

Ranching, Rendering, and Regional Economies in the 18th-Century Pimería Alta

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Research Themes:

- Ecology and economics of colonialism
 - Introduction of Eurasian livestock
 - Role of Native labor
 - Connect local to global
- Zooarchaeology = more than diet
 - “the study of animal remains from archaeological sites”



Skinning mark on deer
astragalus, 18th century,
Alabama

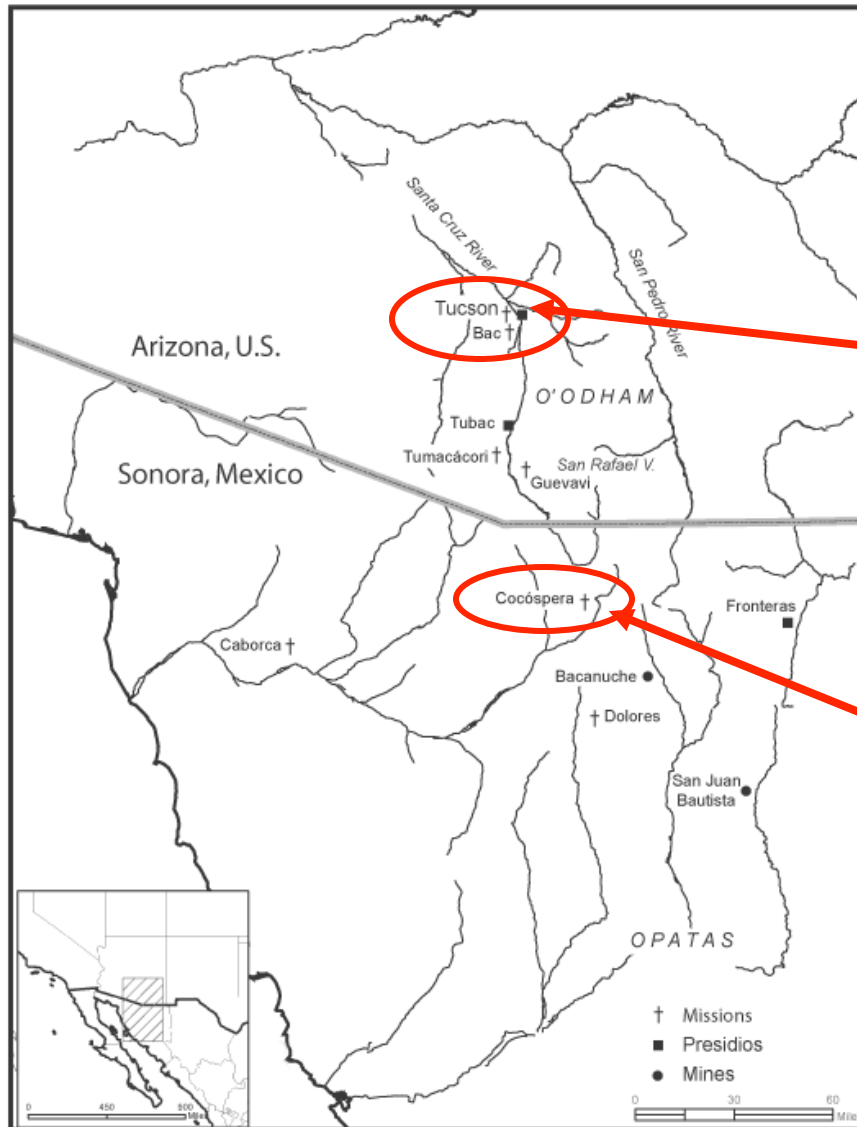
Pimería Alta Missions

Mission San Agustín
de Tucson

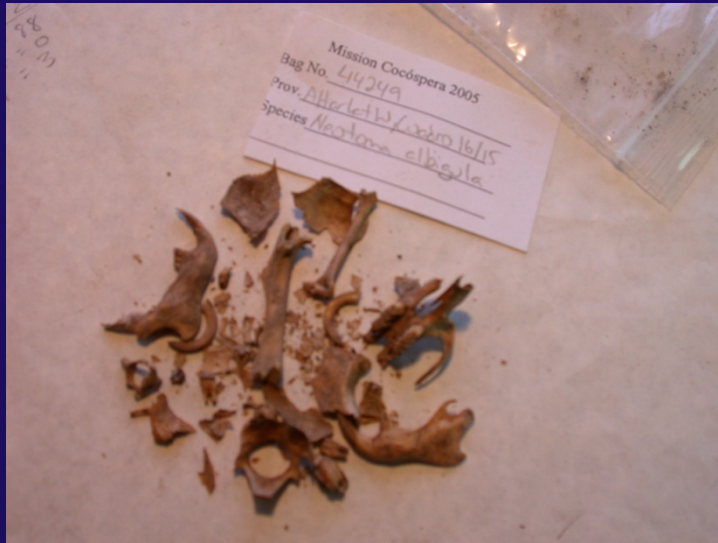
(A.D. 1795-1820)

Mission Nuestra
Señora del Pilar y
Santiago de
Cocóspera

(18th Century)



Quantifying Animal Remains

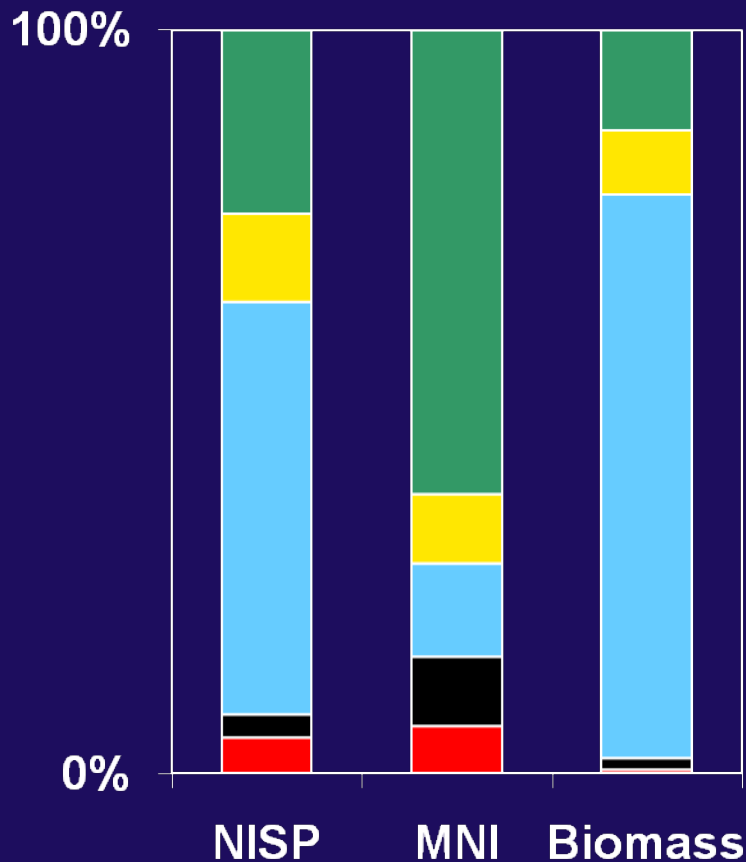


NISP: Number of Identified Specimens (bone count)

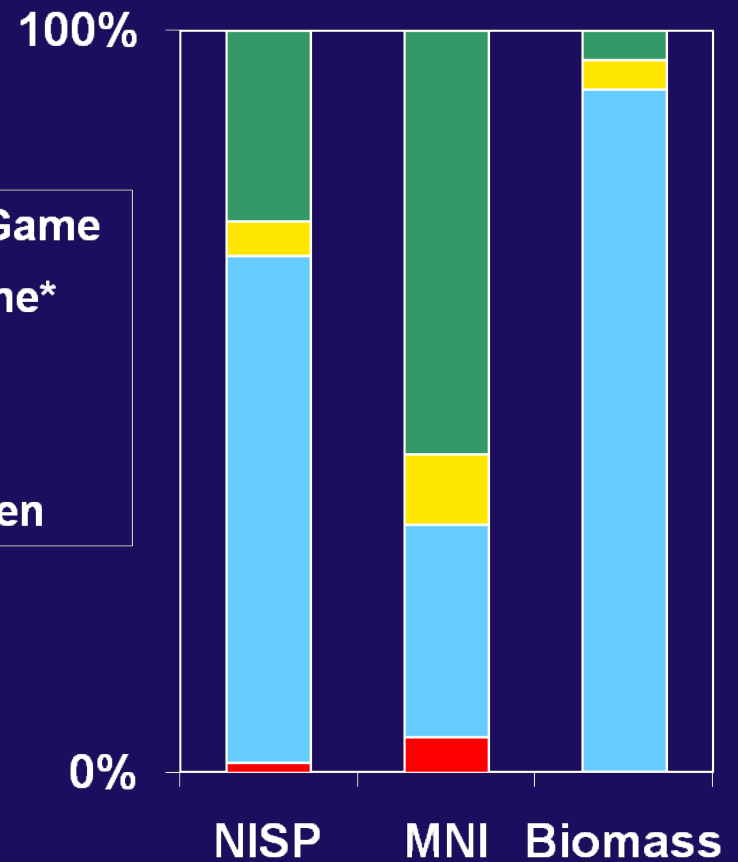
MNI: Minimum Number of Individuals

Biomass: Meat Weight

Mission Cocóspera (NISP = 6,406)



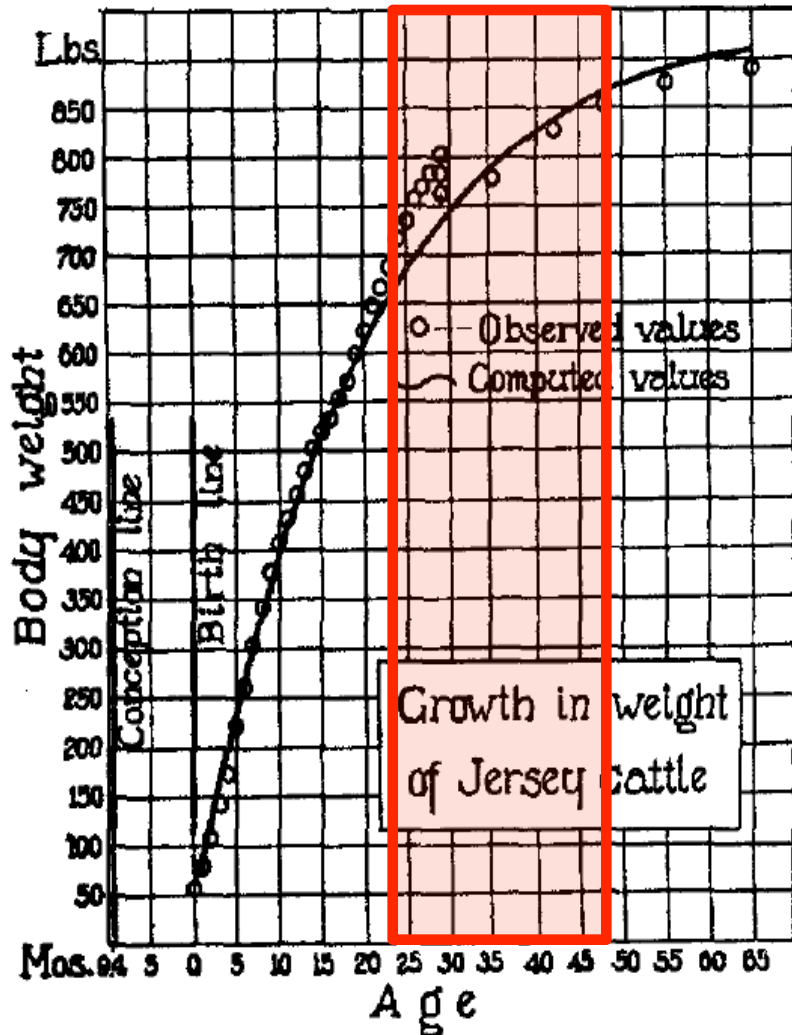
Mission San Agustín (NISP = 7,933)



NISP: bone count
MNI: min # of individuals
Biomass: meat weight

* Caprine = sheep and goats

Fall Slaughter



“On November 11, [1758], Cathalina, wife of Cristóbal the culi, burst from an intestinal blockage caused by eating too much meat during the slaughter. She did not receive the sacraments and was buried here in the cemetery without cross and without light and without ringing the bells. Gaspar Stiger” Mission San Ignacio, 1758

Red = Age of mission cattle

Fragmentation Index

Mission San Agustín	Mission Cocóspera
0.32	0.11

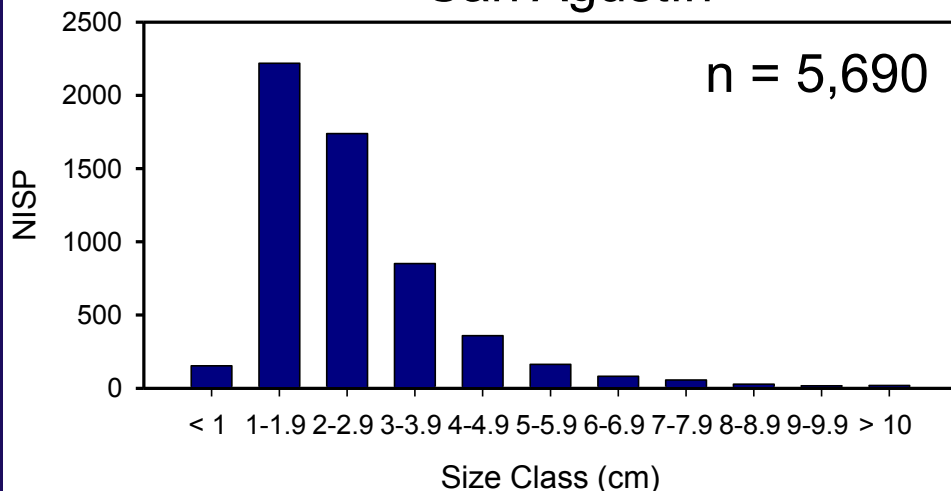


1 = all bones whole



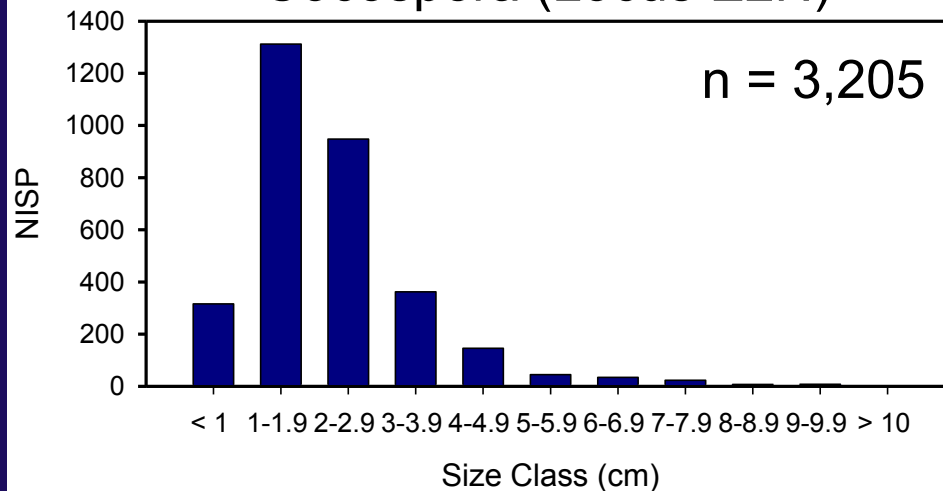
Fragment Size*

San Agustín



*Fragments from medium to large body size mammals only.

Cocóspera (Locus E2N)



Tallow

- Break open bones and boil off fat and grease
- 18th century: candles, “butter”, industrial lubricants, soap

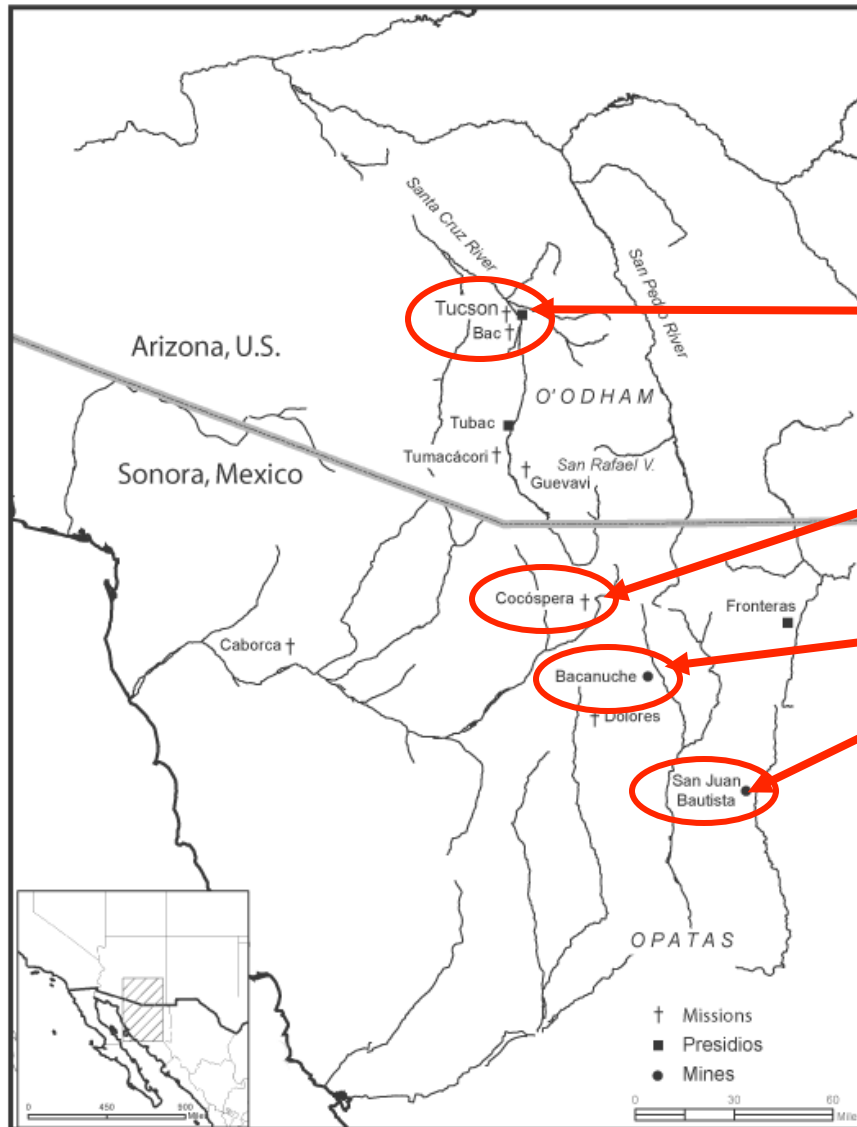


Demonstration tallow vat at
Sonoma Mission, California (U.S.)
<http://missiontour.org/sonoma/tour03.htm>

“Those who slaughter several cattle at one time throw all the bones and marrow into a kettle full of water, cook them, and skim off the fat floating on top.”

Pfefferkorn, Sonora: A Description of the Province, 1795.

Regional Economic Interactions



Mission San Agustín

Mission Cocóspera

Mines

- Candles
- Axle Grease
- Soap
- Cattle hide

How were herds managed on
the landscape?

Stable Isotope Applications

- Free-ranging or foddering? (C,O)
 - Possible to tell?
- Watering practices? (O)
 - A post-hoc question...

$$\delta(^{18}\text{O}, ^{13}\text{C}, ^{15}\text{N}) = \left[\frac{R_{\text{sample}} - R_{\text{standard}}}{R_{\text{standard}}} \right] \times 1000$$





Sampling modern
cattle teeth, water,
and graze.



Dr. Deanna Grimstead collecting water
samples at the McGibbon-King Ranch,
Three Points, AZ

Confounding $\delta^{13}\text{C}$ Variables

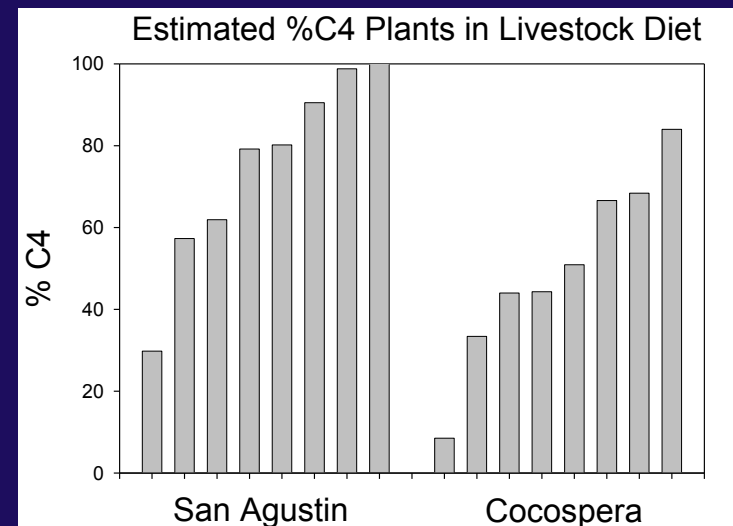
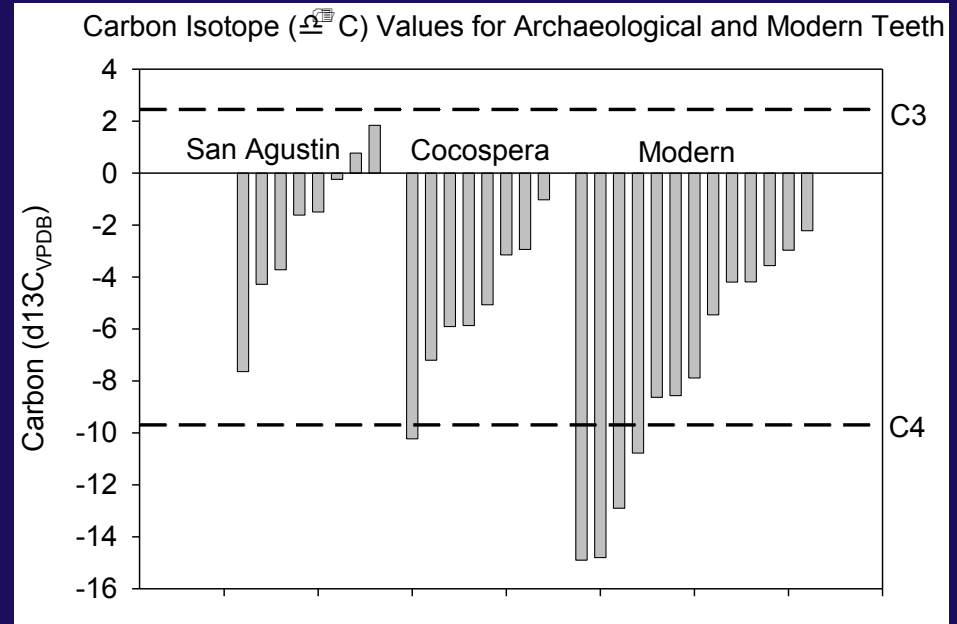
- Desert grasses and maize all follow C4 pathways
- CAM plants (eg. cacti) blur C3/C4 signal



$$\delta^{13}\text{C} = \left[\frac{\frac{^{12}\text{C}}{^{13}\text{C}}_{\text{smpl}} - \frac{^{12}\text{C}}{^{13}\text{C}}_{\text{std}}}{\frac{^{12}\text{C}}{^{13}\text{C}}_{\text{std}}} \right] \times 1000$$

Carbon ($\delta^{13}\text{C}$) Results

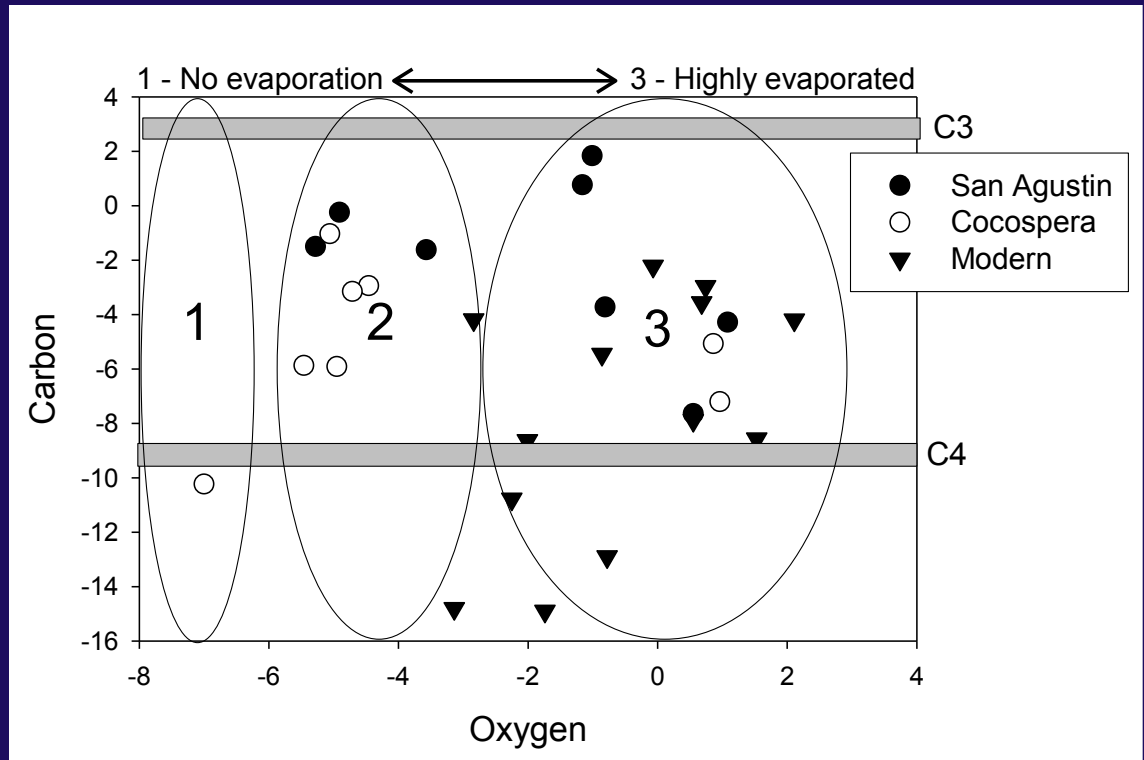
- Animal diets mixed, but lots of C4
- CAM plants may muddy signal
- Riparian C3 plants are minor



Oxygen ($\delta^{18}\text{O}$) Results

- Livestock drinking evaporated water
- Water storage!

Water Sample	VSMOW $\delta^{18}\text{O}\text{‰}$
Meteoric	-7.73
Evaporated: Cattle Trough	-3.20
Evaporated: Dam #1	-4.28
Evaporated: Dam #2	-3.76



$$\delta^{18}\text{O}_{(\text{PO}_4^{-3})} = 0.71[\delta^{18}\text{O}_{\text{H}_2\text{O}}] + 22.6$$

Isotope Implications

- Maize-foddering not distinguishable from free-ranging in Sonoran Desert
- Livestock probably grazed away from riparian zones
- Missions stored water for livestock use!

Conclusions:

- Cattle ranching paramount
- Ranching = commodity extraction
 - Tallow
- Cattle free-ranged, water storage
- Missions supported regional economy
 - Driven by O'odham labor



Future Directions: Mission Guevavi

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