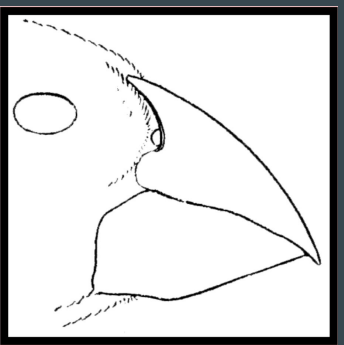
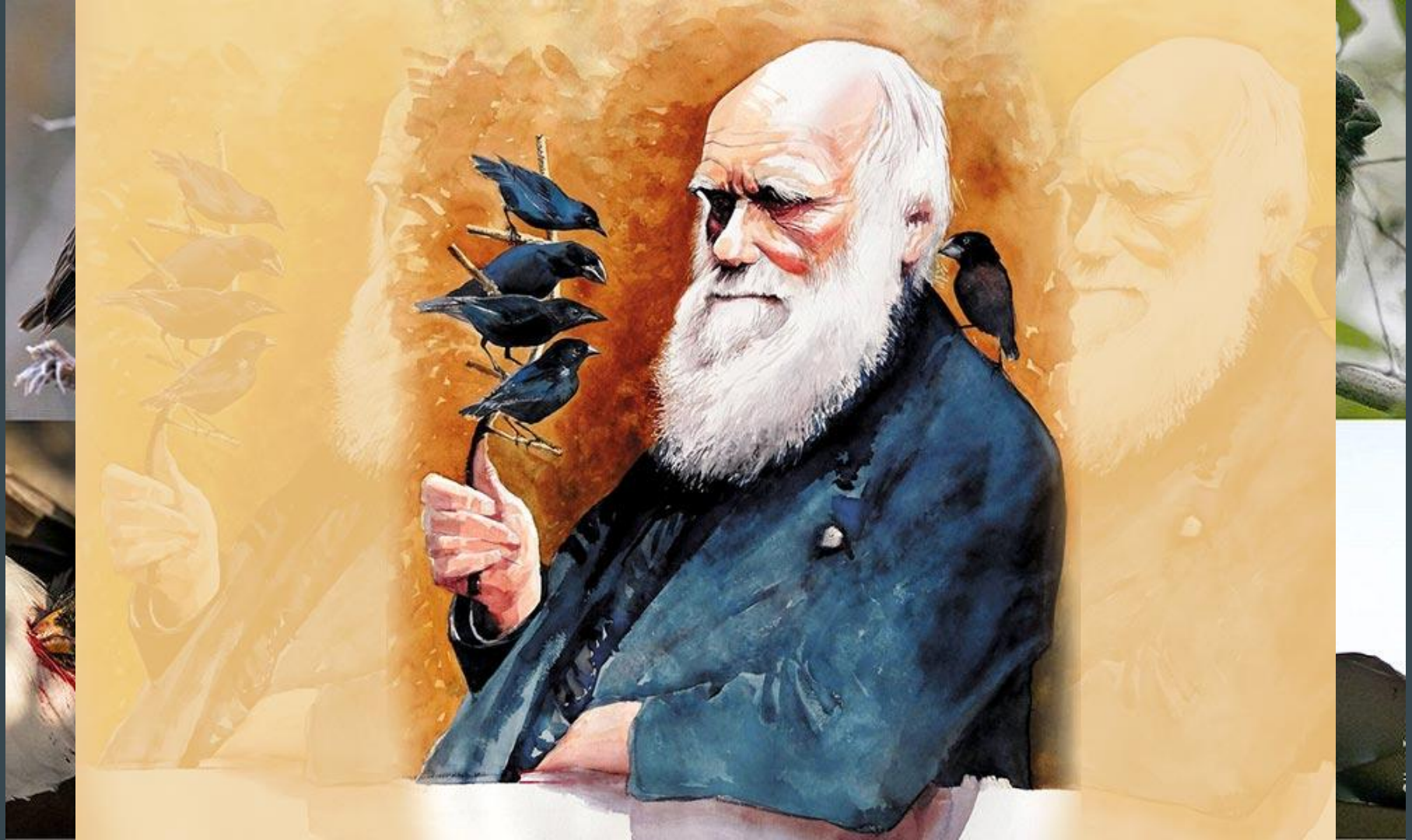
BIRDD - Using Galapagos Data to Explore Ecological and Evolutionary Concepts

John Jungck & Sam Donovan
University of Delaware & BioQUEST Curriculum Consortium
jungck@udel.edu & sam.donovan@bioquest.org



NABT Atlanta, November 2021



Outline

Overview of the BIRDD project

Introduction to the 3 Ps educational philosophy

Hands on with some data (orientation to the Galapagos)

The diversity of BIRDD data and projects

Exploring BIRDD morphology data using CODAP

Research opportunities for students using existing data

BIRDD: Beagle Investigation Returns with Darwinian Data

This project grew out of a desire to find ways to help students develop a deep understanding of evolutionary biology.

All too frequently evolution is treated as a topic in biology courses.

In order to develop a more sophisticated understanding of evolutionary biology, students must have opportunities to engage in evolutionary problem solving.

BIRDD: Design features

Concentrate on real data from real organisms.

Provide enough types of data to support more open-ended investigations.

Engage students with research like problem solving.

BIRDD: The long view - 4 project phases

Digital data - Spreadsheets provide access to data in electronic formats.

Databases organize data - Integrating data types into a single interface.

Web accessible data - Hyperlinked information supporting open pedagogy.

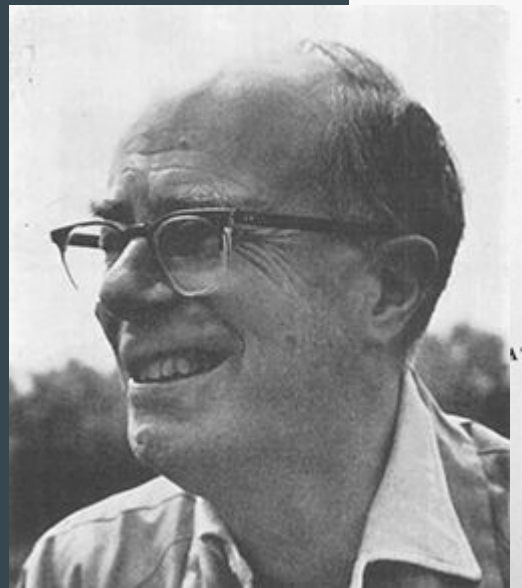
Internet enabled research - Participatory pedagogy and authentic science.

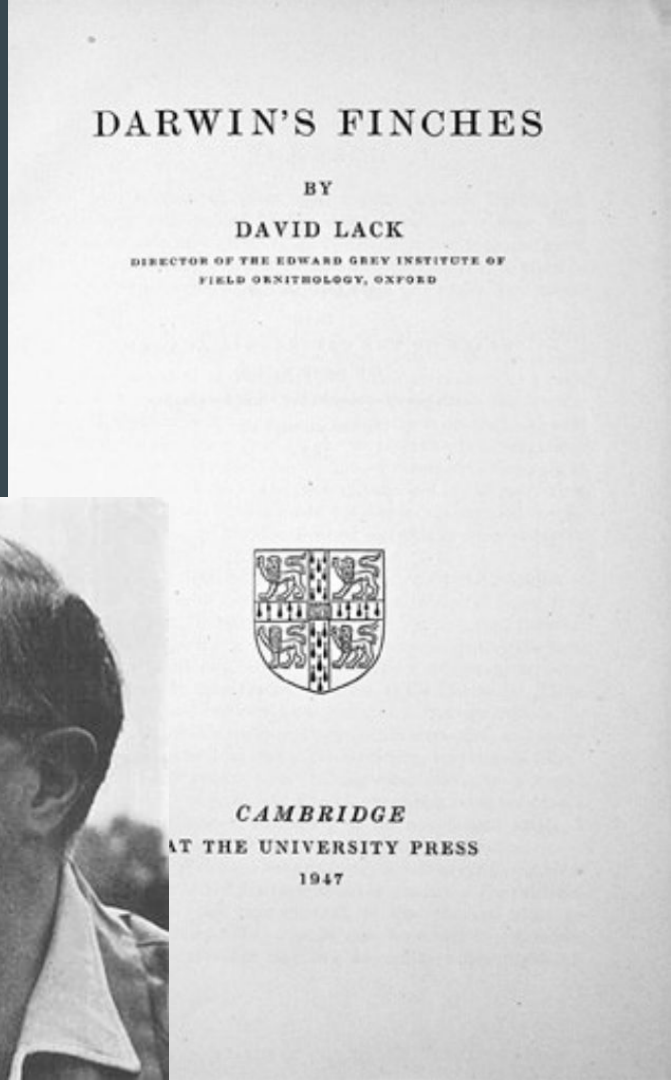
Electronic data

Compiled morphological data from over 7,400 individual Darwin's finches. The majority of the data are beak/bill dimensions.

Included are measurements on 51 historically important specimens collected by Charles Darwin and others on HMS Beagle.

David Lack measured over 6,500 specimens and deposited copies of his measurements in the British Museum (Natural History) and the California Academy of Sciences (CAS)





DRYAD

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Data from: The BioQUEST Library IV

Jungck, John R.

Publication date: June 18, 2008
Publisher: Dryad
https://doi.org/10.5061/dryad.159

Citation

Jungck, John R. (2008), Data from: The BioQUEST Library IV, Dryad, Dataset, https://doi.org/10.5061/dryad.159

Usage Notes

Greenhouse Near Puerto Ayora
GrnHous493_L.jpg

Farm Field Near Puerto Ayora
Field498_L.jpg

Data Files

Download dataset

› June 18, 2008

Metrics

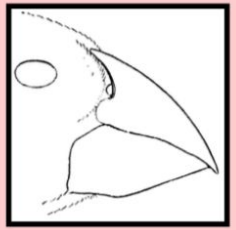
656 views

1530 downloads

0 citations

About BIRDD

Beagle Investigations Return Darwinian Data:
The Darwin's Finch Data Resource (DFDR)
Main Table of Contents (version 2.0)



+ Click buttons to go to information or data sets.
  (boldface buttons are functional)
+ **To return to this location from anywhere in BIRDD**,
  Click a Return to Main Table of Contents button,
  or
  Select Go to Main Table of Contents
  under the *Script* menu

Introduction to BIRDD, Database Notes

How To Navigate Around BIRDD

Print All "How To" Pages

Finch Morphology Data

DNA Sequence Data

Skeletal Data

Species Data

Vocalization Data

Protein Data

Island Data

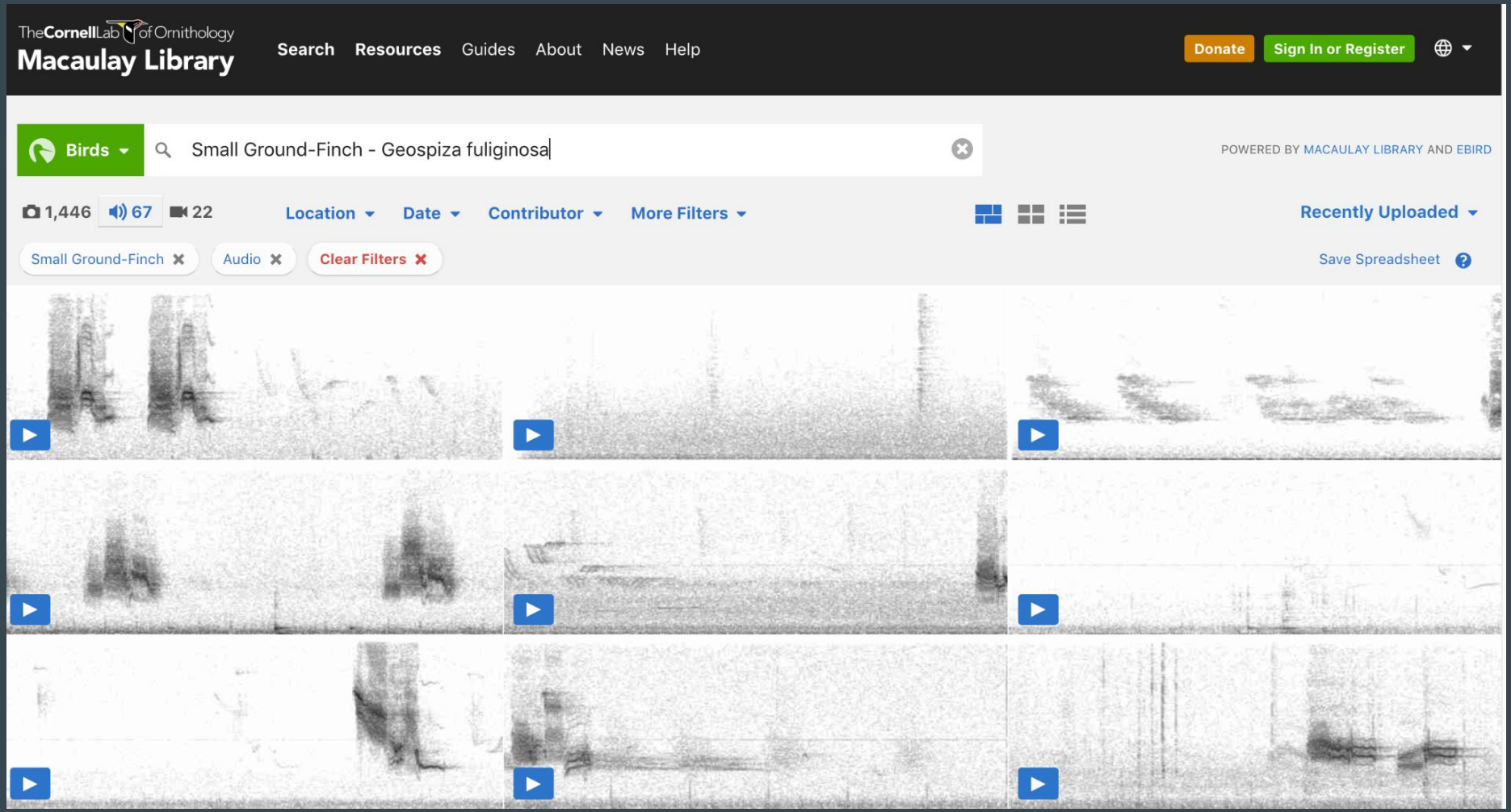
Weather Data

Pictures & Panoramas

Bibliography

Quit

Tourist Data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22
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Small Ground-Finch
Audio
Clear Filters
Save Spreadsheet

BIRDD

Beagle Investigations Return with Darwinian Data

BIRDD Home

Molecular Data

Island & Habitat Data

Morphological Data

Species Data

Introduction to the Finch Problem Space

The Galapagos Islands have been an important natural laboratory for evolution research for over 175 years. The archipelago contains over 40 islands that very in size, habitats and inhabitants. The islands are home to the Galapagos finches (a.k.a. Darwin's finches) which stand as one of the most widely recognized examples of research in evolutionary biology. The 13 species of finches have subtle variations in their beak morphology and behavior that reflect their divergence and ecological specialization.

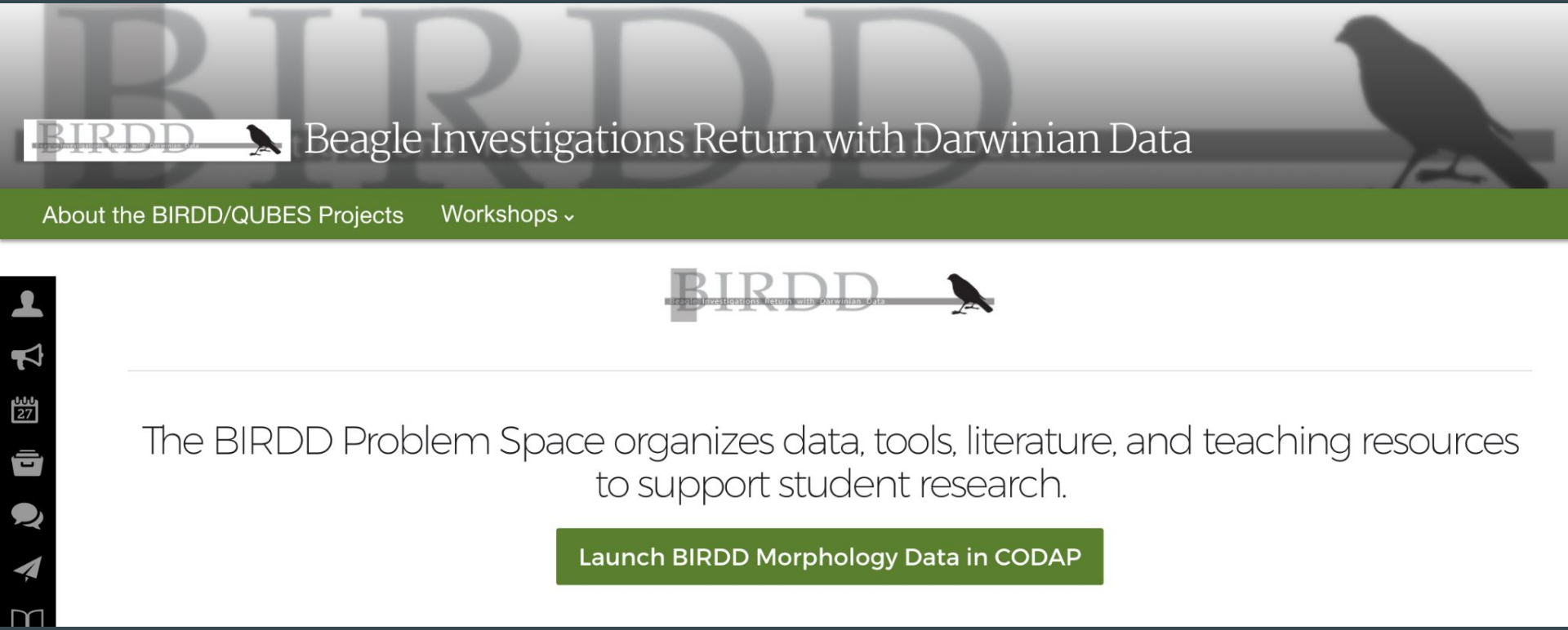
Too often the Galapagos Finches are presented as a canonical example of evolution without providing students with the opportunity to engage with data or the types of reasoning that biologists use to make sense of their similarities and differences. This problem space provides a collection of introductory materials and data resources designed to support students as they reason about the evolutionary relationships between the species.

The materials provided here are modified from the BIRDD database which is published as part of the BioQUEST Library.

National Library of Medicine

National Center for Biotechnology Information

Literature		Genes		Proteins	
Bookshelf	0	Gene	16,053	Conserved Domains	0
MeSH	0	GEO DataSets	53	Identical Protein Groups	19,535
NLM Catalog	0	GEO Profiles	0	Protein	21,126
PubMed	103	HomoloGene	0	Protein Family Models	1
PubMed Central	1,407	PopSet	34	Structure	0


BIRDD
Beagle Investigations Return with Darwinian Data
About the BIRDD/QUBES Projects
Workshops
BIRDD
The BIRDD Problem Space organizes data, tools, literature, and teaching resources to support student research.
Launch BIRDD Morphology Data in CODAP


BioQUEST

Problem Posing

To understand science as it is practiced, rather than solving already well-formulated problems from a textbook, students must be engaged in problem-posing. To appreciate this, students must learn that they could stand in the field or laboratory forever and no problems would come to them pre-posed.

Problem Solving

After having posed a problem, students need to experience open-ended problem-solving. Real scientific problems do not have answers at the back of the book. The scientist entertains multiple competing hypotheses and makes inferences over a long series of experimental observations.

Peer Persuasion

Research is not complete, no matter how many experiments have been conducted, no matter how many puzzles have been solved, until peers outside of a research team are persuaded of the utility of the answers. Persuasion is a social process and an essential one for students to experience in order to understand the nature of scientific theories and paradigm shifts.

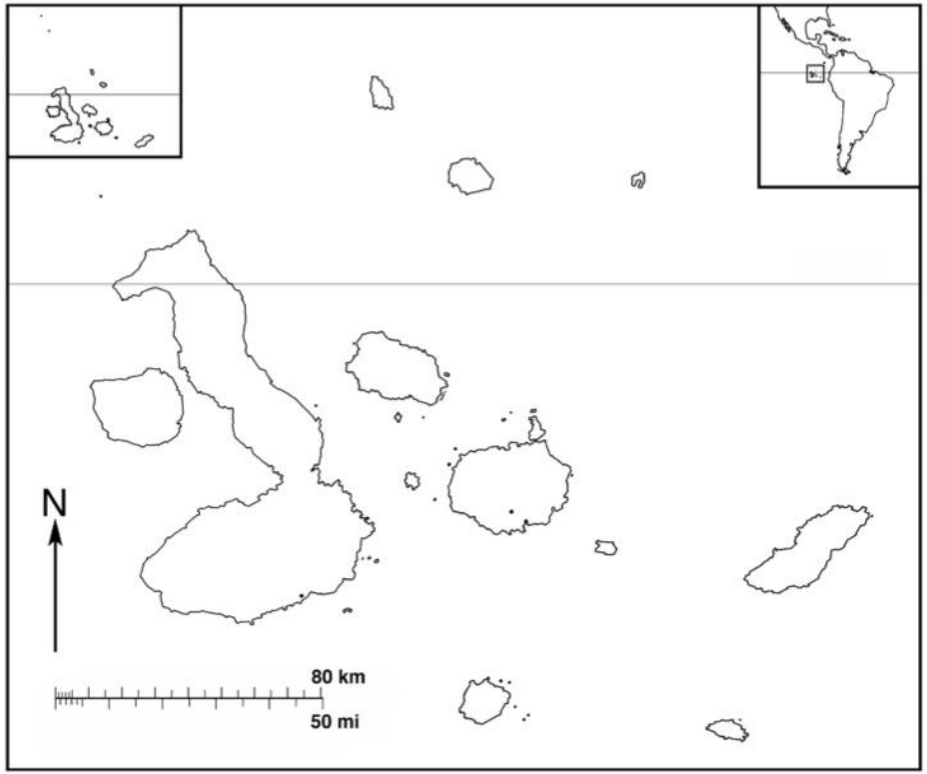
Galápagos Archipelago: Blank

Land Area
8000 km

Length
NW-SE
430 km

Length
SW-NE
220 km

Distance
to Mainland



Map_Source Scanned from Harris, M. (1982), modifications & changes from Grant, P. (1986), US Defense Mapping Agency (1985).

Hands on with some data (orientation to the Galapagos)

Do you see different types of patterns when you look at different scales or resolutions? For example, try dividing the archipelago into 4 quadrants and looking at the distributions within each. Or, try mapping genera instead of species. What does it look like if you make island categories of small, medium and large?

Are there features that seem to correlate with the presence or absence of particular species? Which species are most likely to be found together?

Find a phylogeny of the finches and see if that information is useful in explaining what you have observed.

Report out

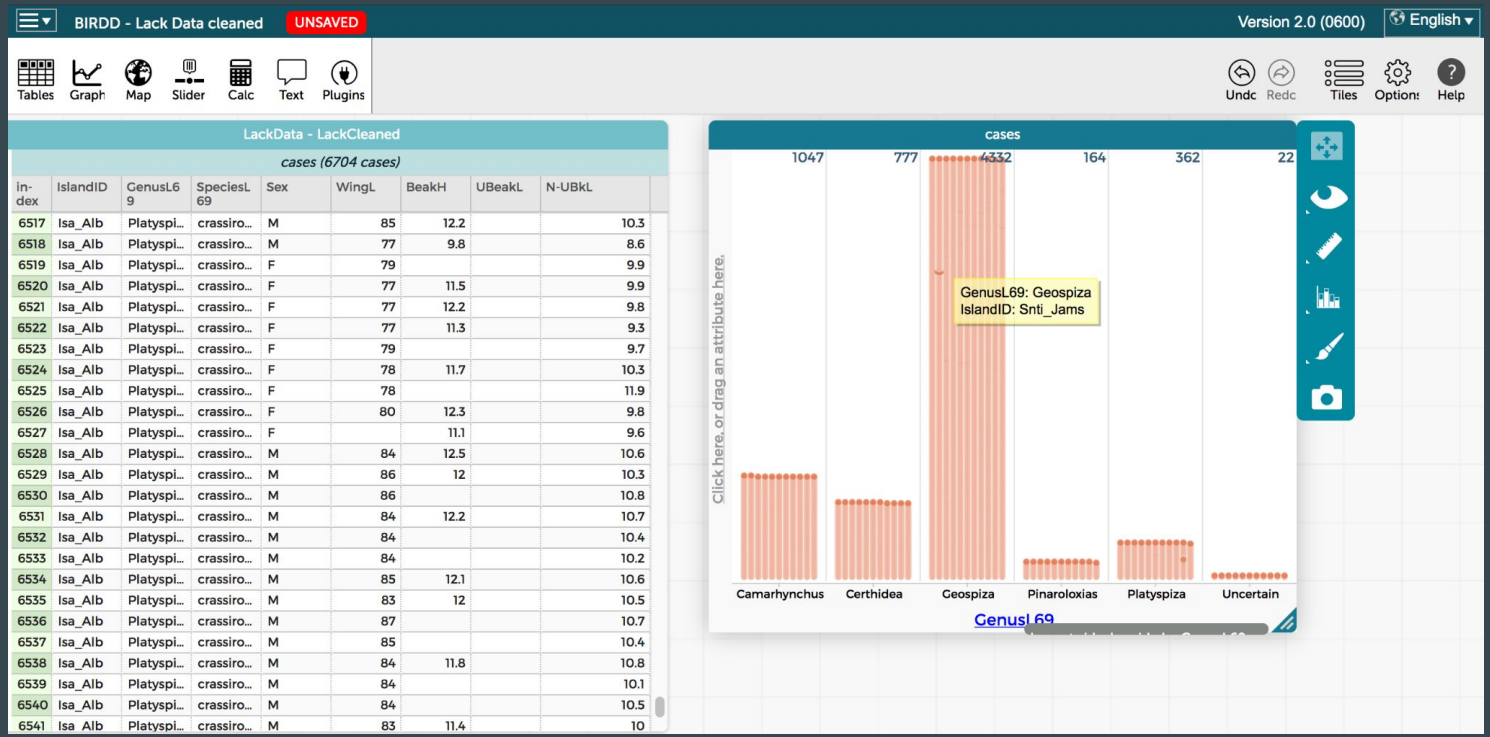
Who are you?

What did you learn?

What questions arose?

What kinds of data do you need?

Working with BIRDD Morphology Data in CODAP



Working with BIRDD Morphology Data in CODAP

bit.ly/NABT_BIRDD

https://payments.evolutionsociety.org/

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