

SIO 249 Special Topics; Paleobiology Seminar (or: “Paleobiology Do-It-Minar” and writing a scientific paper)

Since you have unwisely expressed interest in this experiment, here is the plan I propose for this class.

Goals:

The goal of this course is to research, illustrate, write and submit a research paper (and accompanying cover letter to the journal editor) all within the Winter Quarter. The subject will be a ‘fossil forest’, I discovered a few years ago in the Latrania Formation of Alverson Canyon in the central Coyote Mountains. Although I have not made an intensive literature review, I believe that this find may be highly unusual; at least I have not found records of such an extensive palm forest in the fossil record.

Background:

The fossil palm grove is on BLM land adjacent to the Anza Borrego Desert State Park and is crossed by the “Wind caves” or “Domelands” trail in the Coyote Mountains Wilderness. I believe that the fossil site is within the *Coyote Mountains Fossil Site Area of Critical Environmental Concern* (ACEC) that gives it (weak) protection against fossil collecting and disturbance. I am trying to confirm this designation with the el Centro BLM. Hence, we will not be making collections and will take “only photographs” (as well as measurements!) and minimize our impact.

The site consists of shallow marine sandstones of the Latrania Formation in the lower Imperial Group (~5.3-6.3 Ma) that are richly fossiliferous with sand dollars, diverse gastropods, bivalves (including oysters), fish (I have found vertebra) and palm stumps. The sediments dip shallowly to the SW and the stump-bearing beds occur over ~1-3 acres or more of exposure. There may be several discrete horizons of palm stumps. The stumps are mostly upright, and range in diameter from ~25 cm to somewhat over a meter and stand up to 1.5 m high. Some stumps occur in clumps where stems have pressed against the others in a clump, like they were budding or growing asexually. Still, most stumps appear to have supported single stems. There are a few horizontal logs, but when I visited the site last Spring, I counted over 40 upright stumps. Stumps are preserved as iron-stained concretions and are commonly hollow (and even filled with marine fossils, in some cases). Many stumps are tear-drop shaped. Well-preserved examples show lumpy adventitious root casts extending from the bottoms of the stumps. I do not know if wood is preserved or if there are any leaves, stems or fruits preserved.

My initial interpretation was that the stumps were those of *Washingtonia* palms, like those that inhabit desert washes today, but the wide spacing of the stumps and their modest diameter compared to *Washingtonias* I am familiar with suggests these could be coconut palms. Today, the northern range of coconuts ends just south of the Gulf of California, so if these are coconuts, they had a northern range extension in the Pliocene. If these are coconuts, we may find the seed husks.

I attach a preliminary set of references to fossil palms and to Imperial Group geology and paleontology at the end of this document.

What We Will Do:

I suggest that we divide up the duties between class members to keep the work-load manageable within the bounds of a seminar course. I suggest that one or two people be

assigned to each task. You can be assigned to more than one task as well. In addition to their assigned tasks everyone will be responsible for the final editing of the paper.

Authorship will be alphabetical unless the group decides otherwise. I will be lead editor and senior author. I suggest drafting the paper for the journal “*Palaios*” since they have published similar papers. However, the choice of the journal will be decided by the group.

Tasks:

1. Field work

- a. Description of the stratigraphic section
- b. Description, photography and measurement of the stumps (and possibly mapping)
- c. Description of the taphonomy of the stumps and logs
- d. Description of the associated invertebrate and vertebrate fauna based upon field observation

2. Illustration—Construction of figures showing:

- a. A montage of the best images or drawings of stumps
- b. A montage of images or drawings of invertebrate fauna
- c. A location map
- d. A measured stratigraphic section

3. Literature review

- a. What do we know about fossil palms?
- b. What do we know about Coyote mountains geology?
- c. What do we know about Coyote Mountains paleontology?
- d. Palm ecology and biogeography

4. Modern Analogs

- a. Illustrations or descriptions of possible modern analogs

5. Writing

- a. Abstract (written at the end, once the paper is largely complete)
- b. Introduction—this should be written by those involved in the literature review
- c. Methods—written by those involved in field work
- d. Results
 - i. The stratigraphic context
 - ii. The number of fossil forests
 - iii. Fossil palm morphology—statistics on number of preserved stems, size, height, orientation, growth form, taphonomy....
- e. Discussion
 - i. The Coyote Mountains Fossil Palm grove
 - ii. Comparisons with other fossil occurrences of palms
 - iii. Implications for biogeography
 - iv. Modern Analogs
- f. Conclusions
- g. Figure Captions (written by those that made the figures)
- h. Tables (if any)
- i. References
- j. Acknowledgements
 - i. We will note the contributions of each author and thank anyone else who assisted in the research.

6. Editing

- a. All authors will participate in editing the final document.

A Strawman Schedule for the Quarter:

We will meet weekly for 1.5 hours to discuss our findings and progress. We will need to decide as a group when this meeting will be.

Week 1: Initially, we will hear from the people working on the literature review.

1. What do Palm fossils look like?
2. What kinds of settings do they occur in?
3. Fossil record and biogeography of palms associated with marine or near shore environments.

1st Weekend—I suggest spending the first weekend of the Quarter on an overnight trip to the site where we will conduct the field work.

1. If needed, we can repeat this the next weekend, or we can return in smaller groups as needed to collect more data.

Week 2: This meeting will focus on our interpretation with presentations by:

1. Those measuring the section
2. Those measuring the stumps

Week 3: More interpretation; presentations by:

1. Those involved in taphonomic studies and modern analogs
2. Those describing the associated fossil fauna

Week 4: Preliminary determination of our conclusions

1. What are our primary conclusions?
2. What conclusion shall we use to focus the paper?
3. Discussion of figures needed to illustrate the paper

Week 5: Preliminary presentation of draft figures

Week 6. Writing groups work on:

1. Introduction
2. Methods
3. Results
4. Preliminary discussion
5. Lit review people assemble a endnote file of relevant literature

Week 7: Preliminary presentation of written work (in draft form, perhaps very ‘drafty’ form)

Week 8: Assemble full version of paper for initial round of comments

Week 9: Assemble final version for editorial comments by all authors

Week 10: Write ‘cover letter’ to the editor

1. Discuss why the paper is significant
2. Suggest potential reviewers
3. Submit both paper and cover letter.

Fossil Palm References

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