Biology 113 Closed Book Take-Home Exam #3 – Evolution

There is no time limit on this test, though I have tried to design one that you should be able to complete within 3 hours. There are 6 pages in this test, including this cover sheet. You are not allowed to look at someone else's test, nor use your notes, old tests, the internet, any books, nor are you allowed to discuss the test with anyone until all exams are turned in by12:30 on Monday Nov. 18. **EXAMS ARE DUE BY 12:30 ON MONDAY NOVEMBER 18**. If you turn in your exam late, you will lose a letter grade for each day you are late. The **answers to the questions must be typed within this test** unless you want to draw on a separate page. If you do not write your answers in the appropriate location, I may not find them. Tell me where to look if you put your answer at the back of your test.

I have provided you with a "Data Gallery" in the form of figures and tables. To choose a figure in support of your answer, simply state Figure #x. You do NOT need to move the figure on your test. Do not assume how many of the data images you will use, or not use. **Simply choosing the data is not sufficient support for your answer. You must explain the significance of the data and how they support your answer.** I have given you sentence limits so be concise.

-3 pts if you do not follow this direction.
Please do not write or type your name on any page other than this cover page.
Staple all your pages together when finished with the exam. Do not print test pages without answers. I only want to see your answers. You can type your answers right under each question.

Name (please print): I lost the answer key and am recreating it a year later.

Read the pledge and sign if you can do so with honor:

_____

On my honor I have neither given nor received unauthorized information regarding this work, I have followed and will continue to observe all regulations regarding it, and I am unaware of any violation of the Honor Code by others.

How long did this exam take you to complete?

Lab Questions:

6 pts.

1) For your brine shrimp experiment, you had a tube with nothing added to it and another tube with only methanol added to it. What was the function of these two tubes in your shrimp toxicity test? **Limit your answer to a maximum of 3 sentences.**

water = + control: how many die anyway?
methanol = - control: is solvent toxic?

6 pts.

2) When you started your bacterial evolution experiment, cell growth was inhibited by the antibiotic. How do cell populations become resistant to antibiotics if they were not resistant at the beginning? **Limit your answer to a maximum of 3 sentences.**

random mutations and variation in population
some were selected by you
natural selection accelerated by your intervention

Lecture Questions:

12 pts.

3) Figure 26 shows a dot plot comparison of two *E. coli* genomes. Interpret the data in that figure to find examples of three types of mutations that could lead to new phenotypes and even speciation. You need to state the type of mutation and draw a picture to show each mutation as displayed in a dot plot. **Limit your answer to a maximum of 2 sentences for each type.**

1. inversion
2. insertion/deletion
3. duplication

10 pts.

4) The best working hypothesis for global coral bleaching is increased water temperature. Use one example of correlational data and one example of causal data that support the hypothesis that warm water is causing coral bleaching. Explain how the data support the hypothesis. **Limit your answer to a maximum of 3 sentences for each type of data.**

correlation: #32 temperatures and bleaching
causal: #9 photosynthesis and temperature with 2 species of algae

10 pts.

5) Variation in a population can be generated by two separate causes. Give a distinct example of each cause using the data in the Data Gallery. It is best if you can use statistical analysis as part of your answer. **Limit your answer to a maximum of 2 sentences for each example.**

1. genetic #10 with error bars
2. environmental #14 with error bars

16 pts.

6) Look at Figure 3. You may want to expand the image so you can read the writing. You are allowed use the internet for this question to look up what sorts of animals are represented by each name.

A) Write the letter A on Figure 3 at the most recent common ancestor (MRCA) for all reptiles in this figure.

B) Which animals are the closest living relatives of primates? **one sentence maximum**

Rattus

C) Write the letter C on Figure 3 to indicate the MRCA of all vertebrates.

D) What genome event separates your answer to question C from the invertebrates? Support your answer with data from a different figure. **Limit your answer to a maximum of 2 sentences.**

#2 whole genome duplication

10 pts.

7) A loss of genetic diversity is a form of evolution.

a) Give one example of a bottleneck effect. Explain why bottlenecks reduce genetic diversity. Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

#24 or 4 or 20

b) Give an example of random loss of genetic diversity that is not the consequence of natural selection. Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

#31 genetic drift, isolation and snail population

10 pts.

8) Populations must adapt to their environment as it changes.

a) Give one example of plants that exhibit diffuse co-evolution. Support your answer with data. **Limit your answer to a maximum of 3 sentences.**

#23 fruits

b) Give one example of an animal species that has evolved adaptations to a habitat that experiences frequent disturbances. Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

#12 muscles

10 pts.

9)

a) Give one example of an animal's behavior that benefits a plant directly and the animal indirectly through mutualistic co-evolution. Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

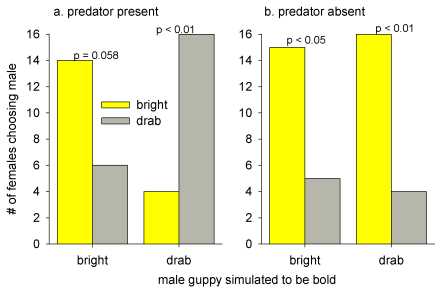
#17, moth fly after pollen

b) Given an example of variation that is caused by the genetics of many genes. You may *NOT* use an example here that you have used previously for this exam. Support your answer with data. **Limit your answer to a maximum of 2 sentences.**
#25 yucca moth behavior
#13 guppies behavior

10 pts.
10) Dr. Paradise provided us with some bonus data with regards to human evolution.
a) Summarize the main lesson from these data. **Limit your answer to a maximum of 2 sentences.**
variation in the population
b) What implications do the new data have on our current classification of previously described hominid fossil species? **Limit your answer to a maximum of 2 sentences.**
might not be so many species as we currently have listed

Data Gallery

1



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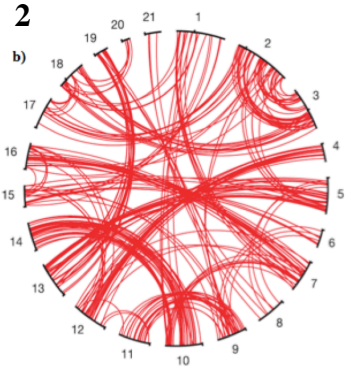

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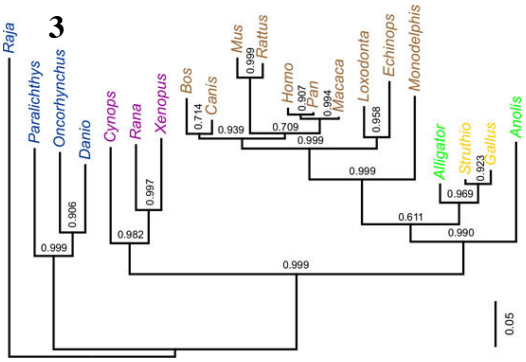

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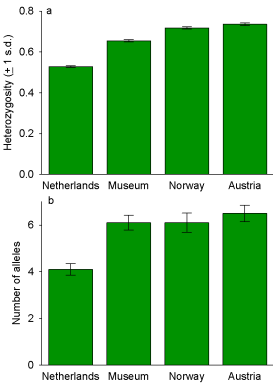

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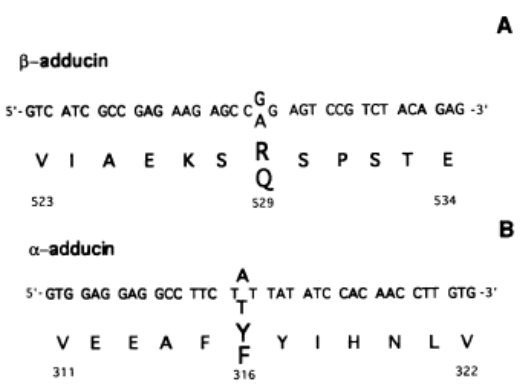

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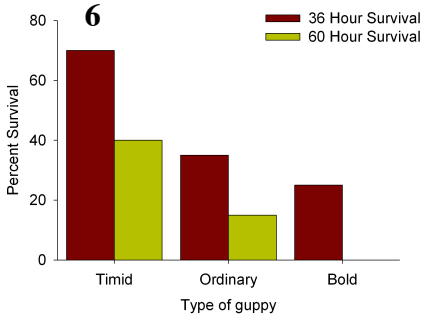

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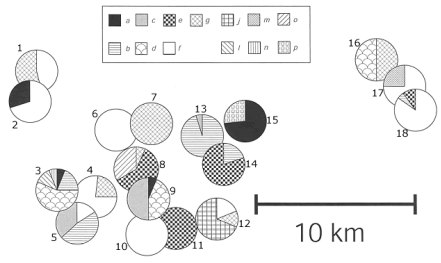

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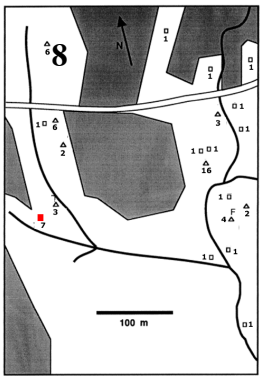

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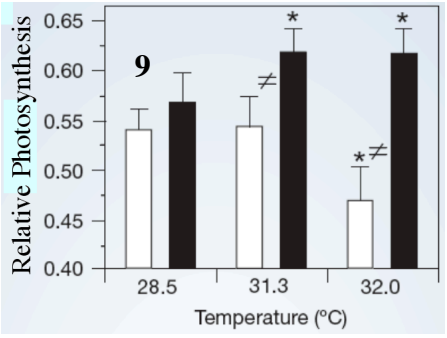

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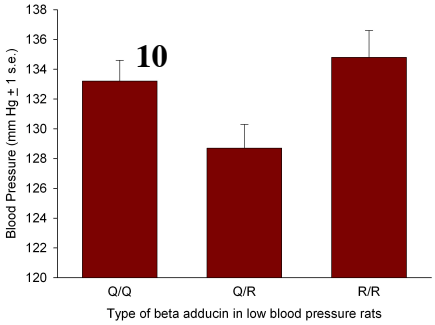

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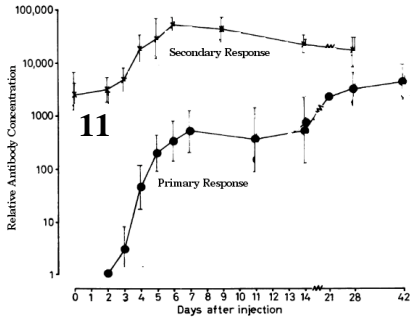

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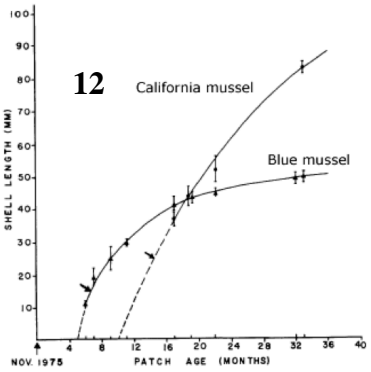

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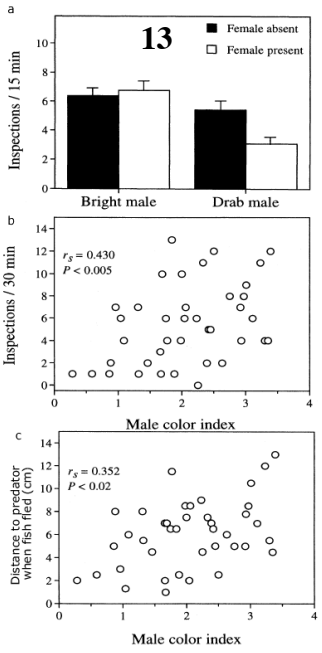

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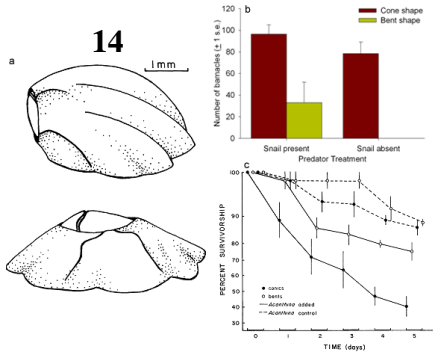

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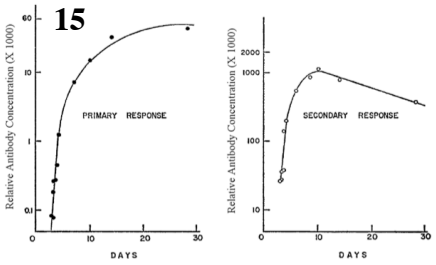

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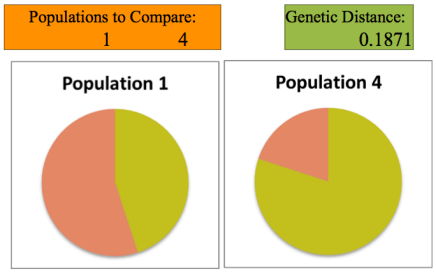

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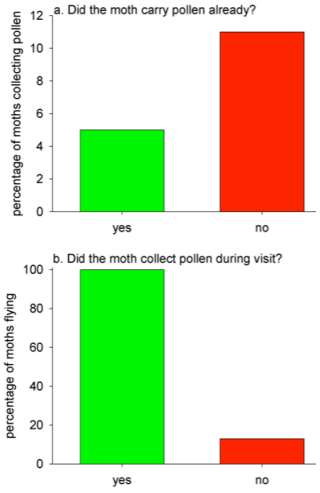

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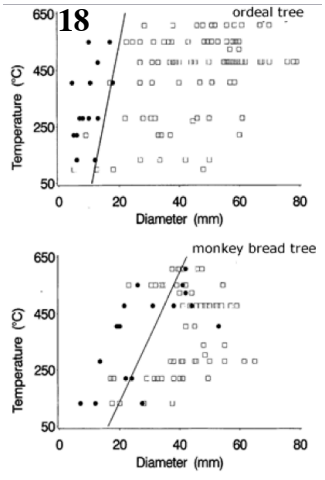

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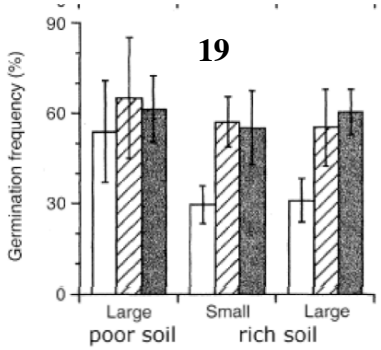

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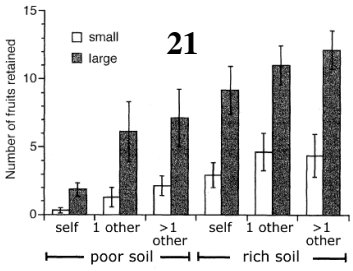
	Dutch museum	*Norway*	*Austria*
Dutch present	0.111 (0.062-0.177)	0.160 (0.124-0.193)	0.152 (0.108-0.194)
Dutch museum		0.050 (0.011-0.109)	0.036 (0.006-0.078)
Norway			0.031 (0.013-0.050)

21



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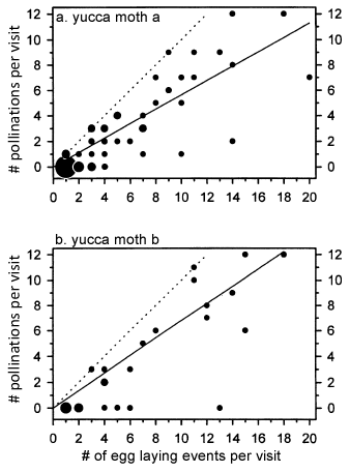

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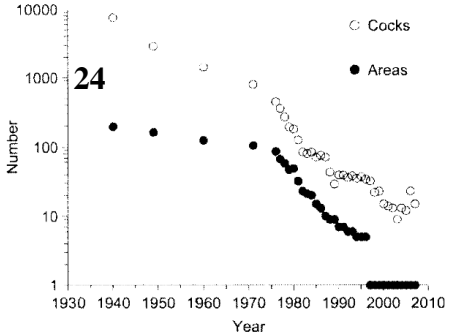
variable	OP term	season: summer	season: autumn	season: winter	s.s.?
water content (%)	WP	67.9 ± 6.2	60.0 ± 9.2	52.0 ± 16.4	yes
relative yield	(1-WP)*P/(P+S)	16.3 ± 6.2	20.9 ± 7.6	23.5 ± 8.1	yes
pulp dry mass (mg)	(1-WP)*P	52.9 ± 56.7	97.2 ± 86.9	122.8 ± 245.6	no
fruit wet mass (mg)	P + S	324.1 ± 340.6	414.9 ± 296.7	468.0 ± 738.8	no
number of seeds	-	3.5 ± 5.6	2.1 ± 2.3	2.8 ± 3.2	
lipid content (%)	d_1	2.5 ± 1.2	7.4 ± 13.7	19.7 ± 18.7	yes
protein content (%)	d_2	4.3 ± 1.7	4.3 ± 1.8	5.0 ± 1.4	no
lipid profitability	OP_1	0.38 ± 0.21	1.55 ± 2.96	4.73 ± 4.64	yes
protein profitability	OP_2	0.69 ± 0.29	0.85 ± 0.34	1.12 ±0.38	yes

24



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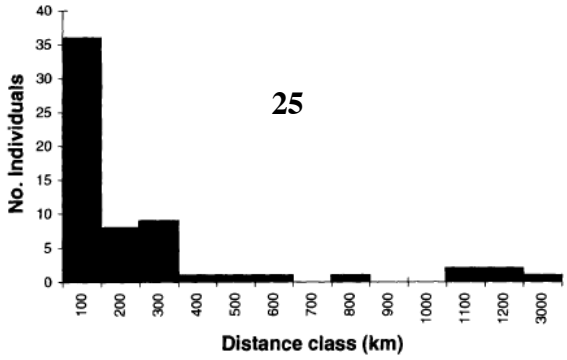

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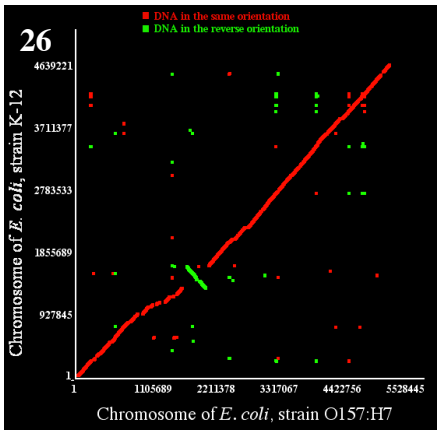

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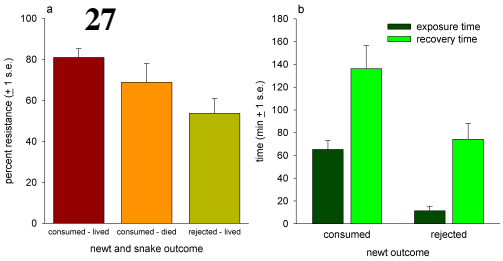

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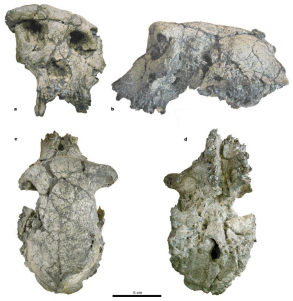

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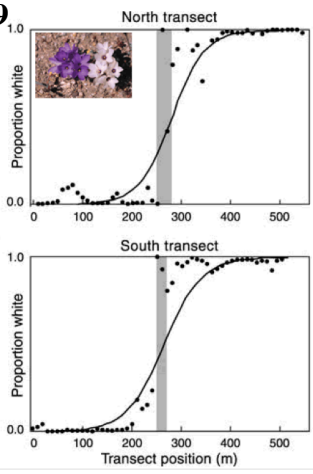

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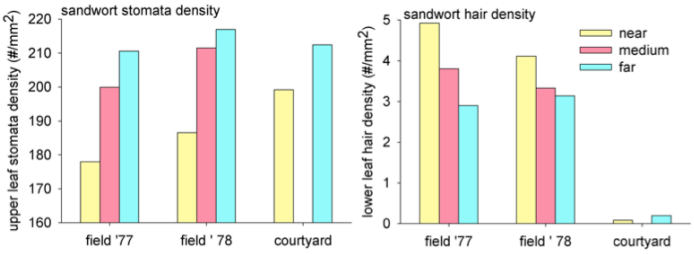

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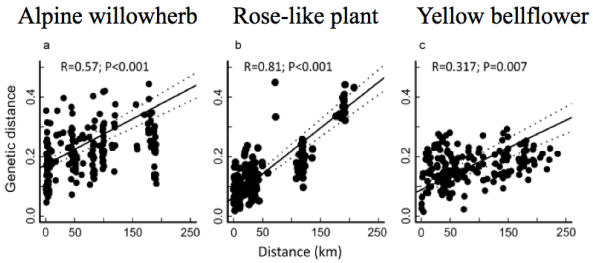

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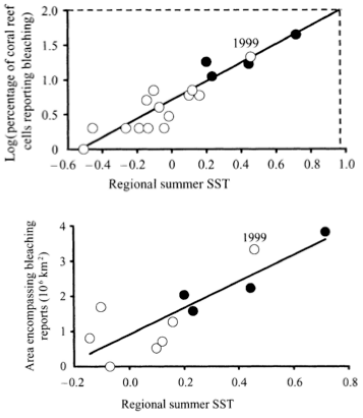
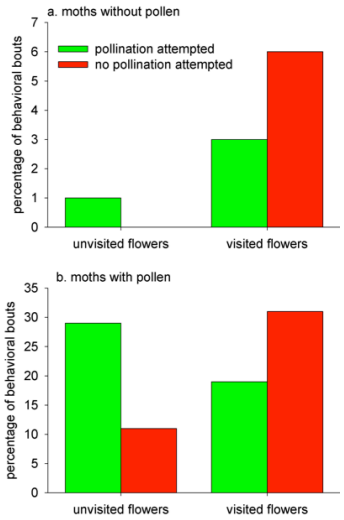
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