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***Viola pumila* Chaix in Italy:
conservation experiences
of a species at the margin of its range**

Scientific workshop *How can we protect and preserve biodiversity?*

Bologna, May 3rd-4th, 2013

***Viola pumila* Chaix**

Species herbaceous, perennial, Eurasian, typical of humid grasslands on ditches and canals sides (0-200 m a.s.l.).

Stem erect, leafy, glabrous.

Flower pentamerous, zygomorphic; corolla pale violet (April).

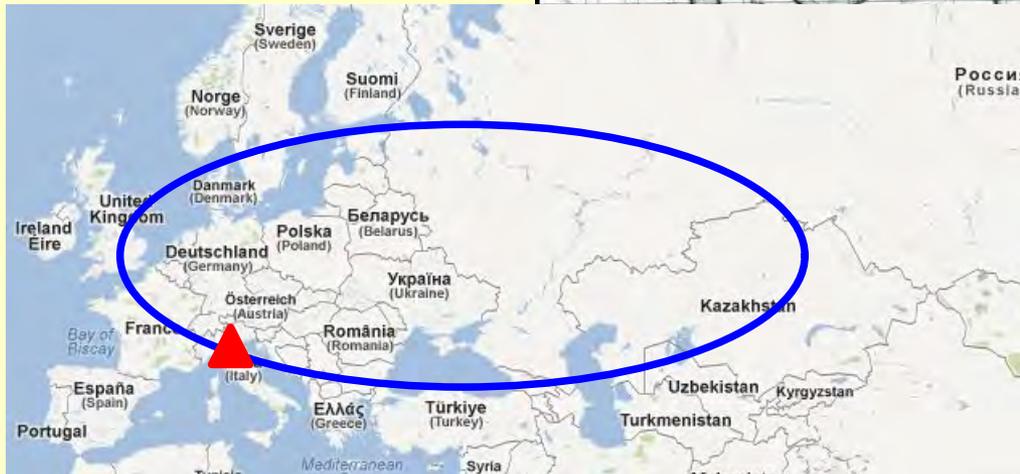
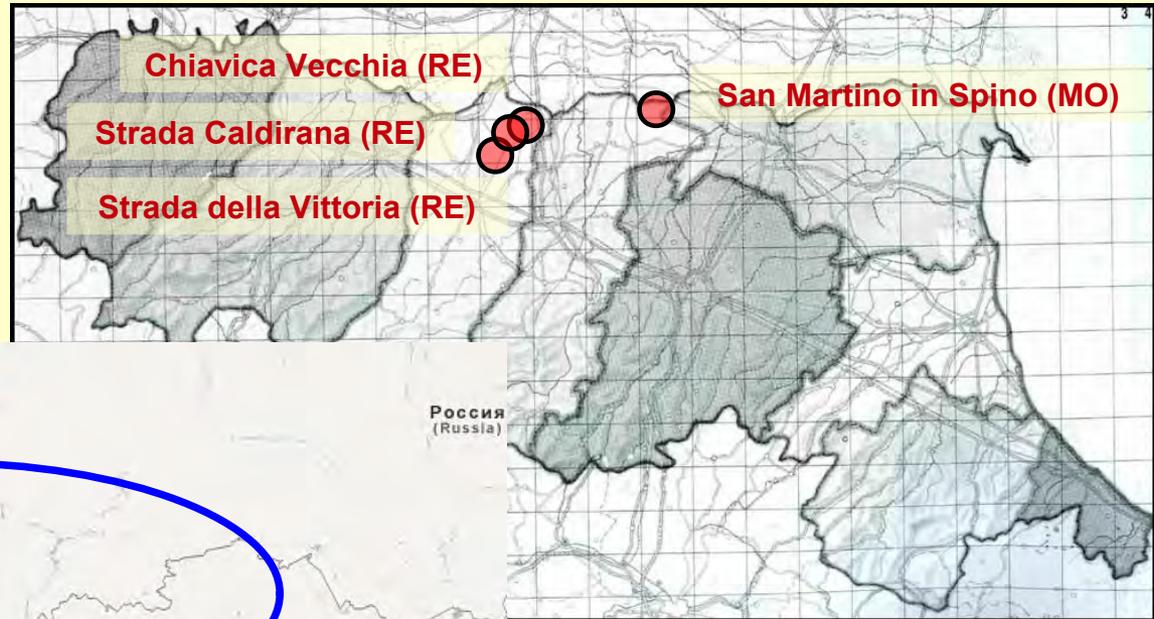
Capsule plurisperm loculicide.



Major threats

- Fragmented spatial distribution
- Urban development and agriculture in the areas where it grows
- Drainage of humid zones
- River regulation
- Argin management promoting ruderal and exotic species

The four Italian populations, situated in the low Po plain (provinces of Modena and Reggio Emilia), are at the south-western margin of the range, completely isolated from the other European ones.



According to the IUCN criteria (2001), *V. pumila* in Italy is **critically endangered** (Buldrini and Dallai, 2011).

In 2003, a conservation project of *V. pumila* started at the Botanical Garden of Modena, based on an *in situ/ex situ* integrated strategy and aimed at a reinforcement of the natural populations.

“Emergency” measure (very low number of individuals).

Project steps:

- brief study about species ecology
- seeds collection from the populations of the province of Reggio Emilia and their maintainment
- viability tests (TTC)
- *in vitro* germination and cultivation
- transfer on soil, acclimatization in humid greenhouse, repotting
- *ex situ* cultivation in the Botanical Garden
- collocation in a specific area near one of the natural sites in the province of Reggio Emilia, where seeds had been collected, with extensive involvement of the local population









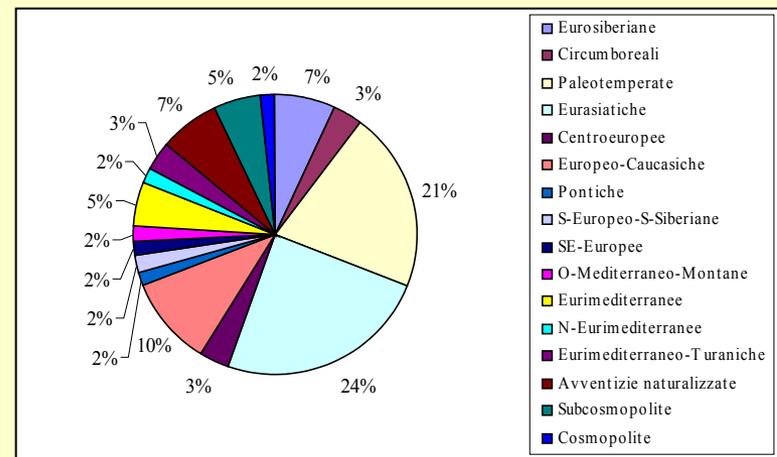
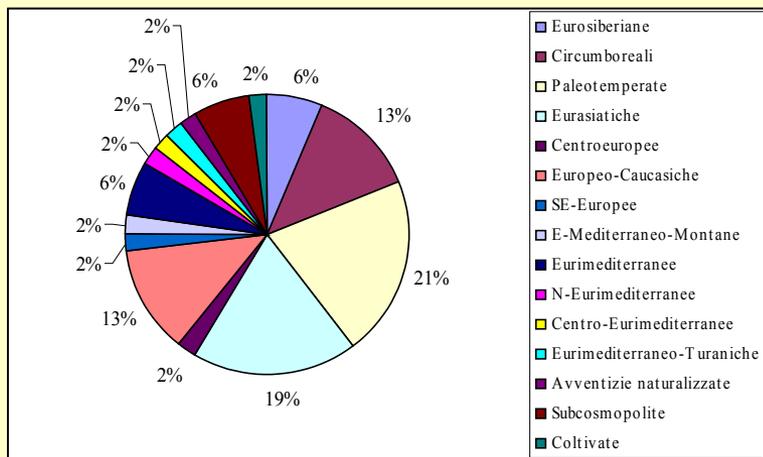
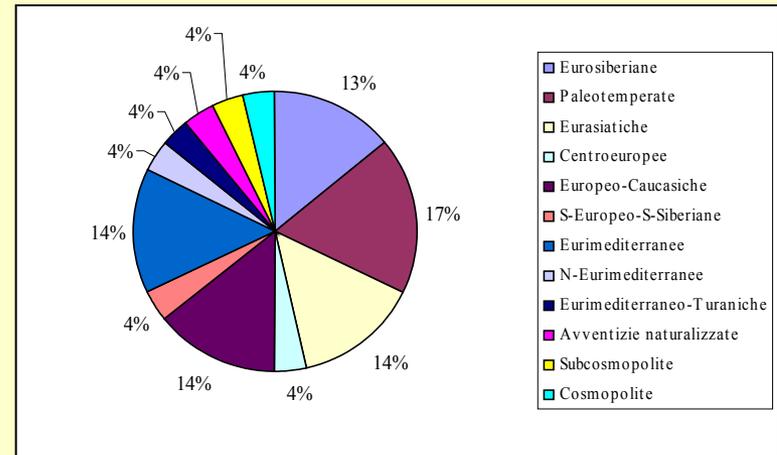
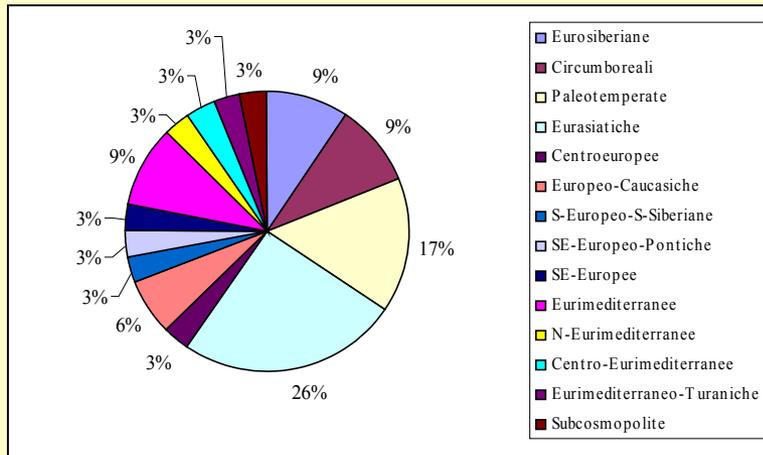
Chiavica Vecchia (RE).

The transferred plants regularly produced fruits and seeds from the subsequent year (2005).

The conservation project of *V. pumila* has been continued until 2012, with multidisciplinary analyses regarding:

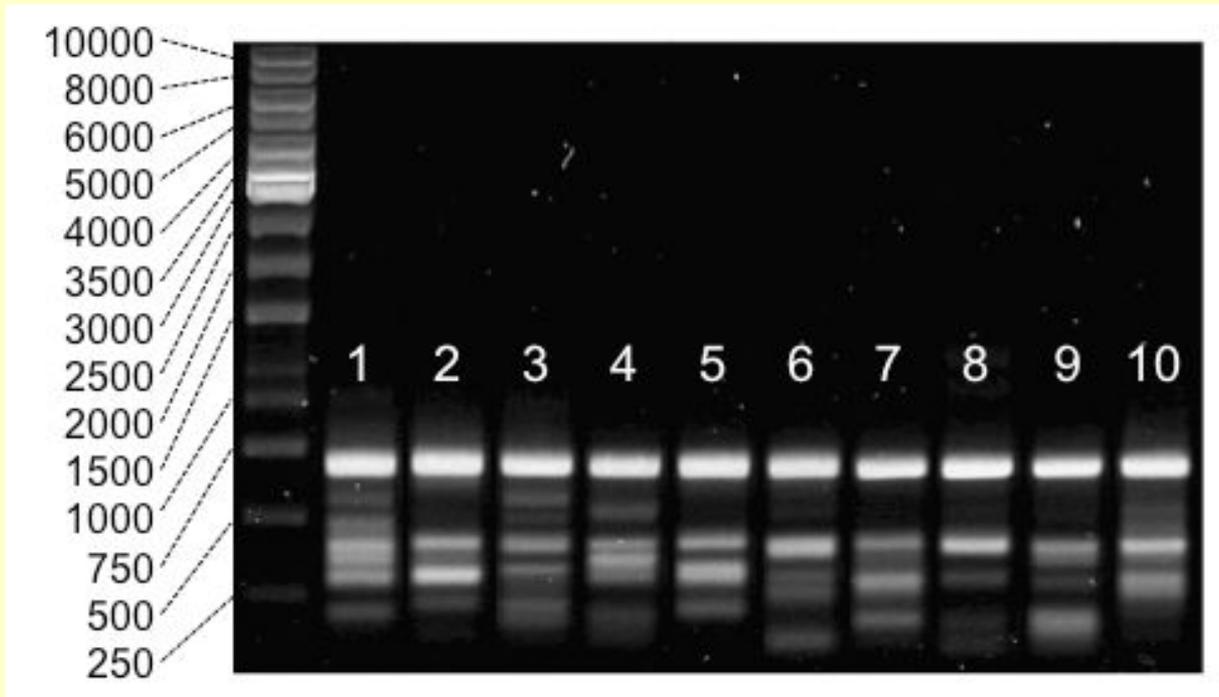
- ecological, floristic and chorological study of the habitat
- periodic control of the natural and reintroduction sites
- description of the infra- and intra-population genetic variability, to obtain data on the effects of the population dimensions and their prevailing reproductive strategies

Chorological spectra of the natural sites



Presence of septentrional species (eurosibiric and circumboreal) up to 19%
(Po valley average: 10%)

Genetic variability analysis by ISSR molecular markers (Buldrini *et al.*, 2013)

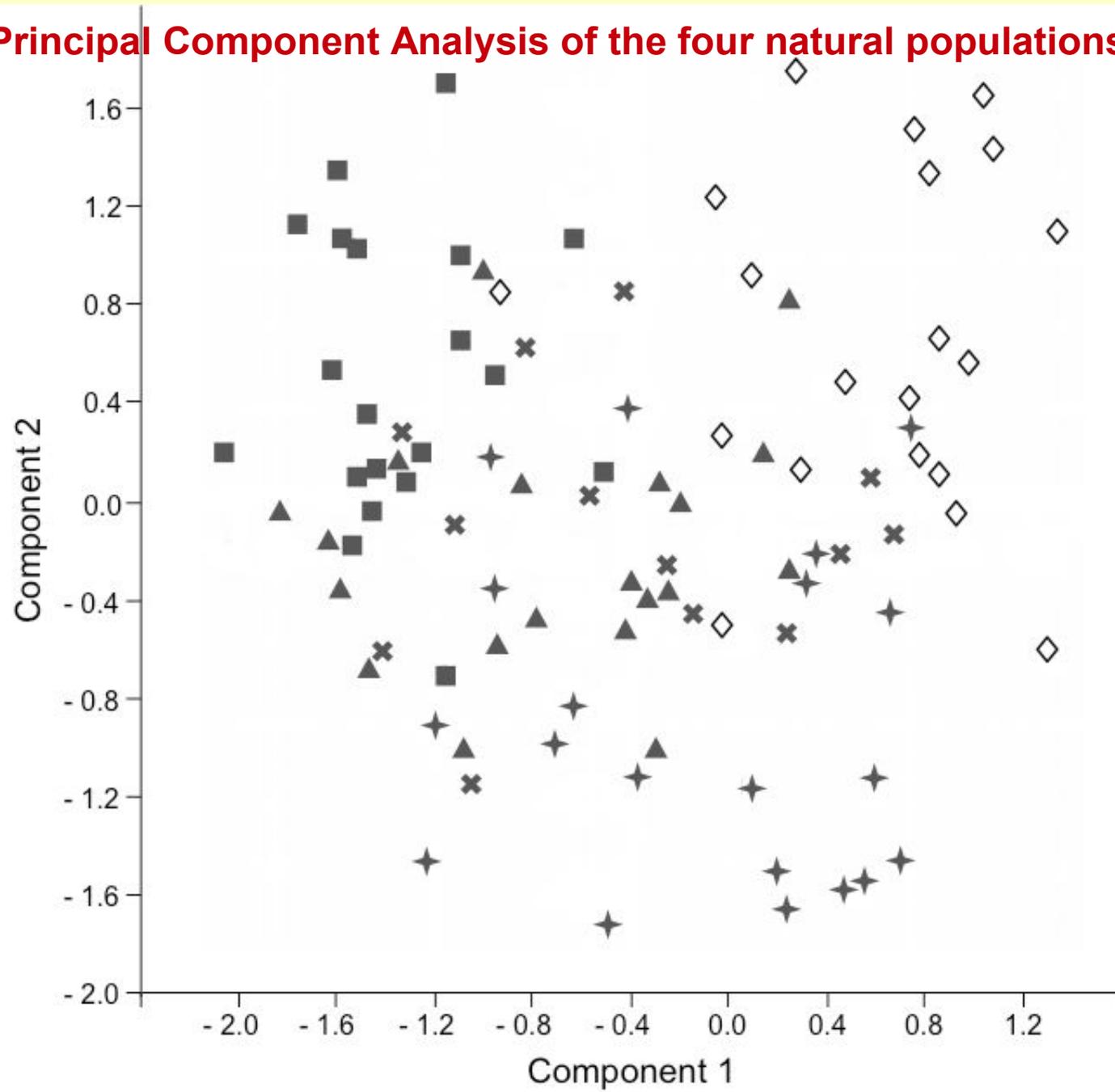


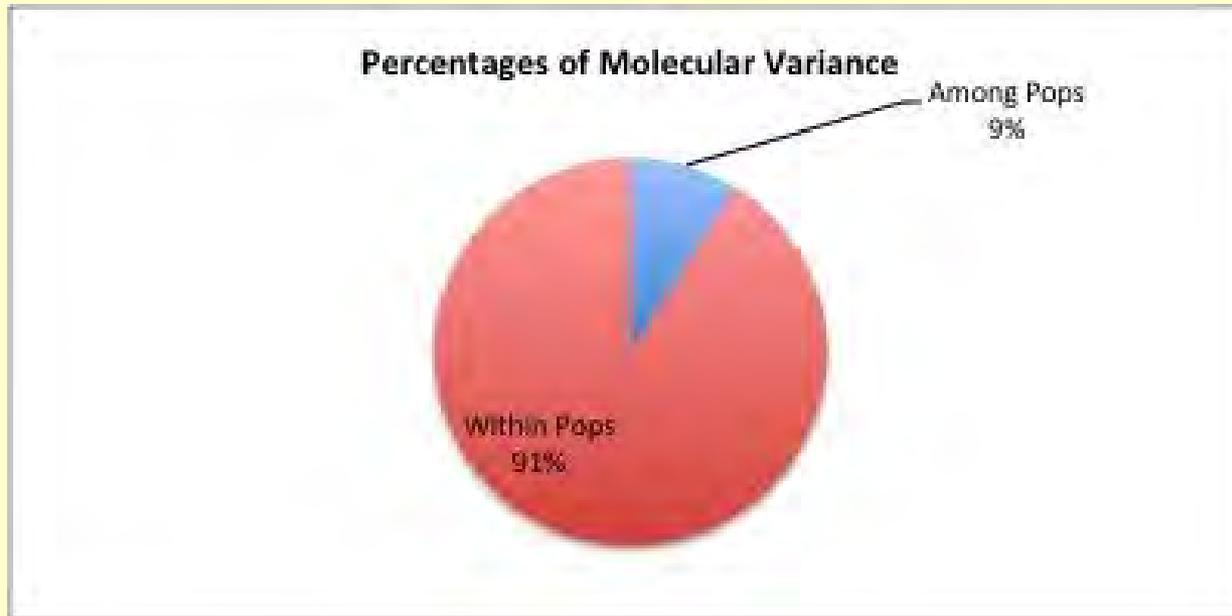
ISSR profile obtained with the UBC-857* primer on 10 samples from the province of Modena

P: polymorphism; G_{st} : genetic differentiation; Nm: gene flow

P	G_{st}	Nm
96,65	0,05	9,79

Principal Component Analysis of the four natural populations





Diversity given not by fixation of localised alleles, but by the same *loci* with different frequency in the sampled individuals. Variability not congruent with the small populations size.

Gene flow only apparent (now impossible because of the disjunction): photograph of a past situation.

“Genetic conservation” (populations decline extremely rapid and recent, so that we do not see any effects of the genetic drift).

Conservation suggestions

- Reinforcement of the natural populations
- Use in environmental restoration projects involving habitat reconstruction (swampy areas, alluvial grasslands)
- Introduction in areas ecologically suitable, close to the natural populations and in their same ecological and environmental context
- Hybridization of Modena and Reggio Emilia populations, to maintain the good variability and avoid a demographic reduction
- Cultivation in parks and gardens of the low plain