Year 13 Science: Relationships within a species: territories, hierarchies, mating

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Tadpoles in a drying puddle all feed on the same algae until it runs out. Is this scramble or contest competition?

2. A helper raises 2 extra full siblings (r = 0.5), or could breed alone and raise 0.6 chicks. Use Hamilton's rule to decide whether helping is favoured.

3. Why do most red deer contests end in roaring and walking rather than antler fights?

4. A kekeno bull holds a beach territory where several females give birth and mate with him. Name the mating system.

5. State Hamilton's rule and say what each letter stands for.

Exam-style question: kākāpō leks

Kākāpō breed only in years when rimu trees fruit heavily. In those summers males walk to ridgetops, each clears a track-and-bowl system, and booms from its bowl for up to eight hours a night for three to four months. Females travel several kilometres to the lek, mate with one male and raise the chicks alone.

6. Describe what a lek is and identify the mating system shown.

7. Explain how booming leads to a female choosing a male.

8. Discuss why lek mating gives an advantage to the females and to the successful males, compared with males that do not display.

Fix the mistake

9. Correct this statement: "Helpers raise their siblings for the good of the species."

10. Correct this statement: "Low-ranked animals gain nothing from a hierarchy."

11. Correct this statement: "A territory is wherever an animal lives and feeds."

12. Correct this statement: "The kākāpō male booms so that it attracts a female."

Answer key (for parents and tutors)

1. Tadpoles in a drying puddle all feed on the same algae until it runs out. Is this scramble or contest competition?
   Scramble competition: no tadpole defends the algae; all share it until it runs out.
2. A helper raises 2 extra full siblings (r = 0.5), or could breed alone and raise 0.6 chicks. Use Hamilton's rule to decide whether helping is favoured.
   r × B = 0.5 × 2 = 1.0, and C = 0.6 chicks given up; 1.0 > 0.6, so helping is favoured.
3. Why do most red deer contests end in roaring and walking rather than antler fights?
   Ritualised displays let stags judge each other's strength, so the weaker one withdraws without injury and the winner avoids wounds; fights happen only between closely matched stags.
4. A kekeno bull holds a beach territory where several females give birth and mate with him. Name the mating system.
   Polygyny.
5. State Hamilton's rule and say what each letter stands for.
   r × B > C: r is the relatedness to the individuals helped, B the extra offspring they raise because of the help, and C the offspring the helper gives up.
6. Describe what a lek is and identify the mating system shown.
   A lek is a gathering of males at display sites, where they compete only by display and females come to choose; males give no parental care, and a few males mate with many females, so it is a form of polygyny (Achieved).
7. Explain how booming leads to a female choosing a male.
   The bowl acts as an amplifier, so the low-frequency boom carries several kilometres at night and leads females to the lek; females compare booming males and choose one, probably on how long and how strongly he can keep booming (Merit).
8. Discuss why lek mating gives an advantage to the females and to the successful males, compared with males that do not display.
   Booming for months costs a male a lot of body fat, so only males in the best condition can keep it up: it is an honest signal. Females raise chicks alone in a rare mast year, so choosing a high-quality male gives chicks better genes for survival; they gain nothing else from males. Successful males father many chicks while weak or silent males father none, so alleles for strong booming spread despite the cost (Excellence links signal, choice and reproductive success).
9. Correct this statement: "Helpers raise their siblings for the good of the species."
   Kin selection works at the level of alleles: helping relatives passes on copies of the helper's own alleles.
10. Correct this statement: "Low-ranked animals gain nothing from a hierarchy."
    They avoid costly fights, keep group protection from predators and may rise in rank and breed later.
11. Correct this statement: "A territory is wherever an animal lives and feeds."
    That is a home range; a territory is the part that is actively defended against others of the same species.
12. Correct this statement: "The kākāpō male booms so that it attracts a female."
    Say why that works: booming is costly, so only fit males can keep it up, and females choosing them get chicks with better survival.