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Royal Botanic Gardens Kew

NKUA Seed Bank

MILLENNIUM SEED BANK PARTNERSHIP

Conserving the Flora of the Balkans: Native Plants of Greece

Report for the Millennium Seed Bank Project Partnership, Royal Botanic Gardens, Kew

Project Period Covered By This Report

Year: (2)

From: **20/02/2023 – 30/09/2023**

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Prepared by:

Full Name: Costas A. Thanos

Name of Organisation: NKUA Seed Bank

Title of Position: Prof. Emer., NKUA Project Team Leader

Address: Section of Botany, Department of Biology, National and Kapodistrian University of Athens, Panepistimiopolis, Athens 15784, Greece

Phone Number: 30-2107274655; 30-6976657987

E-Mail: cthanos@biol.uoa.gr

1.0 Project Overview

1.1 The NKUA Team

Costas A. Thanos, Professor Emeritus	Team Leader
Aikaterina Stefi, Biologist BSc, PhD, Research Associate	Lab Manager
Aikaterini Koutsovoulou, Biologist BSc, PhD, Researcher	Leader of Germination & Storage
Apostolos Kaltsis, Biologist BSc, MSc, Researcher	Leader of Seed Collecting & Data
Spyridon Oikonomidis, Biologist BSc, PhD Cand., Res Assoc	Senior Collector, Student Researcher
Aikaterini Goula, Biologist BSc, PhD Candidate	Taxonomist
Konstantina Mitsigiorgi, Biologist BSc, PhD Student	Field and Lab associate
Sofoklis Mouratidis, Biologist BSc, MSc Student	Field and Lab associate
Anna Maranti, Biologist BSc. (only in the 1st year)	Field and Lab associate
Nikolaos Katsikis, Biology Student	Field and Lab associate
Konstantinos Maramathas, Biology Student	Field and Lab associate
Maria Chalikiopoulou, Biology Student	Field and Lab associate
Anna Boziki, Biology Student	Field and Lab associate
Fermele Bashari, Biology Student	Field and Lab associate
Fotini Tsigeli, Biology Student (2nd year)	Field and Lab associate
Katerina Dimitriou, Biology Student (2nd year)	Field and Lab associate
Alexandros Panagiotakis, Biology Student (2nd year)	Field and Lab associate

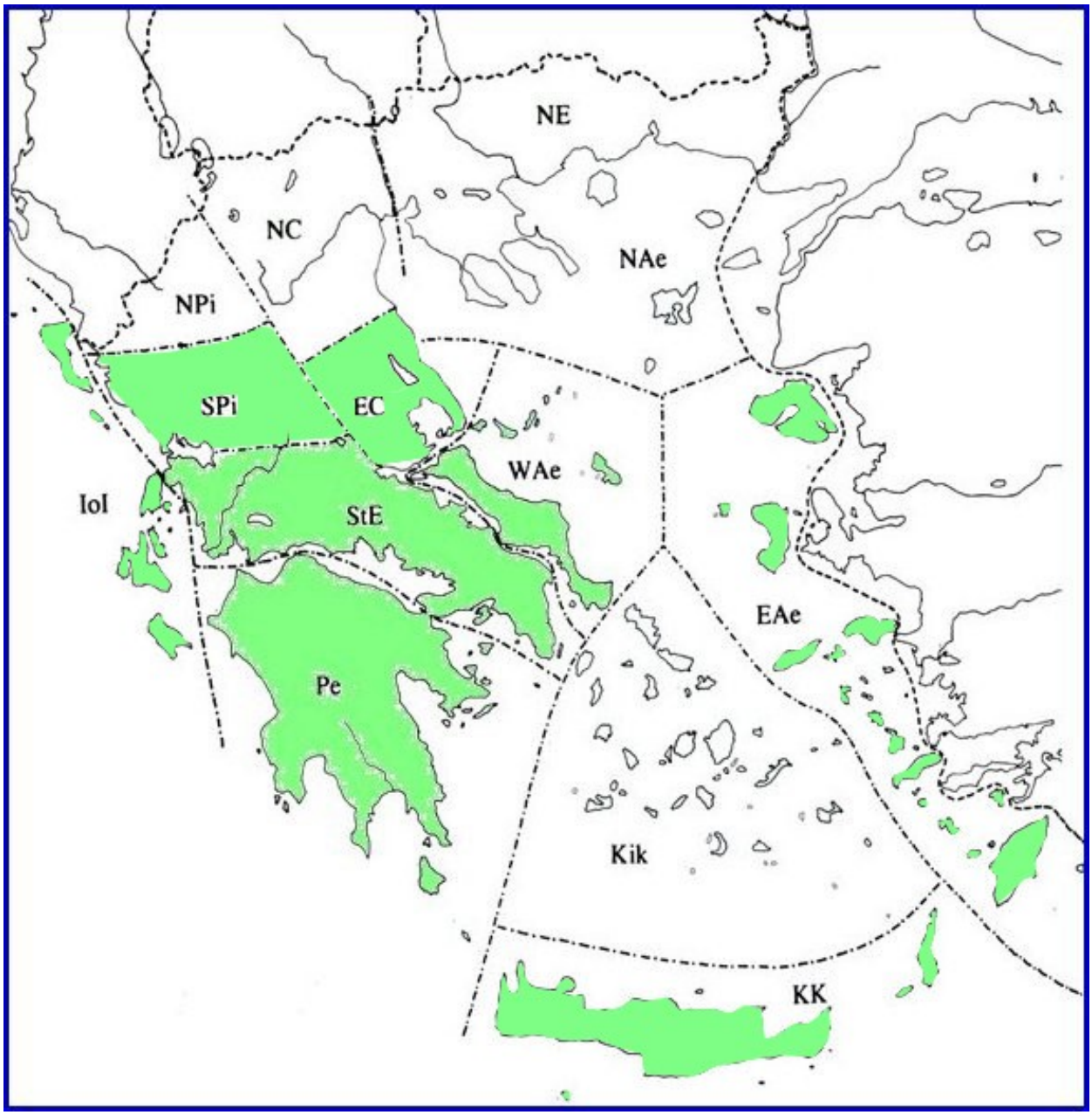
1.2 The main goals of the Project

The Project is a collaboration of the Millennium Seed Bank of RBG Kew and the NKUA Seed Bank within the framework of MSB Partnership and with the highly appreciated funding from several sponsors (The A.G. Leventis Foundation, Players of People's Postcode Lottery, Linde, The Steel Charitable Trust & Navarino).

The main goals of the Project are:

1. **Ex situ Conservation.** Seed collections of 160 species from mainland Greece including a third of all accessible ENSCONET Consortium target species in southern mainland Greece (30% of the species). At least 25% of the collected species will be Greek endemics. All collections will be duplicated to the MSB, associated vouchers will be lodged at Kew's herbarium, and the data will be made available through MSBP Data Warehouse.
2. **Training and capacity building for NKUA** staff and students in seed collecting, processing and banking. In addition, research training in germination testing to MSB standards will be provided to the visiting PhD student at the MSB.
3. **Research into germination** of collected species to support ex situ and in situ conservation of 160 native plant species from Greece's mainland. Research will be undertaken by a PhD student to investigate storage and germination of Greek Orchidaceae species. Methodology will follow ENSCONET guidelines.
4. **Sharing and dissemination of project learning.** Seed collection data and germination protocols accessible through MSBP Data Warehouse and made public after publication

by NKUA or within three years of project end. Opportunities sought to disseminate project learning through the ENSCONET Consortium, regional conferences, MSBP's Samara newsletter, and Kew's social networks. Seedlings supplied to Kew's nursery staff to support future dissemination work through planting beds and public engagement signs.



Map 1. The 13 floristic regions of Greece. Shown with green colour: Peloponnese (Pe), Central Greece (Sterea Ellas, StE), Ionian Islands (IoI), South Pindos (SPi), East Central (EC), West Aegean Islands (WAe), East Aegean Islands (EAe) and Crete-Karpathos (KK); these are the eight (8) regions where seed collections took place (so far) during the second year of the Project.

2.0 Achievements

2.1. Seed Collections

During the period Feb. 20 till Sep. 30, 2023 we have collected seeds from 145 confirmed taxa and in addition, 17 collections not yet fully identified. We are confident that we have already achieved the accumulated goal of 330 seed collections and the 83 target mark for Greek endemics. It must be noted that apart from the unidentified yet collections, we will continue collecting during autumn and winter (small number of collections expected, of course).

[Note: 187 seed collections of 2022 (61 of them Greek endemics) were delivered to the MSB in two dispatches, in January and July, 2023.]

Table 1. Collections realised till Sep. 30, 2023.

Collections	Actual *(collections made up to reporting date)*	Target *(this year)*	Total Actual *(cumulative)*	Total Target *(for the length of the project – if funded for 3 years*
Number of Collections	145	160	332 (1sty: 187)	500
Number of Species	145	160	332 (1sty: 187)	500
Number of Species New to MSB	115/92 (Greece/Global)	130 (flexible target)	240/197 (1sty: 135/105) (Greece/Global)	400 (flexible)
Number of Greek endemics	33	40	94 (1sty: 61)	125
ENSCONET Priority Species	6	9	10(1sty: 4)	All accessible targets (30)

The full list of the taxa collected (mostly under the guidance of the senior collectors Mr Apostolos Kaltsis and Mr Spyros Oikonomidis) is given in **Appendix 1**.

The list of field trips (a total of 31 from Feb. 20 to Sep. 30, 2023) is shown in **Appendix 2**.

2.2. Significant taxa collected

- *Consolida samia*: A narrow endemic species of Greece, occurring only in a single, small population in the SW screes of Mt Kerketefs (Samos Isl.) and considered a 'lost species' until now. The plant is characterised as CR by the IUCN and we rediscovered

it in its locus classicus, 61 years after its first collection and characterization as a new species to Science. See our reports in the Project website here and here.

- *Allium calamarophilon*: Also a 'lost species' and a narrow endemic of Greece (Euboea Isl.), currently characterised as CR by the IUCN. It single population is found in steep cliffs by the sea but we additionally found it in the neighboring inland area. A report about its rediscovery will be posted in the Project website soon.
- *Polygala helenae*: Endemic of Greece (only in Cythera Isl.), currently characterised as CR by the IUCN. Its populations are small and fragmented. The species is mainly threatened by habitat loss and grazing but we managed to make a sizeable collection this year. The seeds are very impressive and bear an elaiosome for ant dispersal; as a reason of that we almost lost our seed accession (left to dry on the lab) by an ant raid! Fortunately, we managed to recover most seeds from the thieves! See the report in our website here.
- *Saponaria jagelii*: Endemic of Greece, currently characterised as CR by the IUCN. It was growing only in two small populations on the island of Elafonisos, very close to the southeastern coast of Peloponnese but both in 2022 and 2023 we could not find any plants in the most frequented site. See our 2023 report here.
- *Paeonia clusii* subsp. *rhodia*: Endemic of Greece, found only on Rhodes Island. It grows in several small and fragmented populations within pine forests. See its beautiful fruits and seeds in Fig. 7.
- We also managed to collect seeds from some otherimportant, rare and threatened endemics, among which the following: *Teucrium halacsyanum*, *Arenaria leucadia*, *Lomelosia crenata* subsp. *dallaportae*, *Silene holzmanii*, and *Bolanthus laconicus*.

2.3 Herbarium vouchers

A total of 14 plant specimens have been collected and are currently under preparation as herbarium vouchers (see **Appendix 3**). As it has been explained it is very difficult to obtain proper herbarium vouchers from the majority of the taxa collected as this would mean almost doubling the field trips, which under the circumstances is not feasible, on the basis of both human resources and logistics. The accurate identification of the taxa collected will be certified by our taxonomist (Ms Katerina Goula) with the use of all relevant plant material and information available.

2.4 Handling of Seed Accessions

The large majority of the seed accessions (more than 100 out of the 162) have already been dried, cleaned and weighed (under the guidance of Dr Katerina Stefi), but we do not have yet an estimate of the total number of seeds collected per accession.

2.5 Training the next generation of seed conservation scientists

The Workshop 'Seed Conservation Techniques Course' (6 to 10 June, 2022) jointly organised by RBG Kew and NKUA gave the opportunity to several trainees (among them 8 students in their last, 4th year of studies for the Biology BSc Degree) to both familiarise with ex situ plant conservation and to get practically trained in various aspects of seed curation. Almost all of them have continued assisting in the Project throughout the 2nd year and 3 of them were recruited as Diploma Thesis students (a 2-semester experimental 'course'), studying seed germination ecophysiology of several seed accessions, each. Currently, they have all finished with their experimental work and are about to present their Thesis. In the meantime, we have recruited an extra 3 students, also at their final year of studies - one of them as a Diploma Thesis student for the academic year 2023-24).

2.5 The Project Website

The development of the website, assigned to our junior colleagues Mr Spyros Oikonomidis and Mr Sofoklis Mouratidis was eventually finalised by November 2022 and the site was thereafter launched (press here). The website hosts 5 modules (About us – Activities – Deliverables – Resources – News) and is regularly updated with news and material produced during the Project operation.

2.6 Seed Viability/Germination Assessments and Long-Term Storage

Protocols and procedures for the assessment of seed viability and germinability for all seed accessions (to be collected during the Project implementation) have already been agreed and elaborated, under the guidance of Dr Katerina Koutsovoulou. All seed accessions have been tested in several experiments under various, targeted conditions according to the bibliographic data and all available information with the aim to minimise the number of seeds used for the seed lot assessment (see **Appendix 4**). At a later stage and upon the completion of the germination tests, we proceeded with dividing the accessions and, on the one hand, preparing the seed packages (already 187 seed accessions delivered to MSB) and, on the other, placing seed accessions under long-term storage at the NKUA Seed Bank.

2.7 Research on Orchid Seeds and Preparations for the 2nd visit of the PhD student to MSB

Mr Spyros Oikonomidis is now in the final year of his PhD Thesis; he is quite active in pursuing his research on seed biology of the Greek orchids and his first visit to the MSB (early 2023) proved particularly successful (see the report at the Project website here). A

second visit to MSB and a common research plan (with the use of MSB-stored orchid seeds) are currently organized for December 2023.

2.8 Equipment procured, or in progress

We have bought a number of precision sieves and together with our previously existing ones, we have now an almost complete set of 11 sieves. We also managed to buy numerous air- and water-proof glass jars of various sizes for the long term storage of seeds.

For our drying room (kept at a constant temperature of 16-17 °C) we bought a 20L dehumidifier and the relative humidity of the room is always between 40 and 45%, while inside the drying chambers, RH is kept between 15 and 20% with the use of a routinely replaced supply of silica gel.

We installed a wifi network and with the use of tailored software we have connected all our temperature and RH loggers, constantly recording temperature and relative humidity in our rooms, drying cabinets and germination chambers.

We have repaired one germination chamber and our fully operating set is composed by 7 chambers, all set at different constant or daily alternating temperatures. We have also added wifi-controlled LED strips to 3 of them and now all chambers have lighting capacity.

Recently we bought a 3rd freezer (325 L of useful volume) which is currently operating constantly at -20 °C and thus the storage capacity of our Seed Bank has been substantially increased.

Finally, we received with gratitude a used dryer/incubator, as a kind donation by RGB, Kew, and we have installed it in our drying room.

3.0 Images with Captions

Figure 1. Selection #I of plants collected. From top to bottom and left to right: 1) *Teucrium halacsyanum*, 2) *Asphodelus fistulosus*, 3) *Campanula drabifolia*, 4) *Arenaria leucadia*, 5) *Saponaria calabrica*, 6) *Tragopogon porrifolius*, 7) *Muscari pulchellum*, 8) *Silene colorata*, 9) *Crocus cancellatus* subsp. *mazziaricus* (©Spyros Oikonomidis & NKUA Seed Bank).

Figure 2. Selection #II of plants collected. From top to bottom and left to right: 1) *Putoria calabrica*, 2) *Lomelosia crenata* subsp. *Dallaportae*, 3) *Sedum urvileii*, 4) *Scabiosa tenuis*, 5) *Hypericum empetrifolium*, 6) *Dianthus biflorus*, 7) *Bolanthus graecus*, 8) *Ruta graveolens*, 9) *Bellardia trixago* (©Spyros Oikonomidis & NKUA Seed Bank).

Figure 3. Selection #III of plants collected. From top to bottom and left to right: 1) *Neotinea maculate,* 2) *Reseda alba*, 3) *Onosma stridii*, 4) *Salvia verbenaca*, 5) *Petrorhagia thessala*, 6) *Epipactis microphylla*, 7) *Campanula spruneriana* subsp. *Spruneriana*, 8) *Armeria canescens*, 9) *Glaucium flavum* (©Spyros Oikonomidis & NKUA Seed Bank).

Figure 4. Selection #IV of plants collected. From top to bottom and left to right: 1) *Serapias lingua*, 2) *Veronica oetaea*, 3) *Cerinthe minor* ,4) *Bolanthus laconicus*, 5) *Euphorbia acanthothamnos*, 6) *Cerastium candidissimum*, 7) *Lavandula stoechas* subsp. *Stoechas*, 8) *Biscutella didyma*, 9) *Campanula cymaea* (©Spyros Oikonomidis & NKUA Seed Bank).

Figure 5. Selection of orchid seeds, photographed under a stereomicroscope. From top to bottom and left to right: 1) *Ophrys helenae*, 2) *Neotinea maculate*, 3) *Neotinea lacteal*, 4) *Limodorum abortivum*, 5) *Himantoglossum robertianum*, 6) *Epipactis microphylla*, 7) *Epipactis helleborine* subsp. *Helleborine*, 8) *Dactylorhiza saccifera* subsp. *Saccifera*, 9) *Cephalanthera damasonium* (©Spyros Oikonomidis & NKUA Seed Bank).

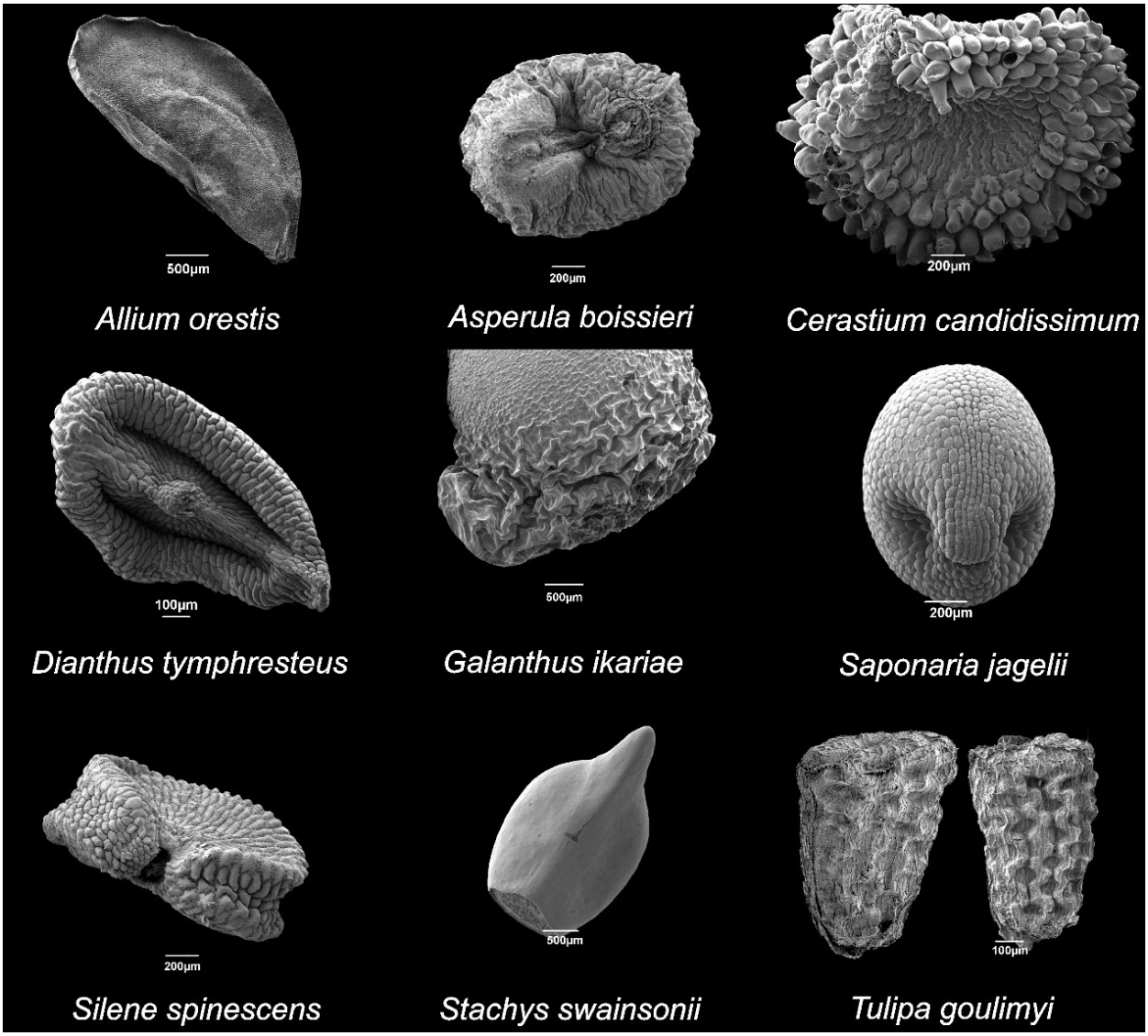


Figure 6. Scanning electron micrographs of the seeds of 9 Greek endemic species, after coating with gold (©Aikaterina L. Stefi & NKUA Seed Bank).

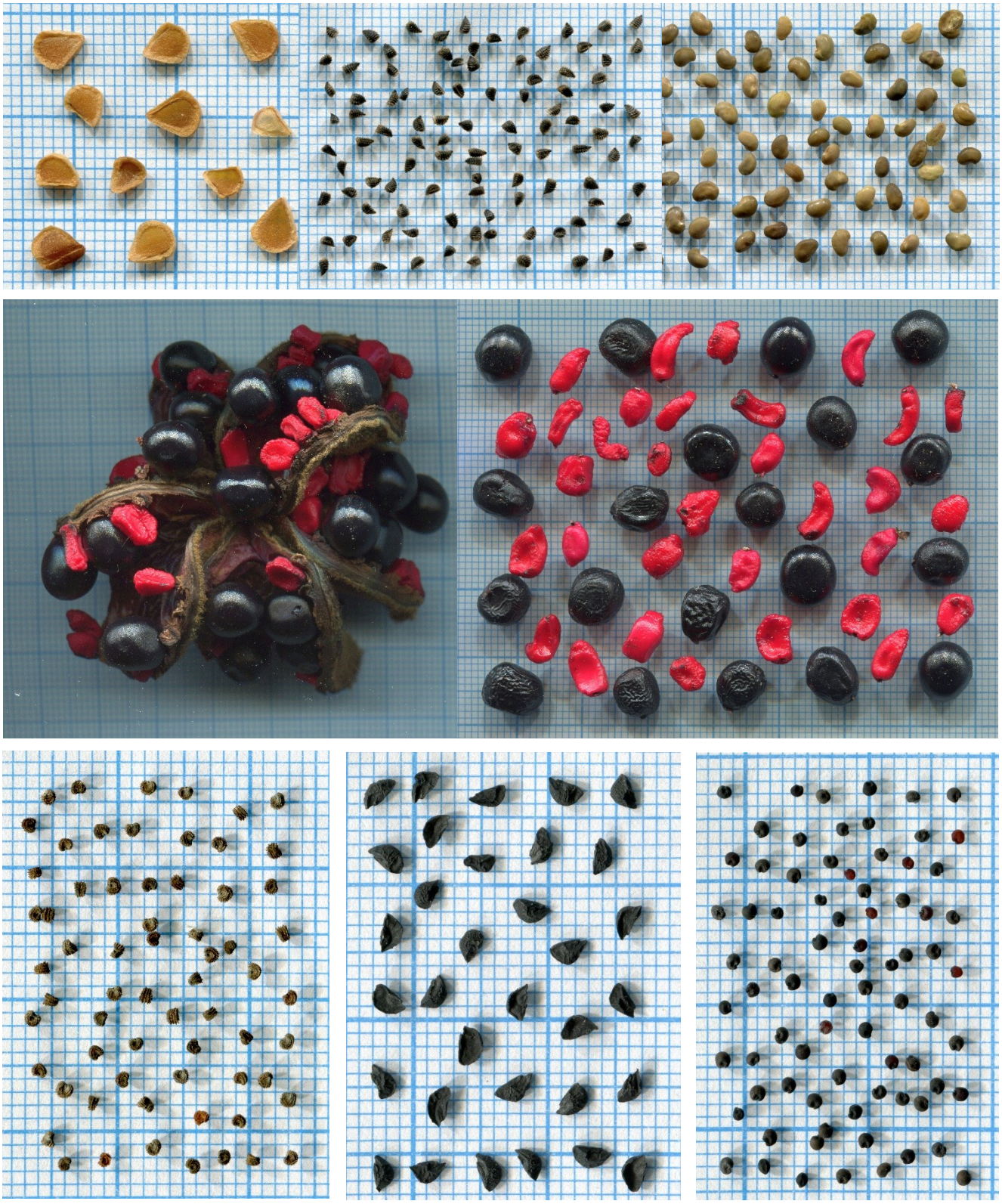


Figure 7. Selection #I of scanned seeds of 8 Greek endemics. From top to bottom and left to right: 1) *Fritillaria rhodia*, 2) *Consolida samia*, 3) *Onobrychis ebenoides*, 4-5) *Paeonia clusii* subsp. *rhodia*, mature dehisced fruits (left) – fertile (black) and infertile/'lure' (red) seeds (right), 6) *Silene holzmannii*, 7) *Allium calamarophilon*, 8) *Muscari pulchellum*, 8) *Saponaria jagelii* (©Costas A. Thanos & NKUA Seed Bank).

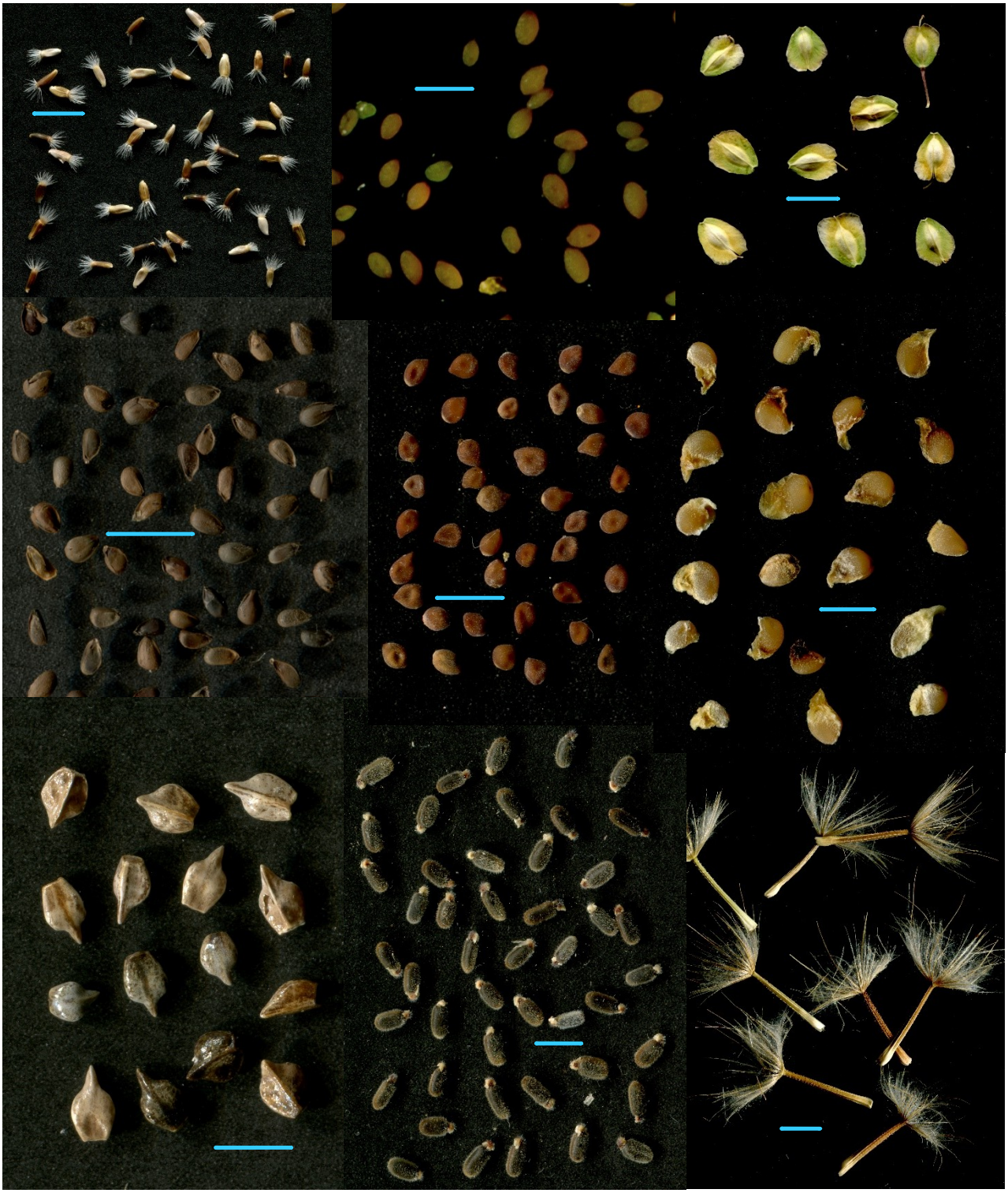


Figure 8. Selection #II of scanned seeds of 9 Greek endemics. From top to bottom and left to right: 1) *Centaurea attica* subsp. *attica*, 2) *Veronica oetaea*, 3) *Aethionema retsina*, 4) *Tulipa orientalis*, 5) *Linum leucanthum*, 6) *Galanthus ikariae*, 7) *Onosma stridii*, 8) *Polygala helenae*, 9) *Scorzonera crocifolia*. The blue bar corresponds to 5 mm [1 mm in *Veronica oetaea*]. (©Costas A. Thanos & NKUA Seed Bank).

Figure 9. Important plants from Cythera Island. The 3 plants on top are Cytherian endemics, the other 3 (bottom) are Greek endemics (© Aikaterina L. Stefi & NKUA Seed Bank).

Figure 10. Cleaning seed accessions by the Project team with the use of various sieves, needles, forceps and the Agriculex aspirator (©Aikaterina L. Stefi & NKUA Seed Bank).

4.0 Project Challenges

Overall, the Project implementation has been relatively smooth on all scientific, administrational and financial grounds. However, we have faced some difficulties and challenges, which we briefly present below.

1. The weather throughout 2023 has been quite erratic and much more unpredictable than in previous years/decades. The season started warmer than usual in late winter – early spring but the following months (including June which was also much wetter) were relatively cooler to be followed by an extremely hot July, deviating by more than 2.5 °C from the average of the previous decade. These temperature fluctuations had obvious impacts on both our predictions for the right collection times and, more importantly, the reproductive success of the plants themselves.
2. General elections were held twice in Greece (end of May and end of June) and added some pressure on our collection schedules.
3. The fire season was once more a major negative factor, particularly in July and August as Greece faced some unprecedentedly large and long megafires and thousand of smaller fire incidents throughout the country.
4. It seems that the ENSCONET Priority Species have proven much harder to target and collect than anticipated and it is clear that we are falling behind our targets. Therefore, in the 3rd year we will pay particular attention towards filling at least a part of the gap.

6.0 Appendices

APPENDIX 1

Detailed List of Seed Collections carried out between Feb. 20 and Sep. 30, 2023.

#	Taxon name	Collection Number	Greek Endemic	Chorology (according to VPG)
1	*Acantholimon graecum*	20230903-AK07	NO	Balkan
2	*Achillea taygetea*	20230909-SO01	YES	Greek endemic
3	*Alcea biennis* subsp. *biennis*	20230917-SO01	NO	East Mediterranean
4	*Allium calamarophilon*	20230713-AK01	YES	Greek endemic
5	*Allium flavum* subsp. *tauricum*	20230903-AK10	NO	Mediterranean-European
6	*Allium gomphrenoides*	20230628-KS04	YES	Greek endemic
7	*Allium guttatum*	20230902-AK02	NO	Mediterranean
8	*Alyssum fulvescens*	20230528-AK01	NO	East Mediterranean
9	*Alyssum minutum*	20230508-SO02	NO	Mediterranean-European
10	*Alyssum simplex*	20230718-SO06	NO	Euro-Siberian
11	*Anthemis rhodensis* subsp. *pulvinalis*	20231001-CT01	YES	Greek endemic
12	*Arenaria leucadia*	20230512-SO03	YES	Greek endemic
13	*Arenaria serpyllifolia*	20230628-SM01	NO	European-SW Asian
14	*Armeria undulata*	20230903-AK06	NO	East Mediterranean
15	*Asperula taygetea*	20230629-KS10	YES	Greek endemic
16	*Asphodeline liburnica*	20231001-CT02	NO	East Mediterranean
17	*Asphodelus fistulosus*	20230518-SO07	NO	Mediterranean
18	*Asphodelus ramosus*	20230518-SO06	NO	Mediterranean
19	*Atractylis cancellata*	20230626-SO08	NO	Mediterranean
20	*Bellardia trixago*	20230628-SO02	NO	Mediterranean-SW Asian
21	*Bellardia viscosa*	20230626-SO11	NO	Mediterranean-European
22	*Bolanthus graecus*	20230718-SO05	YES	Greek endemic
23	*Bolanthus laconicus*	20230908-SO01	YES	Greek endemic
24	*Brassica nigra*	20230811-SO01	NO	Paleotemperate
25	*Briza maxima*	20230518-SO01	NO	Subtropical-tropical
26	*Cakile maritima* subsp. *maritima*	20230615-SM01	NO	Mediterranean-European
27	*Campanula aizoon*	20230902-AK11	YES	Greek endemic
28	*Campanula drabifolia*	20230518-SO05	YES	Greek endemic
29	*Campanula drabifolia*	20230718-SO04	YES	Greek endemic
30	*Campanula hagielia*	20230527-SO02	NO	East Mediterranean
31	*Campanula lyrata* subsp. *lyrata*	20230702-AK03	NO	East Mediterranean
32	*Campanula nisyria*	20230813-SM02	YES	Greek endemic
33	*Campanula saxatilis* subsp. *cytherea*	20230629-KS02	YES	Greek endemic

34	*Capsella grandiflora*	20230503-SM01	NO	Balkan-Italy
35	*Cardamine graeca*	20230526-AK02	NO	Mediterranean
36	*Centaurea affinis* subsp. *affinis*	20230902-AK04	NO	Balkan
37	*Centaurea grisebachii*	20230916-SO01	NO	Balkan
38	*Centaurea redempta* subsp. *cytherea*	20230629-KS01	YES	Greek endemic
39	*Cephalaria ambrosioides*	20230902-AK06	NO	Balkan
40	*Cerinthe minor* subsp. *cleiostoma*	2020620-AK07	NO	Balkan
41	*Cirsium creticum* subsp. *creticum*	20230902-AK05	NO	Mediterranean
42	*Cirsium italicum*	20230527-SO01	NO	Mediterranean
43	*Cistus monspeliensis*	20230629-KS07	NO	Mediterranean
44	*Cistus parviflorus*	20230628-KS03	NO	East Mediterranean
45	*Colutea arborescens* subsp. *arborescens*	20230812-SO01	NO	European-SW Asian
46	*Consolida samia*	20230703-AK01	YES	Greek endemic
47	*Crocus cancellatus* subsp. *mazziaricus*	20230403-SO01	NO	Balkan-Anatolia
48	*Cynara cardunculus* subsp. *cardunculus*	20230706-SO01	NO	Mediterranean
49	*Daucus carota* subsp. *drepanensis*	20230626-SO06	NO	Mediterranean
50	*Daucus guttatus* subsp. *guttatus*	20230627-SO02	NO	Mediterranean
51	*Delphinium hellenicum*	20230628-KS01	YES	Greek endemic
52	*Dianthus biflorus*	20230728-SO01	YES	Greek endemic
53	*Dianthus crinitus*	20231001-CT04	NO	Mediterranean-SW Asian
54	*Echinops graecus*	20230903-AK02	YES	Greek endemic
55	*Eruca vesicaria*	20230518-SO04	NO	Mediterranean-SW Asian
56	*Euphorbia acanthothamnos*	20230811-SO02	NO	East Mediterranean
57	*Euphorbia dendroides*	20230811-SO03	NO	Mediterranean
58	*Fritillaria rhodia*	20230528-SO01	YES	Greek endemic
59	*Gladiolus anatolicus*	20230930-CT01	NO	East Mediterranean
60	*Glaucium flavum*	20230812-SO02	NO	Mediterranean-European
61	*Globularia cordifolia*	20230902-AK03	NO	Mediterranean-European
62	*Helianthemum salicifolium*	20230718-SO07	NO	European-SW Asian
63	*Helichrysum plicatum*	20230903-AK04	NO	East Mediterranean
64	*Hypericum empetrifolium*	20230808-SO01	NO	East Mediterranean
65	*Juncus maritimus*	20230626-SO02	NO	Mediterranean-European
66	*Juniperus turbinata*	20230718-SO02	NO	Mediterranean-Atlantic
67	*Jurinea mollis*	20230620-AK05	NO	European-SW Asian
68	*Lagurus ovatus* subsp. *ovatus*	20230518-SO03	NO	Mediterranean
69	*Legousia speculum-veneris*	20230903-AK09	NO	Mediterranean-European
70	*Lomelosia crenata* subsp. *dallaportae*	20230811-SO04	NO	Balkan-Italy
71	*Lotus cytisoides*	20230614-SO04	NO	Mediterranean
72	*Lotus halophilus*	20230615-SM02	NO	Mediterranean
73	*Lunaria annua* subsp. *pachyrhiza*	20230627-SO04	NO	Balkan-Italy
74	*Malcolmia maritima*	20230626-SO03	NO	Mediterranean
75	*Malcolmia orsiniana* subsp. *orsiniana*	20230722-AK02	NO	Balkan-Italy
76	*Malva parviflora*	20230812-SO03	NO	Mediterranean-SW Asian
77	*Matthiola sinuata*	20230629-KS03	NO	Mediterranean-European
78	*Micromeria graeca* subsp. *graeca*	20230812-SO04	NO	Mediterranean

79	*Minuartia attica* subsp. *idaea*	20230614-SO02	YES	Greek endemic
80	*Misopates orontium*	20230518-SO02	NO	Mediterranean-European
81	*Muscari pulchellum*	20230420-SO02	YES	Greek endemic
82	*Myosotis alpestris* subsp. *suaveolens*	20260626-SO05	NO	Balkan
83	*Myrtus communis*	20230812-SO05	NO	Mediterranean
84	*Nepeta orphanidea*	20230909-SO02	YES	Greek endemic
85	*Nepeta parnassica*	20230902-AK09	NO	Balkan
86	*Onobrychis ebenoides*	20230620-AK02	YES	Greek endemic
87	*Onopordum illyricum* subsp. *cardunculus*	20230627-SO03	NO	Mediterranean
88	*Onosma graeca*	20230629-KS11	NO	East Mediterranean
89	*Ophrys spitzelii*	20230623-SO01	NO	European
90	*Orlaya daucoides*	20230903-AK01	NO	Mediterranean-SW Asian
91	*Ornithogalum narbonense*	20230628-KS07	NO	Mediterranean
92	*Orobanche pubescens*	20230614-SO01	NO	Mediterranean
93	*Paeonia clusii* subsp. *rhodia*	20231001-CT05	YES	Greek endemic
94	*Paeonia clusii* subsp. *rhodia*	20231001-CT06	YES	Greek endemic
95	*Paliurus spina-christi*	20230902-AK08	NO	European-SW Asian
96	*Pallenis spinosa*	20230626-SO04	NO	Mediterranean
97	*Papaver hybridum*	20230722-AK05	NO	European-SW Asian
98	*Papaver somniferum*	20230811-SO05	NO	Mediterranean
99	*Petrorhagia dubia*	20230628-KS05	NO	Mediterranean
100	*Phelipanche mutelii*	20230626-SO09	NO	Paleotemperate
101	*Plantago crassifolia*	20230512-SO02	NO	Mediterranean
102	*Plantago holosteum*	20230620-AK01	NO	European
103	*Portulaca oleracea*	20230830-CT01	NO	Cosmopolitan
104	*Ptilostemon afer* subsp. *afer*	20230902-AK07	NO	Balkan
105	*Putoria calabrica*	20230811-SO06	NO	Mediterranean
106	*Rhinanthus pindicus*	20230628-SO01	NO	Balkan
107	*Romulea bulbocodium*	20230512-SO01	NO	Mediterranean
108	*Rosa canina*	20230811-SO07	NO	Paleotemperate
109	*Ruta graveolens*	20230718-SO01	NO	Mediterranean-European
110	*Salsola soda*	20230813-SM03	NO	Paleotemperate
111	*Sanguisorba minor*	20230722-AK03	NO	European-SW Asian
112	*Saponaria calabrica*	20230620-AK04	NO	Mediterranean-SW Asian
113	*Scabiosa tenuis*	20230808-SO02	NO	Balkan
114	*Scrophularia heterophylla*	20230629-KS05	NO	East Mediterranean
115	*Scutellaria orientalis* subsp. *alpina*	20230903-AK03	NO	Mediterranean-SW Asian
116	*Sedum litoreum*	20230813-SM04	NO	Mediterranean
117	*Sedum sediforme*	20230808-SO03	NO	Mediterranean
118	*Sedum urvillei*	20230808-SO04	NO	Mediterranean
119	*Sideritis montana*	20230722-AK06	NO	Mediterranean-SW Asian
120	*Silene colorata*	20230420-SO01	NO	Mediterranean
121	*Silene holzmannii*	20230614-SO03	YES	Greek endemic
122	*Silene italica*	20230722-AK01	NO	European-SW Asian
123	*Silene nocturna*	20230718-SO03	NO	Mediterranean

124	*Silene oligantha* subsp. *parnesia*	20230808-SO05	NO	Greek endemic
125	*Silene samia*	20230526-AK03	NO	East Mediterranean
126	*Silene subconica*	20230626-SO10	NO	Mediterranean
127	*Sinapis alba*	20230420-SO04	NO	European-SW Asian
128	*Spartium junceum*	20230812-SO06	NO	Mediterranean
129	*Stachys spreitzenhoferi*	20230629-KS04	YES	Greek endemic
130	*Stellaria media*	20230626-SO01	NO	Cosmopolitan
131	*Stipa pulcherrima*	20230626-SO07	NO	Euro-Siberian
132	*Taraxacum minimum*	20230508-SO01	NO	Mediterranean
133	*Teucrium divaricatum* subsp. *divaricatum*	20230628-KS02	NO	East Mediterranean
134	*Teucrium francisci-werneri*	20230628-KS06	YES	Greek endemic
135	*Teucrium halacsyanum*	20230627-SO01	YES	Greek endemic
136	*Teucrium polium* subsp. *capitatum*	20230629-KS12	NO	Mediterranean
137	*Thymus holosericeus*	20230812-SO07	YES	Greek endemic
138	*Tragopogon porrifolius*	20230420-SO03	NO	Mediterranean
139	*Tulipa goulimyi*	20230629-KS06	YES	Greek endemic
140	*Verbascum boissieri*	20231011-SO01	YES	Greek endemic
141	*Verbascum graecum*	20230808-SO06	NO	Balkan
142	*Verbascum syriacum*	20231001-CT03	NO	East Mediterranean
143	*Verbascum undulatum*	20230808-SOO7	NO	Balkan
144	*Veronica oetaea*	20230706-SO02	YES	Greek endemic
145	*Xeranthemum inapertum*	20230903-AK08	NO	Mediterranean-European

APPENDIX 2

List of field trips made between Feb. 20 and Sep. 30, 2023.

	DATE of DEPARTURE	DATE of RETURN	DESTINATION
1	2023 03 10	2023 03 10	StE - Parnitha Mt.
2	2023 03 28	2023 03 29	SPi - Ioannina
3	2023 04 01	2023 04 03	Pe - Elafonissos Isl.
4	2023 04 05	2023 04 05	StE - Kithairon Mt.
5	2023 04 09	2023 04 10	IoI - Lefkas Isl.
6	2023 04 28	2023 05 01	Pe - Kythera Isl.
7	2023 05 08	2023 05 08	StE - Elikon Mt.
8	2023 05 12	2023 05 14	IoI - Lefkas Isl.
9	2023 05 18	2023 05 18	StE - Hymettus Mt.
10	2023 05 25	2023 05 28	EAe - Samos Isl.
11	2023 05 27	2023 05 30	EAe - Rhodes Isl.
12	2023 06 12	2023 06 12	WAe - Kymi, Evoia
13	2023 06 14	2023 06 16	KK - Karpathos Isl.
14	2023 06 20	2023 06 20	StE - Parnitha Mt.
15	2023 06 26	2023 06 27	SPi - Metsovo
16	2023 06 27	2023 06 28	IoI - Lefkas
17	2023 06 27	2023 06 29	Pe - Kythera Isl.
18	2023 07 01	2023 07 04	EAe - Samos Isl.
19	2023 07 06	2023 07 06	StE - Oeta Mt.
20	2023 07 06	2023 07 06	WAe - Kymi-Aliveri, Evoia
21	2023 07 18	2023 07 18	StE - Oeta Mt.
22	2023 07 18	2023 07 18	StE - Hymettus Mt.
23	2023 07 22	2023 07 22	StE - Giona Mt.
24	2023 08 08	2023 08 08	StE - Parnitha Mt.
25	2023 08 11	2023 08 13	IoI - Lefkas Isl.
26	2023 08 13	2023 08 13	EC - Trikala
27	2023 09 02	2023 09 03	StE - Giona & Tymphristos Mts.
28	2023 09 08	2023 09 09	Pe - Parnon Mt.
29	2023 09 13	2023 09 14	Pe - Kyllini Mt.
30	2023 09 16	2023 09 17	StE - Giona & Parnassos Mts.
31	2023 09 26	2023 10 01	EAe - Rhodes-Kastellorizo Isls.

APPENDIX 3

List of Herbarium Vouchers under preparation. Additional 18 samples have been collected as well (53 in total) but not studied nor fully identified yet. The same holds for 18 taxa of the list below.

	Taxon	**Collection Date**	**Locality**
1	*Allium* sp.	03/07/2023	Samos
2	*Alyssum* sp.	09/05/2023	Parnitha
3	*Arenaria* cf. *stellaria*	18/05/2023	Ioannnina
4	*Asperula pulvinaris*	27/06/2023	Lefkas
5	*Consolida samia*	03/07/2023	Samos
6	*Delphinium hellenicum*	28/06/2023	Kythera
7	*Gagea* sp.	09/05/2023	Parnitha
8	*Geocaryum* sp.	09/05/2023	Parnitha
9	*Jurinea mollis*	09/05/2023	Parnitha
10	*Lomelosia crenata* subsp. *dallaportae*	27/06/2023	Lefkas
11	*Malcomia* sp.	09/05/2023	Parnitha
12	*Minuartia stellata*	15/06/2023	Karpathos
13	*Onosma kaherei*	09/05/2023	Parnitha
14	*Polygala helenae*	29/04/2023	Kythera
15	*Polygala* sp.	09/05/2023	Parnitha
16	*Ranunculus* sp.	09/05/2023	Parnitha
17	*Rhinanthus* sp.	28/06/2023	Aoos Lake
18	*Saponaria calabrica*	09/05/2023	Parnitha
19	*Sedum sediforme*	27/06/2023	Lefkas
20	*Sedum* sp.	28/05/2023	Samos
21	*Sherardia* cf. *arvensis*	18/05/2023	Ioannnina
22	*Silene samia*	26/05/2023	Samos
23	*Silene* sp.1	15/06/2023	Karpathos
24	*Silene* sp.2	26/06/2023	Velouchi
25	*Stachys spreitzenhoferi*	28/06/2023	Kythera
26	*Stachys spruneri*	09/05/2023	Parnitha
27	*Teucrium francisci-werneri*	28/06/2023	Kythera
28	*Teucrium halacsyanum*	12/05/2023	Lefkas
29	*Valerianella* sp.	09/05/2023	Parnitha
30	*Verbascum* sp.	09/05/2023	Parnitha
31	*Veronica beccabunga*	26/06/2023	Velouchi
32	*Veronica* sp.	09/05/2023	Parnitha
33	*Viola aetolica*	26/06/2023	Velouchi
34	*Viola* sp.1	08/05/2023	Elikonas
35	*Viola* sp.2	09/05/2023	Parnitha

APPENDIX 4

List of the 2022 seed accessions which have been tested for germination and their optimum conditions with maximum germination. Orchid seeds are not included in this table.

	Taxon	Accession #	Temp	FG L/Dcor	FG D cor	Empty	Dead	Pretreat
1	Acer sempervirens	0320-K-111	5	100.0	95.7	36	0	
2	Achillea holosericea	0394-K-185	20	97.9		0	0	
3	Achillea ligustica	0358-K-149	15	0.0	0.0	100	0	
4	Aethionema retsina	0287-K-078	20		100.0			
5	Aethionema saxatile subsp. graecum	0230-K-021	15	100.0	92.3	70	16	
6	Alchemilla aroanica	0339-K-130	15	77.8	0.0	10	0	
7	Allium ampeloprasum	0349-K-140	15	100.0	100.0	4	0	
8	Allium chamaespathum	0293-K-084	15		100.0			
9	Allium hymettium	0296-K-087	10		92.0			
10	Allium subhirsutum	0295-K-086	15		100.0			
11	Alyssum montanum subsp. montanum	0258-K-049	20	0.0	100.0	44	56	
12	Anagyris foetida	0238-K-029	15	100.0		0	0	chipped
13	Anthemis cotula	0328-K-119	25/15	73.3	0.0	40	0	
14	Anthemis cretica subsp. cretica	0362-K-153	15	64.3	11.8	44	0	
15	Anthemis pindicola	0396-K-187	15	97.8	0.0	10	0	
16	Anthemis tomentosa subsp. tomentosa	0252-K-043	15	6.3	17.5	4	14	
17	Anthyllis vulneraria subsp. rubiflora	0375-K-166	15	100.0		0	0	chipped
18	Aquilegia ottonis subsp. ottonis	0357-K-148	15	0.0	0.0	0	0	
19	Armeria canescens	0241-K-032	10	94.6		26	0	
20	Asperula arcadiensis	0284-K-075	15	100.0	31.8	12	0	
21	Asphodeline lutea	0210-K-001	15	11.1	69.8	2	8	
22	Ballota acetabulosa	0391-K-182	15	54.3	71.1	2	6	
23	Biscutella didyma subsp. apula	0318-K-109	20	41.5	13.6	10	8	
24	Bituminaria bituminosa	0309-K-100	15	100.0		0	0	chipped
25	Brassica cretica subsp. aegaea	0256-K-047	15	74.0	95.8	0	0	
26	Bubon macedonicum	0353-K-144	15	100.0	72.2	16	8	
27	Bupleurum capillare	0356-K-147	15	55.6	59.4	16	30	
28	Campanula andrewsii subsp. andrewsii	0227-K-018	15	91.5	2.1	2	4	
29	Campanula asperuloides	0279-K-070	5	97.8	11.6	10	0	
30	Campanula celsii subsp. parnesia	0216-K-007	10	87.5	0.0	4	0	
31	Campanula celsii subsp. spathulifolia	0226-K-017	15	89.6	0.0	4	0	
32	Campanula cymaea	0257-K-048	15	100.0	0.0	0	0	
33	Campanula spatulata subsp. spruneriana	0371-K-162	15	100.0	89.8	0	0	
34	Campanula topaliana	0222-K-013	15	96.7	0.0	36	4	
35	Campanula topaliana subsp. topaliana	0376-K-167	5	61.2	2.3	2	0	
36	Campanula versicolor	0347-K-138	15	100.0	0.0	60	4	
37	Capsella bursa-pastoris	0321-K-112	25/15	41.7	4.1	4	0	
38	Carex distans	0306-K-097	25/15	20.0		14	6	
39	Centaurea achaia subsp. achaia	0364-K-155	10		100.0			
40	Centaurea affinis subsp. laconiae	0335-K-126	15	100.0		30	0	
41	Centaurea attica subsp. attica	0277-K-068	15	100.0		60	8	
42	Centaurea pichleri subsp. pichleri	0283-K-074	15	0.0		100	0	

43	Centaurea princeps	0366-K-157	15	0.0		90	0	
44	Centaurium erythraea	0282-K-073	15	100.0	4.0	0	0	
45	Centranthus ruber subsp. sibthorpi	0213-K-004	15	97.3	65.8	14	12	
46	Cerastium candidissimum	0211-K-002	15		100.0			
47	Cistus creticus subsp. creticus	0272-K-063	15	83.7		16	0	sandpaper
48	Cistus salviifolius	0219-K-010	15	82.1		8	14	sandpaper
49	Clypeola jonthlaspi subsp. jonthlaspi	0304-K-095	15	12.8	2.8	22	0	
50	Conium divaricatum	0260-K-051	10	38.8	89.6	2	6	
51	Dianthus serratifolius subsp. serratifolius	0365-K-156	15	100.0		48	0	
52	Dianthus tymphresteus	0276-K-067	15	95.7		6	0	
53	Digitalis laevigata subsp. graeca	0237-K-028	20	2.5	0	8	12	
54	Digitalis laevigata subsp. laevigata	0269-K-060	20	98.0	12.5	0	0	
55	Ebenus sibthorpii	0348-K-139	15	100.0		0	0	chipped
56	Eleocharis palustris subsp. palustris	0355-K-146	25/15	4.8	0.0	16	0	
57	Elytrichia juncea subsp. juncea	0350-K-141	15	27.3	23.8	8	4	
58	Epilobium hirsutum	0386-K-177	15	100.0	33.3	14	0	
59	Erysimum microstylum	0217-K-008	15	36.6	25.0	10	8	
60	Euphorbia myrsinites	0274-K-065	20	87.0	0.0	0	8	
61	Euphrasia salisburgensis	0323-K-114	5	100	22.2	30	0	
62	Fibigia clypeata subsp. clypeata	0341-K-132	15	24.0	6.0	0.0	0.0	
63	Fritillaria graeca	0302-K-093	10	90.0	97.7	0	0	
64	Fritillaria obliqua subsp. obliqua	0305-K-096	10		0.0			
65	Galanthus ikariae	0312-K-103	15		8.0			
66	Galium melanantherum	0228-K-019	20	64.0		0	0	
67	Galium thymifolium	0334-K-125	15	74.2	82.4	32	6	
68	Geranium robertianum	0369-K-160	15	60.0		0	0	
69	Globularia alypum	0240-K-031	15	100.0	100.0	86	12	
70	Heliosperma pusillum subsp. albanicum	0372-K-163	20	90.0		0	0	
71	Heracleum sphondylium subsp. pyrenaicum	0385-K-176	5	100.0	57.9	62	4	
72	Hypericum empetrifolium subsp. empetrifolium	0250-K-041	15	83.3	6.7	28	0	
73	Inula verbascifolia subsp. methanea	0239-K-030	15	92.3	100.0	74	0	
74	Johrenia distans	0343-K-134	15	11.1	16.7	20	44	
75	Lavandula stoechas subsp. stoechas	0225-K-016	15	92.9	29.4	40	4	
76	Linum leucanthum	0294-K-085	25/15	100.0		4	0	sandpaper
77	Lomelosia crenata subsp. crenata	0236-K-027	15	100.0	100.0	86	0	
78	Lomelosia hymettia	0251-K-042	15	96.0	95.2	46	4	
79	Lotus ornithopioides	0289-K-080	15	100.0		0	0	sandpaper
80	Malabaila involucrata	0374-K-165	15	100.0	100.0	40	16	
81	Malcolmia macrocalyx subsp. scyria	0310-K-101	20	4.0	26.0	0	0	
82	Malva arborea	0259-K-050	15	100.0		0	16	chipped
83	Marrubium velutinum subsp. cylleneum	0235-K-026	20	57.1		0	30	
84	Melica ciliata subsp. ciliata	0392-K-183	15	97.4	94.6	22	0	
85	Micromeria juliana	0224-K-015	15	100.0	6.1	20	0	
86	Minuartia attica subsp. attica	0229-K-020	20	100	70	10	0	
87	Minuartia dirphya	0255-K-046	10		100.0			
88	Minuartia juniperina	0221-K-012	15	8.9	0.0	4	6	
89	Minuartia parnonia	0231-K-022	15	70.6	15.8	32	4	
90	Minuartia stellata	0329-K-120	15	27.8	4.0	0	28	
91	Muscari commutatum	0273-K-064	10	100.0	100.0	0	0	
92	Muscari comosum	0247-K-038	10	48.0	98.0	0	0	
93	Myosotis ramosissima subsp. ramosissima	0322-K-113	20	100.0		0	4	
94	Nepeta argolica subsp. argolica	0271-K-062	20	84.2		50	12	

95	Nepeta argolica subsp. dirphya	0254-K-045	20	47		42	20	
96	Nepeta nuda subsp. nuda	0246-K-037	25/15	57.5	0.0	20	0	
97	Nigella arvensis subsp. aristata	0292-K-083	10		100.0			
98	Nigella damascena	0290-K-081	20		47.8			
99	Odontarrhena chalcidica	0401-K-192	15	97.9	100.0	2	4	
100	Onosma stridii	0220-K-011	15	0.0		100	0	
101	Origanum vulgare subsp. hirtum	0214-K-005	15	100.0	64.7	26	6	
102	Ostrya carpinifolia	0380-K-171	5		64.0			-
103	Osyris alba	0382-K-173	20	0.0				chipped
104	Papaver rhoeas	0244-K-035	15	22.7	10.9	4	8	
105	Paronychia albanica subsp. graeca	0359-K-150	15	100.0	38.0	0	2	
106	Paronychia macrosepala	0261-K-052	15	100.0		4	0	
107	Petrorhagia dubia	0367-K-158	15	26.7	16.1	30	10	
108	Petrorhagia obcordata	0291-K-082	20	96		0	0	
109	Petrorhagia thessala	0331-K-122	15	95.0	100.0	20	0	
110	Phagnalon rupestre subsp. graecum	0249-K-040	20	100.0	62.0	0	0	
111	Phlomis fruticosa	0285-K-076	15	70.6	11.1	38	28	
112	Plantago afra	0263-K-054	20	88.9	41.7	12	16	
113	Potentilla pedata	0344-K-135	25/15	97.6	28.9	16	0	
114	Potentilla speciosa subsp. speciosa	0326-K-117	15	0.0	0.0	12	0	
115	Prospero autumnale	0297-K-088	15		100.0			
116	Ptilostemon chamaepeuce	0317-K-108	15	100.0		10	10	
117	Ranunculus sprunerianus	0379-K170	25/15	93.5		2	4	
118	Reseda alba subsp. alba	0319-K-110	25/15	0.0	4.1	2	0	
119	Rhinanthus pubescens	0267-K-058	5	78.0	4.0	0	0	
120	Rumex kerneri	0234-K-025	25/15	62.0	100.0	0	0	
121	Salvia ringens	0352-K-143	15	0.0	0.0	96	0	
122	Salvia verbenaca	0325-K-116	15	87.0	30.0	4	4	
123	Saponaria jagelii	0281-K-072	10		60.0			
124	Scabiosa atropurpurea	0303-K-094	20	20.0		40	10	
125	Scabiosa ochroleuca	0265-K-056	15	92.3	71.4	42	6	
126	Scabiosa webbiana	0215-K-006	15	100.0	86.7	76	0	
127	Scaligeria napiformis	0270-K-061	15	93.9	97.9	0	2	
128	Scorzonera crocifolia	0268-K-059	15	65.3	47.7	0	2	
129	Scutellaria rupestris	0363-K-154	15	34.1	0.0	10	2	
130	Sedum litoreum	0299-K-090	10	40.0		0	0	
131	Senecio eubaeus	0253-K-044	10	100		0	8	
132	Senecio thapsoides subsp. thapsoides	0242-K-033	15	100.0	100.0	82	6	
133	Sideritis euboea	0324-K-115	15	87.5	71.4	64	4	
134	Sideritis raeseri subsp. attica	0275-K-066	15	52.8	0.0			
135	Silene auriculata subsp. auriculata	0354-K-145	15	100.0	8.7	12	4	
136	Silene caesia	0368-K-159	15	0.0	0.0	20	8	
137	Silene conica	0315-K-106	15	0	13.6	8	0	
138	Silene fabaria subsp. fabaria	0245-K-036	20	100.0	28.0	0	4	
139	Silene gigantea subsp. hellenica	0307-K-098	20	8.3	2.2	4	0	
140	Silene multicaulis subsp. sporadum	0360-K-151	25/15	75.0		60	0	
141	Silene parnassica subsp. parnassica	0377-K-168	10	100		0	0	
142	Silene reinholdii	0301-K-092	20	0.0	0.0	0	0	
143	Silene roemeri subsp. macrocarpa	0378-K-169	15		100			
144	Silene sedoides	0300-K-091	15	95.1		8	10	
145	Silene spinescens	0388-K-179	15	100.0	0.0	62	30	
146	Smyrnium perfoliatum subsp. rotundifolium	0327-K-118	5	95.7	100.0	0	6	

147	Stachys spruneri	0337-K-128	15	100.0		90	0	
148	Stachys swainsonii subsp. swainsonii	0311-K-102	15	100.0	82.6	48	0	
149	Staehelina uniflosculosa	0266-K-057	15	100.0	0.0	42	6	
150	Teucrium aroanium	0345-K-136	15	0.0	0.0	56	8	
151	Teucrium brevifolium	0243-K-034	15	44.4	5.1	20	8	
152	Teucrium flavum subsp. hellenicum	0218-K-009	15	100.0		70	10	
153	Teucrium flavum subsp. hellenicum	0248-K-039	15	100.0		60	0	
154	Thymus leucotrichus subsp. leucotrichus	0232-K-023	20	100.0	66.7	0	4	
155	Thymus longicaulis	0338-K-129	15	66.7	85.7	80	8	
156	Tordylium apulum	0308-K-099	10	0.0		0	0	
157	Tragopogon crocifolius	0212-K-003	15	93.5	100.0	22	16	
158	Trifolium stellatum	0280-K-071	20	91.3		8	0	sandpaper
159	Typha domingensis	0387-K-178	20	0	0	30	0	
160	Umbilicus horizontalis	0288-K-079	10	4.2	0.0	2	2	
161	Verbascum speciosum subsp. megaphlomos	0346-K-137	15	2.7	0.0	20	6	
162	Verbascum undulatum	0286-K-077	15	62.0	0.0	0	0	
163	Veronica glauca subsp. peloponnesiaca	0314-K-105	20	2.0		0	0	