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Domestication of date palms in Siwa Oasis and across the Middle East and North Africa: **Articulating the scales of ethnography and of domestication over the long term**

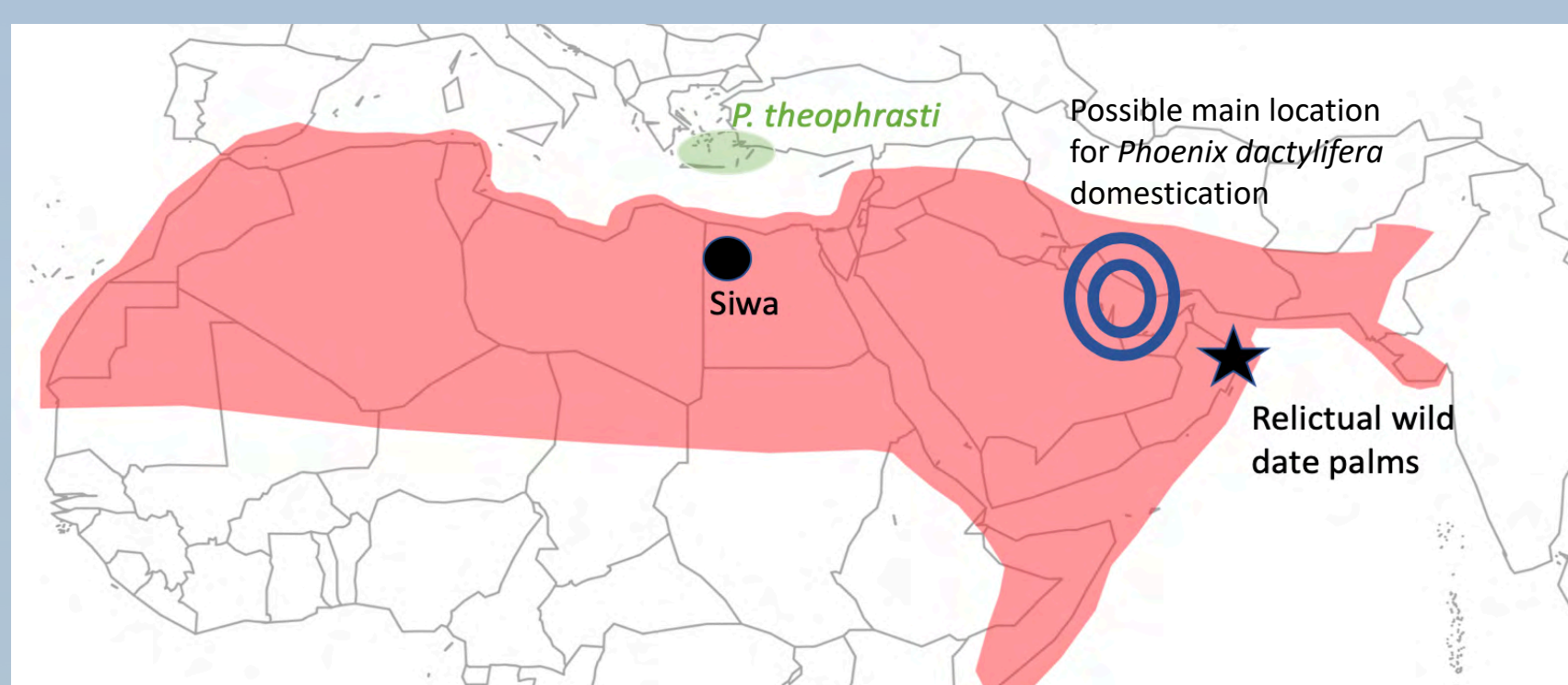
Data : under publication (Gros-Balthazard & Battesti et al.)

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(CNRS/Musée de l'Homme, MNHN & Center for Genomics and Systems Biology, NYU Abu Dhabi)

Studying date palm agrobiodiversity in the oasis of Siwa (Egypt), by combining ethnobotany and genetics, we demonstrated:

- The existence of **"ethnovarieties,"** i.e., voluntary collections of multiple clones sharing mostly phenotypic characteristics under the same local name, as a way to manage agrobiodiversity.
- Siwa's cultivated date palms form a third genetic cluster, with **a large and unique diversity,** compared to the previously described Middle Eastern and North African date palms.
- Siwa region's feral date palms are also distinct, sharing alleles with another *Phoenix* species (*P. theophrasti*), a gene pool for local farmers.



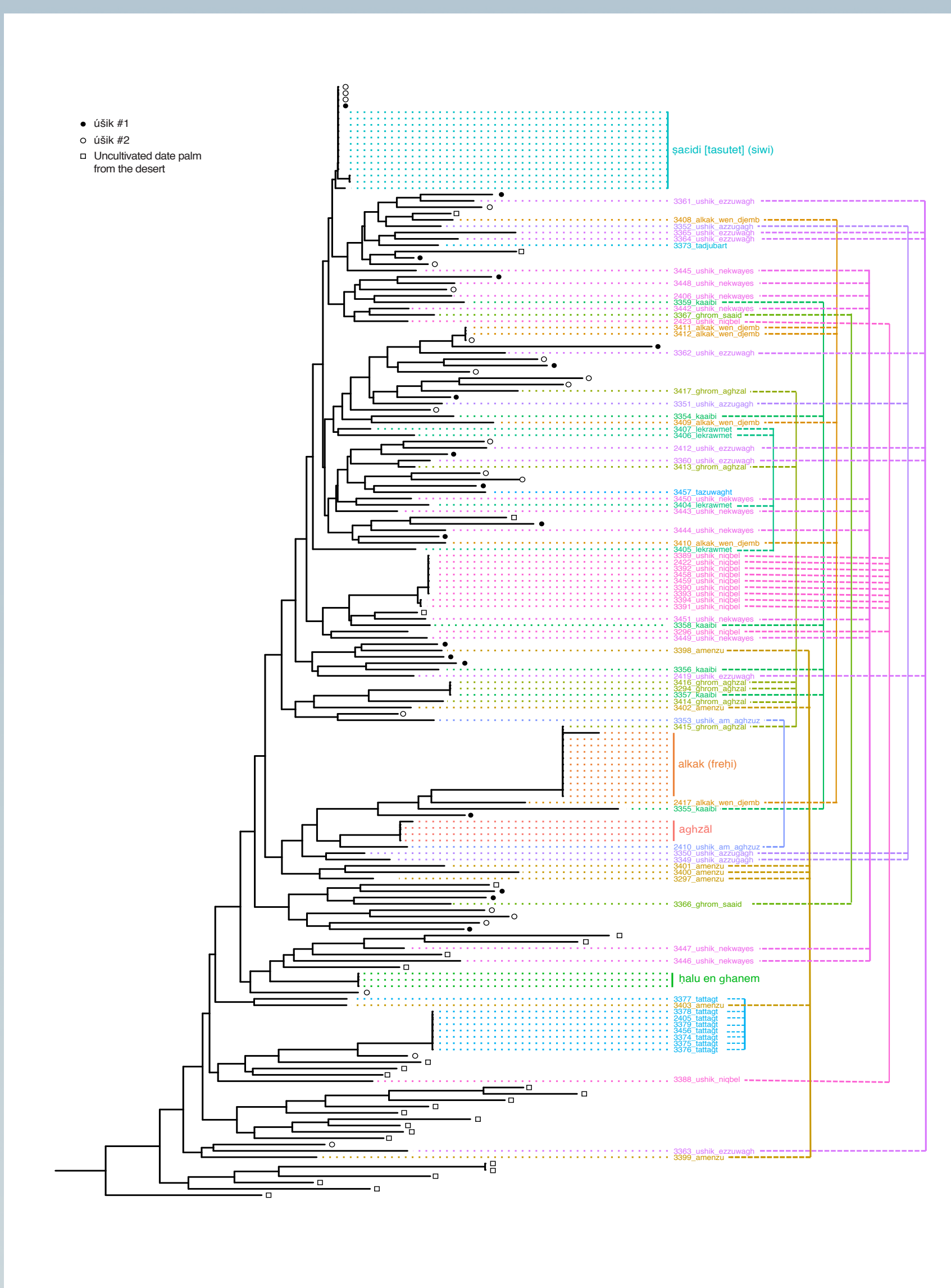
Siwa oasis (Egypt), at the crossroads of ancient Trans-Saharan routes and of the oriental and western genetic cluster

INTRODUCTION

The history of the date palm (*Phoenix dactylifera* L.) as a cultivated plant is still poorly known, despite some major advances made using genetic tools¹. An unexpectedly high differentiation between African and Middle Eastern populations was discovered and its origins was only recently explained by the North African date palms being introgressed by a wild relative: *Phoenix theophrasti* Greuter². Moreover, **ways of assessing the current agrobiodiversity** of the cultivated date palm do not yet seem well established⁴.

OBJECTIVES: To better seize the long- and short-term domestication process of this cultivated and emblematic crop, the date palm, our approach combines **anthropology** (ethnoecology) with **population genetics** (using 17 microsatellite markers).

An original folk categorization system by Siwa inhabitants



The most direct consequence is the demonstration that we had until then a clear **underestimation of the richness in genetic resources** of date palm: about fifteen named types identified are not about fifteen genetic combinations of alleles.

Why such a complex local system in Siwa for categorizing living organisms and in particular date palms?

- To **stock a huge amount of information** and to be able to mobilize it easily.
- To **allow a flexible management of agrobiodiversity** in this local context.

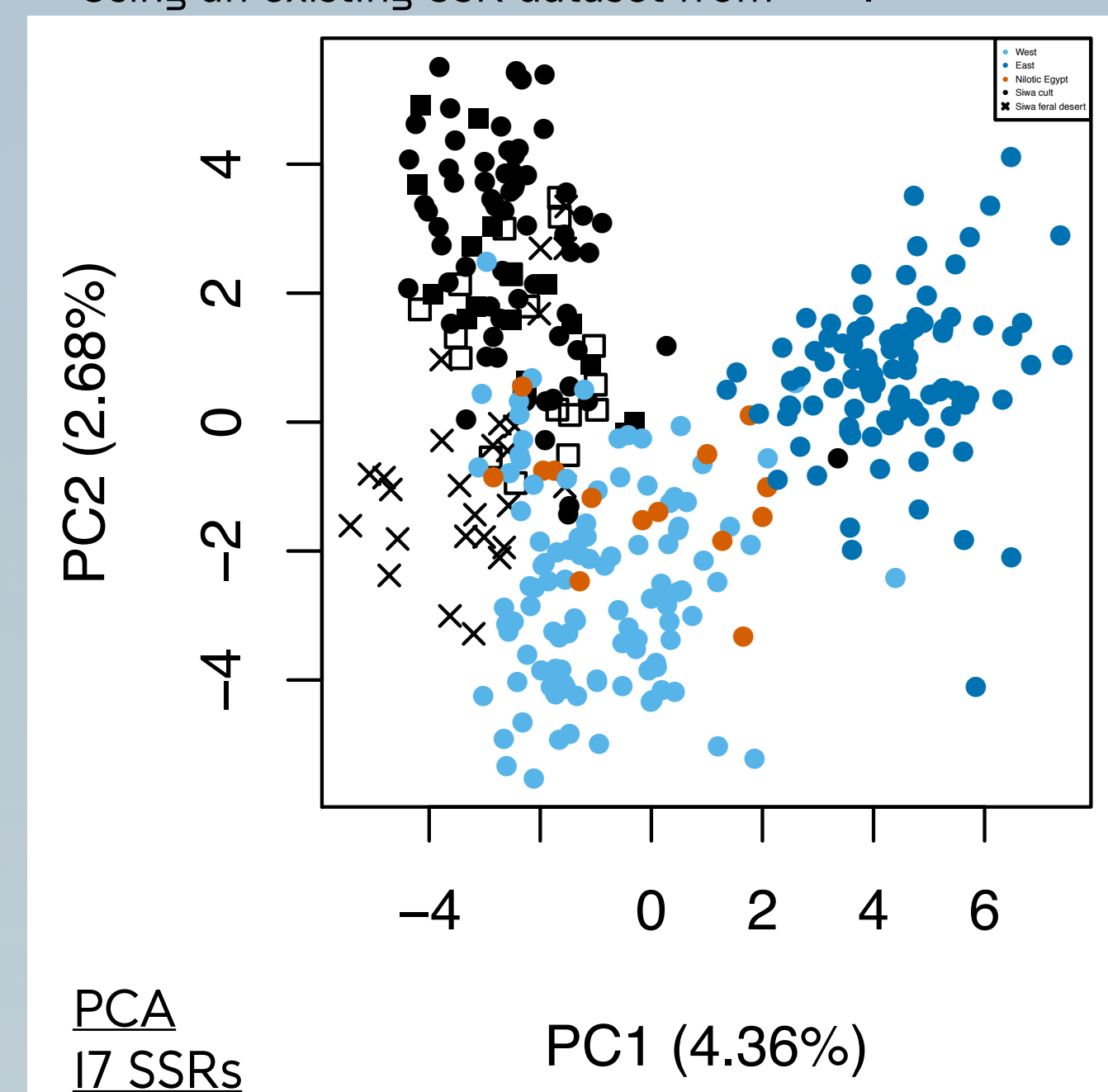
Some named types are **true cultivars** as supposed to be in oasis phoeniculture: they share not only a formal identity, important for Siwan people, but also a genetic identity. Some are (what we coined) **"ethnovarieties,"** i.e., voluntary collections of multiple clones sharing mostly phenotypic characteristics under the same local name.

The existence of "ethnovarieties" results from **a cultural practice of oasis farmers** towards date palm trees and from their way to think of them^{3, 4}.

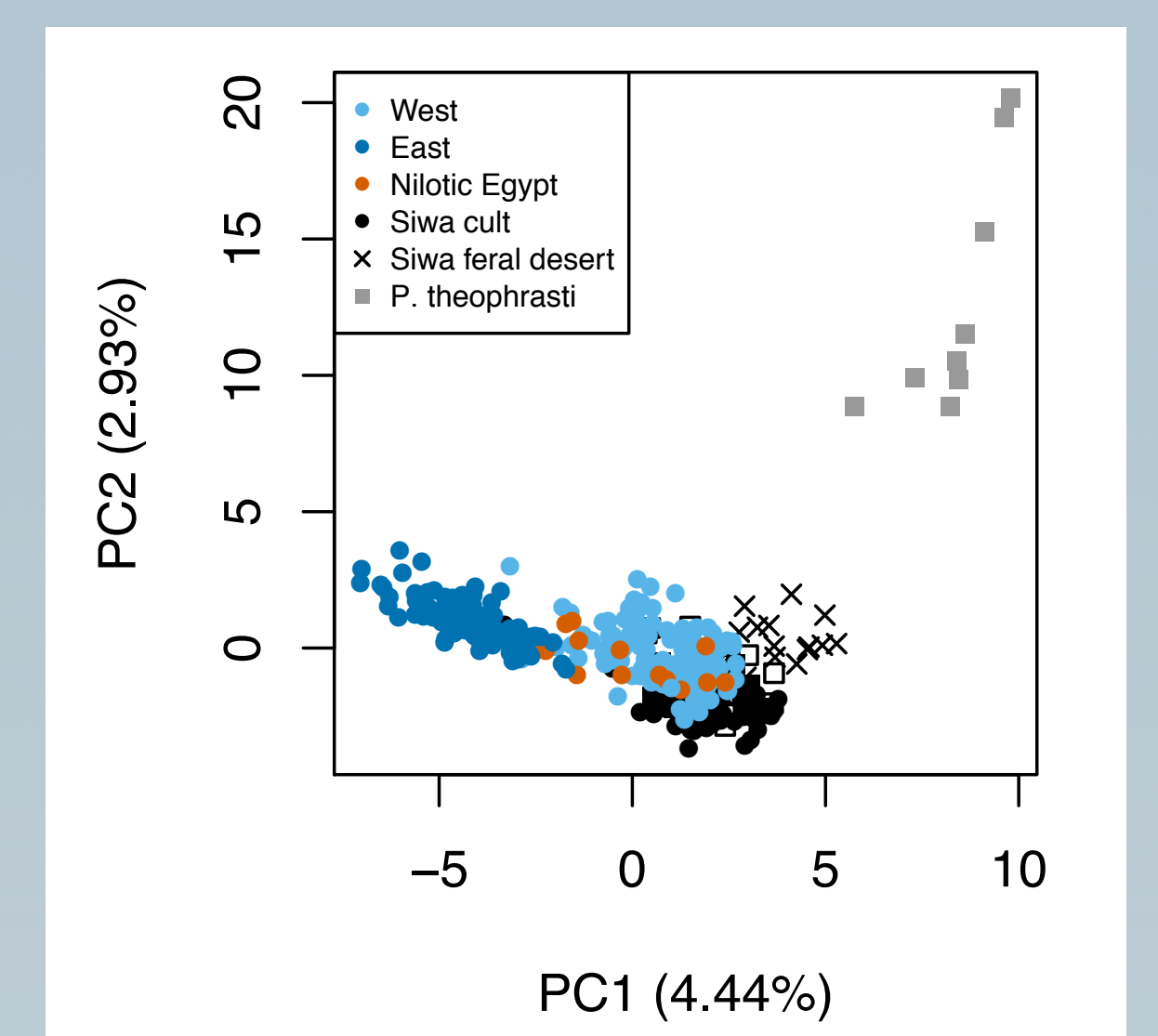
The same idea applies to the notion we call **"categories,"** a way to name other date palms that are not or poorly reproduced by off-shoot by the local community.

An original, large and unique biodiversity in Siwa

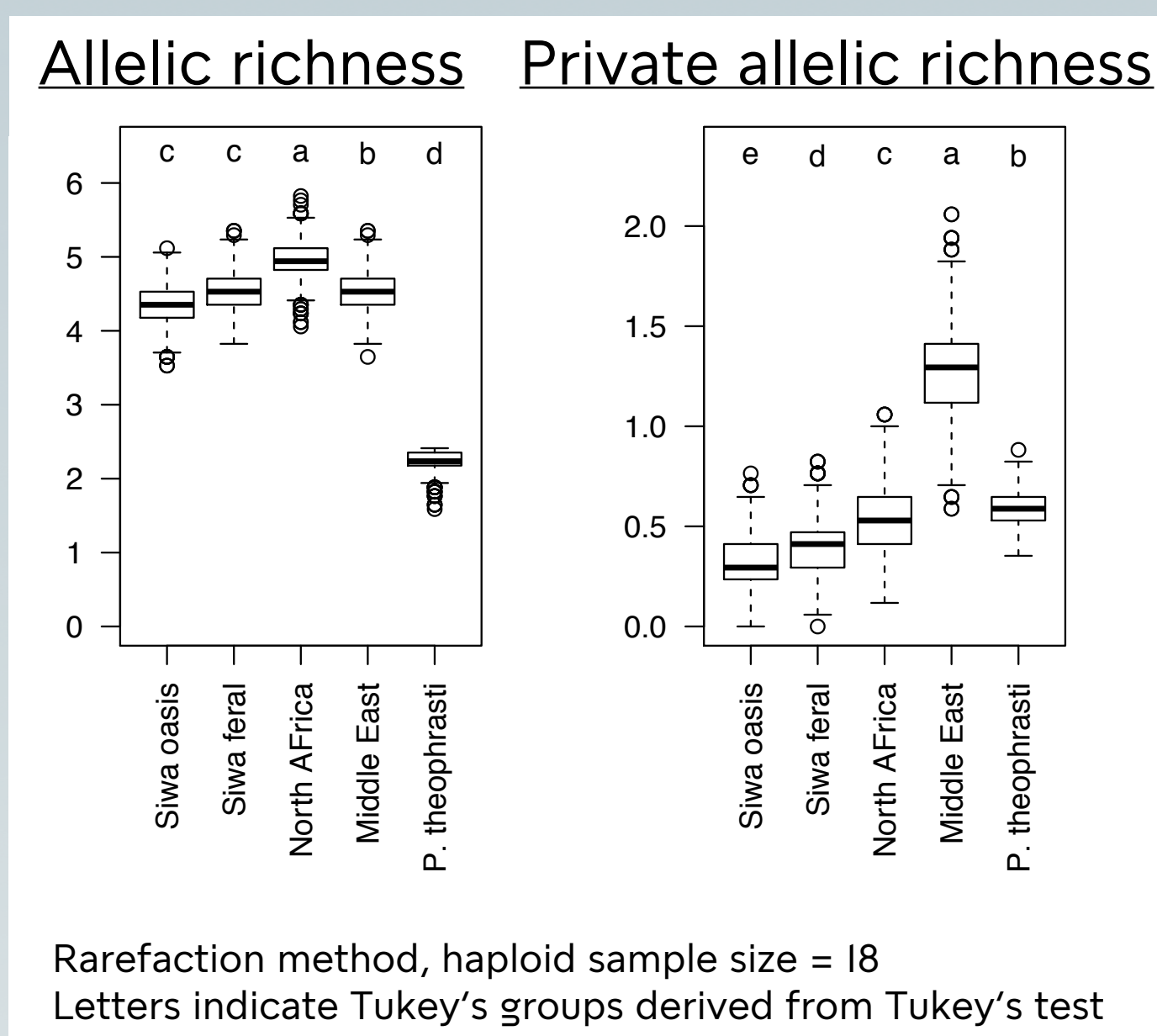
Using an existing SSR dataset from ^{5, 6, 7}.



While we expected Siwa diversity to be found within the known African cluster, we found that it constitutes **a separate population.**



Feral date palms, collected in abandoned oasis around Siwa **share alleles with Phoenix theophrasti**, the species that is known to have introgressed African date palms².



Rarefaction method, haploid sample size = 18
Letters indicate Tukey's groups derived from Tukey's test

Siwa date palms show a **very large diversity** and a diversity that is **unique to this oasis.**

The origins of Siwa date palms is a mystery. Genomic data and our island theory of oases will further help us understanding this unique diversity.



With the decisive collaboration of the Farmers of the Siwa Oasis (Egypt) who shared their practices and knowledge.



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1 - Gros-Balthazard, Muriel, Khaled M. Hazzouri & Jonathan M. Flowers (2018), Genomic Insights into Date Palm Origins. *Genes*, 9 (10), 502. <https://doi.org/10.3390/genes9100502>
2 - Flowers, Jonathan M., et al. (2019), Cross-species hybridization and the origin of North African date palms. *PNAS*, 116 (5), p. 1651-1658. <https://www.pnas.org/content/116/5/1651>
3 - Battesti, Vincent & Gros-Balthazard, Muriel et al. (2018), Date palm agrobiodiversity (*Phoenix dactylifera* L.) in Siwa oasis, Egypt : combining ethnography, morphometry, and genetics. *Human Ecology*, 46 (4), p. 529-546. <https://hal.archives-ouvertes.fr/hal-01716788>
4 - Battesti, Vincent (2013), L'agrobiodiversité du dattier (*Phoenix dactylifera* L.) dans l'oasis de Siwa (Égypte) : entre ce qui se dit, s'écrit et s'oublie ». *Revue d'ethnologie*, 4, <http://dx.doi.org/10.4000/ethnologie.1538>
5 - Zango, O. et al. (2017), Genetic diversity of Southeastern Nigerian date palms reveals a secondary structure within Western populations. *Tree Genet. Genomes* 13, 75. <https://doi.org/10.1007/s11295-017-1150-z>
6 - Zehdi-Azouzi, S. et al. (2015), Genetic structure of the date palm (*Phoenix dactylifera* L.) in the Old World reveals a strong differentiation between eastern and western populations. *Ann. Bot.* 116, 101-112. <https://doi.org/10.1093/aob/mcv068>
7 - Moussouni, Souhila et al. (2017), Diversity of Algerian oases date palm (*Phoenix dactylifera* L., *Arecaceae*): Heterozygote excess and cryptic structure suggest farmer management had a major impact on diversity. *PLOS ONE*, 12 (4), e0175232. <https://doi.org/10.1371/journal.pone.0175232>