

Is there ever 'altruism'?

By the definition of natural selection, no!

However, cooperative systems do exist... why and how when it seems more beneficial to cheat?

Exploiting Cooperative Behavior

- Cooperative social groups all have the potential to be exploited
- Exploitation can occur in different ways

The Producer-Scrounger Model

- A producer invests energy in creating a resource, which the scrounger then exploits

The Producer-Scrounger Model

- A producer invests energy in creating a resource, which the scrounger then exploits
- Example: Excluded red deer males



Clifton-Brock *et al.*, 1979

The Producer-Scrounger Model

- Another example: Young male elephant seals enter harems by 'pretending' to be female, then mate while the owner of the harem is engaged in a fight



Le Boeuf, 1974

The Producer-Scrounger Model

- How are scroungers maintained in a population?
- This model can be an evolutionary stable strategy

The Producer-Scrounger Model

- Strong negative frequency-dependant selection on the scrounger's payoffs
- Spice finches (*Lonchura punctulata*) vary use of foraging strategies depending on the costs in various foraging situations



Giraldeau *et al.*, 1994

Cheaters Within Mutualisms

- Within a mutualism, it would seem that cheaters could easily exploit resources and overtake populations
- Why doesn't this happen?

Cheaters Within Mutualisms

- Cheating yucca moths occur parapatrically with mutualistic yucca moths
- DNA analyses found that hybridization often occurs between the two, resulting in a mutualistic phenotype

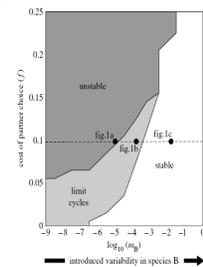


Segraves *et al.*, 2005

Cheaters Within Mutualisms

- Is it possible that cheaters are necessary to maintain mutualisms?

- Foster and Kokko developed a model that shows cheaters may help maintain genetic variability within mutualisms, providing partner choice as a mechanism for maintaining cooperation (Foster and Kokko, 2006)



Punishing Cheaters

- One important way cheaters are suppressed in cooperative groups is through enforcement of cooperation
- Something to think about: does policing and punishment reduce variation in cooperativity and therefore the incentive for maintenance of cooperation?

Punishing Cheaters

- Some fish police their mutualists

- When *C. striatus* was anesthetized, *L. dimidiatus* fed entirely on mucous and ignored ectoparasites



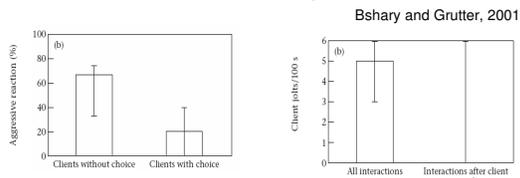
Ctenochaetus striatus (below) actively seek *Labroides dimidiatus* (left) to clean for parasites



Bshary and Grutter, 2001

Punishing Cheaters

- *C. striatus* regularly 'jolted' and chased *L. dimidiatus* after mouth contact
- After chasing, jolts were less common and *L. dimidiatus* cleaned ectoparasites

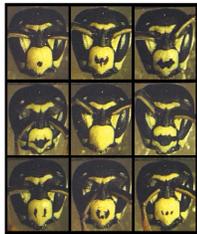


Punishing Cheaters

- Signals of quality are hard to copy; honesty is maintained through genetics and social enforcement
- When production of a signal has low-cost, maintenance in social situations tend to be high-cost

Punishing Cheaters

- Highly variable black facial patterns of paper wasps *Polistes dominulus* strongly predict both body size and social dominance
- Experimentally altered subordinate wasps were treated much more harshly by dominant wasps, even when they were altered to have worse signals



Tibbetts and Dale, 2004

Questions

- Can cooperative societies exist without cheaters? Are cheaters necessary to maintain not only cooperation but social hierarchies?
- Some cheaters are genetic (status badges) and others cheat as an alternate mating/foraging strategy. Can animals "choose" to cheat? What are the evolutionary consequences of obligate vs. opportunistic cheaters?