Re: Hamilton's rule

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- *From*: Guy Hoelzer <hoelzer@xxxxxxx>
- *Date*: Wed, 19 Oct 2005 02:06:26 −0400 (EDT)

in article dj1v9k$1pcv$1@xxxxxxxxxxxxxxxxxxx, Catherine Woodgold at an588@xxxxxxxxxxxxxxxxxxx wrote on 10/17/05 9:56 PM:

> Guy Hoelzer (hoelzer@xxxxxxx) writes:
>> Just for the record, I never argued that "r" is frequency dependent, and
>> that is not my position.
>
> If in the inequality instead of "r" you use "R", the
> ratio between cost and benefit below which the
> altruistic choice will increase the rate of the
> altruistic gene,

OK. I will pursue this model below, but it is entirely unrelated to Hamilton's theory of kin selection. Your model now lies squarely in the realm of pure Darwinian selection.

> then in a diploid species R is
> dependent on how common that gene is in the
> population. It even gets negative sometimes, I think.

I don't see why the result of a simple economical (cost/benefit) analysis would necessarily be frequency dependent. As I said above, your model simply assesses the net cost or benefit of a mutation, which could be either positively or negatively frequency dependent, but need not be either.

If I apply your standard Darwinian model (natural selection will favor an increase in the frequency of any mutation for which R<1) specifically to mutations leading to altruistic behavior, which is I think what you intended, then you have landed in the discrete prisoner's dilemma game. I agree with you that analysis of this game suggests that the fitnesses associated with alternative genotypes in this game are indeed likely to be frequency dependent. If you are leading to the argument that this logic should also apply in a population experiencing kin selection, I agree. However, it is not necessarily the case that these two processes (kin selection and ordinary Darwinian selection) would have some interesting sort of interaction. My initial impression in thinking about the effects of both processes is that they would have essentially additive effects (act independently). Still, it might be that positive frequency dependent selection could take over driving an altruism allele to higher frequency

when the effects of kin selection peter out under some conditions. Is this what you had in mind?

Guy Hoelzer

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- ***References***:
  - ♦ ***Re: Hamilton's rule***
    - ◊ *From:* John Edser
  - ♦ ***Re: Hamilton's rule***
    - ◊ *From:* Catherine Woodgold

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