

Courtship time (min)	Expected number of offspring
0	0
1	6
2	10
3	18
4	30
5	50
6	70
7	82
8	90
9	96
10	100

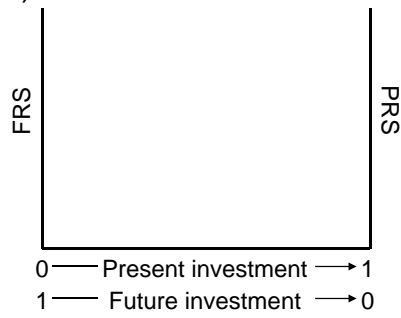
1. The relationship between male courtship time and expected number of offspring has been determined experimentally in a newly identified species of *Drosophila*. However, no demographic information is available that would suggest how difficult it is to find mates. What range of courtship times could you expect to see if these males are maximizing their reproductive success?
2. If the average time to find a mate was found to be 5 min, how long should a male court a female to maximize reproductive success?

Feeding time (min)	Insect larvae obtained
0	0
1	5
2	9
3	12
4	14
5	15

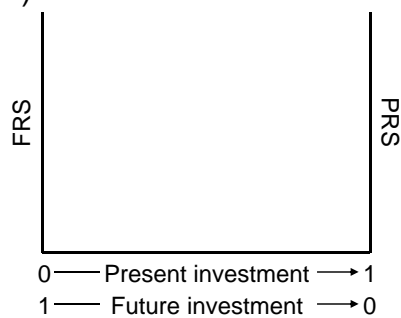
- Woodpeckers experience diminishing returns when they continue to feed at a particular site (values in table).

1. If you noted that woodpeckers generally forage for 4 minutes at any particular site, how long would you expect it takes them on average to locate a new foraging site?
2. If you instead noted that it takes 3 minutes to locate a new foraging site, what is the maximum sustained feeding rate the woodpecker could maintain?

1)



2)



1. In a typical iteroparous fish, female fecundity increases with size and the typical lifespan is 5 years. How would present vs. future reproductive success differ in 2, 3 and 4 year old females?
2. Would the answer change if the typical lifespan was 10 years?

Courtship Time (min)	Probability of mating – Long tail	Probability of mating – Short tail
0	0	0
1	0.35	0.25
2	0.60	0.4
3	0.77	0.45
4	0.90	0.47
5	0.96	0.47

- There are two male morphs of swordtail fish. One morph has developed an elongated tail that makes their courtship display more attractive to females, but that compromises swimming performance. This long tail morph typically requires 6 minutes to find a mate. The second morph has maintained a short tail that allows normal swimming performance, and averages 2 minutes to locate a mate.
- Which morph has higher fitness? Explain.
  - What effect would there be on morph fitness if males instead congregated in leks?

- In sticklebacks, females prefer males that allocate carotenoids to the skin of the jaw (albeit with diminishing returns for more intense displays). However, these carotenoids are no longer available for immune function, imposing a physiological cost on the signalling males. Use labelled graphs to illustrate your answers to the following questions:
- How would you expect males of high and low genetic quality to differ with respect to the intensity of their carotenoid display, and their overall fitness?
  - How would you expect carotenoid displays to change if water turbidity (cloudiness) was increased?
  - How would you expect a male's carotenoid display and fitness to change if he was supplemented with antibiotics?
  - BONUS: Would you expect a difference in carotenoid displays between fish nesting in shallow water (<1 m) vs. deep water (>10m)? Why?