GRAZIANO ROSSI, THOMAS ABELI, ANDREA MONDONI & SIMONE ORSENIGO

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Lombardy Seed Bank

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Stations at High Altitude for Research on the Environment

CLIMATE AND MOUNTAIN VEGETATION

CLIMATE CHANGE EXERTS A GREAT PRESSURE ON LIFE:

Are high mountain plant species able to cope with climate change? How?

Monitoring, field and lab. experiments on a critical life-phase: REPRODUCTION

TIPS FOR A DISCUSSION

Upward plant migration

The GLORIA project and the first monitoring

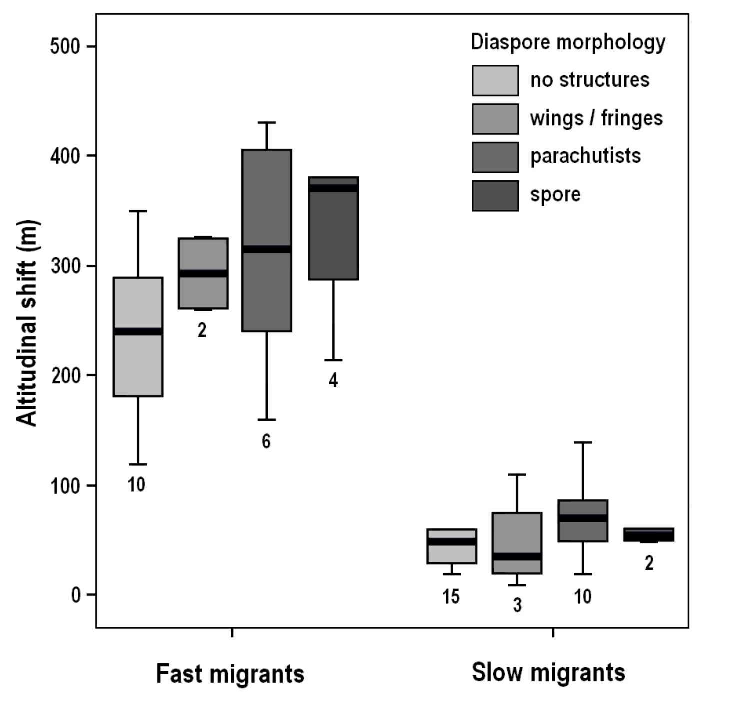
Effect of climate on plant reproduction

Extreme weather events

Seed germination and ecology

UPWARD MIGRATION

An increase in species richness from 153 to 166 species was observed in Bernina area (4049 m). Moreover, **52 species were recorded from altitudes 10–430 m higher than their 1950s** limits.



Parolo & Rossi (2008) *Basic and Applied Ecology* 9: 100–107

SPECIES HAVE MOVED UPSLOPE TERMOPHILIZATION

opposite effects on richness:

Boreal-temperate, increase (+3.9 species)

Mediterranean, decrease (–1.4 species)

Recent Plant Diversity Changes on Europe's Mountain Summits
Harald Pauli *et al.*
Science **336**, 353 (2012);
DOI: 10.1126/science.1219033

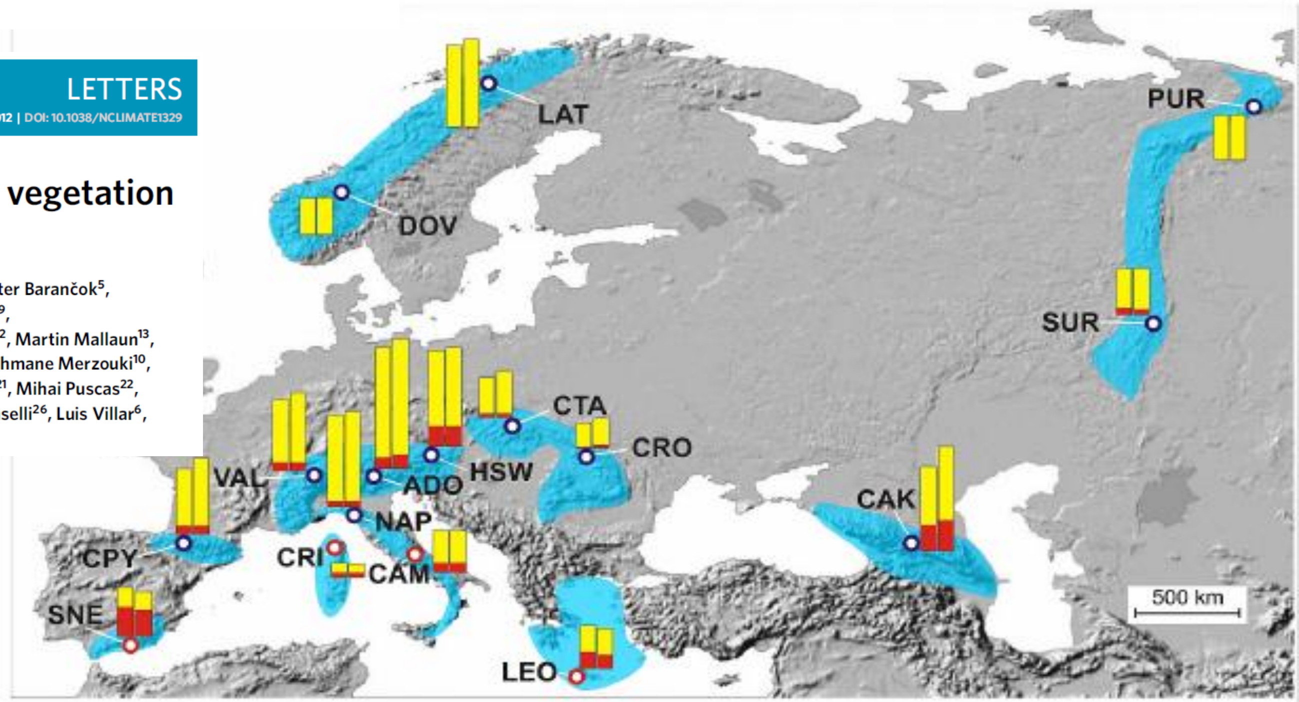
nature climate change

LETTERS

PUBLISHED ONLINE: 10 JANUARY 2012 | DOI: 10.1038/NCLIMATE1329

Continent-wide response of mountain vegetation to climate change

Michael Gottfried[1], Harald Pauli[2]*, Andreas Futschik[3], Maia Akhalkatsi[4], Peter Barančok[5], José Luis Benito Alonso[6], Gheorghe Coldea[7], Jan Dick[8], Brigitta Erschbamer[9], María Rosa Fernández Calzado[10], George Kazakis[11], Ján Krajči[5], Per Larsson[12], Martin Mallaun[13], Ottar Michelsen[14], Dmitry Moiseev[15], Pavel Moiseev[15], Ulf Molau[16], Abderrahmane Merzouki[10], Laszlo Nagy[17,18], George Nakhutsrishvili[19], Bård Pedersen[20], Giovanni Pelino[21], Mihai Puscas[22], Graziano Rossi[23], Angela Stanisci[21], Jean-Paul Theurillat[24,25], Marcello Tomaselli[26], Luis Villar[6], Pascal Vittoz[27], Ioannis Vogiatzakis[28] and Georg Grabherr[2]



Pauli *et al.* (2012) *Science* 336: 353-355

CLIMATE CHANGE AND REPRODUCTIVE BIOLOGY

Response of alpine plant flower production to temperature and snow cover fluctuation at the species range boundary

Thomas Abeli · Graziano Rossi ·
Rodolfo Gentili · Andrea Mondoni ·
Paolo Cristofanelli

High mean temperature (June-July) is significantly correlated with low number of flower produced.

10 Plant Ecol (2012) 213:1–13

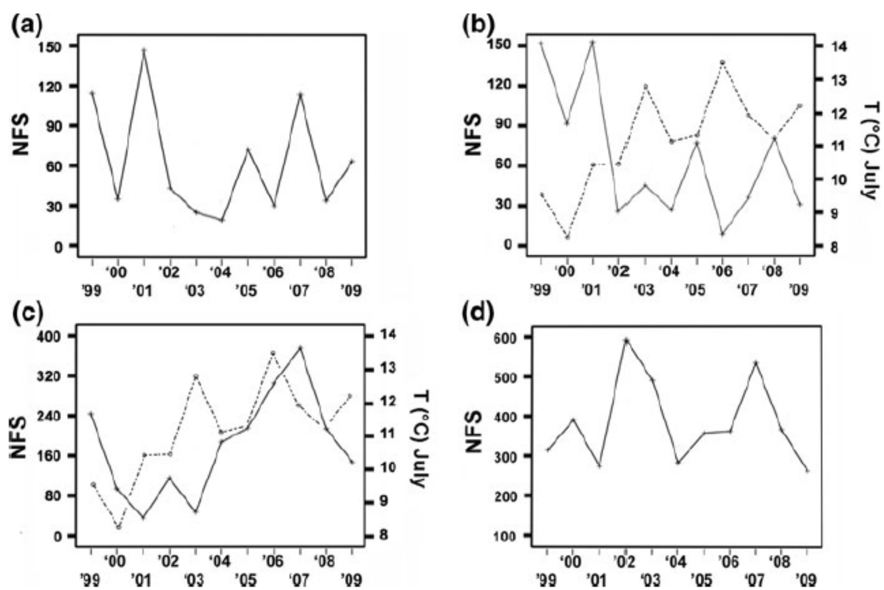
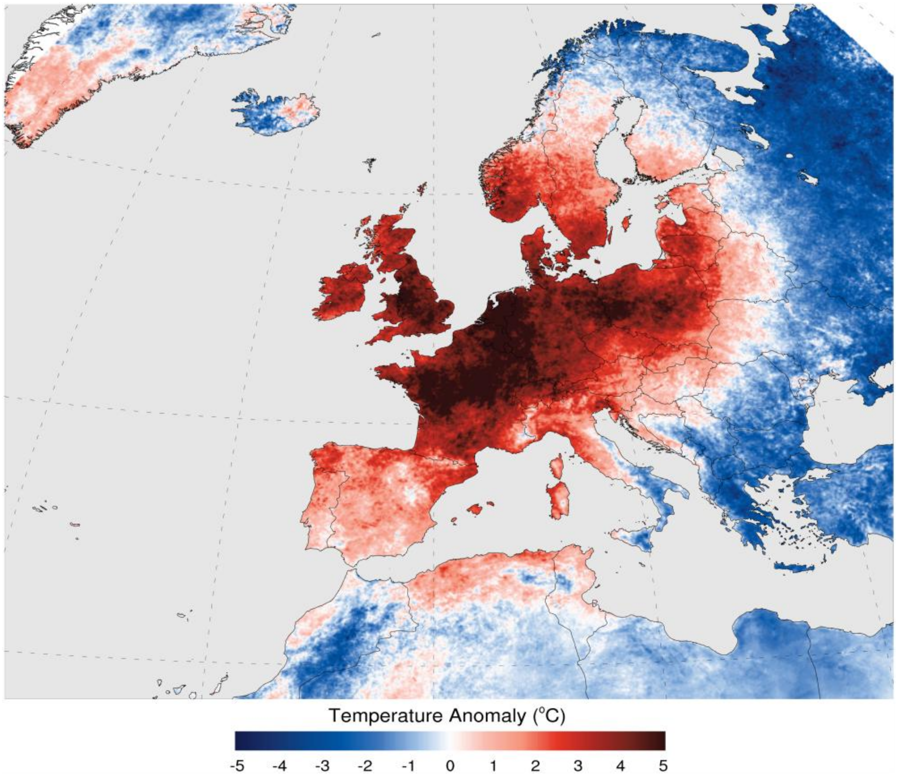


Fig. 4 Trends (solid line) of the number of flowering stems (NFS) of the studied species from 1999 to 2009; **a** *C. foetida*, **b** *L. alpina*, **c** *S. incanus* subsp. *incanus*, **d** *S. suecica*. Dashed line in **b** and **c** represents the mean temperature of July recorded at M. Cimone and resulted significantly correlated with the flowering abundance of *L. alpina* and *S. incanus*

Abeli et al., 2012 *Plant Ecology* 213:1-13

HEAT-WAVE EFFECTS ON ALPINE PLANTS



Nordic Journal of Botany 29: 001–007, 0000
doi: 10.1111/j.1756-1051.2011.01303.x,

Subject Editor: Jens Christian Svenning. Accepted 31 August 2011

Effect of the extreme summer heat waves on isolated populations of two orophitic plants in the north Apennines (Italy)

Thomas Abeli, Graziano Rossi, Rodolfo Gentili, Maurizia Gandini, Andrea Mondoni and Paolo Cristofanelli

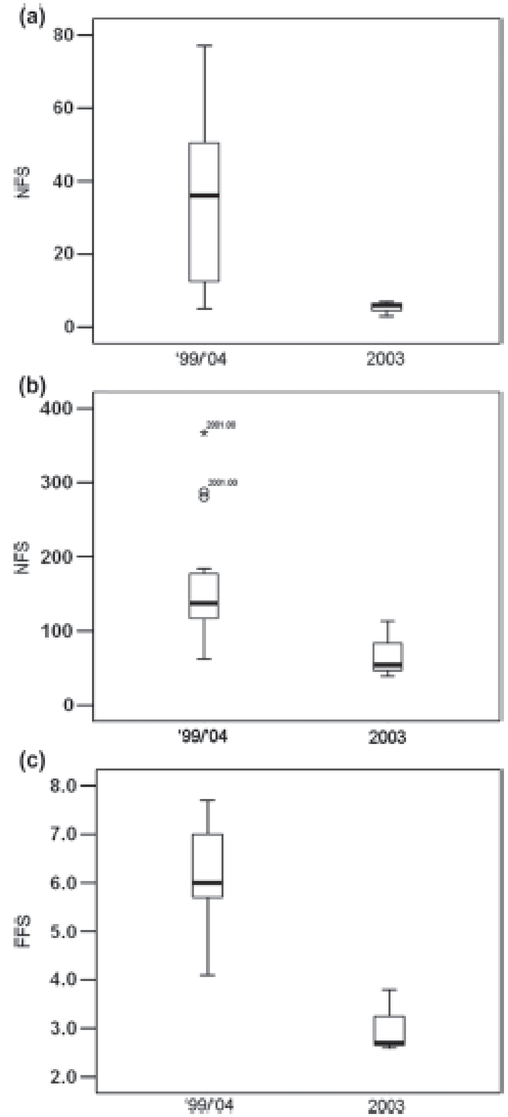
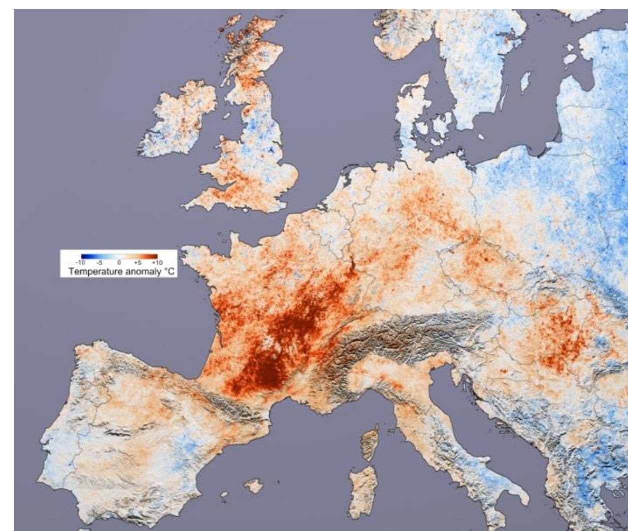


Figure 2. Comparison between the number of flowering stems (NFS) and inflorescences per flowering stems (FFS) in 2003 and the rest of the time series. Box plots on the left represent the values of NFS or FFS of the whole time series (2003 excluded), while box plots on the right represent the values of NFS or FFS recorded in 2003 only: (a) NFS of *Alopecurus alpinus*, (b) NFS of *Vicia cusnae* and (c) FFS of *Vicia cusnae*.

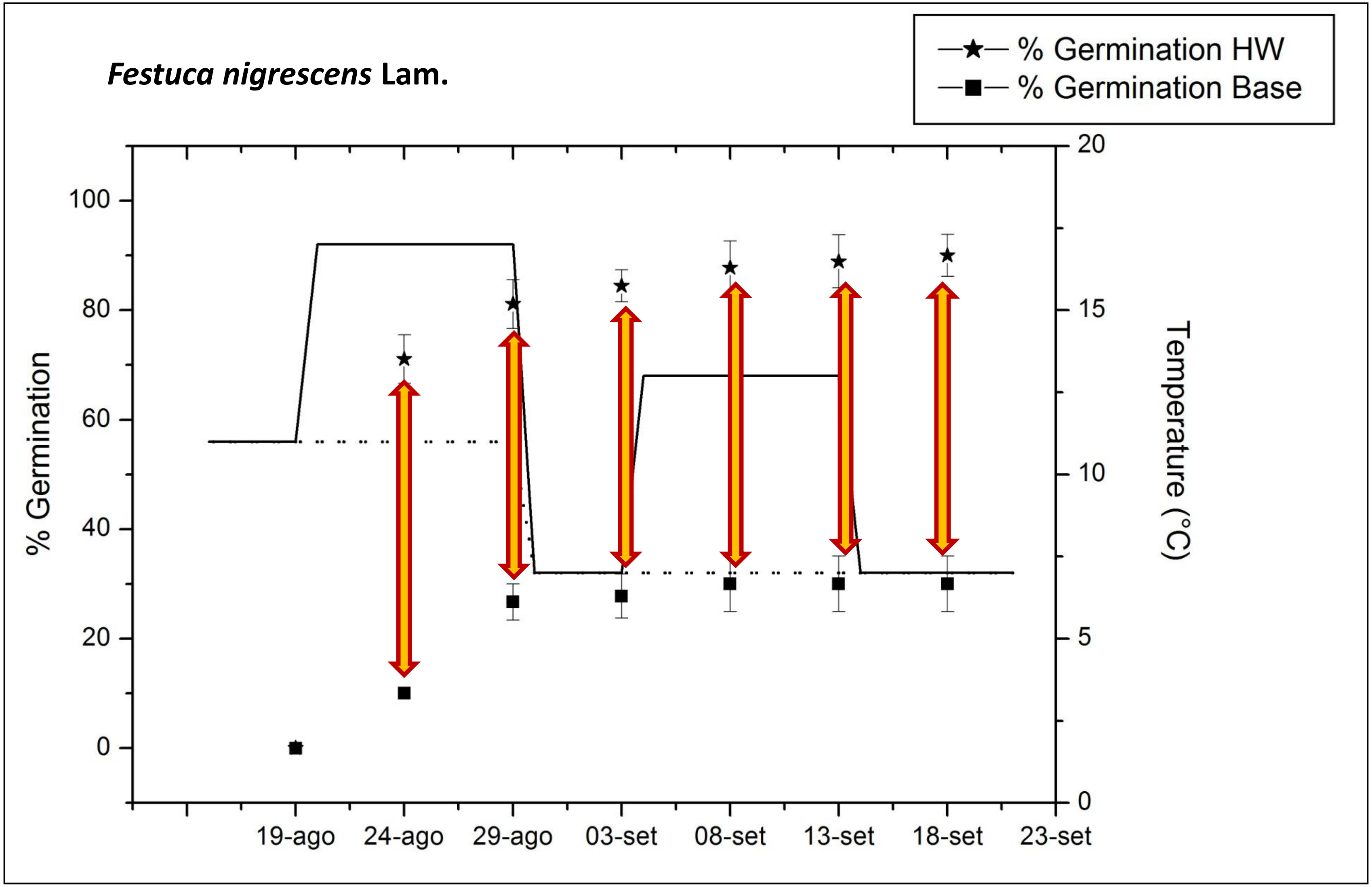
EFFECTS OF HEAT WAVES ON GERMINATION OF ALPINE PLANTS

One of the consequence of climate change is the increase of extreme climatic events like heat waves, storm and drought (IPCC, 2007)

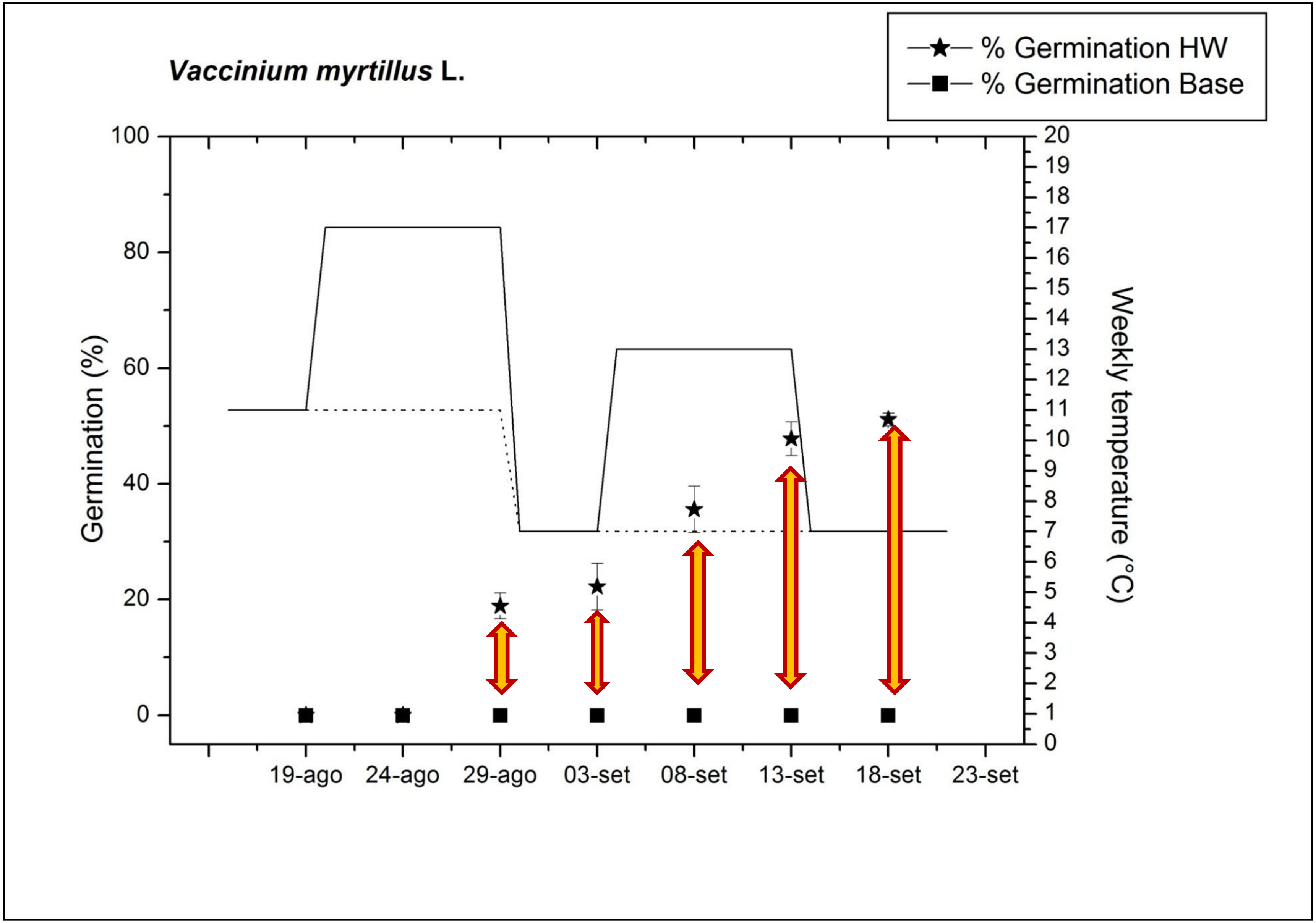
MONTE CIMONE, 2165 m



IMMEDIATE RESPONSE OF GERMINATION TO HWs

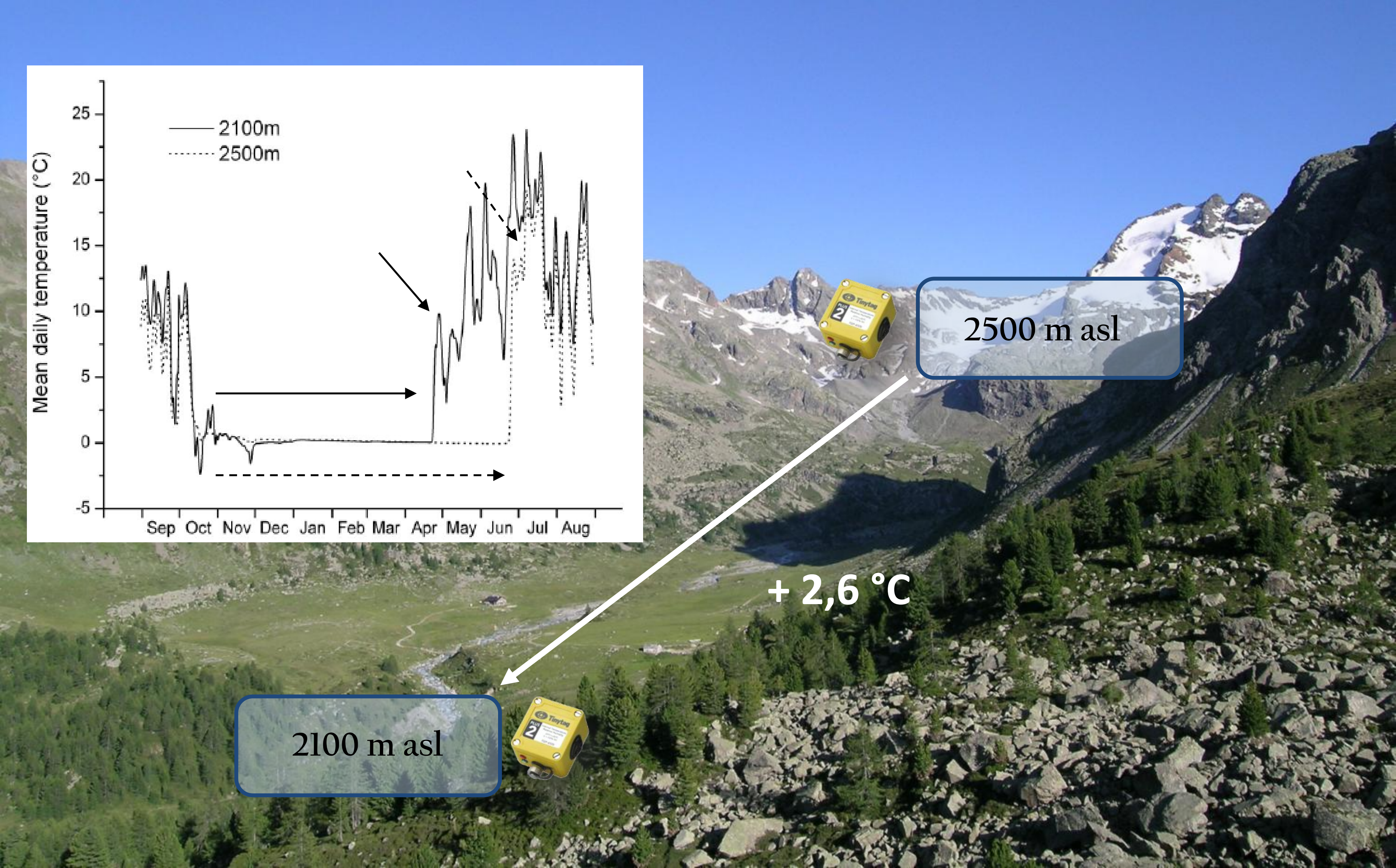


DELAYED RESPONSE OF GERMINATION TO HWs



SEED ECOLOGY AND CLIMATE CHANGE

Future scenarios with **autumn T higher and spring T lower** will **influence time of seed germination** (**shift from spring to autumn**) rather than final percentage.

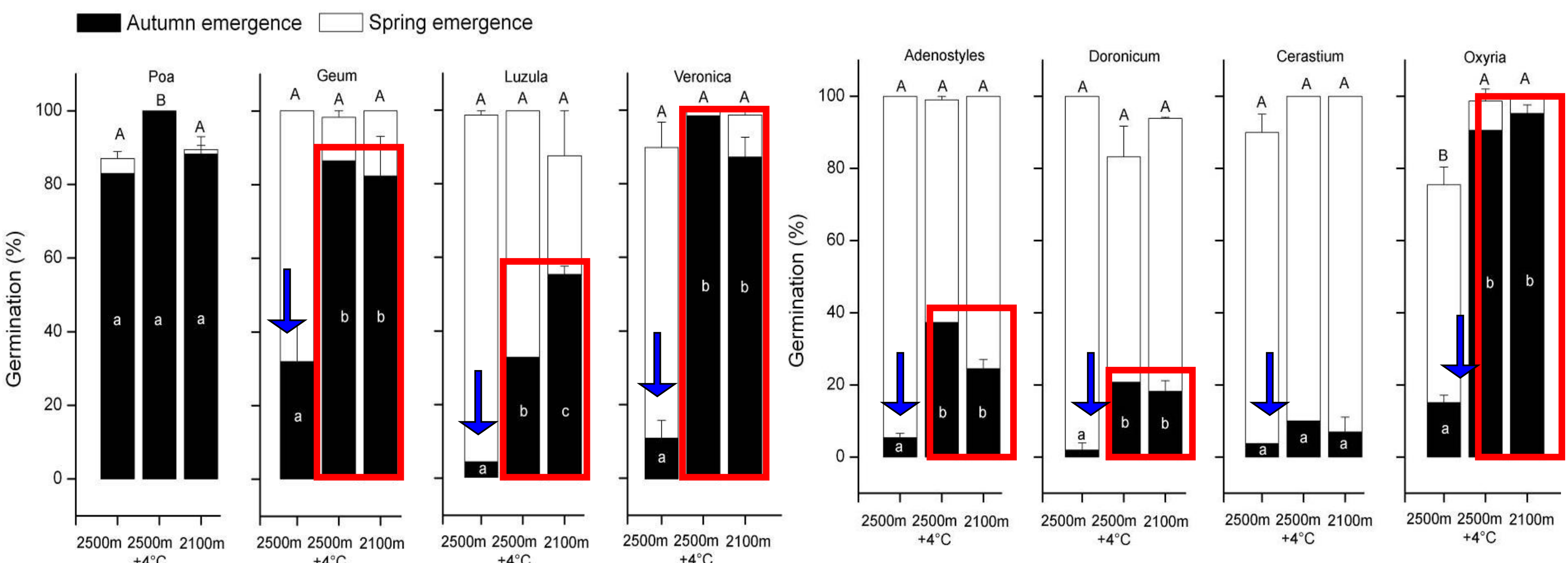


Annals of Botany Page 1 of 10
doi:10.1093/aob/mcs097, available online at www.aob.oxfordjournals.org

ANNALS OF BOTANY Founded 1887

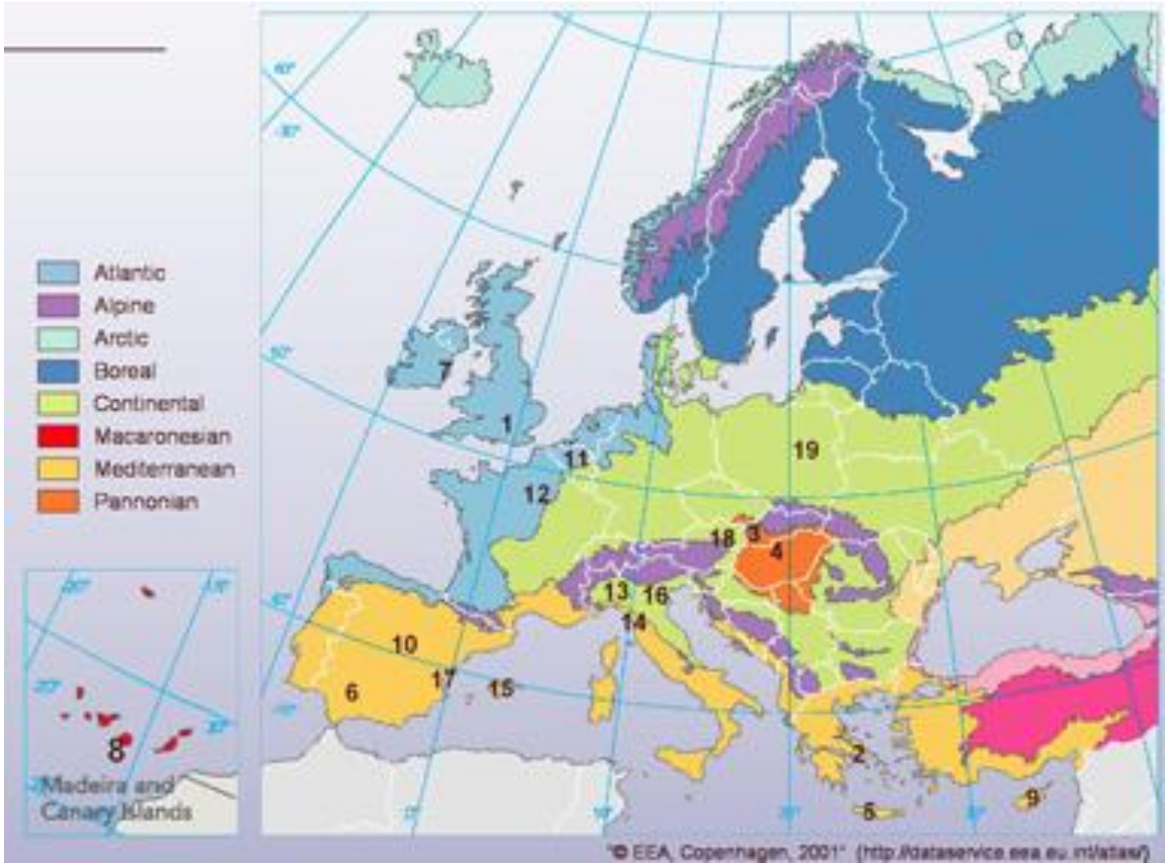
Climate warming could shift the timing of seed germination in alpine plants

Andrea Mondoni[1,*], Graziano Rossi[2], Simone Orsenigo[2] and Robin J. Probert[3]

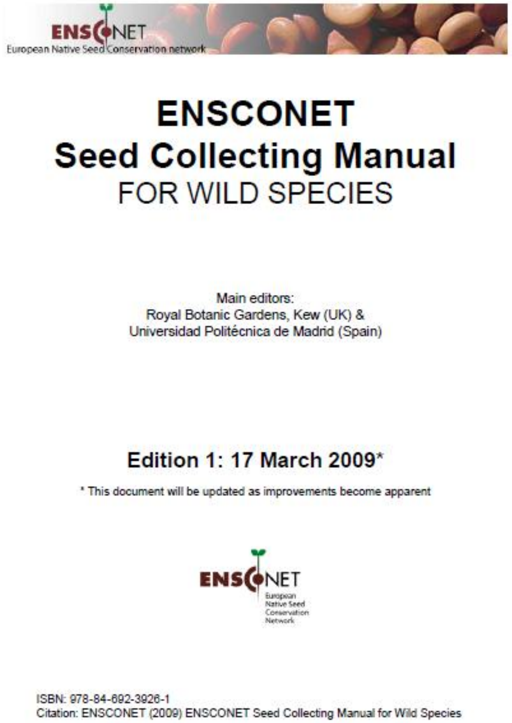


Mondoni et al., 2012 *Annals of Botany* 110:155-164

European Native Seed Conservation NETwork



19 partners in Europe and Mediterranean Area


ENSCONET
European Native Seed Conservation network

ENSCONET
Seed Collecting Manual
FOR WILD SPECIES

Main editors:
Royal Botanic Gardens, Kew (UK) &
Universidad Politécnica de Madrid (Spain)

Edition 1: 17 March 2009*

* This document will be updated as improvements become apparent

ENSCONET
European Native Seed Conservation Network

ISBN: 978-84-692-3926-1
Citation: ENSCONET (2009) ENSCONET Seed Collecting Manual for Wild Species

NEPAL

2010-2013

Seeds of 100 species collected in 1 year of field activity

SHARE Seed Bank

Stations at High Altitude for Research on the Environment

Ex situ conservation in developing country, Nepal as study case.

Studi Trent. Sci. Nat., 90 (2012): 227-231 ISSN 2035-769

Ev-K2-CNR/NAST Himalayan Seed Bank Project - Kathmandu (Nepal)

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[*] E-mail dell'Autore per la corrispondenza: *graziano.rossi@unipv.it*

WHAT'S NEXT?

Effect of ozone (O_3) on seed germination

Combined effect of photoperiod, temperature and water availability on plant adaptation

Seed germination above vegetation limits

GRAZIANO ROSSI, THOMAS ABELI, ANDREA MONDONI & SIMONE ORSENIGO

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THANK YOU