Asking and Answering Questions:
ADW’s Flexible Querying Tool

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Explore!

Dive in

Ask questions

Answer questions

Large and small
The Animal Diversity Web is:

- a global natural history database
- built by students
- using museum data
- that supports student inquiry
• a global natural history database

1.4 million pages monthly to over 400,000 unique visitors
• built by students
77 institutions, hundreds of courses, over 3500 student authors
> 4000 species, 400 higher taxa, 19,000 live animal images
• using museum data

7,500 specimen images
that supports student inquiry

Over 30 institutions, thousands of students, and more than 30 prepared activities

Dr. Phil Myers
What goes into supporting flexible querying?

- taxonomic skeleton
- a fully structured database
- controlled vocabulary keywords
- data fields
• taxonomic skeleton
• a fully structured database
• controlled vocabulary keywords

Some key physical features

- Endothermic
- Heterothermic
- Homiothermic
- Bilateral symmetry
- Polymorphic
- Poisonous (bad news if you bite it)
- Venomous (bad news if it bites you)

Sexual dimorphism

- Sexes alike
- Female larger
- Male larger
- Sexes colored or patterned differently
- Female more colorful
- Male more colorful
- Sexes shaped differently
- Ornamentation (antlers, wattles, etc.)

Key behaviors

- arboreal (lives in trees)
- scansorial (specialized for climbing in trees)
- cursorial (specialized for running)
- terricolous (lives on the ground)
- fossorial (specialized for burrowing under ground)
- troglobophilic (breeds and thrives in caves)
- flies
- glides
- saltatorial (specialized for jumping and hopping)
- natatorial (specialized for swimming)
- diurnal (active during the day)
- nocturnal (active at night)
- crepuscular (active at dusk and dawn)
- parasite
- motile (able to move around)
- nomadic (moves throughout a large range year-round)
- migratory (moves seasonally between different regions)
- sedentary (mainly stays in one general area)
- hibernation (inactive during the winter)
- aestivation (dormant during hot weather or times of little food)
- daily torpor (dormant for a part of each day)
- solitary
- territorial (area defended by an animal or group)
- social (lives mainly in a group)
- colonial (lives in large groups)
- dominance hierarchies
- data fields

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<th>Average</th>
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The result:

- flexible presentation of content
- flexible queries to explore hypotheses
• flexible presentation of content

BioKIDS Critter Catalog
• flexible presentation of content

Customized pocket guides
• flexible queries to explore hypotheses
• flexible queries to explore hypotheses

Sample Activities

ADW project staff and collaborating faculty have created a suite of learning activities that use data from the Animal Diversity Web, extracted with Quaardvark. In each activity students construct their own searches and extract data sets that are large enough for them to find patterns. Below is a list of activities suitable for different types of undergraduate courses, followed by a full list of activities. Activity titles link to individual pages with downloadable activity documents.

Suitable for introductory biology students:

- An Introduction to the Animal Diversity Web and Quaardvark
- Taxonomic Diversity and the Environment
- Introduction to Data Analysis
- Life History Impacts on Number of Offspring
- Form and Function
- Generalized Sexual Dimorphism And Mating System Exercise
- Mass and Lifespan in Aves
- Sociality And Habitat In Aves
- Patterns in Life Histories and Conservation Risk
- Ecotree Exercise
- Endangered Species Lab
- Terrestrial/Aquatic Comparisons
- Relating Natural History Traits to Basal Metabolic Rate
- Body Mass and Basal Metabolic Rate in Birds and Mammals

Suitable for ecology, conservation, wildlife classes:

- An Introduction to the Animal Diversity Web and Quaardvark
- Taxonomic Diversity and the Environment
- Introduction to Data Analysis
• flexible queries to explore hypotheses
• flexible queries to explore hypotheses
Query for bats native to the Nearctic.
• flexible queries to explore hypotheses
Query: What group of animals are you interested in searching?

- Animal Group: "Chiroptera"
- Geographic Range: Nearctic :: Native

Report: What do you want to know about them?

- Taxonomic Ranks > Species
- Taxonomic Ranks > Family
- Physical Description > Mass: Average (g)

Primary Diet:
- Carnivore: eats animal tissue
  - Eats terrestrial vertebrates
  - Eats aquatic vertebrates
  - Eats fish
  - Eats eggs
  - Sanguivore: eats blood
  - Eats body fluids
  - Insectivore: eats insects
  - Eats non-insect arthropods
    - Eats crustaceans, arachnids, etc.
  - Mallophage: eats ticks, etc.
  - Oviparous: lays eggs
  - Ovoviviparous: viviparous with eggs at birth
- Vertebrate: eats vertebrates
- Herbivore: eats plants
- Oligotrophic: eats small prey
- Predation
- Ecosystem Roles
Show images of skull morphology.
Select "submit."
Report is presented in the browser window and is downloadable.
• flexible queries to explore hypotheses
• flexible queries to explore hypotheses

<table>
<thead>
<tr>
<th>Species</th>
<th>Family</th>
<th>Mass - average - g</th>
<th>Lifespan (wild, undetermined) - undetermined - average - years</th>
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<td>Anteropsetus cataracta</td>
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</tbody>
</table>
• image queries of live animals using controlled vocabulary
Flexible queries to explore hypotheses

Dendroica caerulescens

Parulidae

- Nearctic
- Nearctic :: Native
- Neotropical
- Neotropical :: Native

Dendroica cerulea

Parulidae

- Nearctic
- Nearctic :: Native
- Neotropical
- Neotropical :: Native

Dendroica coronata

Parulidae

- Nearctic
- Nearctic :: Native
- Neotropical
- Neotropical :: Native

Dendroica kirtlandii

Parulidae

- Nearctic
- Nearctic :: Native
- Neotropical
- Neotropical :: Native
Nearly limitless inquiries

- students pose hypotheses and explore data on their own
- supports data analysis skills
- supports observation and measurement of specimens

Additional possibilities

- Integrate with other databases (collection, image, range maps, etc.)
Evidence of efficacy

• exercises built and tested in over 30 classrooms at 20+ institutions

• Over 3000 students evaluated, pre/post-assessment via participant perception indicator tools

• significant increases in student confidence in their ability to formulate and answer scientific hypotheses and manipulate data

Spring 2018

• QUBES Faculty Mentoring Network around using ADW querying in undergraduate classrooms – come join us!
Thank you!

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