



Ecological and Evolutionary Consequences of Two Distinct Modes of Speciation in Plants

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**Ecological and evolutionary consequences of
two distinct modes of speciation in plants**

A dissertation presented

by

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to

The Department of Organismic and Evolutionary Biology

in partial fulfillment of the requirements

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In the subject of

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ECOLOGICAL AND EVOLUTIONARY CONSEQUENCES OF TWO DISTINCT MODES OF SPECIATION IN PLANTS

ABSTRACT

Speciation—the evolutionary process by which new species arise—can occur through genetic divergence maintaining the ploidy—the number of complete sets of chromosomes in the cells—of the descendant lineages relatively unchanged (i.e., homoploid speciation) or through drastic changes in ploidy associated with whole-genome duplications (i.e., polyploid speciation). In this thesis, I use the *Arabidopsis arenosa* species complex and the Angiosperm family Brassicaceae to explore different hypotheses about the ecological and evolutionary consequences of these two distinct modes of speciation in plants. The *A. arenosa* complex includes at least three highly divergent diploid lineages and one recently formed polyploid lineage. In chapter 1, I explore the potential consequences of human-induced global warming on one instance of homoploid speciation in *A. arenosa*. Here, I offer empirical evidence supporting the hypothesis that climate-induced range shifts may increase sympatry between two parapatric lineages and demonstrate that rising temperatures will undermine reproductive isolation by increasing the probability of introgressive hybridization. Next, in chapter 2, I evaluate the ecological consequences of the recent case of polyploid speciation in *A. arenosa*. Here, I find no evidence supporting the hypothesis that

successful establishment of neopolyploids is contingent on climatic niche shifts from their diploid progenitors, but I show how this neopolyploid lineage has significantly expanded its niche instead. Finally, in chapter 3, I study the long-term evolutionary consequences of polyploidy in the family Brassicaceae which exhibits an extensive inter-specific variation in chromosome numbers and a high incidence of polyploid species. Here, I show macroevolutionary evidence supporting the hypothesis that polyploidy has significant effects on the long-term diversification of lineages, contradicting the traditional model that considers polyploidy as an evolutionary dead-end. Altogether, this dissertation contributes to our understanding of the short- and long-term ecological and evolutionary consequences of homoploid vs. polyploid modes of speciation.

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CONTRIBUTIONS

Introduction: Y. Franchesco Molina-Henao (YFMH) wrote the text.

Chapter 1: YFMH conceived the ideas, collected and analysed the data; YFMH and Robin Hopkins (RH) wrote and discussed the ideas on the text.

Chapter 2: YFMH conceived the ideas, collected and analysed the data; YFMH and RH wrote and discussed the ideas on the text. Chapter 2 has previously been published as the following paper:

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Chapter 3: YFMH and Cristian Román-Palacios (CRP) conceived the ideas, collected and analysed the data; YFMH, CRP and Mike Barker wrote and discussed the ideas on the text.

Conclusions and future directions: YFMH wrote the text.

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INTRODUCTION

A central goal in evolutionary biology is to explain the processes that generate and maintain biodiversity on our planet. Speciation is the evolutionary process by which lineages diverge to become reproductively isolated entities known as species (Coyne and Orr, 2004, Sobel et al., 2010). Pragmatically, here I distinguish two modes of speciation based on the ploidy—the number of complete sets of chromosomes in the cells—of the descendant lineages. Speciation can occur by maintaining the ploidy of the descendant lineages relatively unchanged (i.e., homoploid speciation). Alternatively, speciation can happen by drastic changes in ploidy associated with whole-genome duplications (i.e., polyploid speciation). I use the sand rock-cress or *Arabidopsis arenosa* species complex, and the mustard family or Brassicaceae to explore different hypotheses about the ecological and evolutionary consequences of these two distinct modes of speciation in plants.

The *A. arenosa* complex is an obligate outcrosser that includes diploid and polyploid populations. Diploid populations ($2n = 2x = 16$ chromosomes) are split into three highly divergent lineages (Kolář et al., 2016a, Monnahan et al., 2018) known as Carpathian, Dinaric, and Pannonian, according to their respective ecogeographical region. The Carpathian lineage is found in the mid-altitudes to high altitudes of the western Carpathians in Slovakia, and mid-altitudes of southern and eastern Carpathians in Romania and the southern Dinarides in Serbia. The Carpathian lineage also includes diploid populations found along the Baltic sea coast. The Dinaric lineage is found in the foothills of the Dinaric Alps and their surroundings in Slovenia, Croatia, and Bosnia and

Herzegovina. The Pannonian lineage is found in the Pannonian lowlands of Hungary and southern Slovakia. The Carpathian and Dinaric lineages diverged approximately 650,000 generations ago, whereas the Pannonian lineage diverged approximately 760,000 generations ago from the Carpathian-Dinaric ancestor (Kolář et al., 2016a). In chapter 1, I explore the potential consequences of human-induced global warming on the divergence between the Carpathian and Pannonian diploid lineages in *A. arenosa*—one instance of homoploid speciation.

Human-induced climate change may result in extraordinary increases in global temperature, which is predicted to have a significant effect on biodiversity loss during the twenty-first century (Sala et al., 2000). For instance, climate-induced range shifts could increase sympatry between previously isolated species which could increase introgressive hybridization and, consequently, weaken reproductive isolation (RI) (Becker et al., 2013, Garroway et al., 2010). Here, in chapter 1, I offer empirical evidence supporting the hypothesis that climate-induced range shifts may increase sympatry between the Carpathian and Pannonian lineages which currently exhibit parapatric distributions. Also, I demonstrate that increasing temperatures undermine reproductive isolation by increasing the probability of introgressive hybridization from the Pannonian into the Carpathian genomes.

Polyploid *A. arenosa* populations ($2n = 4x = 32$ chromosomes) are broadly distributed through Central and Northern Europe. The widespread tetraploid is an autopolyploid lineage since it shows no evidence of chromosome pairing preference during meiotic segregation (Hollister et al., 2012, Arnold et al., 2015, Arnold et al., 2016) due to having four sets of chromosomes derived from the same ancestral lineage. The

autotetraploids likely originated from a single ancestral population that arose approximately 11,000-30,000 generations ago in the Carpathian Mountains, where its closest living diploid relatives are still found (Monnahan et al., 2018, Arnold et al., 2015), and the two cytotypes broadly overlap (Schmickl et al., 2012, Kolář et al., 2016b). In chapter 2, I evaluate the ecological consequences of the recent transition from the Carpathian diploids to the widespread autotetraploids in *A. arenosa*—one case of polyploid speciation.

The success of a new polyploid lineage is thought to be mostly dependent on its ability to ecologically diverge from the progenitor lineage(s) to avoid competing with and mating with them (Fowler and Levin, 1984, Levin, 1983, Levin, 2002, Levin, 1975).

Although this has been a long-standing hypothesis, recent advances in niche analyses provide novel insights into whether and how the successful establishment of polyploid lineages involves shifts in their niches (Parisod and Broennimann, 2016). In chapter 2, I find no evidence supporting the hypothesis that successful establishment of *A. arenosa* autotetraploids is contingent on climatic niche divergence from their Carpathian diploid progenitors. In contrast, I show a significant climatic niche expansion in the autotetraploids in a relatively short time.

The long-term evolutionary significance of polyploidy is still debated (Soltis et al., 2009, Van de Peer et al., 2009, Mayrose et al., 2011, Arrigo and Barker, 2012, Tank et al., 2015). Discussions on the evolutionary role of polyploidy in plant evolution date back to Stebbins (1970) and Wagner (1970) who considered polyploidy to have negligible effects on the long-term evolution of lineages which induced the idea of polyploidy as an evolutionary ‘dead-end.’ Recently, the ‘dead-end’ hypothesis has been reformulated to

predict that polyploids undergo extinction more frequently than diploids (Mayrose et al., 2011, Arrigo and Barker, 2012, Wood et al., 2009, Mayrose et al., 2015, Estep et al., 2014). However, in chapter 3, colleagues and I show evidence to claim that polyploidy influence the long-term evolution of lineages regardless of whether polyploids are more likely to go extinct than diploids.

Here, we use the family Brassicaceae to examine the role of ploidy in driving macroevolution. The Brassicaceae is a speciose clade (c.a. 3500 species) that includes several major crop plants and numerous model genera in evolutionary research such as *Arabidopsis* itself (Al-Shehbaz et al., 2006, Beilstein et al., 2006, Hohmann et al., 2015). The Brassicaceae exhibits extensive inter-specific variation in chromosome numbers and high incidence of polyploid species (Wood et al., 2009, Rice et al., 2015, Lysak, 2018). In chapter 3, I used a compiled ploidy database, along with the Brassicaceae phylogeny, to show that polyploid lineages have experienced faster rates of speciation and extinction than diploids. Moreover, even though net diversification rates were faster in diploids, both polyploids and diploids diversify at positive rates. Importantly, we also found species turnover rates to be higher in polyploids and differences in species richness among genera to be positively influenced by polyploidy. Therefore, we conclude that polyploidy is a major source of evolutionary novelty within clades, that has significant implications in driving present-day diversity patterns in the Brassicaceae.

In summary, this dissertation contributes to our understanding of the short- and long-term ecological and evolutionary consequences of both homoploid and polyploid modes of speciation.

CHAPTER 1

Global warming could undermine reproductive isolation between parapatric lineages in *Arabidopsis arenosa*

1.1 Abstract

Human-induced climate change is predicted to cause a significant loss of biodiversity through a variety of proximate mechanisms. The homogenization of diversity through increased species hybridization is one of the more poorly understood mechanisms. Reproductive isolation (RI) between closely related species may decline as a result of increased sympatry due to climate-induced range shifts, and yet empirical evidence connecting aspects of climate change to ecogeographical changes and decreases in RI remain elusive. Here, we combine predictive distribution modeling with a large-scale manipulative experiment to evaluate if and how hybridization will increase due to decreased RI in response to climate change in the *Arabidopsis arenosa* complex. We find that climate-induced range shifts are predicted to significantly increase sympatry between two distinct *A. arenosa* lineages (Carpathian vs. Pannonian). Furthermore, key reproductive barriers to gene flow are highly sensitive to temperature and are predicted to decrease with warmer climates significantly. Surprisingly, the most temperature-dependent barriers are related to fertility, which is classically assumed to be insensitive to the environment. Our findings demonstrate that the invasion of the Pannonians into the Carpathian suitable habitats in a future global warming scenario will not only increase the probability of heterospecific crosses because increased sympatry but may also facilitate the invasion of the Pannonian genetic diversity into the Carpathian genomes through loss of environmentally-dependent RI barriers.

1.2 Introduction

Human-induced climate change, and specifically increases in temperature (Karl and Trenberth, 2003), will likely cause a significant loss of biodiversity in the twenty-first century (Parmesan, 2006). This predicted loss motivates the need to understand how elevated temperatures directly affect the evolutionary processes that generate and maintain biodiversity. Specifically, climate change can increase hybridization between species by expanding range overlap between closely related species and by interfering with traits that maintain reproductive isolation between species (Garroway et al., 2010, Becker et al., 2013, Muhlfeld et al., 2014, Vallejo-Marín and Hiscock, 2016). This increase in hybridization can have severe fitness consequences in populations (Muhlfeld et al., 2014), cause genomic instability (Allendorf et al., 2001), and decrease local species diversity through extinction or homogenization (Rhymer and Simberloff, 1996). It is important to understand if increases in hybridization are due merely to the increased opportunity for heterospecific matings from expanded sympatric zones, or if the environmental change will directly affect the traits that prohibit reproduction and gene flow between species.

The mechanisms that limit the opportunity or success of heterospecific matings are known as reproductive isolating (RI) barriers. These barriers can be either environmentally-dependent (i.e., intrinsic RI) or environmentally-independent (i.e., extrinsic RI) (Coyne and Orr, 2004). Intrinsic isolation typically includes barriers such as hybrid inviability and sterility that are thought to be invariable to biotic and abiotic environmental context. Extrinsic isolation includes barriers such as ecological maladaptation and environmentally-dependent behavioral or life-history timing

mismatches. Extrinsic RI barriers are susceptible to climate change induced variation that could cause significant increases in hybridization and gene flow between species. Evaluating the strength of barriers to reproduction under manipulated environmental conditions is a powerful method for predicting how climate changes will affect RI and thus the possibility for gene flow in a changing climate.

Climate is predicted to change in many ways across multiple axes, but an increase in temperature is one of the most anticipated results of this multidimensional phenomenon (Karl and Trenberth, 2003, Rosenzweig et al., 2008). Temperature is also one of the most relevant environmental cues for the biology of organisms as it regulates everything from metabolism to life-history timing to ecosystem functioning (Angilletta, 2009, Kingsolver, 2009). The predicted changes in temperature, the importance of temperature to relevant biological processes, and the feasibility of manipulating temperature in controlled experiments make this component of climate change ideal for manipulative experiments to identify extrinsic RI susceptible to climate-change variation.

Here we investigate the extent to which climate change (specifically temperature) will increase hybridization between divergent lineages in the *Arabidopsis arenosa* complex. We predict the extent to which range expansions and shifts will increase sympatry between the two lineages and determine how variation in temperature affects the strength of RI barriers. *A. arenosa* is an obligate outcrosser closely related to *A. lyrata* and the genetic model plant *A. thaliana* (Al-Shehbaz and O'Kane, 2002), which includes diploid and recently formed autotetraploid populations (Arnold et al., 2015). The two most divergent diploid lineages (which diverged approximately 760,000 generations ago (Kolář et al., 2016a)) are found in central Europe Carpathian Mountains

and Pannonian Basin respectively. These lineages occupy parapatric ranges restricted by distinct climatic niches that differ along an altitudinal gradient (Kolář et al., 2016a). The Carpathian lineage inhabits in the mid- to high-altitudes of the western Carpathians in Slovakia, and mid-altitudes of southern and eastern Carpathians in Romania and the south Dinarides in Serbia. The Pannonian lineage inhabits the Pannonian lowlands of Hungary and south Slovakia. We modeled and compared the current and future distribution of suitable habitats for the Carpathian and Pannonian lineages to estimate the effects of climate on their geographic distributions. Then, we calculated the strength of RI barriers between these lineages across different temperatures to determine which extrinsic barriers will vary with temperature.

1.3 Results and discussion

We found that the environmental niches between the Carpathian and Pannonian lineages are significantly divergent along the temperature gradient. Moreover, we show that climate change scenarios predict dramatic shifts in their geographic ranges which would increase the probability of sympatry between these parapatric lineages considerably. Therefore, we determined the temperature sensitivity of reproductive isolation (RI) by experimentally measure RI between the Carpathian and Pannonian lineages in four different temperatures. Then, we offer empirical evidence supporting the hypothesis that climate-induced range shifts may increase sympatry between two parapatric lineages and demonstrate that rising temperatures further undermine reproductive isolation by increasing the probability of introgressive hybridization, specifically from the Pannonian into de Carpathian genomes.

Environmental niche modeling — The two divergent Carpathian and Pannonian *A. arenosa* lineages currently occupy distinct niche space with a mere 0.2% overlap (Schoener's $D = 0.002$). Tests of niche divergence based on Schoener's D demonstrate that the two niches are neither equivalent ($P < 0.001$) nor similar (Carpathian compared to background: $P = 0.703$ and Pannonian compared to background: $P = 0.733$). The climatic space inhabited by the two lineages varies extensively with the first two axes of our principal components' analysis (PCA-env) explaining 69.18% of the total variance observed in the climatic dataset. PC1 corresponds to a precipitation axis and describes 38.22% of the variance with BIO12 (annual precipitation) and BIO17 (precipitation of driest quarter) having the most significant contributions. PC2 corresponds to a temperature axis and describes 30.96%

of the variance with BIO1 (annual mean temperature) and BIO10 (mean temperature of the warmest quarter) having the most significant contributions (Fig. 1.1; Table S1.2).

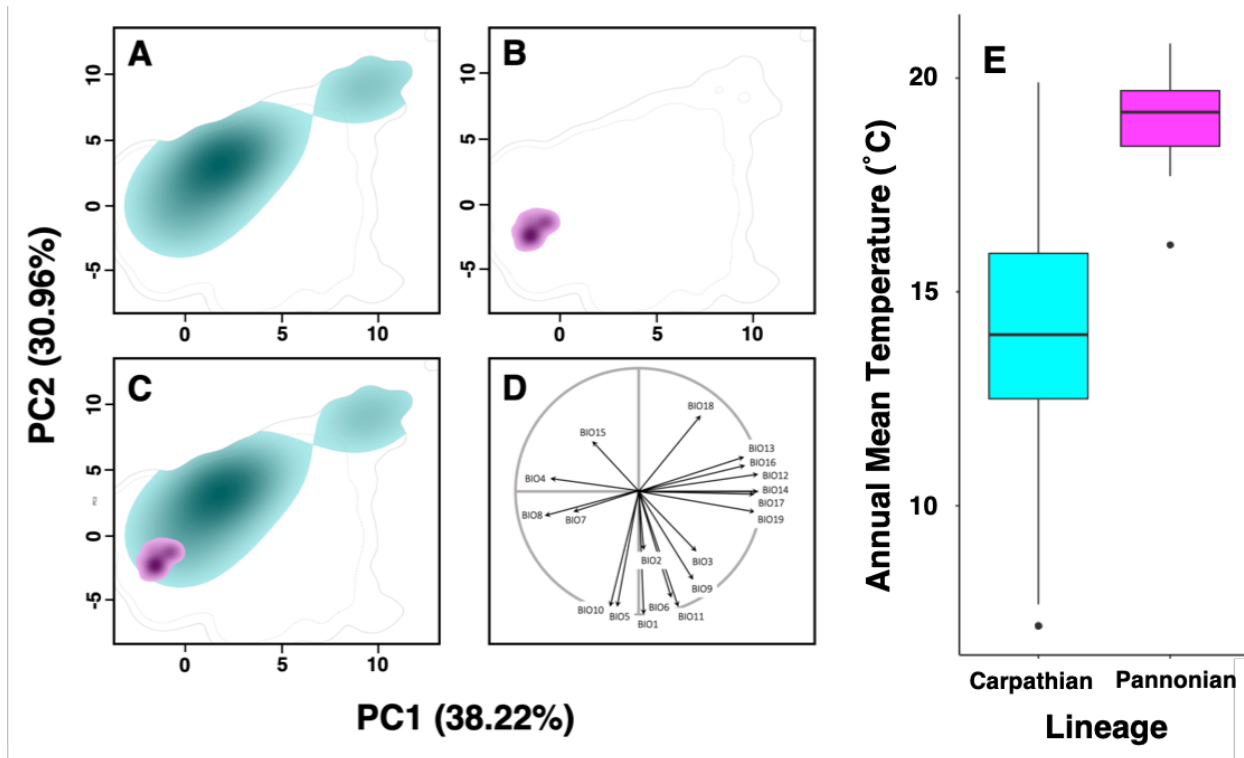


Figure 1.1 Comparison of environmental niche models between Carpathian (N = 103) and Pannonian (N = 27) *Arabidopsis arenosa* lineages in Central Europe. **A.** Carpathian niche model. **B.** Pannonian niche model. **C.** Overlap between Carpathian and Pannonian models. Continuous gray line delimits the full environmental space available within the background area; dashed gray line delimits the percentile 75 of the environmental space available within the background area. Darker shading indicates a higher density of presence data. **D.** Correlation circle of WorldClim variables used in the PCA-env (Complete list of climatic variables and respective contributions at table S1.2). **E.** Comparison of distributions of BIO1 variable (Annual Mean Temperature) between Carpathian and Pannonian lineages. BIO1 is the variable with the greatest contribution to PC2 or temperature axis.

Predictive habitat distribution modeling—We performed predictive habitat distribution modeling to determine if the sympatry between the Carpathian and Pannonian lineages may increase under future scenarios of climate change. Specifically, we compared the current and two future (2050 and 2070) distributions of suitable habitats for each lineage and quantified the overlapping between such distributions of suitability through time. We predict a significant increase in suitable habitat for the Pannonian lineage in both 2050 and 2070, with a corresponding decrease in suitable habitat for the Carpathian lineage. These range shifts increase the overlap of suitable habitats from ~6.60% in current conditions, to ~27.54% in 2050, and ~35.17% in 2070 (Fig. 1.2). Therefore, climate change is predicted to result in a substantial increase in potential sympatry between both lineages in the future.

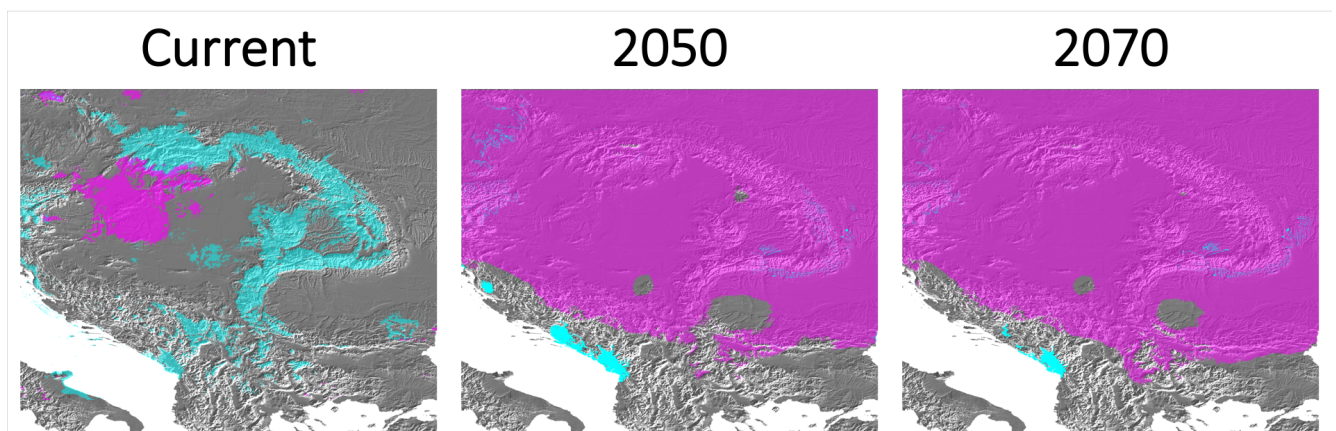


Figure 1.2 Overall predicted changes in climatically suitable habitats for each lineage of *A. arenosa*. Blue areas indicate suitable habitat for the Carpathian lineage, pink areas indicate suitable habitat for the Pannonian lineage.

Experimental measurements of RI—To determine if changes in climate are predicted to increase hybridization by decreasing extrinsic RI barriers, we experimentally quantified key barriers to gene flow between the Carpathian and Pannonian lineage across four different temperatures. We generated experimental half-

sib seeds families from four “cross-types” (maternal region X paternal region) including two parental types - Carpathian X Carpathian (CXC) and Pannonian X Pannonian (PXP), and two hybrid types - Carpathian X Pannonian (CXP) and Pannonian X Carpathian (PXC). We divided each half-sib family between four temperature treatments (9°C, 14°C, 19°C, and 24°C) and measured a suite of phenotypes related to plant viability and fertility (including germination, survival to flowering, flowering, flowering time, pollen viability, and seed set from controlled crosses). We determined how these traits varied due to cross-type and temperature and calculated the strength of RI from these traits at each temperature.

We used Generalized Linear Mixed Models (GLMMs) to test if cross-type (CXC, PXP, CXP, and PXC), temperature, and the interaction of these two main effects explained variation in the measured traits. We tested for significant barriers to gene flow by comparing parent phenotypes to each other and to hybrids (as indicated by a cross-type effect). We tested for a significant change in RI across environments by testing for a significant interaction between cross-type and temperature. We found variation in germination, flowering time, pollen viability, and seed set were significantly predicted by a cross-type by temperature interaction, while survival was significantly predicted by cross type. We found that whether individuals flowered depending only on temperature but not on either cross-type or an interaction of cross-type and temperature (Table 1.1).

This significant interaction between temperature and cross type in many of our models indicates that the different parental and hybrid cross-types vary in their phenotypic response to temperature (Table 1.1). For seed germination we found that individuals from the warmer Pannonian lineage (PXP) and hybrid cross-type with

Pannonian mothers and Carpathian fathers (PXC) had consistent germination rates across temperatures but that Carpathian individuals (CXC) and the CXP hybrids had higher rates of germination in warmer temperatures (Fig. 1.3a, Table S1.3). Variation in survival until vernalization (termed early survival) showed a significant effect of cross-type, but each cross-type was consistent across temperature treatments (Table 1.1). All cross-types showed a similar increase in the proportion of flowering plants with increasing temperature (Fig. 1.3c, Table S1.3). Since we found no effect of either cross-type nor an interaction of cross-type and temperature, we excluded flowering from the calculations of reproductive isolation (Table 1.1). We did find the interaction between temperature and cross-type explained that variation in flowering time. In general, all cross-types flower faster at higher temperatures. However, the relative timing of each cross-type varied across temperature (Fig. 1.3g, Table S1.3). We also found a significant interaction between cross-type and temperature affecting pollen viability (Table 1.1). Consistent with local adaptation to a colder climatic niche, CXC pollen viability was substantially lower in warmer temperatures than in colder temperatures. The other cross-types had consistently high pollen viability across all temperatures (Fig. 1.3d, Table S1.3). Similar to results with pollen viability, CXC cross-type had lower seed set at warmer temperatures, with the rest of the cross-types having a general positive correlation between seed set and temperature (Figs. 1.3e and 1.3f, Table S1.3). (Fig. 1.3f, Table S1.3).

Table 1.1 Generalized Linear Mixed Models (GLMM) for the seven phenotypes evaluated. Significant effects (P -value < 0.05) are indicated in bold fonts.

RESPONSE VARIABLE	FIXED EFFECTS					RANDOM EFFECTS		R ² (95% CI)
	Temperature	Cross	Wald X ² (df) P-value	Mother Population	Father Population	Variance		
			Temperature x Cross			Mother ID	Father ID	
Germination	77.425 (1) < 0.001	115.371 (3) < 0.001	67.880 (3) < 0.001	8.191 (2) 0.017	7.604 (2) 0.022	0.499	0.971	0.144 (0.128-0.164)
Survival	0.383 (1) 0.536	17.261 (3) < 0.001	4.025 (3) 0.259	0.365 (2) 0.833	0.195 (2) 0.907	< 0.001	< 0.001	0.014 (0.009-0.027)
Flowering	83.638 (1) < 0.001	5.882 (3) 0.117	2.563 (3) 0.464	16.220 (2) < 0.001	4.052 (2) 0.132	< 0.001	< 0.001	0.054 (0.041-0.080)
Flowering Time	547.270 (1) < 0.001	3.840 (3) 0.323	19.460 (3) < 0.001	20.770 (3) < 0.001	-5.140 (3) > 0.999	< 0.001	NA	NA
Pollen Viability	16.644 (1) < 0.001	105.401 (3) < 0.001	68.118 (3) < 0.001	3.859 (2) 0.145	3.318 (2) 0.190	< 0.001	< 0.001	0.286 (0.243-0.343)
Seed Set	172.173 (1) < 0.001	990.907 (7) < 0.001	792.529 (7) < 0.001	0.820 (2) 0.664	0.382 (2) 0.826	7.227	< 0.001	0.842 (0.827-0.858)

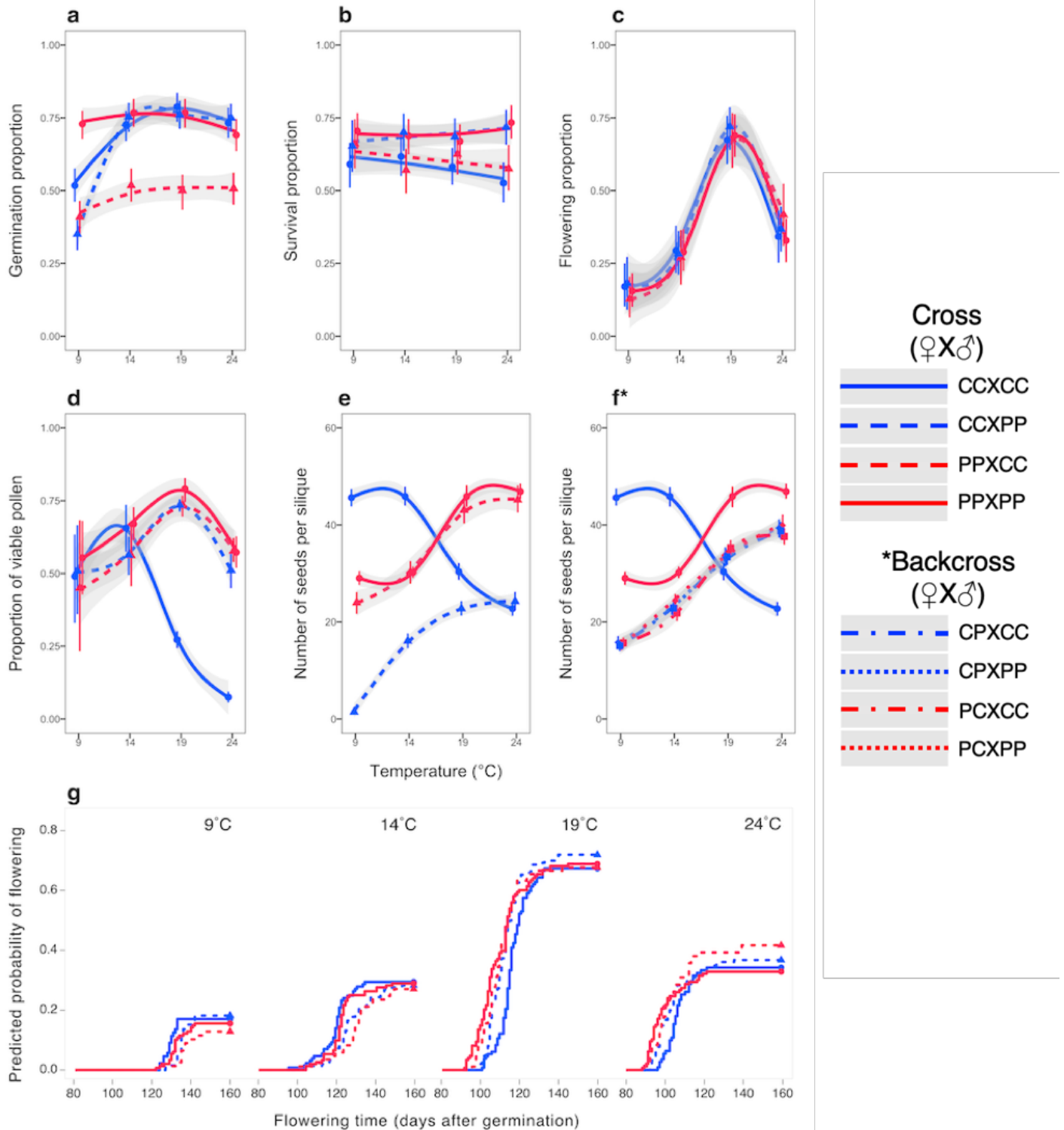


Figure 1.3 Phenotypes responses to temperature. a. Germination proportion. **b.** Survival proportion. **c.** Flowering proportion. **d.** Pollen viability. **e-f.** Seed set. **g.** Flowering time.

Quantifying reproductive barriers— We calculated how traits contributed to reproductive isolation through reduction in gene flow from the Carpathians into the Pannonia ($RI_{Car \rightarrow Pan}$) lineages and gene flow from the Pannonia into the Carpathians ($RI_{Pan \rightarrow Car}$) lineages (Table S1.4).

Premating isolation—We calculated premating RI as differences in seed germination, early survival and pollen viability between conspecific cross-types (i.e., PXP vs. CXC) across temperatures. The strength of premating RI between Carpathian and Pannonian lineages was highly dependent on temperature. Specifically, we found that lower germination of CXC than PXP seeds resulted in significant RI at 9°C. For early survival (to reproduction), we found the Pannonians have a 16.9% advantage over the Carpathians at the warmest temperature (24°C) (Fig. 1.4 and Table 1.2). We found variation in flowering time caused significant RI, but surprisingly, this was the only premating barrier that did not vary across temperatures. Also, counter to most findings, we found a very strong environmental dependency of RI due to pollen sterility. The Pannonian lineage has a 48.6% and 76.8% of advantage over the Carpathian lineage in pollen viability at 19°C and 24°C respectively (Fig. 1.4 and Table 1.2).

Postmating isolation—We measured postmating RI by comparing seed set from within parental-type crosses to between-parental-type crosses to between hybrid and parental-type crosses. We also compared hybrid and parental cross-type germination, survival, flowering time, pollen viability. Again, we found significant temperature-dependent RI barriers from these traits. Specifically, we found that lower seed set in (PXP)XC than in PXP resulted in significant RI only at 9°C, while lower seed set in (CXC)XP than in CXC resulted in significant RI at 9°C, 14°C, and 19°C. Both

heterospecific cross-types (CXP and PXC) had lower germination than both the parental cross-types resulting in similarly weak RI across temperatures. We found that hybrids survived better than CXC parental types at 19°C and 24°C indicating slight heterosis and negative RI. The hybrid cross-types flowered significantly earlier than the PXP parents resulting in significant RI across all temperatures. These hybrids flowered later than CXC at cold temperatures (9°C and 14°C) but flowered earlier at warmer temperatures (19°C and 24°C) resulting in significant RI across all temperatures but variable strengths (Fig. 1.4 and Table 1.2). We found very weak or no RI comparing hybrid pollen in viability to Pannonian plants. We found that hybrids showed strong heterosis for pollen viability compared to Carpathian plants in warm temperatures. Finally, we found that lower seed set in heterospecific cross-types ((CXP)XP and (PXC)XP) than in PXP resulted in significant RI across all temperatures. Once again we found temperature sensitive RI between hybrids and Carpathian plants such that hybrids had lower seed set at 9°C and 14°C but higher at 19°C and 24°C (Fig. 1.4 and Table 1.2).

Table 1.2 Summary of individual contributions of the different isolating barriers to reproductive isolation between the Carpathian and Pannonian lineages of *Arabidopsis arenosa*.

GENE FLOW SOURCE	RI Pan→Car (95% CI)				RI Car→Pan (95% CI)			
	9°C	14°C	19°C	24°C	9°C	14°C	19°C	24°C
PREMATING								
Germination	-0.169 (-0.233, -0.106)	-0.028 (-0.076, 0.019)	0.014 (-0.030, 0.058)	0.029 (-0.022, 0.081)	0.169 (0.106, 0.233)	0.028 (-0.019, 0.076)	-0.014 (-0.058, 0.030)	-0.029 (-0.081, 0.022)
Survival	-0.088 (-0.190, 0.015)	-0.055 (-0.156, 0.046)	-0.073 (-0.180, 0.035)	-0.169 (-0.276, -0.062)	0.088 (-0.015, 0.190)	0.055 (-0.046, 0.155)	0.073 (-0.035, 0.180)	0.169 (0.062, 0.276)
Flowering Time	0.417 (0.224, 0.610)	0.339 (0.182, 0.495)	0.410 (0.311, 0.509)	0.492 (0.344, 0.640)	0.417 (0.224, 0.610)	0.339 (0.182, 0.495)	0.410 (0.311, 0.509)	0.492 (0.344, 0.640)
Pollen Viability	-0.061 (-0.143, 0.022)	-0.012 (-0.062, 0.037)	-0.486 (-0.529, -0.443)	-0.768 (-0.804, -0.732)	0.061 (-0.022, 0.143)	0.012 (-0.037, 0.061)	0.486 (0.443, 0.529)	0.768 (0.732, 0.804)
POSTMATING								
Seed Set	0.950 (0.926, 0.974)	0.483 (0.440, 0.526)	0.139 (0.096, 0.182)	-0.036 (-0.086, 0.014)	0.102 (0.048, 0.155)	-0.005 (-0.050, 0.040)	0.035 (-0.006, 0.076)	0.021 (-0.015, 0.058)
Hybrid Germination	0.152 (0.077, 0.227)	0.066 (0.020, 0.113)	0.112 (0.070, 0.153)	0.076 (0.030, 0.122)	0.314 (0.257, 0.371)	0.094 (0.051, 0.137)	0.098 (0.055, 0.141)	0.047 (-0.001, 0.095)
Hybrid Survival	-0.056 (-0.151, 0.039)	-0.018 (-0.111, 0.074)	-0.099 (-0.162, -0.035)	-0.109 (-0.214, -0.004)	0.033 (-0.049, 0.114)	0.034 (-0.052, 0.120)	0.008 (-0.078, 0.095)	0.060 (-0.018, 0.139)
Hybrid Flowering Time	0.696 (0.517, 0.876)	0.431 (0.271, 0.591)	0.337 (0.237, 0.437)	0.354 (0.226, 0.483)	0.494 (0.242, 0.746)	0.439 (0.276, 0.601)	0.225 (0.143, 0.307)	0.280 (0.161, 0.399)
Hybrid Pollen Viability	0.010 (-0.067, 0.086)	0.075 (0.025, 0.124)	-0.459 (-0.500, -0.419)	-0.758 (-0.794, -0.722)	0.070 (-0.003, 0.142)	0.087 (0.046, 0.128)	0.034 (0.005, 0.063)	0.024 (-0.018, 0.067)
Hybrid Seed Set	0.572 (0.537, 0.607)	0.327 (0.292, 0.362)	-0.041 (-0.077, -0.005)	-0.214 (-0.252, -0.176)	0.400 (0.355, 0.444)	0.130 (0.093, 0.166)	0.166 (0.132, 0.200)	0.152 (0.123, 0.181)

Table 1.3 Summary of absolute contributions of the different isolating barriers to reproductive isolation and estimation of total reproductive isolation between the Carpathian and Pannonian lineages of *Arabidopsis arenosa*.

GENE FLOW SOURCE	RI Pan→Car (95% CI)				RI Car→Pan (95% CI)			
	9°C	14°C	19°C	24°C	9°C	14°C	19°C	24°C
PREMATING								
Germination	-0.169 (-0.233, -0.106)	-0.028 (-0.076, 0.019)	0.014 (-0.030, 0.058)	0.029 (-0.022, 0.081)	0.169 (0.106, 0.233)	0.028 (-0.019, 0.076)	-0.014 (-0.058, 0.030)	-0.029 (-0.081, 0.022)
Survival	-0.103 (-0.223, 0.017)	-0.056 (-0.158, 0.047)	-0.071 (-0.177, 0.034)	-0.166 (-0.271, -0.062)	0.074 (-0.012, 0.160)	0.053 (-0.045, 0.152)	0.074 (-0.034, 0.182)	0.175 (0.065, 0.285)
Flowering Time	0.534 (0.284, 0.784)	0.370 (0.197, 0.543)	0.435 (0.318, 0.551)	0.564 (0.386, 0.742)	0.321 (0.167, 0.476)	0.318 (0.168, 0.468)	0.388 (0.280, 0.497)	0.431 (0.292, 0.570)
Pollen Viability	-0.051 (-0.118, 0.016)	-0.009 (-0.049, 0.026)	-0.304 (-0.390, -0.219)	-0.441 (-0.607, -0.275)	0.031 (-0.009, 0.071)	0.008 (-0.022, 0.037)	0.273 (0.191, 0.354)	0.329 (0.183, 0.475)
POSTMATING								
Seed Set	0.752 (0.471, 1.000)	0.348 (0.242, 0.454)	0.132 (0.084, 0.181)	-0.038 (-0.091, 0.014)	0.046 (0.015, 0.076)	-0.003 (-0.030, 0.024)	0.012 (-0.002, 0.026)	0.004 (-0.004, 0.012)
Hybrid Germination	0.007 (-0.059, 0.074)	0.028 (0.005, 0.052)	0.091 (0.051, 0.131)	0.084 (0.032, 0.135)	0.120 (0.055, 0.185)	0.059 (0.028, 0.091)	0.029 (0.008, 0.050)	0.007 (-0.007, 0.021)
Hybrid Survival	-0.003 (-0.036, 0.030)	-0.008 (-0.043, 0.028)	-0.048 (-0.120, 0.024)	-0.111 (-0.217, -0.004)	0.011 (-0.014, 0.036)	0.021 (-0.028, 0.070)	0.003 (-0.021, 0.026)	0.009 (-0.011, 0.029)
Hybrid Flowering Time	0.021 (-0.268, 0.310)	0.164 (0.046, 0.282)	0.260 (0.158, 0.362)	0.394 (0.222, 0.567)	0.135 (0.014, 0.257)	0.241 (0.117, 0.365)	0.059 (0.012, 0.105)	0.027 (-0.040, 0.094)
Hybrid Pollen Viability	0.000 (-0.023, 0.022)	0.019 (-0.005, 0.042)	-0.231 (-0.340, -0.123)	-0.526 (-0.789, -0.262)	0.013 (-0.009, 0.035)	0.028 (0.004, 0.051)	0.008 (-0.001, 0.017)	0.003 (-0.007, 0.013)
Hybrid Seed Set	0.001 (-0.293, 0.296)	0.060 (-0.028, 0.148)	-0.032 (-0.061, -0.004)	-0.265 (-0.370, -0.160)	0.044 (-0.054, 0.142)	0.034 (0.004, 0.064)	0.031 (-0.002, 0.064)	0.010 (-0.028, 0.048)
TOTAL RI	0.995 (0.991, 0.999)	0.872 (0.820, 0.924)	0.224 (0.009, 0.440)	-0.536 (-1.119, 0.046)	0.921 (0.873, 0.969)	0.759 (0.663, 0.856)	0.843 (0.800, 0.887)	0.944 (0.922, 0.967)

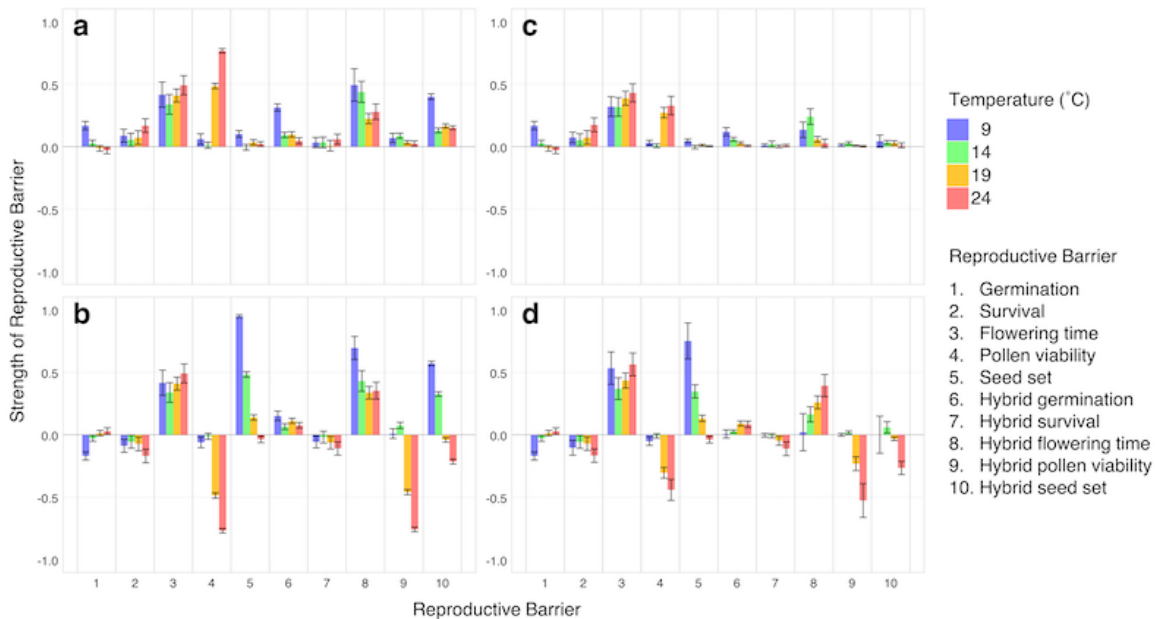


Figure 1.4 Strength of reproductive barriers across temperatures. **a-b.** Individual contribution: **a.** Reproductive isolation from the Carpathians into the Pannonians. **b.** Reproductive isolation from the Pannonians into the Carpathians. **c-d.** Absolute contribution: **c.** Reproductive isolation from the Carpathians into the Pannonians. **d.** Reproductive isolation from the Pannonians into the Carpathians

Total RI across temperatures— Total reproductive isolation between species reflects the accumulated effect of each pre- and post-zygotic barrier to gene flow. Carpathian and Pannonian lineages show highly temperature dependent total reproductive isolation. We find a nearly complete barrier to gene flow from the Carpathian lineages into the Pannonian lineages across all temperatures. Contrastingly, we found that reproductive isolation from the Pannonian lineage to the Carpathian lineage decreases from nearly complete to strongly negative as temperature increases. In other words, in cooler temperatures (9°C and 14°C) these two lineages can not generate viable and fertile hybrids, but as temperatures warm toward 24°C, the Carpathian individuals are predicted to mate more successfully with Pannonian and hybrid individuals than with other Carpathian individuals. This hybridization and

differential mating success will lead to homogenization of genomic differentiation between these two lineages and swarming of the Carpathian genome.

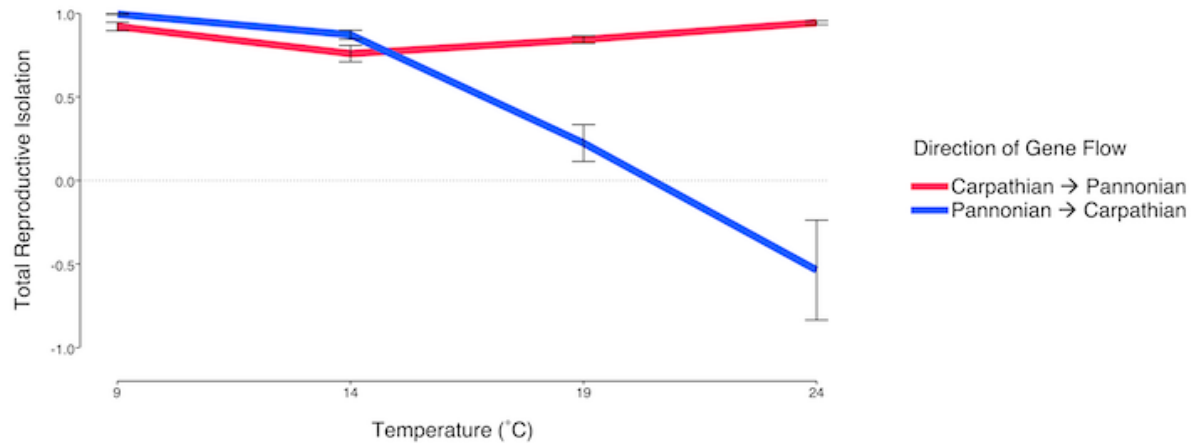


Figure 1.5 Total reproductive isolation across temperatures in both directions. Total isolation from the Carpathians into the Pannonians is stable across temperatures; however, total isolation from the Pannonians into the Carpathians is temperature sensitive reaching negative values at the highest temperature.

Climate change has long been hypothesized to cause significant loss of biodiversity. Here, we explore how the mechanisms that generate and maintain biodiversity are directly affected by an aspect of climate change – temperature. We demonstrate that range shifts due to predicted geographic changes in niche availability will drastically increase the co-habitation of currently isolated lineages. This increase in sympatry significantly increases the probability of mating between lineages. We also quantify how temperature variation, a major aspect of climate change, will directly affect the strength of reproductive isolating barriers between diverged lineages. We find that two lineages of *A. arenosa* have nearly complete barriers to reproduction at cold temperatures but with warming, these two lineages will be highly compatible and may actually be more successful mating disassortatively. Surprisingly, the temperature-dependent variation in RI results from variation in pollen viability and seed set. These are two traits traditionally thought to cause intrinsic RI that is independent of context. However, we find that one

lineage significantly increases sterility with increasing temperature. This increase in sterility leads to a substantially higher reproductive success from between-lineages crosses than within lineage crosses. This significant reduction in RI associated with warming temperatures combined with increased sympatry will likely result in a complete loss of one lineage or homogenization of the two lineages

1.4 Methods

Locality and climate data collection—To characterize the climatic niches for both lineages (Carpathian and Pannonian) in *A. arenosa*, we retrieve climate data from specific locations where the lineages are known to grow. We collected a total of 130 presence data corresponding to 103 Carpathian populations and 27 Pannonian populations (Table S1.1). We modeled the environmental niches for each lineage based on the 19 WorldClim climatic variables (Hijmans et al., 2005). Bioclimatic variables (BIO1-BIO19) were obtained from WorldClim v2.0 at 30s spatial resolution at <http://worldclim.org/version2>. The WorldClim database is based on spatially interpolated data between weather stations and average values of climate variables from ~1970 to 2000. We included all available climate variables in our analyses (Table S1.2).

We estimated the ‘background region’ to extract climate data for the niche similarity analyses (see below). The background region is a set of data points in the vicinity of the presence data of both lineages that establishes the environmental domain available to the taxa given the geographic range. This area is much broader than the presence data, which include just the conditions under which a species is known to occur. To create the background region, we projected the geographic coordinates for each population in ArcGIS 9.3 (Environmental Systems Research Institute, Redlands, CA, USA) and drew a convex polygon around all projected data points to delineate the observed geographic range. We then randomly select points within this polygon to create a climate ‘background region’.

Niche-modeling analyses—Our Environmental Niche Modeling (ENM) analyses were divided into two parts. First, we estimated the niches for Carpathian and Pannonian lineages and calculated niche overlap. Second, we tested for ENM equivalency and similarity. We estimated the ENMs using the package ‘*ecospat*’ (Di Cola et al., 2017, Broennimann et al., 2012) in R 2.13.2 (R Core Team 2012). Specifically, we used an ordination approach (Principal Component Analysis, PCA) to estimate the occurrence and climatic factor densities along environmental axes (PCA-env) and used these densities to calculate ENM overlap. ENM overlap was evaluated

using the Schoener's D metric (Schoener, 1968) that varies from 0 (no overlap) to 1 (complete overlap). Furthermore, equivalency and similarity tests are complementary measures of ENM divergence, but they test slightly different hypotheses. The niche equivalency test evaluates if ENMs are statistically identical when compared directly with each other using a bootstrap resampling approach (Warren et al., 2008, Broennimann et al., 2012). For each ENM comparison, we generated a null distribution of divergence based on all the observed presence data points. Specifically, we pooled all the presence data points for both lineages in the comparison and resampled by randomly reassigning presence points to two sets. We then calculated D on these resampled sets. We resampled 1000 times to create a null distribution of D . If the observed D is less than the null distribution of D , then the hypothesis of niche equivalency is rejected, and ENMs are not equivalent. The ENM similarity test uses bootstrap resampling to evaluate if one ENM predicts the other better than a randomly generated ENM from the geographic range (Warren et al., 2008, Broennimann et al., 2012). We estimated a null distribution of ENM similarity by extracting climate variables from a randomly generated set of geographic localities within the 'background region' containing both lineages. The ENM based on these background points is our 'random' ENM. We compared this random ENM to the actual ENM of each lineage calculated by the presence data using the D statistic. For each comparison, we resample the background points 1000 times comparing actual Carpathian and Pannonian ENM to random background ENM. Observed D 's greater than the null distribution indicate that ENMs are more similar than expected given their geographic ranges, while values significantly less than the null distribution indicate ENMs divergence. A non-significant result from the similarity test indicates that there is low power to detect similarities or differences or the expected similarity between niches given the null hypothesis pulled from the geographic ranges is very high, and thus the actual niche differentiation merely is what is expected by chance.

Predictive habitat distribution modeling—To estimate the effects of climate change on the geographic distribution of the Carpathian and Pannonian lineages in *A. arenosa*, we modeled and compared the current and future distribution of suitable habitats for each lineage based on the 19 WorldClim climatic variables (Hijmans et al., 2005). Bioclimatic variables (BIO1-BIO19) were obtained from WorldClim v2.0 at 30s spatial resolution at <http://worldclim.org/version2>, corresponding to the period ~1970–2000 (hereafter 'Current'). First, we conducted two commonly applied species distribution modelling (SDM) methods implemented in R package biomod2 (Thuiller et al., 2016), generalized linear model (GLM) and maximum entropy (MAXENT). GLM is a linear regression model that allows for non-linearity and is based on an assumed relationship between the predictor variables and the response variable. MAXENT uses environmental data for known presence localities and a large set of background points (or pseudoabsences) in a machine learning methodology using the principle of

maximum entropy to model species distributions. This method determines models with uniform/spread out distributions while considering the study region as a density estimation. Pseudoabsences were chosen from the defined background areas following the recommendations of Barbet-Massin et al. (2012), and the calibration was replicated ten times for each modeling method. For each model, we randomly chose testing data as 30% of the occurrences, and we assessed model performance using two indicators: the full area under the receiver operating characteristic curve (AUC) and the partial receiver operating characteristic (pROC) curve method. For the final ensemble of projections, we only considered models with significant pROC values (p-value ≤ 0.001) and $AUC \geq 0.7$ (Gogol-Prokurat, 2011). Predicted habitat suitability for the retained models was transformed into binary data using the threshold that maximizes the true skills statistics (TSS) value (Liu et al., 2005).

We obtained the future climate layers from WorldClim at 30s spatial resolution from the Coupled Model Intercomparison Project Phase 5 projections (CMIP5) at http://worldclim.org/cmip5_30s, corresponding to two time periods: 2041–2060 (hereafter ‘2050’) and 2061–2080 (hereafter ‘2070’). We considered two global climate models for each future period, the Community Climate System Model version 4 (CCSM4), and the NASA Goddard Institute for Space Studies E2-R Model (GISS-E2-R). Each global climate model was generated by the two most extreme Representative Concentration Pathway (RCP) greenhouse-gas scenarios (RCP 2.6 W/m² and RCP 8.5 W/m²). In total, we estimated four climate model-scenario combinations for each future period. We trimmed the obtained future climate layers using the same background areas used for calibrating the models for each lineage. We projected the retained calibrated models to current and future climates. For each of the nine combinations of climate-model scenario per lineage (i.e., one for current and four for each of the two future periods), the ensemble projections produced habitat suitability matrices with each value denoting the proportion of the number of models predicting the corresponding cell as climatically suitable to the total number of models. Then, we transformed habitat suitability matrices to binary matrices using the average threshold that maximized the TSS value across all retained models and estimated the number of climatically suitable cells for each contemporary and future prediction. Next, we combined the resulting binary matrices for each future time period and lineage in order to geographically visualize the overall predicted changes in climatically suitable habitats for each lineage. The combined projections produced raster maps with each cell value denoting the number of scenarios under which the particular cell was predicted as suitable. Cells with a value greater than or equal to two (i.e., 50% of the estimated scenarios for each future period) were displayed as climatically suitable for the *A. arenosa* lineages. Finally, we estimated the proportion of overlapping of climatically suitable areas between the Carpathian and Pannonian lineages for each time period.

Seed collections and experimental set-up—We generated seeds for this experiment by performing controlled crosses between individuals grown from seeds collected in two different localities for each lineage (See experimental design section for more details). Seeds from the Carpathian lineage were collected from the Retezat Mountains at 850m.a.s.l. (*RZA*; 45.368°N, 22.751°E) in Romania and Strečno at 390m.a.s.l. (*SNO*; 49.167°N, 18.851°E) in Slovakia. Seeds from the Pannonian lineage were collected from Kesztlőc at 330m.a.s.l. (*KZL*; 47.717°N, 18.768°E) and the Szigliget Castle at 130m.a.s.l. (*SZI*; 46.801°N, 17.433°E) both localities in Hungary (Figure 1.6).

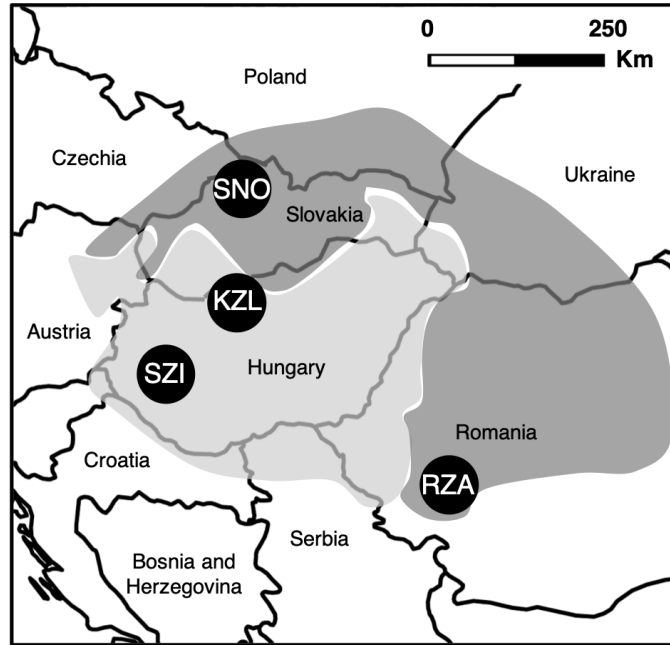


Figure 1.6 Ecogeographic regions and location of sampled populations. Carpathian Mountains range in dark gray: *RZA*: Retezat, Romania, and *SNO*: Strečno, Slovakia. Pannonian lowland in light gray: *KZL*: Kesztlőc, Hungary, and *SZI*: Szigliget, Hungary.

We started our experiment with two half-sib plants from each of three maternal lines from our four populations (*RZA* and *SNO* from the Carpathian, and *KZL* and *SZI* from the Pannonian). For each of these 24 parental individuals, we generated seeds from four types of breeding: (i). Within a population, (ii). Between populations within a region, and (iii & iv). Between regions to each of the two populations. This strategy resulted in four cross-types (maternal region X paternal region): Carpathian X Carpathian (CXC), Pannonian X Pannonian (PXP), Carpathian X Pannonian (CXP), and Pannonian X Carpathian (PXC). We haphazardly selected pollen donors for these crosses ensuring that individuals were not used as pollen donors more than four times, in total, we performed 96 crosses. From each cross, we planted 12 seeds in each of four temperature treatments (a total of 48 seeds per each cross): (i). 9°C (16h day)–5°C (8h night), (ii). 14°C (16h day)–9°C (8h night), (iii). 19°C (16h day)–15°C (8h night), and (iv). 24°C (16h day)–20°C (8h night). We will refer to these treatments by their daytime

temperature of 9°C, 14°C, 19°C, and 24°C respectively. We grew all plants in four Conviron MTPC-144 plant growth chambers with one chamber per temperature treatment. In total, we generated 4608 seeds, 1152 seeds per cross-type (CXC, PXP, CXP, and PXC), with 288 seeds of each cross-type in each temperature.

We sowed the seeds in soil (50% Sunshine Mix #4 / 50% fine vermiculite) and stratified them at 4°C for two weeks in complete darkness. We moved seeds into their assigned temperature treatments and we recorded seedling emergence (germination) and survival of seedlings for the next 60. Next, we vernalized the plants for 60 days at 4°C (8h day–16h night). After vernalization, we returned plants to their temperature treatments and recorded flowering, flowering time, pollen viability, and seed set from controlled crosses. We use these phenotypes to estimate pre- and post-mating reproductive isolation barriers in the four different temperature treatments.

Phenotyping and statistical analyses—We measured six phenotypes on each individual in our experiment: germination, survival, flowering, flowering time, pollen viability, and seed set from controlled crosses. Germination, survival, and flowering were recorded as a binary response where 0 = failure and 1 = success. We quantified flowering time as the number of days from germination until the first flower open minus 60 days of vernalization. We quantified pollen viability as the proportion of viable pollen grains for greater than 200 grains per sample. Viable pollen grains were evaluated with Alexander’s staining method (Alexander, 1969).

For each of our experimental plants, we evaluated seed set success from crosses with pure Carpathian and pure Pannonian individuals. For this assay, we chose two CXC fathers and two PXP fathers each with 100% pollen viability for a total of four fully fertile fathers. From each temperature, we chose two mothers of every cross-type (CXC, PXP, CXP, and PXC) for a total of eight mothers per temperature and 32 mothers in total. Every mother was pollinated with pollen from the four fathers, pollen from each father was used to pollinate six flowers; in total, 24 flowers per mother were pollinated. From each cross we quantified the number of seeds developed per silique.

We tested whether variation in the measured phenotypes was explained by cross-type (CXC, PXP, CXP, and PXC), temperature treatment, or their interaction. For germination, survival, flowering, pollen viability, and seed set we fit generalized linear mixed effect models (GLMMs) with temperature treatment, cross-type, and their interaction, as well as mother and father population as fixed effects, and mother and father identities as random effects using the *glmer* function in R package *lme4* (Bates et al., 2015). For germination, survival, and flowering we assume a binomial distribution of error terms. For the number of viable pollen grains we use the total number of counted pollen grains as an offset and assume a Poisson distribution of error terms. For the number of seeds per silique, we assume a Poisson distribution of error terms. To analyze flowering time, we fit a survival model with temperature, cross-type, and their interaction, as well as mother and father population as covariates and mother identity as

a random effect using the `survfit` and `survreg` functions in R package *survival* (Therneau and Grambsch, 2000, Therneau, 2015).

Calculating reproductive barriers strength—For any phenotype for which we found either significant cross-type effect or significant cross-type by temperature interaction effect, we calculated the strength of reproductive isolation associated with this trait. We use a method for calculating *RI* that allows a simple linear correlation between *RI* and the probability of gene flow between lineages (Sobel and Chen, 2014):

$$RI = 1 - 2 \left(\frac{H}{H+C} \right) \quad (1)$$

In equation (1), *H* and *C* represent either the number of heterospecific and conspecific matings or the amount of viable heterospecific and conspecific offspring. Using this equation, the *RI* values 1, 0, and -1 correspond to 0%, 50%, and 100% heterospecific outcomes, respectively. In order to investigate asymmetries in the strength of barriers, we calculated the strength of *RI* from the Carpathians into the Pannonia ($RI_{Car \rightarrow Pan}$) separately from the strength of *RI* that reduces gene flow from the Pannonia into the Carpathians ($RI_{Pan \rightarrow Car}$). Specific calculations for each trait for each species are found in Table S1.4.

We calculated flowering time *RI* based on temporal co-occurrence. The minimum value of *RI* is zero (total co-occurrence), so, we use an analogous equation for *RI* that ranges from 0 to 1 (Sobel and Chen, 2014):

$$RI = 1 - \left(\frac{S}{S+U} \right) \quad (2)$$

In equation (2), *S* and *U* represent the shared and unshared portions of occurrence. Using this equation, the *RI* values 1, 0.5, and 0 correspond to 0%, 50%, and 100% shared occurrence, respectively. We estimated the proportion of temporal co-occurrence $\left(\frac{S}{S+U} \right)$ using the overlap function in R package *overlapping* (Pastore, 2017). Since temporal isolation is symmetrical, the strength of *RI* that reduces gene flow from the Carpathians into the Pannonia ($RI_{Car \rightarrow Pan}$) equals *RI* that reduces gene flow from the Pannonia into the Carpathians ($RI_{Pan \rightarrow Car}$).

For each barrier, we used 10,000 bootstrap resamples of our raw datasets to calculate 95% confidence intervals of individual contributions (Efron, 1987). To calculate total *RI*, we assume that reproductive barriers act sequentially and estimate their absolute contributions (Sobel and Chen, 2014). Finally, we resampled from the distributions of each separate barrier strength 10,000 times during total *RI* calculation to estimate 95% confidence intervals.

CHAPTER 2

Autopolyploid lineage shows climatic niche expansion but not divergence in *Arabidopsis arenosa*

2.1 Abstract

Successful establishment of neopolyploids, and therefore polyploid speciation, is thought to be contingent on environmental niche shifts from their progenitors. We explore this niche shift hypothesis in the obligate outcrosser *Arabidopsis arenosa* complex, which includes diploid and recently formed autotetraploid populations. To characterize the climatic niches for both cytotypes in *A. arenosa*, we first gathered climatic data from localities with known ploidy types. We then estimated the climatic niches for diploids and autotetraploids and calculated niche overlap. Using this niche overlap statistic, we tested for niche equivalency and similarity. We explored differences in niches by estimating and comparing niche optimum and breadth and calculated indices of niche expansion and unfilling. We found that climatic niche overlap between diploids and autotetraploids is substantial. Although the two niche models are not significantly divergent, they are not identical as they differ in both optimum and breadth along two environmental gradients. Autotetraploids fill nearly the entire niche space of diploids and have expanded into novel environments. In conclusion, we find climatic niche expansion but not divergence, together with a moderate change in the niche optimum, in the autotetraploid lineage of *A. arenosa*. These results indicate that the climatic niche shift hypothesis alone cannot explain the coexistence of tetraploid and diploid cytotypes.

2.2 Introduction

Speciation initiated by whole-genome duplication, or polyploidy, is widespread throughout plant evolution (Grant, 1981, Wood et al., 2009, Soltis et al., 2007). Despite the high incidence of polyploidization, the success of a new polyploid lineage is thought to be largely dependent on its ability to ecologically diverge from the progenitor lineage(s). It has been hypothesized that neopolyploid lineages will be successful only if they establish a new ecological niche or spread to a new geographic location and therefore avoid competing with and mating with parental lineages (Fowler and Levin, 1984, Levin, 1983, Levin, 2002, Levin, 1975). Although this has been a long-standing hypothesis (Anderson, 1971, Borrill and Lindner, 1971, Cavanah and Alexander, 1963, Hagberg and Ellerström, 1959, Lewis, 1967a, Lewis, 1967b), recent advances in niche analyses can provide novel insights into if and how successful establishment of polyploid lineages involves shifts in their niches (Parisod and Broennimann, 2016).

In general, new species face two challenges – they must evolve reproductive isolation to prevent gene flow with closely related species and establish a unique niche, either through ecological divergence or successfully outcompeting other species (Coyne and Orr, 2004, Via, 2009, Barton, 2010). Because crosses between plants of different ploidy levels frequently result in reduced hybrid fertility (Pegoraro et al., 2016, Roccaforte et al., 2015, Borges et al., 2012, Greiner and Oberprieler, 2012, Husband and Schemske, 2000, Husband and Sabara, 2004, Gross and Schiestl, 2015, Sweigart et al., 2008, however see Lafon-Placette et al., 2017), it has been suggested that polyploidization causes instantaneous speciation (Schluter, 2001, Schluter, 2000, Rundle and Nosil, 2005). However, for a new polyploid lineage to become a new

species, it must also overcome the challenge of establishing a self-sustaining population. In this way, ecological adaptation can play a significant role in the process of polyploid speciation.

A central challenge faced by neopolyploids is avoiding costly hybridization with parental lineages. Levin (1975) described this selection against newly formed polyploids as the “minority cytotype disadvantage” (MCD). When initially formed neopolyploids are rare relative to their progenitor lineages, they will often mate with the more frequent diploid lineages. These cross-cytotype matings often fail or result in sterile hybrids and therefore significantly impede successful propagation and establishment of a stable polyploid population (Husband, 2000). Hence, the MCD represents a significant challenge for polyploid establishment and speciation.

One primary mechanism by which the MCD can be overcome is through habitat segregation by niche divergence or what is known as the "niche shift hypothesis" (NSH) (Husband, 2000, Levin, 2004). The study of niche divergence has experienced recent advances due to the availability of global climate data and the development of novel analytical approaches (Wiens and Graham, 2005, Warren et al., 2008, Broennimann et al., 2012). These advanced methods and data availability combined with taxon distribution data have allowed for the development of refined environmental niche models (ENMs) that characterize species niches and allow assessment of how niches vary between species (Guisan et al., 2014). Niche divergence is characterized by the extent of niche overlap, which is evaluated using tests for niche equivalency and niche similarity (Warren et al., 2008).

Niche equivalency is a conservative test that determines if two observed niches are identical. Rejecting this null hypothesis indicates that the two niches are not statistically equivalent (Fig. 2.1). The niche similarity test determines if niches are more similar than expected by chance, testing if the ENM of one taxon predicts the ENM of another taxon better than a null model (Fig. 2.1). The null model in the niche similarity test controls for the geographic distribution of the species to determine if the two niches are more similar than would be expected given the niches available across the geographic range of the species (Warren et al., 2008). The niche similarity test is less stringent than the niche equivalency test but is often underpowered to detect significant similarity or differences between niches. If ENMs are not conserved, as indicated by the niche equivalency and the niche similarity test, they can differ in niche optimum, niche breadth, or both. Differences in niche optimum are caused by differences in the occupied environmental conditions (i.e. differences in the “mean” niche), while differences in niche breadth are caused by the expansion of a niche or the “unfilling” of taxa’s ecological tolerances (Guisan et al., 2014, Petitpierre et al., 2012, Di Cola et al., 2017).

Previous empirical analyses of niche divergence between diploids and polyploids have produced inconsistent results across species leading to ambiguous patterns. Most of the reported examples about ecological consequences of polyploidization, which use niche-modeling approaches, come from studies focused on allopolyploids. Although several studies show niche divergence between allopolyploids and at least one of their progenitors (Glennon et al., 2012, Theodoridis et al., 2013, Glennon et al., 2014, Harbert et al., 2014, Han et al., 2015, Lopez-Alvarez et al., 2015, Marchant et al., 2016),

other studies show allopolyploid lineages have intermediate or non-divergent ecological niches (Oberprieler et al., 2012, Glennon et al., 2014, Harbert et al., 2014, Marchant et al., 2016, Boucher et al., 2016, Casazza et al., 2017). For autopolyploids, some studies have found significant ecological segregation between polyploids and their ancestors (Visger et al., 2016, Mandak et al., 2016, Lazaroff et al., 2016, Zozomova-Lihova et al., 2015, Thompson et al., 2014, Mered'a et al., 2016, Stahlberg, 2009, Schonswetter et al., 2007, Sonnleitner et al., 2016, Hulber et al., 2015), and yet other studies find no ecological divergence between cytotypes (Hanzl et al., 2014, Godsoe et al., 2013). Most of the reported studies are limited to evaluating if niches are conserved but do not investigate how the niches of the two cytotypes differ in aspects such as optima and breadths (but see Kirchheimer et al., 2016). Understanding if and how polyploids undergo ecological niche shifts remains a persistent challenge.

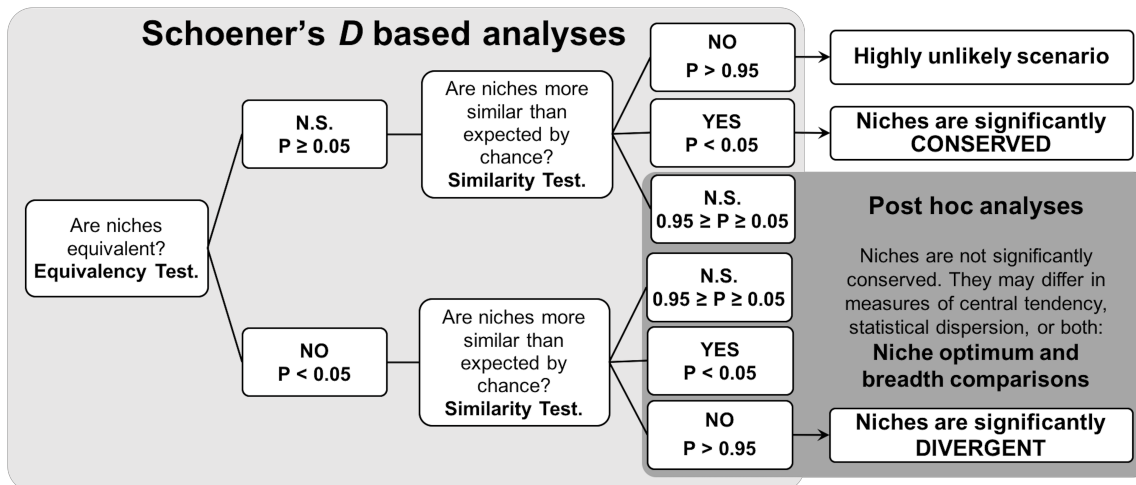


Figure 2.1 Workflow diagram describing the niche evolution analyses performed in this study, and the conclusions derived from the possible test results. N.S. represents a non-significant result.

We performed a thorough characterization of whether and how polyploid niches diverge from progenitor niches using the *Arabidopsis arenosa* (L.) (Sand rock-cress) complex (Brassicaceae). *A. arenosa* is an obligate outcrosser closely related to *A. lyrata* and the genetic model plant *A. thaliana* (Al-Shehbaz and O'Kane, 2002). Diploid ($2n = 2x = 16$) *A. arenosa* populations are found in Eastern Europe and the Balkans, and along the southern Baltic Coast in Poland, whereas polyploid ($2n = 4x = 32$) populations are broadly distributed through Central and Northern Europe. Recent genome-wide sequence analyses have resolved the phylogenetic relationships and demographic histories within the *A. arenosa* complex (Kolář et al., 2016a, Yant and Bomblies, 2017, Novikova et al., 2016, Monnahan et al., 2018). Although these phylogenetic results differ from the previously described taxonomy of the group based on morphology (Schmickl et al., 2012, e.g., Měsíček and Goliašová, 2002, Hohmann et al., 2014), we will use the demographic history inferred from the genome-wide analyses as the evolutionary framework for our study.

Diploid populations of *A. arenosa* are split into three highly divergent lineages (Kolář et al., 2016a, Monnahan et al., 2018): (i) The Carpathian lineage, found in the mid-altitudes to high altitudes of the western Carpathians in Slovakia, and mid-altitudes of southern and eastern Carpathians in Romania and the southern Dinarides in Serbia. The Carpathian lineage also includes diploid populations found along the Baltic sea coast. (ii) The Dinaric lineage, found in the foothills of the Dinaric Alps and their surroundings in Slovenia, Croatia, and Bosnia and Herzegovina. And (iii) the Pannonian lineage, found in the Pannonian lowlands of Hungary and southern Slovakia. The Carpathian and Dinaric lineages diverged approximately 650,000 generations ago,

whereas the Pannonian lineage diverged approximately 760,000 generations ago from the Carpathian-Dinaric ancestor (Kolář et al., 2016a). The widespread *A. arenosa* tetraploid cytotype represents an autopolyploid lineage with chromosome segregation during meiosis showing no evidence of pairing preference (Hollister et al., 2012, Arnold et al., 2015, Arnold et al., 2016). The autotetraploids likely originated from a single ancestral population that arose approximately 11,000-30,000 generations ago in the Carpathian Mountains, where its closest living diploid relatives are still found (Monnahan et al., 2018, Arnold et al., 2015), and the two cytotypes broadly overlap (Schmickl et al., 2012, Kolář et al., 2016b). Although gene flow from both tetraploid *A. lyrata* and diploid *A. arenosa* into tetraploid *A. arenosa* has been reported (Jorgensen et al., 2011, Arnold et al., 2016, Baduel et al., 2018, Novikova et al., 2016, Monnahan et al., 2018), even the hybrid lineages show fully random chromosome pairing and trace back to a single origin with subsequent gene flow between geographically proximal taxa.

Here, we applied ENM to estimate the climatic niche spaces of autotetraploid lineage and the diploid progenitor lineage (the Carpathian lineage). We restrict our analyses of diploids to just the Carpathian lineage because the tetraploid lineage arose from the Carpathian lineage far more recently than the Carpathian lineage divergence from the other diploid lineages (a full analysis of all diploid *A. arenosa* is also reported in Fig. S3.2.) We used an ordination-based analysis of climate variables to assess shifts in environmental space between cytotypes. Then, we applied a resampling method to evaluate differences in ENM optimum and breadth between cytotypes. If climatic niche differentiation was important for autotetraploid *A. arenosa* establishment, we

hypothesize that the niches of the two cytotypes are divergent. However, we find climatic niche expansion but not divergence, together with a moderate change in the niche optimum, in the autotetraploid lineage.

2.3 Results

We estimated a climatic niche overlap of 54.1% between the progenitor diploid and the tetraploid *A. arenosa* (Schoener's $D = 0.541$). Schoener's D based tests of equivalency and similarity show that diploid and autotetraploid niches are not equivalent ($P = 0.002$) but are more similar than expected by chance in both comparisons ($2x \rightarrow$ background: $P = 0.042$ and $4x \rightarrow$ background: $P = 0.045$) (Fig. 2.2). We found qualitatively similar results when we compared the tetraploid lineages to the all diploid lineages (Fig S2.2).

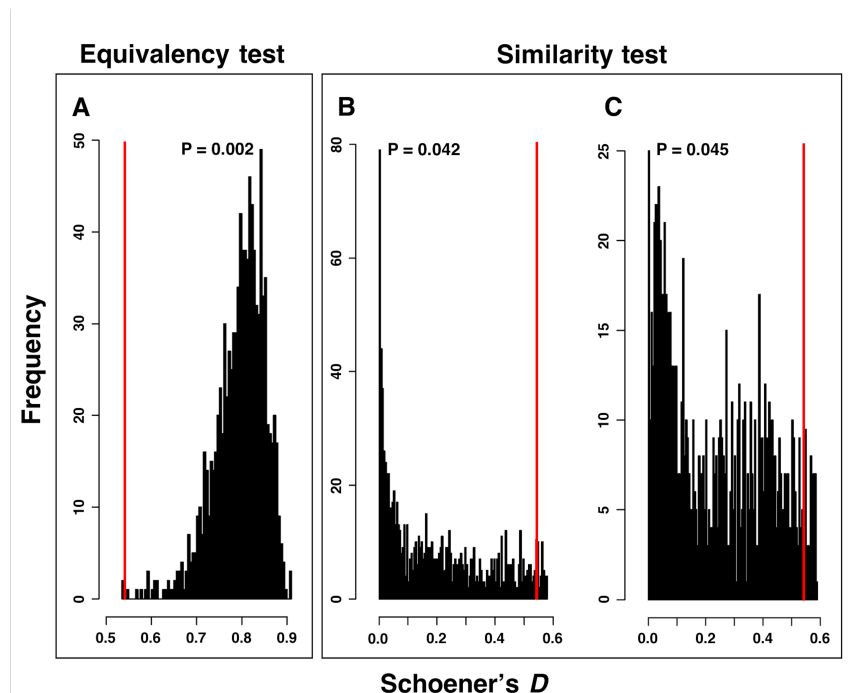


Figure 2.2 Histograms of Schoener's D based bootstrap tests with 1000 resamples. Black bars indicate resamples of estimated and red line represents observed $D = 0.541$. **A.** Equivalency test, which predicts no statistically significant differences between alternative niche models. **B.** Similarity test ($2x \rightarrow$ background), and **C.** Similarity test ($4x \rightarrow$ background).

The first two components of our principal components' analysis (PCA-env) explain 74.38% of the total variance observed in the climatic dataset. PC1 corresponds to a precipitation axis and describes 44.11% of the variance with BIO12 (annual precipitation), BIO17 (precipitation of driest quarter), and BIO19 (precipitation of coldest quarter) having the greatest contributions. PC2 corresponds to a temperature axis and describes 30.27% of the variance with BIO11 (mean temperature of coldest quarter), BIO6 (minimum temperature of coldest month), and BIO1 (annual mean temperature) having the greatest contributions (Fig. 2.3; Table S2.2).

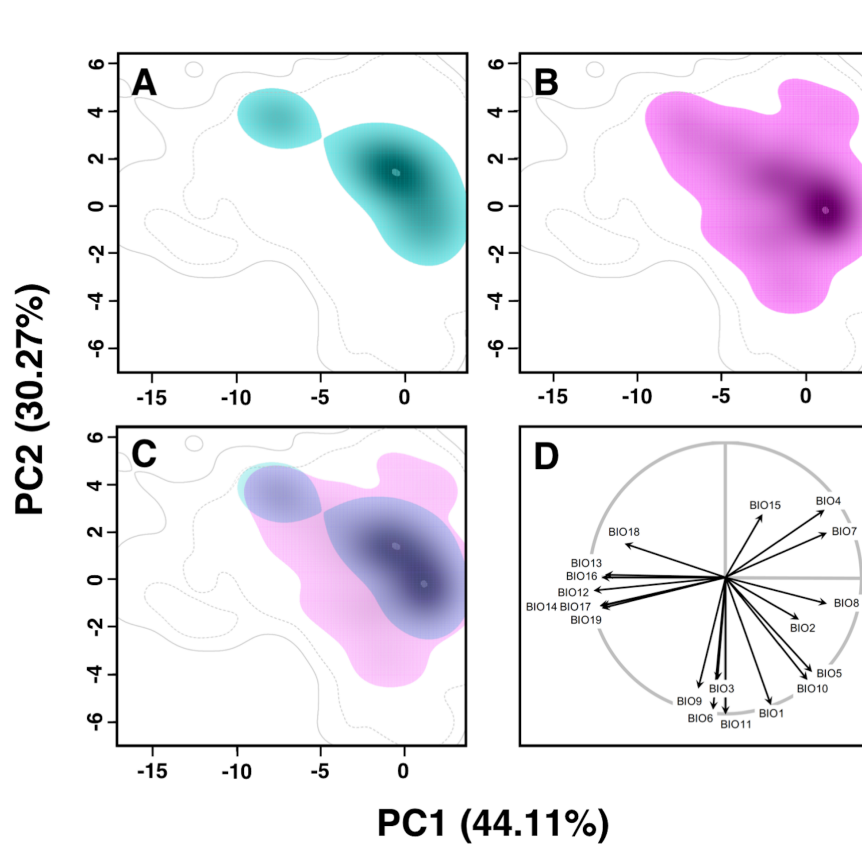


Figure 2.3 Niche dynamics observed comparing diploid (N = 103) and tetraploid (N = 208) *Arabidopsis arenosa* cytotypes in Central and Northern Europe. **A.** Diploid niche model. **B.** Tetraploid niche model. **C.** Overlap between diploid and tetraploid models. Continuous gray line delimits the full environmental space available within the background area; dashed gray line delimits the percentile 75 of the environmental space available within the background area. Darker shading indicates a higher density of presence data. Clearer dots represent niche centroids. **D.** Correlation circle of WorldClim variables used in the PCA-env (Complete list of climatic variables and respective contributions at table S2.2).

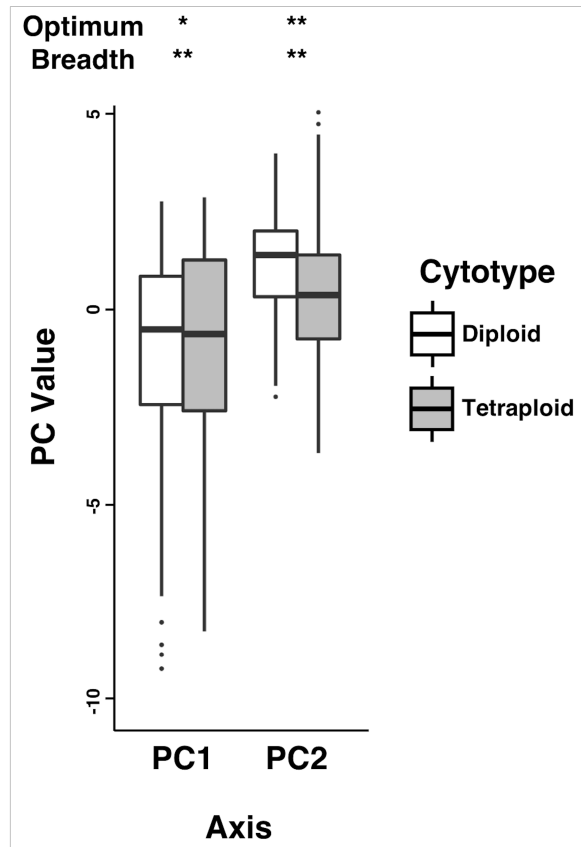


Figure 2.4 Values of principal components along the two environmental gradients (PCA-env axes). Comparisons are made between diploid (N = 103) and tetraploid (N = 208) cytotypes of *Arabidopsis arenosa* in Central and Northern Europe. Niche optimum and breadth correspond to the median and the length of the 95% inter-percentile interval along the two PCA-env axes respectively. * P < 0.01, ** P < 0.001.

Table 2.1 Comparisons of the niche optimum and breadth along the two environmental gradients (PCA-env axes).

AXIS	CYTOTYPE	OPTIMUM	BREADTH
PC1	2X	-0.510	11.948
	4X	-0.626	11.099
	DIFFERENCE	0.116	0.849
PC2	2X	1.393	6.222
	4X	0.370	8.711
	DIFFERENCE	1.023	2.489

Notes: comparisons are made between Carpathian diploid (N = 103) and tetraploid (N = 208) cytotypes of *Arabidopsis arenosa* in Central and Northern Europe. Niche optimum and breadth values correspond to the median and the length of the 95% inter-percentile interval along the two PCA-env axes respectively. Both optimum and breadth show significant differences along the two environmental axes (P < 0.01; Fig. 2.4).

2.4 Discussion

Polyploid lineages must persist in the face of competition and costly hybridization with its diploid progenitors. The niche shift hypothesis (NSH) proposes that the ecological niche of polyploid lineages must diverge for these lineages to successfully establish (Levin, 1975, Fowler and Levin, 1984). Some studies support the NSH. For instance, it has been reported that polyploids are generally found in drier (Hagerup, 1932, Watanabe, 1986, Maherali et al., 2009, Treier et al., 2009) and more exposed habitats than diploids (Rothera and Davy, 1986, Watanabe, 1986, Lumaret et al., 1987, Brammall and Semple, 1990). However, the extent to which polyploids are adapted to more extreme environments and therefore differentiated from diploids remains controversial (te Beest et al., 2012). Our work uses refined analyses of environmental niches to test the NSH in the autotetraploid lineage of *A. arenosa*. We found that the tetraploid niche has a significant degree of overlap with the diploid niche, and yet is not conserved. Niche differences result from an increase in tetraploid niche breadth and a small but significant change in optimum.

Recent advances in ecological niche modeling analyses provide new opportunities to understand whether and how neopolyploid lineages have altered their niches to allow successful establishment. We used Schoener's *D*, as a summary statistic for niche overlap, to test the hypothesis of niche conservatism versus niche divergence (Warren et al., 2008). Niches are conserved when two specific criteria are satisfied (Fig. 2.1): (i) niche equivalency hypothesis is not rejected (i.e., $0.025 \leq P \leq 0.975$) and (ii) niche similarity test is significant (i.e., $P < 0.05$). If niches are divergent, or not conserved, they can vary in their breadth, optimum, or both.

We determined if and how the *A. arenosa* tetraploid niche diverged from the diploid progenitor. In general, we found that the niche overlap between cytotypes was equal or higher for *A. arenosa* than has been observed in other diploid-autopolyploid species complexes (Glennon et al., 2012, Thompson et al., 2014, Kirchheimer et al., 2016, Visger et al., 2016). Despite a high degree of overlap, the autotetraploid niche is not identical to the diploid niche, as evaluated by the equivalency test, but when controlling for geographic range, the two niches are statistically “similar.” Although both equivalency and similarity tests assess niche conservatism, their approaches are slightly different, and therefore this type of inconsistency is common when comparing niches (e.g., Glennon et al., 2014).

The test for niche equivalency is conservative as it directly compares two niches and asks if they are identical. The test for niche similarity controls for the geographic range of the taxa by asking if, given the possible niches available in their ranges, two species maintain similar niches or shift and expand into new niches. The ability to detect significant similarity is therefore highly dependent on the geographic ranges of the two species. This difference between the tests likely explains the seemingly contradictory results in the *A. arenosa* species complex. The autotetraploid lineage experienced a geographic range expansion since formation from the diploid ancestors (Arnold et al., 2015). Relative to the diploid niche, the possible niche divergence across this range expansion is considerable. Thus, there is a high null expectation of how much the autotetraploid and diploid niches could diverge. Compared to this null expectation, the two niches remained more similar than expected even though they are not identical. This climatic niche stability between diploid and autotetraploid cytotypes in *A. arenosa* is

consistent with the notion that autopolyploid lineages exhibit lower rates of niche evolution than allopolyploids. For instance, a previous study conducted in the *Alyssum montanum* species complex showed that allopolyploids expand into different climatic conditions than those of their diploid congeners, but autopolyploids occupy ecological niches similar to their ancestors and are limited to peripheral and less competitive geographic areas (Arrigo et al., 2016).

Our exploration of the divergence between the autotetraploid and diploid niches revealed significant differences in both breadth and optimum. The autotetraploid niche expanded to encompass broader temperature tolerances and underwent a slight change in the niche optimum such that more populations inhabit climates with a greater variability throughout the year. Therefore, our finding of expansion in the autotetraploid niche shows weak support for the hypothesis that polyploid lineages are more tolerant than their diploid progenitors of extreme environmental conditions. It is possible that our ENMs did not incorporate an important axis of ecological variation and thus we missed key aspects of divergence. For example, we could not evaluate microclimate, soil, phenology, or biotic interactions. Tetraploid lineages may have diverged in other ways besides climatic niche to better compete or coexist with the diploid ancestors. For example, the tetraploids may have shifted their life-history timing to not reproduce simultaneously with the diploids.

Furthermore, tetraploid *A. arenosa* exhibits a tetrasomic inheritance (Hollister et al., 2012, Arnold et al., 2015, Arnold et al., 2016) which is a crucial autopolyploid feature that consists in the random pairing of the two sets of homologous chromosomes such that the four alleles at a given locus pair and segregate at random. All tetraploid *A.*

arenosa populations that have been tested are in Hardy-Weinberg equilibrium assuming a random pairing tetraploid model, even those from hybrid regions (Hollister et al., 2012, Arnold et al., 2015, Arnold et al., 2016). Autotetraploids may be able to compete with diploids as a result of having twice as much genetic material per individual.

Consequently, autotetraploid populations are distinguished by high heterozygosity and by nearly doubled effective population size as compared to diploids (Ronfort, 1999, Ronfort et al., 1998, Arnold et al., 2012). These features may result in selection being more efficient within tetraploid populations than diploid populations allowing for more rapid adaptation. However, the efficiency of selection and the long-term adaptive potential of autopolyploids remain mostly unexplored (Parisod et al., 2010). The potential advantages of tetrasomic inheritance may have allowed for autotetraploid lineages of *A. arenosa* to more rapidly establish in disturbed landscapes following the last deglaciation period.

In fact, Monnahan et al. (2018) found a higher proportion of nonsynonymous polymorphisms fixed by positive selection in tetraploid compare to diploid *A. arenosa*, which implies that autotetraploid populations may respond faster to directional selection (Selmecki et al., 2015). Indeed, tetraploid *A. arenosa* has extended its range beyond their diploid ancestor range, including new human-made habitats and postglacial environments (Kolář et al., 2016a), suggesting an improved capability to establish in novel environments. In general, it has been suggested that in extreme or regularly glaciated environments, the increased available genetic diversity in polyploid individuals relative to diploids can allow for more rapid colonization (Comai, 2005, Brochmann et al., 2004, Novikova et al., 2018).

Additionally, polyploidy might decrease the negative consequences of interspecific hybridization and introgression (Alix et al., 2017). Indeed, hybridization is broadly recognized as a source of variation for adaptation to new environments (e.g., Lewontin and Birch, 1966, Seehausen, 2004, Rieseberg et al., 1999). Interploidal gene flow from diploid into tetraploid *A. arenosa* and gene flow from tetraploid *A. lyrata* into tetraploid *A. arenosa* have been previously reported (Jorgensen et al., 2011, Arnold et al., 2015, Baduel et al., 2018, Arnold et al., 2016, Monnahan et al., 2018). Multiple events of introgression into tetraploid *A. arenosa* may offer an additional substrate for local adaptation. Specifically, population genomics analyses have suggested that migrant alleles from tetraploid *A. lyrata* may have facilitated adaptation of tetraploid *A. arenosa* to the challenging serpentine habitat in the Austrian Alps (Arnold et al., 2016); in the same sense, adaptive introgression from Baltic diploid populations may have facilitated the evolution of early flowering in tetraploid *A. arenosa* adapted to a railway environment in Berchtesgaden in the Bavarian Alps (Baduel et al., 2018). These findings suggest that hybridization and introgression could have played a role in the observed niche expansion in the diploid to autotetraploid transition in *A. arenosa*.

In conclusion, expansion of niche breadth, together with a slight change in the niche optimum, but not a significant ecological niche shift, occurred during (or after) the *A. arenosa* autotetraploids moved out of the Carpathian Mountains. Whether climatic niche differences between the diploid and autotetraploid were an immediate consequence of polyploidy (i.e. tetrasomic inheritance), a result of subsequent evolution (i.e. gene flow) or a combination of both is beyond the scope of this study. Therefore, it

is important to consider our findings as representing a combination of both autopolyploidy and subsequent evolution.

2.5 Methods

Locality and climate data collection—To characterize the climatic niches for both cytotypes (diploid and autotetraploid) in *A. arenosa*, we retrieve climate data from specific locations where the species is known to grow. We only used locality information from occurrences for which ploidy was determined using flow cytometry (Schmickl et al., 2012, Yant et al., 2013, Kolář et al., 2016b, Kolář et al., 2016a, Schmickl and Koch, 2011, Wright et al., 2015, Novikova et al., 2016). To the best of our ability, we sampled every known population that fit our criteria at the time of our analysis. We collected a total of 311 presence data corresponding to 103 Carpathian diploid populations (the ancestral lineage for the tetraploids, including 10 presence data from the Baltic Sea coast) and 208 autotetraploid populations (Fig. 2.5, Table S2.1). These populations are from both the allopatric portion of the lineages' ranges as well as the sympatric region where there is some history of inter-ploidy hybridization (Monnahan et al., 2018). As reported in Fig. S3.2, we also performed our analyses on diploid populations from across the *A. arenosa* range by adding 47 populations from the Pannonian and Dinaric lineages to our data set (Table S2.1). We extracted climate data for each georeferenced location from the WorldClim database (Hijmans et al., 2005) at a ~1km² resolution, using 'raster' package (Hijmans and van Etten, 2012) in R 2.13.2 (R Core Team 2012). The WorldClim database is based on spatially interpolated data between weather stations and average values of climate variables from 1950 to 2000. We included all available climate variables in our analyses (Table S2.2).

We estimated the 'background region' to extract climate data for the niche similarity analyses (see below). The background region is a set of data points in the vicinity of the presence data of both cytotypes that establishes the environmental domain available to the taxa given the geographic range. This area is much broader than the presence data, which include just the conditions under which a species is known to occur. To create the background region, we projected the geographic coordinates for each population in ArcGIS 9.3 (Environmental Systems Research Institute, Redlands, CA, USA) and drew a convex polygon around all projected data points to delineate the observed geographic range. We then randomly select points within this polygon to create a climate 'background region'.

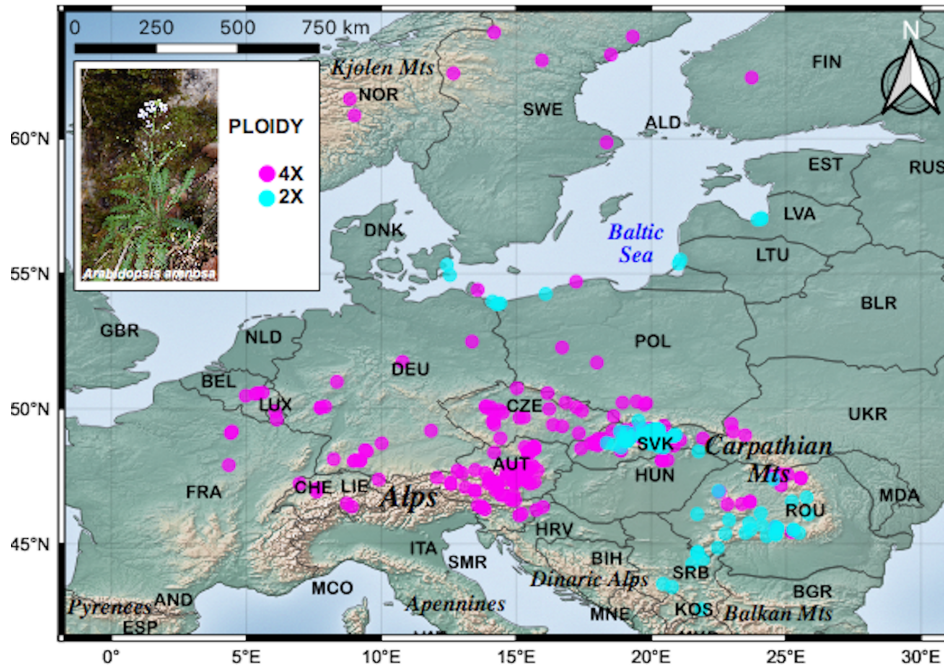


Figure 2.5 Map of *Arabidopsis arenosa* populations used for niche modeling analyses (N = 311) in Central and Northern Europe with ploidy verified by flow cytometry. Magenta circles represent autotetraploid (4X, N = 208), and cyan circles represent Carpathian diploid (2X, N = 103) populations. Photo of *A. arenosa* courtesy of K. Bomblies.

Niche-modeling analyses—Our ENM analyses were divided into four parts. First, we estimated the niches for diploids and tetraploids and calculated niche overlap. Second, we tested for ENM equivalency and similarity. Third, we estimated and compared ENM optima and breadths. Finally, we calculated ENM expansion-unfilling indices.

Niche overlap estimates—We estimated the ENMs using the package ‘*ecospat*’ (Di Cola et al., 2017, Broennimann et al., 2012) in R 2.13.2 (R Core Team 2012). Specifically, we used an ordination approach (Principal Component Analysis, PCA) to estimate the occurrence and climatic factor densities along environmental axes (PCA-env) and used these densities to calculate ENM overlap. ENM overlap was evaluated using the Schoener’s *D* metric (Schoener, 1968) that varies from 0 (no overlap) to 1 (complete overlap).

Niche equivalency and similarity tests—Equivalency and similarity tests are complementary measures of ENM divergence, but they test slightly different hypotheses. The niche equivalency test evaluates if ENMs are statistically identical when compared directly with each other using a bootstrap resampling approach (Warren et al., 2008, Broennimann et al., 2012). For each ENM comparison, we generated a null distribution of divergence based on all the observed presence data points. Specifically, we pooled all the presence data points for both cytotypes in the comparison and resampled by randomly reassigning presence points to two sets. We then calculated *D* on these resampled sets. We resampled 1000 times to create a null

distribution of D . If the observed D is less than the null distribution of D , then the hypothesis of niche equivalency is rejected, and ENMs are not equivalent. If niches were not equivalent, we evaluated differences in niche optimum and breadth to determine why (Fig. 2.1). The ENM similarity test uses bootstrap resampling to evaluate if one ENM predicts the other better than a randomly generated ENM from the geographic range (Warren et al., 2008, Broennimann et al., 2012). We estimated a null distribution of ENM similarity by extracting climate variables from a randomly generated set of geographic localities within the 'background region' containing both cytotypes. The ENM based on these background points is our 'random' ENM. We compared this random ENM to the actual ENM of each lineage calculated by the presence data using the D statistic. For each comparison, we resample the background points 1000 times comparing actual diploid and tetraploid ENM to random background ENM. Observed D 's greater than the null distribution indicate that ENMs are more similar than expected given their geographic ranges, while values significantly less than the null distribution indicate ENMs divergence. A non-significant result from the similarity test indicates that there is low power to detect similarities or differences or the expected similarity between niches given the null hypothesis pulled from the geographic ranges is very high, and thus the actual niche differentiation merely is what is expected by chance. If niches were not similar, we proceeded to test differences in niche optimum and breadth (Fig. 2.1).

Niche optimum and breadth estimates—Schoener's D offers an estimate of niche conservatism versus divergence; however, it carries limited information regarding how the niches of the two cytotypes vary. Specifically, Schoener's D , and therefore our tests of equivalency and similarity, do not discriminate between differences in niche optima and breadths (Glennon et al., 2014). If compared niches were not significantly equivalent, we calculated the ENM optimum and the ENM breadth, respectively, as the median and the length of the 95% inter-percentile interval along the first two PCA-env axes (Broennimann et al., 2012). We evaluated if diploid and autotetraploid differed in ENM optimum and breadth using a bootstrap resampling approach. For each comparison, we generated a null distribution of differences in the ENM optima and the ENM breadths based on all the observed presence data points. Specifically, we pooled all the presence data points for both cytotypes and resampled by randomly reassigning presence points to two sets. Then, we calculated the median and the length of the 95% inter-percentile interval on these two resampled sets and estimated their differences. We resampled 1000 times to create a null distribution of differences in the ENM optima and the ENM breadths. If the observed difference in the median is higher than the null distribution of median differences, then the hypothesis of similar ENM optima is rejected. If the observed difference in 95% inter-percentile interval is higher than the null distribution, then the autotetraploid ENM has expanded with respect to the diploid ENM.

To calculate the observed differences in breadth, we subtract diploid from autotetraploid estimates.

Niche dynamic indices of expansion and unfilling—Niche overlap between cytotypes can be characterized by niche unfilling and niche expansion. To calculate the degree of unfilling and expansion of autotetraploids we used the package ‘*ecospat*’ (Di Cola et al., 2017) in R 2.13.2 (R Core Team 2012). Unfilling is the proportion of the diploid ENM density located outside the tetraploid ENM. Expansion is the proportion of the autotetraploid ENM density located outside the diploid ENM density. This classification provides additional information about the drivers of the niche dynamic between diploid and autotetraploid lineages (Guisan et al., 2014, Petitpierre et al., 2012, Di Cola et al., 2017).

CHAPTER 3

Polyploidy is not an evolutionary ‘dead-end’ in the Brassicaceae

3.1 Abstract

Although polyploidy, or whole-genome duplication, is widespread across the Plant Tree of Life, its long-term evolutionary significance is still poorly understood. Here we examine the effects of polyploidy in driving macroevolutionary patterns within the angiosperm family Brassicaceae, a speciose clade exhibiting extensive inter-specific variation in chromosome numbers. We inferred ploidy levels from haploid chromosome numbers for 80% of species in the most comprehensive species-level chronogram for the Brassicaceae published to date. Here we show that ploidy drives diversification rates across the Brassicaceae, with polyploids experiencing faster rates of speciation and extinction, but slower rates of diversification. Nevertheless, diversification rates are, on average, positive for both polyploidy and diploidy. We also show that despite diversifying significantly slower than diploids, polyploids have played a significant role in driving present-day differences in species richness among clades within the Brassicaceae. Overall, although most polyploids go extinct before sustainable populations are established, rare successful polyploids persist to significantly contribute to the long-term evolution of lineages. Our findings, suggesting that polyploidy has played a major role in shaping the long-term evolution within the Brassicaceae, highlight the importance of polyploidy in driving diversity patterns across the Plant Tree of Life.

3.2 Introduction

Although polyploidy—the heritable condition of carrying more than two complete sets of chromosomes—is widespread across the plant phylogeny, its evolutionary significance is still debated (Soltis et al., 2009, Van de Peer et al., 2009, Mayrose et al., 2011, Arrigo and Barker, 2012, Tank et al., 2015). Discussions on the evolutionary role of polyploidy in plant evolution date back to Stebbins (1950, 1970) and Wagner (1970) who considered polyploidy to have negligible effects on the long-term evolution of lineages. This idea, later known as the ‘dead-end’ hypothesis in polyploidy, was recently restated such as polyploids are predicted to undergo extinction more frequently than diploids (Mayrose et al., 2011, Arrigo and Barker, 2012, Wood et al., 2009, Mayrose et al., 2015, Estep et al., 2014).

We note that polyploidy can influence the long-term evolution of lineages (Paterson et al., 2004, De Bodt et al., 2005, Jaillon et al., 2007, Fawcett et al., 2009, Jiao et al., 2011) regardless of whether polyploids are more likely to go extinct than diploids (Mayrose et al., 2011, Arrigo and Barker, 2012, Wood et al., 2009, Mayrose et al., 2015, Estep et al., 2014). Both interpretations of the ‘dead-end’ hypothesis are thus not equivalent to each other. Specifically, while the original hypothesis is focused on the evolutionary role of polyploidy as a process (Stebbins, 1950, Stebbins, 1970, Wagner, 1970), the modern perspective compares macroevolutionary rates between polyploids and diploids (Mayrose et al., 2011, Arrigo and Barker, 2012, Wood et al., 2009, Mayrose et al., 2015, Estep et al., 2014). Discussions around the role of polyploidy (or polyploids) in the evolution of plant lineages have, therefore, been obscured by the fact that different interpretations of the ‘dead-end’ hypothesis are identically named.

Here we examine the long-term evolutionary significance of polyploidy in the evolution of plants (Stebbins, 1950, Stebbins, 1970, Wagner, 1970). Specifically, we test if polyploids have significantly contributed to the long-term evolution of plants, despite being more likely to experience extinction than diploids (Mayrose et al., 2011, Arrigo and Barker, 2012, Wood et al., 2009, Mayrose et al., 2015, Estep et al., 2014). We predict that if rare successful polyploids have significantly contributed to present-day diversity patterns (Arrigo and Barker, 2012), polyploidy (as a process) is not an evolutionary dead-end. Here, we first use state-of-art methods to test the relationship between diversification rates and ploidy. We then examine the role of polyploidy in driving the long-term evolution across clades.

Our analyses are based on the Angiosperm family Brassicaceae, an ideal lineage for studying the short- and long-term significance of polyploidy in the evolution of flowering plants. The systematics and evolutionary history of this angiosperm family have been studied extensively (Al-Shehbaz et al., 2006, Beilstein et al., 2006, Hohmann et al., 2015). Furthermore, a comprehensive species-level phylogeny for the family including ~48% of the extant species (1,667 out of ~3,500 species; The Plant List, 2013, Smith and Brown, 2018) was recently published. Haploid chromosome counts, which are here used in to infer species ploidy, are available for ~55% of extant species within the family (The Plant List, 2013, Rice et al., 2015, Lysak, 2018). Ploidy levels were inferred using a model-based (Mayrose et al., 2010, Glick and Mayrose, 2014) for a total of 1,336 species, representing more than 80% of the species in the tree and almost 40% of the total family richness. We then used the compiled ploidy database, along with

the Brassicaceae phylogeny, to examine the role of ploidy in driving macroevolutionary rates within the family.

First, we analyzed the fit of different trait-dependent and trait-independent models of diversification that accounted for the potential effects of unassessed traits (i.e., hidden states; Hidden State Speciation and Extinction models; HiSSE; Beaulieu and O'Meara, 2016b) or not (Binary State Speciation and Extinction models; BiSSE; Maddison et al., 2007, FitzJohn et al., 2009). We found that polyploid lineages have experienced faster rates of speciation and extinction. However, net diversification rates were faster in diploids, with both polyploids and diploids diversifying, on average, at positive rates. Next, we test whether polyploid-generated diversity has significantly contributed to the present-day differences in species richness among clades. We used phylogenetic path regression models (Gonzalez-Voyer and Von Hardenberg, 2014), based on 65% of the total genera in the family (243 out of 372), to test for the indirect contribution of polyploidy richness on differences in species among clades in the Brassicaceae. We compared models that assumed clade richness to be affected only by diversification rates and clade age, or polyploid and diploid richness influencing clade richness through net rates of diversification.

Overall, we found polyploidy to influence differences in species richness among genera positively. We, therefore, suggest that although polyploids are more likely to experience extinction than diploids, rare successful polyploids diversify and significantly influence the long-term evolution of particular lineages within the Brassicaceae. Our analyses show that polyploidy is not an 'evolutionary dead-end' (Stebbins, 1950, Stebbins, 1970, Wagner, 1970), but, instead, an important source of evolutionary

novelty within clades, that has major implications in driving present-day diversity patterns in plants.

3.3 Results

We collected haploid chromosome counts for 816 Brassicaceae species representing 49% of taxa sampled in the phylogeny (Smith and Brown, 2018) and 24% of the total family richness (The Plant List, 2013; Table S3.1). We used this database to infer species ploidy levels for 1,333 in the tree (80% of the species in the tree, and 38% of the total family richness; Fig. 3.1; Table S3.2) using on the likelihood-based approach implemented in ChromEvol Perl package (Mayrose et al., 2010, Glick and Mayrose, 2014). Overall, we found that nearly a half of the analyzed Brassicaceae species were polyploids ($n=654$) and that these lineages were phylogenetically clustered in particular branches of Brassicaceae phylogeny (Pagel's $\lambda=0.816$, $P<0.001$; D-statistic=0.006, $P<0.001$; Fig. 3.1).

We then explored the association between diversification rates and changes in ploidy across the Brassicaceae phylogeny. For this, we compared the fit of ten different hypotheses of trait-dependent diversification models that accounted for the potential effects of unassessed traits ($n=6$; hidden states; Hidden State Speciation and Extinction models, HiSSE; (Beaulieu and O'Meara, 2016b); Table S3.3) or not ($n=4$; Binary State Speciation and Extinction models, BiSSE; (Maddison et al., 2007, FitzJohn et al., 2009); Table S3.3). The fit of each of these ten alternative models was then compared against two null models that assumed diversification rates to be independent of ploidy changes. Overall, we found that changes in ploidy were important drivers of diversification rates

across the Brassicaceae (Fig. 3.1; Table S3.3). The favored hypothesis, a HiSSE model assuming trait-dependent diversification (next model $\Delta AICc=385.589$; Table S3.3), suggested that, in addition to unassessed traits (i.e., hidden states), ploidy has played a significant role in driving diversification rates across the phylogeny (Table S3.3).

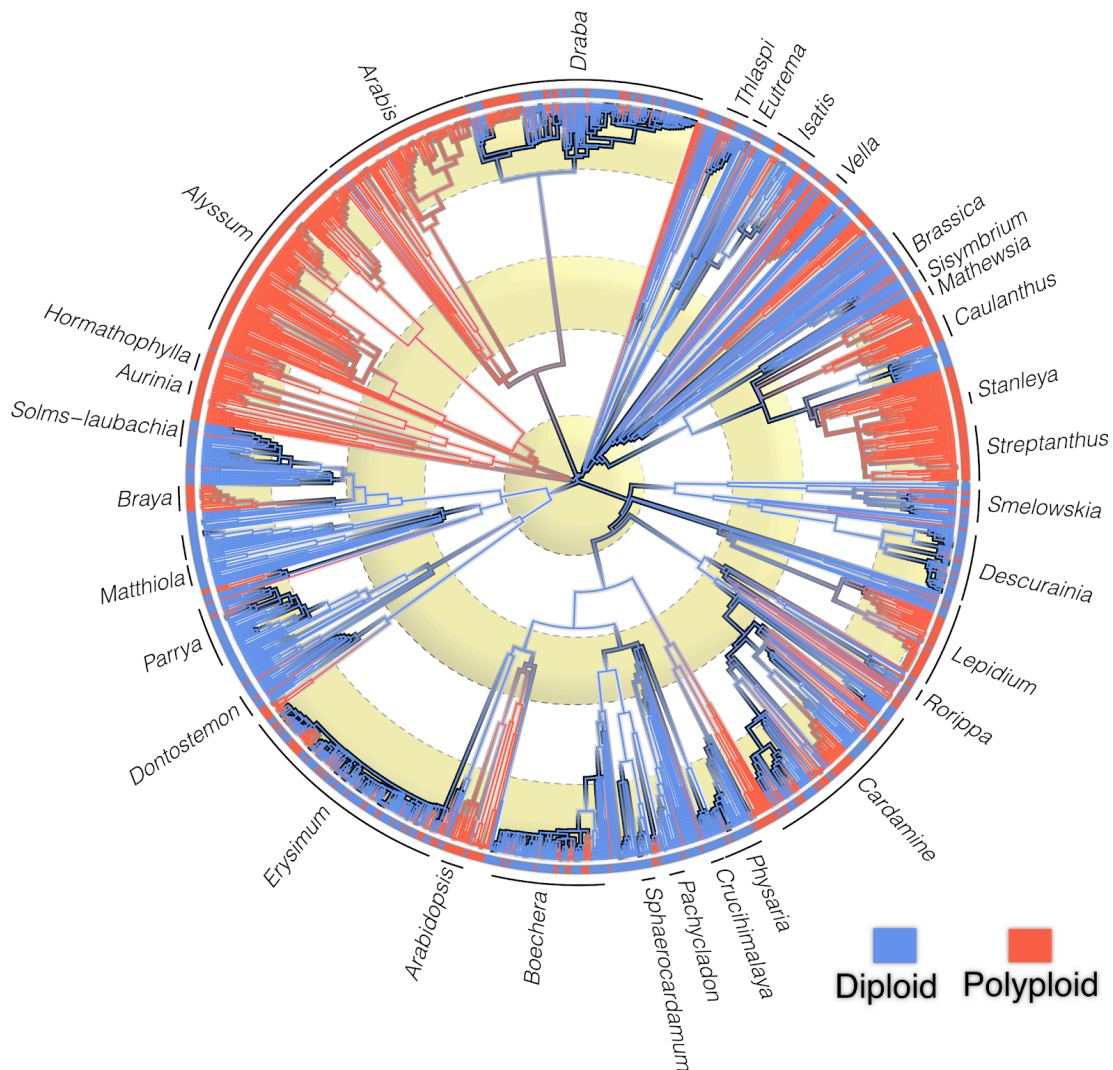


Figure 3.1 Phylogeny depicting the temporal evolution of ploidy across 1,366 Brassicaceae species (nearly 40% of the total family richness). Species are here coded as diploid or polyploid based on the evolution of haploid chromosome numbers across the tree. Ploidy levels were inferred using the Ploidy Inference Pipeline implemented in ChromEvol. We also show the ancestral state reconstruction of ploidy based on the best-fitting Hidden State Speciation and Extinction (HiSSE) model. Specifically, the favored HiSSE model assumed ploidy changes to influence diversification rates across the tree significantly. We depict also variation in net diversification rates across branches of the phylogeny – fast-evolving branches are marginally highlighted in black. Ancestral state reconstructions shown here are for visualization of diversification rates, and not used to ploidy changes across the tree. Instead, the ancestral state reconstruction for chromosomal numbers across the Brassicaceae is based on ChromEvol subtrees. Rings in the background are placed each ~5 My.

Our analyses indicate that polyploids, on average, speciate 48.7% faster (mean speciation rate polyploids=1.063 events My⁻¹, diploids=0.715 events My⁻¹; Fig. 3.2; Table S3.4), and experience extinction 73.3% faster relative to diploids (mean extinction rate polyploids=0.863 events My⁻¹, diploids=0.498 events My⁻¹; Fig. 3.2; Table S3.4). Congruently, we found that while diploids diversify 8.5% faster (mean diversification rate polyploids=0.199 events My⁻¹, diploids=0.216 events My⁻¹; Fig. 3.2; Table S3.4), the evolutionary turnover in polyploids is 58.8% faster (mean turnover rate polyploids=1.926 events My⁻¹, diploids=1.213 events My⁻¹; Fig. 3.2; Table S3.4). In sum, our analyses suggest that despite polyploids diversify slower than diploids, their net rates of diversification are, on average, positive.

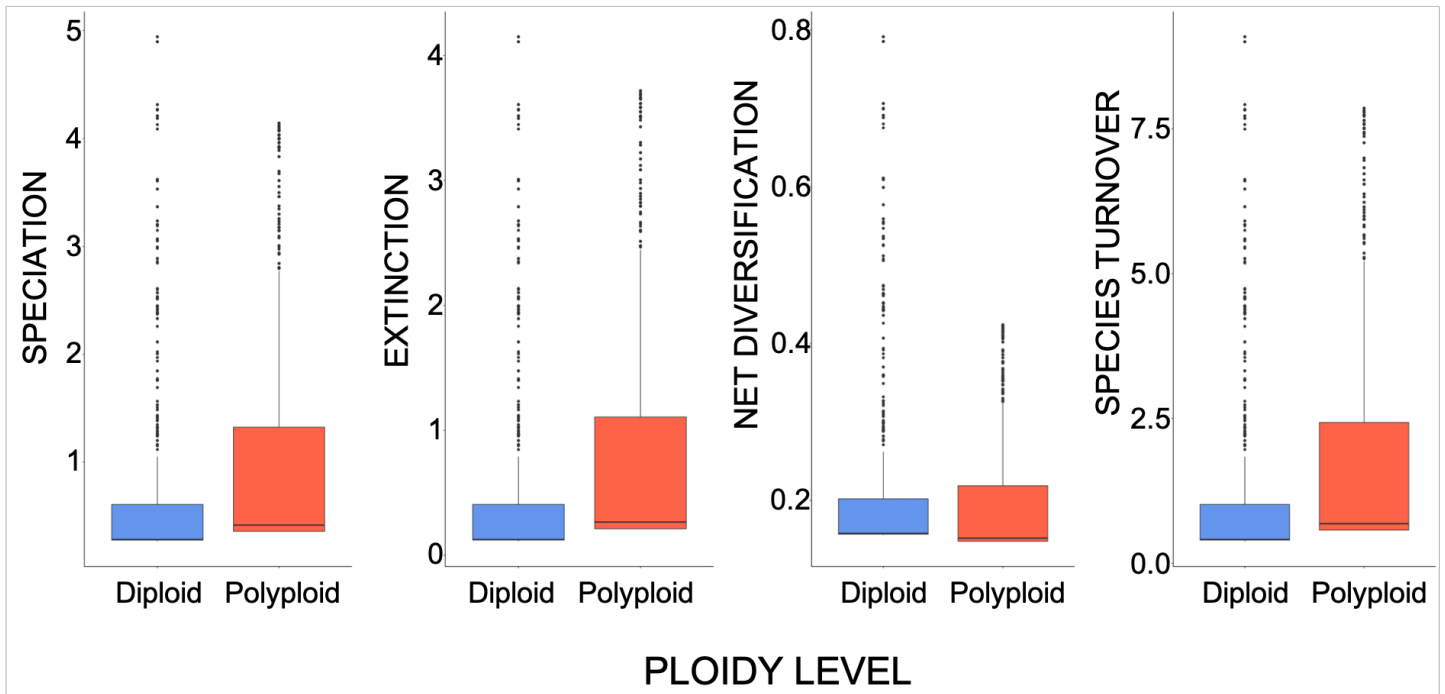


Figure 3.2 Comparison of observed macroevolutionary rates between diploid and polyploids in the Brassicaceae. Rates units in events My⁻¹.

It is still unclear, however, whether polyploidy-generated diversity has significantly contributed to present-day differences in species richness across clades in the Brassicaceae. Here, we based our analyses on 97% of genera in the tree and 65% of the total generic richness within the family (Table S3.5). First, we used phylogenetic generalized least squares (PGLS) models to test whether polyploid richness influences species richness through diversification rates. Strikingly, we found that 16–30% of the variance in net diversification rates is explained by polyploid richness (log-transformed polyploid richness versus net diversification rates; PGLS slope=0.085–0.444, $r^2=0.166$ –0.304, $P<0.001$; Table S3.6). Second, we used 14 phylogenetic path regression models to test whether polyploid richness has indirectly shaped present-day patterns of species richness among clades through diversification rates (Table S3.7; Fig. 3.3). We found, based on the best-fitting model, that polyploidy is an indirect driver of differences in species richness among clades across the Brassicaceae (next model $\Delta\text{CICc}=21.021$; Fig. 3.3; Table S3.7). Specifically, we show that despite diploids contribute four times more than polyploids to net diversification rates, polyploidy-generated diversity has significantly influenced species richness through its effect on net diversification rates.

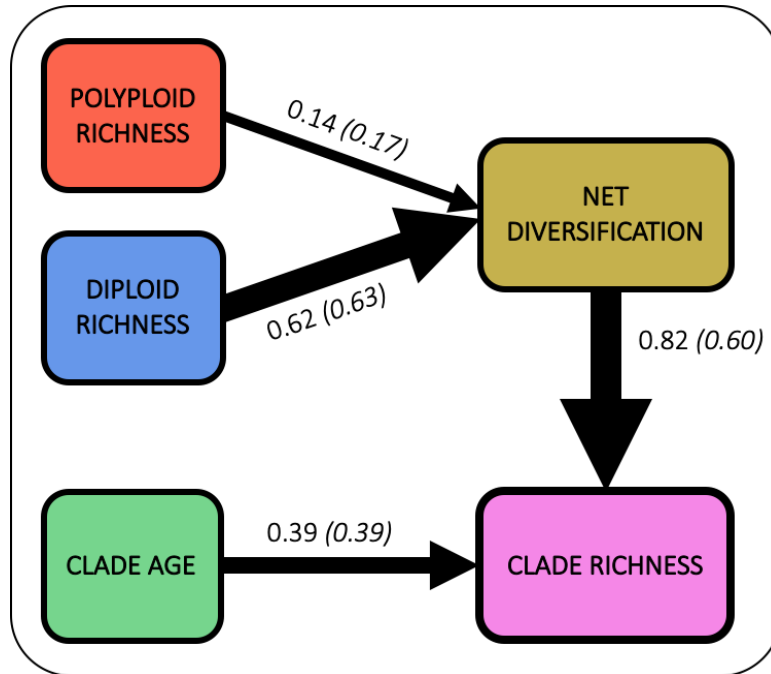


Figure 3.3 Path analysis showing the preferred drivers of species richness differences across clades in the Brassicaceae. Results are based on 65% of the total generic richness within the family. We show results for the best-fitting phylogenetic path model. This model included the indirect effects of polyploid and diploid richness on species richness. We also note that the selected model assumed clade richness to directly influenced by clade age and net rates of diversification. Here, polyploid richness is simply the number of polyploid species within each clade (based on ChromEvol analyses). We note that, contrary to the frequency of polyploidy, polyploid raw richness was a significant predictor of diversification rates explaining 16–30% of the variance. We present results for both stem-based MS and DR rates. We acknowledge that DR rates are usually referred to as related to speciation, but results are congruent to those based on MS. Path coefficient for MS estimator are indicated below each arrow outside of parentheses. DR-related coefficients are indicated next to MS-related coefficients but in parentheses. Finally, the clade age is always based on stem groups.

3.4 Discussion

We investigated the long-term evolutionary significance of polyploidy in the Brassicaceae. To our knowledge, our study based on 80% of the taxa in the largest species-level phylogeny for the Brassicaceae, representing 38% of the total species diversity, and 65% of genera, is by far the most comprehensive study ever conducted examining the role of polyploidy in shaping the present-day diversity within a single plant lineage. Our analyses highlight three main aspects of the role of polyploidy in influencing the evolution within the Brassicaceae. First, polyploidy is not rare in the

family with nearly 50% of species inferred as polyploids. Second, because species turnover is relatively higher in polyploids, we recover the creative role of polyploidy in the evolution of the Brassicaceae. Third, we found that polyploidy has significantly shaped present-day differences in species richness among clades in the Brassicaceae. Below, we discuss the implications of our findings in the family and contextualize their implications in the understanding of diversity patterns across the Plant Tree of Life.

How does polyploidy influence macroevolutionary rates? —Polyploidy is associated with increased speciation, extinction, and turnover rates in the Brassicaceae. Even though net diversification rates are positive in polyploids, these rates are higher in diploids relative to those in polyploids. We acknowledge that previous studies have discussed the evolutionary trade-offs associated with polyploidy (Comai, 2005, Otto, 2007, Sémon and Wolfe, 2007, Madlung, 2013, Van De Peer et al., 2017). Thus, we first focus on explaining why polyploidy increases both speciation and extinction rates. Then, we explore the creative role of polyploidy in the evolution of Brassicaceae, and finally, we discuss the long-term consequences of polyploidy in driving present-day differences in species richness.

Speciation rates are predicted to be higher in polyploids relative to diploids. Specifically, polyploids are more likely to colonize and successfully establish in habitats that are potentially unsuitable for diploids (Theodoridis et al., 2013, Harbert et al., 2014, Thompson et al., 2014, Hulber et al., 2015, Lopez-Alvarez et al., 2015, Zozomova-Lihova et al., 2015, Marchant et al., 2016, Visger et al., 2016, Molina-Henao and Hopkins, 2019). From a genomic perspective, the increased speciation rate found in polyploids could potentially be explained by their ability to mask deleterious mutations,

increased number of gene copies that can potentially harbor new beneficial mutations or changes in gene regulation that favor genome plasticity (Comai, 2005, Otto, 2007, Sémon and Wolfe, 2007, Madlung, 2013, Van De Peer et al., 2017). Nevertheless, we note that both ecological/physiological and genomic hypotheses should be considered when explaining why does polyploidy trigger speciation rates in the Brassicaceae.

The role of extinction in shaping the evolution of polyploids has been widely discussed before. In agreement with previous studies, our results suggest that polyploids are more likely to go extinct than diploids. The specific triggers of extinction in polyploidy has been a matter of recent discussion; for instance, polyploidy may (i) increase asexual reproduction and self-compatibility which generally decrease effective population sizes (Soltis et al., 2010, Otto and Whitton, 2000), (ii) exhibit (specially autopolyploids) increased rates of segregation errors during meiosis (Parisod et al., 2010), (iii) increase the accumulation of deleterious mutations and ultimately cause fitness reductions (Otto and Whitton, 2000), (iv) may generate species that are poorly suited for available niches due to genomic shock following hybridization which undergo higher extinction risk (Arrigo and Barker, 2012). Nevertheless, coupled with the creative role of polyploidy in plant evolution (see below), most polyploids are expected to be unsuccessful evolutionary ‘experiments’ that are quickly wiped out from clades.

Finally, we note that the relative importance of polyploids in shaping plant evolution should not exclusively be inferred from extinction or speciation rates alone (Arrigo and Barker, 2012). A comprehensive approach for examining the evolutionary role of polyploidy should also account for differences in net diversification and species turnover among lineages. Here, we found that Brassicaceae polyploids (i) experience

species turnover much faster than diploid relatives, and (ii) diversify slower than diploids, but at positive rates. Our results on species turnover and net diversification rates combined suggest that polyploidy is a creative process in the evolution of the Brassicaceae by enabling lineages to ‘explore’ novel genotypic and phenotypic combinations that, in some particular cases, are successful (i.e., able to establish and diversify). Our results show that when polyploid lineages are successful, these lineages diversify and significantly contribute to clade richness. However, we highlight that although it is more likely for polyploids to undergo extinction than to be successful, polyploidy is still an important process driving differences in species richness among clades.

How does polyploidy influences species richness? —Different descriptors of lineage macroevolution are central to the alternative definitions of ‘dead-end’ hypothesis in polyploidy (e.g., speciation, extinction, diversification, turnover, clade richness). For instance, if a ‘dead-end’ is defined based on the long-term evolutionary contribution among lineages, one would have to focus on estimating the contribution of polyploidy in ultimately driving differences in species richness among clades. Conversely, if a ‘dead-end’ is defined based on the relationship between extinction and net diversification rates between polyploids and diploids, one should focus on comparing extinction and net diversification rates between polyploids and diploids. We note again that the latter definition of the ‘dead-end’ (exclusively based on macroevolutionary rates) provides an alternative and non-equivalent interpretation of the original definition based on the long-term evolutionary consequence of polyploidy. Here we found using the Brassicaceae, that polyploidy positively influences differences in species richness among clades.

However, despite the fact that the contribution of polyploids to clade richness is significant, diploids contribute significantly more than polyploids. We, therefore, highlight that under the classic definition of the dead-ends hypothesis, polyploidy is not an 'evolutionary dead-end' but a central driver of evolutionary diversification (Soltis et al., 2009, Freeling, 2009, Huminiecki and Conant, 2012, Garsmeur et al., 2013, Mayfield-Jones et al., 2013).

Overall, we note that a positive association between polyploid richness and species richness has been demonstrated both theoretically and using real-world data (Otto and Whitton, 2000, Vamosi and Dickinson, 2006). Based on this perspective, the positive association between clade richness and polyploid numbers found in our study could either be just a simple artifact of the analyses we utilized, or the consequence of diploidization rates being significantly low ('ratchet' model of polyploidy (Meyers and Levin, 2006, Scarpino et al., 2014)). Nevertheless, we note three main aspects that suggest our results are not affected by the "inertia" in polyploid richness. First, previous analyses on the relationship between species richness and polyploid richness assumed clades to be independent of each other. However, because lineages share an evolutionary history, the phylogenetic relationships between them can potentially influence the association between polyploid richness and clade richness. Second, we account for the effect of clade age in the association between polyploid richness and clade richness. Specifically, if polyploidization rates outnumber diploidization, more polyploids are expected to be accumulated not only in richer clades but also in the older ones. This temporal scaling (Scholl and Wiens, 2016, Henao-Diaz et al., 2019) was not accounted for by previous studies on the association between polyploidy and clade

richness. Third, we note that polyploid richness does not directly influence clade richness. In particular, our analyses suggest that ploidy affects diversification rates before influencing clade richness.

Finally, we note that the association between clade richness and polyploid richness could be driven by the differential contribution of allo- and autopolyploids to the overall polyploid richness. Specifically, one would expect allopolyploid richness to be positively associated with clade richness given that allopolyploids lineages are potentially more likely to be formed in species-rich clades. Nevertheless, it is also known that successful allopolyploids are more likely to be formed by distantly related diploids than closely related ones (Buggs et al., 2008, Soltis and Soltis, 2009). Autopolyploidy, on the other hand, is potentially unrelated to clade richness. Our analyses based on chromosomal counts cannot differentiate between allo- and autopolyploids. However, we found that models assuming polyploid richness to be dependent on clade richness fitted worse than other models. Thus, it is unlikely that the association between polyploid richness and clade richness is an artifact of the predicted diversity-dependence richness in allopolyploids. We acknowledge, however, that this question remains to be explored in further studies.

Are polyploids ‘evolutionary dead-ends’? —The traditional perspective on polyploids as ‘evolutionary dead-ends’ dates back to Stebbins (Stebbins, 1950, Stebbins, 1970) and Wagner (Wagner, 1970). These authors suggested that polyploidy does not contribute significantly to long-term evolution. However, recent studies (Mayrose et al., 2011, Arrigo and Barker, 2012) have used this concept to mean that polyploids are more likely to go extinct than diploids are. We suggest that despite

extinction rates are ultimately related to the long-term significance of polyploidy, their contribution in driving present-day diversity patterns can also be affected by other aspects such as diversification and turnover rates.

Nonetheless, the long-term contribution of polyploidy should not only be measured in terms of the macroevolutionary parameters but also, on whether polyploidy contributes to species richness differences among clades. Finally, we think that it is important to distinguish between polyploids (i.e., lineages) as being ‘dead-ends’ and polyploidy (i.e., trait or a process) as a ‘dead-end.’ We conclude polyploidy is not an ‘evolutionary dead-end’ given that although most polyploids arise but fail to persist, those that persist are important drivers of diversification.

Polyploidy and the Angiosperm Tree of Life—Our results recovering polyploidy as a major driver of diversification and species richness differences among clades shows that polyploidy is not an ‘evolutionary dead-end’ in the Brassicaceae. We suggest that our findings can be extended to other branches of the Plant Tree of Life. Specifically, our findings in the Brassicaceae (i.e., a high phylogenetic signal in polyploidy, and a high frequency across clades) are potentially an optimal indicator of polyploidy being an important driver of the macroevolution within other plant lineages. Nevertheless, we acknowledge that further quantitative studies are required to examine the specific relationship between diversification rates, clade richness, and ploidy across the Plant Tree of Life.

Here we compare our estimates of polyploidy frequency in the Brassicaceae, where nearly half of extant diversity is polyploid, to previous estimates of polyploid frequency in other lineages of the Angiosperm Tree of Life. Specifically, because

polyploid frequency in lineages such as Asteraceae (47–64%; Góral ski et al., 2014), Poaceae (62–67%; Paterson et al., 2004, Góral ski et al., 2014, Blanc and Wolfe, 2004, Malcomber and Kellogg, 2005, Schlueter et al., 2004), Rosaceae (84%; Góral ski et al., 2014), Higher monocots (46.58%; Wood et al., 2009), Solanaceae (Schlueter et al., 2004), Fabaceae (Lavin et al., 2005, Pfeil et al., 2005), and Cleomaceae (Schranz and Mitchell-Olds, 2006), are similar (or larger) than in the Brassicaceae, polyploidy has potentially been a major macroevolutionary driver in these other lineages. The influence of ploidy in the long-term evolution is potentially not only restricted to the Brassicaceae but likely to have a positive effect on diversity in other branches of the Plant Tree of Life.

Conclusions—We show that polyploidy is not ‘evolutionary dead-ends’ in the Brassicaceae. We demonstrate that polyploids are frequently ‘dead-ends,’ but those that are successful significantly contribute to the long-term evolution of the family. Our analyses show that polyploidy has played a significant role in driving macroevolutionary patterns within the Brassicaceae by influencing both speciation and extinction rates. We also show that polyploids have indirectly shaped the present-day differences in species richness among clades within the Brassicaceae, despite diversifying slower than diploids. We suggest that polyploidy in plants, instead of being an ‘evolutionary dead-end,’ is a major source of evolutionary innovation within particular clades of the Angiosperm Tree of Life. Furthermore, by demonstrating the significant role of polyploidy in shaping present-day diversity patterns within a single Angiosperm family, we also show that polyploids are an inevitable and substantial part in the origins of its plant diversity. Polyploidy has potential implications in explaining higher-level diversity patterns across the Angiosperm Tree of Life.

3.5 Methods

Brassicaceae phylogeny—The relationship between polyploidization and diversification rates is expected to be influenced, among others, by the phylogenetic relationships among species, and the evolutionary timing represented in branch lengths (Beaulieu and O'Meara, 2016b, Maddison et al., 2007, Soltis et al., 2014, Beaulieu and O'Meara, 2016a). Since the phylogeny and timing of evolution in the Brassicaceae has been extensively discussed before (Al-Shehbaz et al., 2006, Beilstein et al., 2006, Hohmann et al., 2015, Hall et al., 2002, Bailey et al., 2006, Beilstein et al., 2008, Franzke et al., 2016, Guo et al., 2017), we focused on analyzing the association between diversification rates and ploidy changes across the phylogeny. Our analyses are based on the Brassicaceae subtree extracted using the `extract.clade` function (`ape` R package version 5.2; Paradis et al., 2004) from the original GBMB Angiosperm phylogeny from Smith and Brown (Smith and Brown, 2018). The Brassicaceae subtree, including a total of 1,667 species (we pruned 100 tips corresponding to subspecies), is currently the largest-species level chronogram of the family. This phylogeny was constructed using PyPHLAWD based on GenBank release 218 (February 2017), with calibration points following Magallón et al. (2015). Additional methodological details are summarized in Smith and Brown (Smith and Brown, 2018) and https://github.com/FePhyFoFum/big_seed_plant_trees.

Ploidy inference—Chromosome number for each species in the tree were retrieved from the Chromosome Count Database (CCDB; Rice et al., 2015) using the `chromer` R package version 0.1 (Pennell, 2016). Raw haploid chromosome counts are provided in Table S3.1. Species ploidy levels were then inferred using a maximum likelihood approach using the Ploidy Inference Pipeline implemented in ChromEvol v.2.0 (Mayrose et al., 2010, Glick and Mayrose, 2014). Furthermore, we also used a more conservative approach for estimating ploidy levels from haploid chromosome counts. Results for this alternative non-model-based method were congruent to the ones based on ChromEvol and are presented in the supplement for this article.

Model-based ploidy inference analyses in ChromEvol failed to run on the full Brassicaceae phylogeny, consisting of 1,667 species, and with chromosome counts ranging between 4 and 156 (Table S3.1). We note that the inference of species ploidy under ChromEvol represents a challenge given the size of the tree and variation in chromosomal counts (among and within) species. Specifically, no study has used ChromEvol for analyzing chromosomal number evolution in phylogenies with more than 600 tips. Previous studies have analyzed trees containing between 18 and 588 species (Mayrose et al., 2011, Mota et al., 2016, Crowl et al., 2016, Glick et al., 2016, Schneider et al., 2017, Ogutcen and Vamosi, 2016, Pimentel et al., 2017, Pereira et al., 2018, Yang et al., 2017, Garcia et al., 2008, McCann et al., 2016, Escudero et al., 2018, De Oliveira et al., 2015, Moraes et al., 2017, Moraes et al., 2015, Campbell et al., 2016,

Carnicero et al., 2017). Then, we developed an alternative approach to infer ploidy levels on our dataset (1,667 species). First, we estimated the median chromosome number across all the available counts for each species (Salman-Minkov et al., 2016). This approach reduces the computational time required to run ChromEvol while summarizing the overall trend in chromosomal counts within each species. Second, we extracted all possible subtrees from the Brassicaceae phylogeny using the subtrees function implemented in the ape R package (Paradis et al., 2004). Then, we selected subtrees with (i) size between 25 and 550 species, and (ii) a maximum of 70% of missing data (i.e., species lacking chromosome counts). We run the Ploidy Inference Pipeline (PIP) in the resulting 342 subtrees.

We used the default parameters for each Chromevol run. We allowed ChromEvol to optimize the base number for each subtree. The PIP first compares the fit (AICc; Hurvich and Tsai, 1989) among ten probabilistic models of chromosome count evolution along branches as a function of polyploidy and dysploidy (Mayrose et al., 2010). Confidence in ploidy assignment based on the best-fitting model is assessed from 100 simulations (Mota et al., 2016, Zhan et al., 2014). By last, PIP classifies each taxon as polyploid if the maximum likelihood estimate of polyploidization from the root to the tip is larger than 0.9 or assigns a diploid state otherwise. The PIP allowed us to infer ploidy levels for 517 species lacking chromosome counts. Unassigned species are those with assignment probability lower than 0.9. Finally, we note that some authors often refer to PIP-inferred polyploids as neopolyploids (Zhan et al., 2014, Zhan et al., 2016). However, we refer these lineages as polyploid given that the subtrees do not follow taxonomic limits (i.e., generic-level analyses as used in other studies).

Alternatively, we inferred species ploidy level relative to their generic base following Stebbins (Stebbins, 1938) and others (Wood et al., 2009, Klekowski Jr, 1973, Goldblatt, 1980). Precisely, we coded species as polyploid where sporophytic ($2n$) counts were greater than or equal to 3.5 times the lowest haploid (n) count of the corresponding genus (Table S3.2). However, main results are based on ChromEvol given that (i) chromosome evolution in the Brassicaceae is faster than the assumed using the Stebbins' fraction, (ii) Stebbins' fraction depends on taxonomic delimitation, and (iii) ploidy cannot be estimated for species with missing data under the Stebbins method. For the latter reason, species-level sampling decreases to a half of analyzed richness under the ChromEvol database (i.e. 642 fewer species and 104 fewer genera than the database constructed using ChromEvol).

Testing for phylogenetic signal in ploidy—We analyzed the phylogenetic signal in ploidy across the Brassicaceae phylogeny using Pagel's Lambda (Pagel, 1999) and the D -statistics (Fritz and Purvis, 2010). The first index measures the fit of the data to a Brownian motion model in which trait evolution matches the phylogeny. Lambda values close to 1 suggest a high phylogenetic signal in the trait, and values close to zero indicates that trait to be randomly distributed across the phylogeny (Pagel, 1999). We

used the *phylosig* function in *Phytools* version 0.6-60 (Revell, 2012), to estimate the λ value in ploidy across the tree. Statistical significance was approached on 1,000 simulations. Alternatively, the *D*-statistics measure the phylogenetic signal of binary traits (such as ploidy). We estimated the phylogenetic signal under the *D*-statistics using the *phylo.d* function in the *Caper* R package version 1.0.1 (Orme, 2013). Values of *D*-statistic close to 0 indicates the trait conservatism expected under Brownian motion, and a value of 1 indicates a random distribution of the trait across the tree (Fritz and Purvis, 2010). For both analyses, the ploidy database is provided in Table S3.2.

Species-level diversification analyses—We used both Binary State Speciation and Extinction models (BiSSE; Maddison et al., 2007, FitzJohn et al., 2009) and Hidden State Speciation and Extinction models (HiSSE; Beaulieu and O'Meara, 2016b) to examine the importance of ploidy changes on the Brassicaceae diversification. These models also allowed us to quantify rates of speciation and extinction associated with polyploid and diploid states. BiSSE models were fitted using the *diversitree* R package version 0.9-10 (FitzJohn, 2012). HiSSE models were fitted using the *hisse* R package version 1.8.9 (Beaulieu and O'Meara, 2016a, Beaulieu and O'Meara, 2016b). Species were coded as being either diploid (0) or polyploid (1) based on *ChromEvol*-inferred ploidy states. We specified the following sampling fraction in both BiSSE and HiSSE models based on the ploidy database generated using *ChromEvol*: diploid=0.499, polyploid=0.501 (Table S3.2).

We fitted a total of 12 different trait-dependent diversification models (both BiSSE and HiSSE; Table S3.3). Four of the analyzed models corresponded to a hypothesis of trait-dependent diversification under a BiSSE framework. Using *hisse* function in the *hisse* R package, we first fitted a model assuming turnover, extinction, and transition rates to be constrained between states (i.e., diploid and polyploid). A second model constrained only transition rates between states, with turnover and extinctions free between states. A third model constrained both turnover and extinction rates to be equal between states but allowed transition rates to vary between states. Finally, we fitted a model allowing all parameters to be free between states (turnover, extinction, and transition rates).

Next, we focused on fitting ten additional models under a HiSSE framework (Table S3.3). We first fitted two-character independent models (CID2, CID4) that assumed diversification rates to be exclusively driven by the hidden states (states A or B; not by the observed states 0 or 1). We fitted a 2-state character independent model using the *hisse* function in the *hisse* package. This null model has the same number of parameters as a BiSSE model (see above; Beaulieu and O'Meara, 2016b). We specified only two free parameters in the *turnover.anc*, and *eps.anc* arguments of the *hisse* function (one parameter for 0A and 1A, and another parameter for 0B and 1B). Alternatively, we fitted the 4-state character independent model under default

parameters using the `hisse.null4` in the `hisse` R package. This null model has the same complexity as a general HiSSE model. The remaining six HiSSE models correspond to alternative hypotheses of trait-dependent diversification. These models were fitted using the `hisse` function implemented in the `hisse` R package. Specifically, we first fitted a model with two hidden states being present, independent turnover and extinction parameters across the four states, and transition rates constrained to be equal. The second and third HiSSE models assumed only a single hidden state (hidden state present in either state 0 or 1), with turnover and extinction rates set to be free among states. Transition rates constrained to be equal between states. HiSSE models four and five that assumed only a single hidden state for each observed state (hidden state for either state 0, or 1). All the remaining parameters (turnover, epsilon, and transition rates) were set free between states. Finally, we fitted a full HiSSE. This model includes two hidden states, assumes independent diversification parameters across states, and allow for different transition rates among states.

We compared the fit among the analyzed 12 models using Akaike Information Criteria (Akaike, 1974) (AIC values: dAIC, and wAIC; Table S3.3). Akaike weights were estimated using the `akaike.weights` in the `qpcR` R package version 1.4-1 (Ahmed and Kim, 2018). We then focused on analyzing the outcome of the best fitting model(s). For this, we used the `MarginRecon` (`hisse` R package) to visualize the association between ploidy changes and diversification rates across the Brassicaceae phylogeny. We also estimated the confidence intervals for speciation and extinction rates associated with each state in the best fitting model(s) using the `SupportRegion` implemented in the `hisse` R package. Finally, we summarized rates of speciation, extinction, and net diversification at the tips of the tree by running the `GetModelAveRates` (`hisse` R package) on the marginal reconstruction object from the best-fitting model.

Clade-level diversification analyses—We analyzed the role of polyploid species in driving species richness among Brassicaceae genera using phylogenetic regressions (Martins and Hansen, 1997) and phylogenetic path analyses (Gonzalez-Voyer and Von Hardenberg, 2014). We first constructed an ordinal-level phylogeny for the family by pruning from each genus, all species except one. This step was conducted using the `drop.tip` function in the `ape` R package. We note that 97% of genera in the tree were monophyletic (243 out of the total 250). The remaining 3% non-monophyletic genera ($n=7$) were simply excluded from the phylogenetic path analyses. We also highlight that 51% of Brassicaceae genera were excluded from crown-based analyses. These lineages were represented by a single species in the tree (124 of 243). Stem-based analyses are, however, based on all the 243 analyzed genera.

We first constructed a database summarizing clade-level diversification rates (two different estimators; see below), species richness, clade age (stem and crown), and the proportion of polyploid species within clades. We retrieved species richness for each of the 243 analyzed genera from (The Plant List, 2013). We estimated rates of

diversification within each genus using the Method-of-Moments estimator (MS hereafter; Magallon and Sanderson, 2001). Net diversification was estimated for the crown and stem groups after assuming three different relative extinction fractions ($e=0$, $e=0.5$, and $e=0.9$). MS rates were estimated using the `bd.ms` function implemented in the `geiger` R package version 2.0.6.1 (Harmon et al., 2008, Pennell et al., 2014). Note that stem-based rates are available for all 243 genera, but only 119 were included in crown-based analyses.

Alternatively, we estimated species-specific rates of diversification (potentially reflecting speciation rates; (Belmaker and Jetz, 2015, Quintero and Jetz, 2018) based on the DR statistic (Jetz et al., 2012, Steel and Mooers, 2010). We estimated species-specific rates based on the full species-level phylogeny of the Brassicaceae (1,667 species). Species-specific DR rates, summarized in Table S3.8, were then used to estimate the mean DR within genera ($n=243$).

We summarized the richness of polyploids within each clade using three different indexes. First, we simply obtained the absolute number of polyploid species within each genus (log-transformed). Second, we estimated the ratio between polyploid richness within each clade and the total number of species sampled in the tree for the same genus. Third, we estimated the ratio between polyploid richness and total clade richness. The analyzed database including clade age, richness, diversification rates, and proportion of polyploids is provided in Table S3.5. Then, we tested whether diversification rates among genera was influenced by polyploidy. We specifically tested the relationship between MS and DR rates against each of the three indexes of polyploid richness (see above). Phylogenetic regressions (Harvey and Pagel, 1991) were fitted using the `Caper` R package. We used the `pgls` function from the same package and allowed lambda to be estimated from the dataset.

Finally, phylogenetic path analyses were used to test the indirect effect of polyploidy in species richness among clades. The following procedure was repeated for each polyploidy index that was found to significantly predict diversification rates (see above PGLS). Models were fitted using the `define_model_set` function implemented in the R `phylopath` package version 1.0.2 (van der Bijl, 2018). Models were analyzed in `phylopath` package under a lambda model of evolution developed to analyze continuous traits. We fitted and compared a total of 30 phylogenetic path models (25 MS-based models, and five DR-based) that tested the indirect contribution of polyploidy in species richness among Brassicaceae genera. However, the main results are presented for stem-based rates of net diversification based on MS estimator (see below). Results were largely congruent to those based on DR rates because both approaches included all the 243 analyzed genera. Phylogenetic path regression models assumed different clade age (stem, crown), diversification rate estimates (MS based on crowns or stems, or DR), and variable influence of polyploid and diploid richness on net diversification rates. Our main results are, therefore, based on both stem-based MS and DR (all

clades are included). Models were compared using a modified version of the Akaike Information Criteria (AIC; Akaike, 1974) that was developed for phylogenetic path analyses. This index is known as the C statistic Information Criterion (i.e., CIC statistic; Cardon et al., 2011) and is also calculated in the phylopath R package.

Finally, we highlight that missing data have a significant effect on the inferred effects of ploidy on species richness (through net diversification rates). Specifically, our results were congruent when DR and stem-based MS rates were analyzed for 243 of the genera, but crown-based results for MS estimator, where 119 clades were excluded, were remarkably different. Given the effect of missing data on the resulting patterns, we did not perform phylogenetic path analyses based on Stebbins dataset. Phylogenetic path analyses cannot account for missing data. Specifically, the Stebbins-based ploidy level dataset included only 138 genera, which represents 55% of the genera in the tree, and 37% of the total family diversity.

CONCLUSIONS AND FUTURE DIRECTIONS

Under certain circumstances homoploid speciation may be reversible; however, this may not be the case for polyploid speciation. Here, we show that the potential invasion of the Pannonian *Arabidopsis arenosa* lineage into the Carpathian suitable habitats, in a future global warming scenario, will not only increase the probability of heterospecific crosses because increased sympatry but also may facilitate the invasion of the Pannonians into the Carpathian genomes through a mechanism mediated by hybrids with higher fertility at warmer temperatures, which could cause the collapse of two independent lineages.

Additionally, we show that expansion of niche breadth, together with a slight change in the niche optimum, but not a significant ecological niche shift, occurred during (or after) the *A. arenosa* autotetraploids moved out of the Carpathian Mountains. Whether climatic niche differences between the diploid and autotetraploid were an immediate consequence of polyploidy (i.e. tetrasomic inheritance), a result of subsequent evolution (i.e. gene flow) or a combination of both is beyond the scope of this study. Therefore, it is important to consider our findings as representing a combination of both autopolyploidy and subsequent evolution.

Finally, we show that polyploidy is not an evolutionary dead-end. We demonstrate that successful polyploids significantly contribute to the long-term evolution of the Brassicaceae family. Our analyses show that polyploidy has played a significant role in driving macroevolutionary patterns within the Brassicaceae by influencing both speciation and extinction rates. We also show that polyploids have indirectly shaped the

present-day differences in species richness among clades within the Brassicaceae, despite diversifying slower than diploids. We suggest that polyploidy in plants, instead of being an 'evolutionary dead-end,' is a major source of evolutionary innovation within particular clades of the Angiosperm Tree of Life. Furthermore, by demonstrating the significant role of polyploidy in shaping present-day diversity patterns within a single Angiosperm family, we also show that polyploids are an inevitable and substantial part in the origins of its plant diversity. Polyploidy has potential implications in explaining higher-level diversity patterns across the Angiosperm Tree of Life.

SUPPLEMENTARY MATERIAL FOR CHAPTER 1

SUPPLEMENTARY TABLES

Table S1.1. List of georeferenced localities for 130 (103 Carpathian and 27 Pannonian) populations of *Arabidopsis arenosa* and their respective bibliographic sources.

LINEAGE	LONGITUDE	LATITUDE	ALTITUDE (M.A.S.L.)	SOURCE
Carpathian	19.54°	49.57°	1508	Kolář <i>et al.</i> (2016a)
Carpathian	19.72°	49.26°	1589	Kolář <i>et al.</i> (2016b)
Carpathian	20.11°	49.26°	988	Kolář <i>et al.</i> (2016b)
Carpathian	20.21°	49.25°	1377	Kolář <i>et al.</i> (2016b)
Carpathian	20.23°	49.25°	1157	Kolář <i>et al.</i> (2016b)
Carpathian	20.22°	49.24°	1864	Kolář <i>et al.</i> (2016a)
Carpathian	20.20°	49.23°	1427	Schmickl and Koch (2011)
Carpathian	20.22°	49.23°	1779	Kolář <i>et al.</i> (2016b)
Carpathian	20.31°	49.23°	839	Kolář <i>et al.</i> (2016b)
Carpathian	20.22°	49.21°	1662	Kolář <i>et al.</i> (2016b)
Carpathian	20.03°	49.20°	1720	Schmickl <i>et al.</i> (2012)
Carpathian	20.12°	49.20°	1553	Schmickl <i>et al.</i> (2012)
Carpathian	20.21°	49.20°	1887	Kolář <i>et al.</i> (2016a)
Carpathian	20.28°	49.20°	1259	Kolář <i>et al.</i> (2016b)
Carpathian	20.03°	49.18°	1746	Schmickl <i>et al.</i> (2012)
Carpathian	20.06°	49.18°	1954	Kolář <i>et al.</i> (2016b)
Carpathian	20.09°	49.18°	2204	Kolář <i>et al.</i> (2016a)
Carpathian	20.15°	49.18°	2231	Kolář <i>et al.</i> (2016a)
Carpathian	18.86°	49.17°	358	Yant <i>et al.</i> (2013)
Carpathian	20.14°	49.17°	2165	Kolář <i>et al.</i> (2016a)
Carpathian	20.15°	49.16°	1916	Kolář <i>et al.</i> (2016b)
Carpathian	20.25°	49.16°	1118	Kolář <i>et al.</i> (2016b)
Carpathian	19.09°	49.15°	488	Kolář <i>et al.</i> (2016a)
Carpathian	20.05°	49.15°	1802	Kolář <i>et al.</i> (2016b)
Carpathian	20.16°	49.15°	1695	Kolář <i>et al.</i> (2016b)
Carpathian	19.87°	49.12°	869	Kolář <i>et al.</i> (2016a)
Carpathian	19.43°	49.11°	638	Kolář <i>et al.</i> (2016b)
Carpathian	20.93°	49.06°	716	Kolář <i>et al.</i> (2016a)
Carpathian	19.68°	49.04°	726	Kolář <i>et al.</i> (2016a)
Carpathian	19.70°	49.04°	773	Kolář <i>et al.</i> (2016b)
Carpathian	20.18°	49.04°	917	Kolář <i>et al.</i> (2016a)
Carpathian	19.79°	49.03°	655	Schmickl <i>et al.</i> (2012)
Carpathian	20.32°	49.03°	650	Kolář <i>et al.</i> (2016b)
Carpathian	19.81°	49.02°	667	Kolář <i>et al.</i> (2016b)
Carpathian	19.91°	49.02°	1150	Schmickl and Koch (2011)
Carpathian	20.85°	49.01°	582	Kolář <i>et al.</i> (2016b)
Carpathian	20.86°	49.00°	971	Kolář <i>et al.</i> (2016a)
Carpathian	19.76°	48.98°	835	Kolář <i>et al.</i> (2016b)
Carpathian	20.38°	48.96°	574	Kolář <i>et al.</i> (2016b)
Carpathian	19.27°	48.95°	718	Kolář <i>et al.</i> (2016b)
Carpathian	18.97°	48.94°	1189	Schmickl and Koch (2011)
Carpathian	20.27°	48.92°	802	Schmickl <i>et al.</i> (2012)
Carpathian	20.28°	48.90°	978	Kolář <i>et al.</i> (2016b)

Carpathian	20.24°	48.89°	946	Kolář <i>et al.</i> (2016b)
Carpathian	19.04°	48.88°	1309	Schmickl and Koch (2011)
Carpathian	20.25°	48.88°	973	Schmickl and Koch (2011)
Carpathian	20.53°	48.88°	814	Yant <i>et al.</i> (2013)
Carpathian	19.02°	48.82°	669	Schmickl and Koch (2011)
Carpathian	20.13°	48.82°	786	Kolář <i>et al.</i> (2016b)
Carpathian	19.10°	48.81°	513	Schmickl <i>et al.</i> (2012)
Carpathian	19.13°	48.81°	852	Kolář <i>et al.</i> (2016b)
Carpathian	19.98°	48.79°	1145	Kolář <i>et al.</i> (2016b)
Carpathian	20.08°	48.77°	997	Kolář <i>et al.</i> (2016b)
Carpathian	20.10°	48.77°	733	Kolář <i>et al.</i> (2016b)
Carpathian	20.02°	48.75°	783	Kolář <i>et al.</i> (2016b)
Carpathian	18.37°	48.74°	505	Kolář <i>et al.</i> (2016b)
Carpathian	20.14°	48.74°	610	Kolář <i>et al.</i> (2016b)
Carpathian	19.96°	48.71°	1071	Kolář <i>et al.</i> (2016b)
Carpathian	18.64°	48.69°	552	Kolář <i>et al.</i> (2016b)
Carpathian	20.27°	48.62°	526	Kolář <i>et al.</i> (2016b)
Carpathian	18.89°	48.58°	382	Schmickl <i>et al.</i> (2012)
Carpathian	20.47°	48.57°	391	Kolář <i>et al.</i> (2016b)
Carpathian	21.77°	48.43°	200	Kolář <i>et al.</i> (2016b)
Carpathian	24.55°	47.40°	557	Kolář <i>et al.</i> (2016a)
Carpathian	22.51°	46.96°	316	Schmickl <i>et al.</i> (2012)
Carpathian	25.78°	46.72°	1267	Kolář <i>et al.</i> (2016b)
Carpathian	25.23°	46.58°	853	Kolář <i>et al.</i> (2016b)
Carpathian	24.08°	46.14°	438	Schmickl <i>et al.</i> (2012)
Carpathian	21.72°	46.11°	189	Kolář <i>et al.</i> (2016b)
Carpathian	25.85°	46.11°	641	Kolář <i>et al.</i> (2016b)
Carpathian	22.90°	45.89°	241	Kolář <i>et al.</i> (2016b)
Carpathian	23.65°	45.78°	1010	Schmickl <i>et al.</i> (2012)
Carpathian	24.11°	45.70°	526	Kolář <i>et al.</i> (2016b)
Carpathian	24.61°	45.64°	1555	Kolář <i>et al.</i> (2016a)
Carpathian	24.70°	45.58°	1755	Kolář <i>et al.</i> (2016b)
Carpathian	24.70°	45.57°	1461	Kolář <i>et al.</i> (2016b)
Carpathian	23.70°	45.53°	1388	Kolář <i>et al.</i> (2016b)
Carpathian	25.28°	45.53°	1145	Kolář <i>et al.</i> (2016a)
Carpathian	25.29°	45.53°	948	Kolář <i>et al.</i> (2016a)
Carpathian	23.51°	45.41°	1305	Kolář <i>et al.</i> (2016b)
Carpathian	25.50°	45.41°	2075	Kolář <i>et al.</i> (2016b)
Carpathian	22.76°	45.38°	955	Wright <i>et al.</i> (2015)
Carpathian	24.64°	45.36°	1022	Kolář <i>et al.</i> (2016b)
Carpathian	24.64°	45.35°	779	Kolář <i>et al.</i> (2016b)
Carpathian	24.30°	45.29°	304	Kolář <i>et al.</i> (2016a)
Carpathian	22.48°	44.86°	729	Schmickl <i>et al.</i> (2012)
Carpathian	21.74°	44.71°	533	Kolář <i>et al.</i> (2016a)
Carpathian	21.71°	44.66°	265	Kolář <i>et al.</i> (2016b)
Carpathian	21.93°	44.42°	421	Kolář <i>et al.</i> (2016b)
Carpathian	21.54°	44.27°	282	Kolář <i>et al.</i> (2016b)
Carpathian	20.45°	43.52°	925	Kolář <i>et al.</i> (2016b)
Carpathian	20.79°	43.40°	997	Kolář <i>et al.</i> (2016b)
Carpathian	21.88°	42.59°	966	Kolář <i>et al.</i> (2016b)
Carpathian	14.13°	53.99°	17	Kolář <i>et al.</i> (2016a)
Carpathian	14.42°	53.92°	13	Kolář <i>et al.</i> (2016a)
Carpathian	21.03°	55.38°	2	Kolář <i>et al.</i> (2016a)
Carpathian	21.10°	55.53°	12	Kolář <i>et al.</i> (2016a)
Carpathian	24.10°	57.04°	3	Kolář <i>et al.</i> (2016a)
Carpathian	23.96°	57.02°	9	Kolář <i>et al.</i> (2016a)
Carpathian	12.55°	54.96°	49	Kolář <i>et al.</i> (2016a)

Carpathian	12.44°	55.34°	19	Kolář <i>et al.</i> (2016a)
Carpathian	14.29°	53.89°	3	Kolář <i>et al.</i> (2016a)
Carpathian	16.10°	54.27°	-2	Kolář <i>et al.</i> (2016a)
Pannonian	17.28°	46.98°	175	Kolář <i>et al.</i> (2016a)
Pannonian	17.45°	46.84°	142	Kolář <i>et al.</i> (2016a)
Pannonian	17.90°	47.10°	243	Kolář <i>et al.</i> (2016a)
Pannonian	18.23°	46.10°	340	Kolář <i>et al.</i> (2016a)
Pannonian	18.78°	47.82°	163	Kolář <i>et al.</i> (2016a)
Pannonian	18.92°	47.46°	267	Kolář <i>et al.</i> (2016a)
Pannonian	18.99°	47.67°	398	Kolář <i>et al.</i> (2016a)
Pannonian	19.00°	48.24°	329	Kolář <i>et al.</i> (2016a)
Pannonian	19.51°	48.25°	236	Kolář <i>et al.</i> (2016a)
Pannonian	19.86°	48.23°	299	Kolář <i>et al.</i> (2016a)
Pannonian	19.86°	48.17°	407	Kolář <i>et al.</i> (2016a)
Pannonian	20.03°	47.87°	703	Kolář <i>et al.</i> (2016a)
Pannonian	20.20°	47.94°	192	Kolář <i>et al.</i> (2016a)
Pannonian	20.33°	47.99°	337	Kolář <i>et al.</i> (2016a)
Pannonian	17.30°	46.99°	242	Kolář <i>et al.</i> (2016a)
Pannonian	17.43°	46.81°	112	Kolář <i>et al.</i> (2016a)
Pannonian	17.45°	46.83°	112	Kolář <i>et al.</i> (2016a)
Pannonian	17.88°	47.09°	243	Kolář <i>et al.</i> (2016a)
Pannonian	17.90°	47.35°	284	Kolář <i>et al.</i> (2016a)
Pannonian	17.93°	47.09°	244	Kolář <i>et al.</i> (2016a)
Pannonian	18.09°	48.35°	318	Kolář <i>et al.</i> (2016a)
Pannonian	18.21°	47.07°	179	Kolář <i>et al.</i> (2016a)
Pannonian	18.56°	48.34°	259	Kolář <i>et al.</i> (2016a)
Pannonian	18.93°	47.79°	195	Kolář <i>et al.</i> (2016a)
Pannonian	19.00°	48.28°	280	Kolář <i>et al.</i> (2016a)
Pannonian	19.00°	48.27°	280	Kolář <i>et al.</i> (2016a)
Pannonian	19.05°	47.49°	109	Kolář <i>et al.</i> (2016a)

Table S1.2. List of WorldClim variables used in the PCA-env analysis and their respective contributions on PC1 and PC2.

WORLDCLIM VARIABLE	DESCRIPTION	PC1	PC2
BIO1	Annual Mean Temperature	-0.010	-0.977
BIO2	Mean Diurnal Range (Mean of monthly (max temp - min temp))	0.035	-0.462
BIO3	Isothermality (BIO2/BIO7) (* 100)	0.462	-0.481
BIO4	Temperature Seasonality (Standard deviation *100)	-0.718	0.093
BIO5	Max Temperature of Warmest Month	-0.171	-0.912
BIO6	Min Temperature of Coldest Month	0.282	-0.847
BIO7	Temperature Annual Range (BIO5-BIO6)	-0.500	-0.159
BIO8	Mean Temperature of Wettest Quarter	-0.735	-0.203
BIO9	Mean Temperature of Driest Quarter	0.435	-0.695
BIO10	Mean Temperature of Warmest Quarter	-0.219	-0.923
BIO11	Mean Temperature of Coldest Quarter	0.284	-0.913
BIO12	Annual Precipitation	0.951	0.134
BIO13	Precipitation of Wettest Month	0.845	0.208
BIO14	Precipitation of Driest Month	0.922	-0.010
BIO15	Precipitation Seasonality (Coefficient of Variation)	-0.370	0.397
BIO16	Precipitation of Wettest Quarter	0.847	0.266
BIO17	Precipitation of Driest Quarter	0.945	-0.018
BIO18	Precipitation of Warmest Quarter	0.500	0.610
BIO19	Precipitation of Coldest Quarter	0.921	-0.165

Table S1.3 Summary of descriptive statistics (mean and standard error) for the seven phenotypes evaluated, per cross-type per temperature.

RESPONSE VARIABLE	MEAN (standard error)															
	CXC				PXP				CXP				PXC			
	9°C	14°C	19°C	24°C	9°C	14°C	19°C	24°C	9°C	14°C	19°C	24°C	9°C	14°C	19°C	24°C
Germination	0.517 (0.029)	0.726 (0.026)	0.788 (0.024)	0.733 (0.026)	0.729 (0.026)	0.767 (0.025)	0.767 (0.025)	0.691 (0.027)	0.351 (0.028)	0.754 (0.025)	0.760 (0.025)	0.750 (0.026)	0.410 (0.029)	0.517 (0.029)	0.500 (0.030)	0.507 (0.030)
Survival	0.591 (0.040)	0.617 (0.034)	0.582 (0.033)	0.526 (0.034)	0.705 (0.032)	0.688 (0.031)	0.670 (0.032)	0.734 (0.031)	0.654 (0.048)	0.701 (0.031)	0.685 (0.031)	0.718 (0.031)	0.661 (0.044)	0.571 (0.041)	0.625 (0.040)	0.575 (0.041)
Flowering	0.171 (0.040)	0.295 (0.040)	0.674 (0.041)	0.342 (0.045)	0.155 (0.030)	0.290 (0.037)	0.689 (0.038)	0.329 (0.039)	0.182 (0.048)	0.283 (0.037)	0.720 (0.037)	0.368 (0.039)	0.128 (0.038)	0.271 (0.048)	0.678 (0.050)	0.417 (0.054)
Flowering Time	129.1 (0.792)	119.4 (1.343)	116.1 (0.755)	107.0 (0.975)	132.4 (1.094)	122.9 (1.396)	109.2 (1.065)	100.0 (1.271)	135.2 (1.127)	127.8 (1.626)	112.4 (0.797)	104.8 (1.303)	136.2 (2.112)	129.2 (2.479)	109.9 (1.083)	104.7 (1.943)
Pollen Viability	0.490 (0.080)	0.656 (0.044)	0.272 (0.015)	0.075 (0.010)	0.554 (0.066)	0.671 (0.030)	0.791 (0.021)	0.573 (0.029)	0.509 (0.081)	0.563 (0.034)	0.735 (0.011)	0.511 (0.032)	0.450 (0.129)	0.561 (0.055)	0.737 (0.019)	0.578 (0.023)
Seed Set									(CXC)XP				(PXP)XC			
									1.458 (0.307)	16.08 (0.825)	22.75 (0.819)	24.25 (0.986)	24.00 (1.250)	30.25 (1.266)	43.04 (1.411)	45.17 (1.503)
	(CXC)XC				(PXP)XP				(CXP)XP				(CXP)XC			
	45.62 (0.934)	45.88 (1.045)	30.38 (0.909)	22.75 (0.774)	29.04 (0.726)	31.00 (0.625)	45.88 (1.139)	46.88 (0.850)	15.08 (0.586)	22.88 (0.887)	33.42 (0.868)	38.79 (1.020)	15.79 (0.684)	22.67 (0.576)	33.29 (1.062)	39.38 (0.996)
									(PXC)XP				(PXC)XC			
									15.67 (0.601)	21.83 (0.838)	32.25 (0.841)	37.62 (0.953)	15.12 (0.508)	24.42 (0.785)	34.54 (0.659)	41.50 (1.080)

Table S1.4 Formulas derived to estimate reproductive isolation between the Carpathian and the Pannonian lineages.

GENE FLOW SOURCE	PAN → CAR		RI ESTIMATION	CAR → PAN		RI ESTIMATION
	CON-	HETERO-		CON-	HETERO-	
PREMATING						
Germination	CXC	PXP	$1 - 2 \left(\frac{PXP}{CXC + PXP} \right)$	PXP	CXC	$1 - 2 \left(\frac{CXC}{PXP + CXC} \right)$
Survival	CXC	PXP	$1 - 2 \left(\frac{PXP}{CXC + PXP} \right)$	PXP	CXC	$1 - 2 \left(\frac{CXC}{PXP + CXC} \right)$
Flowering Time	CXC	PXP	$1 - \left(\frac{S}{S + U} \right) *$	PXP	CXC	$1 - \left(\frac{S}{S + U} \right) *$
Pollen Viability	CXC	PXP	$1 - 2 \left(\frac{PXP}{CXC + PXP} \right)$	PXP	CXC	$1 - 2 \left(\frac{CXC}{PXP + CXC} \right)$
POSTMATING						
Seed Set	CXC	CXP	$1 - 2 \left(\frac{CXP}{CXC + CXP} \right)$	PXP	PXC	$1 - 2 \left(\frac{PXC}{PXP + PXC} \right)$
Hybrid Germination	CXC	PXC, CXP	$1 - 2 \left[\frac{(PXC + CXP)/2}{CXC + (PXC + CXP)/2} \right]$	PXP	CXP, PXC	$1 - 2 \left[\frac{(CXP + PXC)/2}{PXP + (CXP + PXC)/2} \right]$
Hybrid Survival	CXC	PXC, CXP	$1 - 2 \left[\frac{(PXC + CXP)/2}{CXC + (PXC + CXP)/2} \right]$	PXP	CXP, PXC	$1 - 2 \left[\frac{(CXP + PXC)/2}{PXP + (CXP + PXC)/2} \right]$
Hybrid Flowering Time	CXC	PXC, CXP	$1 - \left(\frac{S}{S + U} \right) *$	PXP	CXP, PXC	$1 - \left(\frac{S}{S + U} \right) *$
Hybrid Pollen Viability	CXC	PXC, CXP	$1 - 2 \left[\frac{(PXC + CXP)/2}{CXC + (PXC + CXP)/2} \right]$	PXP	CXP, PXC	$1 - 2 \left[\frac{(CXP + PXC)/2}{PXP + (CXP + PXC)/2} \right]$
Hybrid Seed Set	CXC	(CXP)XC, (PXC)XC	$1 - 2 \left[\frac{((CXP)XC + (PXC)XC)/2}{CXC + ((CXP)XC + (PXC)XC)/2} \right]$	PXP	(CXP)XP, (PXC)XP	$1 - 2 \left[\frac{((CXP)XP + (PXC)XP)/2}{CXC + ((CXP)XP + (PXC)XP)/2} \right]$

*S=Shared, U=Unshared

SUPPLEMENTARY MATERIAL FOR CHAPTER 2

SUPPLEMENTARY TABLES

Table S2.1. List of georeferenced localities for 358 (103 Carpathian diploid, 208 autotetraploid, 27 Pannonian diploid, and 20 Dinaric diploid) populations of *Arabidopsis arenosa* and their respective bibliographic sources.

PLOIDY	LONGITUDE	LATITUDE	ALTITUDE (M.A.S.L.)	REGION	SOURCE
4X	18.62°	49.74°	307	Carpathian	Kolář <i>et al.</i> (2016b)
4X	22.99°	49.46°	374	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.49°	49.38°	628	Carpathian	Schmickl <i>et al.</i> (2012)
4X	19.90°	49.27°	1078	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.98°	49.27°	1091	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.36°	49.26°	651	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.93°	49.25°	1096	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.21°	49.25°	1086	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.63°	49.24°	1258	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.71°	49.24°	1341	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.93°	49.24°	1551	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.06°	49.23°	870	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.72°	49.23°	1341	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.55°	49.21°	955	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.64°	49.21°	1258	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.71°	49.20°	1733	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.74°	49.20°	1733	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.80°	49.20°	1735	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.70°	49.19°	1616	Carpathian	Schmickl <i>et al.</i> (2012)
4X	18.58°	49.18°	411	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.58°	49.17°	894	Carpathian	Kolář <i>et al.</i> (2016b)
4X	23.05°	49.16°	621	Carpathian	Kolář <i>et al.</i> (2016b)
4X	17.33°	49.11°	377	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.28°	49.10°	699	Carpathian	Schmickl <i>et al.</i> (2012)
4X	23.50°	49.03°	618	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.38°	49.02°	680	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.30°	49.01°	697	Carpathian	Schmickl <i>et al.</i> (2012)
4X	19.67°	49.01°	885	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.58°	49.00°	895	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.29°	49.00°	732	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.78°	48.99°	466	Carpathian	Wright <i>et al.</i> (2015)
4X	19.63°	48.98°	1355	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.78°	48.98°	466	Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.64°	48.94°	1637	Carpathian	Kolář <i>et al.</i> (2016b)
4X	18.24°	48.91°	518	Carpathian	Kolář <i>et al.</i> (2016b)
4X	21.93°	48.91°	261	Carpathian	Kolář <i>et al.</i> (2016b)
4X	18.04°	48.89°	212	Carpathian	Wright <i>et al.</i> (2015)
4X	21.09°	48.85°	486	Carpathian	Wright <i>et al.</i> (2015)
4X	17.90°	48.79°	212	Carpathian	Schmickl <i>et al.</i> (2012)
4X	20.00°	48.75°	1011	Carpathian	Kolář <i>et al.</i> (2016b)
4X	17.76°	48.73°	303	Carpathian	Kolář <i>et al.</i> (2016b)
4X	17.94°	48.68°	421	Carpathian	Schmickl <i>et al.</i> (2012)
4X	18.05°	48.66°	330	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.85°	48.64°	598	Carpathian	Kolář <i>et al.</i> (2016b)
4X	17.41°	48.54°	434	Carpathian	Kolář <i>et al.</i> (2016b)
4X	18.89°	48.45°	593	Carpathian	Kolář <i>et al.</i> (2016b)
4X	20.62°	48.11°	502	Carpathian	Kolář <i>et al.</i> (2016b)

4X	20.40°	48.10°	397	Carpathian	Schmickl <i>et al.</i> (2012)
4X	20.43°	48.09°	574	Carpathian	Kolář <i>et al.</i> (2016b)
4X	24.81°	47.59°	1276	Carpathian	Kolář <i>et al.</i> (2016b)
4X	25.08°	47.58°	1186	Carpathian	Kolář <i>et al.</i> (2016b)
4X	24.46°	47.54°	944	Carpathian	Kolář <i>et al.</i> (2016b)
4X	25.56°	47.45°	1249	Carpathian	Kolář <i>et al.</i> (2016b)
4X	25.56°	47.44°	1249	Carpathian	Kolář <i>et al.</i> (2016b)
4X	24.83°	47.17°	760	Carpathian	Kolář <i>et al.</i> (2016b)
4X	22.55°	46.93°	410	Carpathian	Kolář <i>et al.</i> (2016b)
4X	23.67°	46.57°	576	Carpathian	Wright <i>et al.</i> (2015)
4X	23.68°	46.56°	576	Carpathian	Kolář <i>et al.</i> (2016b)
4X	23.37°	46.48°	945	Carpathian	Kolář <i>et al.</i> (2016b)
4X	22.84°	46.47°	1053	Carpathian	Kolář <i>et al.</i> (2016b)
4X	24.63°	45.60°	1940	Carpathian	Kolář <i>et al.</i> (2016b)
4X	25.22°	45.44°	1045	Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.19°	63.96°	374	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.33°	63.80°	144	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	18.52°	63.13°	17	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.96°	62.92°	339	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	12.68°	62.44°	638	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	23.74°	62.28°	107	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	8.84°	61.49°	1204	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	9.01°	60.88°	947	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	18.36°	59.88°	38	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	17.23°	54.72°	7	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.58°	54.42°	5	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.37°	52.50°	37	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	16.71°	52.28°	77	Non-Carpathian	Wright <i>et al.</i> (2015)
4X	10.79°	51.75°	518	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	18.00°	51.72°	132	Non-Carpathian	Wright <i>et al.</i> (2015)
4X	8.36°	51.01°	469	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.03°	50.77°	390	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	5.61°	50.61°	112	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	5.44°	50.59°	146	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	16.17°	50.59°	530	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	5.34°	50.56°	137	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	4.98°	50.49°	143	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.48°	50.28°	322	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	16.84°	50.24°	956	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	18.95°	50.24°	273	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.83°	50.22°	422	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	19.76°	50.16°	308	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.88°	50.11°	415	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	7.93°	50.09°	363	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.07°	50.07°	418	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	7.77°	50.06°	210	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	17.24°	50.06°	1296	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.89°	50.05°	373	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	7.74°	50.05°	337	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	16.23°	50.00°	318	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.39°	49.96°	231	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.13°	49.93°	310	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	17.44°	49.93°	561	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	6.08°	49.91°	383	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.52°	49.87°	316	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.30°	49.69°	439	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.13°	49.68°	413	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.20°	49.61°	385	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	6.13°	49.61°	302	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.13°	49.54°	419	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.19°	49.43°	405	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	16.37°	49.42°	415	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	16.71°	49.36°	484	Non-Carpathian	Kolář <i>et al.</i> (2016b)

4X	11.85°	49.20°	475	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	4.47°	49.17°	136	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	4.42°	49.11°	138	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.62°	48.94°	138	Non-Carpathian	Novikova <i>et al.</i> (2016)
4X	14.42°	48.92°	415	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	10.02°	48.73°	647	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.66°	48.61°	340	Non-Carpathian	Schmickl and Koch (2011)
4X	15.33°	48.59°	532	Non-Carpathian	Schmickl and Koch (2011)
4X	15.66°	48.58°	369	Non-Carpathian	Schmickl and Koch (2011)
4X	15.69°	48.56°	281	Non-Carpathian	Schmickl and Koch (2011)
4X	15.69°	48.55°	281	Non-Carpathian	Schmickl and Koch (2011)
4X	15.69°	48.53°	301	Non-Carpathian	Schmickl and Koch (2011)
4X	15.60°	48.51°	443	Non-Carpathian	Schmickl and Koch (2011)
4X	15.61°	48.51°	443	Non-Carpathian	Schmickl and Koch (2011)
4X	15.63°	48.50°	385	Non-Carpathian	Schmickl and Koch (2011)
4X	9.40°	48.48°	637	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	15.55°	48.45°	366	Non-Carpathian	Schmickl and Koch (2011)
4X	15.57°	48.45°	366	Non-Carpathian	Schmickl and Koch (2011)
4X	9.47°	48.44°	744	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	15.49°	48.42°	568	Non-Carpathian	Schmickl and Koch (2011)
4X	15.44°	48.41°	483	Non-Carpathian	Schmickl and Koch (2011)
4X	15.47°	48.41°	321	Non-Carpathian	Schmickl and Koch (2011)
4X	15.48°	48.41°	321	Non-Carpathian	Schmickl and Koch (2011)
4X	15.51°	48.41°	319	Non-Carpathian	Schmickl and Koch (2011)
4X	15.52°	48.41°	319	Non-Carpathian	Schmickl and Koch (2011)
4X	15.43°	48.41°	483	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.47°	48.40°	321	Non-Carpathian	Schmickl and Koch (2011)
4X	14.19°	48.39°	554	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	8.24°	48.14°	788	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	9.05°	48.10°	754	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	9.22°	48.09°	647	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	9.22°	48.08°	630	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	8.98°	48.07°	753	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	4.35°	47.92°	219	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.62°	47.90°	649	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.67°	47.88°	583	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.37°	47.86°	1023	Non-Carpathian	Schmickl and Koch (2011)
4X	15.27°	47.85°	830	Non-Carpathian	Schmickl and Koch (2011)
4X	15.39°	47.85°	1048	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.00°	47.83°	1128	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.08°	47.82°	1323	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.54°	47.82°	1029	Non-Carpathian	Schmickl and Koch (2011)
4X	15.35°	47.79°	947	Non-Carpathian	Schmickl and Koch (2011)
4X	15.11°	47.77°	1062	Non-Carpathian	Schmickl and Koch (2011)
4X	13.49°	47.74°	653	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.80°	47.73°	948	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	12.83°	47.72°	859	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.40°	47.65°	1447	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	13.00°	47.63°	742	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	13.86°	47.63°	1206	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.65°	47.61°	905	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.74°	47.61°	892	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.90°	47.54°	958	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.06°	47.54°	958	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	12.07°	47.46°	679	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.01°	47.45°	1135	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	9.91°	47.39°	724	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	15.39°	47.37°	955	Non-Carpathian	Wright <i>et al.</i> (2015)
4X	15.34°	47.37°	592	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.68°	47.36°	592	Non-Carpathian	Novikova <i>et al.</i> (2016)
4X	14.55°	47.37°	1840	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.39°	47.34°	955	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.05°	47.31°	1586	Non-Carpathian	Schmickl <i>et al.</i> (2012)

4X	14.93°	47.29°	738	Non-Carpathian	Wright <i>et al.</i> (2015)
4X	15.69°	47.29°	601	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	12.57°	47.28°	965	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.95°	47.28°	738	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.32°	47.28°	1874	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.93°	47.28°	738	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.21°	47.26°	1746	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	13.97°	47.24°	1737	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	6.97°	47.24°	992	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.53°	47.23°	861	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	12.59°	47.22°	1635	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.34°	47.18°	1169	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.12°	47.10°	1675	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	7.63°	47.06°	611	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.31°	47.04°	1394	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	13.46°	46.99°	1340	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.25°	46.98°	941	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	13.49°	46.96°	1340	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	7.61°	46.94°	755	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.90°	46.85°	870	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.45°	46.80°	604	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.55°	46.80°	740	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	14.87°	46.69°	502	Non-Carpathian	Yant <i>et al.</i> (2013)
4X	14.82°	46.63°	492	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	14.97°	46.61°	508	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	8.73°	46.50°	1775	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	13.59°	46.42°	1419	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.75°	46.38°	1233	Non-Carpathian	Schmickl <i>et al.</i> (2012)
4X	8.91°	46.38°	906	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.73°	46.37°	1308	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	16.00°	46.37°	284	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	13.84°	46.28°	894	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.75°	46.26°	456	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.21°	46.12°	420	Non-Carpathian	Kolář <i>et al.</i> (2016b)
4X	15.12°	46.06°	553	Non-Carpathian	Schmickl <i>et al.</i> (2012)
2X	19.54°	49.57°	1508	Carpathian	Kolář <i>et al.</i> (2016a)
2X	19.72°	49.26°	1589	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.11°	49.26°	988	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.21°	49.25°	1377	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.23°	49.25°	1157	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.22°	49.24°	1864	Carpathian	Kolář <i>et al.</i> (2016a)
2X	20.20°	49.23°	1427	Carpathian	Schmickl and Koch (2011)
2X	20.22°	49.23°	1779	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.31°	49.23°	839	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.22°	49.21°	1662	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.03°	49.20°	1720	Carpathian	Schmickl <i>et al.</i> (2012)
2X	20.12°	49.20°	1553	Carpathian	Schmickl <i>et al.</i> (2012)
2X	20.21°	49.20°	1887	Carpathian	Kolář <i>et al.</i> (2016a)
2X	20.28°	49.20°	1259	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.03°	49.18°	1746	Carpathian	Schmickl <i>et al.</i> (2012)
2X	20.06°	49.18°	1954	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.09°	49.18°	2204	Carpathian	Kolář <i>et al.</i> (2016a)
2X	20.15°	49.18°	2231	Carpathian	Kolář <i>et al.</i> (2016a)
2X	18.86°	49.17°	358	Carpathian	Yant <i>et al.</i> (2013)
2X	20.14°	49.17°	2165	Carpathian	Kolář <i>et al.</i> (2016a)
2X	20.15°	49.16°	1916	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.25°	49.16°	1118	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.09°	49.15°	488	Carpathian	Kolář <i>et al.</i> (2016a)
2X	20.05°	49.15°	1802	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.16°	49.15°	1695	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.87°	49.12°	869	Carpathian	Kolář <i>et al.</i> (2016a)
2X	19.43°	49.11°	638	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.93°	49.06°	716	Carpathian	Kolář <i>et al.</i> (2016a)

2X	19.68°	49.04°	726	Carpathian	Kolář <i>et al.</i> (2016a)
2X	19.70°	49.04°	773	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.18°	49.04°	917	Carpathian	Kolář <i>et al.</i> (2016a)
2X	19.79°	49.03°	655	Carpathian	Schmickl <i>et al.</i> (2012)
2X	20.32°	49.03°	650	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.81°	49.02°	667	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.91°	49.02°	1150	Carpathian	Schmickl and Koch (2011)
2X	20.85°	49.01°	582	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.86°	49.00°	971	Carpathian	Kolář <i>et al.</i> (2016a)
2X	19.76°	48.98°	835	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.38°	48.96°	574	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.27°	48.95°	718	Carpathian	Kolář <i>et al.</i> (2016b)
2X	18.97°	48.94°	1189	Carpathian	Schmickl and Koch (2011)
2X	20.27°	48.92°	802	Carpathian	Schmickl <i>et al.</i> (2012)
2X	20.28°	48.90°	978	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.24°	48.89°	946	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.04°	48.88°	1309	Carpathian	Schmickl and Koch (2011)
2X	20.25°	48.88°	973	Carpathian	Schmickl and Koch (2011)
2X	20.53°	48.88°	814	Carpathian	Yant <i>et al.</i> (2013)
2X	19.02°	48.82°	669	Carpathian	Schmickl and Koch (2011)
2X	20.13°	48.82°	786	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.10°	48.81°	513	Carpathian	Schmickl <i>et al.</i> (2012)
2X	19.13°	48.81°	852	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.98°	48.79°	1145	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.08°	48.77°	997	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.10°	48.77°	733	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.02°	48.75°	783	Carpathian	Kolář <i>et al.</i> (2016b)
2X	18.37°	48.74°	505	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.14°	48.74°	610	Carpathian	Kolář <i>et al.</i> (2016b)
2X	19.96°	48.71°	1071	Carpathian	Kolář <i>et al.</i> (2016b)
2X	18.64°	48.69°	552	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.27°	48.62°	526	Carpathian	Kolář <i>et al.</i> (2016b)
2X	18.89°	48.58°	382	Carpathian	Schmickl <i>et al.</i> (2012)
2X	20.47°	48.57°	391	Carpathian	Kolář <i>et al.</i> (2016b)
2X	21.77°	48.43°	200	Carpathian	Kolář <i>et al.</i> (2016b)
2X	24.55°	47.40°	557	Carpathian	Kolář <i>et al.</i> (2016a)
2X	22.51°	46.96°	316	Carpathian	Schmickl <i>et al.</i> (2012)
2X	25.78°	46.72°	1267	Carpathian	Kolář <i>et al.</i> (2016b)
2X	25.23°	46.58°	853	Carpathian	Kolář <i>et al.</i> (2016b)
2X	24.08°	46.14°	438	Carpathian	Schmickl <i>et al.</i> (2012)
2X	21.72°	46.11°	189	Carpathian	Kolář <i>et al.</i> (2016b)
2X	25.85°	46.11°	641	Carpathian	Kolář <i>et al.</i> (2016b)
2X	22.90°	45.89°	241	Carpathian	Kolář <i>et al.</i> (2016b)
2X	23.65°	45.78°	1010	Carpathian	Schmickl <i>et al.</i> (2012)
2X	24.11°	45.70°	526	Carpathian	Kolář <i>et al.</i> (2016b)
2X	24.61°	45.64°	1555	Carpathian	Kolář <i>et al.</i> (2016a)
2X	24.70°	45.58°	1755	Carpathian	Kolář <i>et al.</i> (2016b)
2X	24.70°	45.57°	1461	Carpathian	Kolář <i>et al.</i> (2016b)
2X	23.70°	45.53°	1388	Carpathian	Kolář <i>et al.</i> (2016b)
2X	25.28°	45.53°	1145	Carpathian	Kolář <i>et al.</i> (2016a)
2X	25.29°	45.53°	948	Carpathian	Kolář <i>et al.</i> (2016a)
2X	23.51°	45.41°	1305	Carpathian	Kolář <i>et al.</i> (2016b)
2X	25.50°	45.41°	2075	Carpathian	Kolář <i>et al.</i> (2016b)
2X	22.76°	45.38°	955	Carpathian	Wright <i>et al.</i> (2015)
2X	24.64°	45.36°	1022	Carpathian	Kolář <i>et al.</i> (2016b)
2X	24.64°	45.35°	779	Carpathian	Kolář <i>et al.</i> (2016b)
2X	24.30°	45.29°	304	Carpathian	Kolář <i>et al.</i> (2016a)
2X	22.48°	44.86°	729	Carpathian	Schmickl <i>et al.</i> (2012)
2X	21.74°	44.71°	533	Carpathian	Kolář <i>et al.</i> (2016a)
2X	21.71°	44.66°	265	Carpathian	Kolář <i>et al.</i> (2016b)
2X	21.93°	44.42°	421	Carpathian	Kolář <i>et al.</i> (2016b)
2X	21.54°	44.27°	282	Carpathian	Kolář <i>et al.</i> (2016b)
2X	20.45°	43.52°	925	Carpathian	Kolář <i>et al.</i> (2016b)

2X	20.79°	43.40°	997	Carpathian	Kolář <i>et al.</i> (2016b)
2X	21.88°	42.59°	966	Carpathian	Kolář <i>et al.</i> (2016b)
2X	14.13°	53.99°	17	Baltic	Kolář <i>et al.</i> (2016a)
2X	14.42°	53.92°	13	Baltic	Kolář <i>et al.</i> (2016a)
2X	21.03°	55.38°	2	Baltic	Kolář <i>et al.</i> (2016a)
2X	21.10°	55.53°	12	Baltic	Kolář <i>et al.</i> (2016a)
2X	24.10°	57.04°	3	Baltic	Kolář <i>et al.</i> (2016a)
2X	23.96°	57.02°	9	Baltic	Kolář <i>et al.</i> (2016a)
2X	12.55°	54.96°	49	Baltic	Kolář <i>et al.</i> (2016a)
2X	12.44°	55.34°	19	Baltic	Kolář <i>et al.</i> (2016a)
2X	14.29°	53.89°	3	Baltic	Kolář <i>et al.</i> (2016a)
2X	16.10°	54.27°	-2	Baltic	Kolář <i>et al.</i> (2016a)
2X	17.28°	46.98°	175	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.45°	46.84°	142	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.90°	47.10°	243	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.23°	46.10°	340	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.78°	47.82°	163	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.92°	47.46°	267	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.99°	47.67°	398	Pannonian	Kolář <i>et al.</i> (2016a)
2X	19.00°	48.24°	329	Pannonian	Kolář <i>et al.</i> (2016a)
2X	19.51°	48.25°	236	Pannonian	Kolář <i>et al.</i> (2016a)
2X	19.86°	48.23°	299	Pannonian	Kolář <i>et al.</i> (2016a)
2X	19.86°	48.17°	407	Pannonian	Kolář <i>et al.</i> (2016a)
2X	20.03°	47.87°	703	Pannonian	Kolář <i>et al.</i> (2016a)
2X	20.20°	47.94°	192	Pannonian	Kolář <i>et al.</i> (2016a)
2X	20.33°	47.99°	337	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.30°	46.99°	242	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.43°	46.81°	112	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.45°	46.83°	112	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.88°	47.09°	243	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.90°	47.35°	284	Pannonian	Kolář <i>et al.</i> (2016a)
2X	17.93°	47.09°	244	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.09°	48.35°	318	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.21°	47.07°	179	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.56°	48.34°	259	Pannonian	Kolář <i>et al.</i> (2016a)
2X	18.93°	47.79°	195	Pannonian	Kolář <i>et al.</i> (2016a)
2X	19.00°	48.28°	280	Pannonian	Kolář <i>et al.</i> (2016a)
2X	19.00°	48.27°	280	Pannonian	Kolář <i>et al.</i> (2016a)
2X	19.05°	47.49°	109	Pannonian	Kolář <i>et al.</i> (2016a)
2X	13.87°	45.54°	265	Dinaric	Kolář <i>et al.</i> (2016a)
2X	13.99°	45.67°	456	Dinaric	Kolář <i>et al.</i> (2016a)
2X	14.06°	45.97°	630	Dinaric	Kolář <i>et al.</i> (2016a)
2X	14.29°	45.80°	582	Dinaric	Kolář <i>et al.</i> (2016a)
2X	14.72°	45.55°	872	Dinaric	Kolář <i>et al.</i> (2016a)
2X	14.83°	45.46°	404	Dinaric	Kolář <i>et al.</i> (2016a)
2X	14.86°	46.18°	691	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.59°	45.12°	292	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.61°	44.90°	606	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.85°	45.87°	347	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.90°	44.88°	352	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.99°	46.19°	368	Dinaric	Kolář <i>et al.</i> (2016a)
2X	16.12°	46.16°	360	Dinaric	Kolář <i>et al.</i> (2016a)
2X	17.27°	44.34°	555	Dinaric	Kolář <i>et al.</i> (2016a)
2X	17.37°	44.04°	1070	Dinaric	Kolář <i>et al.</i> (2016a)
2X	17.82°	43.98°	994	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.50°	44.85°	922	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.57°	44.86°	833	Dinaric	Kolář <i>et al.</i> (2016a)
2X	15.60°	44.87°	693	Dinaric	Kolář <i>et al.</i> (2016a)
2X	17.46°	44.04°	657	Dinaric	Kolář <i>et al.</i> (2016a)

Table S2.2. List of WorldClim variables used in the PCA-env analysis and their respective contributions on PC1 and PC2.

WORLDCLIM VARIABLE	DESCRIPTION	PC1	PC2
BIO1	Annual Mean Temperature	0.324	-0.915
BIO2	Mean Diurnal Range (Mean of monthly (max temp - min temp))	0.526	-0.301
BIO3	Isothermality (BIO2/BIO7) (* 100)	-0.076	-0.725
BIO4	Temperature Seasonality (Standard deviation *100)	0.718	0.492
BIO5	Max Temperature of Warmest Month	0.632	-0.683
BIO6	Min Temperature of Coldest Month	-0.084	-0.951
BIO7	Temperature Annual Range (BIO5-BIO6)	0.733	0.322
BIO8	Mean Temperature of Wettest Quarter	0.741	-0.192
BIO9	Mean Temperature of Driest Quarter	-0.187	-0.797
BIO10	Mean Temperature of Warmest Quarter	0.588	-0.732
BIO11	Mean Temperature of Coldest Quarter	-0.002	-0.978
BIO12	Annual Precipitation	-0.957	-0.088
BIO13	Precipitation of Wettest Month	-0.877	0.002
BIO14	Precipitation of Driest Month	-0.899	-0.198
BIO15	Precipitation Seasonality (Coefficient of Variation)	0.271	0.469
BIO16	Precipitation of Wettest Quarter	-0.894	0.016
BIO17	Precipitation of Driest Quarter	-0.923	-0.222
BIO18	Precipitation of Warmest Quarter	-0.732	0.249
BIO19	Precipitation of Coldest Quarter	-0.922	-0.205

SUPPLEMENTARY FIGURES

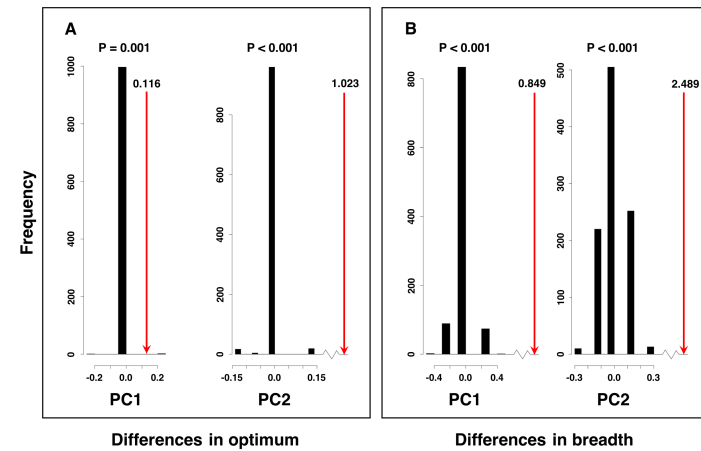


Figure S2.1. Histograms of bootstrap tests with 1000 resamples. Black bars indicate resamples of estimated differences and red line represents observed differences. **A.** niche optimum differences tests. **B.** niche breadth differences tests.

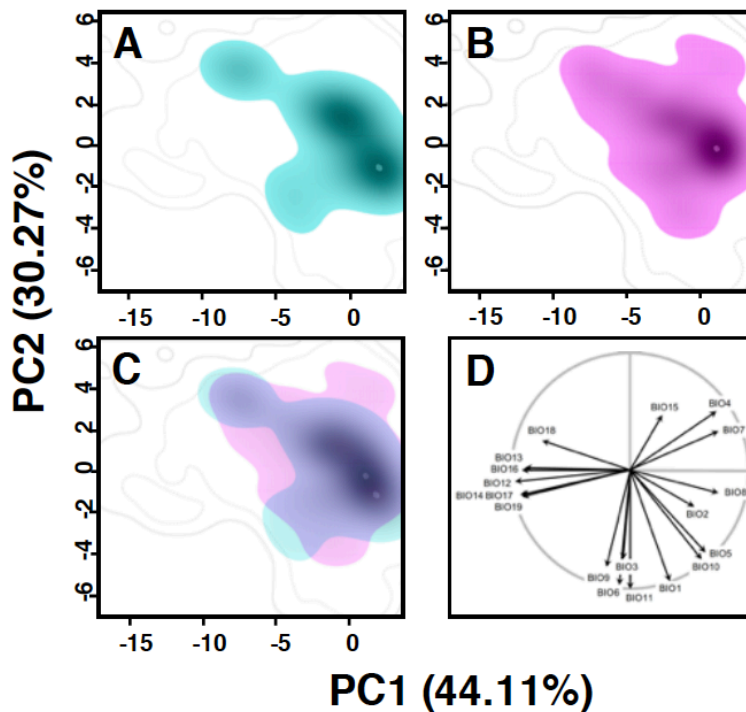


Figure S2.2. Niche dynamics observed comparing all diploid lineages ($N = 150$) and tetraploid ($N = 208$) *Arabidopsis arenosa* cytotypes in Central and Northern Europe. **A.** Diploid niche model. **B.** Tetraploid niche model. **C.** Overlap between diploid and tetraploid models. Continuous gray line delimits the full environmental space available within the background area; dashed gray line delimits the percentile 75 of the environmental space available within the background area. Darker shading indicates a higher density of presence data. Clearer dots represent niche centroids. **D.** Correlation circle of WorldClim variables used in the PCA-env (Complete list of climatic variables and respective contributions at table S2.2). Schoener's $D = 0.6001$. Tetraploid niche expansion = 10.16%.

SUPPLEMENTARY MATERIAL FOR CHAPTER 3

SUPPLEMENTARY TABLES

Table S3.1 Raw haploid chromosome counts for 816 Brassicaceae species.

SPECIES	COUNT TYPE	COUNT	INFERRED N	NUMBER RECORDS
<i>Aethionema_arabicum</i>	gam	11	11	2
<i>Aethionema_arabicum</i>	gam	18	18	2
<i>Aethionema_arabicum</i>	gam	21	21	2
<i>Aethionema_arabicum</i>	gam	22	22	4
<i>Aethionema_arabicum</i>	spor	22	11	2
<i>Aethionema_arabicum</i>	spor	24	12	2
<i>Aethionema_grandiflorum</i>	gam	12	12	2
<i>Aethionema_grandiflorum</i>	gam	14	14	2
<i>Aethionema_grandiflorum</i>	gam	24	24	1
<i>Aethionema_grandiflorum</i>	spor	24	12	1
<i>Aethionema_grandiflorum</i>	spor	48	24	3
<i>Aethionema_saxatile</i>	gam	12	12	9
<i>Aethionema_saxatile</i>	gam	16	16	4
<i>Aethionema_saxatile</i>	gam	24	24	6
<i>Aethionema_saxatile</i>	spor	16	8	1
<i>Aethionema_saxatile</i>	spor	24	12	26
<i>Aethionema_saxatile</i>	spor	36	18	2
<i>Aethionema_saxatile</i>	spor	48	24	31
<i>Alliaria_petiolata</i>	gam	7	7	12
<i>Alliaria_petiolata</i>	gam	18	18	2
<i>Alliaria_petiolata</i>	gam	21	21	12
<i>Alliaria_petiolata</i>	spor	36	18	19
<i>Alliaria_petiolata</i>	spor	40	20	3
<i>Alliaria_petiolata</i>	spor	42	21	58
<i>Alliaria_petiolata</i>	spor	43	22	4
<i>Alyssoides_cretica</i>	spor	16	8	8
<i>Alyssoides_utriculata</i>	spor	8	4	3
<i>Alyssoides_utriculata</i>	spor	16	8	29
<i>Alyssopsis_mollis</i>	gam	8	8	2
<i>Alyssum_alpestre</i>	gam	8	8	2
<i>Alyssum_alpestre</i>	spor	14	7	1
<i>Alyssum_alpestre</i>	spor	16	8	9
<i>Alyssum_alpestre</i>	spor	32	16	5
<i>Alyssum_alyssoides</i>	gam	8	8	2
<i>Alyssum_alyssoides</i>	gam	16	16	7
<i>Alyssum_alyssoides</i>	spor	16	8	7
<i>Alyssum_alyssoides</i>	spor	24	12	4
<i>Alyssum_alyssoides</i>	spor	32	16	74
<i>Alyssum_antiatlanticum</i>	gam	8	8	1

<i>Alyssum_antiatlanticum</i>	spor	16	8	2
<i>Alyssum_argenteum</i>	gam	8	8	2
<i>Alyssum_argenteum</i>	spor	16	8	4
<i>Alyssum_aurantiacum</i>	spor	16	8	2
<i>Alyssum_bertolonii</i>	spor	16	8	9
<i>Alyssum_bracteatum</i>	gam	8	8	1
<i>Alyssum_condensatum</i>	gam	8	8	2
<i>Alyssum_condensatum</i>	spor	16	8	2
<i>Alyssum_condensatum</i>	spor	32	16	3
<i>Alyssum_condensatum_subsp._flexibile</i>	gam	8	8	2
<i>Alyssum_condensatum_subsp._flexibile</i>	spor	16	8	1
<i>Alyssum_condensatum_subsp._flexibile</i>	spor	32	16	1
<i>Alyssum_corsicum</i>	spor	14	7	1
<i>Alyssum_corsicum</i>	spor	16	8	7
<i>Alyssum_corymbosoides</i>	spor	32	16	4
<i>Alyssum_cuneifolium</i>	gam	16	16	2
<i>Alyssum_cuneifolium</i>	gam	24	24	1
<i>Alyssum_cuneifolium</i>	spor	16	8	2
<i>Alyssum_cuneifolium</i>	spor	32	16	1
<i>Alyssum_cuneifolium</i>	spor	48	24	4
<i>Alyssum_cypricum</i>	gam	16	16	2
<i>Alyssum_dasycarpum</i>	gam	8	8	3
<i>Alyssum_dasycarpum</i>	spor	16	8	8
<i>Alyssum_dasycarpum</i>	spor	32	16	1
<i>Alyssum_desertorum</i>	gam	16	16	5
<i>Alyssum_desertorum</i>	spor	16	8	2
<i>Alyssum_desertorum</i>	spor	24	12	1
<i>Alyssum_desertorum</i>	spor	29	14	2
<i>Alyssum_desertorum</i>	spor	32	16	20
<i>Alyssum_diffusum</i>	gam	8	8	1
<i>Alyssum_diffusum</i>	spor	16	8	4
<i>Alyssum_doerfleri</i>	spor	16	8	1
<i>Alyssum_euboeum</i>	spor	16	8	2
<i>Alyssum_fallacinum</i>	gam	8	8	2
<i>Alyssum_floribundum</i>	spor	16	8	2
<i>Alyssum_fragillimum</i>	gam	8	8	2
<i>Alyssum_giosnanum</i>	spor	32	16	2
<i>Alyssum_granatense</i>	gam	24	24	3
<i>Alyssum_granatense</i>	spor	48	24	7
<i>Alyssum_heldreichii</i>	spor	16	8	2
<i>Alyssum_hirsutum</i>	gam	8	8	1
<i>Alyssum_hirsutum</i>	spor	46	23	5
<i>Alyssum_hirsutum</i>	spor	48	24	4
<i>Alyssum_homalocarpum</i>	gam	8	8	2
<i>Alyssum_huber-morathii</i>	spor	16	8	2
<i>Alyssum_huber-morathii</i>	spor	32	16	2
<i>Alyssum_ienense</i>	spor	16	8	4
<i>Alyssum_lepidoto-stellatum</i>	spor	32	16	2
<i>Alyssum_linifolium</i>	gam	7	7	1

<i>Alyssum_linifolium</i>	gam	8	8	7
<i>Alyssum_linifolium</i>	gam	16	16	2
<i>Alyssum_linifolium</i>	spor	14	7	10
<i>Alyssum_linifolium</i>	spor	16	8	14
<i>Alyssum_linifolium</i>	spor	24	12	1
<i>Alyssum_linifolium</i>	spor	32	16	1
<i>Alyssum_linifolium</i>	spor	48	24	1
<i>Alyssum_loiseleurii</i>	gam	16	16	1
<i>Alyssum_loiseleurii</i>	spor	16	8	1
<i>Alyssum_markgrafii</i>	spor	32	16	1
<i>Alyssum_masmenaeum</i>	spor	16	8	2
<i>Alyssum_masmenaeum</i>	spor	32	16	2
<i>Alyssum_meniocoides</i>	gam	8	8	3
<i>Alyssum_meniocoides</i>	gam	20	20	1
<i>Alyssum_meniocoides</i>	spor	14	7	2
<i>Alyssum_minutum</i>	gam	8	8	3
<i>Alyssum_minutum</i>	gam	24	24	3
<i>Alyssum_minutum</i>	spor	16	8	28
<i>Alyssum_montanum</i>	gam	8	8	2
<i>Alyssum_montanum</i>	gam	18	18	1
<i>Alyssum_montanum</i>	gam	24	24	1
<i>Alyssum_montanum</i>	spor	16	8	25
<i>Alyssum_montanum</i>	spor	32	16	39
<i>Alyssum_montanum</i>	spor	48	24	3
<i>Alyssum_montanum_subsp._gmelinii</i>	spor	16	8	1
<i>Alyssum_montanum_subsp._gmelinii</i>	spor	32	16	12
<i>Alyssum_montanum_subsp._gmelinii</i>	spor	48	24	1
<i>Alyssum_murale</i>	gam	8	8	1
<i>Alyssum_murale</i>	spor	16	8	25
<i>Alyssum_murale</i>	spor	32	16	4
<i>Alyssum_nebrodense</i>	spor	16	8	3
<i>Alyssum_obovatum</i>	spor	16	8	13
<i>Alyssum_obovatum</i>	spor	30	15	3
<i>Alyssum_obovatum</i>	spor	32	16	10
<i>Alyssum_ovirense</i>	spor	16	8	2
<i>Alyssum_oxycarpum</i>	gam	8	8	2
<i>Alyssum_oxycarpum</i>	spor	16	8	2
<i>Alyssum_oxycarpum</i>	spor	64	32	1
<i>Alyssum_pateri</i>	gam	16	16	2
<i>Alyssum_pateri</i>	spor	16	8	1
<i>Alyssum_pateri</i>	spor	32	16	2
<i>Alyssum_praecox</i>	spor	32	16	2
<i>Alyssum_robertianum</i>	spor	16	8	6
<i>Alyssum_serpyllifolium</i>	gam	8	8	3
<i>Alyssum_serpyllifolium</i>	gam	16	16	3
<i>Alyssum_serpyllifolium</i>	spor	16	8	13
<i>Alyssum_serpyllifolium</i>	spor	32	16	6
<i>Alyssum_sibiricum</i>	spor	16	8	2
<i>Alyssum_siculum</i>	spor	48	24	2

<i>Alyssum simplex</i>	gam	8	8	3
<i>Alyssum simplex</i>	gam	12	12	1
<i>Alyssum simplex</i>	gam	24	24	3
<i>Alyssum simplex</i>	spor	16	8	36
<i>Alyssum simplex</i>	spor	32	16	5
<i>Alyssum smolikanum</i>	gam	16	16	1
<i>Alyssum smolikanum</i>	spor	32	16	2
<i>Alyssum stapfii</i>	gam	8	8	2
<i>Alyssum stapfii</i>	gam	12	12	1
<i>Alyssum stapfii</i>	gam	24	24	3
<i>Alyssum sribryni</i>	spor	32	16	1
<i>Alyssum strigosum</i>	gam	8	8	7
<i>Alyssum strigosum</i>	spor	16	8	16
<i>Alyssum strigosum</i>	spor	64	32	2
<i>Alyssum tenuifolium</i>	spor	88	44	3
<i>Alyssum tenuifolium</i>	spor	92	46	3
<i>Alyssum tortuosum</i>	gam	8	8	1
<i>Alyssum tortuosum</i>	spor	16	8	9
<i>Alyssum tortuosum</i>	spor	32	16	5
<i>Alyssum turkestanicum</i>	gam	16	16	2
<i>Alyssum turkestanicum</i>	gam	24	24	1
<i>Alyssum turkestanicum</i>	spor	32	16	1
<i>Alyssum turkestanicum</i>	spor	48	24	1
<i>Alyssum umbellatum</i>	spor	14	7	13
<i>Alyssum umbellatum</i>	spor	16	8	10
<i>Anastatica hierochuntica</i>	spor	22	11	12
<i>Anelsonia eurycarpa</i>	gam	7	7	2
<i>Anelsonia eurycarpa</i>	spor	14	7	1
<i>Arabidella trisecta</i>	gam	12	12	2
<i>Arabidella trisecta</i>	gam	18	18	1
<i>Arabidopsis arenicola</i>	gam	8	8	2
<i>Arabidopsis arenicola</i>	spor	16	8	5
<i>Arabidopsis arenicola</i>	spor	32	16	1
<i>Arabidopsis arenosa</i>	gam	8	8	3
<i>Arabidopsis arenosa</i>	gam	16	16	18
<i>Arabidopsis arenosa</i>	spor	16	8	16
<i>Arabidopsis arenosa</i>	spor	28	14	6
<i>Arabidopsis arenosa</i>	spor	30	15	2
<i>Arabidopsis arenosa</i>	spor	32	16	32
<i>Arabidopsis arenosa</i>	spor	34	17	2
<i>Arabidopsis arenosa</i>	spor	39	20	1
<i>Arabidopsis arenosa</i>	spor	40	20	1
<i>Arabidopsis cebennensis</i>	spor	16	8	1
<i>Arabidopsis halleri</i>	gam	8	8	3
<i>Arabidopsis halleri</i>	spor	16	8	37
<i>Arabidopsis halleri subsp. gemmifera</i>	spor	16	8	3
<i>Arabidopsis halleri subsp. ovirensis</i>	spor	16	8	4
<i>Arabidopsis lyrata</i>	gam	8	8	3
<i>Arabidopsis lyrata</i>	gam	16	16	1

<i>Arabidopsis_lyrata</i>	spor	16	8	14
<i>Arabidopsis_lyrata</i>	spor	32	16	4
<i>Arabidopsis_lyrata_subsp._petraea</i>	gam	16	16	5
<i>Arabidopsis_lyrata_subsp._petraea</i>	spor	16	8	58
<i>Arabidopsis_lyrata_subsp._petraea</i>	spor	32	16	12
<i>Arabidopsis_neglecta</i>	spor	16	8	12
<i>Arabidopsis_neglecta</i>	spor	32	16	1
<i>Arabidopsis_suecica</i>	gam	13	13	1
<i>Arabidopsis_suecica</i>	gam	14	14	1
<i>Arabidopsis_suecica</i>	spor	20	10	2
<i>Arabidopsis_suecica</i>	spor	22	11	2
<i>Arabidopsis_suecica</i>	spor	26	13	11
<i>Arabidopsis_suecica</i>	spor	28	14	5
<i>Arabidopsis_thaliana</i>	gam	5	5	22
<i>Arabidopsis_thaliana</i>	gam	6	6	1
<i>Arabidopsis_thaliana</i>	gam	7	7	1
<i>Arabidopsis_thaliana</i>	gam	8	8	1
<i>Arabidopsis_thaliana</i>	spor	10	5	102
<i>Arabidopsis_thaliana</i>	spor	20	10	2
<i>Arabis_aculeolata</i>	gam	16	16	1
<i>Arabis_aculeolata</i>	spor	32	16	3
<i>Arabis_allionii</i>	gam	8	8	3
<i>Arabis_allionii</i>	spor	16	8	25
<i>Arabis_allionii</i>	spor	32	16	12
<i>Arabis_allionii</i>	spor	195	98	1
<i>Arabis_alpina</i>	gam	8	8	17
<i>Arabis_alpina</i>	spor	16	8	109
<i>Arabis_alpina</i>	spor	17	8	4
<i>Arabis_alpina</i>	spor	20	10	2
<i>Arabis_alpina</i>	spor	32	16	5
<i>Arabis_amplexicaulis</i>	gam	16	16	3
<i>Arabis_amplexicaulis</i>	spor	16	8	1
<i>Arabis_amplexicaulis</i>	spor	32	16	1
<i>Arabis_ariana</i>	spor	16	8	2
<i>Arabis_aucheri</i>	gam	8	8	2
<i>Arabis_blepharophylla</i>	gam	8	8	1
<i>Arabis_blepharophylla</i>	spor	16	8	3
<i>Arabis_brachycarpa</i>	spor	16	8	3
<i>Arabis_bryoides</i>	spor	16	8	6
<i>Arabis_caerulea</i>	gam	8	8	3
<i>Arabis_caerulea</i>	spor	16	8	11
<i>Arabis_caerulea</i>	spor	24	12	3
<i>Arabis_carduchorum</i>	spor	16	8	2
<i>Arabis_christianii</i>	spor	32	16	1
<i>Arabis_ciliata</i>	gam	8	8	2
<i>Arabis_ciliata</i>	spor	16	8	33
<i>Arabis_ciliata</i>	spor	17	8	1
<i>Arabis_ciliata</i>	spor	32	16	2
<i>Arabis_ciliata</i>	spor	48	24	2

<i>Arabis_ciliata</i>	spor	56	28	1
<i>Arabis_collina</i>	gam	8	8	1
<i>Arabis_collina</i>	spor	16	8	12
<i>Arabis_collina</i>	spor	32	16	14
<i>Arabis_conringioides</i>	gam	7	7	4
<i>Arabis_conringioides</i>	spor	14	7	4
<i>Arabis_crucisetosa</i>	spor	32	16	1
<i>Arabis_eschscholtziana</i>	gam	32	32	2
<i>Arabis_eschscholtziana</i>	spor	32	16	1
<i>Arabis_eschscholtziana</i>	spor	64	32	1
<i>Arabis_ferdinandi-coburgii</i>	spor	18	9	2
<i>Arabis_flagellosa</i>	spor	32	16	1
<i>Arabis_hirsuta</i>	gam	8	8	3
<i>Arabis_hirsuta</i>	gam	16	16	31
<i>Arabis_hirsuta</i>	spor	8	4	4
<i>Arabis_hirsuta</i>	spor	16	8	31
<i>Arabis_hirsuta</i>	spor	24	12	1
<i>Arabis_hirsuta</i>	spor	28	14	9
<i>Arabis_hirsuta</i>	spor	30	15	9
<i>Arabis_hirsuta</i>	spor	32	16	184
<i>Arabis_hirsuta</i>	spor	33	16	1
<i>Arabis_juressi</i>	spor	32	16	1
<i>Arabis_macdonaldiana</i>	gam	8	8	1
<i>Arabis_modesta</i>	gam	8	8	1
<i>Arabis_modesta</i>	gam	16	16	2
<i>Arabis_modesta</i>	spor	32	16	3
<i>Arabis_nordmanniana</i>	spor	16	8	3
<i>Arabis_nova</i>	gam	6	6	1
<i>Arabis_nova</i>	gam	7	7	2
<i>Arabis_nova</i>	gam	8	8	15
<i>Arabis_nova</i>	spor	8	4	1
<i>Arabis_nova</i>	spor	14	7	4
<i>Arabis_nova</i>	spor	16	8	36
<i>Arabis_oregana</i>	gam	8	8	1
<i>Arabis_oregana</i>	spor	32	16	2
<i>Arabis_parvula</i>	spor	32	16	4
<i>Arabis_planisiliqua</i>	gam	8	8	8
<i>Arabis_planisiliqua</i>	gam	16	16	1
<i>Arabis_planisiliqua</i>	spor	16	8	60
<i>Arabis_planisiliqua</i>	spor	24	12	1
<i>Arabis_procurrens</i>	gam	8	8	1
<i>Arabis_procurrens</i>	spor	16	8	10
<i>Arabis_procurrens</i>	spor	24	12	1
<i>Arabis_procurrens</i>	spor	32	16	4
<i>Arabis_pterosperma</i>	gam	8	8	2
<i>Arabis_pubescens</i>	spor	16	8	2
<i>Arabis_pubescens_subsp._decumbens</i>	gam	8	8	2
<i>Arabis_pubescens_subsp._decumbens</i>	spor	16	8	2
<i>Arabis_pumila</i>	gam	8	8	3

<i>Arabis_pumila</i>	spor	16	8	17
<i>Arabis_pumila</i>	spor	32	16	27
<i>Arabis_sagittata</i>	gam	8	8	13
<i>Arabis_sagittata</i>	gam	9	9	1
<i>Arabis_sagittata</i>	spor	12	6	4
<i>Arabis_sagittata</i>	spor	16	8	77
<i>Arabis_sagittata</i>	spor	17	8	1
<i>Arabis_sagittata</i>	spor	24	12	2
<i>Arabis_sagittata</i>	spor	32	16	2
<i>Arabis_scabra</i>	spor	16	8	7
<i>Arabis_serrata</i>	gam	16	16	1
<i>Arabis_serrata</i>	spor	16	8	1
<i>Arabis_serrata</i>	spor	32	16	4
<i>Arabis_serrata</i>	spor	40	20	1
<i>Arabis_soyeri</i>	spor	16	8	4
<i>Arabis_soyeri_subsp._subcoriacea</i>	gam	8	8	1
<i>Arabis_soyeri_subsp._subcoriacea</i>	spor	16	8	34
<i>Arabis_soyeri_subsp._subcoriacea</i>	spor	32	16	3
<i>Arabis_stelleri</i>	spor	16	8	3
<i>Arabis_stelleri</i>	spor	32	16	3
<i>Arabis_stellulata</i>	spor	16	8	9
<i>Arabis_stenocarpa</i>	spor	16	8	4
<i>Armoracia_rusticana</i>	gam	14	14	2
<i>Armoracia_rusticana</i>	gam	16	16	3
<i>Armoracia_rusticana</i>	spor	32	16	23
<i>Asperuginoides_axillaris</i>	spor	16	8	2
<i>Athysanus_pusillus</i>	spor	26	13	2
<i>Aubrieta_deltoidea</i>	gam	8	8	1
<i>Aubrieta_deltoidea</i>	spor	16	8	23
<i>Aubrieta_parviflora</i>	gam	8	8	7
<i>Aubrieta_parviflora</i>	spor	16	8	1
<i>Aurinia_corymbosa</i>	gam	8	8	1
<i>Aurinia_corymbosa</i>	spor	16	8	6
<i>Aurinia_gionae</i>	gam	8	8	1
<i>Aurinia_gionae</i>	spor	16	8	2
<i>Aurinia_moreana</i>	spor	16	8	2
<i>Aurinia_petraea</i>	gam	8	8	1
<i>Aurinia_petraea</i>	gam	16	16	1
<i>Aurinia_petraea</i>	spor	16	8	6
<i>Aurinia_rupestris</i>	gam	8	8	3
<i>Aurinia_rupestris</i>	spor	16	8	2
<i>Aurinia_saxatilis</i>	gam	8	8	4
<i>Aurinia_saxatilis</i>	spor	16	8	25
<i>Aurinia_saxatilis_subsp._orientalis</i>	gam	8	8	4
<i>Aurinia_saxatilis_subsp._orientalis</i>	spor	16	8	21
<i>Aurinia_sinuata</i>	spor	16	8	5
<i>Barbarea_orthoceras</i>	gam	8	8	6
<i>Barbarea_orthoceras</i>	spor	16	8	19
<i>Barbarea_verna</i>	gam	8	8	5

<i>Barbarea_verna</i>	spor	16	8	9
<i>Barbarea_vulgaris</i>	gam	7	7	1
<i>Barbarea_vulgaris</i>	gam	8	8	25
<i>Barbarea_vulgaris</i>	spor	14	7	1
<i>Barbarea_vulgaris</i>	spor	16	8	75
<i>Barbarea_vulgaris</i>	spor	18	9	3
<i>Berteroa_incana</i>	gam	8	8	5
<i>Berteroa_incana</i>	spor	16	8	63
<i>Berteroa_mutabilis</i>	spor	16	8	5
<i>Berteroa_obliqua</i>	spor	16	8	2
<i>Berteroa_orbiculata</i>	spor	16	8	2
<i>Biscutella_auriculata</i>	gam	8	8	15
<i>Biscutella_auriculata</i>	spor	16	8	16
<i>Biscutella_baetica</i>	gam	8	8	13
<i>Biscutella_baetica</i>	spor	16	8	4
<i>Biscutella_cichoriifolia</i>	spor	16	8	6
<i>Biscutella_didyma</i>	gam	8	8	6
<i>Biscutella_didyma</i>	spor	16	8	15
<i>Biscutella_laevigata</i>	gam	9	9	15
<i>Biscutella_laevigata</i>	gam	18	18	16
<i>Biscutella_laevigata</i>	gam	38	38	2
<i>Biscutella_laevigata</i>	spor	9	4	3
<i>Biscutella_laevigata</i>	spor	18	9	46
<i>Biscutella_laevigata</i>	spor	26	13	2
<i>Biscutella_laevigata</i>	spor	27	14	2
<i>Biscutella_laevigata</i>	spor	34	17	5
<i>Biscutella_laevigata</i>	spor	35	18	6
<i>Biscutella_laevigata</i>	spor	36	18	127
<i>Biscutella_laevigata</i>	spor	37	18	8
<i>Biscutella_laevigata</i>	spor	45	22	2
<i>Biscutella_laevigata</i>	spor	54	27	5
<i>Biscutella_lyrata</i>	gam	6	6	5
<i>Biscutella_lyrata</i>	gam	8	8	14
<i>Biscutella_lyrata</i>	spor	12	6	7
<i>Biscutella_lyrata</i>	spor	16	8	11
<i>Biscutella_maritima</i>	spor	16	8	6
<i>Blennodia_pterosperma</i>	gam	12	12	1
<i>Boechera_arcuata</i>	gam	6	6	1
<i>Boechera_canadensis</i>	gam	7	7	1
<i>Boechera_canadensis</i>	spor	14	7	2
<i>Boechera_cobrensis</i>	gam	7	7	1
<i>Boechera_cobrensis</i>	spor	14	7	1
<i>Boechera_collinsii</i>	spor	14	7	3
<i>Boechera_collinsii</i>	spor	28	14	1
<i>Boechera_constancei</i>	spor	14	7	2
<i>Boechera_crandallii</i>	gam	7	7	1
<i>Boechera_crandallii</i>	spor	14	7	3
<i>Boechera_demissa</i>	spor	21	10	2
<i>Boechera_divaricarpa</i>	gam	5	5	1

<i>Boechera_divaricarpa</i>	gam	7	7	2
<i>Boechera_divaricarpa</i>	gam	8	8	1
<i>Boechera_divaricarpa</i>	gam	10	10	1
<i>Boechera_divaricarpa</i>	gam	11	11	2
<i>Boechera_divaricarpa</i>	gam	14	14	1
<i>Boechera_divaricarpa</i>	gam	15	15	2
<i>Boechera_divaricarpa</i>	gam	21	21	3
<i>Boechera_divaricarpa</i>	spor	13	6	1
<i>Boechera_divaricarpa</i>	spor	14	7	10
<i>Boechera_divaricarpa</i>	spor	21	10	5
<i>Boechera_divaricarpa</i>	spor	22	11	3
<i>Boechera_divaricarpa</i>	spor	28	14	2
<i>Boechera_falcata</i>	spor	14	7	7
<i>Boechera_fendleri</i>	gam	7	7	5
<i>Boechera_fendleri</i>	gam	14	14	2
<i>Boechera_fendleri</i>	gam	21	21	1
<i>Boechera_fendleri</i>	spor	14	7	3
<i>Boechera_fendleri</i>	spor	21	10	2
<i>Boechera_formosa</i>	spor	14	7	1
<i>Boechera_glaucovalvula</i>	gam	7	7	1
<i>Boechera_glaucovalvula</i>	spor	14	7	1
<i>Boechera_grahamii</i>	gam	21	21	1
<i>Boechera_grahamii</i>	spor	21	10	1
<i>Boechera_gunnisoniana</i>	gam	7	7	1
<i>Boechera_gunnisoniana</i>	spor	14	7	1
<i>Boechera_gunnisoniana</i>	spor	21	10	2
<i>Boechera_inyoensis</i>	spor	21	10	3
<i>Boechera_inyoensis</i>	spor	23	12	2
<i>Boechera_koehleri</i>	spor	14	7	1
<i>Boechera_laevigata</i>	gam	7	7	6
<i>Boechera_laevigata</i>	spor	14	7	2
<i>Boechera_lemmonii</i>	gam	21	21	1
<i>Boechera_lemmonii</i>	spor	14	7	5
<i>Boechera_lignifera</i>	gam	7	7	1
<i>Boechera_lignifera</i>	spor	14	7	5
<i>Boechera_lincolnensis</i>	spor	14	7	1
<i>Boechera_lyallii</i>	gam	15	15	1
<i>Boechera_lyallii</i>	gam	21	21	1
<i>Boechera_lyallii</i>	spor	20	10	4
<i>Boechera_lyallii</i>	spor	21	10	6
<i>Boechera_parishii</i>	gam	7	7	1
<i>Boechera_parishii</i>	spor	14	7	3
<i>Boechera_pendulocarpa</i>	spor	14	7	1
<i>Boechera_perennans</i>	gam	7	7	3
<i>Boechera_perennans</i>	spor	14	7	2
<i>Boechera_perstellata</i>	gam	7	7	4
<i>Boechera_perstellata</i>	spor	14	7	1
<i>Boechera_platysperma</i>	gam	7	7	1
<i>Boechera_platysperma</i>	spor	14	7	1

<i>Boechera_puberula</i>	gam	7	7	1
<i>Boechera_puberula</i>	gam	21	21	1
<i>Boechera_puberula</i>	spor	14	7	1
<i>Boechera_repanda</i>	gam	7	7	2
<i>Boechera_repanda</i>	spor	14	7	1
<i>Boechera_retrofracta</i>	spor	14	7	1
<i>Boechera_schistacea</i>	spor	14	7	2
<i>Boechera_serotina</i>	spor	14	7	3
<i>Boechera_spatifolia</i>	spor	14	7	1
<i>Boechera_stricta</i>	gam	7	7	8
<i>Boechera_stricta</i>	gam	21	21	1
<i>Boechera_stricta</i>	spor	14	7	16
<i>Boechera_stricta</i>	spor	20	10	1
<i>Boechera_stricta</i>	spor	21	10	1
<i>Boechera_stricta</i>	spor	28	14	3
<i>Boechera_subpinnatifida</i>	gam	7	7	4
<i>Boechera_subpinnatifida</i>	spor	14	7	2
<i>Boechera_williamsii</i>	gam	14	14	2
<i>Bornmuellera_baldaccii</i>	spor	16	8	2
<i>Bornmuellera_tymphaea</i>	spor	16	8	3
<i>Borodinia_macrophylla</i>	spor	14	7	5
<i>Brassica_balearica</i>	gam	16	16	4
<i>Brassica_balearica</i>	gam	18	18	5
<i>Brassica_balearica</i>	spor	18	9	5
<i>Brassica_balearica</i>	spor	32	16	10
<i>Brassica_balearica</i>	spor	36	18	4
<i>Brassica_barrelieri</i>	gam	9	9	2
<i>Brassica_barrelieri</i>	gam	10	10	16
<i>Brassica_barrelieri</i>	spor	18	9	1
<i>Brassica_barrelieri</i>	spor	20	10	5
<i>Brassica_carinata</i>	gam	17	17	10
<i>Brassica_carinata</i>	spor	16	8	1
<i>Brassica_carinata</i>	spor	34	17	25
<i>Brassica_carinata</i>	spor	36	18	2
<i>Brassica_cretica</i>	gam	9	9	9
<i>Brassica_cretica</i>	spor	18	9	26
<i>Brassica_cretica</i>	spor	20	10	3
<i>Brassica_cretica</i>	spor	36	18	2
<i>Brassica_deflexa</i>	gam	7	7	3
<i>Brassica_desnottesii</i>	gam	10	10	3
<i>Brassica_elongata</i>	gam	11	11	4
<i>Brassica_elongata</i>	spor	22	11	17
<i>Brassica_fruticulosa</i>	gam	8	8	8
<i>Brassica_fruticulosa</i>	spor	16	8	7
<i>Brassica_gravinae</i>	gam	10	10	3
<i>Brassica_gravinae</i>	gam	20	20	2
<i>Brassica_gravinae</i>	spor	20	10	4
<i>Brassica_incana</i>	gam	9	9	4
<i>Brassica_incana</i>	spor	18	9	6

<i>Brassica_insularis</i>	gam	9	9	6
<i>Brassica_insularis</i>	spor	18	9	24
<i>Brassica_insularis</i>	spor	27	14	2
<i>Brassica_junceae</i>	gam	10	10	3
<i>Brassica_junceae</i>	gam	16	16	1
<i>Brassica_junceae</i>	gam	18	18	50
<i>Brassica_junceae</i>	gam	19	19	2
<i>Brassica_junceae</i>	spor	16	8	2
<i>Brassica_junceae</i>	spor	18	9	1
<i>Brassica_junceae</i>	spor	20	10	7
<i>Brassica_junceae</i>	spor	36	18	107
<i>Brassica_junceae</i>	spor	38	19	2
<i>Brassica_macrocarpa</i>	gam	9	9	3
<i>Brassica_macrocarpa</i>	spor	18	9	7
<i>Brassica_montana</i>	gam	9	9	6
<i>Brassica_montana</i>	spor	18	9	6
<i>Brassica_napus</i>	gam	9	9	4
<i>Brassica_napus</i>	gam	10	10	6
<i>Brassica_napus</i>	gam	16	16	2
<i>Brassica_napus</i>	gam	18	18	2
<i>Brassica_napus</i>	gam	19	19	29
<i>Brassica_napus</i>	gam	20	20	5
<i>Brassica_napus</i>	gam	38	38	1
<i>Brassica_napus</i>	spor	10	5	2
<i>Brassica_napus</i>	spor	18	9	2
<i>Brassica_napus</i>	spor	20	10	7
<i>Brassica_napus</i>	spor	28	14	2
<i>Brassica_napus</i>	spor	29	14	1
<i>Brassica_napus</i>	spor	32	16	8
<i>Brassica_napus</i>	spor	36	18	3
<i>Brassica_napus</i>	spor	38	19	59
<i>Brassica_napus</i>	spor	40	20	1
<i>Brassica_napus</i>	spor	57	28	1
<i>Brassica_napus</i>	spor	60	30	1
<i>Brassica_napus</i>	spor	63	32	1
<i>Brassica_napus</i>	spor	65	32	1
<i>Brassica_napus</i>	spor	67	34	1
<i>Brassica_napus</i>	spor	68	34	1
<i>Brassica_napus</i>	spor	76	38	1
<i>Brassica_nigra</i>	gam	8	8	27
<i>Brassica_nigra</i>	gam	16	16	4
<i>Brassica_nigra</i>	spor	16	8	74
<i>Brassica_nigra</i>	spor	18	9	3
<i>Brassica_nigra</i>	spor	24	12	2
<i>Brassica_nigra</i>	spor	32	16	1
<i>Brassica_oleracea</i>	gam	9	9	37
<i>Brassica_oleracea</i>	gam	18	18	4
<i>Brassica_oleracea</i>	spor	18	9	132
<i>Brassica_oleracea</i>	spor	20	10	6

<i>Brassica_oleracea</i>	spor	24	12	2
<i>Brassica_oleracea</i>	spor	36	18	8
<i>Brassica_oleracea</i>	spor	72	36	1
<i>Brassica_oxyrrhina</i>	gam	9	9	16
<i>Brassica_oxyrrhina</i>	spor	18	9	12
<i>Brassica_rapa</i>	gam	9	9	10
<i>Brassica_rapa</i>	gam	10	10	108
<i>Brassica_rapa</i>	gam	11	11	2
<i>Brassica_rapa</i>	gam	20	20	1
<i>Brassica_rapa</i>	spor	10	5	2
<i>Brassica_rapa</i>	spor	18	9	9
<i>Brassica_rapa</i>	spor	20	10	184
<i>Brassica_rapa</i>	spor	22	11	2
<i>Brassica_rapa</i>	spor	29	14	2
<i>Brassica_rapa</i>	spor	30	15	3
<i>Brassica_rapa</i>	spor	36	18	2
<i>Brassica_rapa</i>	spor	38	19	2
<i>Brassica_rapa</i>	spor	40	20	6
<i>Brassica_repanda</i>	gam	10	10	3
<i>Brassica_repanda</i>	gam	11	11	1
<i>Brassica_repanda</i>	gam	30	30	3
<i>Brassica_repanda</i>	gam	80	80	3
<i>Brassica_repanda</i>	spor	20	10	12
<i>Brassica_repanda_subsp._blancoana</i>	spor	20	10	8
<i>Brassica_repanda_subsp._latisiliqua</i>	spor	20	10	4
<i>Brassica_repanda_subsp._saxatilis</i>	gam	10	10	1
<i>Brassica_repanda_subsp._saxatilis</i>	spor	20	10	4
<i>Brassica_tournefortii</i>	gam	10	10	13
<i>Brassica_tournefortii</i>	spor	20	10	19
<i>Brassica_villosa</i>	gam	9	9	2
<i>Brassica_villosa</i>	spor	18	9	6
<i>Braya_alpina</i>	gam	16	16	1
<i>Braya_alpina</i>	gam	21	21	3
<i>Braya_alpina</i>	spor	32	16	4
<i>Braya_alpina</i>	spor	42	21	4
<i>Braya_fernaldii</i>	spor	56	28	2
<i>Braya_glabella</i>	gam	28	28	7
<i>Braya_glabella</i>	gam	42	42	1
<i>Braya_glabella</i>	gam	56	56	1
<i>Braya_glabella</i>	spor	28	14	3
<i>Braya_glabella</i>	spor	42	21	8
<i>Braya_glabella</i>	spor	48	24	2
<i>Braya_glabella</i>	spor	56	28	33
<i>Braya_glabella</i>	spor	64	32	4
<i>Braya_humilis</i>	gam	14	14	3
<i>Braya_humilis</i>	gam	21	21	5
<i>Braya_humilis</i>	gam	25	25	1
<i>Braya_humilis</i>	gam	28	28	5
<i>Braya_humilis</i>	gam	32	32	2

<i>Braya_humilis</i>	gam	56	56	1
<i>Braya_humilis</i>	spor	28	14	9
<i>Braya_humilis</i>	spor	30	15	2
<i>Braya_humilis</i>	spor	40	20	4
<i>Braya_humilis</i>	spor	42	21	20
<i>Braya_humilis</i>	spor	50	25	1
<i>Braya_humilis</i>	spor	56	28	16
<i>Braya_humilis</i>	spor	64	32	2
<i>Braya_humilis</i>	spor	70	35	3
<i>Braya_linearis</i>	gam	21	21	6
<i>Braya_linearis</i>	spor	42	21	11
<i>Braya_linearis</i>	spor	64	32	2
<i>Braya_longii</i>	spor	56	28	2
<i>Braya_pilosa</i>	spor	28	14	2
<i>Braya_rosea</i>	gam	21	21	2
<i>Braya_rosea</i>	spor	18	9	1
<i>Braya_rosea</i>	spor	28	14	7
<i>Braya_rosea</i>	spor	42	21	3
<i>Braya_rosea</i>	spor	56	28	2
<i>Braya_thorild-wulffii</i>	gam	14	14	1
<i>Braya_thorild-wulffii</i>	spor	28	14	8
<i>Bunias_orientalis</i>	gam	7	7	4
<i>Bunias_orientalis</i>	spor	14	7	41
<i>Bunias_orientalis</i>	spor	28	14	2
<i>Bunias_orientalis</i>	spor	42	21	4
<i>Cakile_arabica</i>	gam	9	9	7
<i>Cakile_edentula</i>	gam	9	9	4
<i>Cakile_edentula</i>	gam	18	18	1
<i>Cakile_edentula</i>	spor	18	9	12
<i>Cakile_edentula</i>	spor	36	18	5
<i>Cakile_lanceolata</i>	gam	9	9	2
<i>Cakile_lanceolata</i>	spor	18	9	4
<i>Cakile_maritima</i>	gam	9	9	37
<i>Cakile_maritima</i>	spor	18	9	46
<i>Cakile_maritima</i>	spor	36	18	3
<i>Calepina_irregularis</i>	gam	14	14	7
<i>Calepina_irregularis</i>	gam	21	21	2
<i>Calepina_irregularis</i>	spor	14	7	11
<i>Calepina_irregularis</i>	spor	16	8	1
<i>Calepina_irregularis</i>	spor	28	14	9
<i>Calepina_irregularis</i>	spor	42	21	4
<i>Camelina_alyssum</i>	gam	21	21	1
<i>Camelina_alyssum</i>	spor	40	20	13
<i>Camelina_alyssum</i>	spor	42	21	2
<i>Camelina_microcarpa</i>	gam	8	8	2
<i>Camelina_microcarpa</i>	gam	13	13	4
<i>Camelina_microcarpa</i>	gam	19	19	3
<i>Camelina_microcarpa</i>	gam	20	20	3
<i>Camelina_microcarpa</i>	spor	16	8	4

<i>Camelina_microcarpa</i>	spor	18	9	6
<i>Camelina_microcarpa</i>	spor	20	10	6
<i>Camelina_microcarpa</i>	spor	24	12	3
<i>Camelina_microcarpa</i>	spor	26	13	9
<i>Camelina_microcarpa</i>	spor	32	16	3
<i>Camelina_microcarpa</i>	spor	38	19	1
<i>Camelina_microcarpa</i>	spor	40	20	29
<i>Camelina_rumelica</i>	gam	6	6	4
<i>Camelina_rumelica</i>	gam	12	12	3
<i>Camelina_rumelica</i>	spor	12	6	3
<i>Camelina_rumelica</i>	spor	16	8	1
<i>Camelina_rumelica</i>	spor	26	13	3
<i>Camelina_rumelica</i>	spor	32	16	1
<i>Camelina_rumelica</i>	spor	40	20	2
<i>Camelina_sativa</i>	gam	6	6	3
<i>Camelina_sativa</i>	gam	13	13	1
<i>Camelina_sativa</i>	gam	14	14	1
<i>Camelina_sativa</i>	gam	20	20	3
<i>Camelina_sativa</i>	spor	12	6	3
<i>Camelina_sativa</i>	spor	26	13	6
<i>Camelina_sativa</i>	spor	28	14	3
<i>Camelina_sativa</i>	spor	36	18	3
<i>Camelina_sativa</i>	spor	40	20	16
<i>Camelina_sativa</i>	spor	42	21	1
<i>Capsella_bursa-pastoris</i>	gam	8	8	16
<i>Capsella_bursa-pastoris</i>	gam	16	16	50
<i>Capsella_bursa-pastoris</i>	gam	20	20	2
<i>Capsella_bursa-pastoris</i>	spor	12	6	1
<i>Capsella_bursa-pastoris</i>	spor	16	8	27
<i>Capsella_bursa-pastoris</i>	spor	20	10	1
<i>Capsella_bursa-pastoris</i>	spor	32	16	116
<i>Capsella_bursa-pastoris</i>	spor	40	20	1
<i>Capsella_grandiflora</i>	spor	16	8	1
<i>Capsella_rubella</i>	spor	12	6	1
<i>Capsella_rubella</i>	spor	16	8	19
<i>Cardamine_africana</i>	gam	16	16	3
<i>Cardamine_africana</i>	spor	16	8	9
<i>Cardamine_amara</i>	gam	8	8	9
<i>Cardamine_amara</i>	gam	16	16	8
<i>Cardamine_amara</i>	gam	32	32	1
<i>Cardamine_amara</i>	spor	16	8	455
<i>Cardamine_amara</i>	spor	24	12	7
<i>Cardamine_amara</i>	spor	30	15	1
<i>Cardamine_amara</i>	spor	32	16	54
<i>Cardamine_amara</i>	spor	56	28	2
<i>Cardamine_amara</i>	spor	58	29	1
<i>Cardamine_amara</i>	spor	60	30	1
<i>Cardamine_amara</i>	spor	64	32	1
<i>Cardamine_amara</i>	spor	68	34	1

<i>Cardamine amara</i>	spor	72	36	1
<i>Cardamine amara</i>	spor	76	38	1
<i>Cardamine amara</i>	spor	84	42	1
<i>Cardamine amara</i> subsp. <i>pyrenaea</i>	spor	16	8	19
<i>Cardamine angustata</i>	spor	110	55	1
<i>Cardamine angustata</i>	spor	116	58	1
<i>Cardamine angustata</i>	spor	119	60	1
<i>Cardamine angustata</i>	spor	128	64	9
<i>Cardamine angustata</i>	spor	130	65	1
<i>Cardamine angustata</i>	spor	134	67	1
<i>Cardamine asarifolia</i>	spor	14	7	4
<i>Cardamine asarifolia</i>	spor	16	8	4
<i>Cardamine asarifolia</i>	spor	48	24	4
<i>Cardamine bellidifolia</i>	gam	8	8	13
<i>Cardamine bellidifolia</i>	gam	16	16	4
<i>Cardamine bellidifolia</i>	spor	16	8	63
<i>Cardamine bonariensis</i>	gam	8	8	1
<i>Cardamine breweri</i>	gam	42	42	2
<i>Cardamine breweri</i>	gam	48	48	2
<i>Cardamine breweri</i>	spor	42	21	3
<i>Cardamine breweri</i>	spor	48	24	3
<i>Cardamine bulbosa</i>	gam	16	16	1
<i>Cardamine bulbosa</i>	gam	28	28	2
<i>Cardamine bulbosa</i>	gam	32	32	7
<i>Cardamine bulbosa</i>	gam	40	40	3
<i>Cardamine bulbosa</i>	gam	48	48	3
<i>Cardamine bulbosa</i>	gam	56	56	2
<i>Cardamine bulbosa</i>	spor	16	8	2
<i>Cardamine bulbosa</i>	spor	32	16	1
<i>Cardamine bulbosa</i>	spor	48	24	1
<i>Cardamine bulbosa</i>	spor	56	28	1
<i>Cardamine bulbosa</i>	spor	64	32	8
<i>Cardamine bulbosa</i>	spor	80	40	1
<i>Cardamine bulbosa</i>	spor	96	48	1
<i>Cardamine bulbosa</i>	spor	112	56	1
<i>Cardamine castellana</i>	spor	16	8	16
<i>Cardamine concatenata</i>	gam	64	64	5
<i>Cardamine concatenata</i>	gam	128	128	5
<i>Cardamine concatenata</i>	spor	128	64	1
<i>Cardamine concatenata</i>	spor	240	120	6
<i>Cardamine concatenata</i>	spor	256	128	1
<i>Cardamine conferta</i>	spor	48	24	6
<i>Cardamine cordifolia</i>	gam	12	12	12
<i>Cardamine cordifolia</i>	spor	24	12	10
<i>Cardamine crassifolia</i>	spor	16	8	17
<i>Cardamine crassifolia</i>	spor	44	22	1
<i>Cardamine debilis</i>	gam	24	24	25
<i>Cardamine debilis</i>	spor	48	24	1
<i>Cardamine digitata</i>	spor	28	14	46

<i>Cardamine_digitata</i>	spor	32	16	5
<i>Cardamine_digitata</i>	spor	40	20	4
<i>Cardamine_digitata</i>	spor	42	21	29
<i>Cardamine_digitata</i>	spor	48	24	1
<i>Cardamine_diphylla</i>	spor	74	37	1
<i>Cardamine_diphylla</i>	spor	96	48	7
<i>Cardamine_diphylla</i>	spor	240	120	1
<i>Cardamine_enneaphyllos</i>	gam	26	26	2
<i>Cardamine_enneaphyllos</i>	gam	27	27	2
<i>Cardamine_enneaphyllos</i>	spor	52	26	1
<i>Cardamine_enneaphyllos</i>	spor	54	27	1
<i>Cardamine_enneaphyllos</i>	spor	80	40	16
<i>Cardamine_flexuosa</i>	gam	15	15	4
<i>Cardamine_flexuosa</i>	gam	16	16	7
<i>Cardamine_flexuosa</i>	spor	16	8	1
<i>Cardamine_flexuosa</i>	spor	30	15	1
<i>Cardamine_flexuosa</i>	spor	32	16	90
<i>Cardamine_glanduligera</i>	spor	42	21	5
<i>Cardamine_glanduligera</i>	spor	48	24	17
<i>Cardamine_glauca</i>	spor	16	8	13
<i>Cardamine_graeca</i>	gam	8	8	3
<i>Cardamine_graeca</i>	spor	16	8	12
<i>Cardamine_graeca</i>	spor	18	9	17
<i>Cardamine_hirsuta</i>	gam	7	7	4
<i>Cardamine_hirsuta</i>	gam	8	8	21
<i>Cardamine_hirsuta</i>	gam	16	16	6
<i>Cardamine_hirsuta</i>	spor	16	8	145
<i>Cardamine_hirsuta</i>	spor	32	16	12
<i>Cardamine_hirsuta</i>	spor	64	32	5
<i>Cardamine_hirsuta</i>	spor	80	40	1
<i>Cardamine_hirsuta</i>	spor	90	45	1
<i>Cardamine_impatiens</i>	gam	8	8	8
<i>Cardamine_impatiens</i>	gam	16	16	2
<i>Cardamine_impatiens</i>	spor	16	8	80
<i>Cardamine_impatiens</i>	spor	32	16	10
<i>Cardamine_leucantha</i>	gam	8	8	1
<i>Cardamine_leucantha</i>	spor	16	8	14
<i>Cardamine_leucantha</i>	spor	18	9	3
<i>Cardamine_leucantha</i>	spor	24	12	3
<i>Cardamine_macrophylla</i>	gam	8	8	1
<i>Cardamine_macrophylla</i>	gam	16	16	3
<i>Cardamine_macrophylla</i>	spor	16	8	2
<i>Cardamine_macrophylla</i>	spor	50	25	1
<i>Cardamine_macrophylla</i>	spor	64	32	5
<i>Cardamine_macrophylla</i>	spor	80	40	1
<i>Cardamine_macrophylla</i>	spor	96	48	10
<i>Cardamine_microphylla</i>	spor	16	8	1
<i>Cardamine_microphylla</i>	spor	28	14	7
<i>Cardamine_microphylla</i>	spor	42	21	6

<i>Cardamine_microphylla</i>	spor	52	26	1
<i>Cardamine_microphylla</i>	spor	64	32	5
<i>Cardamine_microphylla</i>	spor	100	50	3
<i>Cardamine_monteluccii</i>	spor	16	8	2
<i>Cardamine_niigatensis</i>	spor	32	16	1
<i>Cardamine_occidentalis</i>	gam	32	32	5
<i>Cardamine_occidentalis</i>	spor	32	16	1
<i>Cardamine_occidentalis</i>	spor	64	32	7
<i>Cardamine_oligosperma</i>	spor	16	8	12
<i>Cardamine_parviflora</i>	gam	8	8	6
<i>Cardamine_parviflora</i>	gam	22	22	1
<i>Cardamine_parviflora</i>	gam	24	24	1
<i>Cardamine_parviflora</i>	spor	16	8	28
<i>Cardamine_parviflora</i>	spor	24	12	1
<i>Cardamine_parviflora</i>	spor	32	16	1
<i>Cardamine_pedata</i>	spor	30	15	5
<i>Cardamine_pensylvanica</i>	gam	16	16	5
<i>Cardamine_pensylvanica</i>	gam	32	32	1
<i>Cardamine_pensylvanica</i>	spor	32	16	20
<i>Cardamine_pensylvanica</i>	spor	64	32	5
<i>Cardamine_pentaphyllos</i>	gam	22	22	3
<i>Cardamine_pentaphyllos</i>	gam	24	24	4
<i>Cardamine_pentaphyllos</i>	spor	48	24	8
<i>Cardamine_plumieri</i>	spor	16	8	2
<i>Cardamine_pratensis</i>	gam	8	8	2
<i>Cardamine_pratensis</i>	gam	14	14	2
<i>Cardamine_pratensis</i>	gam	15	15	2
<i>Cardamine_pratensis</i>	gam	16	16	8
<i>Cardamine_pratensis</i>	gam	21	21	2
<i>Cardamine_pratensis</i>	gam	28	28	12
<i>Cardamine_pratensis</i>	gam	29	29	1
<i>Cardamine_pratensis</i>	gam	30	30	8
<i>Cardamine_pratensis</i>	gam	32	32	4
<i>Cardamine_pratensis</i>	gam	38	38	1
<i>Cardamine_pratensis</i>	spor	16	8	334
<i>Cardamine_pratensis</i>	spor	17	8	12
<i>Cardamine_pratensis</i>	spor	18	9	21
<i>Cardamine_pratensis</i>	spor	19	10	10
<i>Cardamine_pratensis</i>	spor	20	10	15
<i>Cardamine_pratensis</i>	spor	21	10	4
<i>Cardamine_pratensis</i>	spor	23	12	1
<i>Cardamine_pratensis</i>	spor	24	12	21
<i>Cardamine_pratensis</i>	spor	28	14	29
<i>Cardamine_pratensis</i>	spor	30	15	356
<i>Cardamine_pratensis</i>	spor	31	16	2
<i>Cardamine_pratensis</i>	spor	32	16	163
<i>Cardamine_pratensis</i>	spor	33	16	2
<i>Cardamine_pratensis</i>	spor	34	17	15
<i>Cardamine_pratensis</i>	spor	36	18	4

<i>Cardamine pratensis</i>	spor	37	18	2
<i>Cardamine pratensis</i>	spor	38	19	56
<i>Cardamine pratensis</i>	spor	39	20	3
<i>Cardamine pratensis</i>	spor	40	20	18
<i>Cardamine pratensis</i>	spor	42	21	4
<i>Cardamine pratensis</i>	spor	43	22	1
<i>Cardamine pratensis</i>	spor	44	22	118
<i>Cardamine pratensis</i>	spor	45	22	6
<i>Cardamine pratensis</i>	spor	46	23	12
<i>Cardamine pratensis</i>	spor	48	24	73
<i>Cardamine pratensis</i>	spor	50	25	7
<i>Cardamine pratensis</i>	spor	52	26	7
<i>Cardamine pratensis</i>	spor	53	26	1
<i>Cardamine pratensis</i>	spor	54	27	10
<i>Cardamine pratensis</i>	spor	56	28	85
<i>Cardamine pratensis</i>	spor	58	29	18
<i>Cardamine pratensis</i>	spor	59	30	2
<i>Cardamine pratensis</i>	spor	60	30	28
<i>Cardamine pratensis</i>	spor	62	31	7
<i>Cardamine pratensis</i>	spor	64	32	55
<i>Cardamine pratensis</i>	spor	66	33	3
<i>Cardamine pratensis</i>	spor	67	34	1
<i>Cardamine pratensis</i>	spor	68	34	19
<i>Cardamine pratensis</i>	spor	69	34	1
<i>Cardamine pratensis</i>	spor	70	35	9
<i>Cardamine pratensis</i>	spor	71	36	1
<i>Cardamine pratensis</i>	spor	72	36	31
<i>Cardamine pratensis</i>	spor	73	36	1
<i>Cardamine pratensis</i>	spor	74	37	8
<i>Cardamine pratensis</i>	spor	76	38	33
<i>Cardamine pratensis</i>	spor	78	39	11
<i>Cardamine pratensis</i>	spor	80	40	20
<i>Cardamine pratensis</i>	spor	84	42	4
<i>Cardamine pratensis</i>	spor	88	44	4
<i>Cardamine pratensis</i>	spor	90	45	9
<i>Cardamine pratensis</i>	spor	96	48	6
<i>Cardamine pratensis</i>	spor	100	50	4
<i>Cardamine pratensis</i>	spor	118	59	2
<i>Cardamine purpurea</i>	spor	80	40	3
<i>Cardamine purpurea</i>	spor	96	48	8
<i>Cardamine raphanifolia</i>	spor	44	22	4
<i>Cardamine raphanifolia</i>	spor	46	23	9
<i>Cardamine raphanifolia</i>	spor	48	24	29
<i>Cardamine raphanifolia</i>	spor	64	32	8
<i>Cardamine resedifolia</i>	gam	8	8	2
<i>Cardamine resedifolia</i>	spor	16	8	25
<i>Cardamine scutata</i>	gam	16	16	4
<i>Cardamine scutata</i>	spor	32	16	12
<i>Cardamine scutata</i>	spor	72	36	1

<i>Cardamine_tangutorum</i>	spor	42	21	3
<i>Cardamine_trifolia</i>	gam	8	8	2
<i>Cardamine_trifolia</i>	spor	16	8	36
<i>Cardamine_victoris</i>	spor	28	14	10
<i>Cardamine_yezoensis</i>	spor	16	8	5
<i>Cardamine_yezoensis</i>	spor	32	16	7
<i>Cardamine_yezoensis</i>	spor	46	23	2
<i>Cardamine_yezoensis</i>	spor	48	24	3
<i>Cardamine_yezoensis</i>	spor	56	28	3
<i>Cardamine_yezoensis</i>	spor	64	32	2
<i>Cardamine_yezoensis</i>	spor	72	36	3
<i>Cardamine_yezoensis</i>	spor	80	40	1
<i>Cardamine_yezoensis</i>	spor	88	44	1
<i>Cardamine_yezoensis</i>	spor	96	48	1
<i>Carrichtera_annua</i>	gam	8	8	22
<i>Carrichtera_annua</i>	spor	16	8	50
<i>Carrichtera_annua</i>	spor	32	16	3
<i>Catolobus_pendulus</i>	spor	16	8	5
<i>Catolobus_pendulus</i>	spor	21	10	5
<i>Caulanthus_coulteri</i>	gam	14	14	6
<i>Caulanthus_coulteri</i>	spor	28	14	2
<i>Caulanthus_crassicaulis</i>	gam	12	12	2
<i>Caulanthus_crassicaulis</i>	gam	14	14	1
<i>Caulanthus_crassicaulis</i>	spor	24	12	3
<i>Caulanthus_crassicaulis</i>	spor	28	14	2
<i>Caulanthus_glaucus</i>	gam	10	10	2
<i>Caulanthus_glaucus</i>	spor	20	10	1
<i>Caulanthus_heterophyllus</i>	gam	14	14	3
<i>Caulanthus_heterophyllus</i>	spor	28	14	1
<i>Caulanthus_inflatus</i>	gam	10	10	3
<i>Caulanthus_inflatus</i>	gam	14	14	5
<i>Caulanthus_inflatus</i>	spor	28	14	3
<i>Caulanthus_major</i>	spor	28	14	2
<i>Caulanthus_simulans</i>	spor	28	14	1
<i>Caulanthus_simulans</i>	spor	38	19	1
<i>Chalcanthus_renifolius</i>	gam	7	7	1
<i>Chalcanthus_renifolius</i>	spor	14	7	1
<i>Chorisporea_macropoda</i>	gam	7	7	2
<i>Chorisporea_persica</i>	gam	7	7	1
<i>Chorisporea_tenella</i>	gam	7	7	8
<i>Chorisporea_tenella</i>	gam	12	12	2
<i>Chorisporea_tenella</i>	gam	14	14	2
<i>Chorisporea_tenella</i>	spor	14	7	20
<i>Christolea_crassifolia</i>	spor	14	7	12
<i>Chrysochamela_velutina</i>	spor	16	8	1
<i>Chrysochamela_velutina</i>	spor	22	11	1
<i>Cithareloma_lehmannii</i>	gam	13	13	2
<i>Cithareloma_lehmannii</i>	spor	26	13	2
<i>Clastopus_vestitus</i>	spor	16	8	2

<i>Clausia_aprica</i>	spor	14	7	3
<i>Clausia_aprica</i>	spor	28	14	4
<i>Clypeola_aspera</i>	gam	7	7	2
<i>Clypeola_aspera</i>	gam	13	13	2
<i>Clypeola_aspera</i>	gam	14	14	2
<i>Clypeola_aspera</i>	spor	14	7	2
<i>Clypeola_aspera</i>	spor	26	13	2
<i>Clypeola_dichotoma</i>	gam	7	7	5
<i>Clypeola_jonthlaspi</i>	gam	8	8	2
<i>Clypeola_jonthlaspi</i>	gam	14	14	3
<i>Clypeola_jonthlaspi</i>	gam	16	16	4
<i>Clypeola_jonthlaspi</i>	spor	16	8	10
<i>Clypeola_jonthlaspi</i>	spor	32	16	12
<i>Clypeola_lappacea</i>	gam	7	7	6
<i>Cochlearia_aestuaria</i>	gam	6	6	2
<i>Cochlearia_aestuaria</i>	spor	12	6	11
<i>Cochlearia_anglica</i>	gam	6	6	1
<i>Cochlearia_anglica</i>	gam	18	18	1
<i>Cochlearia_anglica</i>	gam	24	24	4
<i>Cochlearia_anglica</i>	gam	25	25	1
<i>Cochlearia_anglica</i>	spor	36	18	4
<i>Cochlearia_anglica</i>	spor	37	18	4
<i>Cochlearia_anglica</i>	spor	42	21	1
<i>Cochlearia_anglica</i>	spor	48	24	23
<i>Cochlearia_anglica</i>	spor	49	24	2
<i>Cochlearia_anglica</i>	spor	50	25	5
<i>Cochlearia_anglica</i>	spor	54	27	2
<i>Cochlearia_anglica</i>	spor	60	30	2
<i>Cochlearia_aragonensis</i>	spor	48	24	6
<i>Cochlearia_danica</i>	gam	21	21	4
<i>Cochlearia_danica</i>	spor	33	16	1
<i>Cochlearia_danica</i>	spor	42	21	43
<i>Cochlearia_glastifolia</i>	spor	38	19	6
<i>Cochlearia_officinalis</i>	gam	6	6	3
<i>Cochlearia_officinalis</i>	gam	7	7	3
<i>Cochlearia_officinalis</i>	gam	12	12	14
<i>Cochlearia_officinalis</i>	gam	14	14	2
<i>Cochlearia_officinalis</i>	gam	18	18	1
<i>Cochlearia_officinalis</i>	spor	12	6	2
<i>Cochlearia_officinalis</i>	spor	14	7	8
<i>Cochlearia_officinalis</i>	spor	18	9	1
<i>Cochlearia_officinalis</i>	spor	24	12	72
<i>Cochlearia_officinalis</i>	spor	26	13	1
<i>Cochlearia_officinalis</i>	spor	28	14	7
<i>Cochlearia_officinalis</i>	spor	32	16	1
<i>Cochlearia_officinalis</i>	spor	34	17	1
<i>Cochlearia_officinalis</i>	spor	36	18	3
<i>Cochlearia_pyrenaica</i>	gam	6	6	9
<i>Cochlearia_pyrenaica</i>	spor	8	4	2

<i>Cochlearia pyrenaica</i>	spor	11	6	2
<i>Cochlearia pyrenaica</i>	spor	12	6	91
<i>Cochlearia pyrenaica</i>	spor	14	7	1
<i>Cochlearia pyrenaica</i>	spor	24	12	5
<i>Cochlearia pyrenaica</i>	spor	26	13	2
<i>Cochlearia pyrenaica</i>	spor	28	14	2
<i>Cochlearia pyrenaica</i>	spor	48	24	5
<i>Cochlearia tatrae</i>	spor	42	21	13
<i>Coincya monensis</i>	gam	8	8	1
<i>Coincya monensis</i>	gam	9	9	1
<i>Coincya monensis</i>	gam	10	10	1
<i>Coincya monensis</i>	gam	12	12	7
<i>Coincya monensis</i>	gam	24	24	1
<i>Coincya monensis</i>	spor	20	10	1
<i>Coincya monensis</i>	spor	24	12	10
<i>Coincya monensis</i>	spor	48	24	2
<i>Conringia orientalis</i>	gam	7	7	6
<i>Conringia orientalis</i>	spor	14	7	17
<i>Conringia orientalis</i>	spor	28	14	1
<i>Conringia planisiliqua</i>	gam	7	7	2
<i>Conringia planisiliqua</i>	gam	9	9	3
<i>Conringia planisiliqua</i>	spor	14	7	3
<i>Conringia planisiliqua</i>	spor	16	8	1
<i>Conringia planisiliqua</i>	spor	18	9	1
<i>Cordylocarpus muricatus</i>	spor	16	8	4
<i>Crambe orientalis</i>	gam	15	15	9
<i>Crambe orientalis</i>	spor	30	15	2
<i>Crucihimalaya himalaica</i>	gam	8	8	3
<i>Crucihimalaya himalaica</i>	spor	16	8	8
<i>Crucihimalaya mollissima</i>	gam	8	8	6
<i>Crucihimalaya mollissima</i>	spor	16	8	2
<i>Crucihimalaya mollissima</i>	spor	32	16	1
<i>Crucihimalaya stricta</i>	gam	7	7	1
<i>Crucihimalaya stricta</i>	spor	14	7	2
<i>Crucihimalaya wallichii</i>	gam	8	8	2
<i>Crucihimalaya wallichii</i>	gam	9	9	3
<i>Crucihimalaya wallichii</i>	spor	14	7	3
<i>Crucihimalaya wallichii</i>	spor	16	8	12
<i>Crucihimalaya wallichii</i>	spor	18	9	2
<i>Cryptospora falcata</i>	spor	14	7	2
<i>Degenia velebitica</i>	spor	16	8	4
<i>Dendroarabis fruticulosa</i>	spor	16	8	1
<i>Descurainia artemisioides</i>	spor	14	7	2
<i>Descurainia bourgeauana</i>	spor	14	7	2
<i>Descurainia californica</i>	gam	7	7	2
<i>Descurainia californica</i>	spor	14	7	3
<i>Descurainia gilva</i>	spor	14	7	2
<i>Descurainia gonzalezii</i>	gam	7	7	1
<i>Descurainia gonzalezii</i>	gam	14	14	1

<i>Descurainia_gonzalezii</i>	spor	14	7	4
<i>Descurainia_gonzalezii</i>	spor	21	10	2
<i>Descurainia_impatiens</i>	gam	7	7	2
<i>Descurainia_incana</i>	gam	7	7	1
<i>Descurainia_incana</i>	spor	14	7	6
<i>Descurainia_incana</i>	spor	28	14	3
<i>Descurainia_incana</i>	spor	42	21	1
<i>Descurainia_incisa_subsp_incisa</i>	spor	14	7	1
<i>Descurainia_lemsii</i>	gam	7	7	1
<i>Descurainia_lemsii</i>	spor	14	7	2
<i>Descurainia_leptoclada</i>	spor	14	7	1
<i>Descurainia_millefolia</i>	spor	14	7	4
<i>Descurainia_myriophylla</i>	gam	7	7	1
<i>Descurainia_myriophylla</i>	spor	14	7	4
<i>Descurainia_myriophylla</i>	spor	28	14	1
<i>Descurainia_pinnata</i>	gam	7	7	3
<i>Descurainia_pinnata</i>	gam	14	14	1
<i>Descurainia_pinnata</i>	gam	21	21	1
<i>Descurainia_pinnata</i>	spor	14	7	2
<i>Descurainia_pinnata</i>	spor	28	14	4
<i>Descurainia_pinnata</i>	spor	42	21	1
<i>Descurainia_pinnata_subsp_brachycarpa</i>	gam	7	7	3
<i>Descurainia_pinnata_subsp_brachycarpa</i>	spor	14	7	1
<i>Descurainia_pinnata_subsp_brachycarpa</i>	spor	28	14	3
<i>Descurainia_pinnata_subsp_glabra</i>	spor	28	14	1
<i>Descurainia_pinnata_subsp_halictorum</i>	gam	7	7	4
<i>Descurainia_pinnata_subsp_halictorum</i>	spor	14	7	2
<i>Descurainia_pinnata_subsp_halictorum</i>	spor	28	14	1
<i>Descurainia_pinnata_subsp_halictorum</i>	spor	42	21	1
<i>Descurainia_pinnata_subsp_intermedia</i>	spor	28	14	1
<i>Descurainia_pinnata_subsp_menziesii</i>	spor	28	14	2
<i>Descurainia_pinnata_subsp_ochroleuca</i>	gam	14	14	3
<i>Descurainia_preauxiana</i>	spor	14	7	4
<i>Descurainia_sophia</i>	gam	7	7	1
<i>Descurainia_sophia</i>	gam	10	10	6
<i>Descurainia_sophia</i>	gam	14	14	23
<i>Descurainia_sophia</i>	spor	12	6	1
<i>Descurainia_sophia</i>	spor	14	7	13
<i>Descurainia_sophia</i>	spor	20	10	6
<i>Descurainia_sophia</i>	spor	28	14	67
<i>Descurainia_sophia</i>	spor	56	28	5
<i>Descurainia_sophioides</i>	spor	14	7	16
<i>Descurainia_sophioides</i>	spor	36	18	2
<i>Descurainia_streptocarpa</i>	gam	14	14	1
<i>Descurainia_virletii</i>	gam	14	14	1
<i>Didymophysa_aucheri</i>	spor	14	7	2
<i>Didymophysa_aucheri</i>	spor	16	8	2
<i>Dimorphocarpa_wislizeni</i>	gam	9	9	13
<i>Dimorphocarpa_wislizeni</i>	spor	18	9	6

<i>Diplotaxis_acris</i>	gam	11	11	4
<i>Diplotaxis_acris</i>	spor	22	11	2
<i>Diplotaxis_catholica</i>	gam	9	9	17
<i>Diplotaxis_catholica</i>	gam	10	10	3
<i>Diplotaxis_catholica</i>	spor	10	5	2
<i>Diplotaxis_catholica</i>	spor	18	9	19
<i>Diplotaxis_catholica</i>	spor	20	10	2
<i>Diplotaxis_erucoides</i>	gam	7	7	25
<i>Diplotaxis_erucoides</i>	gam	9	9	2
<i>Diplotaxis_erucoides</i>	spor	14	7	27
<i>Diplotaxis_erucoides</i>	spor	18	9	2
<i>Diplotaxis_harra</i>	gam	11	11	1
<i>Diplotaxis_harra</i>	gam	13	13	10
<i>Diplotaxis_harra</i>	spor	26	13	8
<i>Diplotaxis_harra</i>	spor	38	19	3
<i>Diplotaxis_tenuifolia</i>	gam	10	10	3
<i>Diplotaxis_tenuifolia</i>	gam	11	11	10
<i>Diplotaxis_tenuifolia</i>	spor	14	7	4
<i>Diplotaxis_tenuifolia</i>	spor	20	10	6
<i>Diplotaxis_tenuifolia</i>	spor	22	11	44
<i>Diplotaxis_tenuifolia</i>	spor	42	21	3
<i>Diptychocarpus_strictus</i>	gam	7	7	7
<i>Diptychocarpus_strictus</i>	spor	14	7	5
<i>Dithyrea_californica</i>	gam	10	10	7
<i>Dithyrea_californica</i>	spor	20	10	2
<i>Dontostemon_crassifolius</i>	gam	7	7	2
<i>Dontostemon_crassifolius</i>	spor	14	7	3
<i>Dontostemon_dentatus</i>	spor	14	7	1
<i>Dontostemon_hispidus</i>	spor	14	7	2
<i>Dontostemon_integrifolius</i>	spor	14	7	4
<i>Dontostemon_intermedius</i>	spor	14	7	1
<i>Dontostemon_pinnatifidus</i>	spor	14	7	1
<i>Dontostemon_senilis</i>	spor	28	14	3
<i>Draba_aizoides</i>	gam	8	8	5
<i>Draba_aizoides</i>	spor	16	8	35
<i>Draba_albertina</i>	gam	12	12	8
<i>Draba_albertina</i>	spor	24	12	4
<i>Draba_alpina</i>	gam	32	32	4
<i>Draba_alpina</i>	gam	37	37	1
<i>Draba_alpina</i>	gam	40	40	5
<i>Draba_alpina</i>	spor	62	31	1
<i>Draba_alpina</i>	spor	64	32	19
<i>Draba_alpina</i>	spor	66	33	2
<i>Draba_alpina</i>	spor	80	40	16
<i>Draba_alpina</i>	spor	112	56	3
<i>Draba_alpina</i>	spor	120	60	2
<i>Draba_altaica</i>	spor	16	8	1
<i>Draba_altaica</i>	spor	18	9	1
<i>Draba_arabisans</i>	gam	48	48	3

<i>Draba_arabisans</i>	spor	94	47	2
<i>Draba_arabisans</i>	spor	96	48	3
<i>Draba_asprella</i>	gam	15	15	2
<i>Draba_asprella</i>	gam	16	16	4
<i>Draba_asprella</i>	spor	30	15	4
<i>Draba_aurea</i>	gam	32	32	2
<i>Draba_aurea</i>	gam	36	36	2
<i>Draba_aurea</i>	gam	37	37	5
<i>Draba_aurea</i>	gam	38	38	2
<i>Draba_aurea</i>	gam	41	41	2
<i>Draba_aurea</i>	spor	40	20	2
<i>Draba_aurea</i>	spor	64	32	3
<i>Draba_aurea</i>	spor	72	36	2
<i>Draba_aurea</i>	spor	74	37	2
<i>Draba_aurea</i>	spor	76	38	2
<i>Draba_aureola</i>	spor	20	10	2
<i>Draba_bellardii</i>	spor	48	24	1
<i>Draba_borealis</i>	gam	40	40	3
<i>Draba_borealis</i>	spor	16	8	2
<i>Draba_borealis</i>	spor	64	32	3
<i>Draba_borealis</i>	spor	80	40	3
<i>Draba_borealis</i>	spor	82	41	1
<i>Draba_brachystylis</i>	spor	44	22	1
<i>Draba_breweri</i>	spor	32	16	1
<i>Draba_bruniifolia</i>	spor	32	16	2
<i>Draba_burkei</i>	gam	10	10	2
<i>Draba_burkei</i>	spor	20	10	1
<i>Draba_cana</i>	gam	16	16	3
<i>Draba_cana</i>	spor	32	16	6
<i>Draba_chionophila</i>	spor	48	24	1
<i>Draba_cinerea</i>	gam	24	24	8
<i>Draba_cinerea</i>	gam	32	32	3
<i>Draba_cinerea</i>	gam	48	48	2
<i>Draba_cinerea</i>	spor	16	8	1
<i>Draba_cinerea</i>	spor	24	12	1
<i>Draba_cinerea</i>	spor	32	16	9
<i>Draba_cinerea</i>	spor	48	24	33
<i>Draba_cinerea</i>	spor	56	28	2
<i>Draba_cinerea</i>	spor	64	32	4
<i>Draba_cinerea</i>	spor	80	40	1
<i>Draba_corymbosa</i>	gam	64	64	2
<i>Draba_corymbosa</i>	gam	72	72	1
<i>Draba_corymbosa</i>	spor	10	5	1
<i>Draba_corymbosa</i>	spor	32	16	2
<i>Draba_corymbosa</i>	spor	80	40	3
<i>Draba_corymbosa</i>	spor	90	45	2
<i>Draba_corymbosa</i>	spor	100	50	5
<i>Draba_corymbosa</i>	spor	120	60	5
<i>Draba_corymbosa</i>	spor	128	64	7

<i>Draba_corymbosa</i>	spor	135	68	2
<i>Draba_corymbosa</i>	spor	144	72	1
<i>Draba_crassa</i>	gam	24	24	1
<i>Draba_crassa</i>	spor	24	12	1
<i>Draba_crassifolia</i>	gam	20	20	15
<i>Draba_crassifolia</i>	gam	40	40	1
<i>Draba_crassifolia</i>	spor	40	20	8
<i>Draba_crassifolia</i>	spor	64	32	1
<i>Draba_cretica</i>	spor	16	8	1
<i>Draba_cusickii</i>	gam	13	13	2
<i>Draba_cusickii</i>	spor	26	13	1
<i>Draba_dedeana</i>	gam	16	16	2
<i>Draba_dedeana</i>	spor	32	16	6
<i>Draba_densifolia</i>	spor	36	18	1
<i>Draba_dubia</i>	gam	8	8	4
<i>Draba_dubia</i>	spor	16	8	21
<i>Draba_eriopoda</i>	spor	16	8	5
<i>Draba_exunguiculata</i>	gam	5	5	1
<i>Draba_exunguiculata</i>	gam	56	56	1
<i>Draba_exunguiculata</i>	spor	56	28	1
<i>Draba_fladnizensis</i>	gam	8	8	14
<i>Draba_fladnizensis</i>	spor	16	8	46
<i>Draba_fladnizensis</i>	spor	32	16	9
<i>Draba_gilliesii</i>	gam	24	24	2
<i>Draba_gilliesii</i>	spor	48	24	1
<i>Draba_glabella</i>	gam	32	32	6
<i>Draba_glabella</i>	gam	40	40	4
<i>Draba_glabella</i>	gam	41	41	1
<i>Draba_glabella</i>	spor	40	20	1
<i>Draba_glabella</i>	spor	64	32	7
<i>Draba_glabella</i>	spor	75	38	2
<i>Draba_glabella</i>	spor	80	40	3
<i>Draba_glacialis</i>	spor	16	8	2
<i>Draba_hederifolia</i>	gam	15	15	1
<i>Draba_hederifolia</i>	spor	30	15	2
<i>Draba_helleriana</i>	gam	9	9	2
<i>Draba_helleriana</i>	spor	18	9	1
<i>Draba_hirta</i>	gam	40	40	1
<i>Draba_hirta</i>	spor	64	32	7
<i>Draba_hirta</i>	spor	80	40	2
<i>Draba_hispanica</i>	gam	8	8	6
<i>Draba_hispanica</i>	spor	16	8	15
<i>Draba_hispida</i>	spor	48	24	1
<i>Draba_hitchcockii</i>	gam	27	27	2
<i>Draba_hitchcockii</i>	spor	54	27	1
<i>Draba_hyperborea</i>	gam	18	18	2
<i>Draba_hyperborea</i>	gam	19	19	4
<i>Draba_hyperborea</i>	spor	14	7	1
<i>Draba_hyperborea</i>	spor	16	8	2

<i>Draba_hyperborea</i>	spor	32	16	2
<i>Draba_hyperborea</i>	spor	36	18	3
<i>Draba_incana</i>	gam	16	16	11
<i>Draba_incana</i>	spor	16	8	1
<i>Draba_incana</i>	spor	32	16	21
<i>Draba_incerta</i>	gam	56	56	3
<i>Draba_incerta</i>	spor	100	50	1
<i>Draba_incerta</i>	spor	112	56	6
<i>Draba_jaegeri</i>	gam	27	27	2
<i>Draba_jaegeri</i>	spor	54	27	3
<i>Draba_jorullensis</i>	gam	12	12	2
<i>Draba_juvenilis</i>	gam	32	32	5
<i>Draba_juvenilis</i>	spor	48	24	4
<i>Draba_juvenilis</i>	spor	64	32	5
<i>Draba_kassii</i>	gam	11	11	2
<i>Draba_kassii</i>	spor	22	11	1
<i>Draba_kotschyi</i>	spor	32	16	1
<i>Draba_kotschyi</i>	spor	48	24	1
<i>Draba_lacaitae</i>	spor	16	8	3
<i>Draba_lacaitae</i>	spor	32	16	1
<i>Draba_lactea</i>	gam	24	24	10
<i>Draba_lactea</i>	spor	16	8	1
<i>Draba_lactea</i>	spor	32	16	11
<i>Draba_lactea</i>	spor	48	24	31
<i>Draba_ladina</i>	spor	32	16	3
<i>Draba_lasiocarpa</i>	gam	8	8	1
<i>Draba_lasiocarpa</i>	spor	16	8	27
<i>Draba_lemmonii</i>	spor	50	25	1
<i>Draba_lonchocarpa</i>	gam	8	8	6
<i>Draba_lonchocarpa</i>	spor	16	8	14
<i>Draba_lonchocarpa</i>	spor	24	12	1
<i>Draba_lonchocarpa</i>	spor	32	16	1
<i>Draba_lutescens</i>	gam	8	8	2
<i>Draba_lutescens</i>	spor	16	8	7
<i>Draba_magellanica</i>	gam	32	32	1
<i>Draba_magellanica</i>	spor	48	24	1
<i>Draba_magellanica</i>	spor	64	32	1
<i>Draba_magellanica</i>	spor	80	40	1
<i>Draba_maguirei</i>	gam	16	16	2
<i>Draba_maguirei</i>	spor	16	8	1
<i>Draba_maguirei</i>	spor	32	16	1
<i>Draba_melanopus</i>	gam	16	16	2
<i>Draba_micropetala</i>	gam	16	16	2
<i>Draba_micropetala</i>	spor	32	16	3
<i>Draba_micropetala</i>	spor	48	24	2
<i>Draba_mogollonica</i>	gam	16	16	2
<i>Draba_mogollonica</i>	spor	22	11	1
<i>Draba_murrayi</i>	spor	28	14	1
<i>Draba_murrayi</i>	spor	48	24	3

<i>Draba_nemorosa</i>	gam	8	8	13
<i>Draba_nemorosa</i>	spor	16	8	25
<i>Draba_nivalis</i>	gam	8	8	10
<i>Draba_nivalis</i>	spor	16	8	36
<i>Draba_norvegica</i>	gam	24	24	18
<i>Draba_norvegica</i>	spor	48	24	26
<i>Draba_nuda</i>	gam	8	8	2
<i>Draba_oblongata</i>	gam	24	24	2
<i>Draba_oblongata</i>	gam	32	32	6
<i>Draba_oblongata</i>	gam	40	40	4
<i>Draba_oblongata</i>	spor	16	8	2
<i>Draba_oblongata</i>	spor	32	16	1
<i>Draba_oblongata</i>	spor	48	24	6
<i>Draba_oblongata</i>	spor	64	32	13
<i>Draba_oblongata</i>	spor	80	40	11
<i>Draba_ochroleuca</i>	spor	80	40	2
<i>Draba_ogilviensis</i>	spor	16	8	1
<i>Draba_olgae</i>	spor	12	6	3
<i>Draba_oligosperma</i>	gam	11	11	2
<i>Draba_oligosperma</i>	gam	32	32	2
<i>Draba_oligosperma</i>	spor	32	16	3
<i>Draba_oligosperma</i>	spor	60	30	2
<i>Draba_oligosperma</i>	spor	64	32	3
<i>Draba_oreades</i>	spor	40	20	2
<i>Draba_oreadum</i>	gam	16	16	5
<i>Draba_oreadum</i>	spor	32	16	2
<i>Draba_oxycarpa</i>	gam	32	32	4
<i>Draba_oxycarpa</i>	spor	64	32	5
<i>Draba_palanderiana</i>	spor	16	8	6
<i>Draba_palanderiana</i>	spor	32	16	7
<i>Draba_palanderiana</i>	spor	48	24	1
<i>Draba_palanderiana</i>	spor	64	32	1
<i>Draba_parnassica</i>	spor	16	8	3
<i>Draba_pauciflora</i>	gam	16	16	1
<i>Draba_pauciflora</i>	gam	24	24	2
<i>Draba_pauciflora</i>	spor	32	16	7
<i>Draba_pauciflora</i>	spor	48	24	4
<i>Draba_paysonii</i>	spor	42	21	3
<i>Draba_pectinipila</i>	spor	22	11	1
<i>Draba_pickeringii</i>	gam	12	12	1
<i>Draba_pickeringii</i>	spor	24	12	2
<i>Draba_pilosa</i>	spor	32	16	1
<i>Draba_porsildii</i>	gam	16	16	3
<i>Draba_porsildii</i>	spor	32	16	4
<i>Draba_praealta</i>	gam	28	28	2
<i>Draba_praealta</i>	spor	56	28	1
<i>Draba_ramosissima</i>	gam	8	8	2
<i>Draba_ramosissima</i>	spor	16	8	1
<i>Draba_rectifructa</i>	gam	12	12	2

<i>Draba_rectifructa</i>	spor	24	12	1
<i>Draba_reptans</i>	gam	15	15	3
<i>Draba_reptans</i>	gam	16	16	1
<i>Draba_reptans</i>	spor	16	8	1
<i>Draba_reptans</i>	spor	30	15	3
<i>Draba_reptans</i>	spor	32	16	3
<i>Draba_rosularis</i>	spor	16	8	2
<i>Draba_ruaxes</i>	spor	72	36	3
<i>Draba_sachalinensis</i>	spor	64	32	2
<i>Draba_sibirica</i>	spor	16	8	7
<i>Draba_sobolifera</i>	gam	13	13	2
<i>Draba_sobolifera</i>	spor	26	13	1
<i>Draba_spectabilis</i>	gam	10	10	5
<i>Draba_spectabilis</i>	gam	16	16	8
<i>Draba_spectabilis</i>	spor	40	20	1
<i>Draba_sphaerocarpa</i>	gam	10	10	2
<i>Draba_sphaerocarpa</i>	spor	20	10	1
<i>Draba_sphaeroides</i>	gam	10	10	2
<i>Draba_sphaeroides</i>	spor	20	10	1
<i>Draba_stenoloba</i>	gam	12	12	2
<i>Draba_stenoloba</i>	gam	20	20	4
<i>Draba_stenoloba</i>	spor	40	20	2
<i>Draba_stenopetala</i>	gam	12	12	1
<i>Draba_stenopetala</i>	spor	24	12	1
<i>Draba_stenopetala</i>	spor	64	32	5
<i>Draba_streptobrachia</i>	gam	5	5	3
<i>Draba_streptobrachia</i>	gam	32	32	3
<i>Draba_streptobrachia</i>	spor	64	32	1
<i>Draba_streptocarpa</i>	gam	20	20	1
<i>Draba_streptocarpa</i>	spor	20	10	1
<i>Draba_streptocarpa</i>	spor	40	20	1
<i>Draba_stylaris</i>	spor	32	16	8
<i>Draba_subalpina</i>	gam	13	13	2
<i>Draba_subalpina</i>	spor	26	13	1
<i>Draba_subamplexicaulis</i>	spor	48	24	2
<i>Draba_subcapitata</i>	gam	8	8	5
<i>Draba_subcapitata</i>	spor	16	8	16
<i>Draba_supranivalis</i>	spor	14	7	1
<i>Draba_supranivalis</i>	spor	16	8	1
<i>Draba_tomentosa</i>	gam	8	8	1
<i>Draba_tomentosa</i>	spor	16	8	21
<i>Draba_ussuriensis</i>	spor	16	8	3
<i>Draba_ussuriensis</i>	spor	32	16	3
<i>Draba_ventosa</i>	spor	36	18	3
<i>Dryopetalon_viereckii</i>	spor	28	14	3
<i>Elburzia_fenestrata</i>	gam	7	7	2
<i>Eremobium_aegyptiacum</i>	gam	10	10	1
<i>Eremobium_aegyptiacum</i>	gam	13	13	3
<i>Eremobium_aegyptiacum</i>	spor	16	8	2

<i>Eremobium_aegyptiacum</i>	spor	20	10	2
<i>Erophila_verna</i>	gam	7	7	8
<i>Erophila_verna</i>	gam	8	8	2
<i>Erophila_verna</i>	gam	10	10	3
<i>Erophila_verna</i>	gam	12	12	2
<i>Erophila_verna</i>	gam	14	14	2
<i>Erophila_verna</i>	gam	15	15	7
<i>Erophila_verna</i>	gam	16	16	2
<i>Erophila_verna</i>	gam	17	17	1
<i>Erophila_verna</i>	gam	18	18	3
<i>Erophila_verna</i>	gam	19	19	2
<i>Erophila_verna</i>	gam	20	20	8
<i>Erophila_verna</i>	gam	26	26	3
<i>Erophila_verna</i>	gam	27	27	1
<i>Erophila_verna</i>	gam	29	29	2
<i>Erophila_verna</i>	gam	32	32	4
<i>Erophila_verna</i>	gam	34	34	1
<i>Erophila_verna</i>	gam	47	47	2
<i>Erophila_verna</i>	gam	54	54	1
<i>Erophila_verna</i>	spor	14	7	9
<i>Erophila_verna</i>	spor	16	8	3
<i>Erophila_verna</i>	spor	20	10	1
<i>Erophila_verna</i>	spor	24	12	2
<i>Erophila_verna</i>	spor	28	14	2
<i>Erophila_verna</i>	spor	30	15	8
<i>Erophila_verna</i>	spor	32	16	7
<i>Erophila_verna</i>	spor	34	17	5
<i>Erophila_verna</i>	spor	36	18	10
<i>Erophila_verna</i>	spor	38	19	2
<i>Erophila_verna</i>	spor	39	20	2
<i>Erophila_verna</i>	spor	40	20	4
<i>Erophila_verna</i>	spor	42	21	1
<i>Erophila_verna</i>	spor	44	22	1
<i>Erophila_verna</i>	spor	46	23	1
<i>Erophila_verna</i>	spor	48	24	1
<i>Erophila_verna</i>	spor	52	26	6
<i>Erophila_verna</i>	spor	54	27	1
<i>Erophila_verna</i>	spor	58	29	2
<i>Erophila_verna</i>	spor	60	30	5
<i>Erophila_verna</i>	spor	64	32	5
<i>Erophila_verna</i>	spor	94	47	1
<i>Erophila_verna_subsp._praecox</i>	spor	32	16	4
<i>Erophila_verna_subsp._praecox</i>	spor	34	17	1
<i>Erophila_verna_subsp._praecox</i>	spor	36	18	2
<i>Erophila_verna_subsp._praecox</i>	spor	48	24	2
<i>Erophila_verna_subsp._praecox</i>	spor	52	26	1
<i>Erophila_verna_subsp._praecox</i>	spor	54	27	1
<i>Erophila_verna_subsp._praecox</i>	spor	56	28	2
<i>Erucaria_erucarioides</i>	gam	8	8	1

<i>Erucaria_erucarioides</i>	spor	16	8	5
<i>Erucastrum_gallicum</i>	gam	15	15	9
<i>Erucastrum_gallicum</i>	spor	30	15	25
<i>Erysimum_arbuscula</i>	spor	28	14	1
<i>Erysimum_asperum</i>	gam	18	18	5
<i>Erysimum_asperum</i>	spor	36	18	5
<i>Erysimum_baeticum</i>	gam	14	14	1
<i>Erysimum_baeticum</i>	gam	28	28	3
<i>Erysimum_bicolor</i>	gam	14	14	3
<i>Erysimum_bicolor</i>	spor	28	14	5
<i>Erysimum_bicolor</i>	spor	32	16	1
<i>Erysimum_bicolor</i>	spor	42	21	2
<i>Erysimum_bonannianum</i>	gam	11	11	1
<i>Erysimum_bonannianum</i>	spor	16	8	1
<i>Erysimum_bonannianum</i>	spor	24	12	1
<i>Erysimum_boreale</i>	spor	16	8	1
<i>Erysimum_caespitosum</i>	gam	28	28	2
<i>Erysimum_capitatum</i>	gam	18	18	41
<i>Erysimum_capitatum</i>	spor	36	18	7
<i>Erysimum_carniolicum</i>	spor	32	16	2
<i>Erysimum_cazorlense</i>	gam	14	14	3
<i>Erysimum_cazorlense</i>	spor	56	28	3
<i>Erysimum_cheiranthoides</i>	gam	8	8	20
<i>Erysimum_cheiranthoides</i>	spor	16	8	52
<i>Erysimum_comatum</i>	spor	14	7	6
<i>Erysimum_comatum</i>	spor	28	14	2
<i>Erysimum_crassicaule</i>	spor	48	24	1
<i>Erysimum_crassipes</i>	gam	7	7	3
<i>Erysimum_crassipes</i>	spor	14	7	5
<i>Erysimum_crassistylum</i>	spor	14	7	9
<i>Erysimum_crassistylum</i>	spor	24	12	1
<i>Erysimum_crassistylum</i>	spor	42	21	4
<i>Erysimum_crepidifolium</i>	gam	7	7	2
<i>Erysimum_crepidifolium</i>	spor	14	7	4
<i>Erysimum_cuspidatum</i>	gam	7	7	2
<i>Erysimum_cuspidatum</i>	gam	8	8	1
<i>Erysimum_cuspidatum</i>	spor	16	8	10
<i>Erysimum_diffusum</i>	gam	14	14	4
<i>Erysimum_diffusum</i>	gam	35	35	1
<i>Erysimum_diffusum</i>	spor	14	7	13
<i>Erysimum_diffusum</i>	spor	28	14	50
<i>Erysimum_diffusum</i>	spor	32	16	4
<i>Erysimum_diffusum</i>	spor	42	21	2
<i>Erysimum_diffusum</i>	spor	56	28	10
<i>Erysimum_diffusum</i>	spor	70	35	6
<i>Erysimum_diffusum</i>	spor	72	36	2
<i>Erysimum_duriaei</i>	gam	7	7	3
<i>Erysimum_duriaei</i>	gam	8	8	1
<i>Erysimum_duriaei</i>	gam	10	10	1

<i>Erysimum_duriaei</i>	gam	11	11	2
<i>Erysimum_duriaei</i>	gam	12	12	1
<i>Erysimum_duriaei</i>	gam	13	13	6
<i>Erysimum_duriaei</i>	gam	14	14	1
<i>Erysimum_duriaei</i>	spor	14	7	10
<i>Erysimum_duriaei</i>	spor	16	8	1
<i>Erysimum_duriaei</i>	spor	20	10	1
<i>Erysimum_duriaei</i>	spor	22	11	2
<i>Erysimum_duriaei</i>	spor	26	13	7
<i>Erysimum_duriaei</i>	spor	28	14	1
<i>Erysimum_duriaei</i>	spor	30	15	1
<i>Erysimum_duriaei</i>	spor	32	16	1
<i>Erysimum_duriaei</i>	spor	38	19	1
<i>Erysimum_duriaei</i>	spor	40	20	1
<i>Erysimum_gelidum</i>	spor	14	7	2
<i>Erysimum_gelidum</i>	spor	56	28	2
<i>Erysimum_hieraciifolium</i>	gam	8	8	1
<i>Erysimum_hieraciifolium</i>	gam	12	12	1
<i>Erysimum_hieraciifolium</i>	gam	16	16	2
<i>Erysimum_hieraciifolium</i>	gam	18	18	1
<i>Erysimum_hieraciifolium</i>	gam	20	20	1
<i>Erysimum_hieraciifolium</i>	spor	16	8	2
<i>Erysimum_hieraciifolium</i>	spor	32	16	8
<i>Erysimum_hieraciifolium</i>	spor	48	24	9
<i>Erysimum_incanum</i>	gam	8	8	4
<i>Erysimum_incanum</i>	gam	16	16	4
<i>Erysimum_incanum</i>	spor	16	8	12
<i>Erysimum_incanum</i>	spor	24	12	2
<i>Erysimum_incanum</i>	spor	32	16	4
<i>Erysimum_incanum</i>	spor	34	17	2
<i>Erysimum_incanum</i>	spor	36	18	2
<i>Erysimum_incanum</i>	spor	48	24	5
<i>Erysimum_ischnostylum</i>	gam	20	20	2
<i>Erysimum_jugicola</i>	gam	9	9	3
<i>Erysimum_jugicola</i>	spor	18	9	36
<i>Erysimum_jugicola</i>	spor	20	10	2
<i>Erysimum_krendlii</i>	spor	14	7	3
<i>Erysimum_kurdicum</i>	spor	16	8	1
<i>Erysimum_leucanthemum</i>	gam	6	6	1
<i>Erysimum_leucanthemum</i>	spor	12	6	1
<i>Erysimum_linariifolium</i>	gam	7	7	2
<i>Erysimum_linariifolium</i>	gam	14	14	1
<i>Erysimum_linariifolium</i>	gam	15	15	1
<i>Erysimum_linariifolium</i>	spor	14	7	4
<i>Erysimum_linariifolium</i>	spor	24	12	1
<i>Erysimum_linifolium</i>	gam	7	7	2
<i>Erysimum_linifolium</i>	spor	14	7	11
<i>Erysimum_majellense</i>	spor	28	14	12
<i>Erysimum_metlesicsii</i>	spor	14	7	3

<i>Erysimum_myriophyllum</i>	gam	14	14	4
<i>Erysimum_myriophyllum</i>	spor	14	7	4
<i>Erysimum_naxense</i>	spor	12	6	1
<i>Erysimum_naxense</i>	spor	24	12	1
<i>Erysimum_nevadense</i>	gam	7	7	4
<i>Erysimum_nevadense</i>	gam	8	8	1
<i>Erysimum_nevadense</i>	spor	14	7	2
<i>Erysimum_ochroleucum</i>	gam	15	15	1
<i>Erysimum_ochroleucum</i>	gam	16	16	1
<i>Erysimum_ochroleucum</i>	spor	16	8	2
<i>Erysimum_ochroleucum</i>	spor	30	15	2
<i>Erysimum_ochroleucum</i>	spor	32	16	1
<i>Erysimum_ochroleucum</i>	spor	34	17	2
<i>Erysimum_ochroleucum</i>	spor	51	26	3
<i>Erysimum_ochroleucum</i>	spor	311	156	2
<i>Erysimum_odoratum</i>	gam	7	7	2
<i>Erysimum_odoratum</i>	gam	14	14	1
<i>Erysimum_odoratum</i>	gam	16	16	7
<i>Erysimum_odoratum</i>	spor	14	7	17
<i>Erysimum_odoratum</i>	spor	16	8	4
<i>Erysimum_odoratum</i>	spor	24	12	2
<i>Erysimum_odoratum</i>	spor	32	16	39
<i>Erysimum_pachycarpum</i>	gam	9	9	2
<i>Erysimum_pectinatum</i>	spor	12	6	1
<i>Erysimum_pectinatum</i>	spor	14	7	2
<i>Erysimum_penyalarensense</i>	spor	38	19	1
<i>Erysimum_perofskianum</i>	gam	8	8	1
<i>Erysimum_perofskianum</i>	gam	9	9	2
<i>Erysimum_perofskianum</i>	spor	12	6	3
<i>Erysimum_perofskianum</i>	spor	14	7	2
<i>Erysimum_perofskianum</i>	spor	18	9	1
<i>Erysimum_perofskianum</i>	spor	32	16	3
<i>Erysimum_perofskianum</i>	spor	36	18	4
<i>Erysimum_perofskianum</i>	spor	38	19	1
<i>Erysimum_perofskianum</i>	spor	40	20	2
<i>Erysimum_popovii</i>	gam	14	14	3
<i>Erysimum_pseudorhaeticum</i>	spor	14	7	57
<i>Erysimum_pulchellum</i>	spor	56	28	1
<i>Erysimum_purpureum</i>	spor	40	20	3
<i>Erysimum_pusillum</i>	spor	14	7	8
<i>Erysimum_pusillum</i>	spor	18	9	3
<i>Erysimum_pusillum</i>	spor	30	15	2
<i>Erysimum_redowskii</i>	gam	12	12	4
<i>Erysimum_redowskii</i>	gam	14	14	3
<i>Erysimum_redowskii</i>	spor	24	12	16
<i>Erysimum_redowskii</i>	spor	28	14	3
<i>Erysimum_redowskii</i>	spor	36	18	19
<i>Erysimum_redowskii</i>	spor	42	21	5
<i>Erysimum_repandum</i>	gam	7	7	7

<i>Erysimum_repandum</i>	gam	8	8	8
<i>Erysimum_repandum</i>	gam	14	14	1
<i>Erysimum_repandum</i>	spor	14	7	3
<i>Erysimum_repandum</i>	spor	16	8	24
<i>Erysimum_rhaeticum</i>	gam	24	24	1
<i>Erysimum_rhaeticum</i>	gam	28	28	7
<i>Erysimum_rhaeticum</i>	spor	14	7	1
<i>Erysimum_rhaeticum</i>	spor	56	28	25
<i>Erysimum_rhodium</i>	spor	12	6	3
<i>Erysimum_rhodium</i>	spor	18	9	2
<i>Erysimum_salangense</i>	spor	70	35	1
<i>Erysimum_scabrum</i>	spor	28	14	3
<i>Erysimum_scoparium</i>	gam	14	14	2
<i>Erysimum_scoparium</i>	spor	28	14	18
<i>Erysimum_semperflorens</i>	spor	14	7	1
<i>Erysimum_senoneri</i>	spor	12	6	5
<i>Erysimum_senoneri</i>	spor	13	6	2
<i>Erysimum_senoneri</i>	spor	18	9	2
<i>Erysimum_senoneri</i>	spor	28	14	2
<i>Erysimum_siliculosum</i>	spor	14	7	3
<i>Erysimum_sisymbrioides</i>	spor	18	9	2
<i>Erysimum_sisymbrioides</i>	spor	20	10	1
<i>Erysimum_smyrnaeum</i>	spor	14	7	3
<i>Erysimum_stenophyllum</i>	spor	14	7	1
<i>Erysimum_subulatum</i>	spor	28	14	1
<i>Erysimum_sylvestre</i>	gam	7	7	8
<i>Erysimum_sylvestre</i>	spor	14	7	56
<i>Erysimum_sylvestre</i>	spor	18	9	3
<i>Erysimum_sylvestre</i>	spor	22	11	4
<i>Erysimum_sylvestre</i>	spor	27	14	2
<i>Erysimum_sylvestre</i>	spor	28	14	2
<i>Erysimum_sylvestre</i>	spor	42	21	3
<i>Erysimum_sylvestre</i>	spor	48	24	1
<i>Erysimum_sylvestre</i>	spor	56	28	2
<i>Erysimum_virgatum</i>	spor	16	8	1
<i>Erysimum_virgatum</i>	spor	32	16	1
<i>Erysimum_virgatum</i>	spor	48	24	7
<i>Erysimum_witmannii</i>	spor	14	7	13
<i>Euclidium_syriacum</i>	gam	7	7	7
<i>Euclidium_syriacum</i>	spor	14	7	5
<i>Eutrema_edwardsii</i>	gam	14	14	2
<i>Eutrema_edwardsii</i>	spor	18	9	3
<i>Eutrema_edwardsii</i>	spor	28	14	25
<i>Eutrema_edwardsii</i>	spor	36	18	1
<i>Eutrema_edwardsii</i>	spor	42	21	10
<i>Eutrema_edwardsii</i>	spor	56	28	3
<i>Eutrema_halophilum</i>	gam	7	7	2
<i>Eutrema_heterophyllum</i>	gam	14	14	1
<i>Eutrema_heterophyllum</i>	spor	14	7	1

<i>Eutrema japonicum</i>	gam	14	14	3
<i>Eutrema japonicum</i>	spor	28	14	7
<i>Eutrema salsugineum</i>	spor	14	7	14
<i>Exhalimolobos parryi</i>	gam	8	8	2
<i>Exhalimolobos parryi</i>	gam	16	16	4
<i>Exhalimolobos weddellii</i>	spor	32	16	2
<i>Farsetia aegyptia</i>	gam	24	24	2
<i>Farsetia aegyptia</i>	spor	24	12	2
<i>Farsetia aegyptia</i>	spor	60	30	2
<i>Farsetia aegyptia</i>	spor	72	36	8
<i>Farsetia aegyptia</i>	spor	78	39	1
<i>Farsetia stylosa</i>	gam	12	12	2
<i>Farsetia stylosa</i>	spor	12	6	3
<i>Farsetia stylosa</i>	spor	24	12	2
<i>Farsetia undulicarpa</i>	gam	12	12	2
<i>Fezia pterocarpa</i>	gam	11	11	2
<i>Fibigia clypeata</i>	gam	8	8	2
<i>Fibigia clypeata</i>	spor	14	7	1
<i>Fibigia clypeata</i>	spor	16	8	21
<i>Fibigia clypeata</i>	spor	26	13	2
<i>Fibigia eriocarpa</i>	spor	14	7	1
<i>Fibigia eriocarpa</i>	spor	16	8	3
<i>Fibigia lunarioides</i>	spor	16	8	1
<i>Fibigia macrocarpa</i>	gam	7	7	2
<i>Fibigia macrocarpa</i>	gam	8	8	1
<i>Fibigia macrocarpa</i>	gam	16	16	1
<i>Fibigia spathulata</i>	spor	16	8	1
<i>Fibigia suffruticosa</i>	gam	8	8	4
<i>Fibigia suffruticosa</i>	spor	16	8	3
<i>Fibigia triquetra</i>	spor	16	8	3
<i>Fibigia umbellata</i>	gam	8	8	1
<i>Galitzkya macrocarpa</i>	spor	16	8	2
<i>Galitzkya macrocarpa</i>	spor	17	8	2
<i>Galitzkya spathulata</i>	spor	16	8	3
<i>Goldbachia laevigata</i>	gam	14	14	8
<i>Goldbachia laevigata</i>	spor	14	7	2
<i>Goldbachia laevigata</i>	spor	28	14	9
<i>Halimolobos henricksonii</i>	spor	16	8	2
<i>Halimolobos lasiolobus</i>	gam	8	8	2
<i>Hesperis dinarica</i>	spor	24	12	5
<i>Hesperis dinarica</i>	spor	32	16	1
<i>Hesperis laciniata</i>	gam	6	6	3
<i>Hesperis laciniata</i>	spor	12	6	7
<i>Hesperis laciniata</i>	spor	14	7	3
<i>Hesperis matronalis</i>	gam	6	6	2
<i>Hesperis matronalis</i>	gam	7	7	8
<i>Hesperis matronalis</i>	gam	8	8	2
<i>Hesperis matronalis</i>	gam	9	9	1
<i>Hesperis matronalis</i>	gam	12	12	5

<i>Hesperis_matronalis</i>	gam	14	14	6
<i>Hesperis_matronalis</i>	gam	16	16	2
<i>Hesperis_matronalis</i>	gam	24	24	1
<i>Hesperis_matronalis</i>	spor	12	6	1
<i>Hesperis_matronalis</i>	spor	14	7	21
<i>Hesperis_matronalis</i>	spor	16	8	3
<i>Hesperis_matronalis</i>	spor	23	12	1
<i>Hesperis_matronalis</i>	spor	24	12	38
<i>Hesperis_matronalis</i>	spor	25	12	1
<i>Hesperis_matronalis</i>	spor	26	13	4
<i>Hesperis_matronalis</i>	spor	28	14	20
<i>Hesperis_matronalis</i>	spor	32	16	3
<i>Hilliella_fumarioides</i>	spor	42	21	1
<i>Hilliella_paradoxa</i>	spor	42	21	1
<i>Hilliella_shuangpaiensis</i>	spor	44	22	6
<i>Hilliella_sinuata</i>	spor	42	21	1
<i>Hilliella_sinuata</i>	spor	44	22	1
<i>Hilliella_yixianensis</i>	spor	42	21	5
<i>Hirschfeldia_incana</i>	gam	7	7	33
<i>Hirschfeldia_incana</i>	gam	8	8	4
<i>Hirschfeldia_incana</i>	gam	9	9	1
<i>Hirschfeldia_incana</i>	spor	14	7	22
<i>Hirschfeldia_incana</i>	spor	15	8	4
<i>Hirschfeldia_incana</i>	spor	16	8	3
<i>Hirschfeldia_incana</i>	spor	18	9	1
<i>Hormathophylla_halimifolia</i>	gam	16	16	3
<i>Hormathophylla_halimifolia</i>	spor	32	16	2
<i>Hornungia_alpina</i>	gam	6	6	1
<i>Hornungia_alpina</i>	spor	12	6	14
<i>Hornungia_petraea</i>	gam	6	6	8
<i>Hornungia_petraea</i>	spor	12	6	50
<i>Ianhedgea_minutiflora</i>	spor	28	14	2
<i>Iberis_amara</i>	gam	7	7	16
<i>Iberis_amara</i>	gam	8	8	1
<i>Iberis_amara</i>	gam	14	14	4
<i>Iberis_amara</i>	spor	14	7	34
<i>Iberis_amara</i>	spor	15	8	2
<i>Iberis_amara</i>	spor	16	8	6
<i>Iberis_amara</i>	spor	18	9	2
<i>Iberis_amara</i>	spor	28	14	2
<i>Iberis_amara</i>	spor	36	18	2
<i>Iberis_saxatilis</i>	gam	8	8	1
<i>Iberis_saxatilis</i>	gam	11	11	2
<i>Iberis_saxatilis</i>	spor	22	11	29
<i>Iberis_saxatilis</i>	spor	23	12	3
<i>Iberis_saxatilis</i>	spor	24	12	3
<i>Iberis_saxatilis</i>	spor	33	16	3
<i>Iberis sempervirens</i>	gam	11	11	5
<i>Iberis sempervirens</i>	gam	33	33	3

<i>Iberis sempervirens</i>	gam	35	35	3
<i>Iberis sempervirens</i>	spor	16	8	3
<i>Iberis sempervirens</i>	spor	22	11	27
<i>Iberis sempervirens</i>	spor	66	33	3
<i>Iberis_spathulata</i>	gam	7	7	2
<i>Iberis_spathulata</i>	spor	14	7	12
<i>Iberis_umbellata</i>	gam	7	7	2
<i>Iberis_umbellata</i>	gam	9	9	7
<i>Iberis_umbellata</i>	gam	17	17	2
<i>Iberis_umbellata</i>	spor	14	7	7
<i>Iberis_umbellata</i>	spor	16	8	5
<i>Iberis_umbellata</i>	spor	18	9	10
<i>Iberis_umbellata</i>	spor	19	10	3
<i>Iberis_umbellata</i>	spor	20	10	3
<i>Iberis_umbellata</i>	spor	22	11	3
<i>Iberis_umbellata</i>	spor	34	17	1
<i>Iberis_umbellata</i>	spor	36	18	1
<i>Ionopsidium_savianum</i>	gam	16	16	5
<i>Ionopsidium_savianum</i>	spor	32	16	11
<i>Ionopsidium_savianum</i>	spor	40	20	1
<i>Isatis_buschiana</i>	spor	14	7	4
<i>Isatis_cappadocica_subsp._besseri</i>	gam	21	21	2
<i>Isatis_gaubae</i>	gam	7	7	2
<i>Isatis_kotschyana</i>	spor	28	14	2
<i>Isatis_leuconeura</i>	spor	14	7	2
<i>Isatis_lusitanica</i>	gam	7	7	9
<i>Isatis_lusitanica</i>	spor	14	7	1
<i>Isatis_microcarpa</i>	spor	14	7	2
<i>Isatis_minima</i>	gam	21	21	1
<i>Isatis_minima</i>	spor	34	17	4
<i>Isatis_minima</i>	spor	42	21	4
<i>Isatis_raphanifolia</i>	spor	14	7	1
<i>Isatis_stocksii</i>	gam	14	14	2
<i>Isatis_tinctoria</i>	gam	7	7	1
<i>Isatis_tinctoria</i>	gam	14	14	6
<i>Isatis_tinctoria</i>	spor	14	7	34
<i>Isatis_tinctoria</i>	spor	26	13	4
<i>Isatis_tinctoria</i>	spor	28	14	48
<i>Kernera_saxatilis_subsp._boissieri</i>	spor	14	7	2
<i>Kernera_saxatilis_subsp._boissieri</i>	spor	16	8	2
<i>Leavenworthia_alabamica</i>	gam	11	11	8
<i>Leavenworthia_alabamica</i>	spor	22	11	3
<i>Leavenworthia_aurea</i>	gam	11	11	1
<i>Leavenworthia_aurea</i>	gam	24	24	3
<i>Leavenworthia_aurea</i>	spor	22	11	1
<i>Leavenworthia_aurea</i>	spor	48	24	1
<i>Leavenworthia_crassa</i>	gam	11	11	8
<i>Leavenworthia_crassa</i>	spor	22	11	3
<i>Leavenworthia_exigua</i>	gam	11	11	13

<i>Leavenworthia_exigua</i>	spor	22	11	3
<i>Leavenworthia_stylosa</i>	gam	15	15	2
<i>Leavenworthia_stylosa</i>	spor	30	15	4
<i>Leavenworthia_texana</i>	spor	22	11	4
<i>Leavenworthia_torulosa</i>	gam	15	15	3
<i>Leavenworthia_torulosa</i>	spor	30	15	5
<i>Leavenworthia_uniflora</i>	gam	15	15	2
<i>Leavenworthia_uniflora</i>	spor	30	15	3
<i>Leiospora_ericocalyx</i>	spor	14	7	2
<i>Lepidium_africanum</i>	spor	16	8	6
<i>Lepidium_africanum</i>	spor	32	16	2
<i>Lepidium_alyssoides</i>	gam	16	16	9
<i>Lepidium_alyssoides</i>	spor	32	16	1
<i>Lepidium_apetalum</i>	gam	16	16	1
<i>Lepidium_apetalum</i>	spor	32	16	5
<i>Lepidium_aucheri</i>	gam	8	8	4
<i>Lepidium_bonariense</i>	spor	32	16	3
<i>Lepidium_bonariense</i>	spor	64	32	6
<i>Lepidium_campestre</i>	gam	8	8	11
<i>Lepidium_campestre</i>	spor	16	8	36
<i>Lepidium_davisii</i>	spor	32	16	1
<i>Lepidium_densiflorum</i>	gam	16	16	6
<i>Lepidium_densiflorum</i>	spor	16	8	1
<i>Lepidium_densiflorum</i>	spor	24	12	1
<i>Lepidium_densiflorum</i>	spor	32	16	34
<i>Lepidium_didymum</i>	gam	8	8	3
<i>Lepidium_didymum</i>	gam	16	16	13
<i>Lepidium_didymum</i>	spor	16	8	1
<i>Lepidium_didymum</i>	spor	32	16	27
<i>Lepidium_draba</i>	gam	16	16	3
<i>Lepidium_draba</i>	gam	32	32	2
<i>Lepidium_draba</i>	spor	32	16	2
<i>Lepidium_draba</i>	spor	62	31	4
<i>Lepidium_draba</i>	spor	64	32	39
<i>Lepidium_draba</i>	spor	66	33	1
<i>Lepidium_draba</i>	spor	67	34	1
<i>Lepidium_draba</i>	spor	68	34	1
<i>Lepidium_draba</i>	spor	69	34	1
<i>Lepidium_draba</i>	spor	70	35	1
<i>Lepidium_draba</i>	spor	72	36	2
<i>Lepidium_draba</i>	spor	80	40	1
<i>Lepidium_graminifolium</i>	gam	8	8	1
<i>Lepidium_graminifolium</i>	gam	16	16	1
<i>Lepidium_graminifolium</i>	spor	14	7	1
<i>Lepidium_graminifolium</i>	spor	16	8	3
<i>Lepidium_graminifolium</i>	spor	48	24	19
<i>Lepidium_heterophyllum</i>	spor	16	8	16
<i>Lepidium_heterophyllum</i>	spor	48	24	1
<i>Lepidium_hirtum</i>	spor	16	8	8

<i>Lepidium_meyenii</i>	gam	32	32	1
<i>Lepidium_meyenii</i>	spor	64	32	1
<i>Lepidium_montanum</i>	gam	16	16	9
<i>Lepidium_montanum</i>	gam	32	32	2
<i>Lepidium_montanum</i>	spor	32	16	4
<i>Lepidium_naufragorum</i>	gam	72	72	1
<i>Lepidium_naufragorum</i>	spor	144	72	1
<i>Lepidium_navasii</i>	spor	32	16	5
<i>Lepidium_oleraceum</i>	gam	36	36	1
<i>Lepidium_oleraceum</i>	spor	72	36	1
<i>Lepidium_perfoliatum</i>	gam	8	8	7
<i>Lepidium_perfoliatum</i>	spor	16	8	27
<i>Lepidium_ruderale</i>	gam	8	8	5
<i>Lepidium_ruderale</i>	gam	16	16	5
<i>Lepidium_ruderale</i>	spor	16	8	20
<i>Lepidium_ruderale</i>	spor	24	12	1
<i>Lepidium_ruderale</i>	spor	28	14	2
<i>Lepidium_ruderale</i>	spor	32	16	38
<i>Lepidium_sativum</i>	gam	8	8	1
<i>Lepidium_sativum</i>	gam	12	12	8
<i>Lepidium_sativum</i>	gam	16	16	3
<i>Lepidium_sativum</i>	spor	12	6	1
<i>Lepidium_sativum</i>	spor	16	8	8
<i>Lepidium_sativum</i>	spor	21	10	1
<i>Lepidium_sativum</i>	spor	24	12	26
<i>Lepidium_sativum</i>	spor	32	16	5
<i>Lepidium_virginicum</i>	gam	8	8	2
<i>Lepidium_virginicum</i>	gam	16	16	10
<i>Lepidium_virginicum</i>	spor	16	8	6
<i>Lepidium_virginicum</i>	spor	32	16	28
<i>Leptaleum_filifolium</i>	gam	7	7	4
<i>Leptaleum_filifolium</i>	spor	14	7	4
<i>Litwinowia_tenuissima</i>	gam	7	7	1
<i>Litwinowia_tenuissima</i>	spor	14	7	4
<i>Lobularia_arabica</i>	gam	18	18	2
<i>Lobularia_arabica</i>	gam	21	21	3
<i>Lobularia_arabica</i>	gam	22	22	1
<i>Lobularia_arabica</i>	gam	23	23	2
<i>Lobularia_arabica</i>	gam	24	24	3
<i>Lobularia_arabica</i>	gam	27	27	4
<i>Lobularia_arabica</i>	gam	36	36	2
<i>Lobularia_arabica</i>	spor	36	18	2
<i>Lobularia_arabica</i>	spor	42	21	4
<i>Lobularia_arabica</i>	spor	46	23	4
<i>Lobularia_arabica</i>	spor	94	47	2
<i>Lobularia_arabica</i>	spor	96	48	2
<i>Lobularia_canariensis_subsp._fruticosa</i>	gam	11	11	2
<i>Lobularia_canariensis_subsp._fruticosa</i>	spor	22	11	2
<i>Lobularia_canariensis_subsp._marginata</i>	gam	11	11	4

<i>Lobularia canariensis</i> _subsp._marginata	spor	22	11	5
<i>Lobularia canariensis</i> _subsp._palmensis	gam	11	11	5
<i>Lobularia canariensis</i> _subsp._palmensis	gam	22	22	4
<i>Lobularia canariensis</i> _subsp._palmensis	spor	22	11	6
<i>Lobularia canariensis</i> _subsp._palmensis	spor	44	22	4
<i>Lobularia canariensis</i> _subsp._spathulata	gam	11	11	3
<i>Lobularia canariensis</i> _subsp._spathulata	spor	22	11	4
<i>Lobularia libyca</i>	gam	6	6	1
<i>Lobularia libyca</i>	gam	11	11	12
<i>Lobularia libyca</i>	spor	22	11	15
<i>Lobularia maritima</i>	gam	11	11	4
<i>Lobularia maritima</i>	gam	12	12	29
<i>Lobularia maritima</i>	gam	24	24	4
<i>Lobularia maritima</i>	gam	35	35	2
<i>Lobularia maritima</i>	gam	36	36	4
<i>Lobularia maritima</i>	spor	22	11	4
<i>Lobularia maritima</i>	spor	23	12	3
<i>Lobularia maritima</i>	spor	24	12	80
<i>Lobularia maritima</i>	spor	30	15	5
<i>Lobularia maritima</i>	spor	36	18	7
<i>Lobularia maritima</i>	spor	42	21	7
<i>Lobularia maritima</i>	spor	48	24	8
<i>Lunaria annua</i>	spor	28	14	7
<i>Lunaria annua</i>	spor	30	15	19
<i>Lunaria rediviva</i>	gam	14	14	6
<i>Lunaria rediviva</i>	gam	15	15	1
<i>Lunaria rediviva</i>	spor	28	14	11
<i>Lunaria rediviva</i>	spor	30	15	21
<i>Lunaria rediviva</i>	spor	60	30	3
<i>Lyrocarpa coulteri</i>	gam	20	20	1
<i>Lyrocarpa coulteri</i>	spor	20	10	6
<i>Lyrocarpa coulteri</i>	spor	36	18	1
<i>Lyrocarpa coulteri</i>	spor	40	20	3
<i>Lyrocarpa coulteri</i>	spor	42	21	1
<i>Macropodium nivale</i>	gam	15	15	2
<i>Macropodium nivale</i>	spor	30	15	10
<i>Macropodium pterospermum</i>	spor	30	15	2
<i>Malcolmia africana</i>	gam	7	7	5
<i>Malcolmia africana</i>	gam	14	14	17
<i>Malcolmia africana</i>	spor	14	7	8
<i>Malcolmia africana</i>	spor	28	14	10
<i>Malcolmia littorea</i>	gam	10	10	2
<i>Malcolmia littorea</i>	spor	20	10	20
<i>Malcolmia maritima</i>	gam	7	7	1
<i>Malcolmia maritima</i>	gam	8	8	6
<i>Malcolmia maritima</i>	spor	14	7	6
<i>Malcolmia maritima</i>	spor	15	8	1
<i>Malcolmia maritima</i>	spor	16	8	8
<i>Malcolmia maritima</i>	spor	17	8	1

<i>Malcolmia_maritima</i>	spor	18	9	1
<i>Malcolmia_maritima</i>	spor	21	10	1
<i>Malcolmia_orsiniana</i>	spor	16	8	2
<i>Malcolmia_orsiniana_subsp._angulifolia</i>	spor	16	8	1
<i>Malcolmia_ramosissima</i>	spor	14	7	1
<i>Malcolmia_ramosissima</i>	spor	24	12	2
<i>Malcolmia_ramosissima</i>	spor	28	14	5
<i>Malcolmia_triloba</i>	spor	24	12	3
<i>Maresia_nana</i>	gam	13	13	1
<i>Maresia_nana</i>	spor	26	13	5
<i>Maresia_nana</i>	spor	28	14	8
<i>Matthiola_farinosa</i>	gam	6	6	2
<i>Matthiola_farinosa</i>	spor	12	6	4
<i>Matthiola_fruticulosa</i>	gam	6	6	9
<i>Matthiola_fruticulosa</i>	spor	12	6	19
<i>Matthiola_fruticulosa</i>	spor	16	8	3
<i>Matthiola_incana</i>	gam	7	7	9
<i>Matthiola_incana</i>	spor	12	6	1
<i>Matthiola_incana</i>	spor	13	6	1
<i>Matthiola_incana</i>	spor	14	7	59
<i>Matthiola_longipetala</i>	gam	6	6	1
<i>Matthiola_longipetala</i>	gam	7	7	7
<i>Matthiola_longipetala</i>	spor	14	7	8
<i>Matthiola_maderensis</i>	spor	14	7	4
<i>Matthiola_parviflora</i>	gam	7	7	1
<i>Matthiola_parviflora</i>	gam	8	8	1
<i>Matthiola_parviflora</i>	spor	8	4	3
<i>Matthiola_parviflora</i>	spor	12	6	3
<i>Matthiola_parviflora</i>	spor	14	7	6
<i>Matthiola_stoddartii</i>	spor	12	6	1
<i>Megadenia_pygmaea</i>	spor	12	6	2
<i>Megadenia_pygmaea</i>	spor	20	10	4
<i>Menonvillea_litoralis</i>	spor	22	11	3
<i>Microthlaspi_granatense</i>	gam	7	7	5
<i>Microthlaspi_granatense</i>	spor	14	7	13
<i>Microthlaspi_umbellatum</i>	spor	14	7	3
<i>Morettia_canescens</i>	gam	11	11	3
<i>Morettia_canescens</i>	spor	22	11	1
<i>Moricandia_arvensis</i>	gam	9	9	3
<i>Moricandia_arvensis</i>	gam	12	12	2
<i>Moricandia_arvensis</i>	gam	14	14	19
<i>Moricandia_arvensis</i>	spor	18	9	2
<i>Moricandia_arvensis</i>	spor	24	12	2
<i>Moricandia_arvensis</i>	spor	28	14	41
<i>Moricandia_foetida</i>	gam	14	14	4
<i>Moricandia_foetida</i>	spor	28	14	4
<i>Moricandia_foleyi</i>	gam	11	11	3
<i>Moricandia_foleyi</i>	spor	22	11	2
<i>Moricandia_moricandioides</i>	gam	14	14	10

<i>Moricandia_moricandioides</i>	spor	28	14	15
<i>Moricandia_nitens</i>	spor	28	14	3
<i>Moricandia_sinaica</i>	spor	28	14	3
<i>Moricandia_spinosa</i>	gam	14	14	2
<i>Moricandia_spinosa</i>	spor	84	42	1
<i>Moricandia_suffruticosa</i>	gam	4	4	1
<i>Moricandia_suffruticosa</i>	gam	14	14	3
<i>Moricandia_suffruticosa</i>	spor	14	7	1
<i>Moricandia_suffruticosa</i>	spor	56	28	1
<i>Myagrurn_perfoliatum</i>	gam	7	7	5
<i>Myagrurn_perfoliatum</i>	spor	14	7	20
<i>Nasturtiopsis_coronopifolia</i>	gam	7	7	2
<i>Nasturtium_microphyllum</i>	gam	32	32	5
<i>Nasturtium_microphyllum</i>	spor	32	16	2
<i>Nasturtium_microphyllum</i>	spor	60	30	1
<i>Nasturtium_microphyllum</i>	spor	64	32	18
<i>Nasturtium_officinale</i>	gam	7	7	6
<i>Nasturtium_officinale</i>	gam	8	8	3
<i>Nasturtium_officinale</i>	gam	14	14	3
<i>Nasturtium_officinale</i>	gam	16	16	47
<i>Nasturtium_officinale</i>	spor	14	7	2
<i>Nasturtium_officinale</i>	spor	18	9	1
<i>Nasturtium_officinale</i>	spor	32	16	84
<i>Nasturtium_officinale</i>	spor	33	16	3
<i>Nasturtium_officinale</i>	spor	34	17	3
<i>Nasturtium_officinale</i>	spor	36	18	3
<i>Nasturtium_officinale</i>	spor	48	24	8
<i>Nasturtium_officinale</i>	spor	60	30	3
<i>Nasturtium_officinale</i>	spor	64	32	9
<i>Neotorularia_contortuplicata</i>	gam	7	7	1
<i>Neotorularia_dentata</i>	gam	7	7	2
<i>Neotorularia_tetracmoides</i>	gam	7	7	4
<i>Neotorularia_torulosa</i>	gam	7	7	11
<i>Neotorularia_torulosa</i>	spor	14	7	7
<i>Neotorularia_torulosa</i>	spor	28	14	1
<i>Neotorularia_torulosa</i>	spor	42	21	1
<i>Nerisyrenia_johnstonii</i>	spor	20	10	2
<i>Nerisyrenia_linearifolia</i>	gam	8	8	3
<i>Nerisyrenia_linearifolia</i>	gam	9	9	3
<i>Nerisyrenia_linearifolia</i>	gam	10	10	1
<i>Nerisyrenia_linearifolia</i>	gam	16	16	1
<i>Nerisyrenia_linearifolia</i>	spor	18	9	5
<i>Nerisyrenia_linearifolia</i>	spor	19	10	2
<i>Nerisyrenia_linearifolia</i>	spor	20	10	3
<i>Nerisyrenia_linearifolia</i>	spor	34	17	3
<i>Nerisyrenia_linearifolia</i>	spor	36	18	3
<i>Neslia_paniculata</i>	gam	7	7	4
<i>Neslia_paniculata</i>	gam	14	14	3
<i>Neslia_paniculata</i>	spor	14	7	21

<i>Neslia_paniculata</i>	spor	28	14	1
<i>Nevada_holmgrenii</i>	gam	7	7	2
<i>Nevada_holmgrenii</i>	spor	14	7	3
<i>Noccaea_caerulescens_subsp._caerulescens</i>	spor	14	7	1
<i>Noccaea_fendleri</i>	gam	7	7	9
<i>Noccaea_fendleri</i>	spor	14	7	5
<i>Noccaea_fendleri</i>	spor	28	14	3
<i>Noccaea_fendleri_subsp._glauca</i>	gam	7	7	4
<i>Noccaea_fendleri_subsp._glauca</i>	gam	14	14	4
<i>Noccaea_fendleri_subsp._glauca</i>	spor	14	7	3
<i>Noccaea_fendleri_subsp._glauca</i>	spor	28	14	7
<i>Noccaea_fendleri_subsp._idahoensis</i>	gam	7	7	1
<i>Noccaea_fendleri_subsp._idahoensis</i>	gam	14	14	1
<i>Noccaea_fendleri_subsp._idahoensis</i>	spor	14	7	1
<i>Noccaea_fendleri_subsp._idahoensis</i>	spor	28	14	1
<i>Noccaea_fendleri_subsp._siskiyouensis</i>	gam	7	7	4
<i>Noccaea_fendleri_subsp._siskiyouensis</i>	spor	14	7	1
<i>Noccaea_papyracea</i>	gam	14	14	2
<i>Noccaea_papyracea</i>	spor	28	14	2
<i>Notoceras_bicorne</i>	gam	11	11	6
<i>Notoceras_bicorne</i>	spor	22	11	8
<i>Octoceras_lehmannianum</i>	spor	14	7	2
<i>Olimarabidopsis_cabulica</i>	spor	48	24	6
<i>Olimarabidopsis_pumila</i>	gam	8	8	5
<i>Olimarabidopsis_pumila</i>	gam	16	16	1
<i>Olimarabidopsis_pumila</i>	spor	16	8	1
<i>Olimarabidopsis_pumila</i>	spor	30	15	1
<i>Olimarabidopsis_pumila</i>	spor	32	16	16
<i>Onuris_graminifolia</i>	spor	18	9	2
<i>Oreophyton_falcatum</i>	spor	32	16	2
<i>Ornithocarpa_torulosa</i>	gam	24	24	2
<i>Ornithocarpa_torulosa</i>	spor	48	24	4
<i>Orychophragmus_violaceus</i>	gam	12	12	5
<i>Orychophragmus_violaceus</i>	spor	22	11	4
<i>Orychophragmus_violaceus</i>	spor	24	12	21
<i>Orychophragmus_violaceus</i>	spor	39	20	1
<i>Orychophragmus_violaceus</i>	spor	48	24	1
<i>Orychophragmus_violaceus</i>	spor	61	30	1
<i>Orychophragmus_violaceus</i>	spor	64	32	1
<i>Orychophragmus_violaceus</i>	spor	70	35	1
<i>Orychophragmus_violaceus</i>	spor	74	37	1
<i>Parlatoria_rostrata</i>	gam	7	7	7
<i>Parolinia_intermedia</i>	spor	22	11	2
<i>Parrya_arctica</i>	spor	14	7	2
<i>Parrya_arctica</i>	spor	21	10	3
<i>Parrya_nudicaulis</i>	spor	14	7	20
<i>Parrya_nudicaulis</i>	spor	28	14	28
<i>Parrya_schugnana</i>	spor	14	7	2
<i>Parrya_schugnana</i>	spor	28	14	3

<i>Parrya_turkestanica</i>	spor	14	7	1
<i>Paysonia_auriculata</i>	gam	8	8	5
<i>Paysonia_auriculata</i>	spor	16	8	4
<i>Paysonia_densipila</i>	gam	8	8	4
<i>Paysonia_densipila</i>	spor	16	8	1
<i>Paysonia_grandiflora</i>	gam	9	9	5
<i>Paysonia_grandiflora</i>	spor	18	9	7
<i>Paysonia_lasiocarpa</i>	gam	7	7	2
<i>Paysonia_lasiocarpa</i>	spor	14	7	5
<i>Paysonia_lescurii</i>	gam	8	8	4
<i>Paysonia_lescurii</i>	spor	16	8	2
<i>Paysonia_stonensis</i>	gam	8	8	2
<i>Paysonia_stonensis</i>	spor	16	8	1
<i>Peltaria_alliacea</i>	spor	14	7	13
<i>Peltaria_alliacea</i>	spor	28	14	6
<i>Peltaria_alliacea</i>	spor	56	28	2
<i>Peltaria_alliacea</i>	spor	58	29	1
<i>Pennellia_longifolia</i>	gam	8	8	5
<i>Pennellia_longifolia</i>	spor	16	8	4
<i>Phoenicaulis_cheiranthoides</i>	spor	28	14	1
<i>Physaria_acutifolia</i>	gam	4	4	2
<i>Physaria_acutifolia</i>	gam	5	5	4
<i>Physaria_acutifolia</i>	gam	8	8	3
<i>Physaria_acutifolia</i>	gam	12	12	2
<i>Physaria_acutifolia</i>	spor	8	4	4
<i>Physaria_acutifolia</i>	spor	10	5	7
<i>Physaria_acutifolia</i>	spor	14	7	2
<i>Physaria_acutifolia</i>	spor	16	8	3
<i>Physaria_acutifolia</i>	spor	24	12	3
<i>Physaria_argyraea</i>	gam	6	6	2
<i>Physaria_argyraea</i>	gam	7	7	1
<i>Physaria_argyraea</i>	gam	8	8	1
<i>Physaria_argyraea</i>	gam	9	9	2
<i>Physaria_argyraea</i>	gam	12	12	2
<i>Physaria_argyraea</i>	gam	15	15	1
<i>Physaria_argyraea</i>	gam	16	16	2
<i>Physaria_argyraea</i>	gam	17	17	2
<i>Physaria_argyraea</i>	gam	18	18	1
<i>Physaria_argyraea</i>	spor	18	9	2
<i>Physaria_argyraea</i>	spor	30	15	2
<i>Physaria_bellii</i>	gam	4	4	1
<i>Physaria_bellii</i>	spor	8	4	6
<i>Physaria_fendleri</i>	gam	6	6	10
<i>Physaria_fendleri</i>	gam	7	7	1
<i>Physaria_fendleri</i>	gam	12	12	2
<i>Physaria_fendleri</i>	spor	12	6	9
<i>Physaria_fendleri</i>	spor	14	7	1
<i>Physaria_fendleri</i>	spor	24	12	1
<i>Physaria_filiformis</i>	gam	7	7	2

<i>Physaria_filiformis</i>	spor	14	7	1
<i>Physaria_gracilis</i>	gam	6	6	3
<i>Physaria_gracilis</i>	spor	12	6	5
<i>Physaria_intermedia</i>	gam	8	8	1
<i>Physaria_intermedia</i>	gam	10	10	1
<i>Physaria_intermedia</i>	gam	18	18	2
<i>Physaria_intermedia</i>	spor	16	8	2
<i>Physaria_intermedia</i>	spor	18	9	3
<i>Physaria_intermedia</i>	spor	20	10	1
<i>Physaria_intermedia</i>	spor	36	18	1
<i>Physaria_newberryi</i>	gam	8	8	3
<i>Physaria_newberryi</i>	spor	8	4	1
<i>Physaria_newberryi</i>	spor	16	8	4
<i>Physaria_occidentalis</i>	gam	5	5	2
<i>Physaria_occidentalis</i>	spor	10	5	3
<i>Physaria_pallida</i>	gam	6	6	1
<i>Physaria_pallida</i>	spor	12	6	1
<i>Physaria_spatulata</i>	gam	5	5	1
<i>Physaria_spatulata</i>	spor	10	5	1
<i>Physaria_spatulata</i>	spor	12	6	2
<i>Physaria_subumbellata</i>	spor	10	5	3
<i>Physoptychis_caspica</i>	spor	16	8	3
<i>Pringlea_antiscorbutica</i>	spor	24	12	4
<i>Pritzelago_alpina</i>	spor	12	6	2
<i>Pseudoarabidopsis_toxophylla</i>	spor	12	6	2
<i>Pseudoarabidopsis_toxophylla</i>	spor	24	12	1
<i>Pseudocamelina_glaucophylla</i>	gam	7	7	1
<i>Pseudocamelina_glaucophylla</i>	spor	14	7	3
<i>Pseudoclausia_turkestanica</i>	gam	7	7	2
<i>Pseudoclausia_turkestanica</i>	spor	14	7	1
<i>Pseudovesicaria_digitata</i>	spor	10	5	4
<i>Psychine_stylosa</i>	gam	15	15	2
<i>Psychine_stylosa</i>	spor	16	8	2
<i>Psychine_stylosa</i>	spor	30	15	3
<i>Raphanus_raphanistrum</i>	gam	9	9	23
<i>Raphanus_raphanistrum</i>	gam	18	18	1
<i>Raphanus_raphanistrum</i>	spor	18	9	65
<i>Raphanus_raphanistrum_subsp._landra</i>	gam	9	9	4
<i>Raphanus_raphanistrum_subsp._landra</i>	spor	18	9	15
<i>Rapistrum_rugosum</i>	gam	8	8	13
<i>Rapistrum_rugosum</i>	spor	14	7	1
<i>Rapistrum_rugosum</i>	spor	16	8	57
<i>Rhizobotrya_alpina</i>	gam	7	7	1
<i>Rhizobotrya_alpina</i>	spor	14	7	3
<i>Ricotia_lunaria</i>	spor	28	14	5
<i>Rorippa_amphibia</i>	gam	14	14	3
<i>Rorippa_amphibia</i>	gam	15	15	2
<i>Rorippa_amphibia</i>	gam	16	16	5
<i>Rorippa_amphibia</i>	spor	16	8	28

<i>Rorippa_amphibia</i>	spor	32	16	61
<i>Rorippa_amphibia</i>	spor	48	24	2
<i>Rorippa_austriaca</i>	gam	8	8	4
<i>Rorippa_austriaca</i>	spor	16	8	40
<i>Rorippa_cantoniensis</i>	spor	16	8	1
<i>Rorippa_indica</i>	gam	8	8	7
<i>Rorippa_indica</i>	gam	12	12	3
<i>Rorippa_indica</i>	gam	14	14	8
<i>Rorippa_indica</i>	gam	16	16	10
<i>Rorippa_indica</i>	gam	21	21	1
<i>Rorippa_indica</i>	gam	24	24	7
<i>Rorippa_indica</i>	gam	28	28	4
<i>Rorippa_indica</i>	spor	16	8	7
<i>Rorippa_indica</i>	spor	24	12	1
<i>Rorippa_indica</i>	spor	28	14	1
<i>Rorippa_indica</i>	spor	32	16	3
<i>Rorippa_indica</i>	spor	48	24	8
<i>Rorippa_indica</i>	spor	56	28	1
<i>Rorippa_islandica</i>	gam	8	8	6
<i>Rorippa_islandica</i>	spor	16	8	25
<i>Rorippa_islandica</i>	spor	32	16	19
<i>Rorippa_palustris</i>	gam	16	16	20
<i>Rorippa_palustris</i>	spor	16	8	7
<i>Rorippa_palustris</i>	spor	32	16	86
<i>Rorippa_sylvestris</i>	gam	16	16	13
<i>Rorippa_sylvestris</i>	gam	24	24	4
<i>Rorippa_sylvestris</i>	spor	16	8	1
<i>Rorippa_sylvestris</i>	spor	32	16	72
<i>Rorippa_sylvestris</i>	spor	40	20	24
<i>Rorippa_sylvestris</i>	spor	41	20	2
<i>Rorippa_sylvestris</i>	spor	48	24	41
<i>Rorippa_sylvestris</i>	spor	96	48	1
<i>Rorippa_teres</i>	spor	32	16	1
<i>Rytidocarpus_moricandioides</i>	spor	28	14	5
<i>Sandbergia_perplexa</i>	spor	14	7	6
<i>Savignya_parviflora</i>	gam	15	15	5
<i>Savignya_parviflora_subsp._longistyla</i>	gam	15	15	2
<i>Schimpera_arabica</i>	gam	7	7	4
<i>Schimpera_arabica</i>	spor	14	7	2
<i>Schivereckia_podolica</i>	spor	16	8	7
<i>Schivereckia_podolica</i>	spor	18	9	3
<i>Schizopetalon_walkerii</i>	gam	10	10	2
<i>Schizopetalon_walkerii</i>	spor	18	9	3
<i>Schouwia_purpurea</i>	gam	18	18	3
<i>Schouwia_purpurea</i>	spor	36	18	6
<i>Selenia_aurea</i>	gam	23	23	5
<i>Selenia_aurea</i>	gam	69	69	2
<i>Selenia_aurea</i>	spor	46	23	1
<i>Selenia_aurea</i>	spor	138	69	1

<i>Selenia_dissecta</i>	gam	7	7	2
<i>Selenia_dissecta</i>	spor	14	7	1
<i>Selenia_grandis</i>	gam	12	12	4
<i>Selenia_grandis</i>	spor	24	12	1
<i>Selenia_jonesii</i>	gam	12	12	1
<i>Selenia_jonesii</i>	spor	24	12	1
<i>Sibara_angelorum</i>	gam	14	14	4
<i>Sibara_deserti</i>	gam	14	14	3
<i>Sibara_deserti</i>	spor	26	13	3
<i>Sibara_deserti</i>	spor	28	14	1
<i>Sibara_laxa</i>	gam	14	14	2
<i>Sibaropsis_hammitii</i>	spor	28	14	2
<i>Sinapidendron_frutescens</i>	gam	9	9	1
<i>Sinapidendron_frutescens</i>	gam	10	10	4
<i>Sinapidendron_frutescens</i>	spor	20	10	4
<i>Sinapis_alba</i>	gam	12	12	12
<i>Sinapis_alba</i>	spor	24	12	71
<i>Sinapis_arvensis</i>	gam	8	8	2
<i>Sinapis_arvensis</i>	gam	9	9	35
<i>Sinapis_arvensis</i>	gam	16	16	1
<i>Sinapis_arvensis</i>	spor	16	8	1
<i>Sinapis_arvensis</i>	spor	18	9	91
<i>Sisymbrella_aspera</i>	gam	8	8	2
<i>Sisymbrella_aspera</i>	spor	16	8	15
<i>Sisymbrium_altissimum</i>	gam	7	7	22
<i>Sisymbrium_altissimum</i>	spor	14	7	40
<i>Sisymbrium_altissimum</i>	spor	195	98	3
<i>Sisymbrium_austriacum</i>	gam	7	7	1
<i>Sisymbrium_austriacum</i>	spor	14	7	8
<i>Sisymbrium_irio</i>	gam	7	7	21
<i>Sisymbrium_irio</i>	gam	8	8	1
<i>Sisymbrium_irio</i>	gam	9	9	2
<i>Sisymbrium_irio</i>	gam	14	14	11
<i>Sisymbrium_irio</i>	gam	21	21	1
<i>Sisymbrium_irio</i>	gam	28	28	1
<i>Sisymbrium_irio</i>	spor	14	7	47
<i>Sisymbrium_irio</i>	spor	16	8	3
<i>Sisymbrium_irio</i>	spor	18	9	2
<i>Sisymbrium_irio</i>	spor	21	10	2
<i>Sisymbrium_irio</i>	spor	28	14	20
<i>Sisymbrium_irio</i>	spor	42	21	12
<i>Sisymbrium_irio</i>	spor	56	28	11
<i>Sisymbrium_loeselii</i>	gam	7	7	15
<i>Sisymbrium_loeselii</i>	spor	14	7	34
<i>Sisymbrium_officinale</i>	gam	7	7	22
<i>Sisymbrium_officinale</i>	spor	14	7	76
<i>Sisymbrium_officinale</i>	spor	195	98	2
<i>Sisymbrium_orientale</i>	gam	7	7	14
<i>Sisymbrium_orientale</i>	gam	14	14	3

<i>Sisymbrium_orientale</i>	spor	7	4	1
<i>Sisymbrium_orientale</i>	spor	14	7	68
<i>Smelowskia_alba</i>	spor	12	6	7
<i>Smelowskia_americana</i>	spor	12	6	2
<i>Smelowskia_americana</i>	spor	22	11	4
<i>Smelowskia_bifurcata</i>	spor	12	6	2
<i>Smelowskia_borealis</i>	spor	12	6	8
<i>Smelowskia_calycina</i>	spor	12	6	6
<i>Smelowskia_calycina</i>	spor	22	11	1
<i>Smelowskia_jacutica</i>	spor	12	6	1
<i>Smelowskia_jacutica</i>	spor	36	18	1
<i>Smelowskia_johnsonii</i>	spor	12	6	1
<i>Smelowskia_media</i>	spor	12	6	4
<i>Smelowskia_media</i>	spor	22	11	1
<i>Smelowskia_parryoides</i>	spor	12	6	6
<i>Smelowskia_parryoides</i>	spor	24	12	4
<i>Smelowskia_porsildii</i>	spor	12	6	3
<i>Smelowskia_porsildii</i>	spor	18	9	2
<i>Smelowskia_porsildii</i>	spor	22	11	5
<i>Smelowskia_porsildii</i>	spor	24	12	4
<i>Smelowskia_porsildii</i>	spor	32	16	2
<i>Smelowskia_pyriformis</i>	spor	12	6	3
<i>Smelowskia_sophiifolia</i>	spor	20	10	2
<i>Smelowskia_tibetica</i>	spor	24	12	1
<i>Sobolewskia_caucasica</i>	spor	16	8	2
<i>Solms-laubachia_eurycarpa</i>	spor	14	7	2
<i>Solms-laubachia_lanata</i>	spor	14	7	1
<i>Solms-laubachia_linearifolia</i>	spor	14	7	2
<i>Solms-laubachia_minor</i>	spor	14	7	1
<i>Solms-laubachia_platycarpa</i>	spor	14	7	2
<i>Solms-laubachia_pulcherrima</i>	spor	14	7	4
<i>Solms-laubachia_retropilosa</i>	spor	14	7	1
<i>Solms-laubachia_retropilosa</i>	spor	28	14	1
<i>Solms-laubachia_xerophyta</i>	spor	14	7	2
<i>Sphaerocardamum_macropetalum</i>	gam	8	8	2
<i>Sphaerocardamum_stellatum</i>	gam	8	8	4
<i>Stanleya_bipinnata</i>	gam	12	12	4
<i>Stanleya_bipinnata</i>	spor	28	14	1
<i>Stanleya_elata</i>	gam	12	12	2
<i>Stanleya_elata</i>	spor	24	12	1
<i>Stanleya_elata</i>	spor	28	14	3
<i>Stanleya_pinnata</i>	gam	12	12	3
<i>Stanleya_pinnata</i>	gam	14	14	5
<i>Stanleya_pinnata</i>	gam	24	24	1
<i>Stanleya_pinnata</i>	gam	28	28	6
<i>Stanleya_pinnata</i>	spor	24	12	5
<i>Stanleya_pinnata</i>	spor	28	14	1
<i>Stanleya_pinnata</i>	spor	48	24	2
<i>Stanleya_pinnata</i>	spor	56	28	3

<i>Stanleya_viridiflora</i>	gam	12	12	2
<i>Stanleya_viridiflora</i>	spor	24	12	2
<i>Stanleya_viridiflora</i>	spor	28	14	2
<i>Sterigmostemum_acanthocarpum</i>	gam	7	7	1
<i>Sterigmostemum_acanthocarpum</i>	spor	14	7	2
<i>Sterigmostemum_incanum</i>	gam	7	7	1
<i>Sterigmostemum_incanum</i>	spor	14	7	1
<i>Sterigmostemum_ramosissimum</i>	spor	14	7	1
<i>Sterigmostemum_sulphureum</i>	gam	7	7	2
<i>Stevenia_cheiranthoides</i>	spor	32	16	3
<i>Streptanthella_longirostris</i>	gam	7	7	2
<i>Streptanthella_longirostris</i>	gam	14	14	4
<i>Streptanthella_longirostris</i>	spor	14	7	1
<i>Streptanthella_longirostris</i>	spor	28	14	4
<i>Streptanthus_barbatus</i>	spor	28	14	1
<i>Streptanthus_barbatus</i>	spor	56	28	1
<i>Streptanthus_barbiger</i>	gam	14	14	2
<i>Streptanthus_barbiger</i>	spor	28	14	2
<i>Streptanthus_batrachopus</i>	gam	14	14	1
<i>Streptanthus_bernardinus</i>	spor	14	7	1
<i>Streptanthus_bernardinus</i>	spor	28	14	1
<i>Streptanthus_brachiatus</i>	spor	28	14	2
<i>Streptanthus_breweri</i>	gam	14	14	2
<i>Streptanthus_breweri</i>	spor	28	14	2
<i>Streptanthus_callistus</i>	gam	14	14	1
<i>Streptanthus_callistus</i>	spor	28	14	1
<i>Streptanthus_carinatus</i>	gam	14	14	5
<i>Streptanthus_carinatus</i>	spor	28	14	2
<i>Streptanthus_carinatus_subsp._arizonicus</i>	gam	14	14	4
<i>Streptanthus_carinatus_subsp._arizonicus</i>	spor	28	14	3
<i>Streptanthus_cordatus</i>	gam	12	12	3
<i>Streptanthus_cordatus</i>	gam	14	14	3
<i>Streptanthus_cordatus</i>	spor	24	12	2
<i>Streptanthus_cordatus</i>	spor	28	14	1
<i>Streptanthus_cordatus</i>	spor	56	28	1
<i>Streptanthus_cutleri</i>	gam	14	14	1
<i>Streptanthus_diversifolius</i>	gam	14	14	2
<i>Streptanthus_diversifolius</i>	spor	28	14	2
<i>Streptanthus_drepanoides</i>	gam	14	14	3
<i>Streptanthus_drepanoides</i>	spor	28	14	2
<i>Streptanthus_farnsworthianus</i>	spor	28	14	2
<i>Streptanthus_fenestratus</i>	spor	28	14	1
<i>Streptanthus_glandulosus</i>	gam	14	14	5
<i>Streptanthus_glandulosus</i>	spor	28	14	2
<i>Streptanthus_glandulosus_subsp._albidus</i>	gam	14	14	3
<i>Streptanthus_glandulosus_subsp._albidus</i>	spor	28	14	2
<i>Streptanthus_glandulosus_subsp._niger</i>	gam	14	14	4
<i>Streptanthus_glandulosus_subsp._niger</i>	spor	28	14	1
<i>Streptanthus_glandulosus_subsp._pulchellus</i>	gam	14	14	3

<i>Streptanthus_glandulosus_subsp._pulchellus</i>	spor	28	14	1
<i>Streptanthus_glandulosus_subsp._sonomensis</i>	spor	28	14	1
<i>Streptanthus_hesperidis</i>	gam	14	14	1
<i>Streptanthus_hesperidis</i>	spor	28	14	2
<i>Streptanthus_hispidus</i>	gam	14	14	1
<i>Streptanthus_howellii</i>	gam	14	14	3
<i>Streptanthus_howellii</i>	spor	28	14	2
<i>Streptanthus_hyacinthoides</i>	spor	28	14	2
<i>Streptanthus_morrisonii</i>	spor	28	14	2
<i>Streptanthus_petiolaris</i>	gam	14	14	1
<i>Streptanthus_petiolaris</i>	spor	28	14	2
<i>Streptanthus_platycarpus</i>	gam	14	14	1
<i>Streptanthus_platycarpus</i>	spor	28	14	3
<i>Streptanthus_polygaloides</i>	spor	28	14	3
<i>Streptanthus_tortuosus</i>	gam	14	14	1
<i>Streptanthus_tortuosus</i>	spor	28	14	1
<i>Succowia_balearica</i>	gam	16	16	2
<i>Succowia_balearica</i>	gam	18	18	9
<i>Succowia_balearica</i>	spor	32	16	2
<i>Succowia_balearica</i>	spor	36	18	13
<i>Synthlipsis_greggii</i>	gam	10	10	4
<i>Synthlipsis_greggii</i>	spor	20	10	5
<i>Teesdalia_nudicaulis</i>	gam	18	18	7
<i>Teesdalia_nudicaulis</i>	spor	18	9	1
<i>Teesdalia_nudicaulis</i>	spor	36	18	30
<i>Tetracme_quadricornis</i>	spor	14	7	2
<i>Thelypodopsis_ambigua</i>	gam	11	11	3
<i>Thelypodopsis_ambigua</i>	spor	22	11	1
<i>Thelypodopsis_vaseyi</i>	gam	10	10	2
<i>Thelypodopsis_vaseyi</i>	spor	20	10	1
<i>Thelypodium_crispum</i>	gam	13	13	2
<i>Thelypodium_crispum</i>	spor	26	13	1
<i>Thelypodium_flexuosum</i>	gam	13	13	2
<i>Thelypodium_flexuosum</i>	spor	26	13	1
<i>Thelypodium_integrifolium</i>	gam	13	13	4
<i>Thelypodium_integrifolium</i>	spor	26	13	1
<i>Thelypodium_laciniatum</i>	gam	12	12	2
<i>Thelypodium_laciniatum</i>	gam	13	13	2
<i>Thelypodium_laciniatum</i>	spor	26	13	1
<i>Thelypodium_sagittatum</i>	spor	26	13	1
<i>Thlaspi_arvense</i>	gam	7	7	37
<i>Thlaspi_arvense</i>	spor	14	7	96
<i>Thlaspi_bulbosum</i>	spor	14	7	2
<i>Thlaspi_goelsingense</i>	gam	28	28	11
<i>Thlaspi_goelsingense</i>	spor	14	7	3
<i>Thlaspi_goelsingense</i>	spor	50	25	1
<i>Thlaspi_goelsingense</i>	spor	56	28	10
<i>Thlaspi_jankae</i>	spor	14	7	1
<i>Thlaspi_jankae</i>	spor	24	12	1

<i>Thlaspi_jankae</i>	spor	28	14	5
<i>Thlaspi_montanum</i>	gam	7	7	2
<i>Thlaspi_montanum</i>	gam	14	14	7
<i>Thlaspi_montanum</i>	spor	28	14	9
<i>Thlaspi_nevadense</i>	gam	14	14	2
<i>Thlaspi_nevadense</i>	spor	28	14	1
<i>Thlaspi_perfoliatum</i>	gam	7	7	3
<i>Thlaspi_perfoliatum</i>	gam	14	14	5
<i>Thlaspi_perfoliatum</i>	gam	21	21	13
<i>Thlaspi_perfoliatum</i>	gam	35	35	1
<i>Thlaspi_perfoliatum</i>	spor	14	7	27
<i>Thlaspi_perfoliatum</i>	spor	28	14	16
<i>Thlaspi_perfoliatum</i>	spor	40	20	7
<i>Thlaspi_perfoliatum</i>	spor	42	21	85
<i>Thlaspi_perfoliatum</i>	spor	70	35	4
<i>Thlaspi_praecox</i>	spor	14	7	12
<i>Thysanocarpus_curvipes</i>	gam	7	7	2
<i>Thysanocarpus_curvipes</i>	gam	28	28	1
<i>Thysanocarpus_curvipes</i>	spor	28	14	5
<i>Tropidocarpum_gracile</i>	gam	8	8	3
<i>Tropidocarpum_gracile</i>	spor	16	8	1
<i>Turritis_glabra</i>	gam	6	6	17
<i>Turritis_glabra</i>	gam	8	8	4
<i>Turritis_glabra</i>	gam	16	16	2
<i>Turritis_glabra</i>	spor	12	6	62
<i>Turritis_glabra</i>	spor	16	8	15
<i>Turritis_glabra</i>	spor	32	16	7
<i>Turritis_laxa</i>	gam	6	6	4
<i>Vella_anremerica</i>	spor	34	17	3
<i>Vella_bourgaeana</i>	gam	17	17	4
<i>Vella_bourgaeana</i>	spor	34	17	4
<i>Vella_bourgaeana</i>	spor	48	24	3
<i>Vella_castrilensis</i>	spor	68	34	1
<i>Vella_lucentina</i>	spor	34	17	2
<i>Vella_mairei</i>	spor	68	34	2
<i>Vella_pseudocytisus_subsp._glabrata</i>	spor	34	17	1
<i>Vella_pseudocytisus_subsp._pau</i>	spor	34	17	3
<i>Vella_spinosa</i>	gam	17	17	11
<i>Vella_spinosa</i>	spor	34	17	12
<i>Xerodraba_pycnophylloides</i>	spor	22	11	3
<i>Yinshania_acutangula_subsp._wilsonii</i>	spor	12	6	4
<i>Yinshania_henryi</i>	spor	12	6	5
<i>Yinshania_henryi</i>	spor	14	7	2
<i>Zerdana_anchonioides</i>	spor	14	7	2

Table S3.2 Ploidy levels and macroevolutionary rates inferred for 1,333 Brassicaceae species.
State: 0 = Diploid, 1 = Polyploid.

SPECIES	PLOIDY (MEDIAN)	STATE	SPECIATION	EXTINCTION	EXTINCTION FRACTION	NET DIVERSIFICATION	TURNOVER
<i>Alliaria_grandifolia</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Alliaria_petiolata</i>	19	1	0.388	0.238	0.056	0.150	0.627
<i>Alyssoides_cretica</i>	4	0	0.273	0.117	0.108	0.156	0.389
<i>Alyssoides_utriculata</i>	6	1	0.359	0.211	0.050	0.148	0.569
<i>Alyssopsis_mollis</i>	8	1	0.400	0.249	0.059	0.151	0.648
<i>Alyssopsis_trinervis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Alyssum_alpestre</i>	8	1	0.370	0.221	0.052	0.149	0.592
<i>Alyssum_alyssooides</i>	8	1	0.390	0.240	0.057	0.150	0.629
<i>Alyssum_americanum</i>	--	1	0.418	0.266	0.063	0.152	0.683
<i>Alyssum_anatolicum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_antiatlanticum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_antilibanoticum</i>	--	1	0.450	0.295	0.070	0.155	0.745
<i>Alyssum_argenteum</i>	8	1	0.373	0.224	0.053	0.149	0.596
<i>Alyssum_aurantiacum</i>	8	1	0.605	0.439	0.104	0.166	1.043
<i>Alyssum_aureum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_baldaccii</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_baumgartnerianum</i>	--	1	0.491	0.333	0.079	0.158	0.824
<i>Alyssum_bertolonii</i>	8	1	0.631	0.464	0.110	0.168	1.095
<i>Alyssum_biovulatum</i>	--	1	0.363	0.215	0.051	0.148	0.579
<i>Alyssum_borzaeanum</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Alyssum_bracteatum</i>	8	1	0.530	0.369	0.087	0.160	0.899
<i>Alyssum_caespitosum</i>	--	1	0.380	0.231	0.055	0.149	0.612
<i>Alyssum_caricum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_chalcidicum</i>	--	1	0.365	0.217	0.051	0.148	0.582
<i>Alyssum_condensatum</i>	8	1	0.363	0.215	0.051	0.148	0.579
<i>Alyssum_corningii</i>	--	1	1.710	1.464	0.346	0.247	3.174
<i>Alyssum_corsicum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_corymbosoides</i>	16	1	0.359	0.211	0.050	0.148	0.569
<i>Alyssum_cuneifolium</i>	16	1	0.800	0.619	0.147	0.180	1.419
<i>Alyssum_cypricum</i>	16	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_dasy carpum</i>	8	1	0.363	0.215	0.051	0.148	0.577
<i>Alyssum_davisianum</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Alyssum_densistellatum</i>	--	1	0.727	0.553	0.131	0.175	1.280
<i>Alyssum_desertorum</i>	14	1	0.415	0.263	0.062	0.152	0.677
<i>Alyssum_diffusum</i>	8	1	0.376	0.227	0.054	0.149	0.604
<i>Alyssum_doerfleri</i>	8	1	0.362	0.214	0.051	0.148	0.576
<i>Alyssum_euboicum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_fallacinum</i>	8	1	0.400	0.250	0.059	0.151	0.650
<i>Alyssum_fastigiatum</i>	--	1	0.955	0.763	0.181	0.191	1.718
<i>Alyssum_filiforme</i>	--	1	0.530	0.369	0.087	0.160	0.899
<i>Alyssum_flexicaule</i>	--	1	0.800	0.619	0.147	0.180	1.419
<i>Alyssum_floribundum</i>	8	1	0.448	0.293	0.069	0.154	0.741
<i>Alyssum_fragillimum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_gevgelicense</i>	--	1	0.365	0.217	0.051	0.148	0.582
<i>Alyssum_giosnanum</i>	16	1	0.359	0.211	0.050	0.148	0.569

<i>Alyssum_granatense</i>	24	1	0.359	0.211	0.050	0.148	0.569
<i>Alyssum_harputicum</i>	--	1	3.964	3.552	0.840	0.411	7.516
<i>Alyssum_heldreichii</i>	8	1	0.369	0.221	0.052	0.149	0.590
<i>Alyssum_hirsutum</i>	23	1	0.359	0.211	0.050	0.148	0.569
<i>Alyssum_homalocarpum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_huber-morathii</i>	12	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_inflatum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_iranicum</i>	--	1	0.380	0.231	0.055	0.149	0.612
<i>Alyssum_kavadarcense</i>	--	1	0.365	0.217	0.051	0.148	0.582
<i>Alyssum_lenense</i>	8	1	0.401	0.250	0.059	0.151	0.651
<i>Alyssum_lepidoto-stellatum</i>	16	1	4.034	3.617	0.856	0.417	7.650
<i>Alyssum_lepidotum</i>	--	1	0.367	0.218	0.052	0.148	0.585
<i>Alyssum_lesbiacum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_linifolium</i>	10	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_loiseleurii</i>	12	1	0.519	0.359	0.085	0.160	0.878
<i>Alyssum_marginatum</i>	--	1	0.366	0.218	0.052	0.148	0.584
<i>Alyssum_markgrafii</i>	16	1	0.362	0.214	0.051	0.148	0.576
<i>Alyssum_masmenaeum</i>	12	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_meniocoides</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_minus</i>	--	1	0.391	0.240	0.057	0.150	0.631
<i>Alyssum_minutum</i>	8	1	0.388	0.238	0.056	0.150	0.625
<i>Alyssum_misirdalianum</i>	--	1	0.902	0.715	0.169	0.188	1.617
<i>Alyssum_montanum</i>	12	1	0.615	0.448	0.106	0.167	1.063
<i>Alyssum_montis-stellae</i>	--	1	0.401	0.250	0.059	0.151	0.651
<i>Alyssum_murale</i>	8	1	0.362	0.214	0.051	0.148	0.576
<i>Alyssum_nebrodense</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_nevadense</i>	--	1	0.936	0.746	0.176	0.190	1.682
<i>Alyssum_niveum</i>	--	1	0.360	0.212	0.050	0.148	0.572
<i>Alyssum_obovatum</i>	15	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_orphilum</i>	--	1	0.389	0.239	0.056	0.150	0.627
<i>Alyssum_ovirense</i>	8	1	3.498	3.121	0.738	0.377	6.620
<i>Alyssum_oxycarpum</i>	8	1	0.359	0.211	0.050	0.148	0.571
<i>Alyssum_paphlagonicum</i>	--	1	3.964	3.552	0.840	0.411	7.516
<i>Alyssum_pateri</i>	16	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_peltarioides</i>	--	1	0.375	0.226	0.053	0.149	0.601
<i>Alyssum_persicum</i>	--	1	0.359	0.211	0.050	0.148	0.571
<i>Alyssum_pinifolium</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_pintodasilvae</i>	--	1	1.162	0.956	0.226	0.207	2.118
<i>Alyssum_polycladum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_praecox</i>	16	1	0.902	0.715	0.169	0.188	1.617
<i>Alyssum_pterocarpum</i>	--	1	0.375	0.226	0.053	0.149	0.601
<i>Alyssum_repens_subsp._transsilvanicum</i>	--	1	0.376	0.227	0.054	0.149	0.603
<i>Alyssum_robertianum</i>	8	1	0.370	0.221	0.052	0.149	0.590
<i>Alyssum_samariferum</i>	--	1	0.448	0.293	0.069	0.154	0.741
<i>Alyssum_serpentinum</i>	--	1	0.365	0.217	0.051	0.148	0.582
<i>Alyssum_serpyllifolium</i>	12	1	1.162	0.956	0.226	0.207	2.118
<i>Alyssum_sibiricum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_siculum</i>	24	1	0.391	0.240	0.057	0.150	0.631
<i>Alyssum_simplex</i>	12	1	0.388	0.238	0.056	0.150	0.625

<i>Alyssum_skopjense</i>	--	1	0.362	0.214	0.051	0.148	0.576
<i>Alyssum_smolikanum</i>	16	1	0.367	0.219	0.052	0.148	0.586
<i>Alyssum_sp._BF-2014</i>	--	1	0.443	0.289	0.068	0.154	0.732
<i>Alyssum_sp._JZL-2014</i>	--	1	0.955	0.763	0.181	0.191	1.718
<i>Alyssum_stapfii</i>	12	1	0.450	0.295	0.070	0.155	0.745
<i>Alyssum_stribryni</i>	16	1	0.366	0.218	0.051	0.148	0.583
<i>Alyssum_strigosum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_sulphureum</i>	--	1	0.359	0.211	0.050	0.148	0.571
<i>Alyssum_tavolarae</i>	--	1	0.631	0.464	0.110	0.168	1.095
<i>Alyssum_tenium</i>	--	1	0.400	0.250	0.059	0.151	0.650
<i>Alyssum_tenuifolium</i>	45	1	0.359	0.212	0.050	0.148	0.571
<i>Alyssum_tetrademon</i>	--	1	1.710	1.464	0.346	0.247	3.174
<i>Alyssum_thymops</i>	--	1	4.034	3.617	0.856	0.417	7.650
<i>Alyssum_tortuosum</i>	8	1	0.418	0.266	0.063	0.152	0.683
<i>Alyssum_turkestanicum</i>	20	1	0.415	0.263	0.062	0.152	0.677
<i>Alyssum_umbellatum</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_virgatum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Alyssum_wulfenianum_subsp._wulfenianum</i>	--	1	3.498	3.121	0.738	0.377	6.620
<i>Alyssum_xanthocarpum</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Ammosperma_cinerea</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Anchonium_billardierei</i>	--	0	0.286	0.128	0.110	0.158	0.414
<i>Anchonium_elichrysofolium_subsp._canescens</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Anelsonia_eurycarpa</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Arabidella_trisecta</i>	15	1	0.396	0.245	0.058	0.151	0.641
<i>Arabidopsis_arenicola</i>	8	1	2.705	2.385	0.564	0.319	5.090
<i>Arabidopsis_arenosa_subsp._arenosa</i>	--	1	0.402	0.251	0.059	0.151	0.654
<i>Arabidopsis_cebennensis</i>	8	1	0.367	0.218	0.052	0.148	0.585
<i>Arabidopsis_croatica</i>	--	1	0.381	0.232	0.055	0.150	0.613
<i>Arabidopsis_halleri</i>	8	1	0.521	0.362	0.086	0.160	0.883
<i>Arabidopsis_kamchatica</i>	--	1	0.383	0.233	0.055	0.150	0.616
<i>Arabidopsis_lyrata</i>	12	1	0.383	0.233	0.055	0.150	0.616
<i>Arabidopsis_neglecta</i>	12	1	0.402	0.251	0.059	0.151	0.654
<i>Arabidopsis_pedemontana</i>	--	1	0.367	0.218	0.052	0.148	0.585
<i>Arabidopsis_petraea_subsp._umbrosa</i>	--	1	2.705	2.385	0.564	0.319	5.090
<i>Arabidopsis_suecica</i>	13	1	0.733	0.558	0.132	0.175	1.291
<i>Arabidopsis_thaliana</i>	5	0	0.503	0.316	0.140	0.188	0.819
<i>Arabidopsis_omezawana</i>	--	1	0.521	0.362	0.086	0.160	0.883
<i>Arabis_abietina</i>	--	1	4.084	3.663	0.867	0.420	7.747
<i>Arabis_aculeolata</i>	16	1	1.813	1.559	0.369	0.254	3.372
<i>Arabis_alaschanica</i>	--	1	0.359	0.212	0.050	0.148	0.571
<i>Arabis_allionii</i>	8	1	0.938	0.748	0.177	0.190	1.687
<i>Arabis_alpina</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Arabis_amplexicaulis</i>	16	1	4.002	3.588	0.849	0.414	7.591
<i>Arabis_androsacea</i>	--	1	0.378	0.229	0.054	0.149	0.607
<i>Arabis_ariana</i>	8	1	1.766	1.515	0.358	0.251	3.281
<i>Arabis_armena</i>	--	1	0.622	0.455	0.108	0.167	1.077
<i>Arabis_aucheri</i>	8	1	0.641	0.472	0.112	0.168	1.113
<i>Arabis_auriculata</i>	--	1	2.335	2.042	0.483	0.292	4.377
<i>Arabis_axillaris</i>	--	0	0.277	0.120	0.109	0.157	0.398

<i>Arabis_axilliflora</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Arabis_beirana</i>	--	1	1.568	1.331	0.315	0.236	2.899
<i>Arabis_bijuga</i>	--	1	4.121	3.698	0.875	0.423	7.820
<i>Arabis_blepharophylla</i>	8	1	1.897	1.636	0.387	0.260	3.533
<i>Arabis_borealis</i>	--	1	4.080	3.660	0.866	0.420	7.741
<i>Arabis_brachycarpa</i>	8	1	3.995	3.582	0.847	0.414	7.577
<i>Arabis_bryoides</i>	8	1	0.359	0.211	0.050	0.148	0.569
<i>Arabis_caerulea</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Arabis_carduchorum</i>	8	1	0.622	0.455	0.108	0.167	1.077
<i>Arabis_christianii</i>	16	1	3.147	2.795	0.661	0.352	5.942
<i>Arabis_ciliata</i>	8	1	0.938	0.748	0.177	0.190	1.687
<i>Arabis_collina</i>	8	1	1.368	1.146	0.271	0.222	2.514
<i>Arabis_conringioides</i>	7	1	0.879	0.693	0.164	0.186	1.571
<i>Arabis_cretica</i>	--	1	0.411	0.260	0.061	0.152	0.671
<i>Arabis_crucisetosa</i>	16	1	2.929	2.593	0.613	0.336	5.522
<i>Arabis_doumetii</i>	--	1	2.805	2.478	0.586	0.327	5.283
<i>Arabis_erikii</i>	--	1	1.583	1.346	0.318	0.237	2.930
<i>Arabis_erubescens</i>	--	1	2.805	2.478	0.586	0.327	5.283
<i>Arabis_eschscholtziana</i>	32	1	4.002	3.588	0.849	0.414	7.590
<i>Arabis_ferdinandi-coburgii</i>	9	1	0.371	0.222	0.053	0.149	0.593
<i>Arabis_flagellosa</i>	16	1	0.604	0.438	0.104	0.166	1.042
<i>Arabis_furcata</i>	--	1	1.897	1.636	0.387	0.260	3.533
<i>Arabis_georgiana</i>	--	1	1.871	1.612	0.381	0.258	3.483
<i>Arabis_graellsiiiformis</i>	--	1	3.995	3.582	0.847	0.414	7.577
<i>Arabis_hirsuta</i>	13	1	0.748	0.572	0.135	0.176	1.320
<i>Arabis_josiae</i>	--	1	0.879	0.693	0.164	0.186	1.571
<i>Arabis_juressi</i>	16	1	3.096	2.748	0.650	0.348	5.845
<i>Arabis_kamelinii</i>	--	1	1.734	1.486	0.351	0.248	3.220
<i>Arabis_karategina</i>	--	1	1.766	1.515	0.358	0.251	3.281
<i>Arabis_kennedyae</i>	--	1	0.360	0.212	0.050	0.148	0.571
<i>Arabis_kokanica</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Arabis_macdonaldiana</i>	8	1	1.636	1.395	0.330	0.241	3.031
<i>Arabis_modesta</i>	16	1	1.766	1.515	0.358	0.251	3.282
<i>Arabis_montbretiana</i>	--	1	2.335	2.042	0.483	0.292	4.377
<i>Arabis_nipponica</i>	--	1	4.002	3.588	0.849	0.414	7.590
<i>Arabis_nordmanniana</i>	8	1	1.478	1.248	0.295	0.230	2.726
<i>Arabis_nova</i>	7	1	0.359	0.211	0.050	0.148	0.570
<i>Arabis_nuristanica</i>	--	1	2.995	2.654	0.628	0.341	5.649
<i>Arabis_nuttallii</i>	--	1	2.929	2.593	0.613	0.336	5.522
<i>Arabis_olympica</i>	--	1	2.770	2.446	0.579	0.324	5.216
<i>Arabis_oregana</i>	12	1	1.842	1.586	0.375	0.256	3.428
<i>Arabis_ottonis-schulzii</i>	--	0	0.277	0.120	0.109	0.157	0.397
<i>Arabis_pangiensis</i>	--	1	4.121	3.698	0.875	0.423	7.820
<i>Arabis_paniculata</i>	--	1	0.597	0.431	0.102	0.165	1.028
<i>Arabis_parvula</i>	16	1	0.641	0.472	0.112	0.168	1.113
<i>Arabis_planisiliqua</i>	8	1	4.105	3.683	0.871	0.422	7.789
<i>Arabis_planisiliqua_subsp._planisiliqua</i>	--	1	3.912	3.504	0.829	0.408	7.416
<i>Arabis_procurrentis</i>	8	1	0.371	0.222	0.053	0.149	0.593
<i>Arabis_pterosperma</i>	8	1	0.586	0.422	0.100	0.164	1.008

<i>Arabis_pubescens</i>	8	1	0.362	0.214	0.051	0.148	0.575
<i>Arabis_pumila</i>	8	1	3.207	2.851	0.674	0.356	6.057
<i>Arabis_pycnocarpa</i>	--	1	4.080	3.660	0.866	0.420	7.741
<i>Arabis_rosea</i>	--	1	1.368	1.146	0.271	0.222	2.514
<i>Arabis_sadina</i>	--	1	0.800	0.620	0.147	0.180	1.420
<i>Arabis_sagittata</i>	8	1	0.762	0.585	0.138	0.177	1.348
<i>Arabis_scabra</i>	8	1	0.407	0.256	0.061	0.151	0.664
<i>Arabis_scopoliana</i>	--	1	0.361	0.213	0.050	0.148	0.575
<i>Arabis_serpyllifolia</i>	--	1	0.439	0.286	0.068	0.154	0.725
<i>Arabis_serrata</i>	16	1	3.299	2.936	0.694	0.363	6.234
<i>Arabis_setosifolia</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Arabis_soyeri</i>	8	1	3.207	2.851	0.674	0.356	6.057
<i>Arabis_stelleri</i>	12	1	3.299	2.936	0.694	0.363	6.234
<i>Arabis_stellulata</i>	4	0	0.268	0.112	0.107	0.156	0.380
<i>Arabis_stenocarpa</i>	8	1	4.105	3.683	0.871	0.422	7.789
<i>Arabis_subflava</i>	--	1	0.360	0.212	0.050	0.148	0.571
<i>Arabis_sudetica</i>	--	1	4.084	3.663	0.867	0.420	7.747
<i>Arabis_surculosa</i>	--	1	0.518	0.359	0.085	0.160	0.877
<i>Arabis_takesimana</i>	--	1	0.748	0.572	0.135	0.176	1.320
<i>Arabis_vochinensis</i>	--	1	0.439	0.286	0.068	0.154	0.725
<i>Armoracia_rusticana</i>	16	1	0.386	0.236	0.056	0.150	0.622
<i>Asperuginoides_axillaris</i>	8	1	0.364	0.216	0.051	0.148	0.580
<i>Aurinia_corymbosa</i>	8	1	0.409	0.258	0.061	0.152	0.667
<i>Aurinia_gionae</i>	8	1	0.394	0.243	0.058	0.150	0.637
<i>Aurinia_leucadea_subsp_diomedea</i>	--	1	0.364	0.215	0.051	0.148	0.579
<i>Aurinia_moreana</i>	8	1	0.385	0.235	0.056	0.150	0.620
<i>Aurinia_petraea</i>	8	1	0.409	0.258	0.061	0.152	0.667
<i>Aurinia_rupestris</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Aurinia_saxatilis</i>	8	1	0.394	0.243	0.058	0.150	0.637
<i>Aurinia_sinuata</i>	8	1	0.367	0.218	0.052	0.148	0.585
<i>Barbarea_vulgaris</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Berteroa_incana</i>	8	1	1.989	1.722	0.407	0.267	3.711
<i>Berteroa_mutabilis</i>	8	1	0.471	0.315	0.074	0.156	0.786
<i>Berteroa_obliqua</i>	8	1	2.022	1.752	0.414	0.269	3.774
<i>Berteroa_orbiculata</i>	8	1	2.022	1.752	0.414	0.269	3.774
<i>Bivonaea_lutea</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Blennodia_canescens</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Blennodia_pterosperma</i>	12	1	0.471	0.315	0.075	0.156	0.786
<i>Boechera_arcuata</i>	6	0	0.330	0.166	0.116	0.164	0.495
<i>Boechera_bodiensis</i>	--	0	1.009	0.752	0.210	0.256	1.761
<i>Boechera_canadensis</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Boechera_cobrensis</i>	7	0	0.312	0.150	0.113	0.162	0.461
<i>Boechera_collinsii</i>	10	1	0.428	0.275	0.065	0.153	0.702
<i>Boechera_constancei</i>	7	0	0.534	0.342	0.144	0.192	0.877
<i>Boechera_crandallii</i>	7	0	0.366	0.197	0.121	0.169	0.563
<i>Boechera_cusickii</i>	--	0	1.009	0.752	0.210	0.256	1.761
<i>Boechera_davidsonii</i>	--	0	0.290	0.131	0.110	0.159	0.422
<i>Boechera_demissa</i>	10	1	1.041	0.843	0.199	0.198	1.884
<i>Boechera_dispar</i>	--	0	0.839	0.605	0.187	0.233	1.444

<i>Boechera_divaricarpa</i>	10	1	0.585	0.420	0.099	0.164	1.005
<i>Boechera_evadens</i>	--	0	0.290	0.131	0.110	0.159	0.421
<i>Boechera_falcata</i>	7	0	0.295	0.135	0.111	0.159	0.430
<i>Boechera_falcifructa</i>	--	0	0.312	0.150	0.113	0.162	0.461
<i>Boechera_fendleri</i>	10	1	1.091	0.890	0.210	0.201	1.981
<i>Boechera_formosa</i>	7	0	0.300	0.140	0.112	0.160	0.440
<i>Boechera_glaucovalvula</i>	7	0	0.341	0.176	0.118	0.166	0.517
<i>Boechera_gracilipes</i>	--	0	1.201	0.918	0.237	0.282	2.119
<i>Boechera_grahamii</i>	16	1	0.746	0.570	0.135	0.176	1.316
<i>Boechera_gunnisoniana</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Boechera_howellii</i>	--	0	1.044	0.782	0.215	0.261	1.826
<i>Boechera_inyoensis</i>	11	1	2.321	2.030	0.480	0.291	4.350
<i>Boechera_johnstonii</i>	--	0	0.404	0.230	0.126	0.174	0.634
<i>Boechera_koehleri</i>	7	0	0.896	0.655	0.195	0.241	1.551
<i>Boechera_laevigata</i>	7	0	0.379	0.208	0.123	0.171	0.587
<i>Boechera_lasiocarpa</i>	--	0	0.282	0.125	0.109	0.158	0.407
<i>Boechera_lemmonii</i>	14	1	0.541	0.380	0.090	0.161	0.921
<i>Boechera_lignifera</i>	7	0	0.348	0.182	0.119	0.167	0.530
<i>Boechera_lincolnensis</i>	7	0	0.341	0.176	0.118	0.166	0.517
<i>Boechera_lyallii</i>	10	1	0.398	0.247	0.058	0.151	0.645
<i>Boechera_macounii</i>	--	0	0.392	0.220	0.125	0.173	0.612
<i>Boechera_missouriensis</i>	--	0	0.642	0.435	0.159	0.206	1.077
<i>Boechera_nevadensis</i>	--	0	0.479	0.294	0.137	0.184	0.773
<i>Boechera_oxyllobula</i>	--	1	1.041	0.843	0.199	0.198	1.884
<i>Boechera_pallidifolia</i>	--	0	3.606	2.997	0.571	0.609	6.603
<i>Boechera_parrishii</i>	7	0	0.404	0.230	0.126	0.174	0.634
<i>Boechera_paupercula</i>	--	0	1.281	0.988	0.248	0.293	2.269
<i>Boechera_pendulocarpa</i>	7	0	0.294	0.135	0.111	0.159	0.429
<i>Boechera_perennans</i>	7	0	0.437	0.258	0.131	0.179	0.695
<i>Boechera_perstellata</i>	7	0	0.282	0.124	0.109	0.158	0.406
<i>Boechera_platysperma</i>	7	0	1.044	0.782	0.215	0.261	1.826
<i>Boechera_polyantha</i>	--	0	0.295	0.135	0.111	0.159	0.430
<i>Boechera_puberula</i>	7	0	0.896	0.655	0.195	0.241	1.551
<i>Boechera_pygmaea</i>	--	0	0.608	0.406	0.155	0.202	1.015
<i>Boechera_rectissima</i>	--	0	0.330	0.166	0.116	0.164	0.495
<i>Boechera_repanda</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Boechera_retrofracta</i>	7	0	0.795	0.568	0.181	0.227	1.363
<i>Boechera_rollei</i>	--	0	0.364	0.195	0.121	0.169	0.560
<i>Boechera_schistacea</i>	7	0	0.375	0.205	0.122	0.170	0.580
<i>Boechera_selbyi</i>	--	0	3.606	2.997	0.571	0.609	6.603
<i>Boechera_serotina</i>	7	0	0.642	0.435	0.159	0.206	1.077
<i>Boechera_serpenticola</i>	--	0	0.839	0.605	0.187	0.233	1.444
<i>Boechera_shockleyi</i>	--	1	2.321	2.030	0.480	0.291	4.350
<i>Boechera_shortii</i>	--	0	0.282	0.124	0.109	0.158	0.406
<i>Boechera_spatifolia</i>	7	0	1.201	0.918	0.237	0.282	2.119
<i>Boechera_stricta</i>	10	1	0.746	0.570	0.135	0.176	1.316
<i>Boechera_subpinnatifida</i>	7	0	0.361	0.193	0.120	0.168	0.553
<i>Boechera_suffrutescens</i>	--	0	0.534	0.342	0.144	0.192	0.877
<i>Boechera_texana</i>	--	0	0.366	0.197	0.121	0.169	0.563

<i>Boechera_tiehmii</i>	--	0	0.295	0.136	0.111	0.159	0.431
<i>Boechera_villosa</i>	--	0	1.153	0.877	0.230	0.276	2.031
<i>Boechera_williamsii</i>	14	1	0.464	0.309	0.073	0.156	0.773
<i>Boechera_yorkii</i>	--	0	0.361	0.193	0.120	0.168	0.553
<i>Bornmuellera_baldaccii</i>	8	1	0.361	0.213	0.050	0.148	0.574
<i>Bornmuellera_cappadocica</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Bornmuellera_dieckii</i>	--	1	0.361	0.213	0.050	0.148	0.574
<i>Bornmuellera_tymphaea</i>	8	1	0.359	0.211	0.050	0.148	0.571
<i>Borodinia_baicalensis</i>	--	0	2.373	1.932	0.400	0.442	4.305
<i>Borodinia_macrophylla</i>	7	0	2.373	1.932	0.400	0.442	4.305
<i>Brassica_balearica</i>	16	1	0.397	0.246	0.058	0.151	0.643
<i>Brassica_barrelieri</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_carinata</i>	17	1	0.500	0.342	0.081	0.158	0.842
<i>Brassica_cretica</i>	10	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_deflexa</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_desnottesii</i>	10	0	0.280	0.122	0.109	0.157	0.402
<i>Brassica_elongata</i>	11	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_fruticulosa</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_gravinae</i>	10	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_incana</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_insularis</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_junceae</i>	16	1	0.403	0.252	0.060	0.151	0.655
<i>Brassica_macrocarpa</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_maurorum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_montana</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_napus</i>	19	1	0.402	0.251	0.059	0.151	0.654
<i>Brassica_nigra</i>	10	0	0.279	0.121	0.109	0.157	0.400
<i>Brassica_oleracea</i>	12	1	0.434	0.281	0.066	0.153	0.715
<i>Brassica_oxyrhina</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_rapa</i>	11	0	0.278	0.121	0.109	0.157	0.399
<i>Brassica_repanda</i>	11	0	0.280	0.122	0.109	0.157	0.402
<i>Brassica_tournefortii</i>	10	0	0.279	0.122	0.109	0.157	0.401
<i>Brassica_villosa</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Braya_alpina</i>	16	1	1.004	0.809	0.191	0.195	1.812
<i>Braya_brachycarpa</i>	--	1	0.632	0.464	0.110	0.168	1.097
<i>Braya_fernaldii</i>	28	1	3.675	3.284	0.777	0.390	6.959
<i>Braya_forrestii</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Braya_gamosepala</i>	--	1	0.775	0.596	0.141	0.178	1.371
<i>Braya_glabella</i>	28	1	0.496	0.338	0.080	0.158	0.835
<i>Braya_humilis</i>	25	1	3.461	3.086	0.730	0.375	6.547
<i>Braya_linearis</i>	21	1	3.461	3.086	0.730	0.375	6.547
<i>Braya_longii</i>	28	1	3.675	3.284	0.777	0.390	6.959
<i>Braya_pilosa</i>	14	1	2.718	2.397	0.567	0.320	5.115
<i>Braya_rosea</i>	21	1	1.104	0.902	0.213	0.202	2.006
<i>Braya_scharnhorstii</i>	--	1	0.375	0.226	0.053	0.149	0.601
<i>Braya_siliquosa</i>	--	1	1.004	0.809	0.191	0.195	1.812
<i>Braya_thorild-wulfii</i>	14	1	2.718	2.397	0.567	0.320	5.115
<i>Bunias_orientalis</i>	10	1	0.390	0.240	0.057	0.150	0.630
<i>Cakile_arabica</i>	9	0	0.279	0.122	0.109	0.157	0.401

<i>Cakile_edentula</i>	14	1	1.065	0.865	0.205	0.199	1.930
<i>Cakile_lanceolata</i>	9	0	1.242	0.954	0.243	0.288	2.196
<i>Cakile_maritima</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Calepina_irregularis</i>	14	1	0.364	0.216	0.051	0.148	0.580
<i>Calymmatium_draboides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Camelina_alyssum</i>	21	1	3.347	2.981	0.705	0.366	6.328
<i>Camelina_microcarpa</i>	13	1	3.174	2.821	0.667	0.354	5.995
<i>Camelina_rumelica</i>	12	1	0.359	0.211	0.050	0.148	0.570
<i>Camelina_sativa</i>	14	1	3.347	2.981	0.705	0.366	6.328
<i>Capsella_bursa-pastoris</i>	10	1	1.876	1.617	0.382	0.259	3.492
<i>Capsella_grandiflora</i>	8	1	0.844	0.661	0.156	0.183	1.505
<i>Capsella_orientalis</i>	--	1	1.876	1.617	0.382	0.259	3.492
<i>Capsella_rubella</i>	7	1	0.844	0.661	0.156	0.183	1.505
<i>Cardamine_adriatica</i>	--	0	0.312	0.150	0.114	0.162	0.462
<i>Cardamine_alpina</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_amara</i>	28	1	0.486	0.329	0.078	0.157	0.815
<i>Cardamine_amporitana</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_angustata</i>	62	1	0.365	0.217	0.051	0.148	0.582
<i>Cardamine_appendiculata</i>	--	1	3.232	2.874	0.680	0.358	6.106
<i>Cardamine_asarifolia</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_barbareaoides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_bellidifolia</i>	8	0	0.280	0.123	0.109	0.157	0.403
<i>Cardamine_blaiddellii</i>	--	1	0.619	0.452	0.107	0.167	1.072
<i>Cardamine_bonariensis</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_bradei</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_breweri</i>	33	1	0.914	0.725	0.172	0.188	1.639
<i>Cardamine_bulbosa</i>	32	1	0.673	0.503	0.119	0.171	1.176
<i>Cardamine_caldeirarum</i>	--	1	0.486	0.329	0.078	0.157	0.815
<i>Cardamine_carnosa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_castellana</i>	8	0	0.333	0.169	0.116	0.165	0.502
<i>Cardamine_circaeoides</i>	--	0	0.382	0.211	0.123	0.171	0.593
<i>Cardamine_clematitis</i>	--	1	0.628	0.461	0.109	0.168	1.089
<i>Cardamine_concatenata</i>	120	1	2.701	2.382	0.563	0.319	5.083
<i>Cardamine_cordifolia</i>	12	1	0.914	0.725	0.172	0.188	1.639
<i>Cardamine_crassifolia</i>	15	1	0.607	0.441	0.104	0.166	1.048
<i>Cardamine_debilis</i>	24	1	0.609	0.443	0.105	0.166	1.052
<i>Cardamine_delavayi</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_dentipetala</i>	--	0	0.480	0.296	0.137	0.185	0.776
<i>Cardamine_digitata</i>	20	1	0.388	0.238	0.056	0.150	0.626
<i>Cardamine_diphylla</i>	48	1	0.361	0.213	0.050	0.148	0.574
<i>Cardamine_douglassii</i>	--	1	0.673	0.503	0.119	0.171	1.176
<i>Cardamine_ecuadorensis</i>	--	0	0.283	0.125	0.109	0.158	0.408
<i>Cardamine_enneaphyllos</i>	26	1	0.377	0.228	0.054	0.149	0.605
<i>Cardamine_fallax</i>	--	0	0.453	0.272	0.133	0.181	0.724
<i>Cardamine_fialae</i>	--	0	0.305	0.144	0.113	0.161	0.450
<i>Cardamine_flexuosa</i>	15	1	1.289	1.073	0.254	0.216	2.361
<i>Cardamine_fragariifolia</i>	--	0	0.278	0.121	0.109	0.157	0.399
<i>Cardamine_gallaecica</i>	--	1	1.289	1.073	0.254	0.216	2.361
<i>Cardamine_glanduligera</i>	21	1	0.392	0.242	0.057	0.150	0.635

<i>Cardamine_glauca</i>	8	0	0.428	0.251	0.130	0.177	0.679
<i>Cardamine_glechomifolia</i>	--	0	0.382	0.211	0.123	0.171	0.593
<i>Cardamine_graeca</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_griffithii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_hirsuta</i>	16	1	3.174	2.821	0.667	0.354	5.995
<i>Cardamine_impatiens</i>	12	1	0.382	0.232	0.055	0.150	0.614
<i>Cardamine_laciniata</i>	--	1	2.701	2.382	0.563	0.319	5.083
<i>Cardamine_leucantha</i>	8	0	0.271	0.115	0.108	0.156	0.387
<i>Cardamine_lihengiana</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_limprichtiana</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_longifructus</i>	--	0	0.484	0.299	0.137	0.185	0.784
<i>Cardamine_lyallii</i>	--	1	0.360	0.212	0.050	0.148	0.571
<i>Cardamine_macrophylla</i>	25	1	0.446	0.292	0.069	0.154	0.738
<i>Cardamine_manshurica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_maritima</i>	--	0	0.305	0.144	0.113	0.161	0.450
<i>Cardamine_matthioli</i>	--	0	0.327	0.163	0.116	0.164	0.490
<i>Cardamine_microphylla</i>	24	1	0.446	0.292	0.069	0.154	0.738
<i>Cardamine_microzyga</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_monteluccii</i>	8	0	0.312	0.150	0.114	0.162	0.462
<i>Cardamine_montenegrina</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_niigatensis</i>	16	1	0.405	0.254	0.060	0.151	0.660
<i>Cardamine_nipponica</i>	--	0	0.280	0.123	0.109	0.157	0.403
<i>Cardamine_nuttallii</i>	--	1	0.628	0.461	0.109	0.168	1.089
<i>Cardamine_occidentalis</i>	32	1	0.448	0.294	0.069	0.154	0.742
<i>Cardamine_oligosperma</i>	8	0	0.283	0.125	0.109	0.158	0.408
<i>Cardamine_ovata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_pancicii</i>	--	0	0.428	0.251	0.130	0.177	0.679
<i>Cardamine_parviflora</i>	14	1	0.424	0.271	0.064	0.153	0.696
<i>Cardamine_pattersonii</i>	--	0	0.283	0.125	0.109	0.158	0.408
<i>Cardamine_paucijuga</i>	--	0	0.453	0.272	0.133	0.181	0.724
<i>Cardamine_pedata</i>	15	1	0.619	0.452	0.107	0.167	1.072
<i>Cardamine_pensylvanica</i>	24	1	0.873	0.687	0.163	0.185	1.560
<i>Cardamine_pentaphyllos</i>	23	1	0.419	0.266	0.063	0.152	0.685
<i>Cardamine_pratensis</i>	24	1	0.405	0.254	0.060	0.151	0.659
<i>Cardamine_purpurea</i>	44	1	0.391	0.241	0.057	0.150	0.632
<i>Cardamine_raphanifolia</i>	24	1	0.593	0.428	0.101	0.165	1.022
<i>Cardamine_regeliana</i>	--	0	0.303	0.143	0.112	0.160	0.445
<i>Cardamine_resedifolia</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_rhizomata</i>	--	0	0.283	0.125	0.109	0.158	0.408
<i>Cardamine_rupestris</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_rupicola</i>	--	1	0.360	0.212	0.050	0.148	0.571
<i>Cardamine_schulzii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_scutata</i>	16	1	0.516	0.356	0.084	0.159	0.872
<i>Cardamine_serbica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_sp._RS-2013</i>	--	1	3.232	2.874	0.680	0.358	6.106
<i>Cardamine_tanakae</i>	--	0	0.484	0.299	0.137	0.185	0.784
<i>Cardamine_tangutorum</i>	21	1	0.446	0.292	0.069	0.154	0.738
<i>Cardamine_trifolia</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Cardamine_umbellata</i>	--	1	0.609	0.443	0.105	0.166	1.052

<i>Cardamine_victoris</i>	14	1	0.390	0.240	0.057	0.150	0.629
<i>Cardamine_zezoensis</i>	30	1	0.361	0.213	0.050	0.148	0.574
<i>Cardamine_yunnanensis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Carrichtera_annua</i>	8	0	0.279	0.122	0.109	0.157	0.400
<i>Catenulina_hedysaroides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Caulanthus_anceps</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Caulanthus_coulteri</i>	14	1	0.692	0.520	0.123	0.172	1.211
<i>Caulanthus_crassicaulis</i>	13	1	0.359	0.211	0.050	0.148	0.570
<i>Caulanthus_flavescens</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Caulanthus_glaucus</i>	10	1	0.359	0.211	0.050	0.148	0.569
<i>Caulanthus_hallii</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Caulanthus_heterophyllus</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Caulanthus_inflatus</i>	14	1	0.359	0.211	0.050	0.148	0.571
<i>Caulanthus_lasiophyllus</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Caulanthus_lemmonii</i>	--	1	0.692	0.520	0.123	0.172	1.211
<i>Caulanthus_major</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Caulanthus_pilosus</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Caulanthus_simulans</i>	16	1	0.359	0.211	0.050	0.148	0.569
<i>Chalcanthus_renifolius</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Chaunanthus_acuminatus</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Chaunanthus_petirolatus</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Chilocardamum_patagonicum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Chlorocrambe_hastata</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Chorispora_bungeana</i>	--	0	0.280	0.123	0.109	0.157	0.403
<i>Chorispora_macropoda</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Chorispora_persica</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Chorispora_purpurascens</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Chorispora_sabulosa</i>	--	0	0.280	0.123	0.109	0.157	0.403
<i>Chorispora_sibirica</i>	--	0	0.280	0.123	0.109	0.157	0.402
<i>Chorispora_songarica</i>	--	0	0.280	0.123	0.109	0.157	0.402
<i>Chorispora_tashkorganica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Chorispora_tenella</i>	10	1	0.452	0.297	0.070	0.155	0.748
<i>Christolea_crassifolia</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Chrysochamela_velutina</i>	10	1	0.360	0.212	0.050	0.148	0.571
<i>Clastopus_vestitus</i>	8	1	0.359	0.211	0.050	0.148	0.569
<i>Clausia_agideliensis</i>	--	1	3.008	2.666	0.631	0.342	5.674
<i>Clausia_aprica</i>	10	1	3.926	3.517	0.832	0.409	7.443
<i>Clausia_kasakhorum</i>	--	1	0.547	0.385	0.091	0.162	0.933
<i>Clausia_robusta</i>	--	1	3.926	3.517	0.832	0.409	7.443
<i>Clausia_trichosepala</i>	--	1	0.364	0.216	0.051	0.148	0.580
<i>Clypeola_aspera</i>	13	1	0.359	0.211	0.050	0.148	0.570
<i>Clypeola_cyclodontea</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Clypeola_dichotoma</i>	7	1	0.359	0.211	0.050	0.148	0.570
<i>Clypeola_jonthlaspi</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Clypeola_lappacea</i>	7	1	0.359	0.211	0.050	0.148	0.570
<i>Coincya_monensis</i>	11	0	0.279	0.122	0.109	0.157	0.401
<i>Conringia_orientalis</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Conringia_planisiliqua</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Cordylocarpus_muricatus</i>	8	0	0.279	0.122	0.109	0.157	0.401

<i>Crambe_orientalis</i>	15	1	0.384	0.234	0.055	0.150	0.619
<i>Crucihimalaya_himalaica</i>	8	0	0.288	0.130	0.110	0.158	0.418
<i>Crucihimalaya_kneuckeri</i>	--	0	0.426	0.249	0.129	0.177	0.675
<i>Crucihimalaya_lasiocarpa</i>	--	0	0.291	0.132	0.111	0.159	0.423
<i>Crucihimalaya_mollissima</i>	8	0	0.426	0.249	0.129	0.177	0.675
<i>Crucihimalaya_mongolica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Crucihimalaya_stricta</i>	7	0	0.288	0.130	0.110	0.158	0.418
<i>Crucihimalaya_tenuisiliqua</i>	--	0	0.291	0.132	0.111	0.159	0.423
<i>Crucihimalaya_wallichii</i>	8	0	0.294	0.135	0.111	0.159	0.429
<i>Cryptospora_falcata</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Cuphonotus_humistratus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cusickiella_douglasii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cusickiella_quadricostata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Cyphocardamum_aretoides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Degenia_velebitica</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Delpinophytum_patagonicum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dendroarabis_fruticulosa</i>	8	1	0.360	0.212	0.050	0.148	0.573
<i>Descurainia_adenophora</i>	--	0	1.280	0.987	0.248	0.293	2.266
<i>Descurainia_antarctica</i>	--	0	0.556	0.361	0.147	0.195	0.917
<i>Descurainia_appendiculata</i>	--	0	4.941	4.150	0.756	0.791	9.091
<i>Descurainia_argentina</i>	--	0	0.621	0.418	0.156	0.204	1.039
<i>Descurainia_artemisioides</i>	7	0	0.318	0.156	0.114	0.163	0.474
<i>Descurainia_athrocarpa</i>	--	0	0.306	0.145	0.113	0.161	0.451
<i>Descurainia_bourgeauana</i>	7	0	0.993	0.738	0.208	0.254	1.731
<i>Descurainia_brevisiliqua</i>	--	0	0.616	0.413	0.156	0.203	1.029
<i>Descurainia_californica</i>	7	0	2.533	2.069	0.422	0.464	4.603
<i>Descurainia_cumingiana_subsp._cumingiana</i>	--	0	1.018	0.761	0.212	0.258	1.779
<i>Descurainia_depressa</i>	--	0	0.305	0.144	0.113	0.161	0.449
<i>Descurainia_gilva</i>	7	0	0.993	0.738	0.208	0.254	1.731
<i>Descurainia_glaucescens</i>	--	0	2.005	1.613	0.348	0.392	3.617
<i>Descurainia_gonzalezii</i>	8	0	2.390	1.946	0.402	0.444	4.336
<i>Descurainia_heterotricha</i>	--	0	1.018	0.761	0.212	0.258	1.779
<i>Descurainia_impatiens</i>	7	0	0.342	0.177	0.118	0.166	0.519
<i>Descurainia_incana</i>	10	0	3.620	3.009	0.573	0.611	6.628
<i>Descurainia_incisa</i>	--	0	3.620	3.009	0.573	0.611	6.628
<i>Descurainia_kochii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Descurainia_lemsii</i>	7	0	2.390	1.946	0.402	0.444	4.336
<i>Descurainia_leptoclada</i>	7	0	1.348	1.045	0.257	0.302	2.393
<i>Descurainia_longipedicellata</i>	--	0	0.639	0.433	0.159	0.206	1.073
<i>Descurainia_millefolia</i>	7	0	1.936	1.553	0.339	0.382	3.489
<i>Descurainia_myriophylla</i>	7	0	1.434	1.119	0.269	0.314	2.553
<i>Descurainia_nelsonii</i>	--	0	0.632	0.427	0.158	0.205	1.060
<i>Descurainia_obtusa_subsp._obtusa</i>	--	0	1.383	1.076	0.262	0.307	2.459
<i>Descurainia_paradisa_subsp._nevadensis</i>	--	0	0.639	0.433	0.159	0.206	1.073
<i>Descurainia_pimpinellifolia</i>	--	0	4.941	4.150	0.756	0.791	9.091
<i>Descurainia_pinnata</i>	14	1	1.183	0.975	0.231	0.208	2.158
<i>Descurainia_preauxiana</i>	7	0	1.485	1.164	0.276	0.321	2.649
<i>Descurainia_sophia</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Descurainia_sophioides</i>	12	1	0.654	0.485	0.115	0.169	1.139

<i>Descurainia_streptocarpa</i>	14	1	1.141	0.936	0.221	0.205	2.077
<i>Descurainia_stricta</i>	--	0	2.259	1.833	0.384	0.426	4.091
<i>Descurainia_tanacetifolia</i>	--	0	0.284	0.126	0.110	0.158	0.410
<i>Descurainia_virletii</i>	14	1	0.521	0.361	0.085	0.160	0.883
<i>Dichasianthus_subtilissimus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Didesmus_aegypticus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Didymophysa_aucheri</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Didymophysa_fedtschenkoana</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dilophia_salsa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dimorphocarpa_wislizeni</i>	9	1	0.362	0.214	0.051	0.148	0.575
<i>Diplotaxis_acris</i>	11	0	0.279	0.122	0.109	0.157	0.401
<i>Diplotaxis_catholica</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Diplotaxis_eruroides</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Diplotaxis_harra</i>	13	0	0.279	0.122	0.109	0.157	0.401
<i>Diplotaxis_tenuifolia</i>	10	0	0.279	0.122	0.109	0.157	0.401
<i>Dipoma_iberideum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Diptychocarpus_strictus</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Dithyrea_californica</i>	10	1	0.359	0.211	0.050	0.148	0.571
<i>Dontostemon_crassifolius</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_dentatus</i>	7	0	0.298	0.138	0.112	0.160	0.436
<i>Dontostemon_elegans</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_glandulosus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_gubanovii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_hispidus</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_integrifolius</i>	7	0	0.298	0.138	0.112	0.160	0.436
<i>Dontostemon_intermedius</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_micranthus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_perennis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_pinnatifidus</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Dontostemon_senilis</i>	14	1	0.392	0.242	0.057	0.150	0.633
<i>Dontostemon_tibeticus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_affghanica</i>	--	0	0.304	0.144	0.112	0.161	0.448
<i>Draba_albertina</i>	12	1	3.257	2.897	0.685	0.360	6.154
<i>Draba_alpina</i>	37	0	4.313	3.608	0.669	0.706	7.921
<i>Draba_altaica</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_alyssoides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_amplexicaulis</i>	--	0	1.691	1.342	0.305	0.349	3.033
<i>Draba_arabisans</i>	48	0	0.609	0.407	0.155	0.202	1.016
<i>Draba_arctica</i>	--	1	0.942	0.752	0.178	0.191	1.694
<i>Draba_aretioides</i>	--	0	1.762	1.404	0.315	0.359	3.166
<i>Draba_arseniewii</i>	--	0	0.281	0.124	0.109	0.157	0.405
<i>Draba_asprella</i>	15	1	3.080	2.733	0.646	0.347	5.812
<i>Draba_aurea</i>	36	1	0.599	0.433	0.102	0.165	1.032
<i>Draba_aureola</i>	10	1	3.080	2.733	0.646	0.347	5.812
<i>Draba_baicalensis</i>	--	0	2.023	1.629	0.351	0.394	3.652
<i>Draba_barbata</i>	--	1	2.707	2.387	0.565	0.320	5.094
<i>Draba_bellii</i>	--	0	0.459	0.278	0.134	0.182	0.737
<i>Draba_bifurcata</i>	--	0	0.389	0.217	0.124	0.172	0.606
<i>Draba_borealis</i>	40	0	0.984	0.731	0.207	0.253	1.715

<i>Draba_brachystylis</i>	22	1	1.398	1.174	0.278	0.224	2.573
<i>Draba_breweri</i>	16	1	0.399	0.249	0.059	0.151	0.648
<i>Draba_burkei</i>	10	1	4.031	3.615	0.855	0.416	7.646
<i>Draba_cana</i>	16	0	1.263	0.972	0.246	0.291	2.236
<i>Draba_cholaensis</i>	--	0	0.289	0.131	0.110	0.159	0.420
<i>Draba_cinerea</i>	26	0	2.525	2.063	0.421	0.463	4.588
<i>Draba_confusa</i>	--	0	1.772	1.412	0.316	0.360	3.184
<i>Draba_corrugata</i>	--	1	0.786	0.607	0.144	0.179	1.393
<i>Draba_corymbosa</i>	60	1	0.658	0.488	0.115	0.170	1.146
<i>Draba_crassa</i>	18	1	0.542	0.381	0.090	0.161	0.922
<i>Draba_crassifolia</i>	26	1	3.257	2.897	0.685	0.360	6.154
<i>Draba_cusickii</i>	13	1	1.304	1.087	0.257	0.217	2.391
<i>Draba_densifolia</i>	18	1	0.786	0.607	0.144	0.179	1.393
<i>Draba_doerfleri</i>	--	0	2.115	1.708	0.364	0.407	3.823
<i>Draba_elata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_elegans</i>	--	0	0.280	0.123	0.109	0.157	0.402
<i>Draba_eriopoda</i>	8	0	0.327	0.164	0.116	0.164	0.491
<i>Draba_eschscholtzii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_falconeri</i>	--	0	0.987	0.733	0.207	0.253	1.720
<i>Draba_fladnizensis</i>	8	0	2.570	2.102	0.427	0.469	4.672
<i>Draba_fuhaiensis</i>	--	0	2.570	2.102	0.427	0.469	4.672
<i>Draba_gilliesii</i>	24	1	0.411	0.259	0.061	0.152	0.670
<i>Draba_glabella</i>	35	1	1.024	0.828	0.196	0.197	1.852
<i>Draba_glacialis</i>	8	0	1.251	0.962	0.244	0.289	2.213
<i>Draba_globosa</i>	--	1	4.031	3.615	0.855	0.416	7.646
<i>Draba_gmelini</i>	--	1	0.942	0.752	0.178	0.191	1.694
<i>Draba_gracillima</i>	--	0	0.327	0.164	0.116	0.164	0.491
<i>Draba_groenlandica</i>	--	0	1.507	1.183	0.279	0.324	2.691
<i>Draba_helleriana</i>	9	0	0.296	0.136	0.111	0.159	0.432
<i>Draba_heterocoma</i>	--	0	0.280	0.123	0.109	0.157	0.402
<i>Draba_himalayensis</i>	--	0	3.531	2.932	0.560	0.599	6.463
<i>Draba_hirta</i>	40	0	2.386	1.943	0.401	0.444	4.329
<i>Draba_hitchcockii</i>	27	0	0.420	0.244	0.129	0.176	0.664
<i>Draba_incerta</i>	56	1	0.512	0.352	0.083	0.159	0.864
<i>Draba_involucrata</i>	--	0	0.288	0.129	0.110	0.158	0.417
<i>Draba_jaegeri</i>	27	0	0.403	0.229	0.126	0.174	0.632
<i>Draba_juniperina</i>	--	1	4.142	3.718	0.879	0.424	7.859
<i>Draba_juvenilis</i>	32	0	3.531	2.932	0.560	0.599	6.463
<i>Draba_kamtschatica</i>	--	0	4.895	4.110	0.750	0.785	9.005
<i>Draba_kananaskia</i>	--	0	1.251	0.962	0.244	0.289	2.213
<i>Draba_kassii</i>	11	1	2.331	2.039	0.482	0.292	4.371
<i>Draba_koeiei</i>	--	0	0.772	0.547	0.177	0.224	1.319
<i>Draba_korshinskyi</i>	--	0	0.281	0.124	0.109	0.157	0.405
<i>Draba_ladina</i>	16	0	1.259	0.969	0.245	0.290	2.228
<i>Draba_laurentiana</i>	--	0	0.474	0.290	0.136	0.184	0.764
<i>Draba_lichiangensis</i>	--	0	0.741	0.521	0.173	0.220	1.261
<i>Draba_lonchocarpa</i>	10	0	0.569	0.372	0.149	0.197	0.941
<i>Draba_longipes</i>	--	0	2.608	2.135	0.432	0.474	4.743
<i>Draba_luteola</i>	--	0	0.411	0.236	0.127	0.175	0.647

<i>Draba_macrocarpa</i>	--	1	3.554	3.173	0.751	0.382	6.727
<i>Draba_magellanica</i>	32	1	3.554	3.173	0.751	0.382	6.727
<i>Draba_matangensis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_melanopus</i>	16	1	0.426	0.273	0.065	0.153	0.699
<i>Draba_micropetala</i>	16	1	0.404	0.253	0.060	0.151	0.657
<i>Draba_mogollonica</i>	14	1	1.340	1.121	0.265	0.220	2.461
<i>Draba_murrayi</i>	19	0	0.308	0.147	0.113	0.161	0.455
<i>Draba_nivalis</i>	8	0	4.895	4.110	0.750	0.785	9.005
<i>Draba_novolympica</i>	--	0	0.821	0.590	0.184	0.231	1.411
<i>Draba_nylamensis</i>	--	0	1.259	0.969	0.245	0.290	2.228
<i>Draba_oblongata</i>	28	0	0.632	0.427	0.158	0.205	1.059
<i>Draba_obovata</i>	--	0	1.762	1.404	0.315	0.359	3.166
<i>Draba_ochroleuca</i>	40	0	4.270	3.570	0.663	0.700	7.840
<i>Draba_odudiana</i>	--	0	0.288	0.130	0.110	0.158	0.418
<i>Draba_ogilviensis</i>	8	1	0.899	0.711	0.168	0.187	1.610
<i>Draba_olgae</i>	6	0	0.772	0.547	0.177	0.224	1.319
<i>Draba_oligosperma</i>	30	0	1.051	0.789	0.216	0.262	1.839
<i>Draba_oxycarpa</i>	32	0	4.087	3.412	0.637	0.675	7.498
<i>Draba_palanderiana</i>	20	1	0.561	0.398	0.094	0.163	0.959
<i>Draba_pauciflora</i>	20	1	0.413	0.261	0.062	0.152	0.675
<i>Draba_paysonii</i>	21	1	0.674	0.503	0.119	0.171	1.177
<i>Draba_pectinipila</i>	11	1	4.142	3.718	0.879	0.424	7.859
<i>Draba_pilosa</i>	16	1	2.707	2.387	0.565	0.320	5.094
<i>Draba_pohlei</i>	--	0	4.313	3.608	0.669	0.706	7.921
<i>Draba_polyphylla</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_porsildii</i>	16	1	0.575	0.411	0.097	0.164	0.986
<i>Draba_praealta</i>	28	0	0.624	0.420	0.157	0.204	1.043
<i>Draba_primuloides</i>	--	0	1.845	1.475	0.326	0.370	3.321
<i>Draba_prozorovskii</i>	--	0	2.608	2.135	0.432	0.474	4.743
<i>Draba_pterosperma</i>	--	0	0.420	0.244	0.129	0.176	0.664
<i>Draba_pycnosperma</i>	--	0	0.828	0.596	0.185	0.232	1.424
<i>Draba_pygmaea</i>	--	0	2.600	2.127	0.431	0.473	4.728
<i>Draba_ramosissima</i>	8	0	0.293	0.134	0.111	0.159	0.428
<i>Draba_ramulosa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_rectifracta</i>	12	1	1.280	1.065	0.252	0.215	2.344
<i>Draba_reptans</i>	15	1	1.409	1.184	0.280	0.225	2.594
<i>Draba_rigida</i>	--	0	0.281	0.123	0.109	0.157	0.404
<i>Draba_ruaxes</i>	36	1	0.491	0.333	0.079	0.158	0.824
<i>Draba_rupestris</i>	--	0	2.115	1.708	0.364	0.407	3.823
<i>Draba_sachalinensis</i>	32	0	2.534	2.070	0.422	0.464	4.604
<i>Draba_scopulorum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_sherriffii</i>	--	0	0.281	0.123	0.109	0.157	0.404
<i>Draba_sikkimensis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_sobolifera</i>	13	1	3.916	3.508	0.830	0.408	7.424
<i>Draba_spectabilis</i>	13	1	1.974	1.708	0.404	0.266	3.682
<i>Draba_sphaerocarpa</i>	10	0	0.716	0.499	0.170	0.217	1.215
<i>Draba_sphaeroides</i>	10	1	2.974	2.635	0.623	0.339	5.609
<i>Draba_staintonii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Draba_stenopetala</i>	12	1	1.486	1.256	0.297	0.230	2.742

<i>Draba_streptobrachia</i>	32	1	1.325	1.107	0.262	0.219	2.432
<i>Draba_stylaris</i>	8	0	0.294	0.135	0.111	0.159	0.428
<i>Draba_subalpina</i>	13	1	3.916	3.508	0.830	0.408	7.424
<i>Draba_subamplexicaulis</i>	24	0	0.284	0.126	0.110	0.158	0.410
<i>Draba_subcapitata</i>	8	0	0.631	0.426	0.158	0.205	1.058
<i>Draba_supranivalis</i>	8	0	0.570	0.374	0.149	0.197	0.944
<i>Draba_surculosa</i>	--	0	2.525	2.063	0.421	0.463	4.588
<i>Draba_tibetica</i>	--	0	0.987	0.733	0.207	0.253	1.720
<i>Draba_tomentosa</i>	8	0	0.570	0.374	0.149	0.197	0.944
<i>Draba_turczaninovii</i>	--	0	1.845	1.475	0.326	0.370	3.321
<i>Draba_ussuriensis</i>	12	0	1.757	1.399	0.314	0.358	3.156
<i>Draba_ventosa</i>	18	1	0.402	0.251	0.059	0.151	0.653
<i>Draba_yunnanensis</i>	--	0	0.286	0.127	0.110	0.158	0.413
<i>Drabastrum_alpestre</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Dryopetalon_viereckii</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Elburzia_fenestrata</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Englerocharis_pauciflora</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Eremoblastus_caspicus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Eremophyton_chevallieri</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Eruca_vesicaria_subsp_sativa</i>	--	1	0.368	0.219	0.052	0.149	0.587
<i>Erucaria_erucarioides</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Erucastrum_gallicum</i>	15	1	0.387	0.237	0.056	0.150	0.624
<i>Erysimum_acrotonum</i>	--	0	3.367	2.790	0.538	0.577	6.158
<i>Erysimum_alaicum</i>	--	0	0.494	0.307	0.139	0.186	0.801
<i>Erysimum_amurense</i>	--	0	0.737	0.517	0.172	0.219	1.254
<i>Erysimum_angustatum</i>	--	1	2.939	2.603	0.616	0.337	5.542
<i>Erysimum_arbuscula</i>	14	1	0.757	0.580	0.137	0.177	1.336
<i>Erysimum_aspermum</i>	--	0	3.149	2.602	0.507	0.547	5.751
<i>Erysimum_asperum</i>	18	1	2.939	2.603	0.616	0.337	5.542
<i>Erysimum_aucherianum</i>	--	0	2.449	1.997	0.410	0.452	4.446
<i>Erysimum_aureum</i>	--	0	2.449	1.997	0.410	0.452	4.446
<i>Erysimum_badghysi</i>	--	0	0.614	0.411	0.155	0.203	1.025
<i>Erysimum_baeticum</i>	21	1	3.461	3.086	0.730	0.375	6.547
<i>Erysimum_belvederense</i>	--	0	0.337	0.172	0.117	0.165	0.509
<i>Erysimum_bicolor</i>	15	1	1.590	1.352	0.320	0.238	2.942
<i>Erysimum_boreale</i>	8	0	4.128	3.448	0.643	0.680	7.576
<i>Erysimum_caboverdeanum</i>	--	1	0.751	0.575	0.136	0.177	1.326
<i>Erysimum_caespitosum</i>	28	1	0.415	0.263	0.062	0.152	0.678
<i>Erysimum_callicarpum</i>	--	0	0.737	0.517	0.172	0.219	1.254
<i>Erysimum_canum</i>	--	0	2.996	2.469	0.486	0.526	5.465
<i>Erysimum_capitatum</i>	18	1	0.485	0.328	0.078	0.157	0.814
<i>Erysimum_carniolicum</i>	16	1	1.323	1.104	0.261	0.218	2.427
<i>Erysimum_cazorlense</i>	21	1	0.672	0.501	0.118	0.171	1.173
<i>Erysimum_cheiranthoides</i>	8	0	0.306	0.145	0.113	0.161	0.451
<i>Erysimum_cheiri</i>	--	0	0.314	0.152	0.114	0.162	0.465
<i>Erysimum_collisparsum</i>	--	0	0.838	0.605	0.186	0.233	1.442
<i>Erysimum_comatum</i>	7	0	0.285	0.127	0.110	0.158	0.413
<i>Erysimum_crassicaule</i>	24	1	0.579	0.415	0.098	0.164	0.994
<i>Erysimum_crassipes</i>	7	0	0.401	0.227	0.126	0.174	0.629

<i>Erysimum_crepidifolium</i>	7	0	0.387	0.215	0.124	0.172	0.602
<i>Erysimum_cuspidatum</i>	8	0	0.289	0.130	0.110	0.159	0.419
<i>Erysimum_cyaneum</i>	--	0	1.326	1.027	0.254	0.300	2.353
<i>Erysimum_czernjajevi</i>	--	0	1.326	1.027	0.254	0.300	2.353
<i>Erysimum_deflexum</i>	--	0	2.415	1.967	0.405	0.447	4.382
<i>Erysimum_diffusum</i>	18	1	0.426	0.273	0.065	0.153	0.699
<i>Erysimum_duriaei</i>	12	1	0.927	0.738	0.175	0.189	1.665
<i>Erysimum_ehrendorferi</i>	--	1	3.178	2.824	0.668	0.354	6.001
<i>Erysimum_elbrusense</i>	--	0	0.932	0.686	0.200	0.246	1.619
<i>Erysimum_fitzii</i>	--	0	1.006	0.750	0.210	0.256	1.755
<i>Erysimum_gelidum</i>	18	1	0.676	0.505	0.119	0.171	1.180
<i>Erysimum_ghaznicum</i>	--	0	3.367	2.790	0.538	0.577	6.158
<i>Erysimum_gomez-campoi</i>	--	0	1.397	1.088	0.264	0.309	2.484
<i>Erysimum_gorbeanum</i>	--	0	2.888	2.376	0.471	0.512	5.264
<i>Erysimum_gramineum</i>	--	1	1.403	1.179	0.279	0.224	2.583
<i>Erysimum_griffithianum</i>	--	0	0.317	0.155	0.114	0.162	0.472
<i>Erysimum_griffithii</i>	--	0	1.165	0.887	0.232	0.278	2.052
<i>Erysimum_gypsaceum</i>	--	0	0.289	0.131	0.110	0.159	0.420
<i>Erysimum_handel-mazzettii</i>	--	0	4.208	3.517	0.654	0.691	7.725
<i>Erysimum_hieraciifolium</i>	16	1	1.541	1.306	0.309	0.234	2.847
<i>Erysimum_hirschfeldioides</i>	--	0	1.022	0.764	0.212	0.258	1.787
<i>Erysimum_humillimum</i>	--	0	0.377	0.206	0.123	0.170	0.583
<i>Erysimum_idae</i>	--	0	0.401	0.227	0.126	0.174	0.629
<i>Erysimum_inense</i>	--	0	1.531	1.204	0.283	0.327	2.735
<i>Erysimum_ischnostylum</i>	20	1	0.699	0.526	0.124	0.173	1.225
<i>Erysimum_jugicola</i>	9	0	0.838	0.605	0.186	0.233	1.442
<i>Erysimum_kamelinii</i>	--	0	0.369	0.199	0.121	0.169	0.568
<i>Erysimum_kerbabaevii</i>	--	0	0.465	0.282	0.135	0.182	0.747
<i>Erysimum_krendlii</i>	7	0	0.594	0.394	0.153	0.200	0.989
<i>Erysimum_kurdicum</i>	8	0	0.389	0.216	0.124	0.172	0.605
<i>Erysimum_lagascae</i>	--	0	2.859	2.352	0.467	0.508	5.211
<i>Erysimum_laxiflorum</i>	--	0	0.328	0.165	0.116	0.164	0.493
<i>Erysimum_lazistanicum</i>	--	0	0.594	0.394	0.153	0.200	0.989
<i>Erysimum_ledebourii</i>	--	0	1.531	1.204	0.283	0.327	2.735
<i>Erysimum_leptostylum</i>	--	0	0.736	0.517	0.172	0.219	1.253
<i>Erysimum_leucanthemum</i>	6	0	3.191	2.638	0.513	0.553	5.829
<i>Erysimum_lilacinum</i>	--	0	0.620	0.416	0.156	0.203	1.036
<i>Erysimum_linariifolium</i>	12	1	0.995	0.800	0.189	0.194	1.795
<i>Erysimum_linifolium</i>	7	0	1.156	0.880	0.231	0.276	2.036
<i>Erysimum_lycaonicum</i>	--	0	0.401	0.227	0.126	0.174	0.628
<i>Erysimum_macrostigma</i>	--	0	0.736	0.517	0.172	0.219	1.253
<i>Erysimum_mediohispanicum</i>	--	1	3.461	3.086	0.730	0.375	6.547
<i>Erysimum_merxmuelleri</i>	--	1	3.145	2.794	0.661	0.352	5.939
<i>Erysimum_metlesicsii</i>	7	0	0.349	0.182	0.119	0.167	0.531
<i>Erysimum_mongolicum</i>	--	0	4.186	3.497	0.651	0.688	7.683
<i>Erysimum_myriophyllum</i>	10	0	0.981	0.728	0.206	0.253	1.709
<i>Erysimum_nasturtioides</i>	--	0	0.932	0.686	0.200	0.246	1.619
<i>Erysimum_naxense</i>	9	0	0.461	0.279	0.134	0.182	0.741
<i>Erysimum_nervosum</i>	--	1	3.178	2.824	0.668	0.354	6.001

<i>Erysimum nevadense</i>	7	0	1.118	0.846	0.225	0.271	1.964
<i>Erysimum ochroleucum</i>	16	1	1.106	0.904	0.214	0.203	2.010
<i>Erysimum odoratum</i>	10	0	0.301	0.141	0.112	0.160	0.442
<i>Erysimum oleifolium</i>	--	0	1.022	0.764	0.212	0.258	1.787
<i>Erysimum pachycarpum</i>	9	0	2.415	1.967	0.405	0.447	4.382
<i>Erysimum pallasii</i>	--	1	3.148	2.796	0.661	0.352	5.944
<i>Erysimum passgalense</i>	--	0	3.203	2.648	0.515	0.555	5.851
<i>Erysimum pectinatum</i>	6	0	0.389	0.217	0.124	0.172	0.606
<i>Erysimum penyalareense</i>	19	1	3.145	2.794	0.661	0.352	5.939
<i>Erysimum perofskianum</i>	9	0	0.458	0.276	0.134	0.181	0.734
<i>Erysimum popovii</i>	14	1	2.794	2.468	0.584	0.326	5.261
<i>Erysimum pseudopurpureum</i>	--	0	0.355	0.188	0.119	0.168	0.543
<i>Erysimum pulchellum</i>	28	1	0.531	0.370	0.088	0.160	0.901
<i>Erysimum purpureum</i>	20	1	0.449	0.295	0.070	0.154	0.744
<i>Erysimum quadrangulum</i>	--	0	2.847	2.341	0.465	0.506	5.188
<i>Erysimum redowskii</i>	14	1	3.148	2.796	0.661	0.352	5.944
<i>Erysimum repandum</i>	8	0	0.349	0.182	0.119	0.167	0.531
<i>Erysimum rhodium</i>	8	0	0.465	0.283	0.135	0.182	0.748
<i>Erysimum rondae</i>	--	0	1.006	0.750	0.210	0.256	1.755
<i>Erysimum roseum</i>	--	0	4.208	3.517	0.654	0.691	7.725
<i>Erysimum ruscinonense</i>	--	0	2.888	2.376	0.471	0.512	5.264
<i>Erysimum salangense</i>	35	1	0.592	0.427	0.101	0.165	1.020
<i>Erysimum scabrum</i>	14	1	0.531	0.371	0.088	0.160	0.902
<i>Erysimum scoparium</i>	14	1	1.590	1.352	0.320	0.238	2.942
<i>Erysimum seipkae</i>	--	0	1.413	1.102	0.266	0.311	2.515
<i>Erysimum semperflorens</i>	7	0	0.648	0.440	0.160	0.207	1.088
<i>Erysimum senoneri</i>	8	0	0.465	0.283	0.135	0.182	0.748
<i>Erysimum siliculosum</i>	7	0	4.186	3.497	0.651	0.688	7.683
<i>Erysimum sintenianum</i>	--	1	0.427	0.274	0.065	0.153	0.701
<i>Erysimum sisymbrioides</i>	10	0	0.327	0.163	0.116	0.164	0.490
<i>Erysimum smyrnaeum</i>	7	0	0.289	0.131	0.110	0.159	0.420
<i>Erysimum spetae</i>	--	0	3.203	2.648	0.515	0.555	5.851
<i>Erysimum stenophyllum</i>	7	0	1.564	1.232	0.287	0.332	2.797
<i>Erysimum subulatum</i>	14	1	0.473	0.317	0.075	0.156	0.790
<i>Erysimum thomsonii</i>	--	0	1.295	0.999	0.250	0.295	2.294
<i>Erysimum uncinatifolium</i>	--	0	0.644	0.438	0.160	0.207	1.082
<i>Erysimum virescens</i>	--	1	0.757	0.580	0.137	0.177	1.336
<i>Erysimum virgatum</i>	16	1	1.491	1.260	0.298	0.231	2.750
<i>Erysimum vitellinum</i>	--	0	1.256	0.966	0.245	0.290	2.222
<i>Erysimum witmannii</i>	7	0	3.070	2.534	0.496	0.537	5.604
<i>Euclidium syriacum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Eutrema altaicum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Eutrema botschantzevii</i>	--	0	3.052	2.518	0.494	0.534	5.570
<i>Eutrema edwardsii</i>	16	1	0.556	0.394	0.093	0.162	0.951
<i>Eutrema halophilum</i>	7	0	3.052	2.518	0.494	0.534	5.570
<i>Eutrema heterophyllum</i>	10	0	0.279	0.121	0.109	0.157	0.400
<i>Eutrema japonicum</i>	14	1	0.399	0.248	0.059	0.151	0.647
<i>Eutrema penlandii</i>	--	1	0.556	0.394	0.093	0.162	0.951
<i>Eutrema salsugineum</i>	7	0	0.698	0.484	0.167	0.214	1.182

<i>Eutrema_verticillatum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Exhalimolobos_berlandieri</i>	--	0	0.356	0.188	0.120	0.168	0.544
<i>Exhalimolobos_hispidulus</i>	--	1	1.594	1.356	0.321	0.238	2.949
<i>Exhalimolobos_palmeri</i>	--	1	1.655	1.412	0.334	0.243	3.067
<i>Exhalimolobos_parryi</i>	12	1	0.510	0.351	0.083	0.159	0.862
<i>Exhalimolobos_weddellii</i>	16	1	1.655	1.412	0.334	0.243	3.067
<i>Fezia_pterocarpa</i>	11	0	0.279	0.122	0.109	0.157	0.400
<i>Fibigia_clypeata</i>	8	1	0.412	0.260	0.061	0.152	0.671
<i>Fibigia_eriocarpa</i>	8	1	0.412	0.260	0.061	0.152	0.671
<i>Fibigia_lunarioides</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Fibigia_macrocarpa</i>	8	1	0.371	0.222	0.053	0.149	0.593
<i>Fibigia_spathulata</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Fibigia_suffruticosa</i>	8	1	0.359	0.211	0.050	0.148	0.569
<i>Fibigia_triquetra</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Fibigia_umbellata</i>	8	1	0.359	0.211	0.050	0.148	0.570
<i>Fortuynia_garcini</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Galitzkya_macrocarpa</i>	8	1	0.363	0.215	0.051	0.148	0.578
<i>Galitzkya_potaninii</i>	--	1	0.363	0.215	0.051	0.148	0.578
<i>Galitzkya_spathulata</i>	8	1	0.359	0.211	0.050	0.148	0.569
<i>Goldbachia_laevigata</i>	14	1	0.360	0.212	0.050	0.148	0.572
<i>Goldbachia_sabulosa</i>	--	1	0.360	0.212	0.050	0.148	0.572
<i>Halimolobos_adpressus</i>	--	0	0.443	0.264	0.132	0.179	0.707
<i>Halimolobos_diffusus</i>	--	0	0.389	0.217	0.124	0.172	0.607
<i>Halimolobos_elatus</i>	--	0	0.550	0.356	0.147	0.194	0.906
<i>Halimolobos_henricksonii</i>	8	0	0.560	0.365	0.148	0.195	0.925
<i>Halimolobos_jaegeri</i>	--	0	0.301	0.141	0.112	0.160	0.443
<i>Halimolobos_lasiolobus</i>	8	0	0.560	0.365	0.148	0.195	0.925
<i>Halimolobos_minutiflorus</i>	--	0	0.443	0.264	0.132	0.179	0.707
<i>Harmsiodoxa_blenodioides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Hesperidanthus_jaegeri</i>	--	0	0.279	0.122	0.109	0.157	0.400
<i>Hesperis_dinarica</i>	14	1	0.363	0.215	0.051	0.148	0.578
<i>Hesperis_laciniata</i>	6	0	0.279	0.122	0.109	0.157	0.401
<i>Hesperis_matronalis</i>	12	1	0.473	0.317	0.075	0.156	0.789
<i>Hesperis_rechingeri</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Hesperis_sibirica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Hesperis_voronovii</i>	--	1	0.473	0.317	0.075	0.156	0.789
<i>Hirschfeldia_incana</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Hormathophylla_baetica</i>	--	1	1.379	1.157	0.274	0.222	2.536
<i>Hormathophylla_cadevalliana</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Hormathophylla_cochleata</i>	--	1	1.379	1.157	0.274	0.222	2.536
<i>Hormathophylla_halimifolia</i>	16	1	0.373	0.224	0.053	0.149	0.597
<i>Hormathophylla_lapeyrousiana</i>	--	1	0.363	0.215	0.051	0.148	0.577
<i>Hormathophylla_longicaulis</i>	--	1	0.799	0.619	0.146	0.180	1.417
<i>Hormathophylla_macrocarpa</i>	--	1	0.373	0.224	0.053	0.149	0.597
<i>Hormathophylla_purpurea</i>	--	1	0.364	0.216	0.051	0.148	0.579
<i>Hormathophylla_reverchonii</i>	--	1	0.799	0.619	0.146	0.180	1.417
<i>Hormathophylla_spinosa</i>	--	1	0.361	0.213	0.050	0.148	0.575
<i>Hornungia_alpina</i>	6	0	0.308	0.147	0.113	0.161	0.456
<i>Hornungia_petraea</i>	6	0	0.279	0.122	0.109	0.157	0.401

<i>Ianhedkea_minutiflora</i>	14	1	0.398	0.247	0.058	0.151	0.644
<i>Iodanthus_pinnatifidus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Irenepharsus_magicus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Isatis_armena</i>	--	0	2.381	1.938	0.401	0.443	4.319
<i>Isatis_brevipes</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Isatis_buschiana</i>	7	0	0.284	0.126	0.110	0.158	0.409
<i>Isatis_cappadocica_subsp._besseri</i>	--	1	0.402	0.251	0.059	0.151	0.653
<i>Isatis_elegans</i>	--	0	2.381	1.938	0.401	0.443	4.319
<i>Isatis_emarginata</i>	--	1	2.629	2.315	0.548	0.314	4.944
<i>Isatis_gaubae</i>	7	0	0.630	0.425	0.158	0.205	1.056
<i>Isatis_gymnocarpa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Isatis_koeiei</i>	--	0	0.283	0.125	0.109	0.158	0.407
<i>Isatis_koelzii</i>	--	0	0.630	0.425	0.158	0.205	1.056
<i>Isatis_kotschyana</i>	14	1	0.402	0.251	0.059	0.151	0.653
<i>Isatis_leuconeura</i>	7	0	0.284	0.126	0.110	0.158	0.409
<i>Isatis_lusitanica</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Isatis_microcarpa</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Isatis_minima</i>	21	1	2.578	2.268	0.536	0.310	4.846
<i>Isatis_multicaulis</i>	--	0	0.279	0.122	0.109	0.157	0.400
<i>Isatis_pachycarpa</i>	--	1	0.360	0.212	0.050	0.148	0.573
<i>Isatis_quadrialata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Isatis_raphanifolia</i>	7	0	0.283	0.125	0.109	0.158	0.407
<i>Isatis_stocksii</i>	14	1	2.608	2.296	0.543	0.312	4.904
<i>Isatis_tinctoria</i>	13	1	0.360	0.212	0.050	0.148	0.573
<i>Isatis_trachycarpa</i>	--	1	2.608	2.296	0.543	0.312	4.904
<i>Isatis_violascens</i>	--	1	2.629	2.315	0.548	0.314	4.944
<i>Isatis_zarrei</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Iskandera_alaica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Iskandera_hissarica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Leavenworthia_alabamica</i>	11	1	3.374	3.005	0.711	0.368	6.379
<i>Leavenworthia_crassa</i>	11	1	3.374	3.005	0.711	0.368	6.379
<i>Leavenworthia_torulosa</i>	15	1	0.868	0.682	0.161	0.185	1.550
<i>Leiospora_eriocalyx</i>	7	0	2.412	1.965	0.405	0.447	4.377
<i>Leiospora_exscapa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Leiospora_pamirica</i>	--	0	2.412	1.965	0.405	0.447	4.377
<i>Lepidium_aegrum</i>	--	1	2.469	2.167	0.513	0.302	4.637
<i>Lepidium_africanum</i>	12	1	0.375	0.226	0.053	0.149	0.601
<i>Lepidium_alyssoides</i>	16	1	0.371	0.222	0.052	0.149	0.592
<i>Lepidium_angustissimum</i>	--	0	0.276	0.120	0.109	0.157	0.396
<i>Lepidium_apetalum</i>	16	1	0.381	0.232	0.055	0.150	0.613
<i>Lepidium_aucheri</i>	8	0	0.279	0.121	0.109	0.157	0.400
<i>Lepidium_banksii</i>	--	1	2.477	2.174	0.514	0.303	4.651
<i>Lepidium_bonariense</i>	24	1	0.365	0.217	0.051	0.148	0.582
<i>Lepidium_campestre</i>	8	0	0.280	0.122	0.109	0.157	0.402
<i>Lepidium_chalepense</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Lepidium_crassum</i>	--	1	2.431	2.132	0.504	0.299	4.563
<i>Lepidium_davisii</i>	16	1	0.359	0.211	0.050	0.148	0.570
<i>Lepidium_densiflorum</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Lepidium_desvauxii</i>	--	1	0.680	0.508	0.120	0.171	1.188

<i>Lepidium didymum</i>	12	1	2.740	2.418	0.572	0.322	5.158
<i>Lepidium draba</i>	33	1	0.458	0.303	0.072	0.155	0.761
<i>Lepidium flexicaule</i>	--	1	2.403	2.105	0.498	0.297	4.508
<i>Lepidium foliosum</i>	--	1	0.669	0.498	0.118	0.171	1.167
<i>Lepidium graminifolium</i>	8	0	0.276	0.119	0.109	0.157	0.395
<i>Lepidium heterophyllum</i>	16	1	0.554	0.392	0.093	0.162	0.947
<i>Lepidium hirtum</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Lepidium juvencum</i>	--	1	2.418	2.120	0.501	0.298	4.537
<i>Lepidium lacerum</i>	--	1	2.584	2.274	0.538	0.311	4.858
<i>Lepidium limenophylax</i>	--	1	2.740	2.418	0.572	0.322	5.158
<i>Lepidium meyenii</i>	32	1	0.359	0.211	0.050	0.148	0.569
<i>Lepidium montanum</i>	16	1	2.703	2.383	0.564	0.319	5.086
<i>Lepidium naufragorum</i>	72	1	0.359	0.211	0.050	0.148	0.570
<i>Lepidium navasii</i>	16	1	0.359	0.211	0.050	0.148	0.569
<i>Lepidium nesophilum</i>	--	1	0.686	0.514	0.122	0.172	1.200
<i>Lepidium obtusatum</i>	--	1	2.326	2.034	0.481	0.292	4.360
<i>Lepidium oleraceum</i>	36	1	2.384	2.088	0.494	0.296	4.472
<i>Lepidium oligodontum</i>	--	1	2.442	2.142	0.507	0.300	4.584
<i>Lepidium panniforme</i>	--	1	2.461	2.160	0.511	0.302	4.621
<i>Lepidium papilliferum</i>	--	1	2.703	2.383	0.564	0.319	5.086
<i>Lepidium perfoliatum</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Lepidium phlebopetalum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Lepidium rekohuense</i>	--	1	2.360	2.066	0.489	0.294	4.426
<i>Lepidium rubtzovii</i>	--	1	3.889	3.483	0.824	0.406	7.373
<i>Lepidium ruderale</i>	13	1	3.889	3.483	0.824	0.406	7.373
<i>Lepidium sativum</i>	11	1	0.359	0.211	0.050	0.148	0.570
<i>Lepidium seditiosum</i>	--	1	2.452	2.151	0.509	0.301	4.604
<i>Lepidium sisymbrioides</i>	--	1	0.387	0.237	0.056	0.150	0.625
<i>Lepidium solandri</i>	--	1	0.387	0.237	0.056	0.150	0.625
<i>Lepidium squamatum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Lepidium subcordatum</i>	--	1	0.370	0.221	0.052	0.149	0.591
<i>Lepidium virginicum</i>	12	1	0.371	0.222	0.052	0.149	0.592
<i>Lepidostemon glaricola</i>	--	1	0.360	0.212	0.050	0.148	0.572
<i>Leptaleum filifolium</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Litwinowia tenuissima</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Lyrocarpa coulteri</i>	20	1	0.359	0.211	0.050	0.148	0.569
<i>Mancoa bracteata</i>	--	0	0.283	0.125	0.109	0.158	0.408
<i>Mancoa foliosa</i>	--	0	0.283	0.125	0.109	0.158	0.408
<i>Mathewsia auriculata</i>	--	1	0.360	0.212	0.050	0.148	0.573
<i>Mathewsia collina</i>	--	1	0.395	0.244	0.058	0.151	0.639
<i>Mathewsia densifolia</i>	--	1	0.370	0.221	0.052	0.149	0.591
<i>Mathewsia foliosa</i>	--	1	0.360	0.212	0.050	0.148	0.573
<i>Mathewsia incana</i>	--	1	0.395	0.244	0.058	0.151	0.639
<i>Mathewsia nivea</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Matthiola bucharica</i>	--	0	0.387	0.215	0.124	0.172	0.601
<i>Matthiola capiomontiana</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Matthiola farinosa</i>	6	0	0.279	0.122	0.109	0.157	0.401
<i>Matthiola fruticulosa</i>	6	0	0.290	0.132	0.110	0.159	0.422
<i>Matthiola incana</i>	6	0	0.914	0.671	0.197	0.244	1.585

<i>Matthiola_longipetala</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Matthiola_maderensis</i>	7	0	0.285	0.127	0.110	0.158	0.413
<i>Matthiola_oxyceras</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Matthiola_parviflora</i>	7	0	0.290	0.132	0.110	0.159	0.422
<i>Matthiola_pulchella</i>	--	0	0.285	0.127	0.110	0.158	0.413
<i>Matthiola_rupestris</i>	--	0	0.914	0.671	0.197	0.244	1.585
<i>Matthiola_stoddartii</i>	6	0	0.387	0.215	0.124	0.172	0.601
<i>Menkea_sphaerocarpa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Microlepidium_pilosulum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Microstigma_brachycarpum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Moricandia_arvensis</i>	12	1	2.583	2.272	0.537	0.310	4.855
<i>Moricandia_foetida</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Moricandia_foleyi</i>	11	1	0.368	0.219	0.052	0.149	0.587
<i>Moricandia_moricandioides</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Moricandia_nitens</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Moricandia_sinaica</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Moricandia_spinosa</i>	28	1	3.696	3.304	0.782	0.392	6.999
<i>Moricandia_suffruticosa</i>	10	1	3.696	3.304	0.782	0.392	6.999
<i>Mostacillastrum_andinum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Mostacillastrum_elongatum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Mostacillastrum_gracile</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Mostacillastrum_stenophyllum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Myagrurn_perfoliatum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Nasturtiopsis_coronopifolia</i>	7	0	0.279	0.122	0.109	0.157	0.400
<i>Nasturtium_microphyllum</i>	30	1	2.843	2.514	0.595	0.330	5.357
<i>Nasturtium_officinale</i>	16	1	2.843	2.514	0.595	0.330	5.357
<i>Neotorularia_contortuplicata</i>	7	0	0.304	0.143	0.112	0.161	0.447
<i>Neotorularia_dentata</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Neotorularia_korolkowii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Neotorularia_tetracmoides</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Neotorularia_torulosa</i>	10	1	0.640	0.472	0.112	0.168	1.113
<i>Nerisyrenia_johnstonii</i>	10	1	0.366	0.218	0.051	0.148	0.583
<i>Nerisyrenia_linearifolia</i>	10	1	0.366	0.218	0.051	0.148	0.583
<i>Neslia_paniculata</i>	10	1	0.359	0.211	0.050	0.148	0.571
<i>Neuontobotrys_frutescens</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Neuontobotrys_intricatissima</i>	--	0	0.290	0.132	0.110	0.159	0.422
<i>Neuontobotrys_lanata</i>	--	0	2.513	2.052	0.419	0.461	4.564
<i>Neuontobotrys_tarapacana</i>	--	0	2.513	2.052	0.419	0.461	4.564
<i>Nevada_holmgrenii</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Octoceras_lehmannianum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Olimarabidopsis_cabulica</i>	24	1	0.501	0.343	0.081	0.158	0.844
<i>Olimarabidopsis_pumila</i>	15	1	0.501	0.343	0.081	0.158	0.844
<i>Olimarabidopsis_umbrosa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Ornithocarpa_torulosa</i>	24	1	0.383	0.234	0.055	0.150	0.617
<i>Orychophragmus_diffusus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Orychophragmus_hupehensis</i>	--	0	0.280	0.123	0.109	0.157	0.402
<i>Orychophragmus_taibaiensis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Orychophragmus_violaceus</i>	24	1	0.393	0.243	0.057	0.150	0.636
<i>Orychophragmus_ziguiensis</i>	--	0	0.280	0.123	0.109	0.157	0.402

<i>Pachycladon_cheesemanii</i>	--	0	0.353	0.186	0.119	0.167	0.538
<i>Pachycladon_ensyii</i>	--	0	1.317	1.019	0.253	0.298	2.336
<i>Pachycladon_exile</i>	--	0	0.353	0.186	0.119	0.167	0.538
<i>Pachycladon_fastigiatum</i>	--	0	1.317	1.019	0.253	0.298	2.336
<i>Pachycladon_latisiliquum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pachycladon_novaezelandiae</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pachycladon_radicatum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pachycladon_stellatum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pachycladon_wallii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pachymitus_cardaminoides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parlatoria_rostrata</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_ajanensis</i>	--	0	0.292	0.133	0.111	0.159	0.425
<i>Parrya_alba</i>	--	0	0.299	0.139	0.112	0.160	0.439
<i>Parrya_albida</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_angrenica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_arctica</i>	8	0	2.437	1.987	0.408	0.451	4.424
<i>Parrya_asperrima</i>	--	0	0.281	0.123	0.109	0.157	0.404
<i>Parrya_australis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_darvazica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_fruticulosa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_kuramensis</i>	--	0	0.546	0.353	0.146	0.194	0.899
<i>Parrya_lancifolia</i>	--	0	0.413	0.238	0.128	0.175	0.651
<i>Parrya_longicarpa</i>	--	0	0.488	0.302	0.138	0.186	0.790
<i>Parrya_maidantalica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_minjanensis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_nauruaq</i>	--	0	2.437	1.987	0.408	0.451	4.424
<i>Parrya_nudicaulis</i>	10	1	0.462	0.307	0.073	0.155	0.769
<i>Parrya_nuratensis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_pavlovii</i>	--	0	0.281	0.123	0.109	0.157	0.404
<i>Parrya_pinnatifida</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_popovii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_pulvinata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_runcinata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_rydbergii</i>	--	0	0.281	0.123	0.109	0.157	0.404
<i>Parrya_saurica</i>	--	0	0.413	0.238	0.128	0.175	0.651
<i>Parrya_saxifraga</i>	--	0	0.546	0.353	0.146	0.194	0.899
<i>Parrya_schugnana</i>	10	1	0.399	0.248	0.059	0.151	0.647
<i>Parrya_simulatrix</i>	--	0	0.285	0.127	0.110	0.158	0.412
<i>Parrya_stenocarpa</i>	--	0	0.298	0.139	0.112	0.160	0.437
<i>Parrya_stenophylla</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Parrya_subsiliquosa</i>	--	0	0.488	0.302	0.138	0.186	0.790
<i>Parrya_tianschanica</i>	--	0	0.299	0.139	0.112	0.160	0.439
<i>Parrya_turkestanica</i>	7	0	0.281	0.123	0.109	0.157	0.404
<i>Parrya_villosula</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Paysonia_auriculata</i>	8	1	0.365	0.216	0.051	0.148	0.581
<i>Paysonia_densipila</i>	8	1	2.627	2.314	0.547	0.314	4.941
<i>Paysonia_grandiflora</i>	9	1	0.359	0.211	0.050	0.148	0.570
<i>Paysonia_lasiocarpa</i>	7	1	0.363	0.214	0.051	0.148	0.577
<i>Paysonia_lescurii</i>	8	1	2.627	2.314	0.547	0.314	4.941

<i>Paysonia_stonensis</i>	8	1	2.168	1.888	0.447	0.280	4.055
<i>Pegaeophyton_scapiflorum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Peltaria_alliacea</i>	14	1	0.394	0.243	0.058	0.150	0.637
<i>Pennellia_longifolia</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Pennellia_micrantha</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Petiniotia_purpurascens</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Phaeonychium_kashgaricum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Phaeonychium_villosum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Phlegmatospermum_eremaeum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Phoenicaulis_cheiranthoides</i>	14	1	0.441	0.287	0.068	0.154	0.728
<i>Physaria_acutifolia</i>	7	0	2.983	2.459	0.484	0.525	5.442
<i>Physaria_argyraea</i>	10	1	1.111	0.909	0.215	0.203	2.020
<i>Physaria_bellii</i>	4	0	3.067	2.531	0.496	0.536	5.597
<i>Physaria_ericarpa</i>	--	0	0.289	0.130	0.110	0.159	0.419
<i>Physaria_fendleri</i>	7	0	1.427	1.114	0.268	0.313	2.541
<i>Physaria_filiformis</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Physaria_goodrichii</i>	--	0	0.280	0.122	0.109	0.157	0.402
<i>Physaria_gracilis</i>	6	0	0.388	0.216	0.124	0.172	0.604
<i>Physaria_hemiphysaria</i>	--	0	0.280	0.123	0.109	0.157	0.403
<i>Physaria_humilis</i>	--	0	0.280	0.122	0.109	0.157	0.402
<i>Physaria_intermedia</i>	10	1	0.451	0.296	0.070	0.155	0.747
<i>Physaria_johnstonii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Physaria_ludoviciana</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Physaria_nelsonii</i>	--	0	0.284	0.126	0.110	0.158	0.411
<i>Physaria_newberryi</i>	8	1	1.332	1.113	0.263	0.219	2.445
<i>Physaria_occidentalis</i>	5	0	0.279	0.122	0.109	0.157	0.401
<i>Physaria_pallida</i>	6	0	0.388	0.216	0.124	0.172	0.604
<i>Physaria_pruinosa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Physaria_pycnantha</i>	--	0	0.361	0.193	0.120	0.168	0.555
<i>Physaria_rosei</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Physaria_spatulata</i>	5	0	0.361	0.193	0.120	0.168	0.555
<i>Physaria_subumbellata</i>	5	0	0.303	0.142	0.112	0.160	0.445
<i>Physocardamum_davisii</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Physoptychis_caspica</i>	8	1	0.359	0.211	0.050	0.148	0.569
<i>Planodes_virginica</i>	--	0	0.279	0.122	0.109	0.157	0.400
<i>Polypsecadium_fremontii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Polypsecadium_grandiflorum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Polypsecadium_harmsianum</i>	--	0	0.279	0.122	0.109	0.157	0.402
<i>Polypsecadium_rusbyi</i>	--	0	0.279	0.122	0.109	0.157	0.402
<i>Pringlea_antiscorbutica</i>	12	0	0.279	0.122	0.109	0.157	0.401
<i>Pritzelago_alpina</i>	6	0	0.308	0.147	0.113	0.161	0.456
<i>Pseudocamelina_glaucophylla</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Pseudoclausia_gracillima</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pseudoclausia_hispida</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pseudoclausia_mollissima</i>	--	0	0.281	0.124	0.109	0.157	0.404
<i>Pseudoclausia_olgae</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pseudoclausia_papillosa</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Pseudoclausia_sarawschanica</i>	--	0	0.281	0.124	0.109	0.157	0.404
<i>Pseudoclausia_turkestanica</i>	7	0	0.279	0.122	0.109	0.157	0.401

<i>Pseudovesicaria_digitata</i>	5	0	0.279	0.122	0.109	0.157	0.401
<i>Psychine_stylosa</i>	15	1	0.386	0.236	0.056	0.150	0.623
<i>Raphanus_raphanistrum</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Raphanus_sativus</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Rapistrum_rugosum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Rhammatophyllum_afghanicum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Rhammatophyllum_frutex</i>	--	0	0.282	0.124	0.109	0.158	0.406
<i>Rhammatophyllum_gaudanense</i>	--	0	0.282	0.124	0.109	0.158	0.406
<i>Rhammatophyllum_ghoranum</i>	--	0	0.280	0.123	0.109	0.157	0.403
<i>Rhammatophyllum_kamelinii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Rhammatophyllum_pachyrhizum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Robeschia_schimperii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Rorippa_amphibia</i>	15	1	4.070	3.651	0.864	0.419	7.721
<i>Rorippa_austriaca</i>	8	0	0.281	0.124	0.109	0.157	0.404
<i>Rorippa_cantonensis</i>	8	0	0.334	0.170	0.117	0.165	0.504
<i>Rorippa_indica</i>	16	1	0.664	0.494	0.117	0.170	1.159
<i>Rorippa_islandica</i>	8	0	0.281	0.124	0.109	0.157	0.404
<i>Rorippa_palustris</i>	12	1	4.070	3.651	0.864	0.419	7.721
<i>Rorippa_sylvestris</i>	20	1	3.958	3.547	0.839	0.411	7.505
<i>Rytidocarpus_moricandioides</i>	14	1	0.360	0.212	0.050	0.148	0.573
<i>Sandbergia_perplexa</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sandbergia_whitedii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sarcodraba_dusenii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Savignya_parviflora</i>	15	1	0.383	0.233	0.055	0.150	0.616
<i>Scambopus_curvipes</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Schimpera_arabica</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Schizopetalon_arcuatum</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Schizopetalon_bipinnatifidum</i>	--	1	1.584	1.346	0.318	0.237	2.930
<i>Schizopetalon_biseriatum</i>	--	1	3.832	3.430	0.811	0.402	7.262
<i>Schizopetalon_brachycarpum</i>	--	1	1.947	1.683	0.398	0.264	3.629
<i>Schizopetalon_dentatum</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Schizopetalon_maritimum</i>	--	1	0.408	0.256	0.061	0.151	0.664
<i>Schizopetalon_rupestre</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Schizopetalon_tenuifolium</i>	--	1	3.832	3.430	0.811	0.402	7.262
<i>Schizopetalon_walkeri</i>	10	1	0.408	0.256	0.061	0.151	0.664
<i>Schoenocrambe_linifolia</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Schouwia_purpurea</i>	18	1	0.376	0.227	0.054	0.149	0.602
<i>Selenia_aurea</i>	46	1	0.383	0.234	0.055	0.150	0.617
<i>Selenia_dissecta</i>	7	0	0.277	0.120	0.109	0.157	0.396
<i>Selenia_jonesii</i>	12	1	0.401	0.250	0.059	0.151	0.652
<i>Sibara_angelorum</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Sibara_deserti</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Sibara_laxa</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Sibaropsis_hammitii</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Sinapidendron_frutescens</i>	10	0	0.279	0.122	0.109	0.157	0.401
<i>Sinapis_alba</i>	12	0	0.279	0.122	0.109	0.157	0.401
<i>Sinapis_arvensis</i>	9	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrella_aspera</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbriopsis_mollipila</i>	--	0	0.279	0.122	0.109	0.157	0.401

<i>Sisymbriopsis_yechengnica</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrium_aculeolatum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrium_altissimum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrium_austriacum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrium_irio</i>	9	1	0.416	0.264	0.062	0.152	0.679
<i>Sisymbrium_loeselii</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrium_officinale</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrium_orientale</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sisymbrium_polymorphum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Smelowskia_alba</i>	6	0	0.279	0.122	0.109	0.157	0.401
<i>Smelowskia_americana</i>	8	0	0.280	0.123	0.109	0.157	0.403
<i>Smelowskia_annua</i>	--	0	0.314	0.152	0.114	0.162	0.465
<i>Smelowskia_bartholomewii</i>	--	1	0.365	0.216	0.051	0.148	0.581
<i>Smelowskia_bifurcata</i>	6	0	0.279	0.122	0.109	0.157	0.401
<i>Smelowskia_borealis</i>	6	0	0.424	0.247	0.129	0.177	0.671
<i>Smelowskia_calycina</i>	8	0	0.280	0.123	0.109	0.157	0.403
<i>Smelowskia_flavissima</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Smelowskia_inopinata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Smelowskia_jacutica</i>	12	1	0.397	0.246	0.058	0.151	0.642
<i>Smelowskia_johnsonii</i>	6	0	0.279	0.122	0.109	0.157	0.401
<i>Smelowskia_media</i>	8	0	0.424	0.247	0.129	0.177	0.671
<i>Smelowskia_parryoides</i>	9	1	0.363	0.215	0.051	0.148	0.578
<i>Smelowskia_porsildii</i>	11	1	0.411	0.259	0.061	0.152	0.670
<i>Smelowskia_pyriiformis</i>	6	0	0.279	0.122	0.109	0.157	0.401
<i>Smelowskia_sisymbrioides</i>	--	0	0.314	0.152	0.114	0.162	0.465
<i>Smelowskia_sophiifolia</i>	10	1	0.363	0.215	0.051	0.148	0.578
<i>Smelowskia_tibetica</i>	12	1	0.365	0.216	0.051	0.148	0.581
<i>Sobolewskia_caucasica</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_baiogoinensis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_eurycarpa</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_flabellata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_himalayensis</i>	--	0	0.359	0.191	0.120	0.168	0.550
<i>Solms-laubachia_jafrii</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_lanata</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_linearifolia</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_linearis</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_minor</i>	7	0	0.281	0.123	0.109	0.157	0.404
<i>Solms-laubachia_platycarpa</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Solms-laubachia_pulcherrima</i>	7	0	0.285	0.127	0.110	0.158	0.412
<i>Solms-laubachia_retropilosa</i>	10	1	0.404	0.253	0.060	0.151	0.657
<i>Solms-laubachia_stewartii</i>	--	0	0.359	0.191	0.120	0.168	0.550
<i>Solms-laubachia_xerophyta</i>	7	0	0.281	0.123	0.109	0.157	0.404
<i>Solms-laubachia_zhongdianensis</i>	--	0	0.285	0.127	0.110	0.158	0.412
<i>Sphaerocardamum_compressum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sphaerocardamum_divaricatum</i>	--	0	0.319	0.157	0.115	0.163	0.476
<i>Sphaerocardamum_fruticulosum</i>	--	0	3.236	2.677	0.519	0.559	5.912
<i>Sphaerocardamum_macropetalum</i>	8	0	0.383	0.211	0.123	0.171	0.594
<i>Sphaerocardamum_macrum</i>	--	0	1.039	0.778	0.214	0.260	1.817
<i>Sphaerocardamum_nesliiforme</i>	--	0	0.279	0.122	0.109	0.157	0.401

<i>Sphaerocardamum_ramosum</i>	--	0	1.039	0.778	0.214	0.260	1.817
<i>Sphaerocardamum_stellatum</i>	8	0	3.236	2.677	0.519	0.559	5.912
<i>Spryginia_falcata</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Spryginia_winkleri</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Stanleya_albescens</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Stanleya_bipinnata</i>	13	1	0.359	0.211	0.050	0.148	0.570
<i>Stanleya_confertiflora</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Stanleya_elata</i>	12	1	0.359	0.211	0.050	0.148	0.569
<i>Stanleya_pinnata</i>	19	1	0.359	0.211	0.050	0.148	0.569
<i>Stanleya_tomentosa</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Stanleya_viridiflora</i>	12	1	0.359	0.211	0.050	0.148	0.570
<i>Stenopetalum_nutans</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sterigmostemum_acanthocarpum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sterigmostemum_eglandulosum</i>	--	0	4.263	3.564	0.662	0.699	7.827
<i>Sterigmostemum_fuhaiense</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sterigmostemum_grandiflorum</i>	--	0	1.971	1.584	0.344	0.387	3.556
<i>Sterigmostemum_incanum</i>	7	0	4.263	3.564	0.662	0.699	7.827
<i>Sterigmostemum_longistylum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sterigmostemum_matthioides</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sterigmostemum_ramosissimum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Sterigmostemum_sulphureum</i>	7	0	0.456	0.275	0.134	0.181	0.732
<i>Sterigmostemum_tomentosum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Sterigmostemum_violaceum</i>	--	0	0.456	0.275	0.134	0.181	0.732
<i>Streptanthella_longirostris</i>	10	1	0.359	0.211	0.050	0.148	0.570
<i>Streptanthus_barbatus</i>	21	1	0.359	0.211	0.050	0.148	0.570
<i>Streptanthus_barbiger</i>	14	1	0.368	0.219	0.052	0.149	0.588
<i>Streptanthus_batrachopus</i>	14	1	0.369	0.220	0.052	0.149	0.589
<i>Streptanthus_bernardinus</i>	10	1	0.376	0.227	0.054	0.149	0.602
<i>Streptanthus_brachiatus</i>	14	1	2.013	1.744	0.413	0.269	3.757
<i>Streptanthus_bracteatus</i>	--	1	0.364	0.216	0.051	0.148	0.580
<i>Streptanthus_breweri</i>	14	1	0.467	0.311	0.074	0.156	0.778
<i>Streptanthus_callistus</i>	14	1	0.367	0.219	0.052	0.148	0.586
<i>Streptanthus_campestris</i>	--	1	0.376	0.227	0.054	0.149	0.602
<i>Streptanthus_carinatus</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_cooperi</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Streptanthus_cordatus</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Streptanthus_cutleri</i>	14	1	0.364	0.216	0.051	0.148	0.580
<i>Streptanthus_diversifolius</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_drepanoides</i>	14	1	0.467	0.311	0.074	0.156	0.778
<i>Streptanthus_farnsworthianus</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_fenestratus</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_glandulosus</i>	14	1	0.360	0.212	0.050	0.148	0.572
<i>Streptanthus_hesperidis</i>	14	1	0.360	0.212	0.050	0.148	0.572
<i>Streptanthus_hispidus</i>	14	1	0.367	0.219	0.052	0.148	0.586
<i>Streptanthus_howellii</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_hyacinthoides</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_longisiliquus</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_maculatus</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Streptanthus_morrisonii</i>	14	1	3.609	3.223	0.763	0.386	6.832

<i>Streptanthus_petiolaris</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_platycarpus</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_polygaloides</i>	14	1	0.359	0.211	0.050	0.148	0.570
<i>Streptanthus_tortuosus</i>	14	1	0.359	0.211	0.050	0.148	0.569
<i>Streptanthus_vernalis</i>	--	1	3.609	3.223	0.763	0.386	6.832
<i>Succowia_balearica</i>	17	1	0.375	0.226	0.054	0.149	0.602
<i>Synstemon_petrovii</i>	--	0	0.286	0.128	0.110	0.158	0.414
<i>Synthlipsis_greggii</i>	10	1	0.359	0.211	0.050	0.148	0.570
<i>Tchihatchewia_isatidea</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Tetracme_contorta</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Tetracme_quadricornis</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Tetracme_secunda</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Thelypodiopsis_ambigua</i>	11	1	0.359	0.211	0.050	0.148	0.569
<i>Thelypodiopsis_elegans</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Thelypodiopsis_vaseyi</i>	10	1	0.359	0.211	0.050	0.148	0.570
<i>Thelypodium_crispum</i>	13	1	0.359	0.211	0.050	0.148	0.569
<i>Thelypodium_flexuosum</i>	13	1	0.359	0.211	0.050	0.148	0.570
<i>Thelypodium_integrifolium</i>	13	1	0.426	0.273	0.065	0.153	0.699
<i>Thelypodium_laciniatum</i>	13	1	0.359	0.211	0.050	0.148	0.570
<i>Thelypodium_sagittatum</i>	13	1	0.426	0.273	0.065	0.153	0.699
<i>Thlaspi_alpinum</i>	--	0	0.367	0.198	0.121	0.169	0.565
<i>Thlaspi_arvense</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Thlaspi_bulbosum</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Thlaspi_calaminare</i>	--	0	0.361	0.193	0.120	0.168	0.554
<i>Thlaspi_cepaeifolium</i>	--	0	0.367	0.198	0.121	0.169	0.565
<i>Thlaspi_densiflorum</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Thlaspi_erraticum</i>	--	1	0.367	0.218	0.052	0.148	0.585
<i>Thlaspi_goesingense</i>	16	1	0.748	0.571	0.135	0.176	1.319
<i>Thlaspi_jankae</i>	12	1	0.748	0.571	0.135	0.176	1.319
<i>Thlaspi_montanum</i>	10	1	0.402	0.251	0.059	0.151	0.653
<i>Thlaspi_nevadense</i>	14	1	0.421	0.269	0.064	0.152	0.690
<i>Thlaspi_perfoliatum</i>	17	1	0.367	0.218	0.052	0.148	0.585
<i>Thlaspi_praecox</i>	4	0	0.286	0.128	0.110	0.158	0.413
<i>Thysanocarpus_conchuliferus</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Thysanocarpus_curvipes</i>	14	1	0.361	0.213	0.050	0.148	0.573
<i>Thysanocarpus_erectus</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Thysanocarpus_laciniatus</i>	--	1	0.361	0.213	0.050	0.148	0.573
<i>Thysanocarpus_radians</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Thysanocarpus_rigidus</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Tropidocarpum_gracile</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Turritis_glabra</i>	8	0	0.279	0.122	0.109	0.157	0.401
<i>Turritis_laxa</i>	6	0	0.279	0.122	0.109	0.157	0.401
<i>Vella_anremerica</i>	17	1	0.359	0.211	0.050	0.148	0.569
<i>Vella_aspera</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Vella_bourgaeana</i>	17	1	0.359	0.211	0.050	0.148	0.570
<i>Vella_castrilensis</i>	34	1	0.359	0.211	0.050	0.148	0.569
<i>Vella_lucentina</i>	17	1	0.359	0.211	0.050	0.148	0.569
<i>Vella_mairei</i>	34	1	0.359	0.211	0.050	0.148	0.569
<i>Vella_pseudocytisus_subsp._glabrata</i>	--	1	0.359	0.211	0.050	0.148	0.569

<i>Vella_spinosa</i>	17	1	0.360	0.212	0.050	0.148	0.572
<i>Warea_cuneifolia</i>	--	1	0.359	0.211	0.050	0.148	0.570
<i>Weberbaueria_herzogii</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Weberbaueria_peruviana</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Weberbaueria_rosulans</i>	--	1	0.359	0.211	0.050	0.148	0.569
<i>Werdermannia_macrostachya</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Werdermannia_mendocina</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Yinshania_acutangula_subsp._acutangula</i>	--	0	0.284	0.126	0.110	0.158	0.409
<i>Yinshania_henryi</i>	6	0	2.331	1.894	0.394	0.436	4.225
<i>Yinshania_zayuensis</i>	--	0	2.331	1.894	0.394	0.436	4.225
<i>Zerdana_anchonioides</i>	7	0	0.279	0.122	0.109	0.157	0.401
<i>Zilla_spinosa_subsp._macroptera</i>	--	0	0.279	0.122	0.109	0.157	0.401
<i>Zuvanda_crenulata</i>	--	0	0.319	0.156	0.114	0.163	0.475
<i>Zuvanda_exacoides</i>	--	0	0.319	0.156	0.114	0.163	0.475

Table S3.3 Summary of 12 different trait-dependent diversification models (both BiSSE and HiSSE)

MODEL	HIDDEN STATES	τ	ϵ	q	lnLik	AIC	Δ AIC	WEIGHTS
BiSSE_1	Absent	Equal	Equal	Equal	-3868.186	7742.371	1130.222	3.733E-246
BiSSE_2	Absent	Free	Free	Equal	-3868.158	7744.317	1132.168	1.411E-246
BiSSE_3	Absent	Equal	Equal	Free	-3867.771	7743.541	1131.392	2.080E-246
BiSSE_4	Absent	Free	Free	Free	-3867.516	7745.033	1132.884	9.867E-247
HiSSE_1	Present for diploids and polyploids	Free	Free	Equal	-3644.154	7306.307	694.158	1.829E-151
HiSSE_2	Present for diploids	Free	Free	Equal	-3609.434	7232.869	620.720	1.619E-135
HiSSE_3	Present for diploids	Free	Free	Equal	-3544.090	7102.180	490.031	3.872E-107
HiSSE_4	Present for diploids and polyploids	Free	Free	Free	-3286.074	6612.149	0.000	9.926E-01
HiSSE_5	Present for diploids	Free	Free	Free	-3458.089	6936.177	324.028	4.315E-71
HiSSE_6	Present for polyploids	Free	Free	Free	-3793.601	7607.203	995.054	8.386E-217
HiSSE-CID2	Present for diploids and polyploids	Equal	Equal	Equal	-3298.967	6621.934	9.786	7.445E-03
HiSSE-CID4	Present for diploids and polyploids	Equal	Equal	Equal within observed and hidden	-3490.705	6999.409	387.260	8.021E-85

Table S3.4 Summary statistics for macroevolutionary parameters associated with observed (diploid [D] and polyploid [P]) and hidden (A and B) states.

PARAMETER	STATES		Mean	Interquartile	
				25%	75%
SPECIATION	OBSERVED	DIPLOID (D)	0.715	0.279	0.609
		POLYPLOID (P)	1.063	0.360	1.325
	HIDDEN	D-A	0.147	0.143	0.150
		D-B	4.672	4.452	4.740
		P-A	0.166	0.150	0.177
P-B	6.478	6.003	6.868		
EXTINCTION	OBSERVED	DIPLOID (D)	0.499	0.122	0.407
		POLYPLOID (P)	0.864	0.212	1.106
	HIDDEN	D-A	0.016	0.015	0.017
		D-B	3.398	3.162	3.573
		P-A	0.000	0.000	0.000
P-B	6.576	6.015	7.219		
NET DIVERSIFICATION	OBSERVED	DIPLOID (D)	0.216	0.152	0.202
		POLYPLOID (P)	0.199	0.148	0.218
	HIDDEN	D-A	0.130	0.128	0.133
		D-B	1.274	1.289	1.168
		P-A	0.166	0.150	0.177
P-B	-0.098	-0.012	-0.351		
TURNOVER	OBSERVED	DIPLOID (D)	1.214	0.401	1.015
		POLYPLOID (P)	1.927	0.573	2.431
	HIDDEN	D-A	0.112	0.105	0.115
		D-B	0.727	0.710	0.754
		P-A	0.001	0.001	0.001
P-B	1.015	1.002	1.051		

Table S3.5 Summary of polyploid richness within each clade including clade age, richness, diversification rates, and proportion of polyploids.

GENUS	STEM AGE	CROWN AGE	SPECIES TREE	RICHNESS	S0	S0.5	S0.9	C0	C0.5	C0.9	DR MEAN	SUBTREE	TOTAL RICHNESS	RAW RICHNESS
<i>Aethionema</i>	33.514	12.010	5	57	0.121	0.100	0.056	0.279	0.256	0.153	0.084	0.000	0.000	0.000
<i>Alliaria</i>	14.741	14.724	2	2	0.047	0.028	0.006	0.000	0.000	0.000	0.062	0.405	0.405	0.527
<i>Alyssoides</i>	4.362	4.345	2	2	0.159	0.093	0.022	0.000	0.000	0.000	0.187	0.405	0.405	0.527
<i>Alyssopsis</i>	3.362	3.331	2	2	0.206	0.121	0.028	0.000	0.000	0.000	0.201	0.405	0.405	0.527
<i>Alyssum</i>	24.049	23.879	107	195	0.219	0.191	0.125	0.192	0.180	0.124	0.447	0.693	0.437	1.737
<i>Ammosperma</i>	21.983	-	1	2	0.032	0.018	0.004	-	-	-	0.044	0.000	0.000	0.000
<i>Anastatica</i>	5.743	-	1	1	0.000	0.000	0.000	-	-	-	0.083	0.000	0.000	0.000
<i>Anelsonia</i>	5.921	-	1	1	0.000	0.000	0.000	-	-	-	0.145	0.000	0.000	0.000
<i>Arabidella</i>	13.474	-	1	7	0.144	0.103	0.035	-	-	-	0.070	0.693	0.134	0.527
<i>Arabidopsis</i>	13.119	11.910	14	14	0.201	0.154	0.063	0.163	0.144	0.065	0.348	0.654	0.619	1.271
<i>Arabis</i>	18.195	18.186	81	112	0.259	0.222	0.137	0.221	0.206	0.134	1.062	0.674	0.529	1.681
<i>Arcyosperma</i>	4.681	-	1	1	0.000	0.000	0.000	-	-	-	0.073	0.000	0.000	0.000
<i>Armoracia</i>	15.141	-	1	3	0.073	0.046	0.012	-	-	-	0.056	0.693	0.288	0.527
<i>Aschersoniodoxa</i>	8.561	7.811	2	3	0.128	0.081	0.021	0.052	0.045	0.015	0.091	0.000	0.000	0.000
<i>Asperuginoides</i>	26.491	-	1	1	0.000	0.000	0.000	-	-	-	0.037	0.693	0.693	0.527
<i>Athysanus</i>	6.894	4.501	2	24	0.461	0.366	0.173	0.552	0.496	0.254	0.137	0.000	0.000	0.000
<i>Aubrieta</i>	18.288	2.989	2	12	0.136	0.102	0.041	0.599	0.527	0.230	0.089	0.000	0.000	0.000
<i>Aurinia</i>	15.131	15.118	8	9	0.145	0.106	0.039	0.099	0.087	0.035	0.261	0.693	0.636	1.162
<i>Baimashania</i>	4.362	4.329	2	2	0.159	0.093	0.022	0.000	0.000	0.000	0.149	0.000	0.000	0.000
<i>Barbarea</i>	10.581	2.431	3	27	0.311	0.249	0.121	1.071	0.966	0.505	0.190	0.000	0.000	0.000
<i>Berteroa</i>	11.008	1.108	4	5	0.146	0.100	0.031	0.827	0.707	0.252	0.315	0.693	0.588	0.959
<i>Biscutella</i>	21.427	9.322	8	53	0.185	0.154	0.085	0.352	0.322	0.190	0.150	0.000	0.000	0.000
<i>Bivonaea</i>	25.251	-	1	1	0.000	0.000	0.000	-	-	-	0.039	0.000	0.000	0.000
<i>Blennodia</i>	6.258	4.324	2	2	0.111	0.065	0.015	0.000	0.000	0.000	0.157	0.405	0.405	0.527
<i>Boechera</i>	5.921	5.910	64	110	0.794	0.678	0.418	0.678	0.631	0.410	0.842	0.172	0.104	1.271
<i>Bornmuellera</i>	4.825	4.808	4	7	0.403	0.287	0.097	0.261	0.225	0.086	0.197	0.693	0.452	0.959
<i>Borodinia</i>	10.686	0.018	2	2	0.065	0.038	0.009	0.000	0.000	0.000	0.153	0.000	0.000	0.000
<i>Botschantzevia</i>	4.362	-	1	1	0.000	0.000	0.000	-	-	-	0.110	0.000	0.000	0.000
<i>Brassica</i>	21.850	21.832	23	39	0.168	0.137	0.072	0.136	0.124	0.069	0.130	0.197	0.121	1.027
<i>Braya</i>	3.911	3.640	14	14	0.675	0.515	0.213	0.535	0.472	0.214	0.967	0.693	0.693	1.311
<i>Bunias</i>	18.701	-	1	3	0.059	0.037	0.010	-	-	-	0.049	0.693	0.288	0.527
<i>Cakile</i>	10.160	4.449	4	6	0.176	0.123	0.040	0.247	0.212	0.078	0.241	0.223	0.154	0.527
<i>Calepina</i>	15.196	-	1	1	0.000	0.000	0.000	-	-	-	0.048	0.693	0.693	0.527
<i>Callothlaspi</i>	11.377	-	1	1	0.000	0.000	0.000	-	-	-	0.070	0.000	0.000	0.000
<i>Calymmatium</i>	4.411	-	1	2	0.157	0.092	0.022	-	-	-	0.101	0.000	0.000	0.000
<i>Camelina</i>	8.544	2.848	4	11	0.281	0.210	0.081	0.599	0.524	0.224	0.404	0.693	0.310	0.959
<i>Capsella</i>	9.346	1.631	4	5	0.172	0.118	0.036	0.562	0.481	0.171	0.326	0.693	0.588	0.959
<i>Cardamine</i>	13.281	13.267	93	203	0.400	0.348	0.230	0.348	0.327	0.226	0.350	0.390	0.188	1.560
<i>Carrichtera</i>	13.648	-	1	1	0.000	0.000	0.000	-	-	-	0.055	0.000	0.000	0.000
<i>Catnulina</i>	6.406	-	1	1	0.000	0.000	0.000	-	-	-	0.122	0.000	0.000	0.000
<i>Catolobus</i>	9.964	-	1	1	0.000	0.000	0.000	-	-	-	0.092	0.000	0.000	0.000
<i>Caulanthus</i>	7.789	7.150	13	17	0.364	0.282	0.123	0.299	0.266	0.126	0.262	0.693	0.568	1.292
<i>Chalcanthus</i>	15.044	-	1	1	0.000	0.000	0.000	-	-	-	0.048	0.000	0.000	0.000
<i>Chaunanthus</i>	6.083	5.550	2	4	0.228	0.151	0.043	0.125	0.107	0.036	0.166	0.693	0.405	0.741
<i>Chilocardamum</i>	2.368	-	1	4	0.585	0.387	0.111	-	-	-	0.237	0.000	0.000	0.000
<i>Chlorocrambe</i>	3.966	-	1	1	0.000	0.000	0.000	-	-	-	0.187	0.693	0.693	0.527

<i>Chorispora</i>	14.889	14.880	9	11	0.161	0.120	0.047	0.115	0.100	0.043	0.218	0.105	0.087	0.527
<i>Christolea</i>	5.209	-	1	2	0.133	0.078	0.018	-	-	-	0.129	0.000	0.000	0.000
<i>Chrysochamela</i>	9.346	-	1	3	0.118	0.074	0.020	-	-	-	0.099	0.693	0.288	0.527
<i>Cithareloma</i>	3.264	-	1	3	0.337	0.212	0.056	-	-	-	0.122	0.000	0.000	0.000
<i>Clastopus</i>	3.322	-	1	2	0.209	0.122	0.029	-	-	-	0.171	0.693	0.405	0.527
<i>Clausia</i>	10.238	3.267	5	5	0.157	0.107	0.033	0.280	0.240	0.085	0.395	0.693	0.693	1.027
<i>Clypeola</i>	19.344	12.278	5	9	0.114	0.083	0.030	0.123	0.107	0.043	0.096	0.693	0.442	1.027
<i>Cochlearia</i>	14.556	14.548	10	18	0.199	0.155	0.068	0.151	0.135	0.065	0.422	0.000	0.000	0.000
<i>Coincya</i>	21.004	-	1	6	0.085	0.060	0.019	-	-	-	0.046	0.000	0.000	0.000
<i>Conringia</i>	19.659	18.542	2	6	0.091	0.064	0.021	0.059	0.051	0.019	0.050	0.000	0.000	0.000
<i>Cordylocarpus</i>	16.581	-	1	1	0.000	0.000	0.000	-	-	-	0.056	0.000	0.000	0.000
<i>Crambe</i>	21.398	-	1	9	0.103	0.075	0.027	-	-	-	0.045	0.693	0.105	0.527
<i>Crucihimalaya</i>	14.627	5.157	8	9	0.150	0.110	0.040	0.292	0.254	0.103	0.359	0.000	0.000	0.000
<i>Cryptospora</i>	6.406	-	1	5	0.251	0.172	0.053	-	-	-	0.122	0.000	0.000	0.000
<i>Cuphonotus</i>	4.042	-	1	2	0.171	0.100	0.024	-	-	-	0.113	0.000	0.000	0.000
<i>Cusickiella</i>	9.138	9.125	2	2	0.076	0.044	0.010	0.000	0.000	0.000	0.103	0.000	0.000	0.000
<i>Cyphocardamum</i>	16.616	-	1	1	0.000	0.000	0.000	-	-	-	0.049	0.000	0.000	0.000
<i>Dactylocardamum</i>	3.727	-	1	1	0.000	0.000	0.000	-	-	-	0.156	0.000	0.000	0.000
<i>Degenia</i>	7.456	-	1	1	0.000	0.000	0.000	-	-	-	0.081	0.693	0.693	0.527
<i>Delpinophytum</i>	23.409	-	1	1	0.000	0.000	0.000	-	-	-	0.041	0.000	0.000	0.000
<i>Dendroarabis</i>	18.195	-	1	1	0.000	0.000	0.000	-	-	-	0.051	0.693	0.693	0.527
<i>Descurainia</i>	14.007	8.527	36	52	0.282	0.234	0.129	0.382	0.350	0.206	1.065	0.105	0.074	0.959
<i>Diceratella</i>	8.965	-	1	11	0.267	0.200	0.077	-	-	-	0.087	0.000	0.000	0.000
<i>Dichasianthus</i>	10.060	-	1	1	0.000	0.000	0.000	-	-	-	0.076	0.000	0.000	0.000
<i>Didesmus</i>	10.160	-	1	2	0.068	0.040	0.009	-	-	-	0.073	0.000	0.000	0.000
<i>Didymophysa</i>	4.568	4.072	2	2	0.152	0.089	0.021	0.000	0.000	0.000	0.152	0.000	0.000	0.000
<i>Dilophia</i>	9.538	-	1	1	0.000	0.000	0.000	-	-	-	0.097	0.000	0.000	0.000
<i>Dimorphocarpa</i>	8.701	-	1	4	0.159	0.105	0.030	-	-	-	0.076	0.693	0.223	0.527
<i>Diplotaxis</i>	22.378	22.324	5	32	0.155	0.125	0.063	0.124	0.113	0.061	0.052	0.000	0.000	0.000
<i>Dipoma</i>	14.619	-	1	1	0.000	0.000	0.000	-	-	-	0.066	0.000	0.000	0.000
<i>Diptychocarpus</i>	13.119	-	1	1	0.000	0.000	0.000	-	-	-	0.061	0.000	0.000	0.000
<i>Dithyrea</i>	7.731	-	1	2	0.090	0.052	0.012	-	-	-	0.095	0.693	0.405	0.527
<i>Dontostemon</i>	10.238	7.766	13	13	0.251	0.190	0.077	0.241	0.212	0.095	0.182	0.074	0.074	0.527
<i>Draba</i>	8.860	8.853	243	376	0.669	0.591	0.412	0.592	0.559	0.407	1.259	0.293	0.111	1.570
<i>Drabastrum</i>	2.711	-	1	1	0.000	0.000	0.000	-	-	-	0.151	0.000	0.000	0.000
<i>Dryopetalon</i>	3.966	-	1	8	0.524	0.379	0.134	-	-	-	0.187	0.693	0.118	0.527
<i>Elburzia</i>	4.568	-	1	1	0.000	0.000	0.000	-	-	-	0.110	0.000	0.000	0.000
<i>Englerocharis</i>	4.492	-	1	2	0.154	0.090	0.021	-	-	-	0.141	0.693	0.405	0.527
<i>Eremoblastus</i>	11.928	-	1	1	0.000	0.000	0.000	-	-	-	0.070	0.000	0.000	0.000
<i>Eremophyton</i>	17.703	-	1	1	0.000	0.000	0.000	-	-	-	0.049	0.000	0.000	0.000
<i>Erophila</i>	11.285	2.388	3	3	0.097	0.061	0.016	0.170	0.147	0.049	0.160	0.000	0.000	0.000
<i>Eruca</i>	1.607	-	1	4	0.863	0.570	0.163	-	-	-	0.120	0.693	0.223	0.527
<i>Erucaria</i>	13.782	-	1	10	0.167	0.124	0.047	-	-	-	0.058	0.000	0.000	0.000
<i>Erucastrum</i>	20.234	-	1	25	0.159	0.127	0.060	-	-	-	0.047	0.693	0.039	0.527
<i>Erysimum</i>	13.933	2.001	134	226	0.389	0.340	0.227	2.362	2.221	1.552	1.328	0.270	0.148	1.528
<i>Euclidium</i>	8.638	-	1	1	0.000	0.000	0.000	-	-	-	0.100	0.000	0.000	0.000
<i>Eutrema</i>	11.577	11.562	9	27	0.285	0.228	0.111	0.225	0.203	0.106	0.187	0.288	0.105	0.870
<i>Exhalimolobos</i>	8.760	1.135	5	9	0.251	0.184	0.067	1.325	1.153	0.470	0.391	0.588	0.368	0.959
<i>Farsetia</i>	18.484	12.387	7	27	0.178	0.143	0.069	0.210	0.189	0.099	0.150	0.000	0.000	0.000

<i>Fezia</i>	18.284	-	1	1	0.000	0.000	0.000	-	-	-	0.052	0.000	0.000	0.000
<i>Fibigia</i>	4.362	4.347	8	13	0.588	0.446	0.181	0.431	0.379	0.169	0.311	0.693	0.480	1.162
<i>Fortuynia</i>	4.212	-	1	2	0.165	0.096	0.023	-	-	-	0.078	0.000	0.000	0.000
<i>Galitzkya</i>	11.008	4.266	3	3	0.100	0.063	0.017	0.095	0.082	0.028	0.153	0.693	0.693	0.870
<i>Goldbachia</i>	15.196	7.576	2	5	0.106	0.072	0.022	0.121	0.103	0.037	0.071	0.693	0.336	0.741
<i>Halimolobos</i>	5.425	5.391	7	8	0.383	0.277	0.098	0.257	0.223	0.088	0.492	0.000	0.000	0.000
<i>Harmsiodoxa</i>	10.120	-	1	3	0.109	0.068	0.018	-	-	-	0.095	0.000	0.000	0.000
<i>Heldreichia</i>	16.723	2.581	4	4	0.083	0.055	0.016	0.269	0.230	0.078	0.168	0.000	0.000	0.000
<i>Hesperidanthus</i>	9.562	-	1	5	0.168	0.115	0.035	-	-	-	0.086	0.000	0.000	0.000
<i>Hesperis</i>	5.172	5.158	6	47	0.744	0.615	0.333	0.612	0.560	0.324	0.235	0.405	0.062	0.870
<i>Hilliella</i>	24.390	18.022	10	10	0.094	0.070	0.026	0.089	0.078	0.033	0.264	0.000	0.000	0.000
<i>Hirschfeldia</i>	18.270	-	1	1	0.000	0.000	0.000	-	-	-	0.050	0.000	0.000	0.000
<i>Hormathophylla</i>	14.168	3.248	10	10	0.163	0.120	0.045	0.496	0.433	0.181	0.352	0.693	0.693	1.223
<i>Ianhedgea</i>	14.987	-	1	1	0.000	0.000	0.000	-	-	-	0.056	0.693	0.693	0.527
<i>Iberis</i>	24.116	8.790	5	27	0.137	0.109	0.053	0.296	0.267	0.140	0.158	0.000	0.000	0.000
<i>Iodanthus</i>	13.281	-	1	1	0.000	0.000	0.000	-	-	-	0.064	0.000	0.000	0.000
<i>Ionopsidium</i>	14.556	14.495	6	6	0.123	0.086	0.028	0.076	0.065	0.024	0.093	0.000	0.000	0.000
<i>Irenepharsus</i>	11.514	-	1	3	0.095	0.060	0.016	-	-	-	0.082	0.000	0.000	0.000
<i>Isatis</i>	12.722	12.703	24	79	0.343	0.290	0.171	0.289	0.268	0.167	0.309	0.318	0.108	1.195
<i>Iskandera</i>	14.568	12.934	2	2	0.048	0.028	0.007	0.000	0.000	0.000	0.068	0.000	0.000	0.000
<i>Kernera</i>	4.894	0.693	2	2	0.142	0.083	0.019	0.000	0.000	0.000	0.128	0.000	0.000	0.000
<i>Lachnocapsa</i>	10.050	-	1	1	0.000	0.000	0.000	-	-	-	0.071	0.000	0.000	0.000
<i>Leavenworthia</i>	11.831	0.631	8	8	0.176	0.127	0.045	2.197	1.903	0.754	0.932	0.693	0.318	0.870
<i>Leiospora</i>	10.060	2.504	3	6	0.178	0.125	0.040	0.439	0.377	0.139	0.211	0.000	0.000	0.000
<i>Lepidium</i>	16.616	16.605	46	232	0.328	0.286	0.192	0.286	0.269	0.189	1.002	0.590	0.148	1.534
<i>Lepidostemon</i>	3.911	-	1	6	0.458	0.320	0.104	-	-	-	0.133	0.693	0.154	0.527
<i>Leptaleum</i>	11.889	-	1	1	0.000	0.000	0.000	-	-	-	0.071	0.000	0.000	0.000
<i>Litwinowia</i>	9.425	-	1	1	0.000	0.000	0.000	-	-	-	0.088	0.000	0.000	0.000
<i>Lobularia</i>	15.943	6.223	10	10	0.144	0.107	0.040	0.259	0.226	0.094	0.451	0.000	0.000	0.000
<i>Lunaria</i>	23.946	23.048	2	3	0.046	0.029	0.008	0.018	0.015	0.005	0.041	0.000	0.000	0.000
<i>Lyrocarpa</i>	4.158	-	1	3	0.264	0.167	0.044	-	-	-	0.158	0.693	0.288	0.527
<i>Macropodium</i>	18.666	7.036	2	2	0.037	0.022	0.005	0.000	0.000	0.000	0.068	0.000	0.000	0.000
<i>Malcolmia</i>	27.642	27.631	9	31	0.124	0.100	0.050	0.099	0.090	0.048	0.096	0.000	0.000	0.000
<i>Mancoa</i>	8.760	1.248	2	8	0.237	0.172	0.061	1.111	0.962	0.381	0.166	0.000	0.000	0.000
<i>Maresia</i>	13.704	-	1	3	0.080	0.051	0.013	-	-	-	0.057	0.000	0.000	0.000
<i>Mathewsia</i>	5.494	5.362	6	10	0.419	0.310	0.117	0.300	0.262	0.110	0.287	0.693	0.470	1.080
<i>Matthiola</i>	17.036	17.028	12	49	0.228	0.189	0.103	0.188	0.172	0.100	0.184	0.000	0.000	0.000
<i>Megacarpaea</i>	14.674	-	1	9	0.150	0.110	0.040	-	-	-	0.049	0.000	0.000	0.000
<i>Megadenia</i>	16.723	-	1	1	0.000	0.000	0.000	-	-	-	0.050	0.000	0.000	0.000
<i>Menkea</i>	4.042	-	1	6	0.443	0.310	0.100	-	-	-	0.113	0.000	0.000	0.000
<i>Menonvillea</i>	22.277	21.175	16	24	0.143	0.113	0.054	0.117	0.105	0.054	0.204	0.000	0.000	0.000
<i>Microlepidium</i>	10.120	-	1	2	0.068	0.040	0.009	-	-	-	0.095	0.000	0.000	0.000
<i>Microstigma</i>	16.404	-	1	3	0.067	0.042	0.011	-	-	-	0.055	0.000	0.000	0.000
<i>Microthlaspi</i>	18.682	18.667	5	5	0.086	0.059	0.018	0.049	0.042	0.015	0.109	0.000	0.000	0.000
<i>Morettia</i>	8.965	8.953	3	3	0.123	0.077	0.020	0.045	0.039	0.013	0.148	0.000	0.000	0.000
<i>Mostacillastrum</i>	3.335	3.324	4	17	0.849	0.659	0.286	0.644	0.572	0.272	0.290	0.000	0.000	0.000
<i>Myagrum</i>	14.721	-	1	1	0.000	0.000	0.000	-	-	-	0.053	0.000	0.000	0.000
<i>Nasturtiopsis</i>	18.299	-	1	2	0.038	0.022	0.005	-	-	-	0.050	0.000	0.000	0.000
<i>Nasturtium</i>	15.177	0.014	2	10	0.152	0.112	0.042	117.787	102.819	43.017	0.112	0.693	0.182	0.741

<i>Neotorularia</i>	9.414	9.260	5	11	0.255	0.190	0.074	0.184	0.161	0.069	0.149	0.182	0.087	0.527
<i>Nerisyrenia</i>	4.158	1.682	2	8	0.500	0.362	0.128	0.824	0.714	0.283	0.250	0.693	0.223	0.741
<i>Neslia</i>	8.544	-	1	1	0.000	0.000	0.000	-	-	-	0.099	0.693	0.693	0.527
<i>Neuontobotrys</i>	3.356	3.285	4	11	0.715	0.534	0.207	0.519	0.455	0.195	0.466	0.000	0.000	0.000
<i>Nevada</i>	6.410	-	1	1	0.000	0.000	0.000	-	-	-	0.123	0.000	0.000	0.000
<i>Noccaea</i>	11.377	7.142	19	80	0.385	0.325	0.192	0.516	0.478	0.299	0.458	0.000	0.000	0.000
<i>Notoceras</i>	15.943	-	1	1	0.000	0.000	0.000	-	-	-	0.053	0.000	0.000	0.000
<i>Octoceras</i>	7.031	-	1	1	0.000	0.000	0.000	-	-	-	0.115	0.000	0.000	0.000
<i>Olimarabidopsis</i>	3.362	3.342	3	3	0.327	0.206	0.054	0.121	0.105	0.035	0.297	0.511	0.511	0.741
<i>Onuris</i>	10.268	7.109	6	6	0.175	0.122	0.039	0.155	0.133	0.049	0.554	0.000	0.000	0.000
<i>Oreophyton</i>	11.629	-	1	1	0.000	0.000	0.000	-	-	-	0.074	0.000	0.000	0.000
<i>Ornithocarpa</i>	14.513	-	1	2	0.048	0.028	0.007	-	-	-	0.065	0.693	0.405	0.527
<i>Orychophragmus</i>	24.819	16.409	5	5	0.065	0.044	0.014	0.056	0.048	0.017	0.115	0.182	0.182	0.527
<i>Pachycladon</i>	5.898	4.730	9	10	0.390	0.289	0.109	0.340	0.297	0.124	0.388	0.000	0.000	0.000
<i>Pachymitus</i>	2.711	-	1	1	0.000	0.000	0.000	-	-	-	0.151	0.000	0.000	0.000
<i>Pachyneurum</i>	8.860	-	1	1	0.000	0.000	0.000	-	-	-	0.099	0.000	0.000	0.000
<i>Parlatoria</i>	6.312	-	1	2	0.110	0.064	0.015	-	-	-	0.103	0.000	0.000	0.000
<i>Parolinia</i>	5.743	-	1	5	0.280	0.191	0.059	-	-	-	0.083	0.000	0.000	0.000
<i>Parrya</i>	9.425	7.163	33	36	0.380	0.310	0.160	0.404	0.367	0.203	0.376	0.059	0.054	0.741
<i>Paysonia</i>	12.172	6.551	6	8	0.171	0.124	0.044	0.212	0.183	0.073	0.382	0.693	0.560	1.080
<i>Pegaeophyton</i>	11.577	-	1	7	0.168	0.120	0.041	-	-	-	0.062	0.000	0.000	0.000
<i>Peltaria</i>	16.689	-	1	4	0.083	0.055	0.016	-	-	-	0.048	0.693	0.223	0.527
<i>Pennellia</i>	5.425	5.230	2	10	0.424	0.314	0.118	0.308	0.269	0.112	0.155	0.000	0.000	0.000
<i>Petiniotia</i>	11.928	-	1	1	0.000	0.000	0.000	-	-	-	0.070	0.000	0.000	0.000
<i>Phaeonychium</i>	5.209	2.696	2	6	0.344	0.241	0.078	0.407	0.350	0.130	0.191	0.000	0.000	0.000
<i>Phlegmatospermum</i>	10.436	-	1	4	0.133	0.088	0.025	-	-	-	0.091	0.000	0.000	0.000
<i>Phoenicaulis</i>	6.410	-	1	1	0.000	0.000	0.000	-	-	-	0.123	0.693	0.693	0.527
<i>Physaria</i>	12.172	6.637	22	106	0.383	0.327	0.201	0.598	0.556	0.360	0.488	0.128	0.028	0.870
<i>Physocardamum</i>	4.825	-	1	1	0.000	0.000	0.000	-	-	-	0.079	0.693	0.693	0.527
<i>Physoptychis</i>	3.322	-	1	3	0.331	0.209	0.055	-	-	-	0.171	0.693	0.288	0.527
<i>Planodes</i>	13.734	-	1	1	0.000	0.000	0.000	-	-	-	0.069	0.000	0.000	0.000
<i>Polycytenium</i>	9.138	-	1	1	0.000	0.000	0.000	-	-	-	0.097	0.000	0.000	0.000
<i>Polypsecadium</i>	3.335	3.118	3	15	0.812	0.623	0.262	0.646	0.572	0.264	0.312	0.000	0.000	0.000
<i>Pringlea</i>	2.368	-	1	1	0.000	0.000	0.000	-	-	-	0.237	0.000	0.000	0.000
<i>Pritzelago</i>	0.798	-	1	1	0.000	0.000	0.000	-	-	-	0.141	0.000	0.000	0.000
<i>Pseudoarabidopsis</i>	11.081	-	1	1	0.000	0.000	0.000	-	-	-	0.079	0.000	0.000	0.000
<i>Pseudocamelina</i>	11.675	-	1	3	0.094	0.059	0.016	-	-	-	0.073	0.000	0.000	0.000
<i>Pseudoclausia</i>	10.089	9.563	7	7	0.193	0.137	0.047	0.131	0.113	0.043	0.244	0.000	0.000	0.000
<i>Pseudovesicaria</i>	10.550	-	1	1	0.000	0.000	0.000	-	-	-	0.077	0.000	0.000	0.000
<i>Psychine</i>	20.389	-	1	1	0.000	0.000	0.000	-	-	-	0.045	0.693	0.693	0.527
<i>Pugionium</i>	14.674	0.358	2	3	0.075	0.047	0.012	1.133	0.983	0.329	0.096	0.000	0.000	0.000
<i>Raphanus</i>	13.806	13.769	2	3	0.080	0.050	0.013	0.029	0.026	0.009	0.064	0.000	0.000	0.000
<i>Rapistrum</i>	13.806	-	1	2	0.050	0.029	0.007	-	-	-	0.057	0.000	0.000	0.000
<i>Rhammatophyllum</i>	5.604	3.578	6	10	0.411	0.304	0.115	0.450	0.393	0.164	0.333	0.000	0.000	0.000
<i>Rhizobotrya</i>	4.894	-	1	1	0.000	0.000	0.000	-	-	-	0.067	0.000	0.000	0.000
<i>Ricotia</i>	26.586	-	1	9	0.083	0.061	0.022	-	-	-	0.037	0.000	0.000	0.000
<i>Robeschia</i>	14.007	-	1	1	0.000	0.000	0.000	-	-	-	0.063	0.000	0.000	0.000
<i>Rorippa</i>	9.949	9.909	8	87	0.449	0.380	0.227	0.381	0.353	0.223	0.362	0.452	0.045	0.959
<i>Rytidocarpus</i>	12.945	-	1	1	0.000	0.000	0.000	-	-	-	0.058	0.693	0.693	0.527

<i>Sandbergia</i>	5.957	2.833	2	2	0.116	0.068	0.016	0.000	0.000	0.000	0.187	0.000	0.000	0.000
<i>Sarcodraba</i>	2.404	-	1	4	0.577	0.381	0.109	-	-	-	0.165	0.000	0.000	0.000
<i>Savignya</i>	18.284	-	1	1	0.000	0.000	0.000	-	-	-	0.052	0.693	0.693	0.527
<i>Scambopus</i>	6.258	-	1	1	0.000	0.000	0.000	-	-	-	0.119	0.000	0.000	0.000
<i>Schimpera</i>	12.722	-	1	1	0.000	0.000	0.000	-	-	-	0.063	0.000	0.000	0.000
<i>Schivereckia</i>	9.482	0.994	2	3	0.116	0.073	0.019	0.408	0.354	0.118	0.162	0.000	0.000	0.000
<i>Schizopetalon</i>	5.494	4.258	9	10	0.419	0.310	0.117	0.378	0.330	0.138	0.540	0.693	0.642	1.195
<i>Schoenocrambe</i>	11.781	-	1	1	0.000	0.000	0.000	-	-	-	0.059	0.000	0.000	0.000
<i>Schouwia</i>	23.753	-	1	1	0.000	0.000	0.000	-	-	-	0.041	0.693	0.693	0.527
<i>Selenia</i>	11.831	9.993	5	5	0.136	0.093	0.028	0.092	0.078	0.028	0.167	0.511	0.336	0.741
<i>Sibara</i>	8.944	7.664	3	6	0.200	0.140	0.045	0.143	0.123	0.046	0.137	0.693	0.405	0.870
<i>Sibaropsis</i>	7.136	-	1	1	0.000	0.000	0.000	-	-	-	0.111	0.693	0.693	0.527
<i>Sinapidendron</i>	18.249	-	1	4	0.076	0.050	0.014	-	-	-	0.052	0.000	0.000	0.000
<i>Sinapis</i>	16.581	16.567	2	5	0.097	0.066	0.020	0.055	0.047	0.017	0.058	0.000	0.000	0.000
<i>Sisymbrella</i>	9.949	-	1	2	0.070	0.041	0.010	-	-	-	0.086	0.000	0.000	0.000
<i>Sisymbriopsis</i>	6.431	6.419	2	5	0.250	0.171	0.052	0.143	0.122	0.043	0.136	0.000	0.000	0.000
<i>Sisymbrium</i>	11.781	11.765	8	48	0.329	0.272	0.148	0.270	0.247	0.144	0.101	0.118	0.021	0.527
<i>Smelowskia</i>	16.615	10.872	18	25	0.194	0.154	0.074	0.232	0.209	0.108	0.247	0.288	0.215	1.080
<i>Sobolewskia</i>	6.312	-	1	4	0.220	0.145	0.042	-	-	-	0.103	0.000	0.000	0.000
<i>Solms-laubachia</i>	5.604	5.583	15	26	0.581	0.464	0.224	0.459	0.414	0.215	0.312	0.065	0.038	0.527
<i>Sphaerocardamum</i>	6.867	3.656	8	8	0.303	0.219	0.077	0.379	0.328	0.130	0.650	0.000	0.000	0.000
<i>Spryginia</i>	14.492	4.912	2	7	0.134	0.096	0.032	0.255	0.220	0.084	0.083	0.000	0.000	0.000
<i>Stanleya</i>	4.838	4.818	7	7	0.402	0.287	0.097	0.260	0.224	0.086	0.234	0.693	0.693	1.125
<i>Stenopetalum</i>	5.898	-	1	10	0.390	0.289	0.109	-	-	-	0.106	0.000	0.000	0.000
<i>Stevenia</i>	18.666	14.573	3	3	0.059	0.037	0.010	0.028	0.024	0.008	0.060	0.000	0.000	0.000
<i>Streptanthella</i>	7.136	-	1	1	0.000	0.000	0.000	-	-	-	0.111	0.693	0.693	0.527
<i>Streptanthus</i>	6.772	6.733	30	35	0.525	0.427	0.219	0.425	0.386	0.212	0.338	0.693	0.619	1.489
<i>Succowia</i>	24.472	-	1	1	0.000	0.000	0.000	-	-	-	0.040	0.693	0.693	0.527
<i>Systemon</i>	1.117	-	1	2	0.621	0.363	0.085	-	-	-	0.129	0.000	0.000	0.000
<i>Synthlipsis</i>	6.513	-	1	2	0.106	0.062	0.015	-	-	-	0.118	0.693	0.405	0.527
<i>Tchihatchewia</i>	5.172	-	1	1	0.000	0.000	0.000	-	-	-	0.078	0.000	0.000	0.000
<i>Teesdalia</i>	24.116	-	1	3	0.046	0.029	0.008	-	-	-	0.041	0.000	0.000	0.000
<i>Tetracme</i>	7.031	7.020	3	10	0.328	0.242	0.091	0.229	0.200	0.084	0.143	0.000	0.000	0.000
<i>Thelypodopsis</i>	6.283	6.228	3	14	0.420	0.321	0.133	0.312	0.276	0.125	0.186	0.693	0.194	0.870
<i>Thelypodium</i>	5.635	5.616	5	17	0.503	0.390	0.170	0.381	0.339	0.161	0.276	0.693	0.258	1.027
<i>Thlaspi</i>	23.821	23.029	13	53	0.167	0.138	0.077	0.142	0.131	0.077	0.347	0.379	0.107	1.080
<i>Thysanocarpus</i>	8.944	8.521	6	6	0.200	0.140	0.045	0.129	0.111	0.041	0.178	0.693	0.693	1.080
<i>Tomostima</i>	6.894	1.502	3	3	0.159	0.101	0.026	0.270	0.234	0.078	0.255	0.000	0.000	0.000
<i>Tropidocarpum</i>	14.524	-	1	4	0.095	0.063	0.018	-	-	-	0.057	0.000	0.000	0.000
<i>Turritis</i>	11.629	3.621	2	2	0.060	0.035	0.008	0.000	0.000	0.000	0.117	0.000	0.000	0.000
<i>Vania</i>	12.221	-	1	1	0.000	0.000	0.000	-	-	-	0.058	0.000	0.000	0.000
<i>Vella</i>	13.648	6.230	8	8	0.152	0.110	0.039	0.223	0.193	0.076	0.160	0.693	0.693	1.162
<i>Warea</i>	5.635	-	1	4	0.246	0.163	0.047	-	-	-	0.164	0.693	0.223	0.527
<i>Weberbaueria</i>	4.492	4.469	3	21	0.678	0.534	0.245	0.526	0.471	0.234	0.190	0.693	0.134	0.870
<i>Werdermannia</i>	12.912	4.110	2	5	0.125	0.085	0.026	0.223	0.191	0.068	0.104	0.000	0.000	0.000
<i>Xerodraba</i>	10.268	5.109	3	7	0.190	0.135	0.046	0.245	0.211	0.081	0.161	0.000	0.000	0.000
<i>Yinshania</i>	16.615	1.256	3	13	0.154	0.117	0.047	1.490	1.313	0.585	0.156	0.000	0.000	0.000
<i>Zerdana</i>	9.146	-	1	1	0.000	0.000	0.000	-	-	-	0.085	0.000	0.000	0.000
<i>Zilla</i>	4.212	-	1	2	0.165	0.096	0.023	-	-	-	0.078	0.000	0.000	0.000
<i>Zuvanda</i>	19.659	0.731	2	3	0.056	0.035	0.009	0.555	0.481	0.161	0.091	0.000	0.000	0.000

Table S3.6 Phylogenetic generalized least squares (PGLS) models testing whether polyploid richness influences species richness through diversification rates

POLYPLOIDY RICHNESS	METHOD	GROUP	e	SLOPE	R ²	P	
Absolute	MS	Crown	0	0.216	0.001	0.806	
			0.5	0.194	0.001	0.801	
			0.9	0.104	0.000	0.746	
		Stem	0	0.085	0.166	<0.001	
			0.5	0.073	0.207	<0.001	
			0.9	0.444	0.304	<0.001	
Proportion tree		Crown	0	3.665	0.021	0.115	
			0.5	3.197	0.021	0.115	
			0.9	1.333	0.021	0.116	
			Stem	0	0.057	0.016	0.046
				0.5	0.044	0.017	0.044
				0.9	0.057	0.016	0.046
Proportion total richness		Crown	0	-0.203	<0.001	0.948	
			0.5	-0.183	<0.001	0.946	
			0.9	-0.095	<0.001	0.933	
		Stem	0	-0.031	0.003	0.403	
			0.5	-0.020	0.002	0.474	
			0.9	-0.007	0.001	0.641	
Absolute	DR	-	0.011	0.458	<0.001		
Proportion tree		-	0.083	0.031	0.006		
Proportion total richness		-	0.085	0.019	0.032		

Table S3.7 Phylogenetic path regression models testing whether polyploid richness has indirectly shaped present-day patterns of species richness among clades through diversification.

METHOD	GROUP	e	POLYPLOIDY	k	q	C	p	CICc	delta_CICc	l	w
MS	Stem (n=243)	0.9	*	12	9	2107.492	0.000	2126.264	0.000	1.000	1.000
		0.9	-	13	8	2261.086	0.000	2277.702	151.438	0.000	0.000
		0.5	*	12	9	2284.479	0.000	2303.252	176.988	0.000	0.000
		0.5	-	13	8	2411.309	0.000	2427.925	301.661	0.000	0.000
		0	*	12	9	2414.687	0.000	2433.460	307.196	0.000	0.000
		0	-	13	8	2519.595	0.000	2536.211	409.947	0.000	0.000
	Crown (n=124)	0.9	-	13	8	3575.756	0.000	3593.065	0.000	1.000	0.609
		0.5	-	13	8	3578.077	0.000	3595.387	2.321	0.313	0.191
		0	-	13	8	3578.429	0.000	3595.738	2.673	0.263	0.160
		0.5	*	12	9	3580.245	0.000	3599.897	6.831	0.033	0.020
		0	*	12	9	3580.681	0.000	3600.332	7.267	0.026	0.016
		0.9	*	12	9	3583.826	0.000	3603.477	10.412	0.005	0.003
DR (n=243)	-	*	3	7	21.308	0.002	36.317	0.000	1.000	1.000	
		-	4	6	68.440	0.000	81.190	44.872	0.000	0.000	

Table S3.8 List of DR (Species-Specific Diversification Rate) statistic estimated for 1,667 Brassicaceae species.

SPECIES	DR
<i>Streptanthus_glandulosus</i>	0.228
<i>Streptanthus_callistus</i>	0.321
<i>Streptanthus_hispidus</i>	0.321
<i>Streptanthus_cutleri</i>	0.318
<i>Streptanthus_bracteatus</i>	0.318
<i>Streptanthus_platycarpus</i>	0.222
<i>Streptanthus_carinatus</i>	0.182
<i>Streptanthus_vernalis</i>	1.410
<i>Streptanthus_morrisonii</i>	1.410
<i>Streptanthus_brachiatus</i>	0.726
<i>Streptanthus_batrachopus</i>	0.414
<i>Streptanthus_barbiger</i>	0.354
<i>Streptanthus_hesperidis</i>	0.277
<i>Streptanthus_drepanoides</i>	0.366
<i>Streptanthus_breweri</i>	0.366
<i>Streptanthus_polygaloides</i>	0.168
<i>Streptanthus_cooperi</i>	0.168
<i>Streptanthus_cordatus</i>	0.160
<i>Streptanthus_howellii</i>	0.176
<i>Streptanthus_longisiliquus</i>	0.176
<i>Streptanthus_barbatus</i>	0.160
<i>Streptanthus_diversifolius</i>	0.229
<i>Streptanthus_tortuosus</i>	0.229
<i>Streptanthus_bernardinus</i>	0.287
<i>Streptanthus_campestris</i>	0.287
<i>Streptanthus_fenestratus</i>	0.192
<i>Streptanthus_farnsworthianus</i>	0.192
<i>Streptanthus_maculatus</i>	0.144
<i>Streptanthus_petiolaris</i>	0.165
<i>Streptanthus_hyacinthoides</i>	0.165
<i>Thelypodium_sagittatum</i>	0.389
<i>Thelypodium_integrifolium</i>	0.389
<i>Thelypodium_flexuosum</i>	0.240
<i>Thelypodium_crispum</i>	0.192
<i>Thelypodium_laciniatum</i>	0.171
<i>Warea_cuneifolia</i>	0.164
<i>Chaunanthus_acuminatus</i>	0.166
<i>Chaunanthus_petiolatus</i>	0.166
<i>Thelypodopsis_elegans</i>	0.203
<i>Thelypodopsis_ambigua</i>	0.203
<i>Thelypodopsis_vaseyi</i>	0.151
<i>Stanleya_confertiflora</i>	0.259
<i>Stanleya_bipinnata</i>	0.259
<i>Stanleya_pinnata</i>	0.225
<i>Stanleya_albescens</i>	0.193
<i>Stanleya_viridiflora</i>	0.255
<i>Stanleya_tomentosa</i>	0.255

<i>Stanleya_elata</i>	0.189
<i>Dryopetalon_viereckii</i>	0.187
<i>Chlorocrambe_hastata</i>	0.187
<i>Thysanocarpus_curvipes</i>	0.224
<i>Thysanocarpus_laciniatus</i>	0.224
<i>Thysanocarpus_radians</i>	0.146
<i>Thysanocarpus_rigidus</i>	0.181
<i>Thysanocarpus_conchuliferus</i>	0.181
<i>Thysanocarpus_erectus</i>	0.112
<i>Sibara_angelorum</i>	0.146
<i>Sibara_laxa</i>	0.146
<i>Sibara_deserti</i>	0.118
<i>Weberbaueria_peruviana</i>	0.198
<i>Weberbaueria_rosulans</i>	0.198
<i>Weberbaueria_herzogii</i>	0.173
<i>Englerocharis_pauciflora</i>	0.141
<i>Hesperidanthus_jaegeri</i>	0.086
<i>Mostacillastrum_elongatum</i>	0.296
<i>Mostacillastrum_andinum</i>	0.296
<i>Mostacillastrum_gracile</i>	0.283
<i>Mostacillastrum_stenophyllum</i>	0.283
<i>Polypsecadium_harmsianum</i>	0.344
<i>Polypsecadium_rusbyi</i>	0.344
<i>Polypsecadium_grandiflorum</i>	0.248
<i>Neuontobotrys_tarapacana</i>	0.663
<i>Neuontobotrys_lanata</i>	0.663
<i>Neuontobotrys_intricatissima</i>	0.333
<i>Neuontobotrys_frutescens</i>	0.203
<i>Pringlea_antiscorbutica</i>	0.237
<i>Chilocardamum_patagonicum</i>	0.237
<i>Sarcodraba_dusenii</i>	0.165
<i>Caulanthus_coulteri</i>	0.506
<i>Caulanthus_lemmonii</i>	0.506
<i>Caulanthus_inflatus</i>	0.290
<i>Caulanthus_heterophyllus</i>	0.229
<i>Caulanthus_simulans</i>	0.207
<i>Caulanthus_glaucus</i>	0.209
<i>Caulanthus_hallii</i>	0.209
<i>Caulanthus_pilosus</i>	0.166
<i>Caulanthus_flavescens</i>	0.280
<i>Caulanthus_lasiophyllus</i>	0.280
<i>Caulanthus_anceps</i>	0.235
<i>Caulanthus_major</i>	0.179
<i>Caulanthus_crassicaulis</i>	0.111
<i>Streptanthella_longirostris</i>	0.111
<i>Sibaropsis_hammittii</i>	0.111
<i>Schizopetalon_biseriatum</i>	1.293
<i>Schizopetalon_tenuifolium</i>	1.293
<i>Schizopetalon_brachycarpum</i>	0.663

<i>Schizopetalon_bipinnatifidum</i>	0.384
<i>Schizopetalon_rupestre</i>	0.212
<i>Schizopetalon_arcuatum</i>	0.178
<i>Schizopetalon_maritimum</i>	0.322
<i>Schizopetalon_walkerii</i>	0.322
<i>Schizopetalon_dentatum</i>	0.195
<i>Mathewsia_collina</i>	0.394
<i>Mathewsia_incana</i>	0.394
<i>Mathewsia_densifolia</i>	0.276
<i>Mathewsia_foliosa</i>	0.262
<i>Mathewsia_auriculata</i>	0.262
<i>Mathewsia_nivea</i>	0.132
<i>Werdermannia_macrostachya</i>	0.104
<i>Werdermannia_mendocina</i>	0.104
<i>Sisymbrium_orientale</i>	0.140
<i>Sisymbrium_officinale</i>	0.140
<i>Sisymbrium_irioides</i>	0.093
<i>Sisymbrium_austriacum</i>	0.084
<i>Sisymbrium_aculeolatum</i>	0.078
<i>Sisymbrium_loeselii</i>	0.094
<i>Sisymbrium_polymorphum</i>	0.094
<i>Sisymbrium_altissimum</i>	0.082
<i>Schoenocrambe_linifolia</i>	0.059
<i>Brassica_rapa</i>	0.233
<i>Brassica_juncea</i>	0.233
<i>Brassica_napus</i>	0.198
<i>Brassica_incana</i>	0.277
<i>Brassica_oleracea</i>	0.277
<i>Brassica_montana</i>	0.237
<i>Brassica_cretica</i>	0.196
<i>Brassica_insularis</i>	0.125
<i>Brassica_macrocarpa</i>	0.095
<i>Brassica_villosa</i>	0.071
<i>Brassica_barrelieri</i>	0.069
<i>Brassica_oxyrhina</i>	0.069
<i>Brassica_deflexa</i>	0.058
<i>Brassica_balearica</i>	0.058
<i>Brassica_repanda</i>	0.108
<i>Brassica_desnottesii</i>	0.108
<i>Brassica_gravinae</i>	0.059
<i>Brassica_elongata</i>	0.052
<i>Brassica_maurorum</i>	0.095
<i>Brassica_tournefortii</i>	0.095
<i>Brassica_fruticulosa</i>	0.075
<i>Brassica_carinata</i>	0.099
<i>Brassica_nigra</i>	0.099
<i>Raphanus_sativus</i>	0.064
<i>Raphanus_raphanistrum</i>	0.064
<i>Rapistrum_rugosum</i>	0.057

<i>Erucastrum_gallicum</i>	0.047
<i>Diplotaxis_acris</i>	0.058
<i>Diplotaxis_tenuifolia</i>	0.058
<i>Diplotaxis_harra</i>	0.052
<i>Diplotaxis_erucoides</i>	0.045
<i>Diplotaxis_catholica</i>	0.044
<i>Moricandia_suffruticosa</i>	0.478
<i>Moricandia_spinosa</i>	0.478
<i>Moricandia_arvensis</i>	0.242
<i>Moricandia_nitens</i>	0.124
<i>Moricandia_sinaica</i>	0.118
<i>Moricandia_foetida</i>	0.118
<i>Moricandia_moricandioides</i>	0.097
<i>Eruca_vesicaria_subsp_sativa</i>	0.120
<i>Moricandia_foleyi</i>	0.120
<i>Rytidocarpus_moricandioides</i>	0.058
<i>Zilla_spinosa_subsp_macroptera</i>	0.078
<i>Fortuynia_garcini</i>	0.078
<i>Sinapis_alba</i>	0.058
<i>Sinapis_arvensis</i>	0.058
<i>Cordylocarpus_muricatus</i>	0.056
<i>Sinapidendron_frutescens</i>	0.052
<i>Hirschfeldia_incana</i>	0.050
<i>Coincya_monensis</i>	0.046
<i>Crambe_orientalis</i>	0.045
<i>Cakile_edentula</i>	0.335
<i>Cakile_lanceolata</i>	0.335
<i>Cakile_maritima</i>	0.182
<i>Cakile_arabica</i>	0.110
<i>Didesmus_aegypticus</i>	0.073
<i>Erucaria_erucarioides</i>	0.058
<i>Eremophyton_chevallieri</i>	0.049
<i>Vella_pseudocytisus_subsp_glabrata</i>	0.177
<i>Vella_aspera</i>	0.177
<i>Vella_mairei</i>	0.192
<i>Vella_anremerica</i>	0.192
<i>Vella_lucentina</i>	0.175
<i>Vella_castrilensis</i>	0.175
<i>Vella_bourgaeana</i>	0.111
<i>Vella_spinosa</i>	0.082
<i>Carrichtera_annua</i>	0.055
<i>Ammosperma_cinerea</i>	0.044
<i>Savignya_parviflora</i>	0.052
<i>Fezia_pterocarpa</i>	0.052
<i>Nasturtiopsis_coronopifolia</i>	0.050
<i>Psychine_stylosa</i>	0.045
<i>Schouwia_purpurea</i>	0.041
<i>Succowia_balearica</i>	0.040
<i>Orychophragmus_hupehensis</i>	0.179

<i>Orychophragmus_ziguiensis</i>	0.179
<i>Orychophragmus_taibaiensis</i>	0.104
<i>Orychophragmus_diffusus</i>	0.063
<i>Orychophragmus_violaceus</i>	0.048
<i>Bivonaea_lutea</i>	0.039
<i>Isatis_cappadocica_subsp._besseri</i>	0.351
<i>Isatis_kotschyana</i>	0.351
<i>Isatis_pachycarpa</i>	0.278
<i>Isatis_tinctoria</i>	0.278
<i>Isatis_microcarpa</i>	0.280
<i>Isatis_lusitanica</i>	0.280
<i>Isatis_raphanifolia</i>	0.314
<i>Isatis_koeiei</i>	0.314
<i>Isatis_koelzii</i>	0.441
<i>Isatis_gaubae</i>	0.441
<i>Isatis_leuconeura</i>	0.366
<i>Isatis_buschiana</i>	0.366
<i>Isatis_elegans</i>	0.352
<i>Isatis_armena</i>	0.352
<i>Isatis_quadrialata</i>	0.155
<i>Isatis_zarrei</i>	0.111
<i>Isatis_violascens</i>	0.582
<i>Isatis_emarginata</i>	0.582
<i>Isatis_minima</i>	0.314
<i>Isatis_trachycarpa</i>	0.325
<i>Isatis_stocksii</i>	0.325
<i>Isatis_multicaulis</i>	0.111
<i>Isatis_brevipes</i>	0.086
<i>Isatis_gymnocarpa</i>	0.070
<i>Schimpera_arabica</i>	0.063
<i>Myagrurn_perfoliatum</i>	0.053
<i>Conringia_orientalis</i>	0.050
<i>Conringia_planisiliqua</i>	0.050
<i>Zuvanda_crenulata</i>	0.091
<i>Zuvanda_exacoides</i>	0.091
<i>Eutrema_penlandii</i>	0.253
<i>Eutrema_edwardsii</i>	0.253
<i>Eutrema_heterophyllum</i>	0.140
<i>Eutrema_verticillatum</i>	0.098
<i>Eutrema_japonicum</i>	0.087
<i>Eutrema_botschantzevii</i>	0.308
<i>Eutrema_halophilum</i>	0.308
<i>Eutrema_salsugineum</i>	0.155
<i>Eutrema_altaicum</i>	0.081
<i>Pegaeophyton_scapiflorum</i>	0.062
<i>Chalcanthus_renifolius</i>	0.048
<i>Thlaspi_cepaeifolium</i>	0.689
<i>Thlaspi_alpinum</i>	0.689
<i>Thlaspi_calaminare</i>	0.550

<i>Thlaspi_praecox</i>	0.473
<i>Thlaspi_nevadense</i>	0.473
<i>Thlaspi_bulbosum</i>	0.298
<i>Thlaspi_goesingense</i>	0.409
<i>Thlaspi_jankae</i>	0.409
<i>Thlaspi_montanum</i>	0.159
<i>Thlaspi_densiflorum</i>	0.102
<i>Thlaspi_erraticum</i>	0.108
<i>Thlaspi_perfoliatum</i>	0.108
<i>Thlaspi_arvense</i>	0.042
<i>Didymophysa_fedtschenkoana</i>	0.152
<i>Didymophysa_aucheri</i>	0.152
<i>Elburzia_fenestrata</i>	0.110
<i>Pseudocamelina_glaucophylla</i>	0.073
<i>Sobolewsia_caucasica</i>	0.103
<i>Parlatoria_rostrata</i>	0.103
<i>Pseudovesicaria_digitata</i>	0.077
<i>Alliaria_petiolata</i>	0.062
<i>Alliaria_grandifolia</i>	0.062
<i>Peltaria_alliacea</i>	0.048
<i>Goldbachia_laevigata</i>	0.071
<i>Goldbachia_sabulosa</i>	0.071
<i>Calepina_irregularis</i>	0.048
<i>Brayopsis_colombiana</i>	0.474
<i>Eudema_nubigena_subsp._nubigena</i>	0.474
<i>Eudema_nubigena_subsp._remyana</i>	0.326
<i>Brayopsis_gamosepala</i>	0.201
<i>Brayopsis_calycina</i>	0.352
<i>Brayopsis_monimocalyx</i>	0.352
<i>Brayopsis_diapensioides</i>	0.195
<i>Eudema_nubigena</i>	0.198
<i>Eudema_rupestris</i>	0.198
<i>Dactylocardamum_imbricatifolium</i>	0.156
<i>Aschersoniodoxa_cachensis</i>	0.091
<i>Aschersoniodoxa_peruviana</i>	0.091
<i>Onuris_papillosa</i>	1.107
<i>Onuris_hatcheriana</i>	1.107
<i>Onuris_spegazziniana</i>	0.564
<i>Onuris_alismatifolia</i>	0.296
<i>Onuris_graminifolia</i>	0.159
<i>Onuris_hauthalii</i>	0.091
<i>Xerodraba_pycnophylloides</i>	0.192
<i>Xerodraba_patagonica</i>	0.192
<i>Xerodraba_pectinata</i>	0.100
<i>Menonvillea_rigida</i>	0.245
<i>Menonvillea_nordenskjoldii</i>	0.245
<i>Menonvillea_spathulata</i>	0.162
<i>Menonvillea_cicatricosa</i>	0.112
<i>Menonvillea_cuneata</i>	0.077

<i>Menonvillea_scapigera_subsp._scapigera</i>	0.091
<i>Menonvillea_scapigera_subsp._longipes</i>	0.091
<i>Menonvillea_flexuosa</i>	0.353
<i>Menonvillea_litoralis</i>	0.353
<i>Menonvillea_filifolia_subsp._filifolia</i>	0.421
<i>Menonvillea_pinnatifida</i>	0.421
<i>Menonvillea_orbiculata</i>	0.225
<i>Menonvillea_chilensis</i>	0.225
<i>Menonvillea_minima</i>	0.069
<i>Menonvillea_scapigera</i>	0.088
<i>Menonvillea_hookeri</i>	0.088
<i>Kernera_saxatilis_subsp._saxatilis</i>	0.128
<i>Kernera_saxatilis_subsp._boissieri</i>	0.128
<i>Rhizobotrya_alpina</i>	0.067
<i>Noccaea_occitanica</i>	1.141
<i>Noccaea_caerulescens</i>	1.141
<i>Noccaea_caerulescens_subsp._caerulescens</i>	0.703
<i>Noccaea_brachypetala</i>	0.399
<i>Noccaea_rotundifolia</i>	0.275
<i>Noccaea_virens</i>	0.264
<i>Noccaea_papyracea</i>	0.264
<i>Noccaea_oppositifolia</i>	0.178
<i>Noccaea_stylosa</i>	0.166
<i>Noccaea_crantzii</i>	0.147
<i>Noccaea_fendleri_subsp._glauca</i>	0.642
<i>Noccaea_fendleri_subsp._siskiyouensis</i>	0.642
<i>Noccaea_fendleri_subsp._idahoensis</i>	0.368
<i>Noccaea_fendleri</i>	0.252
<i>Noccaea_goesingensis</i>	0.522
<i>Noccaea_banatica</i>	0.522
<i>Noccaea_kovatsii</i>	0.490
<i>Noccaea_tymphaea</i>	0.490
<i>Noccaea_cochleariformis</i>	0.093
<i>Callotlaspi_lilacinum</i>	0.070
<i>Vania_trinervia</i>	0.058
<i>Microthlaspi_natolicum_subsp._gaillardotii</i>	0.177
<i>Microthlaspi_natolicum_subsp._sporadium</i>	0.177
<i>Microthlaspi_mediterraneo-orientale</i>	0.089
<i>Microthlaspi_granatense</i>	0.052
<i>Microthlaspi_umbellatum</i>	0.049
<i>Cochlearia_danica</i>	1.031
<i>Cochlearia_pyrenaica</i>	1.031
<i>Cochlearia_excelsa</i>	0.519
<i>Cochlearia_aestuaria</i>	0.261
<i>Cochlearia_tatrae</i>	0.471
<i>Cochlearia_officinalis</i>	0.471
<i>Cochlearia_anglica</i>	0.244
<i>Cochlearia sempervivum</i>	0.069
<i>Cochlearia_aragonensis</i>	0.063

<i>Cochlearia_glastifolia</i>	0.058
<i>Ionopsidium_savianum</i>	0.137
<i>Ionopsidium_abulense</i>	0.137
<i>Ionopsidium_prolongoi</i>	0.075
<i>Ionopsidium_albiflorum</i>	0.077
<i>Ionopsidium_acaule</i>	0.077
<i>Ionopsidium_megalospermum</i>	0.058
<i>Hilliella_rupicola_subsp._rupicola</i>	0.603
<i>Hilliella_shuangpaiensis</i>	0.603
<i>Hilliella_hui</i>	0.303
<i>Hilliella_hunanensis</i>	0.188
<i>Hilliella_sinuata</i>	0.191
<i>Hilliella_rivulorum</i>	0.191
<i>Hilliella_lichuanensis</i>	0.200
<i>Hilliella_paradoxa</i>	0.200
<i>Hilliella_yixianensis</i>	0.112
<i>Hilliella_fumarioides</i>	0.047
<i>Iberis_amara</i>	0.245
<i>Iberis_spathulata</i>	0.245
<i>Iberis_saxatilis</i>	0.150
<i>Iberis_umbellata</i>	0.089
<i>Iberis sempervirens</i>	0.060
<i>Teesdalia_nudicaulis</i>	0.041
<i>Pugionium_dolabratum</i>	0.096
<i>Pugionium_cornutum</i>	0.096
<i>Megacarpaea_delavayi</i>	0.049
<i>Draba_alpina</i>	5.681
<i>Draba_pohlei</i>	5.681
<i>Draba_ochroleuca</i>	4.756
<i>Draba_oxycarpa</i>	3.648
<i>Draba_pygmaea</i>	2.611
<i>Draba_sachalinensis</i>	2.273
<i>Draba_himalayensis</i>	3.034
<i>Draba_juvenilis</i>	3.034
<i>Draba_hirta</i>	2.226
<i>Draba_oligosperma</i>	1.477
<i>Draba_pycnosperma</i>	1.336
<i>Draba_kananaskia</i>	1.499
<i>Draba_glacialis</i>	1.499
<i>Draba_praealta</i>	1.129
<i>Draba_tibetica</i>	1.342
<i>Draba_falconeri</i>	1.342
<i>Draba_arabisans</i>	1.123
<i>Draba_laurentiana</i>	0.909
<i>Draba_confusa</i>	1.728
<i>Draba_glabella</i>	1.728
<i>Draba_borealis</i>	1.401
<i>Draba_prozorovskii</i>	1.866
<i>Draba_longipes</i>	1.866

<i>Draba_fuhaiensis</i>	1.619
<i>Draba_fladnizensis</i>	1.619
<i>Draba_incerta</i>	0.620
<i>Draba_nivalis</i>	2.983
<i>Draba_kamtschatica</i>	2.983
<i>Draba_ussuriensis</i>	1.566
<i>Draba_lichiangensis</i>	1.194
<i>Draba_nylamensis</i>	1.429
<i>Draba_ladina</i>	1.429
<i>Draba_porsildii</i>	1.029
<i>Draba_bellii</i>	0.991
<i>Draba_palanderiana</i>	0.930
<i>Draba_tomentosa</i>	1.049
<i>Draba_supranivalis</i>	1.049
<i>Draba_jaegeri</i>	0.904
<i>Draba_magellanica</i>	2.186
<i>Draba_macrocarpa</i>	2.186
<i>Draba_cana</i>	1.133
<i>Draba_ruaxes</i>	0.764
<i>Draba_barbata</i>	1.587
<i>Draba_pilosa</i>	1.587
<i>Draba_lonchocarpa</i>	0.878
<i>Draba_primuloides</i>	1.305
<i>Draba_turczaninovii</i>	1.305
<i>Draba_oblongata</i>	0.819
<i>Draba_doerfleri</i>	1.741
<i>Draba_rupestris</i>	1.741
<i>Draba_baicalensis</i>	1.315
<i>Draba_cinerea</i>	1.782
<i>Draba_surculosa</i>	1.782
<i>Draba_groenlandica</i>	1.242
<i>Draba_pterosperma</i>	0.849
<i>Draba_hitchcockii</i>	0.849
<i>Draba_murrayi</i>	0.684
<i>Draba_stylaris</i>	0.636
<i>Draba_ramosissima</i>	0.615
<i>Draba_subamplexicaulis</i>	0.518
<i>Draba_lactea</i>	0.476
<i>Draba_kotschyi</i>	1.037
<i>Draba_incana</i>	1.037
<i>Draba_norvegica</i>	0.621
<i>Draba_subcapitata</i>	0.852
<i>Draba_paysonii</i>	0.852
<i>Draba_corymbosa</i>	0.637
<i>Draba_dubia</i>	0.389
<i>Draba_glomerata</i>	0.737
<i>Draba_oreades</i>	0.737
<i>Draba_stenobotrys</i>	0.891
<i>Draba_kusnetzowii</i>	0.891

<i>Draba_lasiophylla</i>	0.460
<i>Draba_altaica</i>	0.460
<i>Draba_amoena</i>	0.448
<i>Draba_staintonii</i>	0.448
<i>Draba_elata</i>	0.375
<i>Draba_sikkimensis</i>	0.337
<i>Draba_ramulosa</i>	0.267
<i>Draba_scopulorum</i>	0.421
<i>Draba_subumbellata</i>	0.421
<i>Draba_tucumanensis</i>	0.345
<i>Draba_zangbeiensis</i>	0.498
<i>Draba_ladyginii</i>	0.498
<i>Draba_gilliesii</i>	0.469
<i>Draba_arseniewii</i>	0.469
<i>Draba_sherriffii</i>	0.436
<i>Draba_rigida</i>	0.385
<i>Draba_hyperborea</i>	0.341
<i>Draba_alyssoides</i>	0.341
<i>Draba_breweri</i>	0.291
<i>Draba_winterbottomii</i>	0.542
<i>Draba_trinervis</i>	0.542
<i>Draba_elegans</i>	0.348
<i>Draba_heterocoma</i>	0.348
<i>Draba_streptocarpa</i>	2.498
<i>Draba_exunguiculata</i>	2.498
<i>Draba_heilii</i>	1.268
<i>Draba_bifurcata</i>	0.768
<i>Draba_crassa</i>	0.768
<i>Draba_corrugata</i>	1.194
<i>Draba_densifolia</i>	1.194
<i>Draba_novolympica</i>	0.992
<i>Draba_sphaerocarpa</i>	0.753
<i>Draba_gmelini</i>	0.728
<i>Draba_arctica</i>	0.728
<i>Draba_aurea</i>	0.694
<i>Draba_luteola</i>	0.694
<i>Draba_helleriana</i>	0.528
<i>Draba_stylosa</i>	0.417
<i>Draba_obovata</i>	1.331
<i>Draba_aretioides</i>	1.331
<i>Draba_amplexicaulis</i>	0.866
<i>Draba_yunnanensis</i>	0.513
<i>Draba_eschscholtzii</i>	0.395
<i>Draba_ventosa</i>	0.385
<i>Draba_setosa</i>	1.191
<i>Draba_radicans</i>	1.191
<i>Draba_korshinskyi</i>	1.507
<i>Draba_cachemirica</i>	1.507
<i>Draba_macbeathiana</i>	0.645

<i>Draba_gracillima</i>	0.671
<i>Draba_eriopoda</i>	0.671
<i>Draba_alberti</i>	0.344
<i>Draba_micropetala</i>	0.351
<i>Draba_matangensis</i>	0.351
<i>Draba_burkei</i>	5.497
<i>Draba_globosa</i>	5.497
<i>Draba_juniperina</i>	5.861
<i>Draba_pectinipila</i>	5.861
<i>Draba_kassii</i>	2.170
<i>Draba_reptans</i>	1.727
<i>Draba_sobolifera</i>	3.448
<i>Draba_subalpina</i>	3.448
<i>Draba_stenopetala</i>	1.764
<i>Draba_asprella</i>	3.618
<i>Draba_aureola</i>	3.618
<i>Draba_sphaeroides</i>	2.877
<i>Draba_spectabilis</i>	2.124
<i>Draba_albertina</i>	2.965
<i>Draba_crassifolia</i>	2.965
<i>Draba_brachystylis</i>	1.698
<i>Draba_mogollonica</i>	1.583
<i>Draba_streptobrachia</i>	1.484
<i>Draba_cusickii</i>	1.329
<i>Draba_rectifructa</i>	1.108
<i>Draba_ogilviensis</i>	0.837
<i>Draba_koeiei</i>	1.088
<i>Draba_olgae</i>	1.088
<i>Draba_affghanica</i>	0.670
<i>Draba_stenocarpa</i>	0.820
<i>Draba_bhutanica</i>	0.820
<i>Draba_aubrietoides</i>	0.695
<i>Draba_cholaensis</i>	0.593
<i>Draba_melanopus</i>	0.565
<i>Draba_odudiana</i>	0.518
<i>Draba_involucrata</i>	0.447
<i>Draba_pauciflora</i>	0.352
<i>Draba_polyphylla</i>	0.213
<i>Draba_bellardii</i>	1.931
<i>Draba_cuatrecasana</i>	1.931
<i>Draba_cryophila</i>	1.437
<i>Draba_aizoides</i>	1.031
<i>Draba_parnassica</i>	0.893
<i>Draba_scardica</i>	0.893
<i>Draba_dedeana</i>	0.800
<i>Draba_cretica</i>	0.800
<i>Draba_athoa</i>	0.731
<i>Draba_acaulis</i>	0.749
<i>Draba_lacaitae</i>	0.749

<i>Draba_hispanica</i>	0.611
<i>Draba_cappadocica</i>	0.369
<i>Draba_bruniifolia</i>	0.318
<i>Draba_araratica</i>	0.261
<i>Draba_lasiocarpa</i>	0.402
<i>Draba_olympica</i>	0.402
<i>Draba_oreadum</i>	0.298
<i>Draba_incompta</i>	0.365
<i>Draba_aucheri</i>	0.365
<i>Draba_rosularis</i>	0.243
<i>Draba_kongboiana</i>	0.470
<i>Draba_ellipsoidea</i>	0.470
<i>Draba_huetii</i>	0.573
<i>Draba_lutescens</i>	0.573
<i>Draba_ossetica</i>	0.235
<i>Draba_jucunda</i>	0.204
<i>Draba_lutea</i>	0.385
<i>Draba_nemorosa</i>	0.385
<i>Draba_hispida</i>	0.208
<i>Draba_nuda</i>	0.197
<i>Draba_sibirica</i>	0.184
<i>Draba_longisiliqua</i>	0.160
<i>Draba_funiculosa</i>	0.126
<i>Draba_hederifolia</i>	0.126
<i>Draba_pusilla</i>	1.801
<i>Draba_rositae</i>	1.801
<i>Draba_schusteri</i>	1.661
<i>Draba_hallii</i>	1.453
<i>Draba_peruviana</i>	2.200
<i>Draba_pickeringii</i>	2.200
<i>Draba_ritacuvana</i>	2.069
<i>Draba_pseudocheiranthoides</i>	2.069
<i>Draba_violacea</i>	2.899
<i>Draba_confertifolia</i>	2.899
<i>Draba_depressa</i>	2.194
<i>Draba_pycnophylla</i>	1.545
<i>Draba_barclayana</i>	1.981
<i>Draba_boyacana</i>	1.981
<i>Draba_standleyi</i>	1.732
<i>Draba_splendens</i>	1.420
<i>Draba_cryptantha</i>	1.623
<i>Draba_wurdackii</i>	1.623
<i>Draba_litamo</i>	1.542
<i>Draba_hidalgensis</i>	1.411
<i>Draba_solitaria</i>	1.407
<i>Draba_sericea</i>	1.403
<i>Draba_pennell-hazenii</i>	1.398
<i>Draba_hammenii</i>	1.395
<i>Draba_nivicola</i>	1.391

<i>Draba_chionophila</i>	1.387
<i>Draba_soratensis</i>	1.382
<i>Draba_farsetioides</i>	1.378
<i>Draba_spruceana</i>	1.372
<i>Draba_hemsleyana</i>	1.365
<i>Draba_funckeana</i>	1.354
<i>Draba_extensa</i>	1.336
<i>Draba_lindenii</i>	1.307
<i>Draba_lapaziana</i>	1.257
<i>Draba_pulvinata_subsp._berryi</i>	1.311
<i>Draba_pulvinata_subsp._pulvinata</i>	1.311
<i>Draba_macleanii</i>	1.039
<i>Draba_matthioides</i>	0.850
<i>Draba_cruciata</i>	0.807
<i>Draba_jorullensis</i>	0.734
<i>Draba_mexicana</i>	0.700
<i>Draba_cuzcoensis</i>	0.643
<i>Draba_hookeri</i>	0.553
<i>Draba_inquisiviana</i>	0.434
<i>Draba_matthioides_subsp._saundersii</i>	0.304
<i>Draba_beltranii</i>	0.191
<i>Draba_lemmonii</i>	0.305
<i>Draba_maguirei</i>	0.305
<i>Draba_stenoloba</i>	0.187
<i>Pachyneurum_grandiflorum</i>	0.099
<i>Schivereckia_podolica</i>	0.162
<i>Schivereckia_monticola</i>	0.162
<i>Tomostima_platycarpa</i>	0.296
<i>Tomostima_araboides</i>	0.296
<i>Tomostima_cuneifolia</i>	0.173
<i>Athysanus_pusillus</i>	0.137
<i>Athysanus_unilateralis</i>	0.137
<i>Erophila_verna</i>	0.184
<i>Erophila_verna_subsp._praecox</i>	0.184
<i>Erophila_verna_subsp._spathulata</i>	0.112
<i>Aubrieta_deltioidea</i>	0.089
<i>Aubrieta_parviflora</i>	0.089
<i>Arabis_eschscholtziana</i>	3.771
<i>Arabis_nipponica</i>	3.771
<i>Arabis_olympica</i>	2.005
<i>Arabis_borealis</i>	2.667
<i>Arabis_pycnocarpa</i>	2.667
<i>Arabis_flagellosa</i>	0.844
<i>Arabis_bijuga</i>	5.090
<i>Arabis_pangiensis</i>	5.090
<i>Arabis_amplexicaulis</i>	2.680
<i>Arabis_nuristanica</i>	1.423
<i>Arabis_paniculata</i>	0.841
<i>Arabis_pterosperma</i>	0.614

<i>Arabis_stelleri</i>	0.901
<i>Arabis_serrata</i>	0.901
<i>Arabis_blepharophylla</i>	2.148
<i>Arabis_furcata</i>	2.148
<i>Arabis_georgiana</i>	2.017
<i>Arabis_oregana</i>	1.819
<i>Arabis_aculeolata</i>	1.537
<i>Arabis_modesta</i>	1.182
<i>Arabis_macdonaldiana</i>	0.817
<i>Arabis_nuttallii</i>	0.932
<i>Arabis_crucisetosa</i>	0.932
<i>Arabis_stenocarpa</i>	2.961
<i>Arabis_planisiliqua</i>	2.961
<i>Arabis_juressi</i>	1.504
<i>Arabis_beirana</i>	0.883
<i>Arabis_scabra</i>	0.566
<i>Arabis_doumetii</i>	0.991
<i>Arabis_erubescens</i>	0.991
<i>Arabis_vochinensis</i>	0.534
<i>Arabis_serpyllifolia</i>	0.534
<i>Arabis_ciliata</i>	0.561
<i>Arabis_allionii</i>	0.561
<i>Arabis_sudetica</i>	3.707
<i>Arabis_abietina</i>	3.707
<i>Arabis_planisiliqua_subsp._planisiliqua</i>	1.934
<i>Arabis_sadina</i>	1.023
<i>Arabis_sagittata</i>	0.900
<i>Arabis_hirsuta</i>	0.905
<i>Arabis_takesimana</i>	0.905
<i>Arabis_pumila</i>	1.432
<i>Arabis_soyeri</i>	1.432
<i>Arabis_surculosa</i>	0.722
<i>Arabis_cretica</i>	0.512
<i>Arabis_androsacea</i>	0.417
<i>Arabis_pubescens</i>	0.337
<i>Arabis_scopoliana</i>	0.283
<i>Arabis_procurrens</i>	0.371
<i>Arabis_ferdinandi-coburgii</i>	0.371
<i>Arabis_stellulata</i>	0.281
<i>Arabis_collina</i>	0.276
<i>Arabis_rosea</i>	0.276
<i>Arabis_bryoides</i>	0.143
<i>Arabis_carduchorum</i>	0.154
<i>Arabis_armena</i>	0.154
<i>Arabis_karategina</i>	0.628
<i>Arabis_ariana</i>	0.628
<i>Arabis_kamelinii</i>	0.361
<i>Arabis_alaschanica</i>	0.195
<i>Arabis_setosifolia</i>	0.218

<i>Arabis_axilliflora</i>	0.218
<i>Arabis_kokanica</i>	0.172
<i>Arabis_caerulea</i>	0.085
<i>Arabis_brachycarpa</i>	0.477
<i>Arabis_graellsiiiformis</i>	0.477
<i>Arabis_christianii</i>	0.240
<i>Arabis_nordmanniana</i>	0.123
<i>Arabis_montbretiana</i>	0.416
<i>Arabis_auriculata</i>	0.416
<i>Arabis_erikii</i>	0.220
<i>Arabis_nova</i>	0.115
<i>Arabis_alpina</i>	0.070
<i>Arabis_josiae</i>	0.146
<i>Arabis_conringioides</i>	0.146
<i>Arabis_ottonis-schulzii</i>	0.075
<i>Arabis_kennedyae</i>	0.118
<i>Arabis_subflava</i>	0.118
<i>Arabis_axillaris</i>	0.065
<i>Arabis_parvula</i>	0.105
<i>Arabis_aucheri</i>	0.105
<i>Dendroarabis_fruticulosa</i>	0.051
<i>Baimashania_pulvinata</i>	0.149
<i>Baimashania_wangii</i>	0.149
<i>Botschantzevia_karatavica</i>	0.110
<i>Arcyosperma_primulifolium</i>	0.073
<i>Stevenia_cheiranthoides</i>	0.063
<i>Stevenia_canescens</i>	0.063
<i>Stevenia_maximowiczii</i>	0.054
<i>Macropodium_nivale</i>	0.068
<i>Macropodium_pterospermum</i>	0.068
<i>Biscutella_algeriensis</i>	0.251
<i>Biscutella_maritima</i>	0.251
<i>Biscutella_didyma</i>	0.179
<i>Biscutella_baetica</i>	0.121
<i>Biscutella_laevigata</i>	0.109
<i>Biscutella_lyrata</i>	0.109
<i>Biscutella_cichoriifolia</i>	0.090
<i>Biscutella_auriculata</i>	0.090
<i>Heldreichia_bupleurifolia_subsp._bourgaei</i>	0.220
<i>Heldreichia_bupleurifolia_subsp._bupleurifolia</i>	0.220
<i>Heldreichia_bupleurifolia_subsp._rotundifolia</i>	0.145
<i>Heldreichia_bupleurifolia_subsp._polymorpha</i>	0.088
<i>Megadenia_pygmaea</i>	0.050
<i>Lunaria_annua</i>	0.041
<i>Lunaria_rediviva</i>	0.041
<i>Ricotia_lunaria</i>	0.037
<i>Alyssum_sp._JZL-2014</i>	1.227
<i>Alyssum_fastigiatum</i>	1.227
<i>Alyssum_nevadense</i>	1.136

<i>Alyssum_densistellatum</i>	1.000
<i>Alyssum_ovirense</i>	1.799
<i>Alyssum_wulfenianum_subsp._wulfenianum</i>	1.799
<i>Alyssum_montanum</i>	0.779
<i>Alyssum_sp._BF-2014</i>	0.645
<i>Alyssum_cuneifolium</i>	0.893
<i>Alyssum_flexicaule</i>	0.893
<i>Alyssum_loiseleurii</i>	0.692
<i>Alyssum_orophilum</i>	0.478
<i>Alyssum_diffusum</i>	0.400
<i>Alyssum_repens_subsp._transsilvanicum</i>	0.318
<i>Alyssum_stribryni</i>	0.226
<i>Alyssum_turkestanicum</i>	0.257
<i>Alyssum_desertorum</i>	0.257
<i>Alyssum_simplex</i>	0.364
<i>Alyssum_minutum</i>	0.364
<i>Alyssum_marginatum</i>	0.250
<i>Alyssum_stapfii</i>	0.287
<i>Alyssum_antilibanoticum</i>	0.287
<i>Alyssum_minus</i>	0.350
<i>Alyssum_siculum</i>	0.350
<i>Alyssum_alyssoides</i>	0.243
<i>Alyssum_granatense</i>	0.151
<i>Alyssum_hirsutum</i>	0.155
<i>Alyssum_xanthocarpum</i>	0.155
<i>Alyssum_umbellatum</i>	0.176
<i>Alyssum_strigosum</i>	0.176
<i>Alyssum_harputicum</i>	2.404
<i>Alyssum_paphlagonicum</i>	2.404
<i>Alyssum_thymops</i>	2.445
<i>Alyssum_lepidoto-stellatum</i>	2.445
<i>Alyssum_corningii</i>	1.170
<i>Alyssum_tetrastemon</i>	1.170
<i>Alyssum_baumgartnerianum</i>	0.530
<i>Alyssum_dasy carpum</i>	0.384
<i>Alyssum_montis-stellae</i>	0.508
<i>Alyssum_lenense</i>	0.508
<i>Alyssum_lepidotum</i>	0.403
<i>Alyssum_niveum</i>	0.302
<i>Alyssum_persicum</i>	0.250
<i>Alyssum_sulphureum</i>	0.195
<i>Alyssum_misirdalianum</i>	0.417
<i>Alyssum_praecox</i>	0.417
<i>Alyssum_aurantiacum</i>	0.241
<i>Alyssum_iranicum</i>	0.246
<i>Alyssum_caespitosum</i>	0.246
<i>Alyssum_doerfleri</i>	0.152
<i>Alyssum_fallacinum</i>	0.559
<i>Alyssum_tenium</i>	0.559

<i>Alyssum_argenteum</i>	0.487
<i>Alyssum_chalcidicum</i>	0.457
<i>Alyssum_samariferum</i>	0.608
<i>Alyssum_floribundum</i>	0.608
<i>Alyssum_kavadarcense</i>	0.439
<i>Alyssum_gevgelicense</i>	0.418
<i>Alyssum_serpentinum</i>	0.383
<i>Alyssum_markgrafii</i>	0.327
<i>Alyssum_murale</i>	0.266
<i>Alyssum_skopjense</i>	0.194
<i>Alyssum_pintodasilvae</i>	0.537
<i>Alyssum_serpyllifolium</i>	0.537
<i>Alyssum_alpestre</i>	0.292
<i>Alyssum_robertianum</i>	0.203
<i>Alyssum_bracteatum</i>	0.237
<i>Alyssum_filiforme</i>	0.237
<i>Alyssum_polycladum</i>	0.129
<i>Alyssum_inflatum</i>	0.123
<i>Alyssum_baldaccii</i>	0.112
<i>Alyssum_euboicum</i>	0.166
<i>Alyssum_fragillimum</i>	0.166
<i>Alyssum_giosnanum</i>	0.153
<i>Alyssum_corymbosoides</i>	0.153
<i>Alyssum_caricum</i>	0.120
<i>Alyssum_anatolicum</i>	0.120
<i>Alyssum_virgatum</i>	0.132
<i>Alyssum_nebrodense</i>	0.132
<i>Alyssum_peltarioides</i>	0.194
<i>Alyssum_pterocarpum</i>	0.194
<i>Alyssum_obovatum</i>	0.110
<i>Alyssum_bertolonii</i>	0.454
<i>Alyssum_tavolarae</i>	0.454
<i>Alyssum_heldreichii</i>	0.266
<i>Alyssum_smolikanum</i>	0.179
<i>Alyssum_condensatum</i>	0.312
<i>Alyssum_biovulatum</i>	0.312
<i>Alyssum_oxycarpum</i>	0.232
<i>Alyssum_huber-morathii</i>	0.169
<i>Alyssum_lesbiacum</i>	0.138
<i>Alyssum_sibiricum</i>	0.138
<i>Alyssum_corsicum</i>	0.125
<i>Alyssum_cypricum</i>	0.119
<i>Alyssum_pinifolium</i>	0.113
<i>Alyssum_masmenaeum</i>	0.104
<i>Alyssum_borzaeanum</i>	0.166
<i>Alyssum_davisianum</i>	0.166
<i>Alyssum_tortuosum</i>	0.211
<i>Alyssum_americanum</i>	0.211
<i>Alyssum_pateri</i>	0.089

<i>Alyssum_linifolium</i>	0.062
<i>Alyssum_meniocoides</i>	0.082
<i>Alyssum_aureum</i>	0.082
<i>Alyssum_tenuifolium</i>	0.042
<i>Alyssum_homalocarpum</i>	0.062
<i>Alyssum_antiatlanticum</i>	0.062
<i>Fibigia_clypeata</i>	0.448
<i>Fibigia_eriocarpa</i>	0.448
<i>Fibigia_macrocarpa</i>	0.316
<i>Fibigia_umbellata</i>	0.258
<i>Fibigia_spathulata</i>	0.258
<i>Fibigia_triquetra</i>	0.269
<i>Fibigia_lunarioides</i>	0.269
<i>Fibigia_suffruticosa</i>	0.226
<i>Alyssoides_cretica</i>	0.187
<i>Alyssoides_utriculata</i>	0.187
<i>Physoptychis_caspica</i>	0.171
<i>Clastopus_vestitus</i>	0.171
<i>Degenia_velebitica</i>	0.081
<i>Hormathophylla_baetica</i>	0.666
<i>Hormathophylla_cochleata</i>	0.666
<i>Hormathophylla_purpurea</i>	0.360
<i>Hormathophylla_lapeyrousiana</i>	0.301
<i>Hormathophylla_macrocarpa</i>	0.323
<i>Hormathophylla_halimifolia</i>	0.323
<i>Hormathophylla_spinosa</i>	0.158
<i>Hormathophylla_longicaulis</i>	0.286
<i>Hormathophylla_reverchonii</i>	0.286
<i>Hormathophylla_cadevalliana</i>	0.153
<i>Bornmuellera_baldaccii</i>	0.249
<i>Bornmuellera_dieckii</i>	0.249
<i>Bornmuellera_tymphaea</i>	0.176
<i>Bornmuellera_cappadocica</i>	0.115
<i>Physocardamum_davisii</i>	0.079
<i>Aurinia_gionae</i>	0.445
<i>Aurinia_saxatilis</i>	0.445
<i>Aurinia_moreana</i>	0.348
<i>Aurinia_sinuata</i>	0.249
<i>Aurinia_leucadea_subsp._diomedea</i>	0.169
<i>Aurinia_corymbosa</i>	0.186
<i>Aurinia_petraea</i>	0.186
<i>Aurinia_rupestris</i>	0.060
<i>Berteroa_orbiculata</i>	0.444
<i>Berteroa_obliqua</i>	0.444
<i>Berteroa_incana</i>	0.243
<i>Berteroa_mutabilis</i>	0.127
<i>Galitzkya_macrocarpa</i>	0.177
<i>Galitzkya_potaninii</i>	0.177
<i>Galitzkya_spathulata</i>	0.106

<i>Clypeola_lappacea</i>	0.126
<i>Clypeola_aspera</i>	0.126
<i>Clypeola_dichotoma</i>	0.078
<i>Clypeola_cyclodontea</i>	0.075
<i>Clypeola_jonthlaspi</i>	0.075
<i>Asperuginoides_axillaris</i>	0.037
<i>Solms-laubachia_pulcherrima</i>	0.487
<i>Solms-laubachia_zhongdianensis</i>	0.487
<i>Solms-laubachia_minor</i>	0.405
<i>Solms-laubachia_xerophyta</i>	0.333
<i>Solms-laubachia_eurycarpa</i>	0.270
<i>Solms-laubachia_linearifolia</i>	0.270
<i>Solms-laubachia_retropilosa</i>	0.218
<i>Solms-laubachia_lanata</i>	0.238
<i>Solms-laubachia_baiogoinensis</i>	0.238
<i>Solms-laubachia_platycarpa</i>	0.205
<i>Solms-laubachia_jafrii</i>	0.174
<i>Solms-laubachia_himalayensis</i>	0.447
<i>Solms-laubachia_stewartii</i>	0.447
<i>Solms-laubachia_linearis</i>	0.256
<i>Solms-laubachia_flabellata</i>	0.207
<i>Rhammatophyllum_frutex</i>	0.453
<i>Rhammatophyllum_gaudanense</i>	0.453
<i>Rhammatophyllum_ghoranum</i>	0.372
<i>Rhammatophyllum_kamelinii</i>	0.296
<i>Rhammatophyllum_afghanicum</i>	0.236
<i>Rhammatophyllum_pachyrhizum</i>	0.191
<i>Sisymbriopsis_mollipila</i>	0.136
<i>Sisymbriopsis_yechengnica</i>	0.136
<i>Euclidium_syriacum</i>	0.100
<i>Neotorularia_contortuplicata</i>	0.203
<i>Neotorularia_torulosa</i>	0.203
<i>Neotorularia_korolkowii</i>	0.116
<i>Neotorularia_dentata</i>	0.112
<i>Neotorularia_tetracmoides</i>	0.112
<i>Cryptospora_falcata</i>	0.122
<i>Catenulina_hedysaroides</i>	0.122
<i>Tetracme_contorta</i>	0.151
<i>Tetracme_secunda</i>	0.151
<i>Tetracme_quadricornis</i>	0.127
<i>Octoceras_lehmannianum</i>	0.115
<i>Braya_alpina</i>	1.144
<i>Braya_siliquosa</i>	1.144
<i>Braya_gamosepala</i>	0.964
<i>Braya_humilis</i>	1.612
<i>Braya_linearis</i>	1.612
<i>Braya_brachycarpa</i>	0.645
<i>Braya_fernaldii</i>	1.705
<i>Braya_longii</i>	1.705

<i>Braya_rosea</i>	0.867
<i>Braya_glabella</i>	0.603
<i>Braya_scharnhorstii</i>	0.346
<i>Braya_pilosa</i>	0.507
<i>Braya_thorild-wulfii</i>	0.507
<i>Braya_forrestii</i>	0.180
<i>Lepidostemon_glaricola</i>	0.133
<i>Phaeonychium_villosum</i>	0.191
<i>Phaeonychium_kashgaricum</i>	0.191
<i>Christolea_crassifolia</i>	0.129
<i>Dilophia_salsa</i>	0.097
<i>Leptaleum_filifolium</i>	0.071
<i>Leiospora_pamirica</i>	0.254
<i>Leiospora_eriocalyx</i>	0.254
<i>Leiospora_exscapa</i>	0.127
<i>Dichasianthus_subtilissimus</i>	0.076
<i>Spryginia_winkleri</i>	0.083
<i>Spryginia_falcata</i>	0.083
<i>Sterigmostemum_eglandulosum</i>	1.171
<i>Sterigmostemum_incanum</i>	1.171
<i>Sterigmostemum_grandiflorum</i>	0.590
<i>Sterigmostemum_sulphureum</i>	0.561
<i>Sterigmostemum_violaceum</i>	0.561
<i>Sterigmostemum_matthioides</i>	0.206
<i>Sterigmostemum_tomentosum</i>	0.189
<i>Sterigmostemum_fuhaiense</i>	0.189
<i>Sterigmostemum_acanthocarpum</i>	0.131
<i>Anchonium_elichrysofolium_subsp._canescens</i>	0.110
<i>Sterigmostemum_longistylum</i>	0.112
<i>Sterigmostemum_amosissimum</i>	0.112
<i>Zerdana_anchonioides</i>	0.085
<i>Anchonium_billardierei</i>	0.129
<i>Synstemon_petrovii</i>	0.129
<i>Microstigma_brachycarpum</i>	0.055
<i>Matthiola_incana</i>	0.286
<i>Matthiola_rupestris</i>	0.286
<i>Matthiola_pulchella</i>	0.252
<i>Matthiola_maderensis</i>	0.252
<i>Matthiola_fruticulosa</i>	0.235
<i>Matthiola_parviflora</i>	0.235
<i>Matthiola_capiomontiana</i>	0.134
<i>Matthiola_oxyceras</i>	0.072
<i>Matthiola_stoddartii</i>	0.157
<i>Matthiola_bucharica</i>	0.157
<i>Matthiola_farinosa</i>	0.082
<i>Matthiola_longipetala</i>	0.058
<i>Eremoblastus_caspicus</i>	0.070
<i>Petiniotia_purpurascens</i>	0.070
<i>Iskandera_alaica</i>	0.068

<i>Iskandera_hissarica</i>	0.068
<i>Hesperis_voronovii</i>	0.332
<i>Hesperis_matronalis</i>	0.332
<i>Hesperis_dinarica</i>	0.192
<i>Hesperis_rechingeri</i>	0.222
<i>Hesperis_laciniata</i>	0.222
<i>Hesperis_sibirica</i>	0.111
<i>Tchihatchewia_isatidea</i>	0.078
<i>Bunias_orientalis</i>	0.049
<i>Parrya_pavlovii</i>	0.426
<i>Parrya_asperrima</i>	0.426
<i>Parrya_darvazica</i>	0.313
<i>Parrya_maidantalica</i>	0.279
<i>Parrya_saxifraga</i>	0.483
<i>Parrya_kuramensis</i>	0.483
<i>Parrya_schugnana</i>	0.263
<i>Parrya_ajanensis</i>	0.486
<i>Parrya_nudicaulis</i>	0.486
<i>Parrya_arctica</i>	0.767
<i>Parrya_nauruaq</i>	0.767
<i>Parrya_turkestanica</i>	0.387
<i>Parrya_rydbergii</i>	0.387
<i>Parrya_albida</i>	0.214
<i>Parrya_subsiliquosa</i>	0.471
<i>Parrya_longicarpa</i>	0.471
<i>Parrya_australis</i>	0.259
<i>Parrya_popovii</i>	0.226
<i>Parrya_pinnatifida</i>	0.226
<i>Parrya_nuratensis</i>	0.264
<i>Parrya_fruticulosa</i>	0.264
<i>Parrya_tianschanica</i>	0.585
<i>Parrya_alba</i>	0.585
<i>Parrya_stenocarpa</i>	0.497
<i>Parrya_simulatrix</i>	0.384
<i>Parrya_stenophylla</i>	0.282
<i>Parrya_saurica</i>	0.410
<i>Parrya_lancifolia</i>	0.410
<i>Parrya_runcinata</i>	0.224
<i>Parrya_minjanensis</i>	0.224
<i>Parrya_pulvinata</i>	0.135
<i>Parrya_villosula</i>	0.156
<i>Parrya_angrenica</i>	0.156
<i>Litwinowia_tenuissima</i>	0.088
<i>Pseudoclausia_mollissima</i>	0.350
<i>Pseudoclausia_sarawschanica</i>	0.350
<i>Pseudoclausia_hispida</i>	0.305
<i>Pseudoclausia_olgae</i>	0.305
<i>Pseudoclausia_turkestanica</i>	0.181
<i>Pseudoclausia_gracillima</i>	0.131

<i>Pseudoclausia_papillosa</i>	0.088
<i>Diptychocarpus_strictus</i>	0.061
<i>Chorispora_sabulosa</i>	0.362
<i>Chorispora_bungeana</i>	0.362
<i>Chorispora_macropoda</i>	0.253
<i>Chorispora_songarica</i>	0.277
<i>Chorispora_sibirica</i>	0.277
<i>Chorispora_tashkorganica</i>	0.131
<i>Chorispora_tenella</i>	0.088
<i>Chorispora_purpurascens</i>	0.105
<i>Chorispora_persica</i>	0.105
<i>Dontostemon_integrifolius</i>	0.269
<i>Dontostemon_dentatus</i>	0.269
<i>Dontostemon_tibeticus</i>	0.153
<i>Dontostemon_perennis</i>	0.145
<i>Dontostemon_gubanovii</i>	0.218
<i>Dontostemon_crassifolius</i>	0.218
<i>Dontostemon_elegans</i>	0.129
<i>Dontostemon_senilis</i>	0.118
<i>Dontostemon_micranthus</i>	0.214
<i>Dontostemon_intermedius</i>	0.214
<i>Dontostemon_hispidus</i>	0.144
<i>Dontostemon_glandulosus</i>	0.137
<i>Dontostemon_pinnatifidus</i>	0.137
<i>Clausia_robusta</i>	0.680
<i>Clausia_aprica</i>	0.680
<i>Clausia_agideliensis</i>	0.343
<i>Clausia_kasakhorum</i>	0.177
<i>Clausia_trichosepala</i>	0.097
<i>Erysimum_mediohispanicum</i>	3.054
<i>Erysimum_baeticum</i>	3.054
<i>Erysimum_popovii</i>	1.877
<i>Erysimum_semperflorens</i>	1.212
<i>Erysimum_gorbeanum</i>	1.928
<i>Erysimum_ruscinonense</i>	1.928
<i>Erysimum_penyalarensense</i>	3.652
<i>Erysimum_merxmulleri</i>	3.652
<i>Erysimum_lagascae</i>	2.334
<i>Erysimum_ochroleucum</i>	1.778
<i>Erysimum_gomez-campoi</i>	1.363
<i>Erysimum_seipkae</i>	1.645
<i>Erysimum_duriaei</i>	1.645
<i>Erysimum_linifolium</i>	1.423
<i>Erysimum_nevadense</i>	1.204
<i>Erysimum_rondae</i>	1.408
<i>Erysimum_fitzii</i>	1.408
<i>Erysimum_myriophyllum</i>	1.246
<i>Erysimum_cazorlense</i>	1.023
<i>Erysimum_belvederense</i>	0.773

<i>Erysimum_virescens</i>	1.083
<i>Erysimum_arbuscula</i>	1.083
<i>Erysimum_caboverdeanum</i>	1.033
<i>Erysimum_bicolor</i>	1.328
<i>Erysimum_scoparium</i>	1.328
<i>Erysimum_ehrendorferi</i>	1.963
<i>Erysimum_nervosum</i>	1.963
<i>Erysimum_gramineum</i>	1.132
<i>Erysimum_ghaznicum</i>	2.520
<i>Erysimum_acrotonum</i>	2.520
<i>Erysimum_leucanthemum</i>	1.768
<i>Erysimum_badghysi</i>	1.133
<i>Erysimum_salangense</i>	1.036
<i>Erysimum_alaicum</i>	0.970
<i>Erysimum_cyaneum</i>	1.731
<i>Erysimum_czernjajevi</i>	1.731
<i>Erysimum_thomsonii</i>	1.603
<i>Erysimum_vitellinum</i>	1.413
<i>Erysimum_griffithii</i>	1.155
<i>Erysimum_laxiflorum</i>	0.778
<i>Erysimum_subulatum</i>	0.752
<i>Erysimum_kerbabaevii</i>	0.908
<i>Erysimum_crassicaule</i>	0.908
<i>Erysimum_pseudopurpureum</i>	0.788
<i>Erysimum_purpureum</i>	0.715
<i>Erysimum_oleifolium</i>	1.168
<i>Erysimum_hirschfeldioides</i>	1.168
<i>Erysimum_scabrum</i>	0.805
<i>Erysimum_spetae</i>	2.260
<i>Erysimum_passgalense</i>	2.260
<i>Erysimum_asperrimum</i>	1.564
<i>Erysimum_lilacinum</i>	0.974
<i>Erysimum_kurdicum</i>	0.791
<i>Erysimum_carniolicum</i>	2.387
<i>Erysimum_witmannii</i>	2.387
<i>Erysimum_canum</i>	1.765
<i>Erysimum_quadrangulum</i>	1.172
<i>Erysimum_metlesicsii</i>	0.782
<i>Erysimum_repandum</i>	0.782
<i>Erysimum_leptostylum</i>	1.257
<i>Erysimum_macrostigma</i>	1.257
<i>Erysimum_ischnostylum</i>	1.160
<i>Erysimum_inense</i>	1.451
<i>Erysimum_ledebourii</i>	1.451
<i>Erysimum_roseum</i>	2.111
<i>Erysimum_handel-mazzettii</i>	2.111
<i>Erysimum_pachycarpum</i>	1.708
<i>Erysimum_deflexum</i>	1.708
<i>Erysimum_humillimum</i>	0.915

<i>Erysimum_callicarpum</i>	1.149
<i>Erysimum_amurense</i>	1.149
<i>Erysimum_kamelinii</i>	0.887
<i>Erysimum_pallasii</i>	1.716
<i>Erysimum_redowskii</i>	1.716
<i>Erysimum_rhodium</i>	1.031
<i>Erysimum_senoneri</i>	1.031
<i>Erysimum_naxense</i>	0.996
<i>Erysimum_perofskianum</i>	0.937
<i>Erysimum_siliculosum</i>	4.419
<i>Erysimum_mongolicum</i>	4.419
<i>Erysimum_boreale</i>	3.358
<i>Erysimum_hieraciifolium</i>	2.301
<i>Erysimum_virgatum</i>	1.431
<i>Erysimum_collisparsum</i>	1.172
<i>Erysimum_jugicola</i>	1.172
<i>Erysimum_sisymbrioides</i>	0.760
<i>Erysimum_cheiri</i>	0.724
<i>Erysimum_cheiranthoides</i>	0.693
<i>Erysimum_odoratum</i>	0.665
<i>Erysimum_idae</i>	0.939
<i>Erysimum_crassipes</i>	0.939
<i>Erysimum_pulchellum</i>	0.912
<i>Erysimum_lazistanicum</i>	1.069
<i>Erysimum_krendlii</i>	1.069
<i>Erysimum_lycaonicum</i>	0.914
<i>Erysimum_crepidifolium</i>	0.795
<i>Erysimum_stenophyllum</i>	1.185
<i>Erysimum_linariifolium</i>	1.185
<i>Erysimum_pectinatum</i>	0.823
<i>Erysimum_griffithianum</i>	0.726
<i>Erysimum_sintenisianum</i>	0.625
<i>Erysimum_aureum</i>	1.228
<i>Erysimum_aucherianum</i>	1.228
<i>Erysimum_smyrnaeum</i>	0.617
<i>Erysimum_gypsaceum</i>	0.609
<i>Erysimum_diffusum</i>	0.594
<i>Erysimum_cuspidatum</i>	0.567
<i>Erysimum_asperum</i>	1.288
<i>Erysimum_angustatum</i>	1.288
<i>Erysimum_capitatum</i>	0.658
<i>Erysimum_comatum</i>	0.458
<i>Erysimum_nasturtioides</i>	1.427
<i>Erysimum_elbrusense</i>	1.427
<i>Erysimum_szowitsianum</i>	1.295
<i>Erysimum_gelidum</i>	1.101
<i>Erysimum_hajastanicum</i>	1.149
<i>Erysimum_leptophyllum</i>	1.149
<i>Erysimum_uncinatifolium</i>	0.756

<i>Erysimum_elymaiticum</i>	0.536
<i>Erysimum_caespitosum</i>	0.397
<i>Erysimum_wilczekianum</i>	0.397
<i>Erysimum_etnense_subsp._etnense</i>	1.430
<i>Erysimum_pusillum</i>	1.430
<i>Erysimum_bonannianum</i>	0.948
<i>Erysimum_rhaeticum</i>	1.282
<i>Erysimum_crassistylum</i>	1.282
<i>Erysimum_sylvestre</i>	0.727
<i>Erysimum_incanum</i>	0.421
<i>Erysimum_majellense</i>	0.830
<i>Erysimum_pseudorhaeticum</i>	0.830
<i>Erysimum_serpentinicum</i>	0.546
<i>Erysimum_echinellum</i>	0.407
<i>Erysimum_ibericum</i>	0.187
<i>Erysimum_gabrielianiae</i>	0.187
<i>Olimarabidopsis_cabulica</i>	0.345
<i>Olimarabidopsis_pumila</i>	0.345
<i>Olimarabidopsis_umbrosa</i>	0.200
<i>Alyssopsis_mollis</i>	0.201
<i>Alyssopsis_trinervis</i>	0.201
<i>Calymmatium_draboides</i>	0.101
<i>Arabidopsis_kamchatica</i>	0.399
<i>Arabidopsis_lyrata</i>	0.399
<i>Arabidopsis_petraea_subsp._umbrosa</i>	0.605
<i>Arabidopsis_arenicola</i>	0.605
<i>Arabidopsis_croatica</i>	0.305
<i>Arabidopsis_arenosa_subsp._arenosa</i>	0.419
<i>Arabidopsis_neglecta</i>	0.419
<i>Arabidopsis_halleri</i>	0.356
<i>Arabidopsis_omezawana</i>	0.356
<i>Arabidopsis_pedemontana</i>	0.295
<i>Arabidopsis_cebennensis</i>	0.295
<i>Arabidopsis_suecica</i>	0.171
<i>Arabidopsis_thaliana</i>	0.171
<i>Arabidopsis_arenosa</i>	0.077
<i>Capsella_orientalis</i>	0.334
<i>Capsella_bursa-pastoris</i>	0.334
<i>Capsella_rubella</i>	0.317
<i>Capsella_grandiflora</i>	0.317
<i>Chrysochamela_velutina</i>	0.099
<i>Catolobus_pendulus</i>	0.092
<i>Camelina_alyssum</i>	0.580
<i>Camelina_sativa</i>	0.580
<i>Camelina_microcarpa</i>	0.301
<i>Camelina_rumelica</i>	0.154
<i>Neslia_paniculata</i>	0.099
<i>Pseudoarabidopsis_toxophylla</i>	0.079
<i>Turritis_glabra</i>	0.117

<i>Turritis_laxa</i>	0.117
<i>Oreophyton_falcatum</i>	0.074
<i>Boechera_selbyi</i>	2.155
<i>Boechera_pallidifolia</i>	2.155
<i>Boechera_paupercula</i>	1.293
<i>Boechera_villosa</i>	0.985
<i>Boechera_falcifructa</i>	0.720
<i>Boechera_cobrensis</i>	0.720
<i>Boechera_formosa</i>	0.688
<i>Boechera_macounii</i>	0.789
<i>Boechera_lemmonii</i>	0.789
<i>Boechera_yorkii</i>	0.797
<i>Boechera_subpinnatifida</i>	0.797
<i>Boechera_williamsii</i>	0.709
<i>Boechera_falcata</i>	0.660
<i>Boechera_polyantha</i>	0.660
<i>Boechera_platysperma</i>	1.152
<i>Boechera_howellii</i>	1.152
<i>Boechera_arcuata</i>	0.738
<i>Boechera_rectissima</i>	0.738
<i>Boechera_dispar</i>	1.273
<i>Boechera_serpenticola</i>	1.273
<i>Boechera_retrofracta</i>	1.119
<i>Boechera_pygmaea</i>	0.919
<i>Boechera_lignifera</i>	0.728
<i>Boechera_lincolnensis</i>	0.747
<i>Boechera_glaucovalvula</i>	0.747
<i>Boechera_davidsonii</i>	0.613
<i>Boechera_collinsii</i>	0.594
<i>Boechera_evadens</i>	0.562
<i>Boechera_constancei</i>	0.912
<i>Boechera_suffrutescens</i>	0.912
<i>Boechera_rollei</i>	0.711
<i>Boechera_tiehmi</i>	0.579
<i>Boechera_lasiocarpa</i>	0.477
<i>Boechera_crandallii</i>	0.812
<i>Boechera_texana</i>	0.812
<i>Boechera_parishii</i>	0.848
<i>Boechera_johnstonii</i>	0.848
<i>Boechera_oxyllobula</i>	1.017
<i>Boechera_demissa</i>	1.017
<i>Boechera_spatifolia</i>	1.256
<i>Boechera_gracilipes</i>	1.256
<i>Boechera_nevadensis</i>	0.891
<i>Boechera_perennans</i>	0.750
<i>Boechera_shockleyi</i>	1.407
<i>Boechera_inyoensis</i>	1.407
<i>Boechera_fendleri</i>	0.854
<i>Boechera_pendulocarpa</i>	0.579

<i>Boechera_bodiensis</i>	1.022
<i>Boechera_cusickii</i>	1.022
<i>Boechera_koehlerii</i>	0.996
<i>Boechera_puberula</i>	0.996
<i>Boechera_schistacea</i>	0.516
<i>Boechera_stricta</i>	0.757
<i>Boechera_grahamii</i>	0.757
<i>Boechera_divaricarpa</i>	0.556
<i>Boechera_lyallii</i>	0.389
<i>Boechera_serotina</i>	0.751
<i>Boechera_missouriensis</i>	0.751
<i>Boechera_laevigata</i>	0.461
<i>Boechera_perstellata</i>	0.402
<i>Boechera_shortii</i>	0.402
<i>Boechera_canadensis</i>	0.172
<i>Boechera_gunnisoniana</i>	0.172
<i>Boechera_repanda</i>	0.165
<i>Anelsonia_eurycarpa</i>	0.145
<i>Sandbergia_whitedii</i>	0.187
<i>Sandbergia_perplexa</i>	0.187
<i>Phoenicaulis_cheiranthoides</i>	0.123
<i>Nevada_holmgrenii</i>	0.123
<i>Cusickiella_douglasii</i>	0.103
<i>Cusickiella_quadricostata</i>	0.103
<i>Polycytenium_fremontii</i>	0.097
<i>Borodinia_baicalensis</i>	0.153
<i>Borodinia_macrophylla</i>	0.153
<i>Halimolobos_lasiolobus</i>	0.804
<i>Halimolobos_henricksonii</i>	0.804
<i>Halimolobos_elatus</i>	0.602
<i>Halimolobos_diffusus</i>	0.402
<i>Halimolobos_jaegeri</i>	0.254
<i>Halimolobos_minutiflorus</i>	0.288
<i>Halimolobos_adpressus</i>	0.288
<i>Pennellia_longifolia</i>	0.155
<i>Pennellia_micrantha</i>	0.155
<i>Sphaerocardamum_fruticulosum</i>	1.262
<i>Sphaerocardamum_stellatum</i>	1.262
<i>Sphaerocardamum_macropetalum</i>	0.636
<i>Sphaerocardamum_divaricatum</i>	0.463
<i>Sphaerocardamum_amosum</i>	0.607
<i>Sphaerocardamum_macrum</i>	0.607
<i>Sphaerocardamum_nesliiforme</i>	0.213
<i>Sphaerocardamum_compressum</i>	0.148
<i>Exhalimolobos_weddellii</i>	0.540
<i>Exhalimolobos_palmeri</i>	0.540
<i>Exhalimolobos_hispidulus</i>	0.310
<i>Exhalimolobos_berlandieri</i>	0.282
<i>Exhalimolobos_parryi</i>	0.282

<i>Mancoa_bracteata</i>	0.166
<i>Mancoa_foliola</i>	0.166
<i>Pachycladon_ensii</i>	0.672
<i>Pachycladon_fastigiatum</i>	0.672
<i>Pachycladon_stellatum</i>	0.350
<i>Pachycladon_latisiliquum</i>	0.287
<i>Pachycladon_wallii</i>	0.237
<i>Pachycladon_cheesemaniae</i>	0.441
<i>Pachycladon_exile</i>	0.441
<i>Pachycladon_novaezealandiae</i>	0.254
<i>Pachycladon_radicatum</i>	0.141
<i>Stenopetalum_nutans</i>	0.106
<i>Blennodia_pterosperma</i>	0.157
<i>Blennodia_canescens</i>	0.157
<i>Scambopus_curvipipes</i>	0.119
<i>Pachymitus_cardaminoides</i>	0.151
<i>Drabastrum_alpestre</i>	0.151
<i>Microlepidium_pilosulum</i>	0.095
<i>Harmsiodoxa_blennodioides</i>	0.095
<i>Phlegmatospermum_erebiae</i>	0.091
<i>Irenepharsus_magicus</i>	0.082
<i>Cuphonotus_humistratus</i>	0.113
<i>Menkea_sphaerocarpa</i>	0.113
<i>Arabidella_trisecta</i>	0.070
<i>Dipoma_iberideum</i>	0.066
<i>Crucihimalaya_mollissima</i>	0.581
<i>Crucihimalaya_kneuckeri</i>	0.581
<i>Crucihimalaya_wallichii</i>	0.369
<i>Crucihimalaya_stricta</i>	0.361
<i>Crucihimalaya_himalaica</i>	0.361
<i>Crucihimalaya_tenuisiliqua</i>	0.261
<i>Crucihimalaya_lasiocarpa</i>	0.261
<i>Crucihimalaya_mongolica</i>	0.095
<i>Physaria_spatulata</i>	0.765
<i>Physaria_pycnantha</i>	0.765
<i>Physaria_ericarpa</i>	0.589
<i>Physaria_subumbellata</i>	0.626
<i>Physaria_intermedia</i>	0.626
<i>Physaria_nelsonii</i>	0.513
<i>Physaria_bellii</i>	1.347
<i>Physaria_newberryi</i>	1.347
<i>Physaria_acutifolia</i>	0.822
<i>Physaria_hemiphsaria</i>	0.392
<i>Physaria_occidentalis</i>	0.334
<i>Physaria_ludoviciana</i>	0.287
<i>Physaria_humilis</i>	0.329
<i>Physaria_goodrichii</i>	0.329
<i>Physaria_pallida</i>	0.331
<i>Physaria_gracilis</i>	0.331

<i>Physaria_filiformis</i>	0.162
<i>Physaria_pruinosa</i>	0.181
<i>Physaria_rosei</i>	0.181
<i>Physaria_johnstonii</i>	0.119
<i>Physaria_argyraea</i>	0.178
<i>Physaria_fendleri</i>	0.178
<i>Paysonia_lescurii</i>	0.729
<i>Paysonia_densipila</i>	0.729
<i>Paysonia_stonensis</i>	0.398
<i>Paysonia_auriculata</i>	0.213
<i>Paysonia_grandiflora</i>	0.132
<i>Paysonia_lasiocarpa</i>	0.093
<i>Nerisyrenia_linearifolia</i>	0.250
<i>Nerisyrenia_johnstonii</i>	0.250
<i>Lyrocarpa_coulteri</i>	0.158
<i>Synthlipsis_greggii</i>	0.118
<i>Dithyrea_californica</i>	0.095
<i>Dimorphocarpa_wislizeni</i>	0.076
<i>Cardamine_raphanifolia</i>	0.550
<i>Cardamine_matthioli</i>	0.550
<i>Cardamine_crassifolia</i>	0.555
<i>Cardamine_castellana</i>	0.555
<i>Cardamine_pratensis</i>	0.368
<i>Cardamine_schulzii</i>	0.314
<i>Cardamine_caldeirarum</i>	0.437
<i>Cardamine_amara</i>	0.437
<i>Cardamine_barbaraeoides</i>	0.239
<i>Cardamine_amporitana</i>	0.219
<i>Cardamine_longifructus</i>	0.843
<i>Cardamine_tanakae</i>	0.843
<i>Cardamine_dentipetala</i>	0.634
<i>Cardamine_niigatensis</i>	0.425
<i>Cardamine_regeliana</i>	0.513
<i>Cardamine_scutata</i>	0.513
<i>Cardamine_flexuosa</i>	0.863
<i>Cardamine_gallaecica</i>	0.863
<i>Cardamine_pensylvanica</i>	0.553
<i>Cardamine_ovata</i>	0.293
<i>Cardamine_paucijuga</i>	0.562
<i>Cardamine_fallax</i>	0.562
<i>Cardamine_manshurica</i>	0.319
<i>Cardamine_rhizomata</i>	0.307
<i>Cardamine_ecuadorensis</i>	0.307
<i>Cardamine_griffithii</i>	0.190
<i>Cardamine_lihengiana</i>	0.179
<i>Cardamine_douglassii</i>	0.311
<i>Cardamine_bulbosa</i>	0.311
<i>Cardamine_bonariensis</i>	0.159
<i>Cardamine_cordifolia</i>	0.244

<i>Cardamine breweri</i>	0.244
<i>Cardamine pentaphyllos</i>	0.104
<i>Cardamine sp. RS-2013</i>	0.646
<i>Cardamine appendiculata</i>	0.646
<i>Cardamine hirsuta</i>	0.341
<i>Cardamine pattersonii</i>	0.284
<i>Cardamine oligosperma</i>	0.284
<i>Cardamine parviflora</i>	0.110
<i>Cardamine trifolia</i>	0.091
<i>Cardamine nuttallii</i>	0.783
<i>Cardamine clematitis</i>	0.783
<i>Cardamine occidentalis</i>	0.617
<i>Cardamine purpurea</i>	0.525
<i>Cardamine debilis</i>	0.728
<i>Cardamine umbellata</i>	0.728
<i>Cardamine victoris</i>	0.523
<i>Cardamine digitata</i>	0.383
<i>Cardamine pedata</i>	0.554
<i>Cardamine blaisdellii</i>	0.554
<i>Cardamine yezoensis</i>	0.331
<i>Cardamine lyallii</i>	0.221
<i>Cardamine rupicola</i>	0.165
<i>Cardamine glechomifolia</i>	0.402
<i>Cardamine circaeoides</i>	0.402
<i>Cardamine microzyga</i>	0.224
<i>Cardamine delavayi</i>	0.181
<i>Cardamine asarifolia</i>	0.148
<i>Cardamine bellidifolia</i>	0.336
<i>Cardamine nipponica</i>	0.336
<i>Cardamine alpina</i>	0.229
<i>Cardamine resedifolia</i>	0.187
<i>Cardamine pancicii</i>	0.265
<i>Cardamine glauca</i>	0.265
<i>Cardamine plumieri</i>	0.127
<i>Cardamine carnosia</i>	0.127
<i>Cardamine glanduligera</i>	0.112
<i>Cardamine graeca</i>	0.108
<i>Cardamine africana</i>	0.102
<i>Cardamine concatenata</i>	0.472
<i>Cardamine laciniata</i>	0.472
<i>Cardamine angustata</i>	0.237
<i>Cardamine diphylla</i>	0.150
<i>Cardamine macrophylla</i>	0.202
<i>Cardamine tangutorum</i>	0.202
<i>Cardamine fragariifolia</i>	0.112
<i>Cardamine yunnanensis</i>	0.107
<i>Cardamine constancei</i>	0.107
<i>Cardamine bradei</i>	0.096
<i>Cardamine pectinata</i>	0.143

<i>Cardamine impatiens</i>	0.143
<i>Cardamine leucantha</i>	0.179
<i>Cardamine microphylla</i>	0.179
<i>Cardamine conferta</i>	0.103
<i>Cardamine enneaphyllos</i>	0.103
<i>Cardamine adriatica</i>	0.409
<i>Cardamine monteluccii</i>	0.409
<i>Cardamine fialae</i>	0.404
<i>Cardamine maritima</i>	0.404
<i>Cardamine serbica</i>	0.261
<i>Cardamine montenegrina</i>	0.261
<i>Cardamine rupestris</i>	0.117
<i>Cardamine limprichtiana</i>	0.069
<i>Iodanthus pinnatifidus</i>	0.064
<i>Nasturtium officinale</i>	0.112
<i>Nasturtium microphyllum</i>	0.112
<i>Leavenworthia crassa</i>	1.901
<i>Leavenworthia alabamica</i>	1.901
<i>Leavenworthia exigua</i>	0.957
<i>Leavenworthia uniflora</i>	0.506
<i>Leavenworthia stylosa</i>	0.783
<i>Leavenworthia aurea</i>	0.783
<i>Leavenworthia texana</i>	0.479
<i>Leavenworthia torulosa</i>	0.145
<i>Selenia mexicana</i>	0.243
<i>Selenia dissecta</i>	0.243
<i>Selenia grandis</i>	0.146
<i>Selenia jonesii</i>	0.116
<i>Selenia aurea</i>	0.086
<i>Planodes virginica</i>	0.069
<i>Ornithocarpa torulosa</i>	0.065
<i>Rorippa cantoniensis</i>	0.351
<i>Rorippa indica</i>	0.351
<i>Rorippa austriaca</i>	0.322
<i>Rorippa islandica</i>	0.322
<i>Rorippa palustris</i>	0.583
<i>Rorippa amphibia</i>	0.583
<i>Rorippa sylvestris</i>	0.293
<i>Rorippa teres</i>	0.093
<i>Sisymbrella aspera</i>	0.086
<i>Barbarea orthoceras</i>	0.222
<i>Barbarea verna</i>	0.222
<i>Barbarea vulgaris</i>	0.126
<i>Armoracia rusticana</i>	0.056
<i>Lepidium limenophylax</i>	3.445
<i>Lepidium didymum</i>	3.445
<i>Lepidium banksii</i>	3.153
<i>Lepidium aegrum</i>	3.133
<i>Lepidium panniforme</i>	3.107

<i>Lepidium_seditiosum</i>	3.070
<i>Lepidium_oligodontum</i>	3.015
<i>Lepidium_crassum</i>	2.927
<i>Lepidium_juvenicum</i>	2.783
<i>Lepidium_flexicaule</i>	2.548
<i>Lepidium_oleraceum</i>	2.195
<i>Lepidium_rekohuense</i>	1.730
<i>Lepidium_obtusatum</i>	1.221
<i>Lepidium_nesophilum</i>	0.773
<i>Lepidium_desvauxii</i>	0.607
<i>Lepidium_foliosum</i>	0.426
<i>Lepidium_africanum</i>	0.268
<i>Lepidium_graminifolium</i>	0.178
<i>Lepidium_rubtzovii</i>	0.765
<i>Lepidium_ruderale</i>	0.765
<i>Lepidium_lacerum</i>	0.384
<i>Lepidium_subcordatum</i>	0.201
<i>Lepidium_papilliferum</i>	0.580
<i>Lepidium_montanum</i>	0.580
<i>Lepidium_davisii</i>	0.291
<i>Lepidium_meyenii</i>	0.258
<i>Lepidium_alyssoides</i>	0.403
<i>Lepidium_virginicum</i>	0.403
<i>Lepidium_bonariense</i>	0.324
<i>Lepidium_navasii</i>	0.221
<i>Lepidium_sisymbrioides</i>	0.385
<i>Lepidium_solandri</i>	0.385
<i>Lepidium_naufragorum</i>	0.256
<i>Lepidium_sativum</i>	0.223
<i>Lepidium_densiflorum</i>	0.223
<i>Lepidium_apetalum</i>	0.165
<i>Lepidium_angustissimum</i>	0.165
<i>Lepidium_aucheri</i>	0.109
<i>Lepidium_squamatum</i>	0.072
<i>Lepidium_phlebopetalum</i>	0.072
<i>Lepidium_chalepense</i>	0.058
<i>Lepidium_heterophyllum</i>	0.234
<i>Lepidium_campestre</i>	0.234
<i>Lepidium_hirtum</i>	0.153
<i>Lepidium_draba</i>	0.107
<i>Lepidium_perfoliatum</i>	0.074
<i>Cyphocardamum_aretoides</i>	0.049
<i>Delpinophytum_patagonicum</i>	0.041
<i>Descurainia_appendiculata</i>	2.845
<i>Descurainia_pimpinellifolia</i>	2.845
<i>Descurainia_glaucescens</i>	1.486
<i>Descurainia_argentina</i>	1.053
<i>Descurainia_cumingiana_subsp_cumingiana</i>	1.211
<i>Descurainia_heterotricha</i>	1.211

<i>Descurainia_stricta</i>	2.141
<i>Descurainia_streptocarpa</i>	2.141
<i>Descurainia_myriophylla</i>	1.772
<i>Descurainia_obtusa_subsp._obtusa</i>	1.613
<i>Descurainia_leptoclada</i>	1.389
<i>Descurainia_adenophora</i>	1.097
<i>Descurainia_virletii</i>	0.666
<i>Descurainia_impatiens</i>	0.517
<i>Descurainia_athrocarpa</i>	0.372
<i>Descurainia_depressa</i>	0.250
<i>Descurainia_incana</i>	1.444
<i>Descurainia_incisa</i>	1.444
<i>Descurainia_californica</i>	0.846
<i>Descurainia_pinnata</i>	0.493
<i>Descurainia_brevisiliqua</i>	0.443
<i>Descurainia_sophioides</i>	0.443
<i>Descurainia_paradisa_subsp._nevadensis</i>	0.720
<i>Descurainia_longipedicellata</i>	0.720
<i>Descurainia_nelsonii</i>	0.497
<i>Descurainia_antarctica</i>	0.307
<i>Descurainia_lemsii</i>	1.759
<i>Descurainia_gonzalezii</i>	1.759
<i>Descurainia_millefolia</i>	1.256
<i>Descurainia_preauxiana</i>	0.847
<i>Descurainia_bourgeauana</i>	0.918
<i>Descurainia_gilva</i>	0.918
<i>Descurainia_artemisioides</i>	0.402
<i>Descurainia_tanacetifolia</i>	0.271
<i>Descurainia_sophia</i>	0.123
<i>Descurainia_kochii</i>	0.123
<i>Robeschia_schimperii</i>	0.063
<i>Ianhedgea_minutiflora</i>	0.056
<i>Pritzelago_alpina</i>	0.141
<i>Hornungia_alpina</i>	0.141
<i>Hornungia_petraea</i>	0.075
<i>Tropidocarpum_gracile</i>	0.057
<i>Smelowskia_bifurcata</i>	0.315
<i>Smelowskia_alba</i>	0.315
<i>Smelowskia_porsildii</i>	0.272
<i>Smelowskia_media</i>	0.407
<i>Smelowskia_borealis</i>	0.407
<i>Smelowskia_americana</i>	0.276
<i>Smelowskia_calycina</i>	0.276
<i>Smelowskia_flavissima</i>	0.131
<i>Smelowskia_parryoides</i>	0.295
<i>Smelowskia_sophiifolia</i>	0.295
<i>Smelowskia_jacutica</i>	0.238
<i>Smelowskia_pyriiformis</i>	0.275
<i>Smelowskia_johnsonii</i>	0.275

<i>Smelowskia_inopinata</i>	0.152
<i>Smelowskia_bartholomewii</i>	0.135
<i>Smelowskia_tibetica</i>	0.135
<i>Smelowskia_annua</i>	0.123
<i>Smelowskia_sisymbrioides</i>	0.123
<i>Yinshania_acutangula_subsp._acutangula</i>	0.094
<i>Yinshania_zayuensis</i>	0.188
<i>Yinshania_henryi</i>	0.188
<i>Lobularia_canariensis_subsp._microsperma</i>	0.735
<i>Lobularia_canariensis_subsp._intermedia</i>	0.735
<i>Lobularia_canariensis_subsp._fruticosa</i>	0.738
<i>Lobularia_canariensis_subsp._palmensis</i>	0.738
<i>Lobularia_canariensis_subsp._spathulata</i>	0.350
<i>Lobularia_canariensis_subsp._canariensis</i>	0.397
<i>Lobularia_canariensis_subsp._marginata</i>	0.397
<i>Lobularia_libyca</i>	0.142
<i>Lobularia_arabica</i>	0.141
<i>Lobularia_maritima</i>	0.141
<i>Notoceras_bicorne</i>	0.053
<i>Morettia_parviflora</i>	0.173
<i>Morettia_canescens</i>	0.173
<i>Morettia_philaeana</i>	0.098
<i>Diceratella_inermis</i>	0.087
<i>Lachnocapsa_spathulata</i>	0.071
<i>Parolinia_intermedia</i>	0.083
<i>Anastatica_hierochuntica</i>	0.083
<i>Farsetia_robecchiana</i>	0.185
<i>Farsetia_undulicarpa</i>	0.185
<i>Farsetia_longistyla</i>	0.152
<i>Farsetia_linearis</i>	0.119
<i>Farsetia_aegyptia</i>	0.176
<i>Farsetia_longisiliqua</i>	0.176
<i>Farsetia_stylosa</i>	0.059
<i>Eremobium_aegyptiacum</i>	0.200
<i>Eremobium_lineare</i>	0.200
<i>Cithareloma_lehmannii</i>	0.122
<i>Eremobium_aegyptiacum_subsp._longisiliquum</i>	0.076
<i>Maresia_nana</i>	0.057
<i>Malcolmia_karelinii</i>	0.132
<i>Malcolmia_scorpoides</i>	0.132
<i>Malcolmia_africana</i>	0.069
<i>Malcolmia_triloba</i>	0.098
<i>Malcolmia_littorea</i>	0.098
<i>Malcolmia_amosissima</i>	0.050
<i>Malcolmia_maritima</i>	0.111
<i>Malcolmia_orsiniana_subsp._angulifolia</i>	0.111
<i>Malcolmia_orsiniana</i>	0.064
<i>Aethionema_erinaceum</i>	0.104
<i>Aethionema_grandiflorum</i>	0.104

<i>Aethionema_elongatum</i>	0.066
<i>Aethionema_saxatile</i>	0.073
<i>Aethionema_arabicum</i>	0.073

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