



HAL
open science

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

Vincent Battesti, Muriel Gros-Balthazard

► To cite this version:

Vincent Battesti, Muriel Gros-Balthazard. Domestication of date palms in Siwa oasis and across the Middle East and North Africa: articulate the scales of ethnography and domestication over the long term. Harlan III, : the Third Jack R. Harlan International Symposium Dedicated to the Origins of Agriculture and the Domestication, Evolution, and Utilization of Genetic Resources, Jun 2019, Montpellier, France. . hal-02270215

HAL Id: hal-02270215

<https://hal.science/hal-02270215v1>

Submitted on 27 Aug 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

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

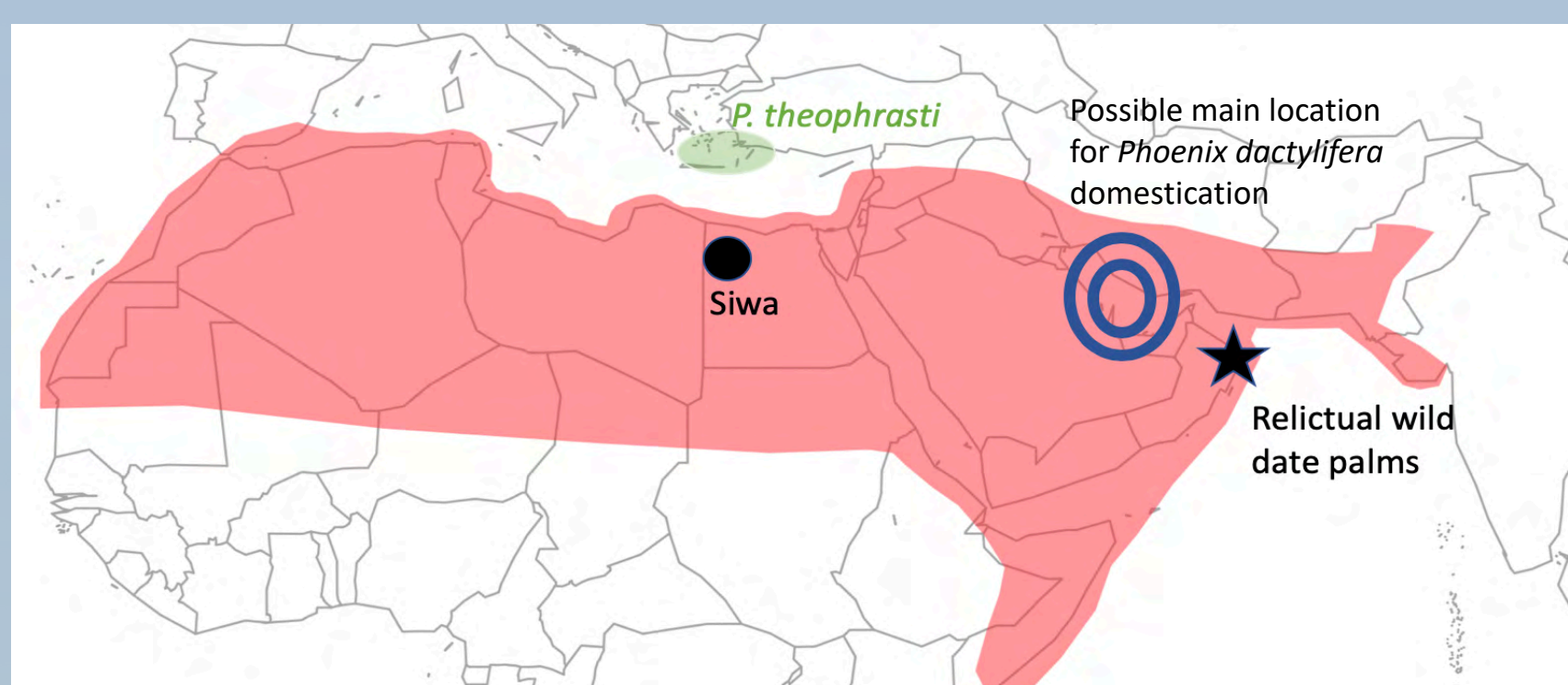
Data : under publication (Gros-Balthazard & Battesti et al.)

Vincent Battesti & Muriel Gros-Balthazard

(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.



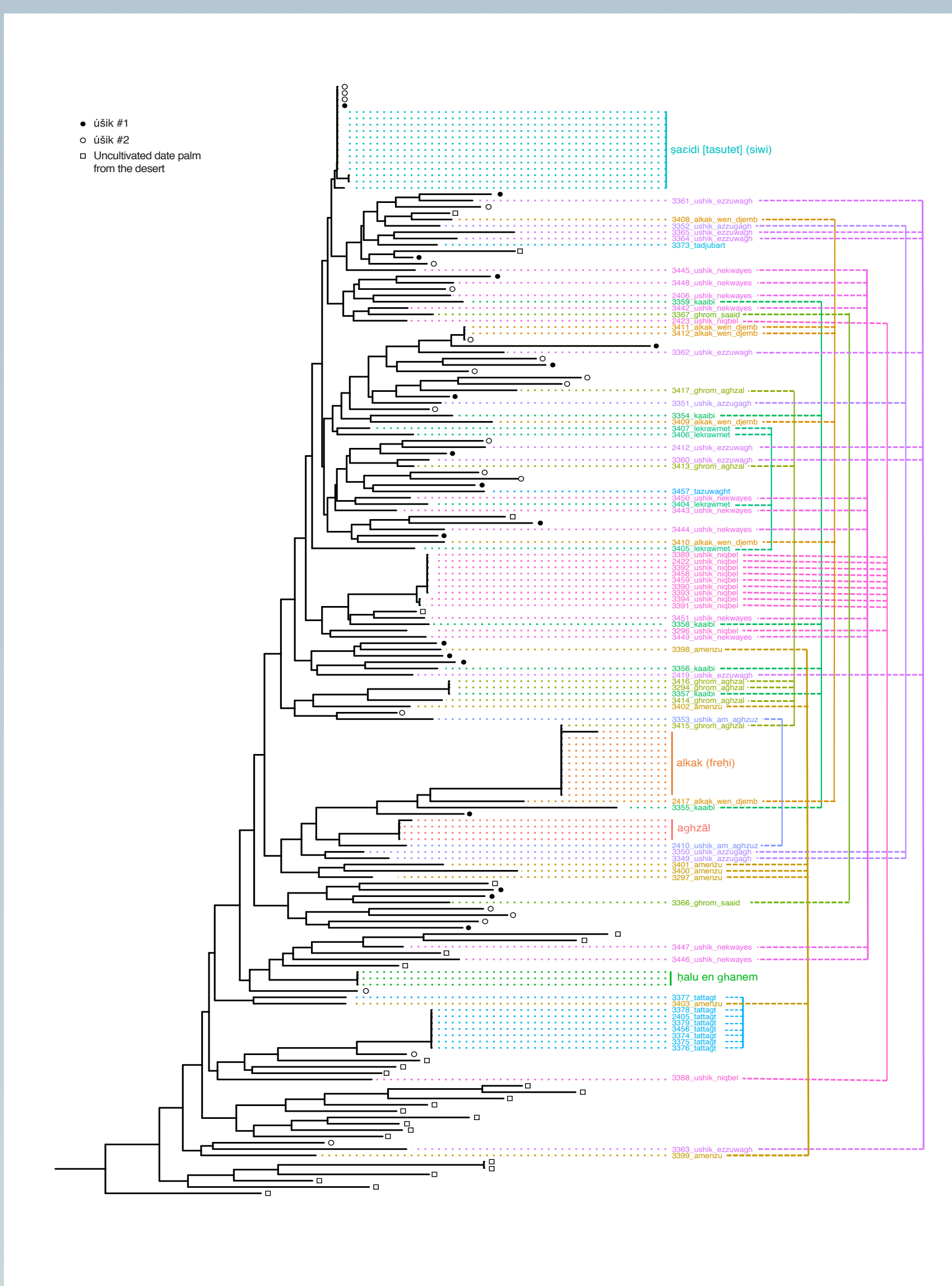
Siwa oasis (Egypt), at the crossroads of ancient Trans-Saharan routes and of the oriental and western genetic cluster

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.

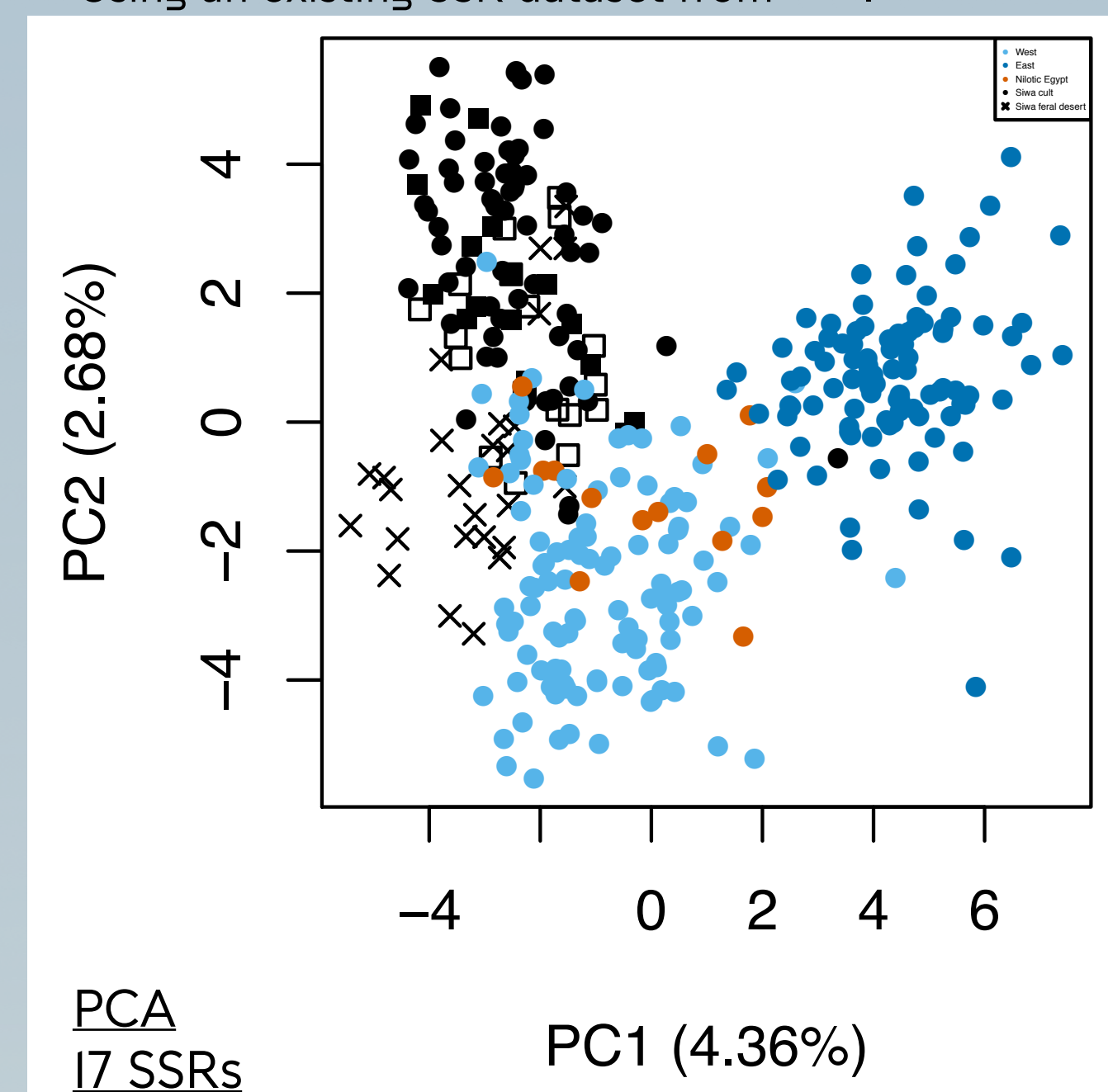
Some named types are true cultivars as supposed to be in oasis phoeniculture: they share not only a formal identity, important for Siwan people, but also a genetic identity. Some are (what we coined) "ethnovarieties," i.e., voluntary collections of multiple clones sharing mostly phenotypic characteristics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

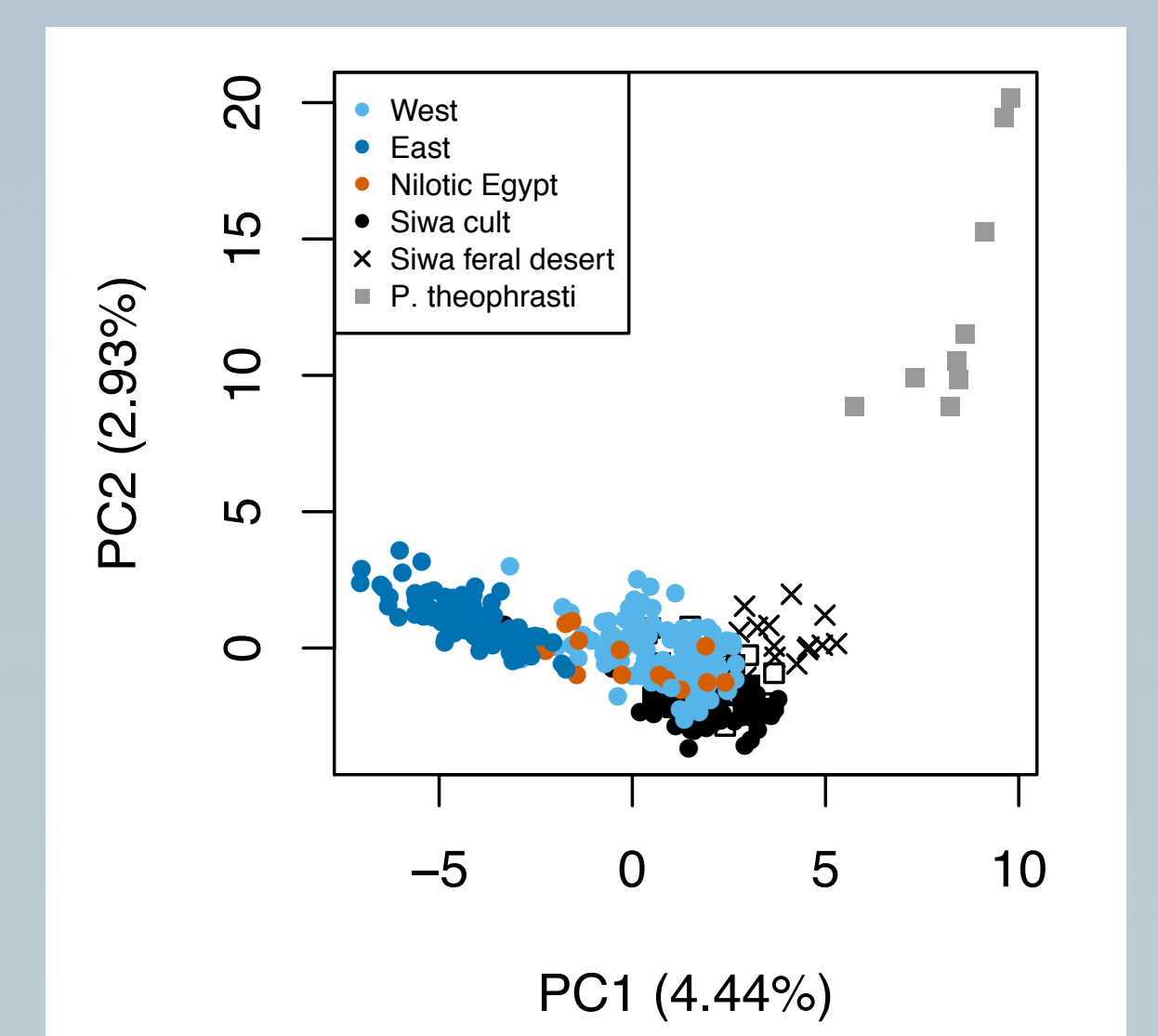
The same idea applies to the notion we call "categories", a way to name other date palms that are not or poorly reproduced by off-shoot by the local community.

An original, large and unique biodiversity in Siwa

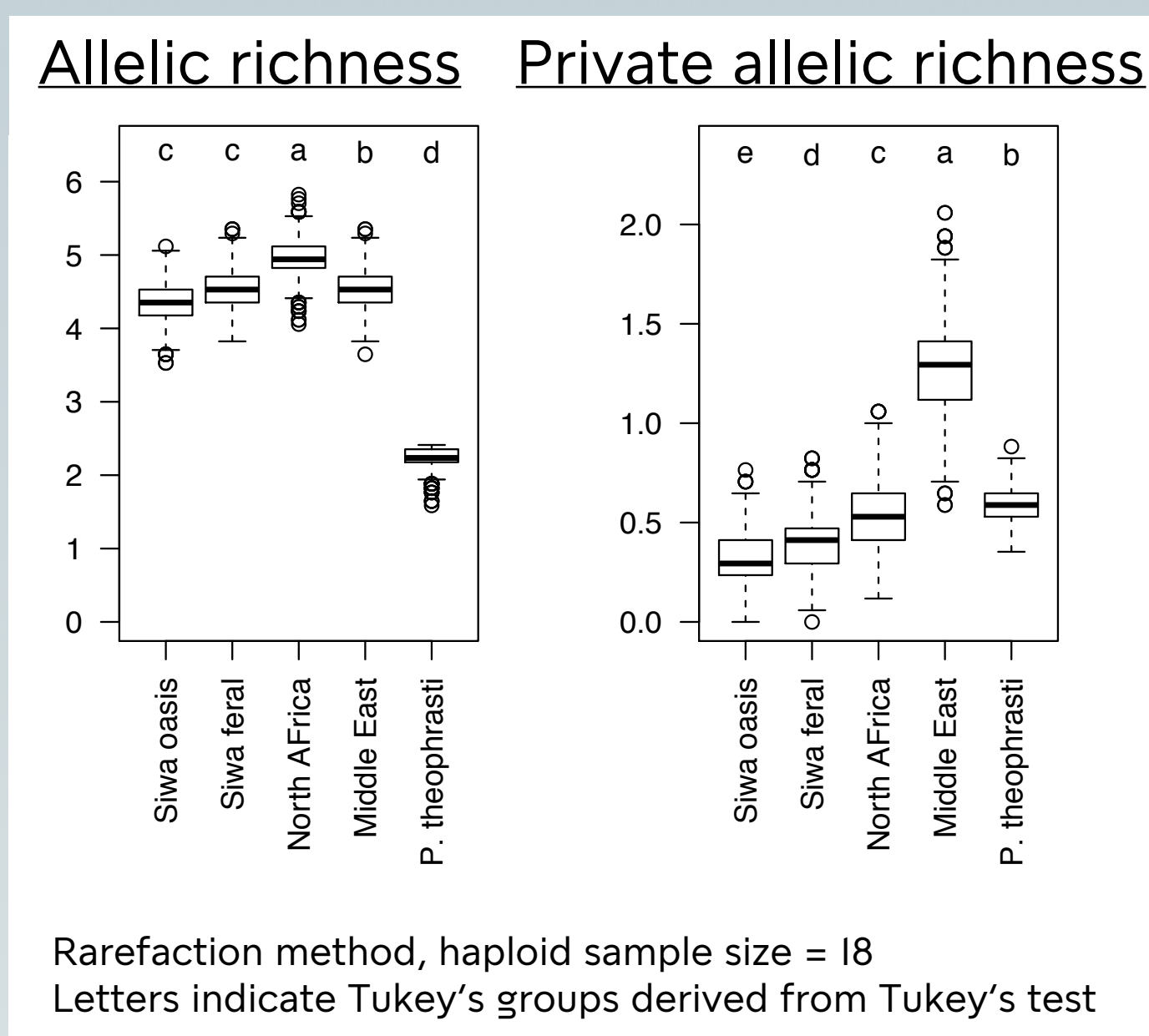
Using an existing SSR dataset from ^{5, 6, 7}.



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.



MUSÉE DE L'HOMME

جامعة نيويورك أبوظبي
NYU | ABU DHABI

UNIVERSITÉ DE MONTPELLIER

Contacts

Vincent Battesti
Musée de l'Homme — UMR 7206 Éco-anthropologie (CNRS MNHN P7)
17, place du Trocadéro - 75016 Paris — France
http://vbat.org — x@vbat.org

Muriel Gros-Balthazard
NYU Abu Dhabi, Saadiyat Campus — Experimental Research (CI), RLI-D
P.O. Box 129188 Abu Dhabi — United Arab Emirates
mgb7@nyu.edu

- 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>