Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 204, Fig.7.a (1921). Syntypes: BM000582841 and BM000582842. E.B. Almq. 94
8. *Capsella bursa-pastoris* [unranked] *latula* E.B.Almq. Acta Horti Berg. 4(6): 24, fig. 18. 1907. Syntypes: BM000582853, BM001134567 and BM001134568. E.B.Almq.210
9. *Capsella bursa-pastoris* [unranked] *reuteri* E.B.Almq. Acta Horti Berg. 4(6): 19, fig. 11. 1907. Type: BM001134565 E.B. Almq 222
10. *Capsella bursa-pastoris* [unranked] *provincialis* E.B.Almq. Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 200, Fig.6.c (1921). Syntypes: BM000582823, BM000582824 Almq 319
11. *Capsella bursa-pastoris* [unranked] *viminalis* E.B.Almq. Acta Horti Berg. 4(6): 44, 1907. Syntype: BM000582830 E.B.Almq 107
12. *Capsella bursa-pastoris* [unranked] *integrella* E.B.Almq . Acta Horti Berg. 4(6): 53. 1907. Syntypes: BM000582843, BM000582844.A.B.Almq 82
13. *Capsella bursa-pastoris*. [unranked] *druceana* E.B.Almq Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 199, Fig.6.b (1921). Type: BM000582835 E.B.Almq. 1409
14. *Capsella bursa-pastoris* [unranked] *retusa* E.B.Almq. Acta Horti Berg. 7(2): 64. 1923 Type: BM000582822 E.B.Almq 309
15. *Capsella bursa-pastoris* [unranked] *scolio-caspica* E.B.Almq Acta Horti Berg. 7(2): 52.Fig.5.g. 1923 Type: BM000582820 E.B:Almq 391
16. *Capsella bursa-pastoris* [unranked] *praelonga* E.B.Almq. Acta Horti Berg. 4(6): 42. Fig.32. 1907. Syntype: BM000582829 E.B. ALmq 103
17. *Capsella bursa-pastoris* [unranked] *germanica* E.B.Almq. Acta Horti Berg. 4(6): 76. 1907. Syntype: BM000582856 E.B.Almq 111
18. *Capsella bursa-pastoris* [unranked] *lata* E.Almq. Acta Horti Berg. 4(6): 23. Fig.16. 1907. Syntypes: BM000582851 and BM000582852 E.B.Almq 168
19. *Capsella bursa-pastoris* [unranked] *gallica* E.B.Almq. Acta Horti Berg. 4(6): 74 Fig. 62. 1907.Syntype: BM000582858 E.B.Almq 30
20. *Capsella bursa-pastoris* [unranked] *brittonii* E.B.Almq Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 198, Fig. 5 c (1921) Type: BM000582815 E.B. Almq. 1373

[1] The publication date of the 7th volume of the Acta Horti Bergiani periodical is 1923 rather than 1921 as mentioned in many sources, such as IPNI. Probably there was a 1921 dated preprint which Almquist cited in Rep Bot. Soc. Exch. Club Brit. Isles (1921) that caused confusion

21. *Capsella bursa-pastoris* [unranked] *cuspidata* E.B.Almq Acta Horti Berg. 7(2): 16. Fig.16.g. 1923 Type: BM000582834 E.B. Almq. 31
22. *Capsella bursa-pastoris* [unranked] *autumnalis* E.B.Almq. Acta Horti Berg. 4(6): 32. Fig. 24 and 25. 1907.Syntypes: BM000582845 and BM000582846 E.B. Almq. 35
23. *Capsella bursa-pastoris* [unranked] *grossa* E.Almq. Acta Horti Berg. 4(6): 29. Fig.22 and 23. 1907.Syntype: BM000582854 E.B. Almq. 110
24. *Capsella bursa-pastoris* [unranked] *turoniensis* E.B.Almq. Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 203, Fig.7.b (1921) Type: BM000582814 E.B. Almq. 406
25. *Capsella bursa-pastoris* [unranked] *tenuissima* E.B.Almq. Acta Horti Berg. 4(6): 79. Fig.65. 1907.Type: BM000582859 E.B. Almq.273
26. *Capsella bursa-pastoris* [unranked] *sinuosa* E.B.Almq. Acta Horti Berg. 7(2): 88. Fig.16.b. 1923 Type: BM000582819 E.B. Almq. 92
27. *Capsella bursa-pastoris* [unranked] *lanceolato-caspica* E.B.Almq. Acta Horti Berg. 7(2): 87. Fig.15.n, 1923 Type: BM000582828 E.B. Almq. 390
28. *Capsella bursa-pastoris* [unranked] *lutetiana* E.B.Almq Acta Horti Berg. 7(2): 74. Fig.12.a. 1923 Type: BM000582826 E.B. Almq. 212
29. *Capsella bursa-pastoris* [unranked] *longisiliqua* E.B.Almq. Acta Horti Berg. 7(2): 84. Fig.15.e. 1923 Type: BM000582827 E.B. Almq. 191
30. *Capsella bursa-pastoris* [unranked] *jeniseiensis* E.B.Almq. Acta Horti Berg. 7(2): 56. Fig.7.b. 1923 Type: BM000582836 E.B. Almq. 818
31. *Capsella bursa-pastoris* [unranked] *pontica* E.B.Almq. Acta Horti Berg. 7(2): 88. 1923 Type: BM000582825 E.B. Almq. 6
32. *Capsella bursa-pastoris* [unranked] *pergrossa* E.B.Almq. Acta Horti Berg. 7(2): 86. Fig.15.q. 1923 Type Syntype: BM000582832 E.B. Almq.113
33. *Capsella bursa-pastoris* [unranked] *abscissa* E.B.Almq. Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 193, Fig.8.b, (1921).Type: BM000582838 E.B. Almq. 225
34. *Capsella bursa-pastoris* [unranked] *patagonica* E.B.Almq. Rep. Bot. Soc. Exch. Club Brit. Isles 6(1): 202, Fig..3.f, (1921)Type: BM000582833 E.B. Almq. 527
35. *Capsella bursa-pastoris* [unranked] *origo* E.B.Almq. Acta Horti Berg. 7(2): 64, Fig.8.h, 1923 Type: BM000582816 E.B. Almq. 108F
36. *Capsella bursa-pastoris* [unranked] *concava* E.B.Almq Acta Horti Berg. 4(6): 12. Fig. 3. and 4 1907 Syntype: BM000582849 E.B. Almq. 44
37. *Capsella bursa-pastoris* [unranked] *acicularis*, 7(2), 81, 1923
38. *Capsella bursa-pastoris* [unranked] *aculeata*, 7(2), 63, 1923
39. *Capsella bursa-pastoris* [unranked] *acutiloba*, 7(2), 85, 1923
40. *Capsella bursa-pastoris* [unranked] *aequinoctialis*, 7(2), 57, 1923
41. *Capsella bursa-pastoris* [unranked] *aestívalis,* 4(6),60, 1907. Fig.12.g, 7(2), 75,1923
42. *Capsella bursa-pastoris* [unranked] *alandica*, 7(2), 86, Fig.15.i, 1923
43. *Capsella bursa-pastoris* [unranked] *albertina*, 7(2), 54, 1923
44. *Capsella bursa-pastoris* [unranked] *algida*, 7(2), 55, Fig.6.a, 1923
45. *Capsella bursa-pastoris* [unranked] *alpestris*, 7(2), 87, Fig.15.t, 1923
46. *Capsella bursa-pastoris* [unranked] *altissíma*, 7(2), 65, Fig.9. 1923
47. *Capsella bursa-pastoris* [unranked] *angermannica*, 7(2), 79, Fig.13.m, 1923
48. *Capsella bursa-pastoris* [unranked] *anglica*, 6(1), 202, Fig.6d, 1921
49. *Capsella bursa-pastoris* [unranked] *angustiloba*, 4(6), 68. Fig.56 and 57, 1907
50. *Capsella bursa-pastoris* [unranked] *bahusiensis*, 7(2), 82, 1923
51. *Capsella bursa-pastoris* [unranked] *bergiana*, 4(6), 49. Fig. 38, 1907
52. *Capsella bursa-pastoris* [unranked] *bicuspis*, 7(2), 83, Fig.15.a, 1923
53. *Capsella bursa-pastoris* [unranked] *biformis*, 4(6), 37, 1907. Fig.8.m, 61 in 7(2), 1923
54. *Capsella bursa-pastoris* [unranked] *bottnica*, 7(2), 68, Fig.9. d, 1923

55. *Capsella bursa-pastoris* [unranked] *brevisiliqua*, 7(2), 67, Fig.9.a, 1923
56. *Capsella bursa-pastoris* [unranked] *calmariensis*, 7(2), 80, Fig.13.g, 1923
57. *Capsella bursa-pastoris* [unranked] *caucasica*, 7(2), 65, Fig.9. k, 1923
58. *Capsella bursa-pastoris* [unranked] *cavata*, 7(2), 58, Fig.7.l, 1923
59. *Capsella bursa-pastoris* [unranked] *cavato-caspica*, 7(2), 52, 1923
60. *Capsella bursa-pastoris* [unranked] *collina*, 4(6), 54. Fig.43, 1907
61. *Capsella bursa-pastoris* [unranked] *compacta*, 7(2), 67, Fig.9. h, 1923
62. *Capsella bursa-pastoris* [unranked] *convexiformis,* 7(2), 60, Fig.8.q, 1923
63. *Capsella bursa-pastoris* [unranked] *convexiuscula,* 7(2), 82, 1923
64. *Capsella bursa-pastoris* [unranked] *cordata*, 7(2), 67, Fig.9. f, 1923
65. *Capsella bursa-pastoris* [unranked] *cordigera*, 7(2), 83, Fig.15.c, 1923
66. *Capsella bursa-pastoris* [unranked] *littoralis* forma *coronopus*, 4(6), 77. Fig.64, 1907
67. *Capsella bursa-pastoris* [unranked] *crassior*, 4(6), 80, 1907
68. *Capsella bursa-pastoris* [unranked] *cuneifolia*, 4(6), 50. 11. fig.1 and 2, 1907
69. *Capsella bursa-pastoris* [unranked] cuneiformis, 7(2), 75, Fig.12.e, 1923
70. *Capsella bursa-pastoris* [unranked] *cuneolata*, 7(2), 73, Fig.11.c, 1923
71. *Capsella bursa-pastoris* [unranked] *curvisiliqua*, 7(2), 90, Fig.16.f, 1923
72. *Capsella bursa-pastoris* [unranked] *cyclops*, 7(2), 65, 1923
73. *Capsella bursa-pastoris* [unranked] *densa*, 4(6), 63. Fig.51, 1907
74. *Capsella bursa-pastoris* [unranked] *dentata,* 4(6), 47, 1907. Fig.12.n, 7(2), 75
75. *Capsella bursa-pastoris* [unranked] *denticulata*, 7(2), 57, Fig.7.e, 1923
76. *Capsella bursa-pastoris* [unranked] *difformis*, 4(6), 34. Fig. 26 and 27, 1907
77. *Capsella bursa-pastoris* [unranked] *diodonta*, 7(2), 84, Fig.15.d, 1923
78. *Capsella bursa-pastoris* [unranked] *elegans*, 7(2), 60, Fig.8.o, 1923
79. *Capsella bursa-pastoris* [unranked] *ellipsoidea*, 4(6), 66. Fig.55, 1907
80. *Capsella bursa-pastoris* [unranked] *emarginata*, 4(6), 53, 1907. Fig.15.g, 7(2), 84, 1923
81. *Capsella bursa-pastoris* [unranked] *exotica*, 7(2), 56, Fig.7.c, 1923
82. *Capsella bursa-pastoris* [unranked] *extrema*, 7(2), 66, 1923
83. *Capsella bursa-pastoris* [unranked] *faucialis*, 7(2), 64, Fig.8.i, 1923
84. *Capsella bursa-pastoris* [unranked] *filiformis*, 7(2), 72, 1923
85. *Capsella bursa-pastoris* [unranked] *foliosa*, 7(2), 54, Fig.6.f, 1923
86. *Capsella bursa-pastoris* [unranked] *frigida*, 7(2), 59, Fig.8.n, 1923
87. *Capsella bursa-pastoris* [unranked] *fucorum*, 4(6), 72. Fig.60, 1907
88. *Capsella bursa-pastoris* [unranked] *gallicica*, 4(6), 74, 1907. Fig.15.s in 7(2), 84,1923
89. *Capsella bursa-pastoris* [unranked] *glauca*, 4(6), 65.Fig.54, 1907
90. *Capsella bursa-pastoris* [unranked] *gothica*, 7(2), 77, Fig.13.b, 1923
91. *Capsella bursa-pastoris* [unranked] *gotlandica*, 4(6), 39. Fig.30, 1907
92. *Capsella bursa-pastoris* [unranked] *gracilescens*, 4(6), 58, 1907. Fig.8.e, in 7(2), 61, 1923
93. *Capsella bursa-pastoris* [unranked] *grandiflora*, 7(2), 53, 1923
94. *Capsella bursa-pastoris* [unranked] *grosso-triangularis,* 7(2), 66, Fig.9. m, 1923
95. *Capsella bursa-pastoris* [unranked] *hanseatica*, 7(2), 63, Fig.8.k, 1923
96. *Capsella bursa-pastoris* [unranked] *hauniensis*, 4(6), 44. Fig.33 and 34, 1907
97. *Capsella bursa-pastoris* [unranked] *helsingica*, 7(2), 69, Fig.10. b, 1923
98. *Capsella bursa-pastoris* [unranked] *herjedalica*, 4(6), 38, 1907. Fig.9.b in 7(2), 66, 1923
99. *Capsella bursa-pastoris* [unranked] *hians,* 7(2), 89, Fig.16.c, 1923
100. *Capsella bursa-pastoris* [unranked] *hiatula*, 7(2), 79, Fig.13.i, 1923
101. *Capsella bursa-pastoris* [unranked] *hiemalis*, 4(6), 27, fig. 20. 1907
102. *Capsella bursa-pastoris* [unranked] *jemtlandica*, 7(2), 68, Fig.10.f, 1923
103. *Capsella bursa-pastoris* [unranked] *incisa* 4(6), 27, 1907
104. *Capsella bursa-pastoris* [unranked] *incisura*, 7(2), 58, Fig.7.o, 1923

105. *Capsella bursa-pastoris* [unranked] *inclinata*, 7(2), 71, 1923
106. *Capsella bursa-pastoris* [unranked] *integrifolia*, 4(6), 83, 1907
107. *Capsella bursa-pastoris* [unranked] *kyphosa*, 7(2), 85, Fig.15.f, 1923
108. *Capsella bursa-pastoris* [unranked] *lacerata*, 4(6), 48. Fig. 37, 1907
109. *Capsella bursa-pastoris* [unranked] *laevigata*, 6(1), 198, Fig.5.d. 1921
110. *Capsella bursa-pastoris* [unranked] *latisiliqua,* 7(2), 90, Fig.16.d, 1923
111. *Capsella bursa-pastoris* [unranked] *laxa,* 4(6), 51. Fig.39, 1907
112. *Capsella bursa-pastoris* [unranked] *lenaensis*, 7(2), 53, Fig.6.e, 1923
113. *Capsella bursa-pastoris* [unranked] *leontodon*, 4(6), 41. Fig.31, 1907
114. *Capsella bursa-pastoris* [unranked] *leptoloba*, 7(2), 61, Fig.8.d, 1923
115. *Capsella bursa-pastoris* [unranked] *linearis*, 4(6), 70. Fig.58, 1907
116. *Capsella bursa-pastoris* [unranked] *lingulata*, 4(6), 52. Fig.42, 1907
117. *Capsella bursa-pastoris* [unranked] *litoralis*, 4(6), 77. Fig.63, 1907
118. *Capsella bursa-pastoris* [unranked] *lobulata*, 7(2), 73, Fig.11.d, 1923
119. *Capsella bursa-pastoris* [unranked] *longipes*, 4(6), 43, 1907
120. *Capsella bursa-pastoris* [unranked] *longirostris*, 4(6): 26, 1907. Fig.6.d. in 7(2), 54, 1923
121. *Capsella bursa-pastoris* [unranked] *lulensis,* 7(2), 60, Fig.8.p, 1923
122. *Capsella bursa-pastoris* [unranked] *macroclada*, 4(6),63, 1907. Fig.8.c in 7(2), 61,1923
123. *Capsella bursa-pastoris* [unranked] *matura*, 7(2), 79, Fig.13.k, 1923
124. *Capsella bursa-pastoris* [unranked] *microcarpa*, 7(2), 62, Fig.8.f, 1923
125. *Capsella bursa-pastoris* [unranked] *microcarpoides*, 7(2), 70, 1923
126. *Capsella bursa-pastoris* [unranked] *monasterialis*, 7(2), 57, Fig.7.d, 1923
127. *Capsella bursa-pastoris* [unranked] *moscovitica*, 7(2), 87, 1923
128. *Capsella bursa-pastoris* [unranked] *multiloba*, 7(2), 76, 1923
129. *Capsella bursa-pastoris* [unranked] *nanella*, 7(2), 73, Fig.11.g, 1923
130. *Capsella bursa-pastoris* [unranked] *nanocarpa*, 7(2), 80, 1923
131. *Capsella bursa-pastoris* [unranked] *nylandica*, 7(2), 55, Fig.6.b, 1923
132. *Capsella bursa-pastoris* [unranked] *obliqua*, 7(2), 60, 1923
133. *Capsella bursa-pastoris* [unranked] *obovata*, 7(2), 68, Fig.10.a, 1923
134. *Capsella bursa-pastoris* [unranked] *obtusa*, 4(6), 37. Fig.29, 1907
135. *Capsella bursa-pastoris* [unranked] *odontophylla*, 7(2), 82, Fig.14.f, 1923
136. *Capsella bursa-pastoris* [unranked] *oelandica*, 7(2), 85, Fig.15.m, 1923
137. *Capsella bursa-pastoris* [unranked] *oviculata*, 7(2), 83, Fig.14.g, 1923
138. *Capsella bursa-pastoris* [unranked] *ovifera,* 7(2), 66, Fig.9. I, 1923
139. *Capsella bursa-pastoris* [unranked] *parallela*, 7(2), 59, 1923
140. *Capsella bursa-pastoris* [unranked] *pedemontana*, 4(6): 25, fig. 17. 1907
141. *Capsella bursa-pastoris* [unranked] *perconcava*, 7(2), 58, Fig.7.m, 1923
142. *Capsella bursa-pastoris* [unranked] *perdentata*, 7(2), 77, Fig. 12.o, 1923
143. *Capsella bursa-pastoris* [unranked] *perfoliosa*, 7(2), 54, 1923
144. *Capsella bursa-pastoris* [unranked] *perhians*, 7(2), 89, Fig.16.e, 1923
145. *Capsella bursa-pastoris* [unranked] *perversa*, 7(2), 78, Fig.13.f, 1923
146. *Capsella bursa-pastoris* [unranked] *pinnata*, 7(2), 74, Fig.12.f, 1923
147. *Capsella bursa-pastoris* [unranked] *pinnato-foliosa*, 7(2), 79, Fig.13.d, 1923.
148. *Capsella bursa-pastoris* [unranked] *polyedra*, 4(6), 64. Fig.52, 1907
149. *Capsella bursa-pastoris* [unranked] *praeflorens*, 7(2), 65, 1923
150. *Capsella bursa-pastoris* [unranked] *praematura*, 4(6): 29, fig. 21. 1907
151. *Capsella bursa-pastoris* [unranked] *praetenella*, 7(2), 70, 1923
152. *Capsella bursa-pastoris* [unranked] *prionophylla*, 4(6), 37, Fig.13.l, 1907
153. *Capsella bursa-pastoris* [unranked] *gallica* forma *prostrata*, 4(6), 75 fig.62, 1907
154. *Capsella bursa-pastoris* [unranked] *querceti*, 4(6), 51. Fig.40, 1907

155. *Capsella bursa-pastoris* [unranked] *ramselensis*, 4(6), 51. Fig.41, 1907
156. *Capsella bursa-pastoris* [unranked] *rhombea*, 4(6), 59. Fig.48, 1907
157. *Capsella bursa-pastoris* [unranked] *rhombella*, 4(6), 65.Fig.53, 1907
158. *Capsella bursa-pastoris* [unranked] *robusta*, 4(6), 43, 1907. Fig.15.h in 7(2), 84, 1923
159. *Capsella bursa-pastoris* [unranked] *rotundata*, 4(6), 61. Fig.50, 1907
160. *Capsella bursa-pastoris* [unranked] *rubelliformis*, 7(2), 56, Fig.7.a, 1923
161. *Capsella bursa-pastoris* [unranked] *rubiginosa,* 4(6), 74, 1907. Fig.7.k in 7(2), 56, 1923
162. *Capsella bursa-pastoris* [unranked] *salinula*, 7(2), 72, Fig.11.h, 1923
163. *Capsella bursa-pastoris* [unranked] *savonica*, 7(2), 80, Fig.13.n, 1923
164. *Capsella bursa-pastoris* [unranked] *scanica*, 4(6): 27. Fig. 18. 1907
165. *Capsella bursa-pastoris* [unranked] *segetum*, 4(6), 36. Fig. 28, 1907
166. *Capsella bursa-pastoris* [unranked] *seleniaca*, 7(2), 70, Fig.10.h, 1923
167. *Capsella bursa-pastoris* [unranked] *semilobata*, 7(2), 54, Fig.6.g, 1923
168. *Capsella bursa-pastoris* [unranked] *serrata*, 4(6), 27, 1907
169. *Capsella bursa-pastoris* [unranked] *serrulata*, 7(2), 82, 1923
170. *Capsella bursa-pastoris* [unranked] *sinuato-linearis*, 7(2), 82, Fig.14.e, 1923
171. *Capsella bursa-pastoris* [unranked] *smolandica*, 7(2), 55, Fig.6.c, 1923
172. *Capsella bursa-pastoris* [unranked] *subaculeata*, 7(2), 63, 1923
173. *Capsella bursa-pastoris* [unranked] *subalgida*, 7(2), 54, Fig.6.h, 1923
174. *Capsella bursa-pastoris* [unranked] *subalpina*, 4(6), 56. Fig.46, 1907
175. *Capsella bursa-pastoris* [unranked] *subarctica*, 7(2), 83, Fig.15.b, 1923
176. *Capsella bursa-pastoris* [unranked] *subaustralis*, 4(6), 13, 1907
177. *Capsella bursa-pastoris* [unranked] *subbergiana*, 7(2), 68, Fig.10.d, 1923
178. *Capsella bursa-pastoris* [unranked] *subcanescens*, 4(6), 73, 1907. Fig.12.d, 7(2), 75, 1975
179. *Capsella bursa-pastoris* [unranked] *subcavata,* 7(2), 58, Fig.7.h, 1923
180. *Capsella bursa-pastoris* [unranked] *subdecumbens*, 4(6), 57. Fig.47, 1907
181. *Capsella bursa-pastoris* [unranked] *subfucorum*, 4(6), 80. Fig.66, 1907
182. *Capsella bursa-pastoris* [unranked] *subrhombea*, 4(6), 59, 1907
183. *Capsella bursa-pastoris* [unranked] *subseleniaca*, 7(2), 70, Fig.10.i, 1923
184. *Capsella bursa-pastoris* [unranked] *suffruticosa*, 7(2), 55, 1923
185. *Capsella bursa-pastoris* [unranked] *tenella*, 7(2), 69, Fig.10.g, 1923
186. *Capsella bursa-pastoris* [unranked] *tenera*, 7(2), 72, Fig.11.f, 1923
187. *Capsella bursa-pastoris* [unranked] *tenerescens*, 7(2), 72, Fig.11.e, 1923
188. *Capsella bursa-pastoris* [unranked] *tibelensis*, 7(2), 80, Fig.13.h, 1923
189. *Capsella bursa-pastoris* [unranked] *tjustiana*, 7(2), 58, Fig.7.n, 1923
190. *Capsella bursa-pastoris* [unranked] *triangularis*, 7(2), 75, Fig.12, 1923
191. *Capsella bursa-pastoris* [unranked] *umensis*, 7(2), 57, Fig.7.f, 1923
192. *Capsella bursa-pastoris* [unranked] *ursina*, 7(2), 68, Fig.10.e, 1923
193. *Capsella bursa-pastoris* [unranked] *varia*, 7(2), 78, Fig.13.e, 1923
194. *Capsella bursa-pastoris* [unranked] *fucorum* forma *ventosa*, 4(6), 73. Fig.61, 1907
195. *Capsella bursa-pastoris* [unranked] *vestrogothica*, 7(2), 85, Fig.15.l, 1923
196. *Capsella bursa-pastoris* [unranked] *viaria*, 7(2), 63, Fig.8.l, 1923
197. *Capsella bursa-pastoris* [unranked] *viarum*, 4(6), 78, 1907. Fig.8.f, in 7(2), 61, 1923
198. *Capsella bursa-pastoris* [unranked] *vímínalís*, 4(6), 44, 1907
199. *Capsella bursa-pastoris* [unranked] *viridis*, 4(6), 69, 1907. Fig.12.c in 7(2), 75, 1923
200. *Capsella bursa-pastoris* [unranked] *wittrockii*, 4(6), 55. Fig.44 and 45, 1907

Synonyms of Druce (1918, 1924, 1926, 1927, 1930, 1931, 1932).

1. *Bursa abscissa* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 8(1): 105 (1927)
2. *Bursa alandica* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 9(3): 258 (1931)

3. *Bursa anglica* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
4. *Bursa batavorum* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
5. *Bursa belgica* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 9(3): 334 (1931)
6. *Bursa bremensis* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 8(1): 105 (1927)
7. *Bursa brittonii* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
8. *Bursa concava* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(5): 863 (1926)
9. *Bursa druceana* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
10. *Bursa gallica* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
11. *Bursa germanica* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
12. *Bursa grossa* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(5): 765 (1926)
13. *Bursa hiatula* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(5): 765 (1926)
14. *Bursa integrella* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(5): 765 (1926).
15. *Bursa laevigata* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)

16. *Bursa mediterranea* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
17. *Bursa origo* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
18. *Bursa patagonica* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
19. *Bursa pergrossa* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 9(1): 19 (1930)
20. *Bursa robusta* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(5): 765 (1926)
21. *Bursa segetum* (Almq.) *Druce* Rep. Bot. Soc. Exch. Club Brit. Isles 9(3): 258 (1931)
22. Bursa sinuosa (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 8(1): 106 (1927)
23. *Bursa sublaevigata* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 9(5): 553 (1932)
24. *Bursa trevirorum* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 169 (1924)
25. *Bursa turoniensis* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 7(1): 170 (1924)
26. *Bursa viminalis* (Almq.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 9(3): 335 (1931)

Synonyms of Shull (1909, 1929)

1. *Bursa bursa-pastoris* [unranked] *heteris* Shull, Publ. Carnegie Inst. Wash. 112: 12, fig. 2-8 (1909). *nom . illeg.*

2. *Bursa bursa-pastoris* [unranked] *rhomboidea* Shull, Publ. Carnegie Inst. Wash. 112: 22, fig. 12-18 (1909).
3. *Bursa bursa-pastoris* [unranked] *simplex* Shull, Publ. Carnegie Inst. Wash. 112: 25, fig. 19 (1909).
4. *Bursa bursa-pastoris* [unranked] *tenuis* Shull, Publ. Carnegie Inst. Wash. 112: 18, fig. 9-11 (1909).
5. *Bursa occidentalis* Shull, Proc. Int. Congr. Pl. Sci. Ithaca 1: 847, figs. 9, 21, 22 (1929).
6. *Bursa occidentalis* var. *concava* Shull, Proc. Int. Congr. Pl. Sci. Ithaca 1: 880 (1929).
7. *Bursa occidentalis* subsp. *madeirae* Shull, Proc. Int. Congr. Pl. Sci. Ithaca 1: 849, fig. 9 (1929).
8. *Bursa tuscaloosae* Shull, Proc. Int. Congr. Pl. Sci. Ithaca 1: 856, fig. 19 (1929)

Synonyms of Rafinesque (1837)

Most of the collections of Rafinesque, including the following *Capsella* taxa no longer exist (Stuckey, 1971). However, acording to the protologue they all appear to be variants of *Capsella bursa-pastoris* named based on leaf morphology (Rafinesque, 1837)

1. *Capsella acutifolia* Raf., New Fl., 1:27 (1837)
2. *Capsella integrifolia* Raf., New Fl., 1:27 (1837)

3. *Capsella dentata* Raf., New Fl., 1:28 (1837)
4. *Capsella bifida* Raf., New Fl., 1:28 (1837)
5. *Capsella furcata* Raf., New Fl., 1:28 (1837)
6. *Capsella ambloides* Raf., New Fl., 1:28 (1837)

Synonyms of Jordan (1864)

There is a *Capsella* collection in the P, LY, and MPU herbariums that include the following taxa of Jordan (his own specimens as well as specimens of others). However, I have not come across any sample that could be dated to 1864 or before that can be a type. But the samples registered with the following names, represent *C. bursa pastoris*

1. *Capsella agrestis* Jord. 1864:339.
1. *Capsella virgata* Jord.1864:339.
2. *Capsella ruderalis* Jord.1864:340
3. *Capsella sabulosa* Jord.1864:341.
4. *Capsella praecox* Jord.1864:342.

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Almquist, E.B. (1923). Studien über die *Capsella bursa-pastoris* (L.) II. Acta Horti Bergiani 7: 41–95. Stockholm.

Druce, G.C. (1918). Botanical Society and Exchange Club of the British Isles. 5 (1): 16. https://www.biodiversitylibrary.org/item/192609#page/32/mode/1up

Druce, G.C. (1924). Botanical Society and Exchange Club of the British Isles. 7 (1): 169. https://www.biodiversitylibrary.org/item/192706#page/181/mode/1up

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Jordan, C.T.A. (1864). Diagnoses d'Especes Nouvelles ou méconnues, pour servir de matériaux à une flore réformée de la France et des contrées voisines. i. 339https://www.biodiversitylibrary.org/item/45150#page/349/mode/1up

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