

Artificial
Selection,
It's
Unnatural!

NSTA 2016
Nashville, TN



ward's
science+

Ward's Kits – What do you get?

- Easy to use resources associated with products
- Quality materials you can trust
- Kits are ready to use straight from the box!
- Contact: robert.geroux@vwr.com
585-321-9149



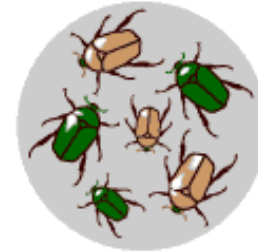
Agenda

- Introduction
- Activity 1
 - Natural Selection Activity
 - Headband craft project
- Activity 2
 - Artificial selection activity
 - Bean beetles
- Prizes and giveaways!



Natural Selection

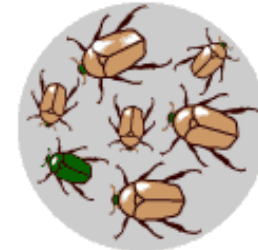
- *The change in heritable traits of a population over time.*
- Let's take an example to better demonstrate
 1. Variation in traits exist in a population
 2. Selection pressure, predation, removes green beetles
 3. Survivors, brown beetles, reproduce and pass on traits
 4. Advantageous trait (brown) becomes more common in population. If process continues, the population will change.



1



2



3



4

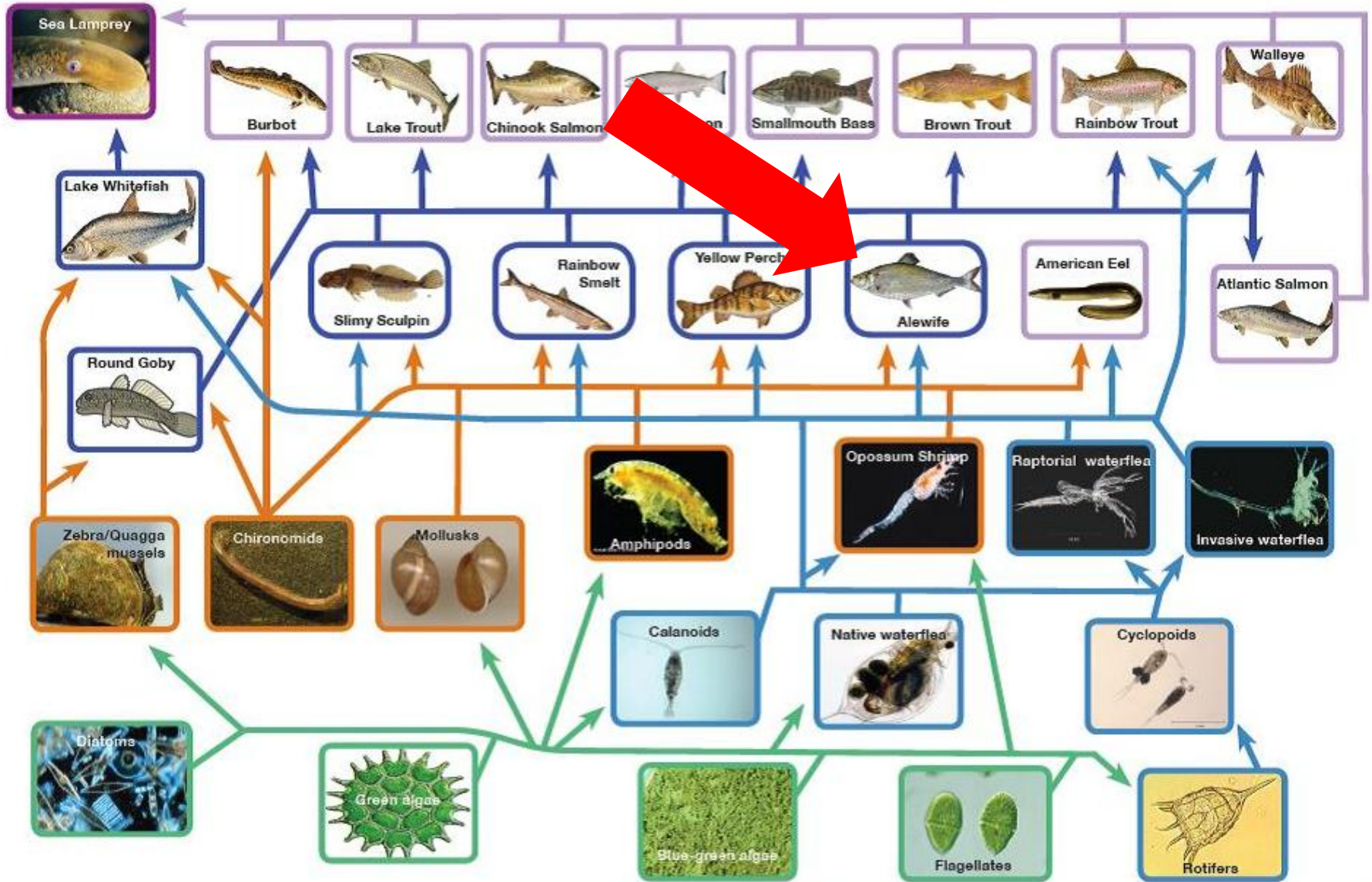
Scenario

- You are all fish in Lake Ontario
 - ❖ *Teaching Tip – You can pick any organism and environment*
- Specifically you are alewives, a pelagic fish integral to the Great Lakes food chain
- Let's take a look at that food web!

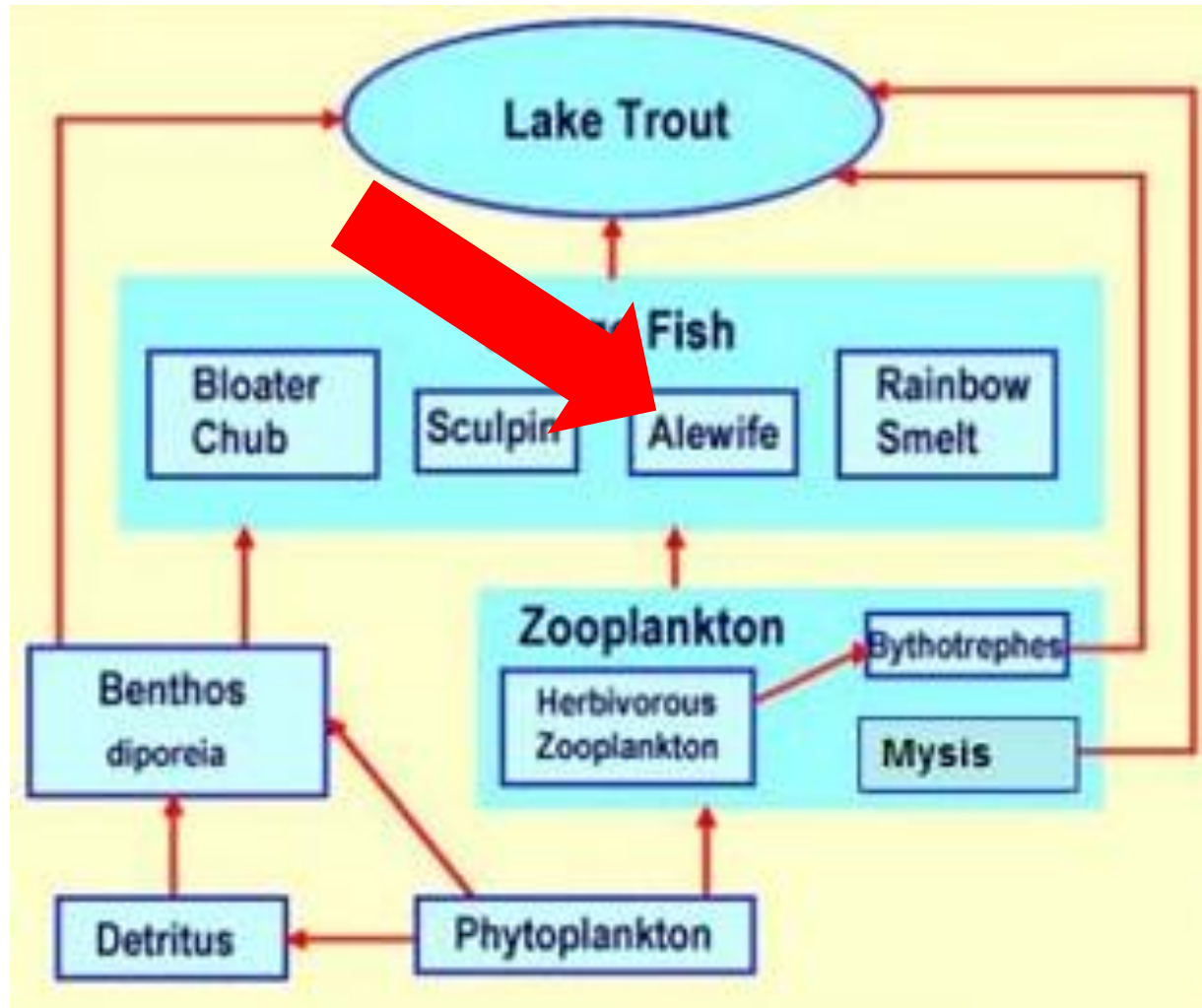




Lake Ontario Food Web



Let's simplify a bit



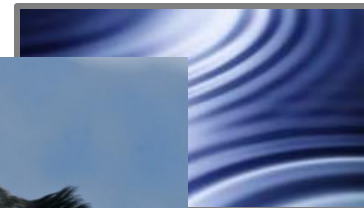
Natural Selection – Pick Your Traits!

- On your table you will find headbands, accessories and zots (sticky beads)
- Spend the next 10-15 minutes choosing accessories for your headbands and attaching them to your headband with zots
- The headband itself and the accessories are your traits



Natural Selection—Who Will Survive?

- Shoreline erosion has caused salt deposits to be exposed increasing the salinity of Lake Ontario
 - All alewives with trait X cannot osmoregulate properly and perish
- Bright colored alewives are conspicuous, all alewives with trait Y are consumed by trout
- Trait Z causes you to have an overactive swimbladder. You are too high in the water column and are being eaten by cormorants!



Artificial Selection

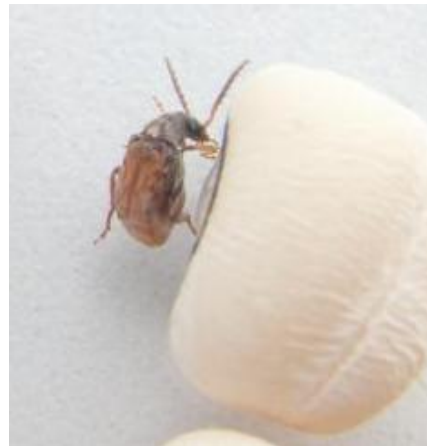
- *The intentional reproduction of individuals in a population that have desirable traits.*
 - *Humans choose which individuals breed*
 - *Often referred to as selective breeding*
- We will now Artificially select for two individuals exhibiting the Ward's Science Logo trait as it is most desirable.



Why use Bean Beetles?

- Easy to handle (can fly usually don't)
- Short development time (~3-4 weeks egg to adult)
 - Depends on temperature, humidity and bean type

(Howe and Currie 1964, Schoof 1941)



Artificial Selection – Bean Beetles

- Activity – Select for the largest individuals in a population
- Compare to control population of randomly selected individuals



Control

- For our control take 10 random bean beetles
- Mass individuals
- Place on Beans
- Incubate
 - ❖ *Teacher tip – It is beneficial to set up multiple controls and/or to select 5 males and 5 females*
 - ❖ *This will prevent a sterile control (all M or all F)*



Student Roles

- **Sorter** – Determine sex (**2-4 students**)
- **Runner** – Take sorted beetles to masser and then to recorder (**4-6 students**)
- **Masser/Calculator** – Label beetles and run scales (**4-6 students**)
- **Recorder** – Keep track of individual masses of beetles on whiteboard (**2 students**). Transcribe whiteboard data to Excel (**1 student**)
- **Top 10'ers** – Maintains the top 10 (5 ♂ 5 ♀) most massive beetles (**2-4 students**)
 - Will change constantly



Experimental Group

- ❖ *Teacher tip – If you have a class or lab section of 15-30 students assign roles and collect data for the whole class*
- For today's activity each table will conduct their own experimental set up
 - Assign Sorter, Masser, Recorder and top 10'er for your group
 - We will skip the runner for now



Sexing Bean Beetles

- Determined by viewing the coloration of the plate covering the abdomen.



- Males also tend to be lighter in color



Compare Results

- Compare each “class” (table) results with that of the other classes.
- Compare with control



Biggest of the Big – Group Data

Beetle #	Sex (M/F)	Mass (g)



Other activities

- Test other variables:
 - Bean types
 - Mung, Adzuki and Black Eyed Peas
 - Temperature
 - Humidity



Statistical Analysis

- Two groups
 - T-test or non-parametric alternative
- Multiple groups
 - ANOVA or Kruskal-Wallis



Additional resources

- www.beanbeetles.org



Next Steps

- Find the products used in this workshop at wardsci.com
- Pick up **helpful literature** on your way out
- Any questions? Email our Plus Us team at: sciencehelp@vwr.com
- Stop by **Ward's Science booth #142** for a chance to win a \$500 science shopping spree along with other great prizes!

