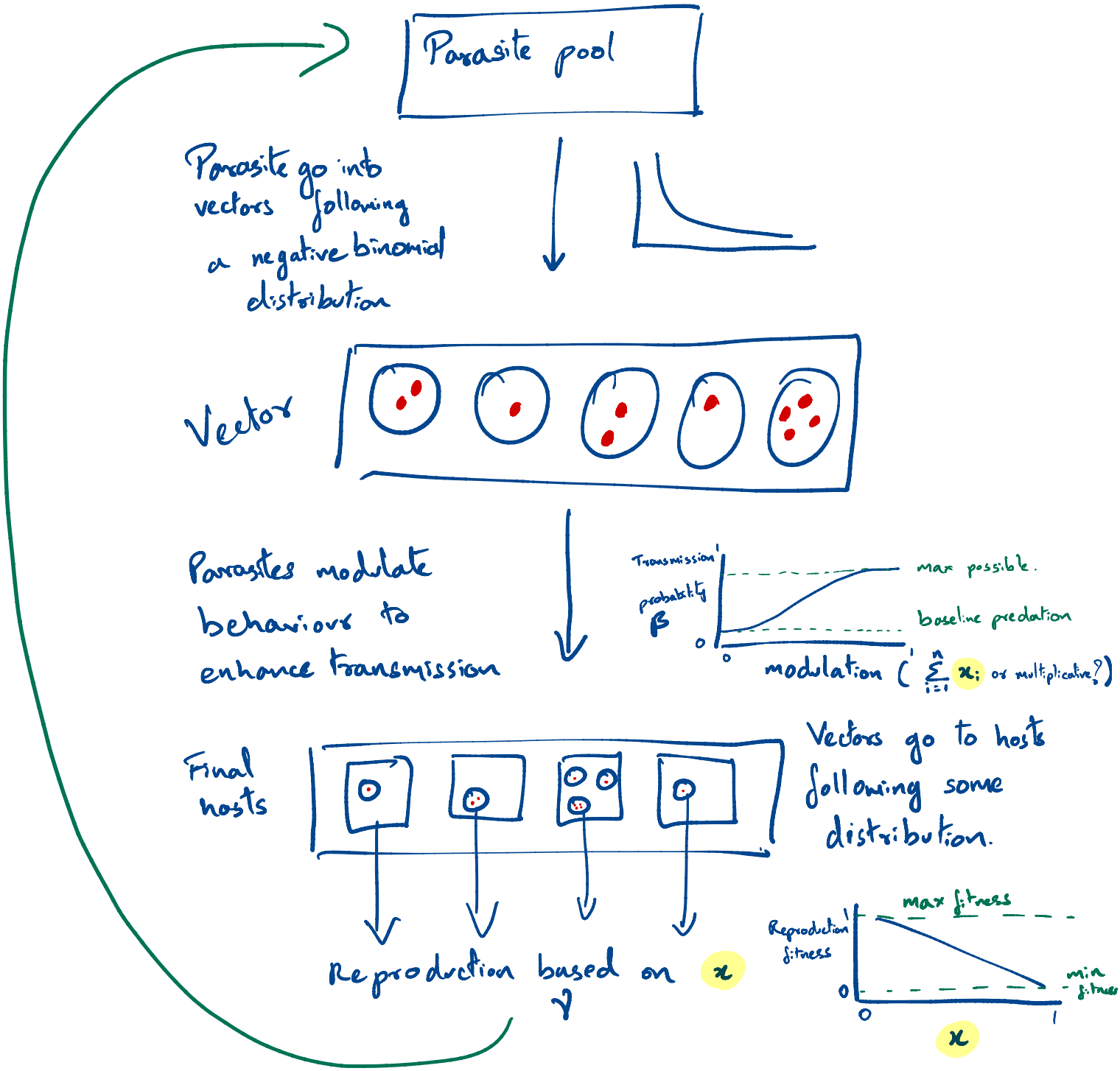
# A rough model for the life cyle !

Evolution takes place on the tradeoff between transmission (via manipulation) & reproduction.




Text

# 1 Thoughts

- If I understand correctly then your sketch is drawn from the perspective of the parasite population and does not take into account the perspectives of the host and vector population. Here, a parasite can be in three states: in the pool of parasite, in a vector, and in a host. Its ability of host manipulation affects its transmission rate from vector to host and its reproduction from host to the common pool. And since multiple strains of parasites can exist, manipulation of a focal parasite may be a disadvantage or advantage depending on the manipulating strategy of other parasites.

Under this approach, the dynamics of the vector and the host do not matter, and I think that the fitness of a parasite with manipulating strategy $x_i$ will be similar in Parker's model, for instance

$$W(x_i, \tilde{x}) = Transmission(x_i, \tilde{x}) Reproduction(x_i, \tilde{x})$$

where $x_i$ is the manipulating ability of the focal parasite $x_i$ and $\tilde{x}$ is the average trait of the neighbour parasites. It needs not be the average, though, it's just one possibility that I came up with. The fitness can also depends on the density of the focal parasite and the neighbour parasites.

One advantage of this approach is that it will make a simple model, and we can deal with as much number of parasite strains as possible (I'm not sure but I think so :D). I think that it would be pretty much similar to Parker's model in terms of mathematical formulation. The interpretation may be different.

One thing that we cannot do with this approach is that we cannot look at the effect of virulence because the dynamics of vectors and final hosts are not taken into account. However, if we want to do this then we have to limit the number of parasite strains that we want to include because now we would have dynamics of different groups of vectors and final hosts that are affected by different strains of parasites and also different combinations of multiple strains of parasite. Usually, I think that previous models only deal with two strains.

Moreover, we will not be able to take into account the feedback of the vector and final host population on the evolution of manipulation. For instance, if there are less available final hosts and vectors, would it be better to increase or decrease the manipulation. If we do not consider virulence, then may be it does not affect that much and we don't really need the host and vector dynamics, but I don't have any obvious intuition in that.

So, in conclusion, just want to be clear which approach we would like to take. I think that both are potentially interesting. But we need to chose one to start with