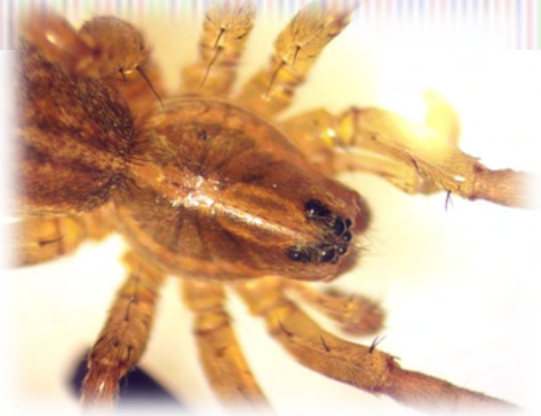

Cold Spring Harbor Laboratory
DNA Learning Center

Barcode Long Island Projects

Independent Projects

Jeffry Petracca, MSc

BARCODE LONG ISLAND

BLI Projects – Independent Projects

Formulating a team and research ideas

BLI Guidelines

- Student team (2-4 members, grades 9-12) with a trained, ***BLI mentor***
- BLI mentors
  - Must have attended a DNA barcoding workshop from DNALC
  - Qualified teacher from Long Island (Queens, Kings, Nassau, or Suffolk) public or private school
  - Responsible for enforcing BLI and safety protocols, and guiding students through their project

  (including reviewing proposals before submission to DNALC*)

BLI Guidelines

- Project must use *DNA barcoding* to answer some scientific research question.
- Teams should develop a “team name” and a professional scientific title.
- They must then submit a scientific proposal

Refer to full list of guidelines here (*bottom right of page*):

https://dnabarcoding101.org/resources/

Research Topics – Independent Projects

- Projects can focus on:
  - Invertebrates
  - Noninvasively obtained [non-human] vertebrate samples
  - Plants*
  - Fungi
  - Algae**

Note: rbcL is limited in species level IDs for plants!

****Note: how will you know you're getting DNA from one organism?***

Research Topics – Independent Projects

- **BLI Project Proposal Rationale:**
  - Abstract, Full Introduction, and Full Methods (*suggested grades: 11-12*)
  - Good for students with more scientific experience or who already did a campaign
  - more exposure to scientific writing (good prep for college!)
  - Projects should include a testable hypothesis
  - Appropriate for:
    - Ecological Studies
    - Protocol Studies
    - Taxonomic Studies
    - Practical Application Studies
    - Longitudinal Analyses – ***make use of the Sample Database***!

Research Topics – Independent Projects

DNA barcoding lends itself to studies involving

biodiversity and species identification

To learn about biodiversity and species identification, check out our video, “DNA Barcoding and Biodiversity”

Collection Methods

DNA Learning Center BARCODING 101

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Barcoding US Ants

About the Program

Program Resources:

- Program Orientation
- Ant Sample Collection
- Sample Documentation
- Laboratory Resources
- Sample Processing & Bioinformatics

NIH National Institute of General Medical Sciences

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
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Barcoding US Ants

ANT SAMPLE COLLECTION

PROTOCOL

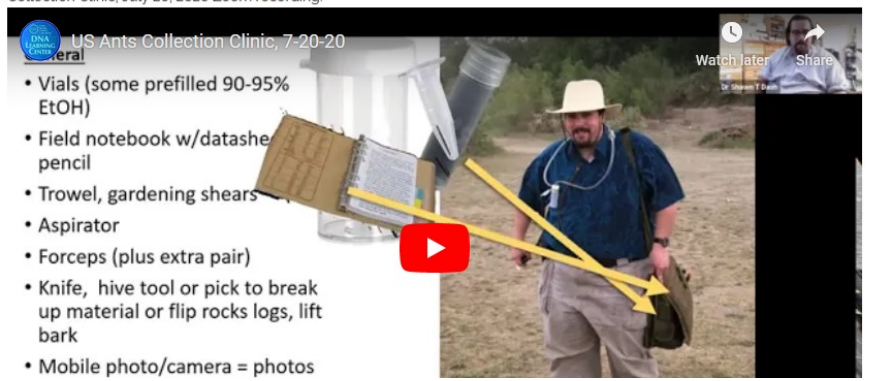
- Collection Guide (PDF): collection and documentation steps. Detailed instructions for different ant collection techniques are summarized.
- Metadata Worksheet (MS Word): use to document observations about site, ants, and ant nests during collection.

ANT COLLECTION

- Ant Collection Recommendations by Genus (PDF)
- Regional Species Hit Lists (PDF)
- Collecting Ants: Shawn Dash (PowerPoint)

ANT COLLECTION CLINICS

- Collection Clinic, July 20, 2020 Zoom recording:



DNA LEARNING CENTER — COLD SPRING HARBOR LABORATORY

Barcoding US Ants

Collection Guide

I. Collect and Document Specimens

The steps below lay out the Collection and Documentation steps of the US Ants Barcoding Project. Detailed instructions for different ant collection techniques are summarized for reference, but not all collection techniques are necessary for all teams. Gear your collection to your geographical area and the ants that you are trying to collect.

Ants belong to a single family, the Formicidae, within the hyper-diverse insect order, Hymenoptera, and they exemplify the importance of insects as ecological indicators with their astounding biodiversity. Ants dominate the ecology of an area with their substantial biomass. They can manipulate species composition, influence trophic interactions, and shape both the abiotic (e.g., through soil shifting) and biotic (e.g., plant-insect interactions) factors affecting an ecosystem. They fill numerous ecological niches taking on the role of predators, mutualists and symbiotic partners, parasites, decomposers and often acting as “keystone species.” Additionally, ants possess a quasi-stable taxonomic and systematic status, creating a situation where species identification is assessable and widely understood. The extant Formicidae contains 21 subfamilies, 411 genera, and more than 15,600 species worldwide. In North America, there are 9 subfamilies, 70 genera, and nearly 800 species.

Collection Methods

You may also obtain specimens from a professional collection (with the guidance of staff or professionals at the institution):

1) Insect collection
2) Herbarium or arboretum
3) Zoo or aquarium
4) Health Department (e.g., mosquitoes)
5) USDA, DEC or agricultural
6) DNALC (Jeff – petracca@cshl.edu)

Examples of Independent Projects:

1) **Ecological Studies:**
   - E.g., Measuring insect diversity in a natural area vs. an area with some variable/factor/difference (e.g., pesticide treatment)

   - Both the natural area and the "disturbed" area should be identical in all ways except for the particular factor being studied

   - Students must show evidence of the variable in question (e.g., records of pesticide application, temperature changes, some measure of air quality, etc.) – ***back-up your hypothesis***!

Examples of Independent Projects:

2) Protocol Studies

- E.g., Testing a different set of primers/barcode marker that provides better species resolution in a group of organisms.

- Students are responsible for coming to their mentor or BLI staff with a reference and an execution plan for their study.

- You must show that there is some reason to change up a protocol

Examples of Independent Projects:

3) Taxonomic Studies

- E.g., Resolving a species complex using DNA barcoding or investigating the evolutionary relationships within a taxon.

- Projects could focus more on classification or even the identification of a new species*

*__Note:__ no project should ever set its goal as the identification of new species unless there is literature support or some compelling reason to believe that new species exist in an area.

Examples of Independent Projects:

4) Practical Application Studies

- E.g., Surveying the different types of types of aquatic mites present in artificial aquatic environments at an aquarium.

- Projects could focus on some question with relevance to animal husbandry, agriculture, human health, animal trade, etc.

Examples of Independent Projects:

5) Longitudinal Studies

- E.g., looking at mosquito diversity across Long Island over time in correlation to changing temperatures

- Projects should incorporate the results of previous year's students from the same mentor OR across multiple BLI teams (this data is available via the Sample Database, iNaturalist, gbif, etc.)

- Should build range maps or discuss notable changes in species over time.

Refrain from these project types

- Bacteria (in any form)
- Vertebrate samples that you need to kill
- Mixed populations
- All the same species
- Multiple samples from the same organism(s)
- Genetic diversity studies
- ***Also, be careful about abundance vs. diversity***

Now compose your own project idea!!!

It’s okay if things change