

Model development – application #3

Graphical Model building software

Objectives

- Develop a simple model for population growth using STELLA, a graphical model building software
- Program the same model In VBA

Population growth

v.1

- Population growth based on a resource (food)
- 2 state-variables: population (size) and substrate (concentration)
- Assumptions:
 - no mortality

Conceptual model



$$uptake = \mu_{max} \cdot \frac{[S]}{[S] + k_s}$$

- [S] – substrate concentration
- μ_{max} - maximum growth rate
- k_s – semi-saturation constant

v.2

- Population growth based on a resource (food)
- 2 state-variables: population (size) and substrate (concentration)
- Assumptions:
 - Constant mortality
 - Instant conversion of dead matter into substrate



- [S] – substrate concentration
- μ_{max} - maximum growth rate
- K_s – semi-saturation constant

$$uptake = \mu_{max} \cdot \frac{[S]}{[S] + k_s}$$

Model inputs

Parameter	Value	Unit
Initial population	0.10	mg C L ⁻¹
Max growth rate	0.09	d ⁻¹
Ks	0.05	mg C L ⁻¹
mortality	0.01	d ⁻¹
Initial Substrate	2.00	mg C L ⁻¹
(for VBA simulations)		
Run time	50.00	days
dt	0.10	day