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DATA Nugget

How to Escape a Predator

Featured scientists: Amy Worthington and John Swallow from Washington State University and University of Colorado, Denver

Research Background:

Stalk-eyed flies are insects that have their eyes on the ends of eyestalks, or long projections from the sides of their head. Eyestalks are a **sexual signal** that males use to attract females. The longer the eyestalks, the more attractive a male is to females and the more mates he gets. For these flies, this process, called **sexual selection,** leads to an elaborate trait, just like a peacock's tail. Males with longer eyestalks have more babies and pass their traits on. Over generations, sexual selection leads to longer and longer eyestalks in males.

However, these eyestalks may come with a cost. Males with longer eyestalks may not be able to move easily and quickly. If they can't move as fast, males with long eyestalks may be worse at escaping predators. **Natural selection** may select against long eyestalks if males with more elaborate traits are killed and eaten more often by predators. If predators eat males with longer eyestalks before the flies reproduce, they will not get to pass on their traits, regardless of how attractive they are to females.

In addition to eyestalk length, other traits could affect survival in male stalk-eyed flies. Perhaps a fly's behavior is more important than its eyestalk length when faced with a predator. When biologists Amy and John first started researching how eyestalk length affected survival, they noticed something intriguing! The flies showed many different behaviors when face to face with a spider predator. Some examples of behaviors included grooming, walking or flying towards the predator, quickly walking or flying away from the predator, displaying forelegs, and bobbing their abdomens. When prey use these **antipredator behaviors**, predators must put in more work to catch prey, and they will sometimes give up. Therefore, antipredator behaviors may influence the predator's choice of prey, and certain behaviors that make prey harder to catch could lead to increased survival.

A stalk-eyed fly and spider interacting in the arena.

To test whether differences in eyestalk length and/or antipredator behavior were important for survival, male stalk-eyed flies were put in cages with predators. Amy and John filmed the fly behaviors and analyzed the footage. They calculated the frequency and proportion of time that flies were displaying antipredator behaviors. If males with longer eyestalks have lower

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survival than males with shorter eyestalks, it suggests that longer eyestalks make it harder to avoid predators. However, if eyestalk length has no effect on survival, it suggests that male flies with long eyestalks are able to compensate for their lack of speed through behavior.

Scientific Question: How do differences in eyestalk length and antipredator behavior affect predation risk in male stalk-eyed flies?

What are the two alternative hypotheses? Find the two alternative hypotheses in the Research Background and underline them. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data below to answer the scientific question:

Table 1: Traits for surviving and dead male flies after predator trial.

Trait	Surviving Males	Standard Error	Dead Males	Standard Error
Average eyestalk length (mm)	7.95	0.08	7.94	0.13
Average Body Width (mm)	1.84	0.02	1.87	0.02
Percent of males	24.59%		75.41%	

Table 2: Behavior of male stalk-eyed flies in the presence of a predator.

Behavior	Surviving Males	Standard Error	Dead Males	Standard Error
Abdomen bobbing (proportion of time involved in behavior)	0.80	0.05	0.69	0.09
Jabbing predator (number/ minute)	0.07	0.03	0.05	0.02
Flying retreat (number/ minute)	0.25	0.04	0.78	0.32
Walking retreat (number/ minute)	0.50	0.05	0.80	0.29

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What data will you use from Table 1 to answer the question?

Independent variable: _____

Dependent variable: _____

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What data will you use from Table 2 to answer the question?

Independent variables: _____

Dependent variable: _____

_____

Draw your graph(s) below:

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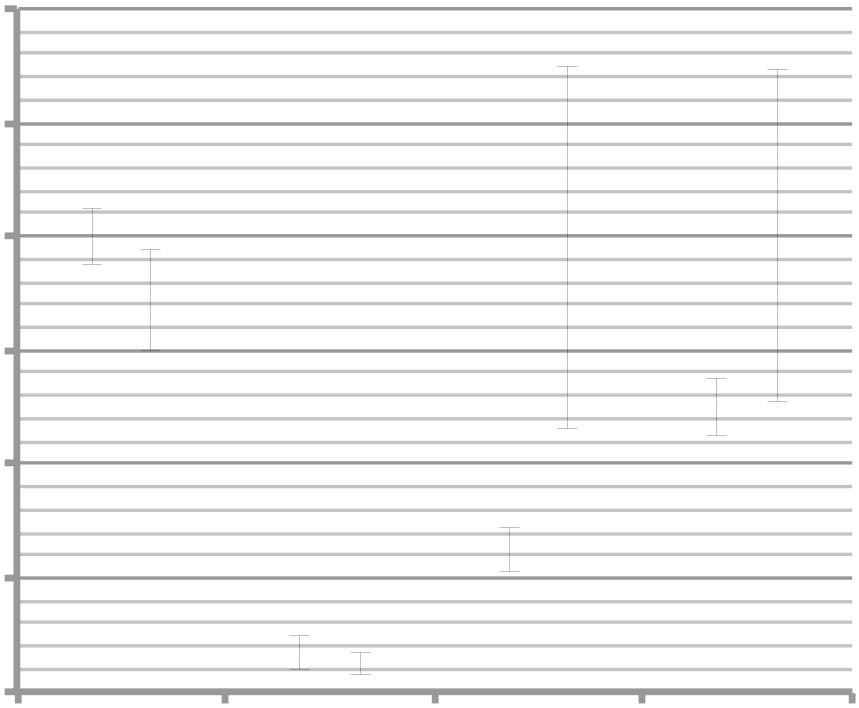

Interpret the data:

Make a claim that answers the question, how do differences in eyestalk length and antipredator behavior affect predation risk in male stalk-eyed flies?

Support your claim using data as evidence. Describe the relationship between the dependent and independent variables. Refer to specific parts of the table or graph.

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Describe your scientific reasoning and explain how the evidence supports your claim.

According to the data, is there sexual selection or natural selection operating on any of the measured traits in male stalk eyed flies?

Your next step as a scientist: Science is an ongoing process. Did this study fully answer your original question? What new questions do you think should be investigated? What future data should be collected to answer them?