M-BITES Equations

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9/8/2017

M-BITES Survival: `MBITES-Survival.R`

Wing Tattering

Per-bout Zero-inflated Beta distribution for damage due to wing tattering

$$rTatterSize = \begin{cases} 0 & P(ttsz.p) \\ Beta(ttsz.a, ttsz.b) & P(1 - ttsz.p) \end{cases}$$

Per-bout Probability of Death due to Wing Tattering

$$\frac{2 + ttr.b}{1 + ttr.b} - \frac{e^{damage \times ttr.a}}{ttr.b + e^{damage \times ttr.a}}$$

Senescence

Per-bout probability of death due to senescence

$$\frac{2 + sns.b}{1 + sns.b} - \frac{e^{sns.a \times age}}{sns.b + e^{sns.a \times age}}$$

M-BITES Energetics: `MBITES-Energetics.R`

Sugar Energetics

Incremental mortality as function of energy reserves

$$\frac{e^{S.a \times energy}}{S.b + e^{S.a \times energy}}$$

Probability to queue sugar bout as function of energy reserves

$$\frac{2 + S.sb}{1 + S.sb} - \frac{e^{S.sa \times energy}}{S.sb + e^{S.sa \times energy}}$$

Blood Energetics

Bloodmeal size

$$rBloodMealSize \sim Beta(bm.a, bm.b)$$

Overfeed

Probability of death due to overfeeding given by

$$\frac{e^{of.a \times bmSize}}{of.b + e^{of.a \times bmSize}}$$

Refeed

Probability to re-enter blood feeding cycle after incomplete blood feeding given by

$$\frac{2 + rf.b}{1 + rf.b} - \frac{e^{rf.a \times bmSize}}{rf.b + e^{rf.a \times bmSize}}$$

Egg Production

Draw normally-distributed egg batch size per bloodmeal

$$rBatchSizeNorm \sim Norm(bs.m, bs.v)$$

Egg batch size as function of bloodmeal size

$$rBatchSizeBms = bmSize \times maxBatch$$

Egg maturation time

$$max(0, Norm(emt.m, emt.v))$$