**Temperature dependence**

Equations from Smallwood CMEE MSc thesis:

[Eq. 11]

[Eq. 8]

[Eq. 7]

This (Eq. 7) is an approximate derivation, per Smallwood, but treat it as though exact

Question to consider: What is the biological meaning of some of these expressions? For example, is deducting the juvenile mortality during the whole juvenile development period ( is that period, is the mortality rate per unit time).

Observe that . Would that be a neater representation of the denominator of the right hand term in (Eq. 7)? Derivative results below use original form. Does an alternative representation help clarify biological meaning?

State variables, parameters and symbols (see Smallwood thesis Table 2)

|  |  |
| --- | --- |
|  | Temperature |
|  | Number of mosquitoes at time *t* |
|  | Population growth rate |
|  | Initial population size |
|  | Carrying capacity (adult mosquitoes) |
|  | A scaling parameter (not temperature dependent), fecundity schedule shape parameter, simulated value constant 2 |
|  | Total juvenile development time |
|  | Mean juvenile mortality rate across all juvenile stages |
|  | Adult mortality rate |
|  | Peak fecundity |
|  | Time between maturation and peak reproduction |
|  | (relative?) peak population density |
|  | Temperature at which a trait is maximized |

Approach

By the chain rule, for each parameter / trait (i.e. in turn represents , …, , … etc),

so work in terms of .

Results

For converting results in terms of into results in terms of ,

An alternative formulation (in terms of )

Individual partial derivative components of form are as follows.

alternative formulation (substituting in for )

alternative formulation (substituting in for )

alternative formulation (substituting in for )

where is the digamma function (logarithmic derivative of the gamma function)

alternative formulation (substituting in for )