ARCTOS and EVOLUTION

A FIRST ATTEMPT AT A TEACHING MODULE

* Goals for our project
* The incorporation of ARCTOS into a module
* Student response to this module and learning outcomes
* Some improvements
* How we met some of our goals using this database

Goals for Curriculum Update

- Increase student's understanding of the nature and process of science
- Build student's quantitative and computational skills
- Use methods and tools currently used in biology

An exploration of population genetics in rock pocket mice (*Chaetodipus intermedius*)

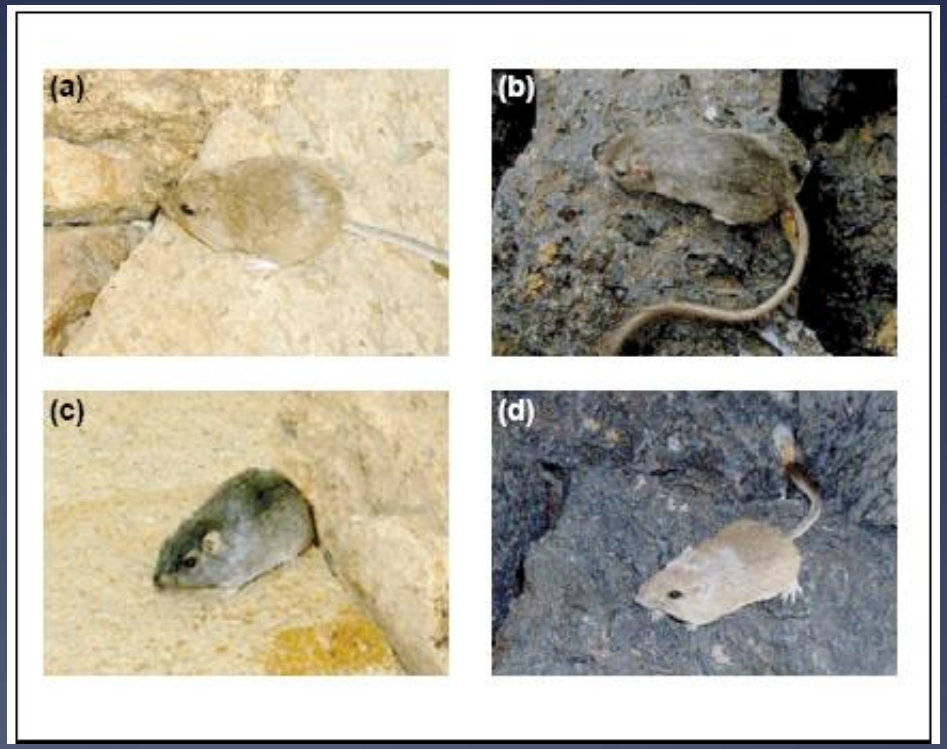
Key Concepts:

~ Making observations and forming hypotheses

~ Testing hypotheses with simulations

~ Geographic variation in morphology

~ Understanding Hardy-Weinberg Equilibrium and the processes that cause violations




Update TRENDS in Genetics Vol.19 No.11 November 2003 585

Research Focus

Mammalian melanism: natural selection in black and white

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Chaetodipus intermedius: Categorizing Pelage Color

Information from ARCTOS

Chaetodipus intermedius ater

Animalia Chordata Mammalia Rodentia Sciurognathi Heteromyidae Chaetodipus intermedius ater

Identified by Museum of Vertebrate Zoology, University of California, Berkeley on 1999-01-27

Nature of ID: legacy

Determination Type: accepted place of collection
assigned by Gabor R. Racz on 2003-03-19

Higher Geography: North America, United States, New Mexico, Lincoln County

Specific Locality: French's Ranch, 12 mi NW Carrizozo

Locality Remarks: Extent set to include edge of lava flow.

Collecting Source: wild caught

Event Date: 28 Oct 1931

Verification Status: unverified

Event Coordinates: 33.763659/-106.025326

Datum: North American Datum 1927

Original Coordinate Format: decimal degrees

Elevation 5400 to 5400 ft

Error: 218 m

Georeference Source: GeoLocate

Georeference Protocol: GeoLocate

Collectors

Seth B. Benson

Identifiers

collector number: 1589

Details

Part Name	Condition	Disposition	#	Label	Remarks
skull	unchecked	in collection	1	Museum of Vertebrate Zoology	
study skin	unchecked	in collection	1	Museum of Vertebrate Zoology	

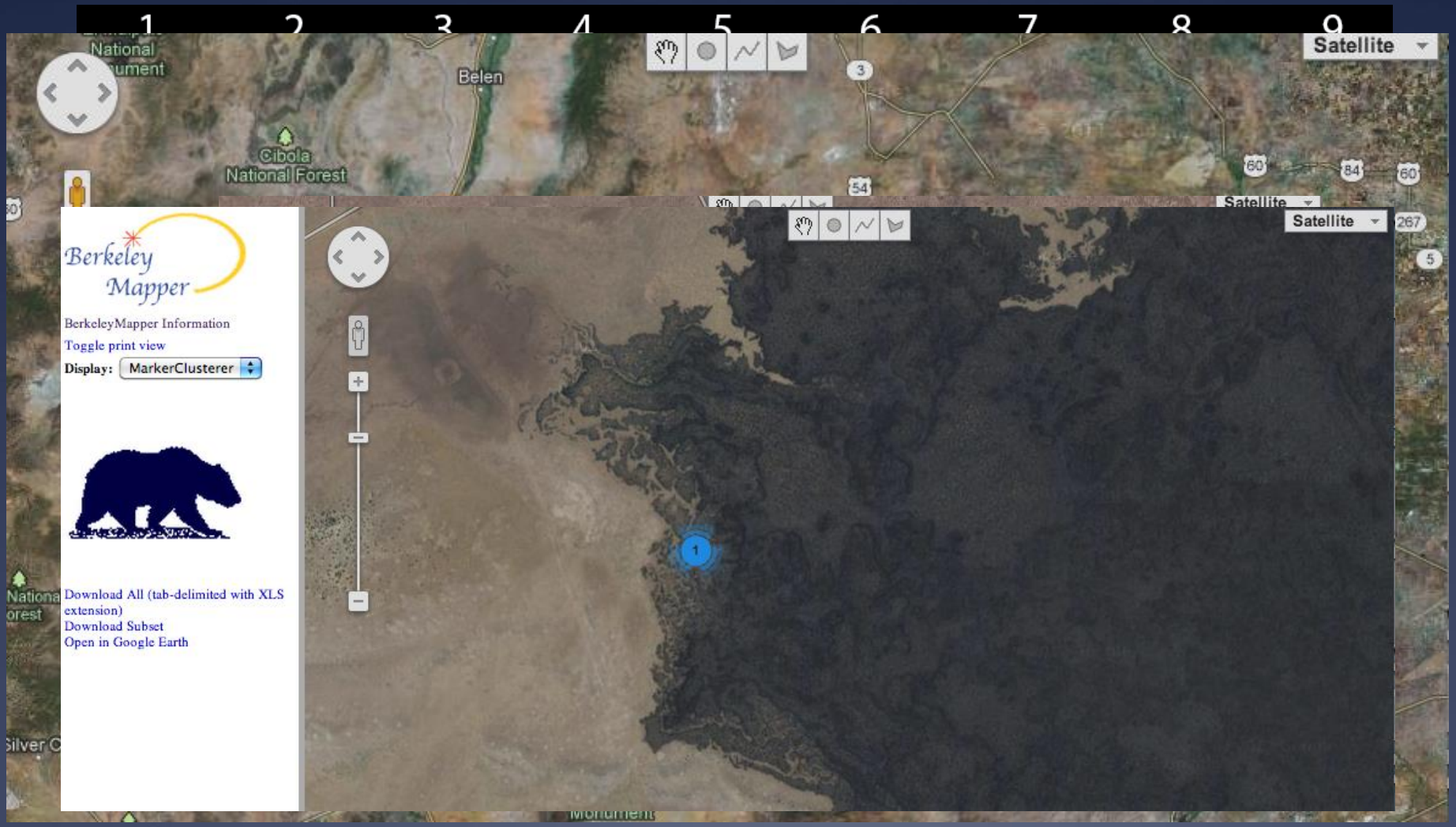
sex: female

Museum of Vertebrate Zoology, University of California, Berkeley, 2005-11-01

Accession

3777

Mapping and Categorizing Substrates



Observations and Hypotheses

- *1) Does your graph indicate a relationship between Substrate Index and Pelage Index? If so, describe the relationship.*
- *2) What other observations, if any, do you have about your data?*
- *3) Consider each of the two collection regions, Pinacates and Carrizozo, separately. Based on the small sample of mice that you observed, how does the variation within each collection* ***site*** *or population compare to the variation between sites?*
- *4) Is your observation in question 3 the same for both regions, Pinacates and Carrizozo?*

Observations and Hypotheses

- *5) List at least two non-heritable factors that could explain the differences between the populations you observed.*
- *6) Recall the characteristics of a population at Hardy Weinberg Equilibrium. For each evolutionary mechanism briefly explain:*
  - *If it alone could account for your observations? Why or why not?*
  - *If the mechanism in combination with other mechanisms could explain your observations? Which mechanisms and how?*
- *7) Today we will focus on two evolutionary mechanisms migration and natural selection.*
  - *Based on your reasoning from question 6 above, write a one-sentence statement explaining the role of natural selection and/or migration in the evolution of the patterns in pelage coloration you observed across populations. Be as explicit as possible (consider the levels of one or both factors that might be necessary).*
    - *Note: Your hypothesis might also be that only one mechanism is sufficient to explain the pattern or that neither is sufficient.*
- *8) Your statement for question seven is the hypothesis you will be investigating today. State the corresponding null hypothesis.*
  - *(Refer to the Introduction for this lab if a reminder about null hypotheses would be helpful.)*

Student Response

* Mostly positive!
* Too obvious?
* Needed more guidance in hypothesis formation and evaluation

Improvements

- Populations with more variation (or more populations sampled)
- Add genetic data
- Provide more structure for constructing and reflecting on hypotheses
- Give students access to a small number of real specimens

How this activity meets our goals

- Encourages students to make their own observations of real samples collected in the field.
- Requires some use of scientific process and reflection
- Gives them access to a resource they could not otherwise have had (particularly in a class of this size)
- Utilizes tools that biologists now have available to them for

Acknowledgements

The team:
Joshua Povich
Tami Mau
Tim Herrlinger
Lloyd Goldwasser
Keith Bouma-Gregson
Naomi Ondrasek
Erin Meyer
Maya DeVries

Thanks to Eileen Lacey and Joseph Cook for inviting me and allowing me this time to speak.

Thanks to you all for your time and consideration.