Week 5
BIO-1306 - Biology 2 – ICB textbook

Hello and Welcome to the weekly resources for BIO-1306 - Biology 2 – ICB textbook!

This week is Week 5 of class, and typically in this week of the semester. your professors are covering these topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout of the semester.

We also invite you to **look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester**.

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

***Keywords*:** Natural Selection, Selective agent, Non-adaptive evolution, Evolution

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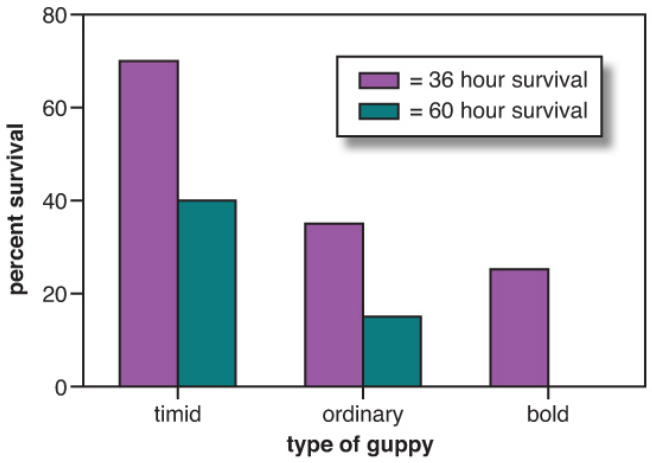
TOPIC OF THE WEEK: Tenets of Natural Selection

This week we will be looking at factors that lead to natural selection.

- Overproduction → More offspring are produced than the resources available in the environment, leading to another tenet (competition)
- Competition → When organisms in a population are forced to compete for limited resources
- Variation → Individuals have different characteristics, leading to different abilities/advantages which help select individuals survive
- Selective Advantage → Certain variations in traits for organisms leads to advantages when competing for resources which leads to greater survival

- Reproduction → Those with the selective advantage that out-compete others in the population are able to reproduce and pass on the advantageous traits to their offspring.

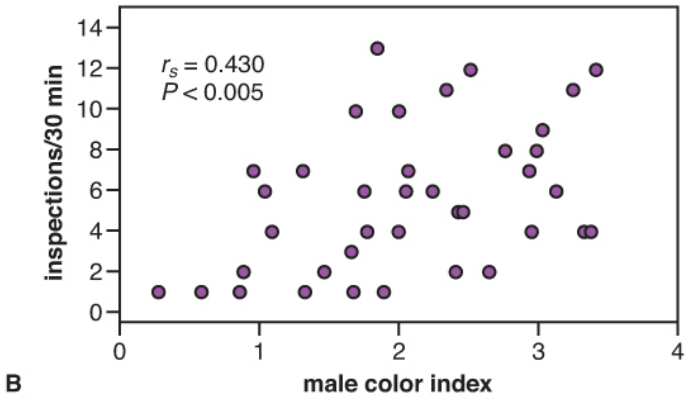
HIGHLIGHT #1: Guppy Behavior Variation



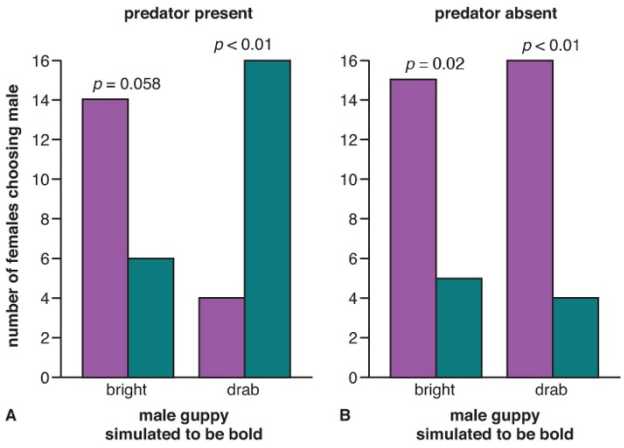
One study conducted by Dugatkin started by observing behaviors of guppies when predators were nearby. Guppies were placed in an aquarium and their predator was placed in the adjacent aquarium. Dugatkin assigned the labels "timid," "ordinary," and "bold" to the guppies based on how much they approached the predator. For example, bold guppies were those that approached the side of the tank facing the predator often, while timid guppies stayed to the other side. After assigning their labels, groups of guppies containing all three types were placed into an aquarium with the predator. The percent survival of each type was recorded after 36 hours and after 60 hours. **What did they find?** They saw that a larger percent of timid guppies survived than bold guppies that would be more likely to approach the predator. Over time, predation was acting as a **selective agent**, selecting against bold individuals. But if that's the case, **why are bold individuals still found in the population?**

HIGHLIGHT #2: Simulating Predator Behavior

The relationship between brightness of the male and boldness was determined and displayed on this graph, showing a **positive correlation between these factors. The brighter guppies were more likely to approach the predator and act bold.**



After establishing the correlation, the relationship between female attraction and boldness was studied.

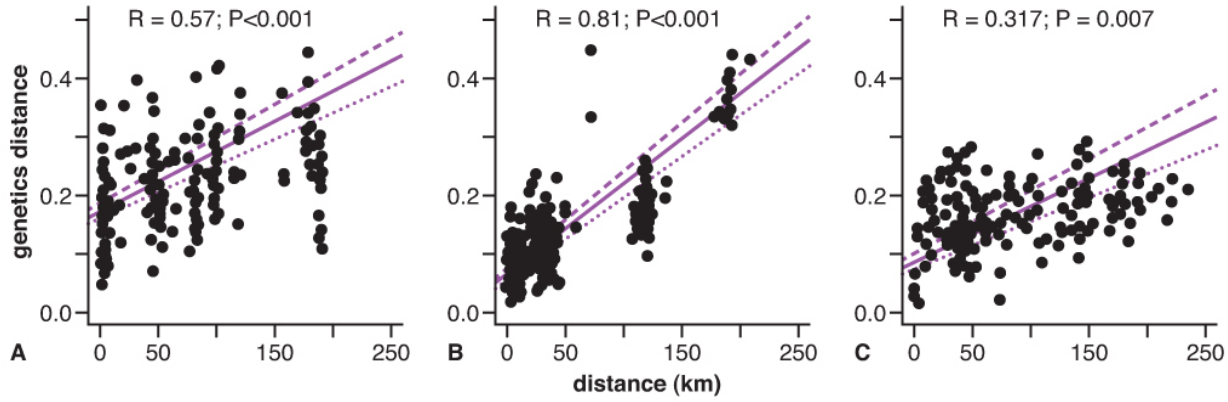


It was seen that when a predator was present, the females gravitated towards the guppy stimulated to be bold, regardless of how bright the guppies were. When the predator was absent, however, the females were mainly attracted to the bright guppies. **What does this mean?** Researchers proposed that the female guppies may associate bright guppies with being bold. When a predator was present, they preferred bold guppies because they could observe which guppies were closely inspecting the predator. When the predator was absent, however, they couldn't clearly tell which guppies were bold since there was no predator to inspect. Because they associate the brightness of guppies with boldness, they could only assume which guppies were bold based on that factor, and so they gravitated towards the bright guppies. This answers our question about why the bold guppies were still surviving in the population despite having a low survivability rate due to predation. Females prefer the bold male guppies, so the bright guppies are able to pass their traits off to their offspring, keeping the bright guppies present in the population. From this study, it's clear that natural selection can play a large part in evolution due to selective traits providing advantages for some organisms to pass their traits to the offspring. **However, can a population evolve without natural selection**?

HIGHLIGHT #3: Non-Adaptive Evolution

Non-adaptive evolution can cause genetic diversity to be lost in populations, but populations continue to evolve in a changing environment.

The Kuss experiments looked into three species of plants that live in the Swiss Alps and analyzed populations of these species within the same geographic area using the same genetic analyses. **What did they find?**



When looking at those plots, we can see that the genetic distance between each population increases as the geographical distance increases which shows that population isolation leads to greater genetic diversity and therefore evolution. **The farther apart two populations are, the less likely they are to exchange genetic material by gene flow**; and in this study, even populations close to each other were genetically dissimilar. You can see in general that as geographic distance increased, genetic distance also increased, which is indicated by the best fit (purple) lines.

It is important to point out that there is significant variation in the data. Some pairs of populations that were geographically close had a high level of genetic distance, and others at the same distance had a low level. This may indicate that there was some randomness in the flow of genetic material that occurred randomly, so pollen or seeds from one population may make it to another population regardless of distance.

In conclusion, **isolation of small, isolated populations can lead to evolutionary changes and loss** due to the disappearance of particular genes.

CHECK YOUR LEARNING:

1. In the guppy experiments, what was predation considered to be?
2. What is the type of evolution caused by random changes in the genome that are neither beneficial not harmful?
3. If individuals in a population die or do not reproduce and this causes some genes to be lost, this would be an example of what?

THINGS YOU MIGHT STRUGGLE WITH:

1. Interpreting the graphs – Remember to look at all the axes on the graph to understand what's being measured or changed. Don't focus too much on the small details, rather look at the big picture.
2. Keeping track of the different ways a population can undergo evolution (natural selection, non-adaptive like genetic drift or bottleneck effect, etc.)
    a. Make sure to really understand the definitions and come up with examples of these terms so that you understand the concept

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Thanks for checking out these weekly resources!
Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: www.baylor.edu/tutoring ! Answers to check your learning questions are below

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Answers:

1. Selective Agent
2. Non-adaptive Evolution
3. Genetic Drift