Red-billed Quelas Activity

Background:

Red-billed quelas are common birds in parts of Africa. These birds make nests and breed in large, very dense colonies. A male and a female mate and occupy a shared nest to raise offspring. During the year, both male and female birds have identical light brown coloration.

During the breeding season, males produce more colorful feathers ranging from red to yellow. Red and yellow pigments come from the bird's food. Based on previous studies of feather color in birds, it was assumed birds with red feathers had a more nutritious diet than birds with yellow feathers.

Biologists have hypothesized that female quelas may prefer to mate with males that have red feathers.

Question 1:

Based on all of the information provided so far, briefly explain the reasoning underlying the hypothesis that female quelas may prefer to mate with males that have red feathers. Your answer should make specific reference to the fitness effect of female choice on female fitness. (**6 marks**)

1) Color correlates with higher quality **males** and/or better genes – males that have better diets or are healthier have advantageous combinations of genes
2) **Female** fitness increases if she picks the male with red feathers (must have specific reference to female fitness) – if the male has advantageous combinations of genes, these will be passed onto the offspring and should increase the fitness of the offspring for a particular female.
3) because she has healthier/better **offspring** with a higher chance of survival

No marks if discussed fitness of male birds and not females. Partial marks if the answer didn't explain the quality of the male but just repeated the provided information of "birds with red feathers had a more nutritious diet".

Question 2:

Decades later, James Dale studied coloration in quelas. He found that the male plumage color is highly correlated with the plumage color of their father. The birds' diet did not affect coloration after all. All birds have the same average number of offspring regardless of their feather color.

Your friend suggests that the feather coloration (red vs. yellow) in red-billed quelas indicates that sexual selection is occurring and feather coloration is a signal used by females to evaluate male quality. Do you agree with his claim? Explain your reasoning with specific reference to the criteria for selection and how they are met or not met in this case.

No sexual selection is not occurring. The criteria for selection are not all met:

The trait is heritable – yes, feather coloration appears heritable as the plumage color of male parents is correlated with the color of male offspring.

There is variation in the trait – yes, feather coloration varies from yellow to red.

There are differences in fitness – no, all birds have the same average number of offspring, equal fitness regardless of feather color.

Adapted from BIOL121 Evolution Midterm Questions 2018 (Bole, Clarkston, Couch, Leander, Savage, VandePol) @BIOL121

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