Bioenergetics

PhD. student

Dr. A. Y. Al-Dubakel.

4- Energy Balance in Fish 3

Crustacean Energy Problems

- Lipids and carbohydrates are typical energy sources for crustaceans
- unfortunately, crustaceans are unable to tolerate diets having greater than 10% lipid (also hard to manufacture the feed!)
- this means that the major energy source must be derived from COH
- various COH are used to various degrees by crustaceans, making it difficult to calculate the true energy value of diets

Why **bioenergetics** is useful to fish ecology? •

1- It is a mathematical representation of how a fish grows

2- Allows researchers, students and managers a way to understand …..

Typical Energy Budgets Differ for Carnivores & Herbivores:

Normalized Percentages	Consumption	Respiration		Waste		Growth
Carnivore	100 =	44	+	27	+	29
Herbivores	100 =	37	+	43	+	20

Bioenergetics ~ Economics

Consumption = Metabolism + Waste + Growth

Consumption = Income

Metabolism = Rent

Rent you have to pay, no matter if you eat or not, no matter if you're making money or not

Wastes & Losses = Taxes

Taxes you have to pay, only if you eat, and its scaled to how much you eat

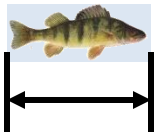
Growth = Savings and Investments

Growth record Is like checking account, I can be zero and even negative sometimes

Lake **A**

Lake **B**

June 1



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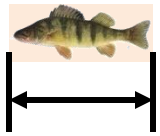

June 1

Sept 1

?

Sept 1

Why would growth be different?

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→ More food?

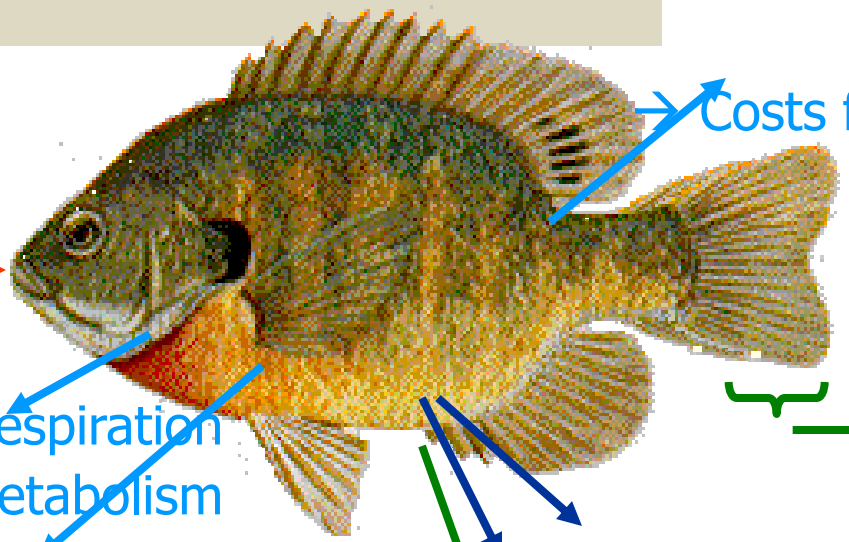
→ Better quality food?

→ Don't work as hard for food?

→ Lakes are different temperatures?

→ Stress, contaminants, food webs

Model Components:



Active Metabolism
→ Costs from activity

Consumption

Respiration
→ Basal Metabolism

Specific Dynamic Action
→ Costs from digestion

ΔBiomass
→ Growth

Egestion-F & Excretion -U

Gonads
→Reproduction

$$C = (R + A + S) + (F + U) + (\Delta B + G)$$

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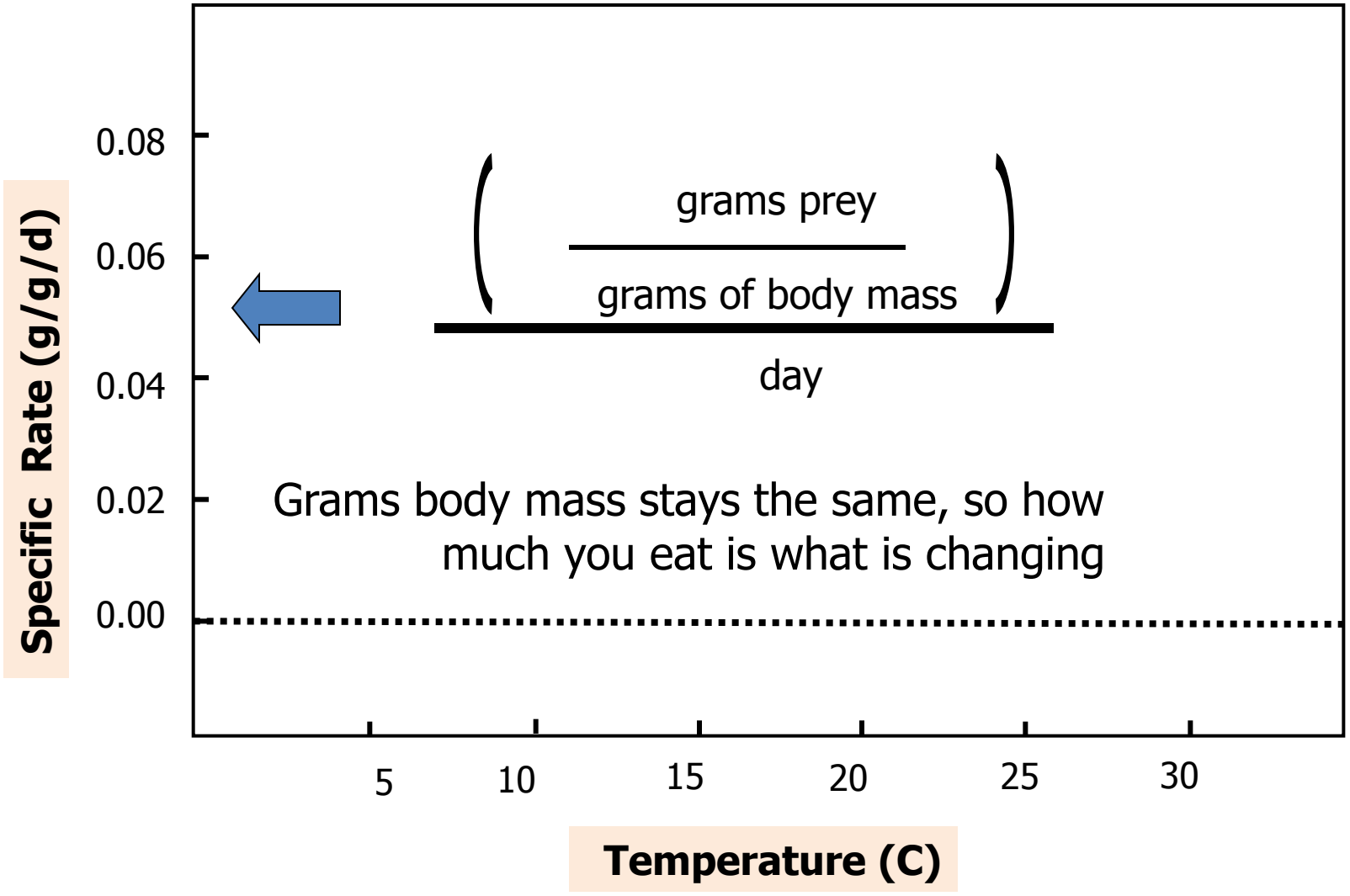
Independent	Losses	Losses	Gains
C = consumption	R = respiration	F= egestion	ΔB = Change in biomass
	A = active metabolism	U = excretion	G = gonads /reproduction
	S = specific dynamic action		

All processes are temp. and size dependent



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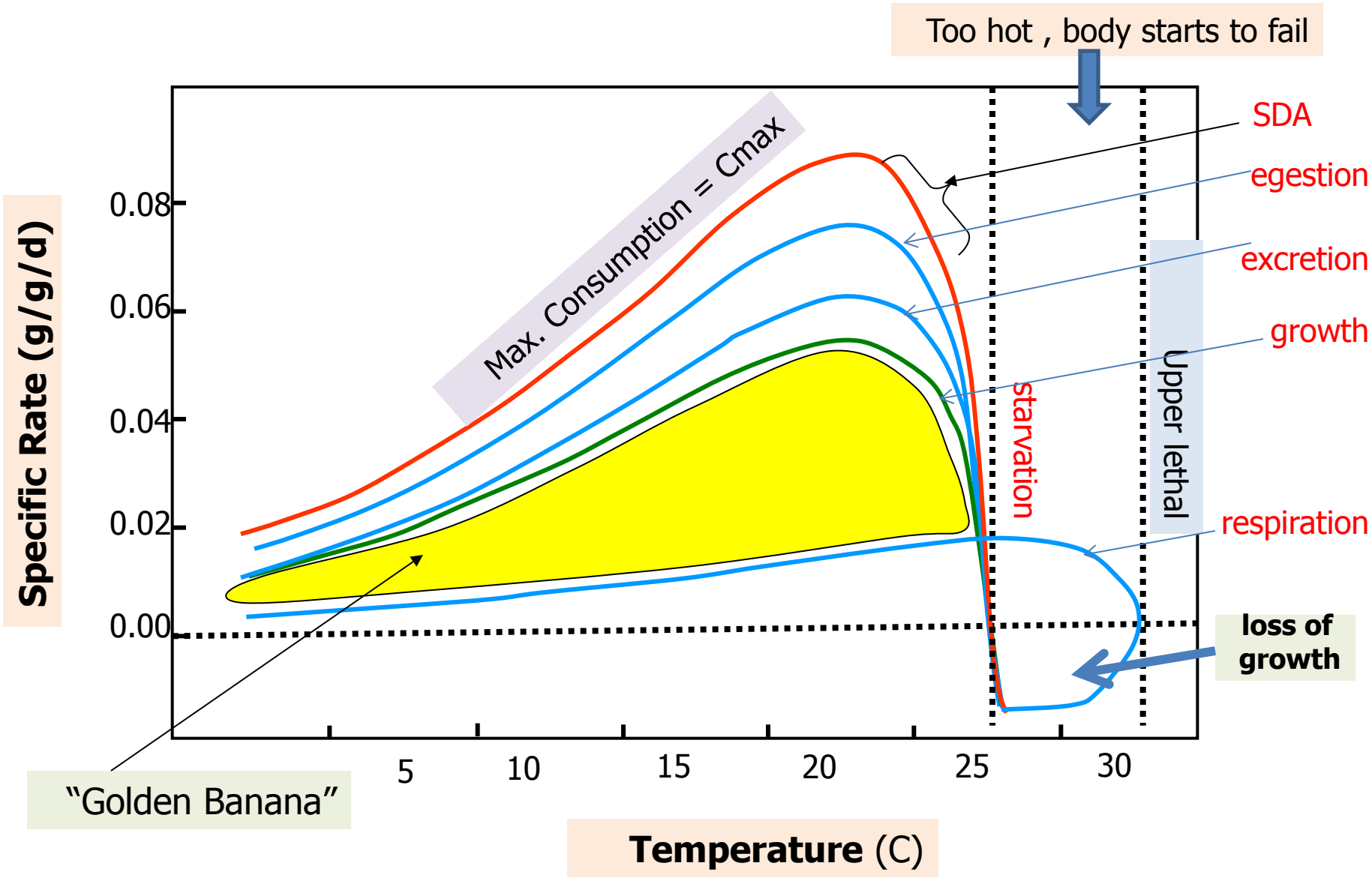
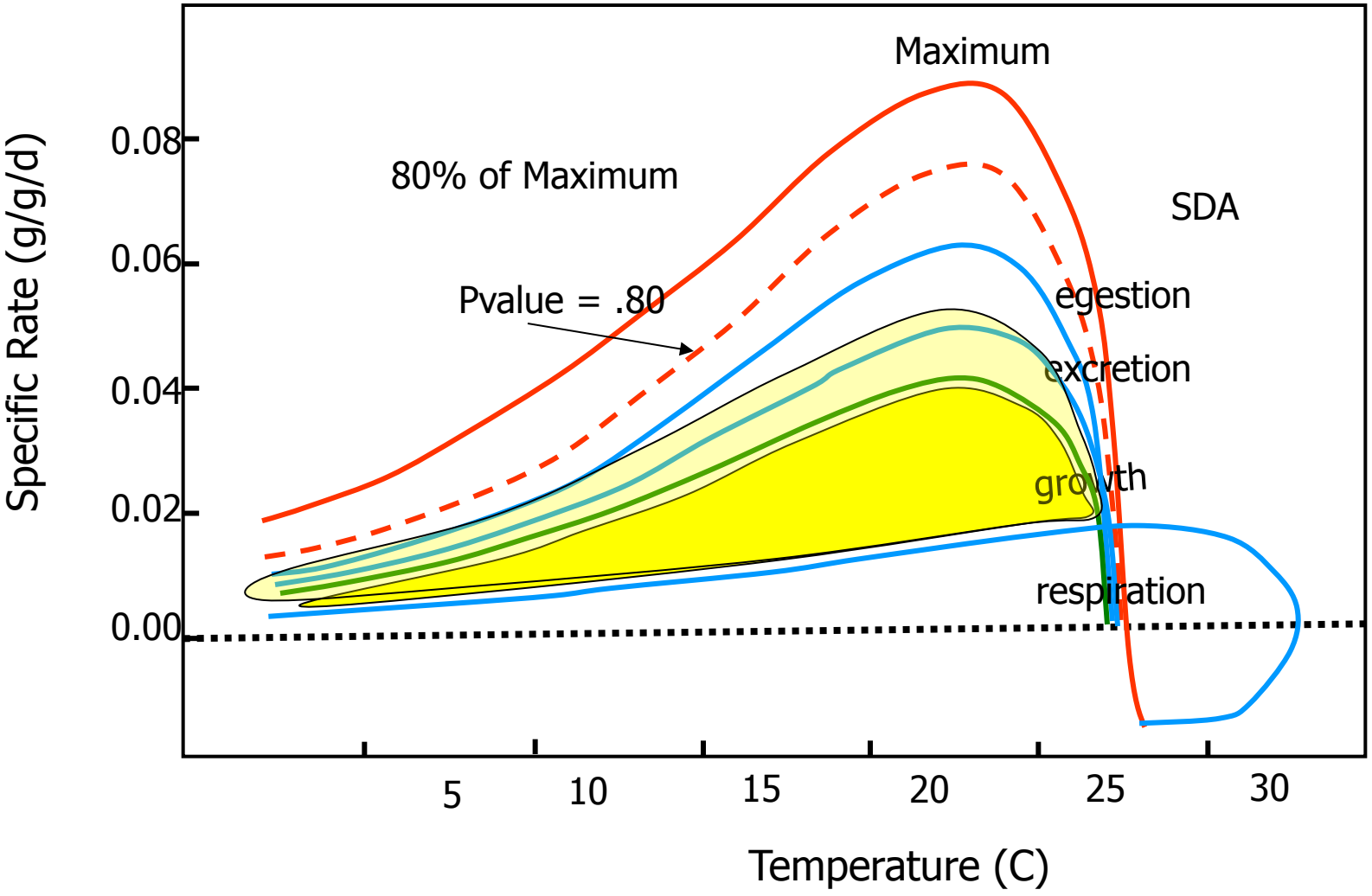


Maximum consumption isn't realistic
p-value = proportion of maximum consumption



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