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Factors driving endemism of an annual Mediterranean plant species

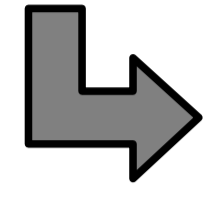
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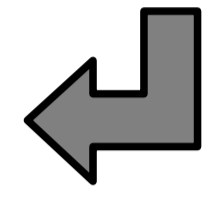
Potentials causes of narrow endemism

Restricted endemic plant species may have a narrower range of ecological tolerance, more specialized requirements, poorer dispersal abilities and lower reproductive investments than their more widespread congeners.



Macroecological hypotheses imply that narrowly endemic species are inferior to widespread species in their abilities to exploit resources and/or disperse.

The prevalence of endemic plants in extreme or azonal habitats, i.e rocky places, cliffs and steep slopes, may have promoted their persistence and enhanced specific traits.



In this poster we present the results of our investigations on niche breadth, diaspore traits and phylogenetic position of *A. provincialis*.

We address three points :

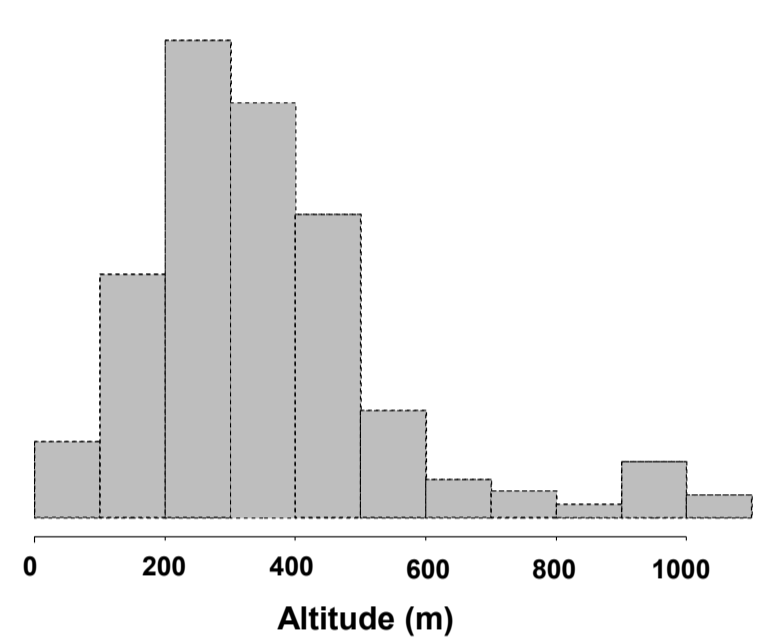
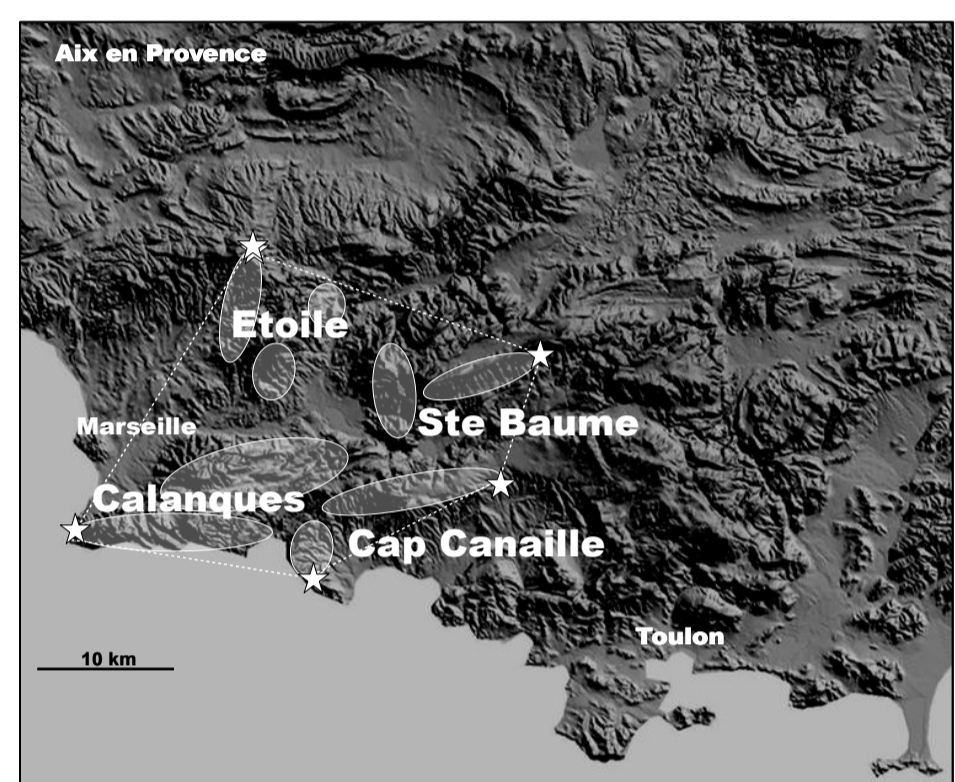
The relationship between the ecological range and the restricted distribution

The possibility of a limited dispersal capacity

The origin of *A. provincialis*



Distribution and range of altitude



Arenaria provincialis is a narrow endemic restricted to the hills and modest calcareous mountains surrounding the city of Marseille.

Is niche breadth the reason for the narrow distribution of *A. provincialis* ?

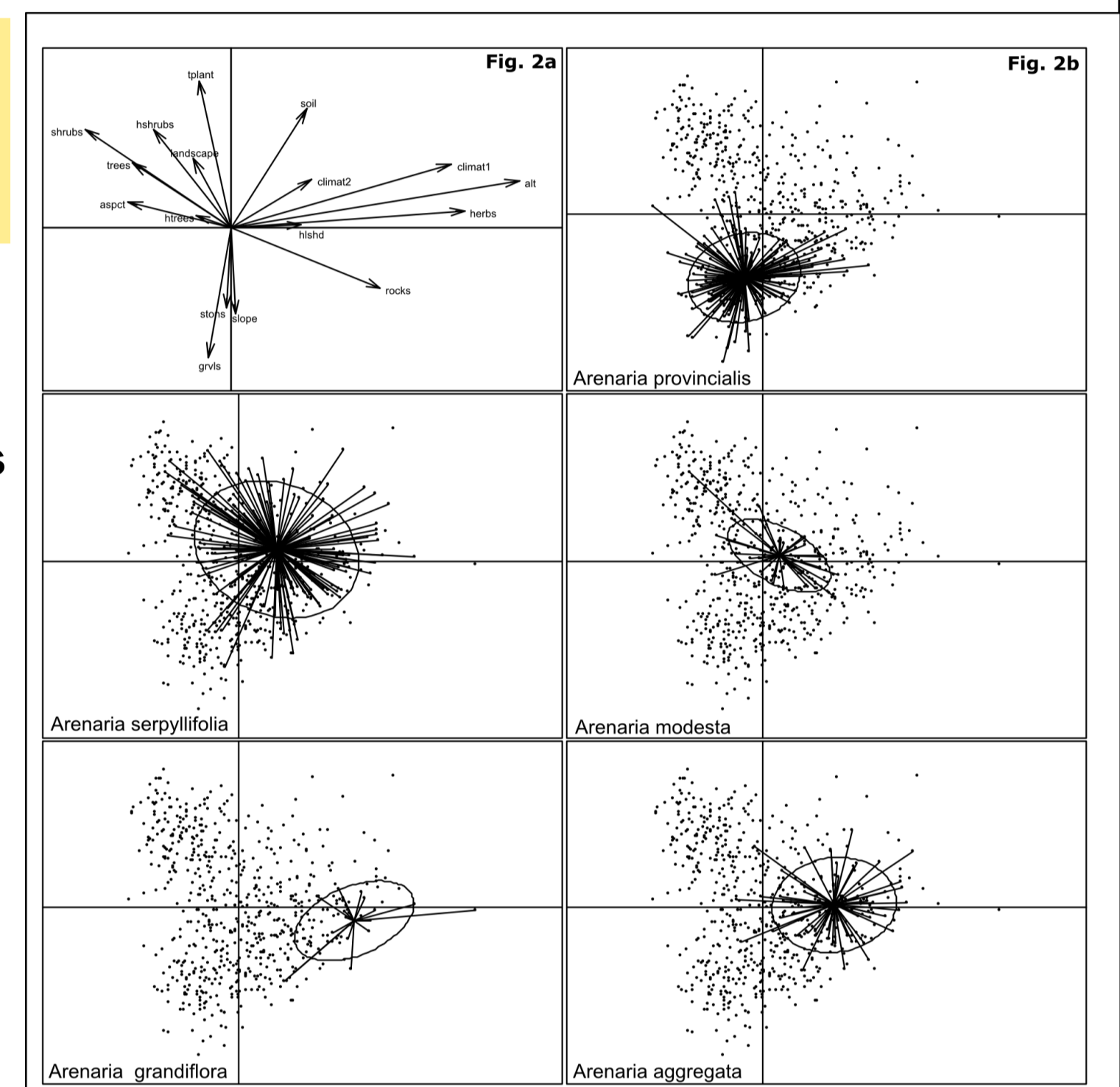
By comparison to *Arenaria* species of Southern Provence :

A. provincialis is a specialist of scree slopes

But it lives also in various rocky habitats

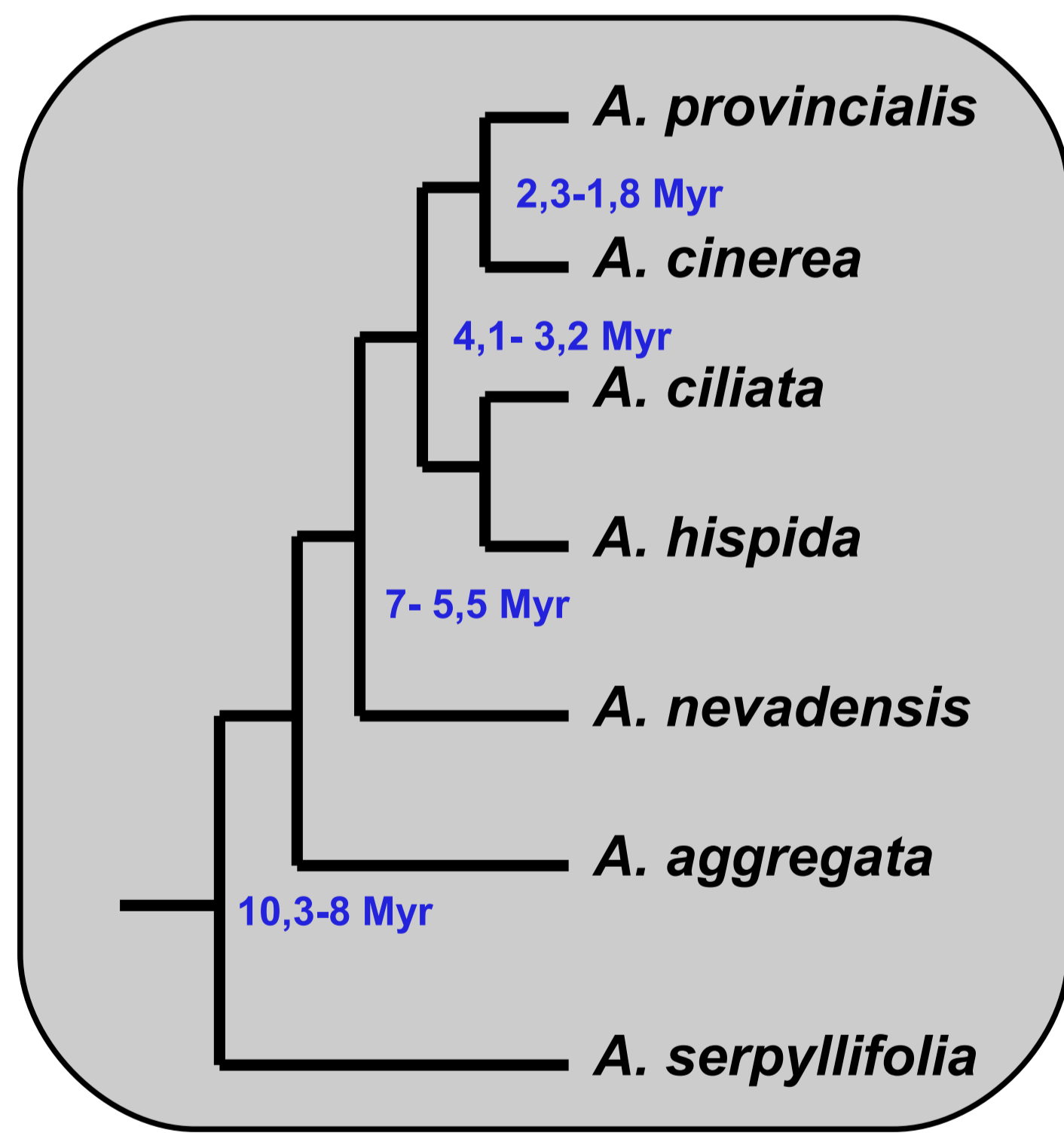
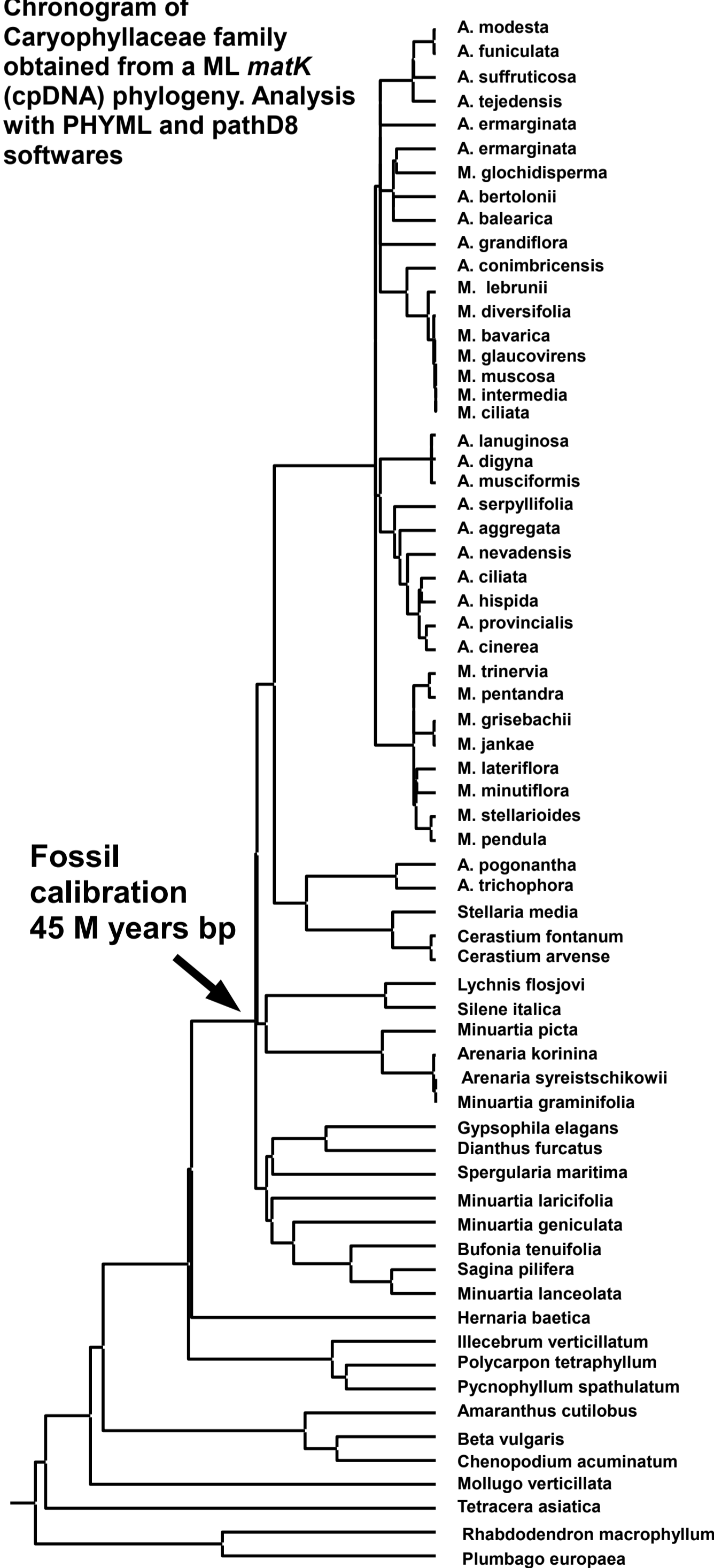
And it is present on a large range of altitude

The ecological niche is not sufficient to explain the restricted distribution of *A. provincialis*



Chronogram of Caryophyllaceae family obtained from a ML *matK* (cpDNA) phylogeny. Analysis with PHYML and pathD8 softwares

Phylogenetic position and molecular dating of the origin of *A. provincialis*



Arenaria provincialis is related to alpine or mountain species.

Molecular dating supports a Quaternary origin

Dispersal : comparison among the *Arenaria* sp of South Provence

Table : Seed traits compared between *Arenaria* species in southern Provence. Seed mass is the mean mass of 1000 seeds per species.

Taxon	Diaspore	Seed mass (mg)	Seeds per capsule	Seed sets per individual
<i>Arenaria provincialis</i>	capsule	1.62	1.06 (1-2)	106 (25-486)
<i>Arenaria aggregata</i>	seed	0.48	5.1 (3-9)	1587 (370-3546)
<i>Arenaria serpyllifolia</i>	seed	0.07	11.1 (5-17)	350 (66-1269)
<i>Arenaria modesta</i>	seed	0.07	16.02 (7-25)	252 (35-1749)
<i>Arenaria grandiflora</i>	seed	0.61	4.4 (3-9)	976 (110-3137)



The diaspore of *A. provincialis* is the capsule and is the biggest



Review of results

Specialized niche but along a wide range of altitude

Occurrence in various rocky habitats

Specialized diaspore adapted to disperse in stony soils (barochory)

Quaternary origin from an alpine or mountain ancestor

Other specific characteristics not shown here : anatomy and growth of the roots, phenology, anatomy of flower...



Conclusions....

Despite its niche specialized on rocky and scree slopes habitats, *A. provincialis* can not be considered as a steno-endemics because it grows within different plant communities (=various habitats) along an altitudinal gradient of nearly 1000 meters.

Because no obvious physical barriers and ecological factors isolate its distribution, we inferred that niche breadth alone is not a sufficient factor to explain the endemism of *A. provincialis*. Then, the comparison of seed traits among *Arenaria*, revealed that *A. provincialis* have evolved a bigger diaspore to allow its seedlings to survive in screes but in parallel this bigger diaspore could have strongly limited its capacity to migrate.

Molecular phylogenetic analysis allows us to propose the hypothesis that such evolution may have occurred during an interglacial phase of the Quaternary period, and that the isolation of its ancestor in southern Provence is the decisive historical factor of its endemism.

