

Table 1: Definitions of Terms

Term	Description	Units
State Variables		
F	Resource	mol Food
M_{E_i}	Reserve- i biomass	mol C
E_i	Reserve- i energy	J
m_{E_i}	Reserve- i density $\left(\frac{M_{E_i}}{M_V}\right)$	$(\text{mol C})(\text{mol C})^{-1}$
M_V	Somatic structural biomass	mol C
L	Somatic structural length	cm
V	Somatic structural volume (L^3)	cm^3
M_H	Biomass of reserves invested in maturation/development	mol C
M_R	Biomass of reserves invested in reproduction buffer, following maturation	mol C
X_i^{SU}	Excreted/non-recycled material of element- i from $SU - x$	mol C
Parameters		
$\{i_M\}$	Surface-area specific maximum ingestion rate	$(\text{mol Food})(V^{2/3} * t)^{-1}$
F_H	Type II functional response half-saturation constant	mol Food
$\{F_a\}$	Type II functional response surface-area search rate	$(\text{cm}^2)(t^{-1})$
$[M_V]$	Volume-specific structural mass $\frac{M_V}{V}$ (constant due to strong homeostasis assumption)	$(\text{mol C})\text{cm}^{-3}$
\dot{r}	Specific growth rate $(\frac{1}{M_V} \frac{dM_V}{dt})$	t^{-1}
M_H^b	Maturity level at birth	mol C
M_H^p	Maturity threshold for puberty	mol C
M_R^r	Reproductive buffer threshold for reproduction	mol C
$k_{M \text{ or } J}$	Maintenance rate coefficient (M for somatic, J for maturity)	t^{-1}
k_{SU-x}	SU disassociation coefficient	$(\text{mol C})t^{-1}$
Y_{1*2}	Yield of transformation/conversion of $Var1$ into $Var2$	—
q_i^{Var}	Quota (ratio) of nutrient- i in state variable, with values normalized so that lowest quota is 1	mol i
κ	Proportion of mobilized reserves allocated to somatic vs reproductive processes	—
κ_i^{GR}	Proportion of SU-rejected reserves recycled back to reserves vs excreted	—
σ	Increase of somatic maintenance costs due to consumer movement	Distance $^{-1}$, variable units
d	Distance walked by consumer	Variable units
ρ_{SU}	Preference for using a specific substrate in maintenance SUs, compared to C-reserve	—
Flux-related Terms		
J_{1*2}	Flux (absolute) from SU/state variable-1 to SU/state variable-2	$(\text{mol C})t^{-1}$
$J_{1*2}^- \text{ or } +$	Flux (absolute) that is rejected by the SU or accepted, respectively	$(\text{mol C})t^{-1}$
Synthesizing Unit (SU)-Related Terms		
θ^{SU}	Fraction of $SU - x$ binding sites that are empty/available to bind substrate	—
θ_i^{SU}	Fraction of $SU - x$ binding sites that are bound with substrate	—