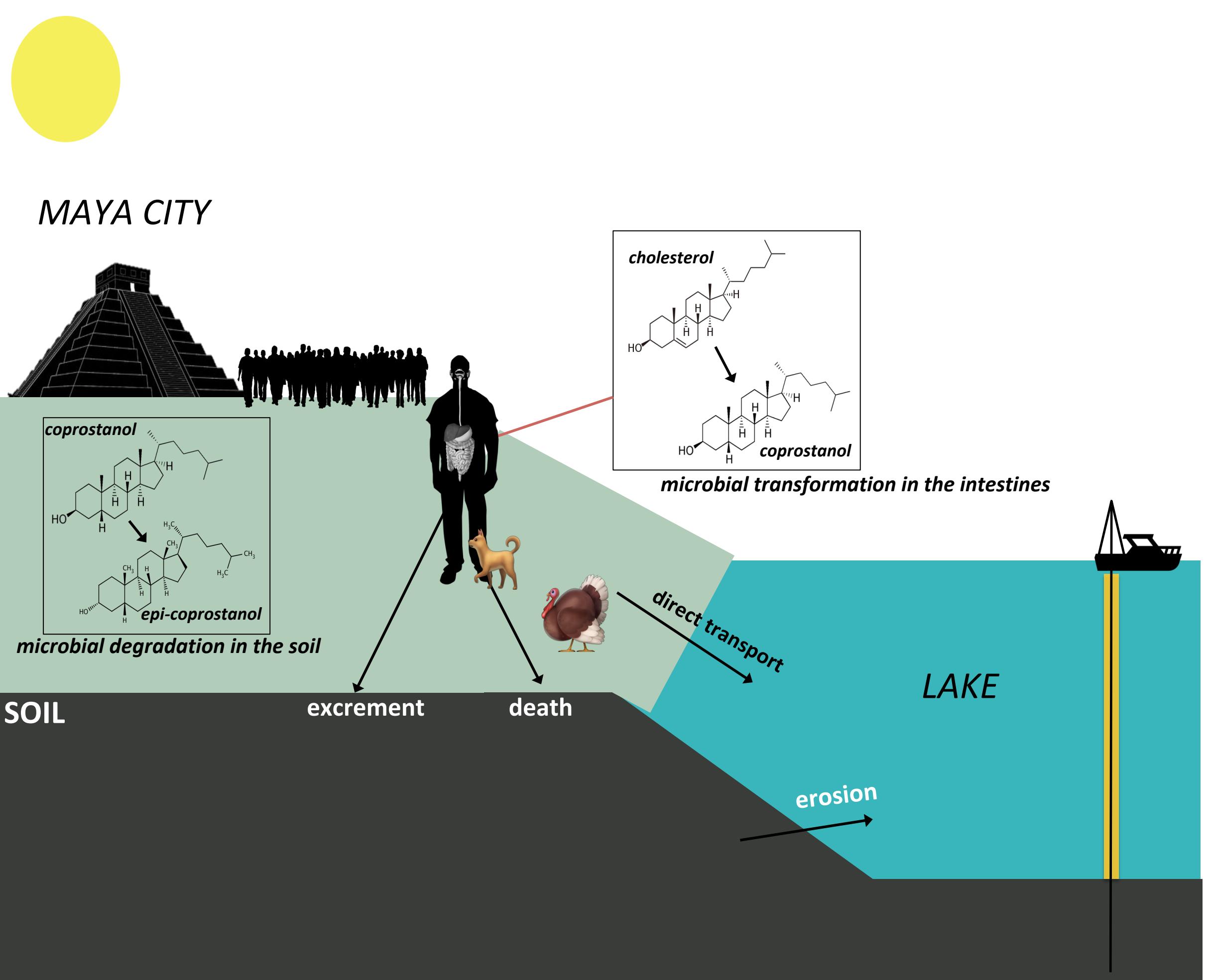


# DETERMINING THE CONTROLS ON FAECAL STANOL CONCENTRATIONS AND RATIOS IN TROPICAL LAKE SEDIMENTS

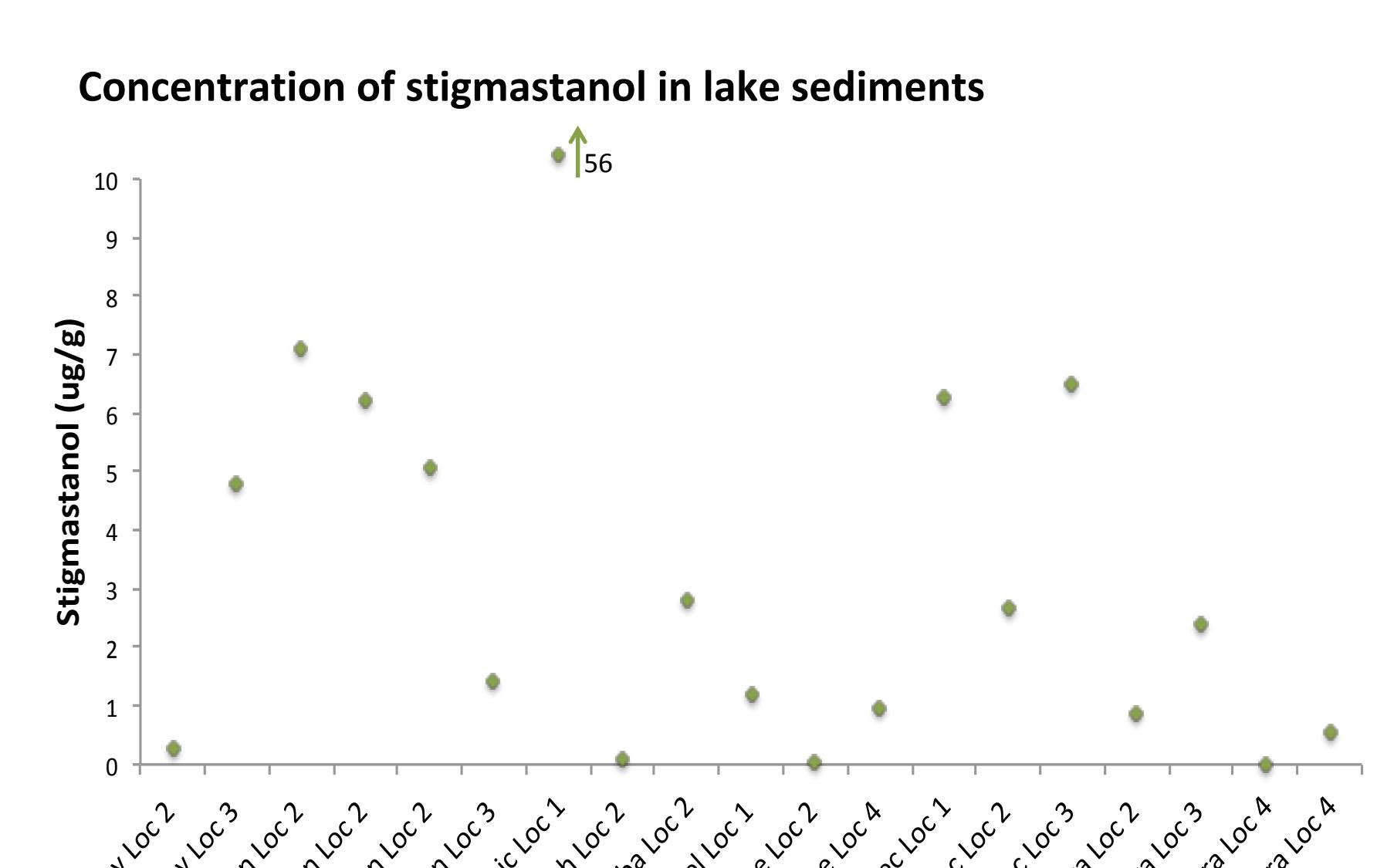
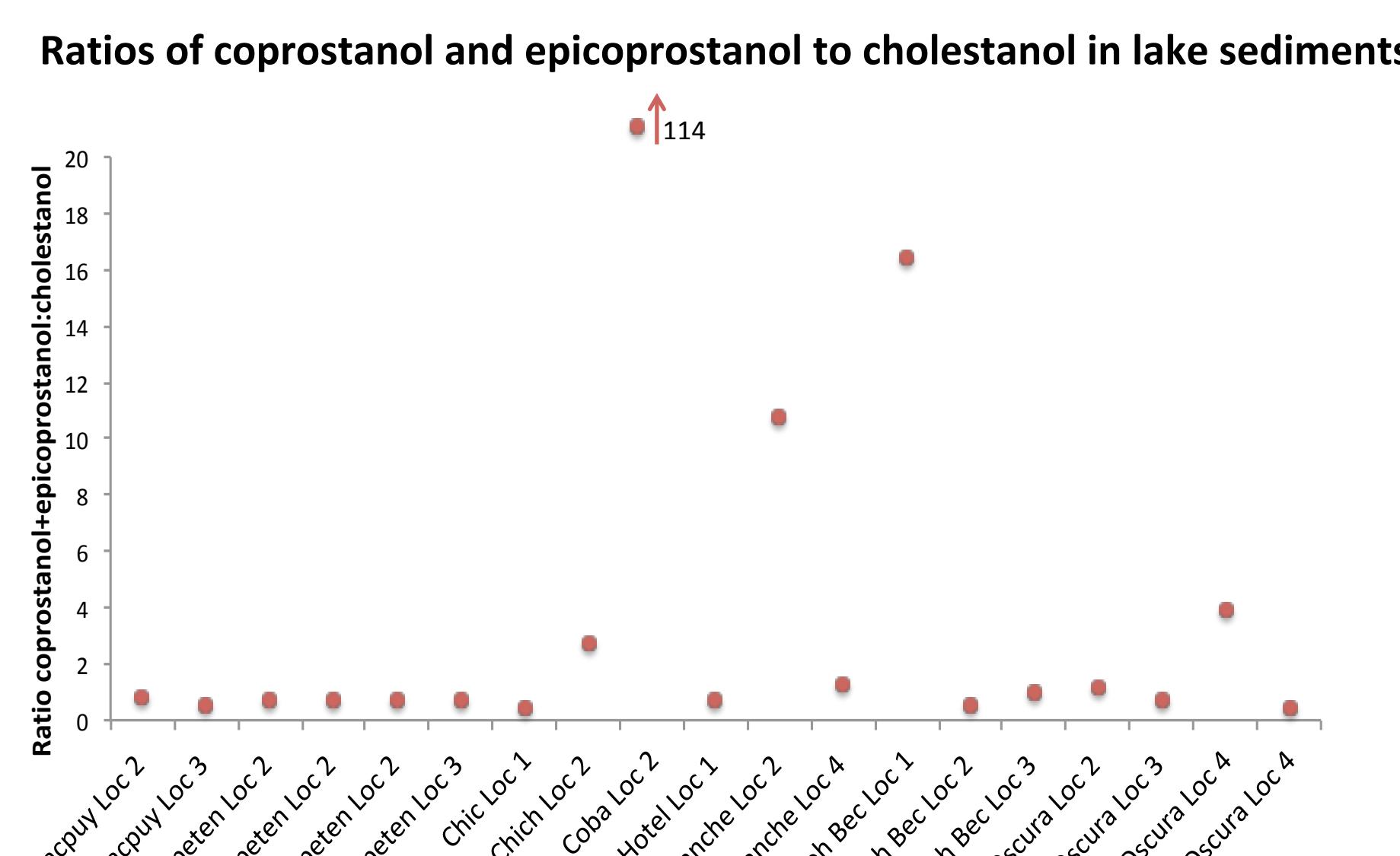
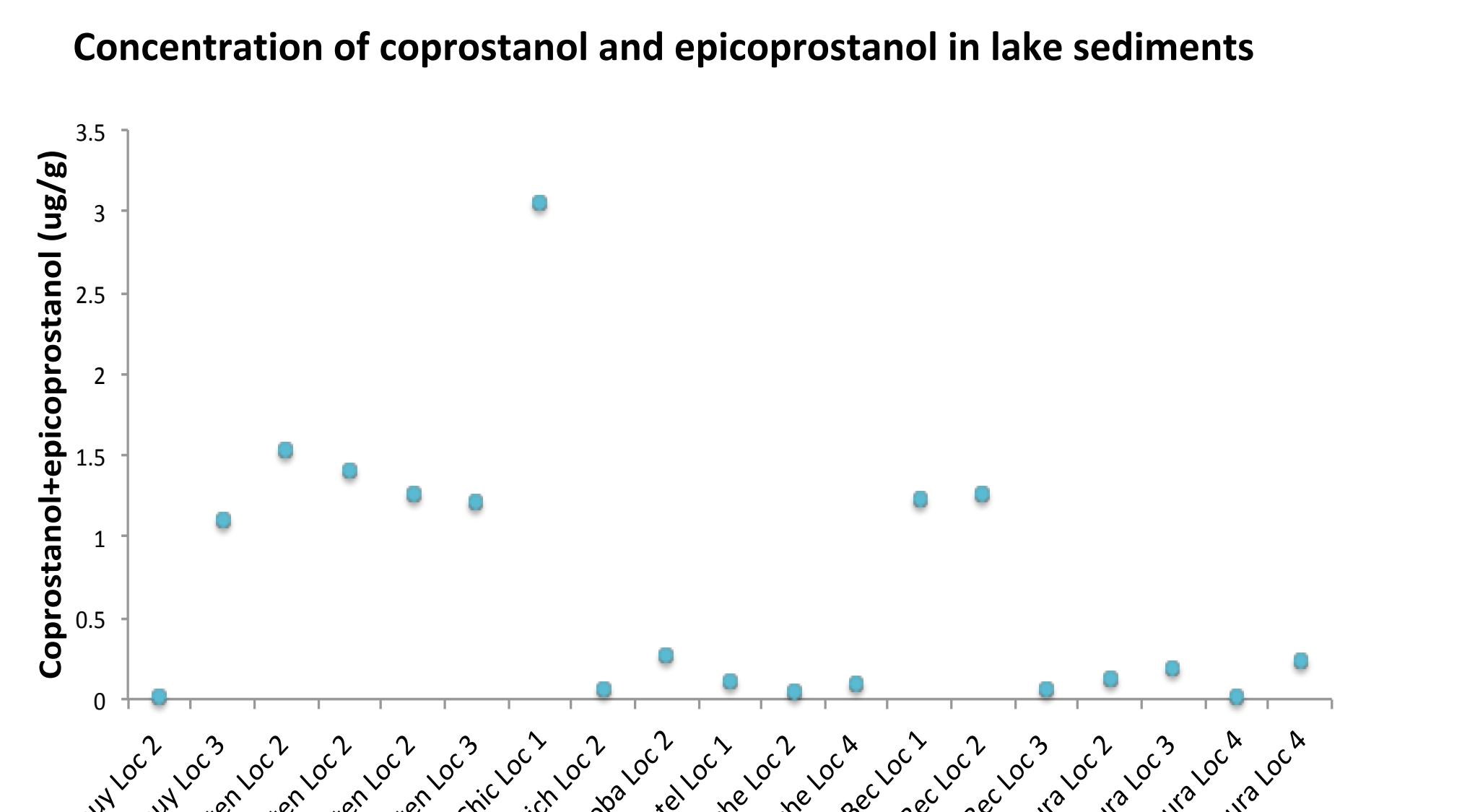
Benjamin Keenan<sup>1</sup>, Peter Douglas<sup>1</sup>, Emma Fabre<sup>2</sup>, Andrew Breckenridge<sup>3</sup>, Kevin Johnston<sup>4</sup>, Jonathan Obrist-Farner<sup>5</sup>

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## ANCIENT APPLICATION

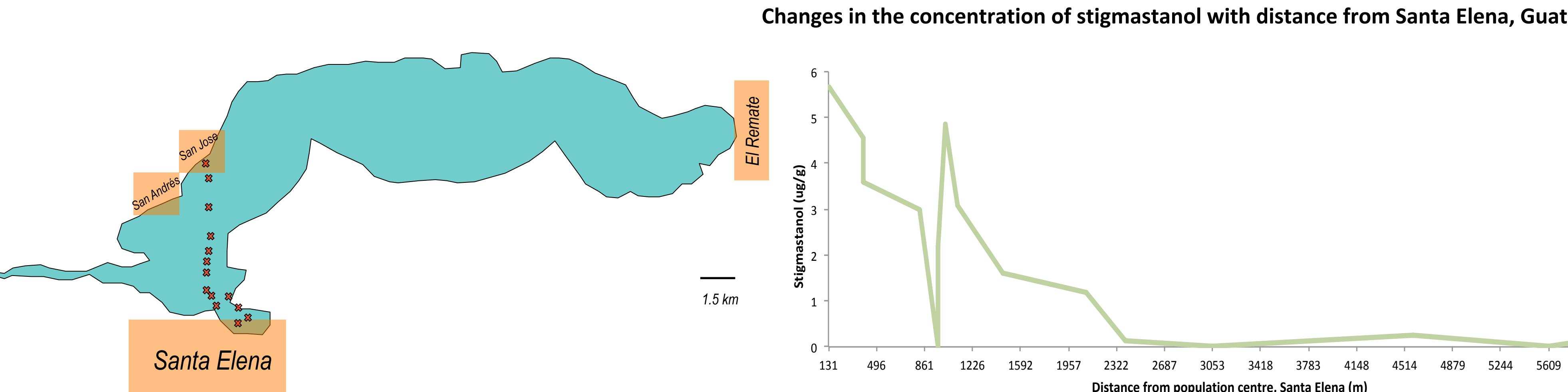


## MODERN CALIBRATION

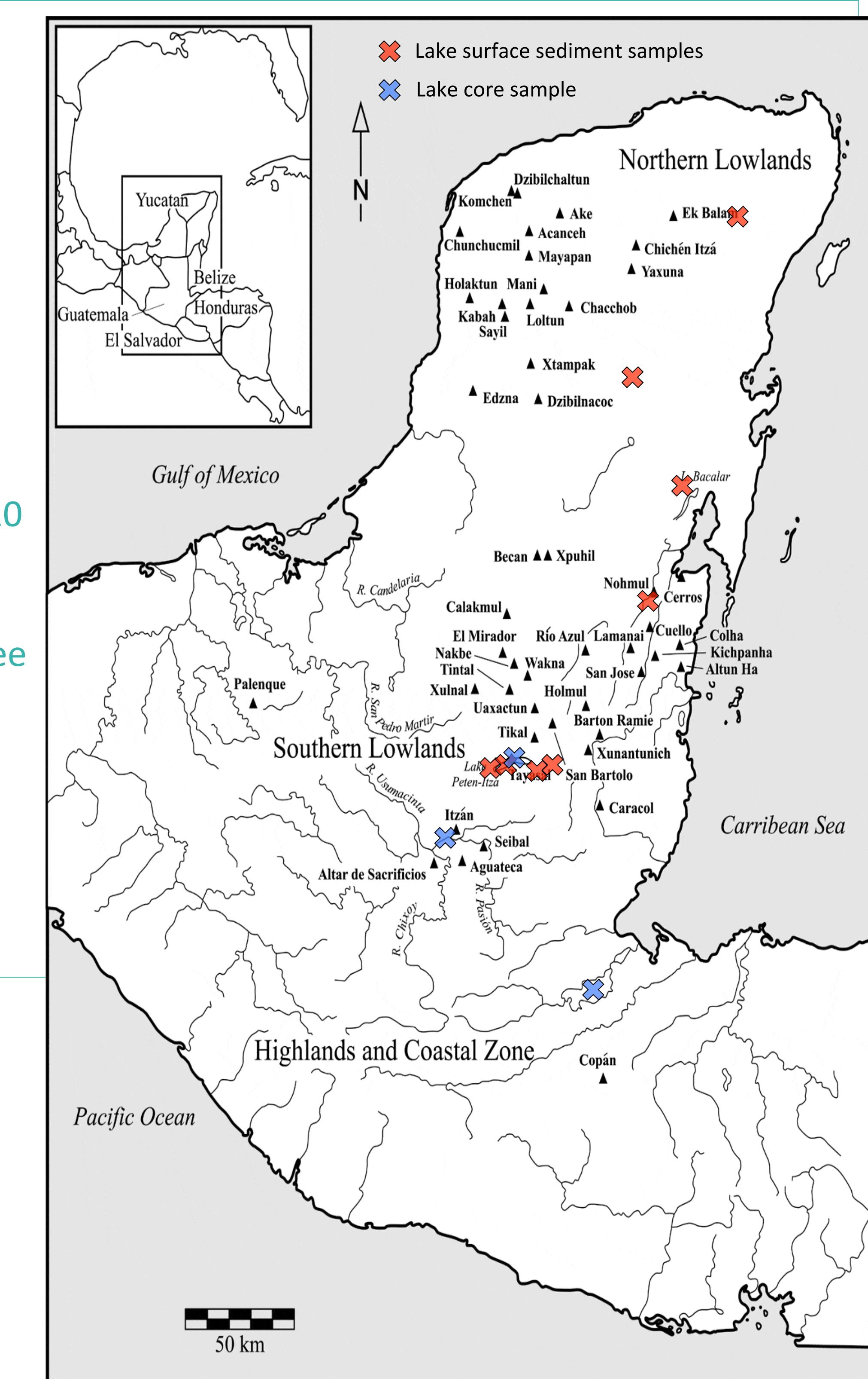
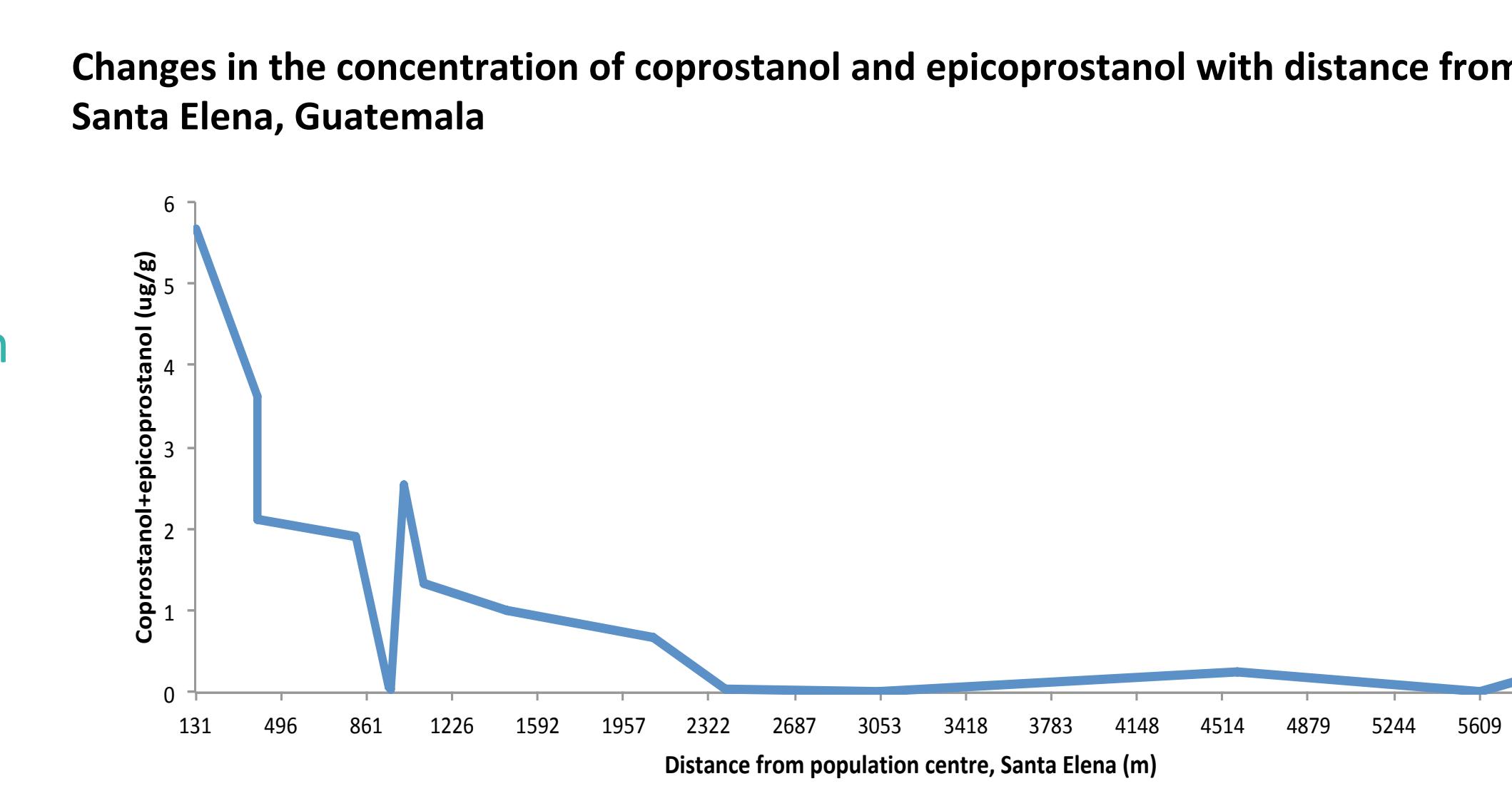


- Lot of variability that does not seem to be related to proximity to human settlements
  - Some sampling sites located close to towns (Coba) but low concentrations
  - Coba is close to a town and has a very high ratio, L. Chichancanab further from town but have very high concentrations
- Unknown effects of sewage management/treatment- different levels of infrastructure across the peninsula*
- Significant spatial variability in concentrations within the same lake (Chichancanab, Noh Bec, Sacuy)
  - Chichancanab extremely high values for coprostanol and stigmastanol. High values do not translate to high ratios: this is likely a function of transport/preservation as opposed to source
  - Stigmastanol is the dominant faecal stanol in modern lake sediments

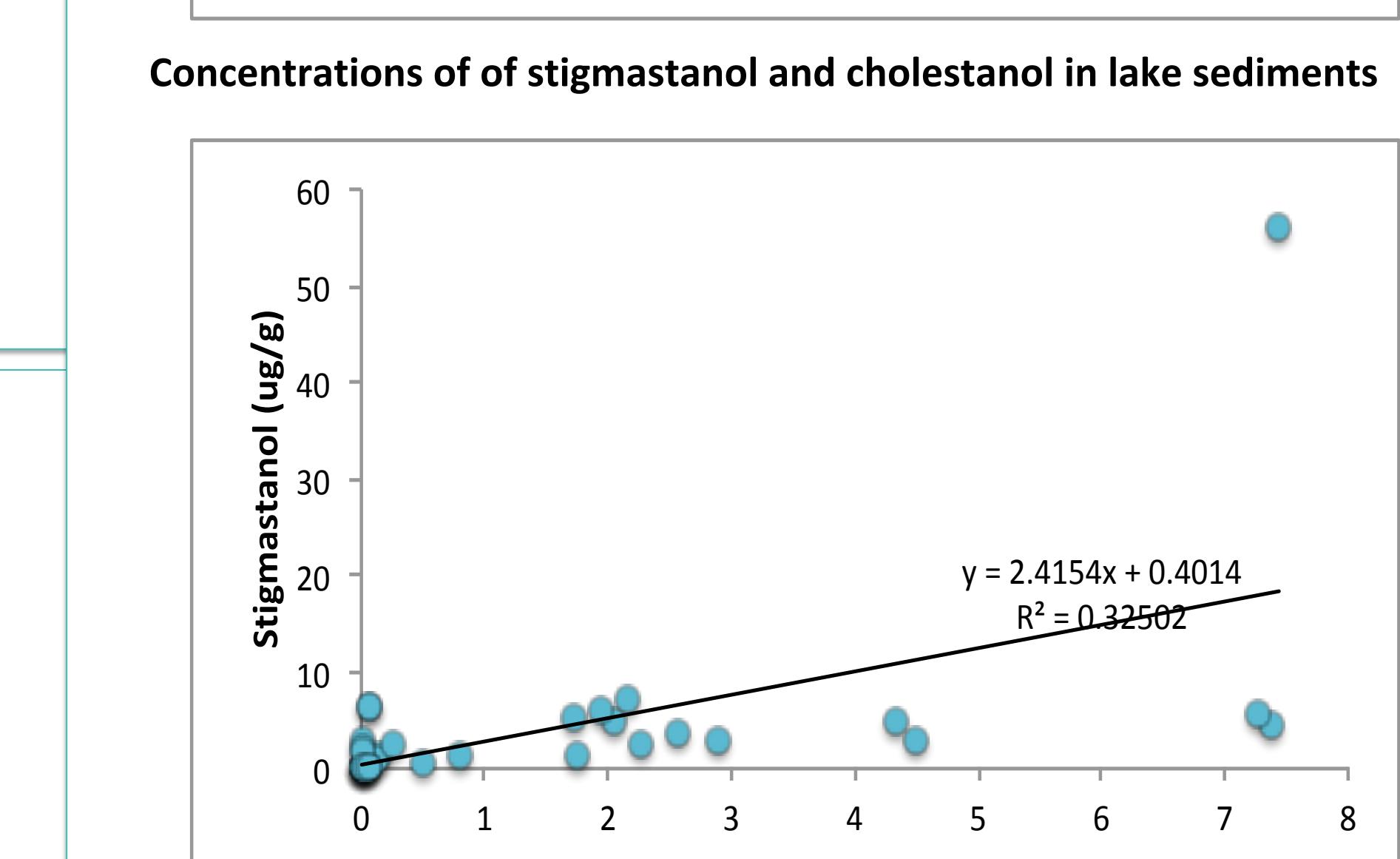
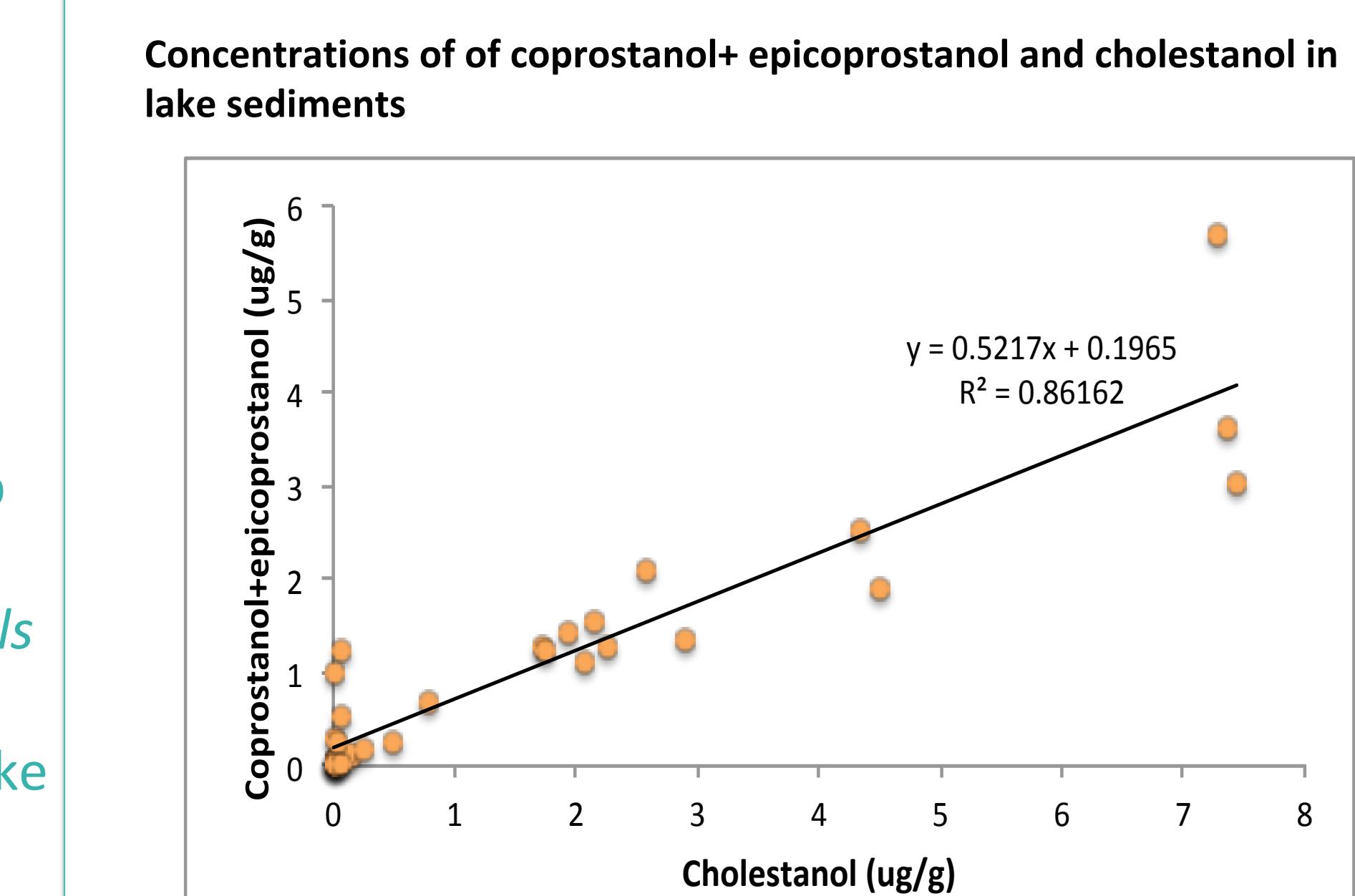
## LAGO PETEN-ITZA



- As expected, concentrations of coprostanol decrease away from Santa Elena but do not increase with proximity to population centres on the northern side of the lake
- Stigmastanol concentrations have a similar pattern and could reflect livestock populations
- Low faecal stanol concentrations close to Santa Elena (861 m from population centre) show that other variables influence either the deposition or preservation of faecal stanols

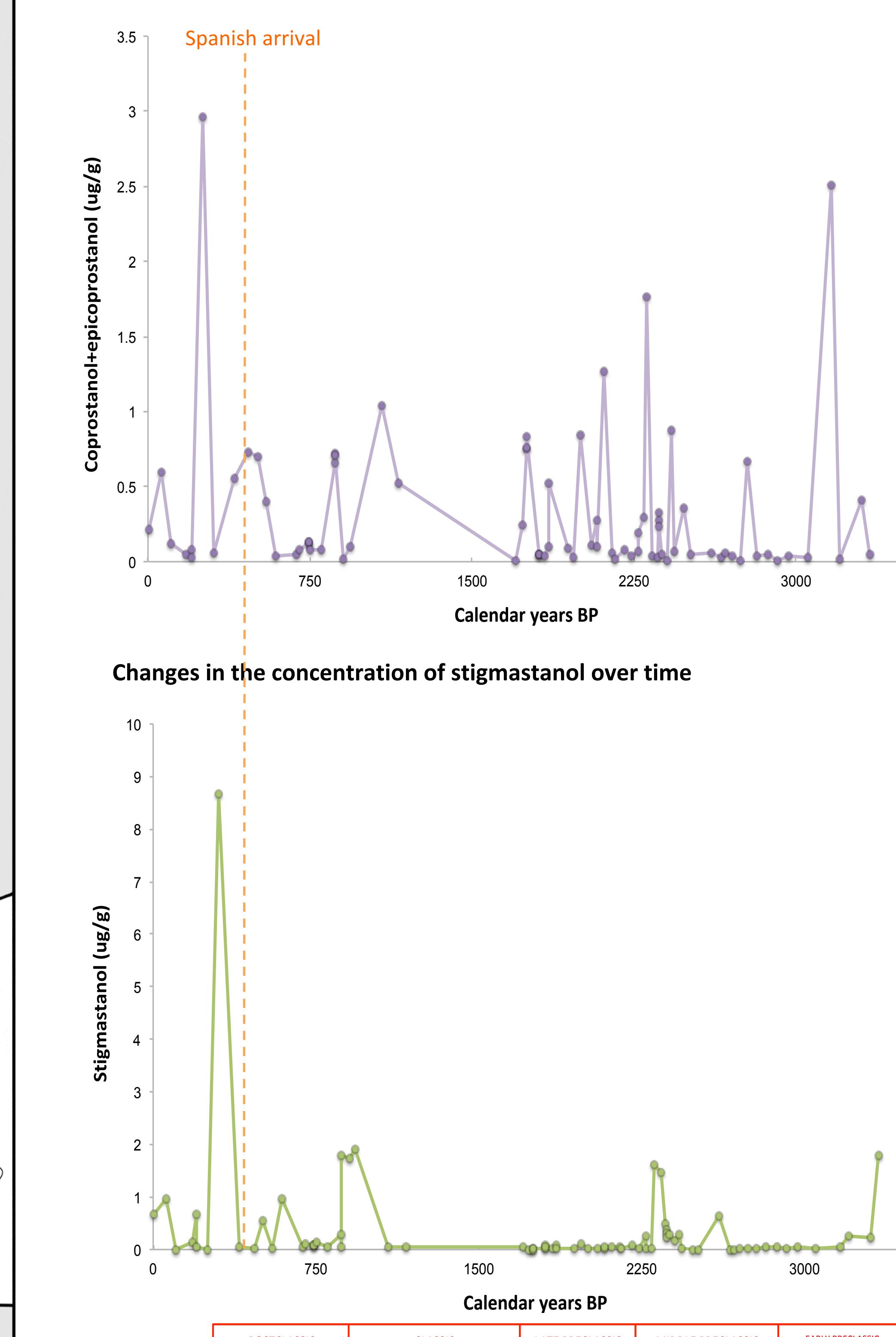


## IS USING RATIOS APPROPRIATE?

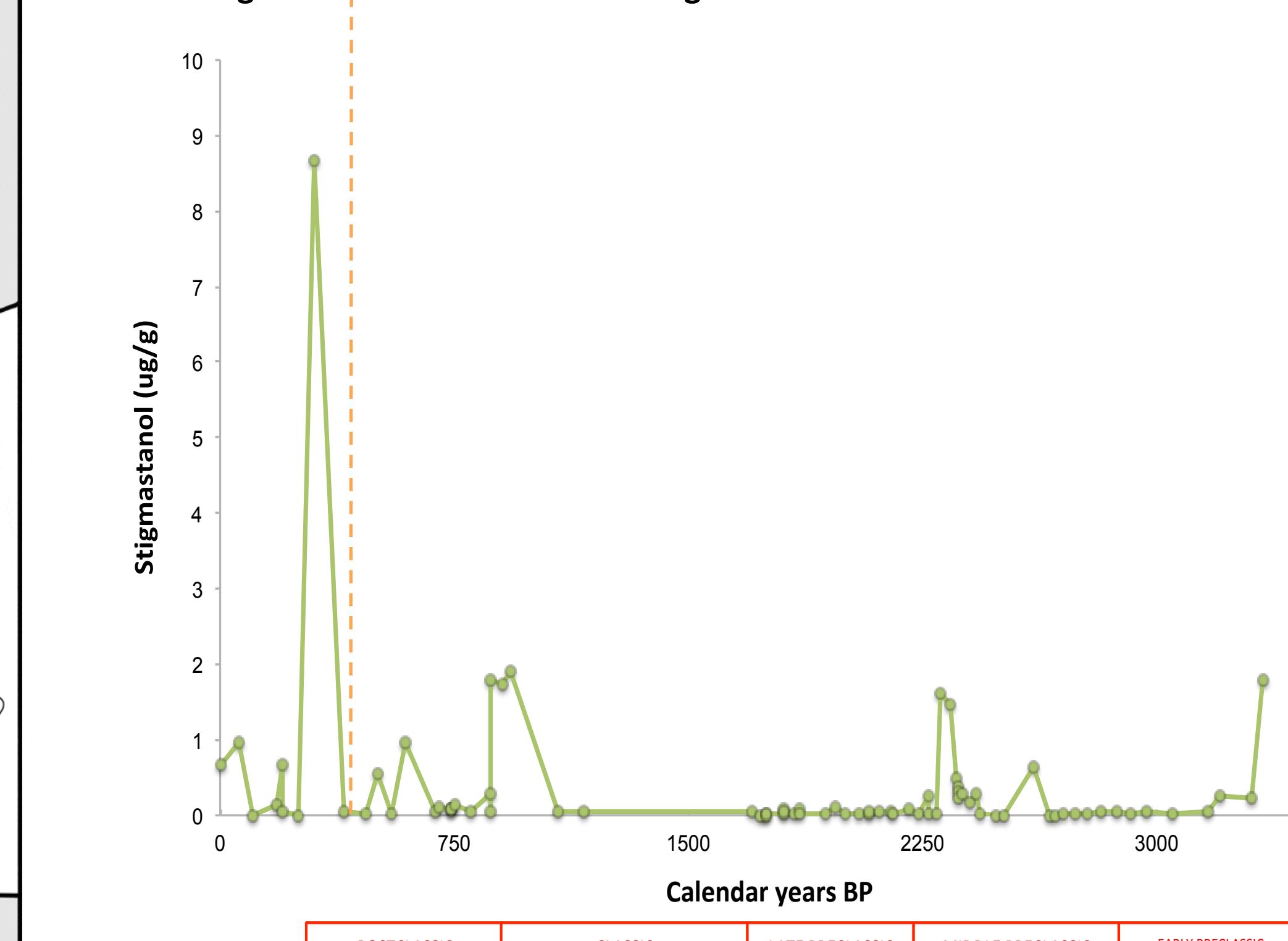


Coprostanol and cholestanol correlation suggests that the processes controlling the deposition/preservation are similar  
The correlation between stigmastanol and cholestanol is less certain

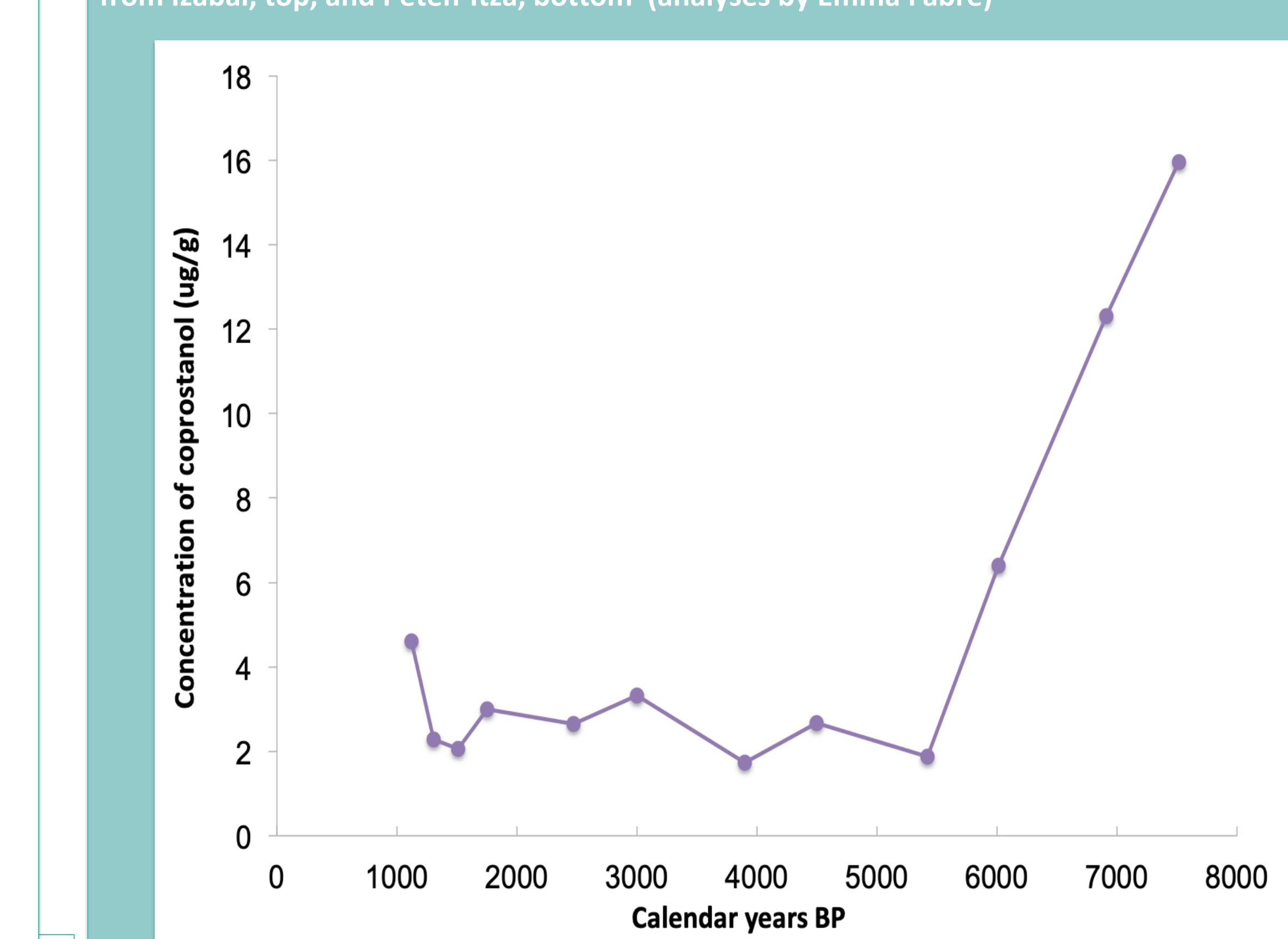
### Changes in the concentration of coprostanol+epicoprostanol over time



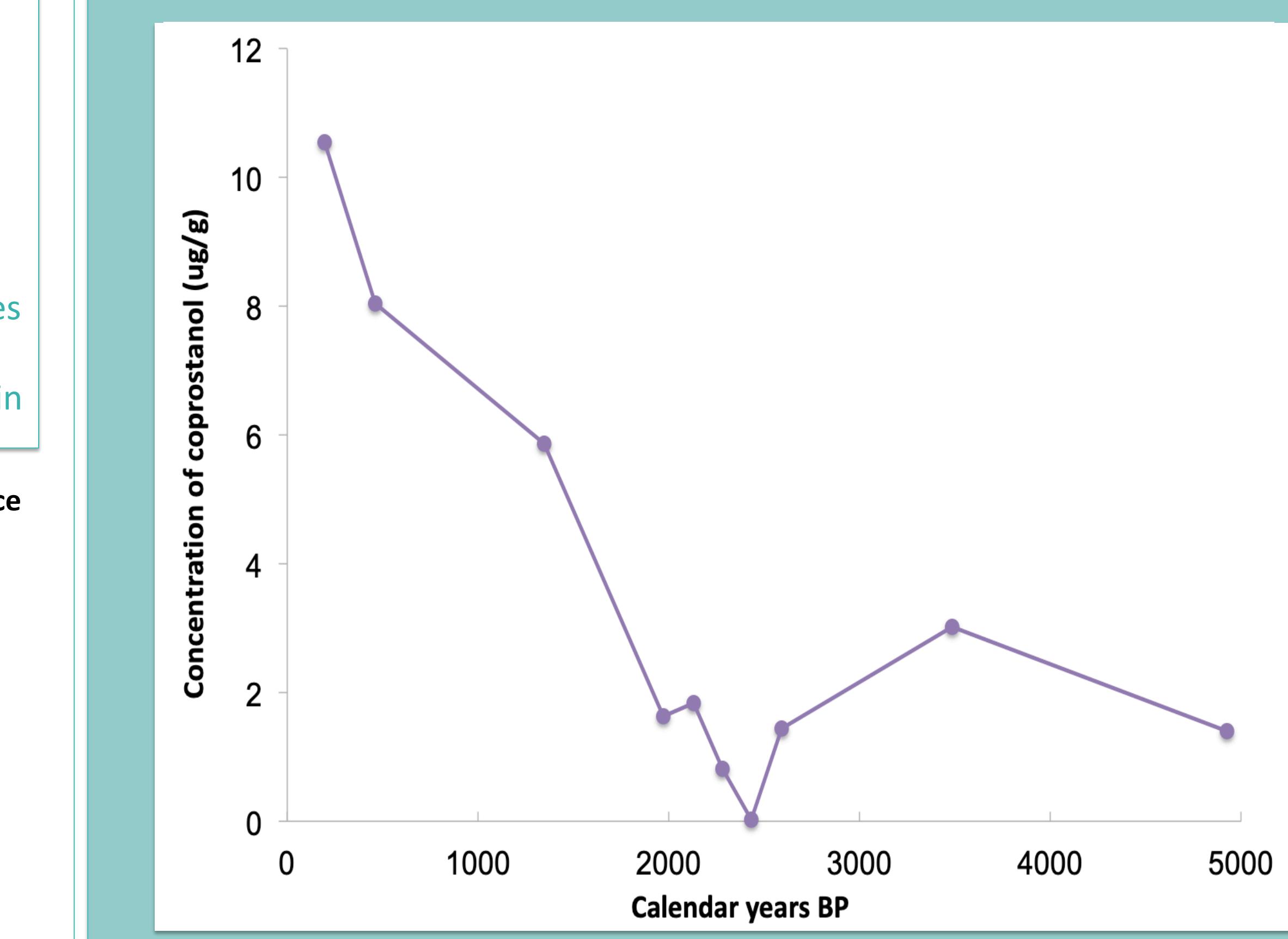
### Changes in the concentration of stigmastanol over time



### Changes in the absolute concentration (ug/g) in coprostanol over time in sediment cores from Izabal, top, and Peten-Itza, bottom (analyses by Emma Fabre)

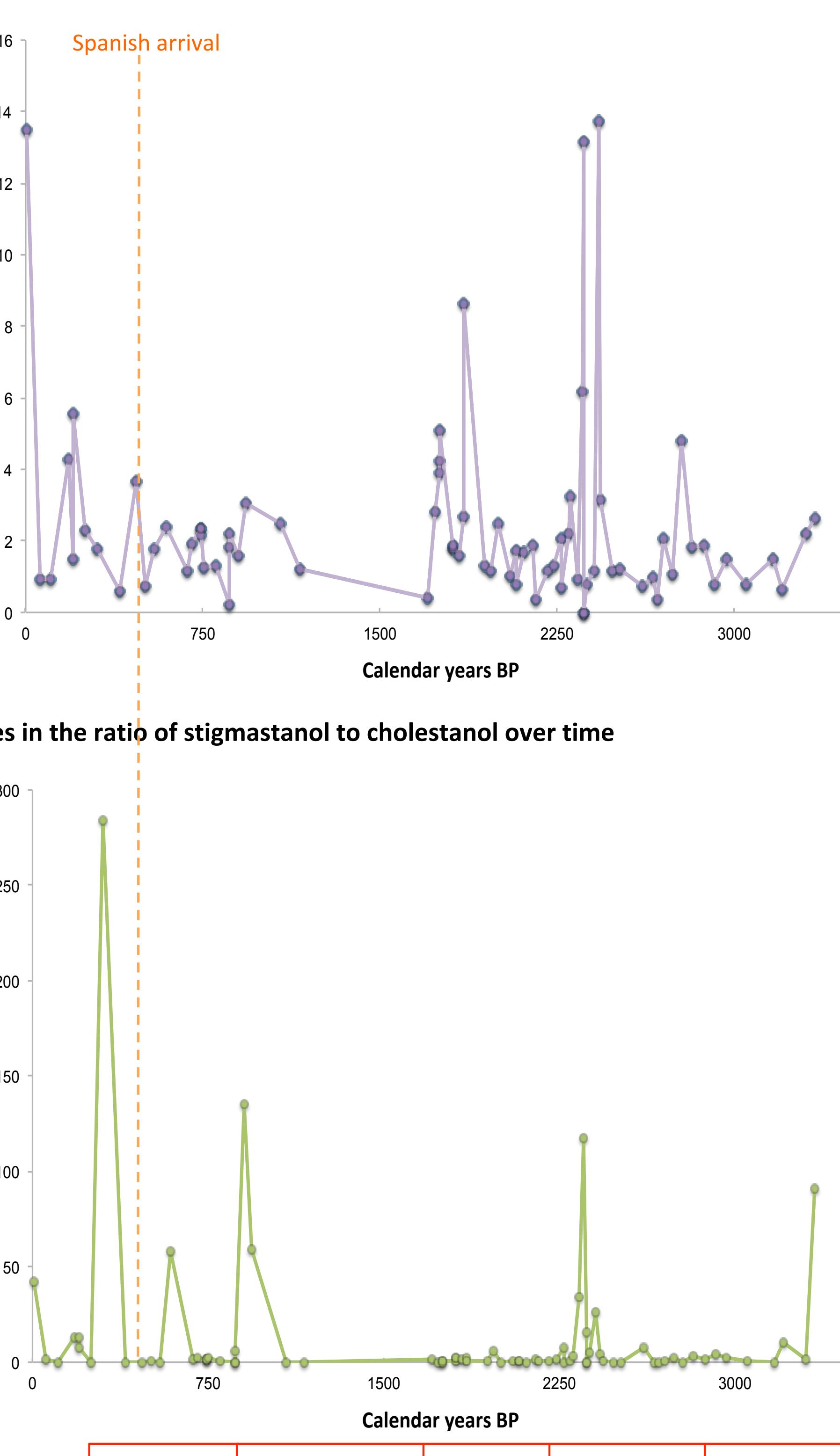


Izabal core shows high concentrations prior to 6000 BC, much earlier than expected, followed by a long term decline



For Peten-Itza there are relatively high values in the Preclassic, decreasing during the Classic and rising to the modern day

### Changes in the ratio of coprostanol and epicoprostanol to cholestanol over time



- For coprostanol, changes in the ratio show possible cycles of boom and bust during the Preclassic
- Absolute concentration in coprostanol and epicoprostanol changes might reflect migration in and out of the area, and the low modern value reflects the fact that the area is not occupied by humans in the modern day
- High coprostanol/cholestanol ratio in the present day may be a result of livestock such as pigs and sheep
- The average values for coprostanol and epicoprostanol in the modern day are likely related to modern waste disposal and management
- Stigmastanol peaks less variable
- Large peaks from 1500 AD onwards could reflect introduction and breeding of livestock by the Spanish (smaller peaks prior to this may be coming from herbivores living around the lake)

## WORKING CONCLUSIONS

- There is a question of whether proximity to population centre is the dominant control on concentration?
- Significant spatial heterogeneity exists in modern lake sediments
- The contribution of livestock farming is very large
- Using coprostanol:cholestanol appropriate for ancient lake core records but this is uncertain for stigmastanol:cholestanol

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