



UNIVERSITÀ
DEGLI STUDI
DI PALERMO



UNIVERSITÉ DE FRIBOURG
UNIVERSITÄT FREIBURG

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Conservation of threatened woody species in the Mediterranean:
endangered Sicilian endemic
Ptilostemon greuteri

2021-2023 (see Annex 2)

Memorandum of Agreement (MoA)

Between the University of Fribourg, Department of Biology and Botanic Garden, Chemin du Musée 10, CH-1700 Fribourg, Switzerland, hereinafter known as **University of Fribourg** and the **Department of Earth and Sea Sciences (DISTEM)**, University of Palermo, Via Archirafi, 22 90123 Palermo, Italy. The agreement shall take effect on signature of this agreement by the respective Parties.

Signed by:
Firmato digitalmente da: Attilio Sulli
Organizzazione: UNIVERSITA' DEGLI STUDI
DI PALERMO/80023730825
Data: 24/04/2023 09:33:13
Prof. Attilio Sulli (Director)

Date:

On behalf of the Department DISTEM
of the University of Palermo

Prof. Gregor Kozlowski
Director
Botanical Garden
University of Fribourg
Chemin du Musée 10
CH-1700 Fribourg (Switzerland)

Prof. Gregor Kozlowski

Date: 24.04.2023

Terms and Conditions

1. The **Department DISTEM of the University of Palermo** shall, for the duration of this agreement, contribute to implement the actions set out in the Project "Conservation of threatened woody species in the Mediterranean: endangered Sicilian endemic *Ptilostemon greuteri*", as detailed in the brochure attached hereto. The Department designates Dott. Alessandro Silvestre Gristina as the person in charge of this agreement. Any replacement of the person in charge must be communicated to and approved by Prof. Gregor Kozlowski on behalf of the University of Fribourg.
2. Proposed starting date and duration of this agreement:
 - 2.1 The duration of this agreement shall be for a **period of 6 months starting from the date of signature of this agreement**. Any extension to the period of operation of the MoA shall be by mutual agreement.
 - 2.2 This agreement may be terminated at any time:
 - 2.2.1 By mutual consent, or
 - 2.2.2 By either party giving one month's written notice of their decision to terminate the agreement.
3. Programme management and reporting requirements:
 - 3.1 The programme will be managed on a day-to-day basis by the **Department DISTEM** which will contribute to implement the activities specified in the project brochure (Annex 2) attached to this agreement.
 - 3.2 The **Department DISTEM** shall submit a brief interim report by **1st July 2023** to University of Fribourg concerning the implementation of the activities agreed with the other project partners.
 - 3.3 The **Department DISTEM** shall report to University of Fribourg more fully by **31st October 2023**. This will be considered the final report, provided the outstanding activities being undertaken during the final months of the project are described adequately.
 - 3.4 The final report, submitted by the **31st October 2023**, should be concise and should include the following sections:
 - a) A description of the work undertaken during the project;
 - b) The outcomes and particular achievements of the project;
 - c) The significance of such achievements (i.e. why was this work is important and what long-term benefits will it have for the target species);



- d) Any difficulties or problems encountered during the project;
- e) A statement of expenditure, in line with the proposed budget provided in annexes.
- f) Illustrative photographs, copies on any brochures and other publications and materials (such as press releases and articles that appeared in the media) prepared as part of the project should be provided to University of Fribourg also with the final report.

4. Finances:

- 4.1 It is agreed that the money allocated by the University of Fribourg shall be expended by the **Department DISTEM**, over a period of 6 months. University of Fribourg will pay the fees to the nominated bank account of the **Department DISTEM** (see Annex 1) and transfer the amount of **EUR 5,000.00** upon signing of this agreement.
- 4.2 Detailed accounts of project expenditure should be kept as an audit of the project may be carried out.
- 4.3 Proposed significant variations from this budget should be communicated to and approved by the University of Fribourg in advance of expenditure.
- 4.4 Any unspent funds are to be returned to University of Fribourg at the end of the contract
- 4.5 The **Department DISTEM** is responsible for payment of all necessary Taxes and Fees applicable under Italian law from within the total value sum.

5. Acknowledgement of the Partnership:

- 5.1 The project partners agree to give due acknowledgement to each other for activities undertaken as part of the project, including in relevant publications, reports, media releases and other outputs from the project, whether in printed or electronic form. University of Fribourg will provide guidance on the appropriate use of logos and names used by any partner.
- 5.2 The project partners agree that all relevant publications, reports, media releases and other outputs from the project should be reviewed by the Partners, or their designated representative(s) prior to their release and in a timely manner, to ensure that all statements contained within them are in agreement with the spirit and terms of this agreement.

6. Insurance:



6.1 The **Department DISTEM** is not covered by any professional indemnity insurance from University of Fribourg and is responsible for arranging their own professional indemnity insurance at their discretion.

6.2 In addition, the **Department DISTEM** is responsible for ensuring that travel, medical and personal liability insurance, including insurance for personal property, required for undertaking this role is in place as appropriate.

6.3 University of Fribourg will not be held liable in any way for injury, loss or damage, unless shown to be directly responsible due to its actions or negligence.

7. Conflicts of Interest

7.1 The **Department DISTEM** shall have no current interests or contracts liable to conflict with the requirements of this agreement.

8. Confidentiality

8.1 Any information of a confidential character to the affairs of either University of Fribourg or the **Department DISTEM** to which either party becomes privy as a result of the work to be performed under this agreement, shall be treated as confidential, during as well as after the performance of the said services, subject to obligations under law, including the Freedom of Information Act.

9. Law

9.1. The law which regulates this agreement is the law of the Republic of Italy.

ANNEX 1 BANK DETAILS:

Bank Account Name: Università degli Studi di Palermo

Bank Account Number: 000300004577

SWIFT Code: UNCRITMMPAE

IBAN Number: IT09A0200804682000300004577

Bank Name: UniCredit S.p.A

Bank Address: Agenzia A - via Roma, 185 - 90133 Palermo

Payment Reference: DISTEM Palermo - Agreement UNIFR Project Ptilostemon greuterii



ANNEX 2

PROJECT BROCHURE:



Ptilostemon greuteri

A project towards conservation and a better understanding of a Sicilian narrow endemic plant species



THE SPECIES

The evergreen *Ptilostemon greuteri* is one of the most striking members of the genus due to its large size (up to 3,5 m). The combination of size and growth form with a single woody stem is very unusual within the Mediterranean flora. The tongue twisting name refers on the one hand to the feathery (*ptilo-*) filaments (*-stemon*, an element of the male flower parts) and on the other to the Swiss botanist Werner Greuter, a well-known specialist of the genus.

Characteristic are the rather big lanceolate leaves (sometimes up to 30 cm long!), with a snow-white, hairy underside, a protection against the high solar radiation in the Mediterranean climate. The inflorescence is also very large and branched with up to 9 flower heads, each bearing about 20 white to pink flowers. Especially conspicuous are the reddish purple outer bracts.

The woodiness and the large size of this species remind of the typical insular evolution of plants growing e.g. on the Canary Islands or Cape Verde Islands.

1. The characteristic white underside of the large, hairy and lanceolate leaves. (vp)
2. A flower head of *P. greuteri* in full bloom. (ag)
3. The two subpopulations of *P. greuteri* grow on Mount Inici in NW Sicily (red square), in the outskirts of Castellammare del Golfo.
4. The *P. greuteri* seeds bare an umbrella-like pappus favouring wind-dispersal. (vp)
5. *Ptilostemon greuteri* (in the lower left corner) in its natural rocky habitat in Sicily. It grows among other perennial species such as the Mediterranean dwarf palm (*Chamaerops humilis*, on the right). (vp)

DISTRIBUTION

There are only two subpopulations of this species, located just outside the city of Castellammare del Golfo in the province of Trapani in Northwestern Sicily (Italy). Detailed maps are presented in a recent publication (Pasta et al. 2022).

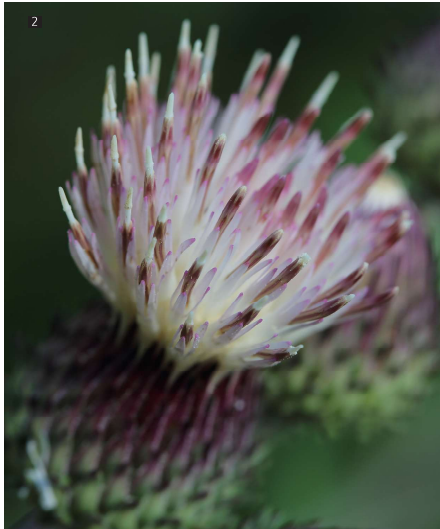
The total number of reproducing individuals growing in the wild does not exceed 500. This very low number makes the species one of the rarest and most endangered species of the Mediterranean Basin.

HABITAT

Ptilostemon greuteri grows on limestone cliffs and ledges as well as in Mediterranean maquis vegetation. It is however confined to the north-facing side of canyons, where it benefits from a more humid and less insolated microclimate.

Among the other woody plants growing in the same habitat, we find species like the Mediterranean dwarf palm (*Chamaerops humilis*), the Cretan pincushion flower (*Lomelosia cretica*) and the tree wormwood (*Artemisia arborescens*).

In one of the populations, *P. greuteri* is found within a stone pine (*Pinus pinea*) plantation.



DISCOVERY

The species was discovered in the 1980s, but was for a long time considered an escaped garden plant, due to its very unusual habit and the proximity of the population with an urban environment.

The formal description as a new species for science was made only in 2006 by two Sicilian botanists from the only known subpopulation at that time (Raimondo & Domina 2006).

A second subpopulation was discovered in 2006, a few kilometers further south on the north-facing slopes of a canyon.

THREATS

As there are only two known subpopulations, the species is considered threatened and listed in the international red list of the IUCN as CR (critically endangered). Both subpopulations lie within a Special Area of Conservation.

Frequency and intensity of wildfires, logging or constructing activities might be a threat for the survival of the species. Habitat protection would probably be the simplest and most cost efficient way to protect the species. *Ptilostemon greuteri* may even play the role of a "flagship species" to protect the extremely rich botanical heritage of Mount Inìci as a whole.

1. The magnificent view from one of the *P. greuteri* subpopulations to the Tyrrhenian Sea and Castellammare del Golfo. (ag)

2. Freely grazing goats in the habitat of *P. greuteri* represent a potential threat to the plants. (gk)

3. Scientists setting up a pollination experiment. (gk)

4. In each of the two subpopulations, a weather station was installed in order to measure precise on-site climate conditions. (gk)

5. Scientist monitoring the very big *P. greuteri* plants. (ag)



THE PROJECT

The main aim of the project is to improve the conservation status of the species by creating and implementing an action plan, which summarises all information needed to protect the species efficiently and in a long term perspective. To this goal, we first need to gain more knowledge about *P. greuteri*, its habitat as well as past, current and predicted threats. This is done by studying its demographic patterns (e.g. number and age), ecological requirements (e.g. air and soil temperature and humidity, soil structure and decomposition rate) and the topographic characteristics of the sites and plant communities where the species grows. On site pollination and germination tests are carried out to better understand reproduction and recruitment patterns.

A detailed digital map of each subpopulation was created and provides important information about the distribution pattern of the species.

Vegetation surveys, microclimatic data collection and in-depth study of the demographic structure of the subpopulations will allow to determine the realized niche of *P. greuteri*. This type of analysis helps define potentially suitable sites



either to find new and unknown subpopulations of *P. greuteri* or for future translocation projects.

Seed collection is important to safeguard the genetic diversity of the species. Seeds will be used in translocation activities to establish new subpopulations in adequate and protected habitats. This will allow to increase the number and the spatial heterogeneity of subpopulations and to help prevent the total destruction of all reproductive individuals. The remaining seeds will be sent to other research institutions (botanical gardens and seed banks) for ex-situ conservation purposes.

Local topographic and climatic factors appear to be crucial for the survival of the species. However the influence of extreme climatic events, the effects of grazing and the impact of wildfires may also play a key role in the long-term survival of the species.

1. Ex-situ cultivation is a tool to prevent the extinction of species, as here in the Botanical Garden of the University of Fribourg, Switzerland. (gk)

2. General view of the location of one subpopulation: in-situ protection is an important tool for the conservation of *P. greuteri*. (nk)

3. The future is green! This *P. greuteri* seedling shows the ability of the species to regenerate in-situ. (gk)

4. Collecting seeds for germination experiments. These results may help to better understand essential requirements for the survival of the species. (vp)

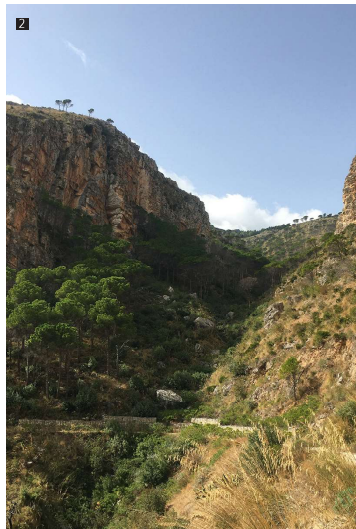
5. Stunning Mediterranean maquis vegetation on Mount Inici. (gk)

FURTHER DEVELOPMENTS

A regular monitoring and the protection of the sites hosting the two remaining subpopulations of *P. greuteri* must be a main target.

Additional investigations on the ecological requirements of the species are needed: only little is known e.g. on the dispersal strategies and establishment of juvenile plants as well as the reaction of *P. greuteri* to fire events and its dependency on a certain fire frequency and/or intensity to propagate.

A thorough search for further, probable yet tiny populations in the mountains around Castellammare del Golfo and other suitable habitats in NW Sicily should be launched. This could lead to the discovery of not only new, so far undetected subpopulations, but also of suitable habitats, where this enigmatic plant could be introduced in order to reduce the extinction risk of one or both known subpopulations.



INTERNATIONAL COLLABORATION

The long-lasting experience of the team of the Botanical Garden of the University of Fribourg (Switzerland) about rare and/or relict woody species and the long-standing and highly developed skills of the Sicilian partners from the Institute of Biosciences and BioResources in Palermo (Italy) led to this collaboration. The project is generously supported by the **Fondation Audemars Piguet** (Switzerland).

Project partners:

Prof. Gregor Kozłowski, Dr. Laurence Fazan, Dr. Nicolas Küffer and **Viviane Perraudin** are biologists working at the Botanical Garden of the University of Fribourg, an important centre for the study of relict woody plant species. Their work focuses on the ecology, distribution and conservation of trees as well as of alpine and aquatic plants.

Dr. Alessandro Silvestre Gristina, Dr. Salvatore Pasta and **Dr. Giuseppe Garfi** are scientists working at the Institute of Biosciences and BioResources in Palermo. Their projects target mainly a better understanding, scientific knowledge and conservation of rare plant species. **Dr. Corrado Marcenò** currently works at the University of Perugia as a senior researcher. **Prof. Riccardo Guarino** is a vegetation ecologist working at the University of Palermo.

REFERENCES

- Gianguzzi L., Caldarella O., Pasta S. 2022.** A new association of relict maquis with *Ptilostemon greuteri* (Oleo-Ceratonion, Quercetea ilicis), located in a circumscribed area of north-western Sicily. *Plant Sociology* 59 (1): 67-83.
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- Raimondo F. M., Domina G. 2006.** *Ptilostemon greuteri* (Compositae) a new species from Sicily. *Willdenowia* 36: 169-175.
- Rivers M. C. 2017.** *Ptilostemon greuteri*. The IUCN Red List of Threatened Species 2017. www.redlist.org.

IMAGE CREDITS

ag – Alessandro Silvestre Gristina; gk – Gregor Kozłowski; nk – Nicolas Küffer; vp – Viviane Perraudin

FOR FURTHER INFORMATION, PLEASE CONTACT

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www.unifr.ch/jardin-botanique

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