Re: Hamilton's rule

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- *From*: "Perplexed in Peoria" <jimmenegay@xxxxxxxxxxxxx>
- *Date*: Wed, 16 Nov 2005 13:20:13 −0500 (EST)

"Guy Hoelzer" <hoelzer@xxxxxxx> wrote in message news:dldgfc$1drk$1@xxxxxxxxxxxxxxxxxxxxxx
> in article dl58qa$p8l$1@xxxxxxxxxxxxxxxxxxx, Catherine Woodgold at
> an588@xxxxxxxxxxxxxxxxxx wrote on 11/12/05 9:29 AM:
>
> > Guy Hoelzer (hoelzer@xxxxxxx) writes:
> >> My confusion is rearing its ugly head again. If the axes of the graph are
> >> "frequency in focal individual (Y axis) vs frequency in population (X
> >> axis)", then I don't see how dominance/recessiveness can influence the lines
> >> at all. What am I missing?
> >
> > One of the lines is labelled "donor". The only individuals
> > who act out the "donor" phenotype are the ones which have
> > the set of genes that code for altruism. If altruism is
> > a recessive trait, then all of the "donors" must have
> > two copies of the altruism gene. Therefore the frequency
> > in the "donor" focal individual is always 1 if altruism
> > is a recessive trait.
> >
> > But if the altruism gene
> > is dominant, then the set of "donors" includes some
> > individuals with one copy of the gene and some individuals
> > with two copies of the gene. If an individual is
> > observed to carry out an altruistic act, or if it
> > finds itself experiencing an overwhelming urge to
> > carry out an altruistic act, then an observer
> > (or the organism itself) can conclude that the
> > individual has one or two copies of the altruism gene.
> > The expected frequency in this individual can thus be
> > predicted to lie between 0.5 and 1 (closer to 1 if
> > the altruism gene is very common in the population).
>
> Maybe I should have said more. All of this was apparent to me. In the
> artificially restricted world of modeling perfect dominance/recessiveness
> the starting point of the donor line would be 0.5 (pure recessiveness) or
> 1.0 (pure dominance). In either case, however, there is a simple linear
> relationship on the frequency/frequency graph that converges on the point
> (1,1). The comment you quoted above came from a discussion where I thought
> it was implied that the shape of the relationship (e.g., linearity) was said

> to depend on dominance/recessiveness. I may have been reading too much into
> Jim's comments, which I still think reached way outside the scope of the
> simple frequency/frequency graph.

Reached way outside how? My claims are fairly simple:
− If the (single) altruism locus is purely recessive, the graph of allele frequency in donors is a constant 1.0. (Obviously).
− If the altruism locus is purely dominant, the graph of allele frequency in donors rises linearly from 0.5 to 1.0 as the allele frequency in the population rises from 0.0 to 1.0. I am uninterested in a 'glitch' in this curve at allele frequency exactly 0.0 − there technically are no donors at exactly this frequency.
− Given other assumptions about gene expression besides pure dominance or recessiveness, it is possible that the donor line may be something other than linear. That doesn't matter as long as the donor D line never drops below the 45 degree population P line. Regardless of how the line runs, or of how many loci are involved, it remains the case that the recipient R line lies a fraction 'r' of the way up from the P line to the D line. This fact is a consequence of the definition of IBD 'r' and the assumption of random mating. This fact is all that is needed to establish Hamilton's rule. The rule does not depend on linearity. The frequency independence of the rule does not depend upon frequency.
− What MAY depend on frequency is how fast the altruism allele spreads. That will depend upon just how separated the lines are, and the count of altruists (or of acts of altruism, depending on what b and c measure). It will also depend on the size of b and c. I offered my straight lines as an argument against YOUR claim that the impetus toward the spread of the altruism alleles pretty much peters out at gene frequencies of 30−40%.

So, I have to ask, what exactly are your claims? Do you still believe that the spread of kin−selected altruism peters out at this level, and that only reciprocity can take things further? If so, what kind of D and R curves are you postulating? And why do you think the curves have that shape?

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- ***Follow−Ups***:
  - ♦ ***Re: Hamilton's rule***
    - ◊ *From:* Guy Hoelzer

- ***References***:
  - ♦ ***Re: Hamilton's rule***
    - ◊ *From:* Catherine Woodgold
  - ♦ ***Re: Hamilton's rule***
    - ◊ *From:* Guy Hoelzer

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