

Bio 45 - Discussion #9 - Termite Film – 19-21 Nov., 2002

I. PURPOSE:

We will watch an amazing film about termite social behavior. This film will fit in well with the topics of inclusive fitness and the evolution of social behavior.

Termites are among the most highly social animals in the world. Like many social Hymenoptera (ants, bees and wasps) and at least one mammal (naked mole-rats) they have sterile worker castes. The 'big' question for the evolution of such social behavior is: "How do you get some of your offspring to give up their own reproduction to help you reproduce?" The proposed answers have varied from 'it is good for the family' to 'the workers actually do better this way than they would on their own'.

Hamilton's inclusive fitness theory offers an explanation for the evolution of sterile worker castes in ants, bees and wasps. His theory basically takes advantage of the fact that male Hymenoptera are haploid. That makes relatedness among sisters higher (all else being equal - like having the same father) than between workers and their own offspring! With this neat insight a lot was explained. However, we will be watching a film about an insect in which males and females are diploid and in which both sexes are workers and soldiers. Thus Hamilton's "two-thirds relatedness" trick does not help us as much. The question of why termites live in family groups with reproduction restricted to a small subset of offspring remains unanswered.

II. READINGS:

Read the sections in Alcock on the evolution of social behavior in insects.

III. ASSIGNMENT:

The film is a long and leaves little time for discussion. You should, however think about how reproductive selfishness and group living might interact to produce such a social system. Play with the following questions. Brainstorm them in your journal.

IV. QUESTIONS:

1. How do termites differ from Hymenoptera in their basic social system? For example, what is the role of males in each social system?
2. The queen and king are locked away in a special chamber. How could the colony be controlled or regulated in its activity by either the king or queen?
3. Most of termite communication is tactile and chemical. How rich could their communication system be? What kinds of information could be conveyed with chemicals? Can it contain as much as, say, our language?
4. Termites, it is estimated, may consume more than one third of all of the plant biomass produced in the world each year! As a result they produce a lot of the world's methane and release more carbon dioxide than humans do in all of our activities. How important is termite social behavior to their ability to be such ecologically important organisms?
5. The film gives you a number of clues about the advantages of termite group living. What are they and how might they relate to the evolution of termite social systems?
6. How did they get the pictures of termites running through the chambers of their nest???