

2024 Bi H2 Q13

Section: Sustainability and Interdependence

Topic: Symbiosis and Social Behaviour

Question Summary

A parasitic fly lays eggs in bee nests. Its larvae eat pollen stores intended for bee larvae. You must identify the symbiotic relationship in solitary bees, explain why flies fail to exploit large social colonies, and show how sterile worker behaviour can be advantageous through kin selection.

Worked Solution

- (a) The relationship between the fly and solitary bees is parasitism. The fly benefits by gaining food for its larvae, while the host bee loses fitness because its larvae starve.
- (b) Large social colonies defend the nest collectively. Guard bees at entrances, alarm pheromones, and coordinated aggression reduce access for the fly, so its larvae cannot develop successfully. High worker numbers allow constant nest surveillance and hygiene, including removal of infected larvae or contaminated food.
- (c) Even though many workers are sterile, helping raises the survival and reproduction of close relatives (the queen and related brood). This increases the workers inclusive fitness through kin selection. Genes that promote helping can spread because they are shared with the reproductive relatives that the workers

support.

Final Answer

- > (a) Parasitism: fly benefits, bee harmed
- > (b) Social colonies prevent exploitation via guards, alarm signals, collective defence, and hygiene
- > (c) Worker sterility is advantageous via kin selection and increased inclusive fitness

Revision Tips

- Parasitism: one benefits, host is harmed; mutualism: both benefit; commensalism: one benefits, other unaffected.
- Social behaviour includes division of labour, communication, and cooperative defence.
- Inclusive fitness = direct fitness + indirect fitness via relatives; kin selection explains altruistic behaviours.

