**Supplementary File 2. Host location probability, and probability of starvation for tsetse, as a function of host density and search efficiency.**

We define:

*A* Total area (km2), assumed closed to host immigration and emigration.

*H* Total hosts, assumed randomly distributed in area A.

 We set λ = *H*/*A*

*Pk* Probability there are k hosts resident, on a given day, in a given

‘neighbourhood’ (defined as a square area, of side 1 km, around the fly).

 *i* Number of days since the fly last fed.

 *σ* Conditional probability that a fly finds a host and feeds on a given day, given

that it is the only host resident in a 1 km2 neighbourhood containing the fly,

and given that the fly is active.

 *ν* Maximum number of days fly can survive without feeding.

 *fi* Probability that a fly succeeds in feeding on day *i* after its last blood-meal.

*F*(λ, σ, ν) Probability that a fly succeeds in feeding at some point in a given hunger cycle of duration *ν* days, given host density *λ* and search efficiency *σ*.

The complement of a probability is denoted by a ‘prime’ suffix; e. g. *fi* ′= 1 − *fi* .

On any particular day, the probability that a given animal is present in a given 1 sq km neighbourhood of a given fly is 1/*A*. If, as in the Nagupande experiment, *A* is large, then 1/*A* is small. Assuming independence between the hosts in their movement, the probability (*Pk*) that there are *k* animals present in this neighbourhood can then be defined approximately by a Poisson distribution with parameter *λ* = *H*/*A*. That is:

  (S2.A)

If there is only one host in the fly’s neighbourhood the probability that the fly fails to feed off it on a given day, given that the fly is active, is *σ*′. If there are *k* hosts in the neighbourhood and we assume independence among the hosts, then the fly fails to feed off any of them with probability (*σ*′)*k*. The probability that it *does* feed, given that there are *k* hosts present and given that the fly is active, is thus 1 - (*σ*′)*k*.

With the above definitions, the probability (*fi*) that a fly succeeds in feeding on day *i* of its hunger cycle is:

  (S2.B)

The probability *F’*(*λ,σ,ν*) that, given search efficiency *σ* and host density *λ* = *N*/*A*, the fly *fails to feed* on *ν* consecutive days, and hence starves, is:

  (S2.C)

If the daily mortality due to starvation is *μf* then a fly escapes starvation on ν consecutive days with probability exp(-*νμf*)and it follows that



and  (S2.D)