



AP Bio

FRQ Fridays

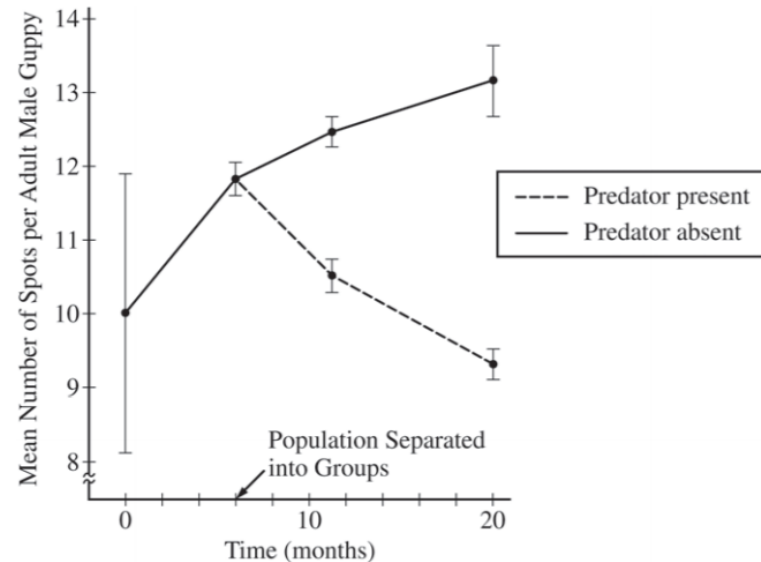
2014 #4
Types of Selection & SEM Bars

FRQ Friday #22

2014 #4

Adult male guppies (*Poecilia reticulata*) exhibit genetically determined spots, while juvenile and adult female guppies lack spots. In a study of selection, male and female guppies from genetically diverse populations were collected from different mountain streams and placed together in an isolated environment containing no predators.

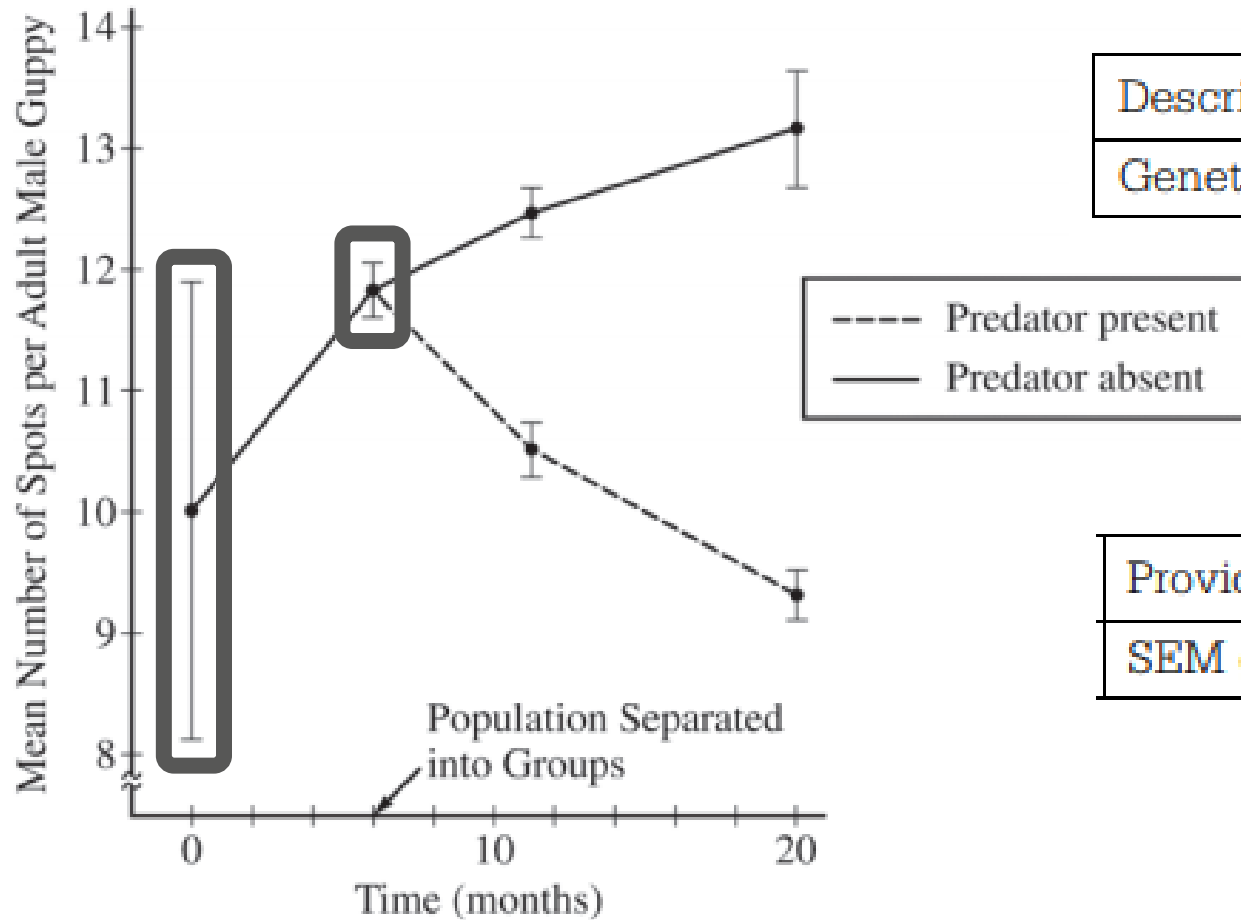
The study population was maintained for several generations in the isolated area before being separated into two groups. One group was moved to an artificial pond containing a fish predator, while a second group was moved to an artificial pond containing no predators. The two groups went through several generations in their new environments. At different times during the experiment, the mean number of spots per adult male guppy was determined as shown in the figure below. Vertical bars in the figure represent two standard errors of the mean (SEM).



FRQ Friday #22

2014 #4

- (a) Describe the change in genetic variation in the population between 0 and 6 months and provide reasoning for your description based on the means and SEM.



Describe change (1 point)

Genetic variation is decreasing

Provide reasoning (1 point)

SEM gets smaller



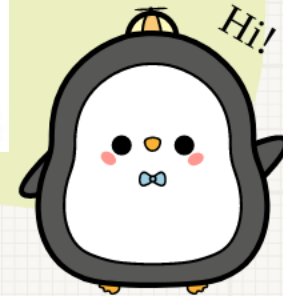
FRQ Friday #22

2014 #4

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Describe change (1 point)	Provide reasoning (1 point)
Genetic variation is decreasing	SEM gets smaller

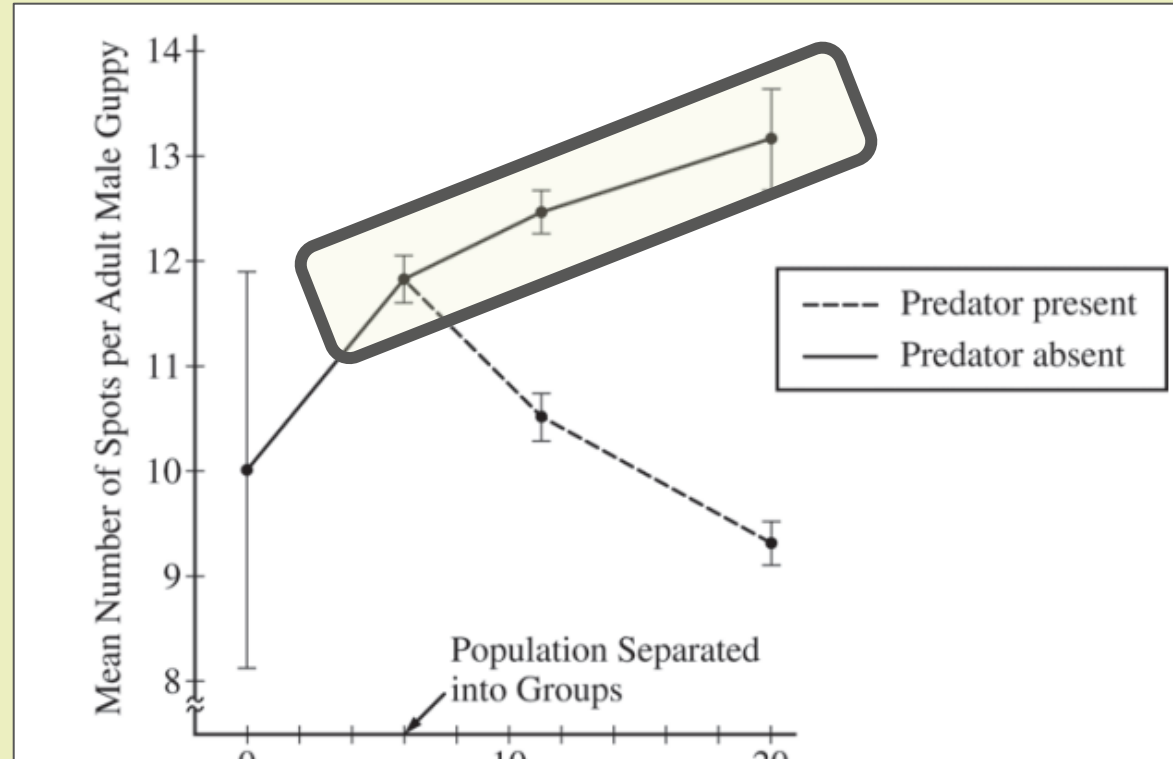
In the period lasting from 0-6 months, the amount of genetic variation in the population decreased. The mean number of spots increased from 10 to 12 and the SEM decreased, which indicates that there was variation in the number of spots, and more of the individuals had a number closer to the mean.



FRQ Friday #22

2014 #4

(b) Propose ONE type of mating behavior that could have resulted in the observed change in the number of spots per adult male guppy between 6 and 20 months in the absence of the predator.



- Sexual selection for individuals with more spots
- Random mating behavior resulted in increased number of spots by chance



FRQ Friday #22

2014 #4

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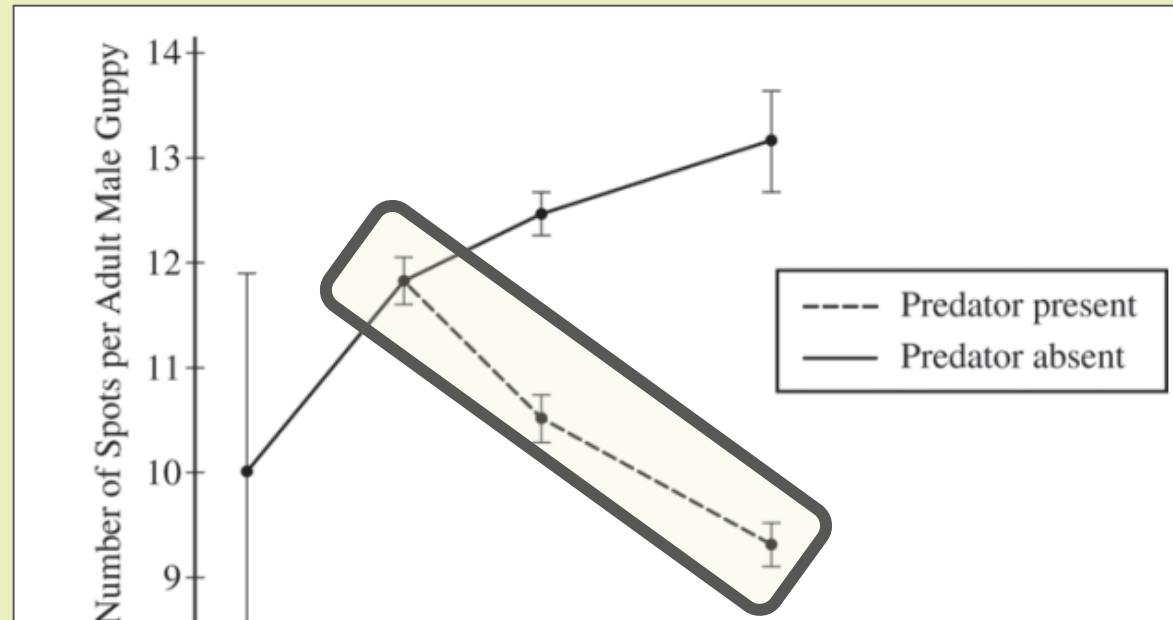
One mating behavior that could've resulted in the further increase in the average number of spots in the absence of the predator is sexual selection or preference. Perhaps female guppies showed a preference for males with a greater number of spots. This would make having spots a favorable trait in males and thus increase its frequency.



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(c) Propose an evolutionary mechanism that explains the change in average number of spots between 6 and 20 months in the presence of the predator.



- Directional selection against individuals with large numbers of spots
- Directional selection for individuals with fewer spots
- Natural selection used in context
- Genetic drift resulted in several generations of decreased numbers of spots

Hi!

FRQ Friday #22

2014 #4

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An evolutionary mechanism that would explain the decrease in spots in the presence of predators is the ~~potential~~ decreased fitness of males with spots. This could be for a number of reasons, but perhaps the spots made the guppies more visible to predators and thus caused them to be eaten more frequently. This would decrease their ability to mate (they may die before they sexually mature) and thus result in a lower frequency of spots.

