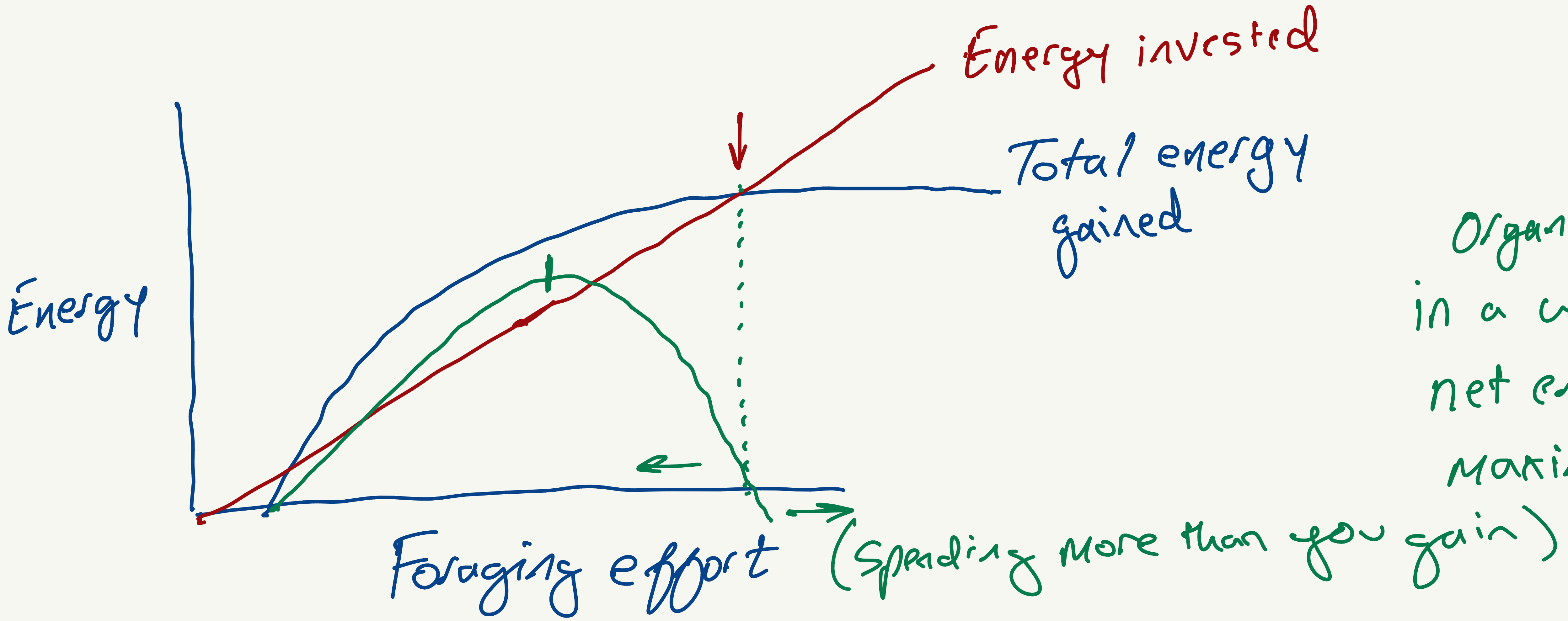
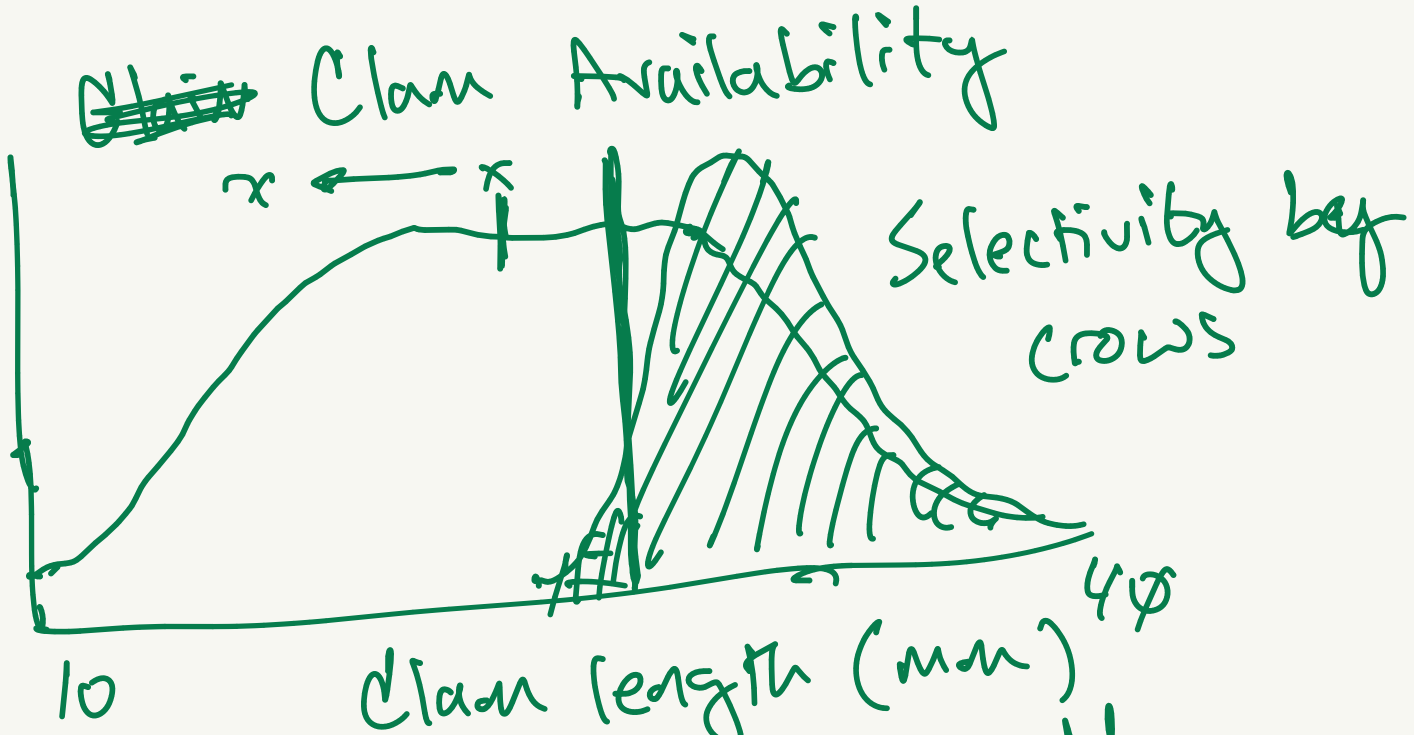


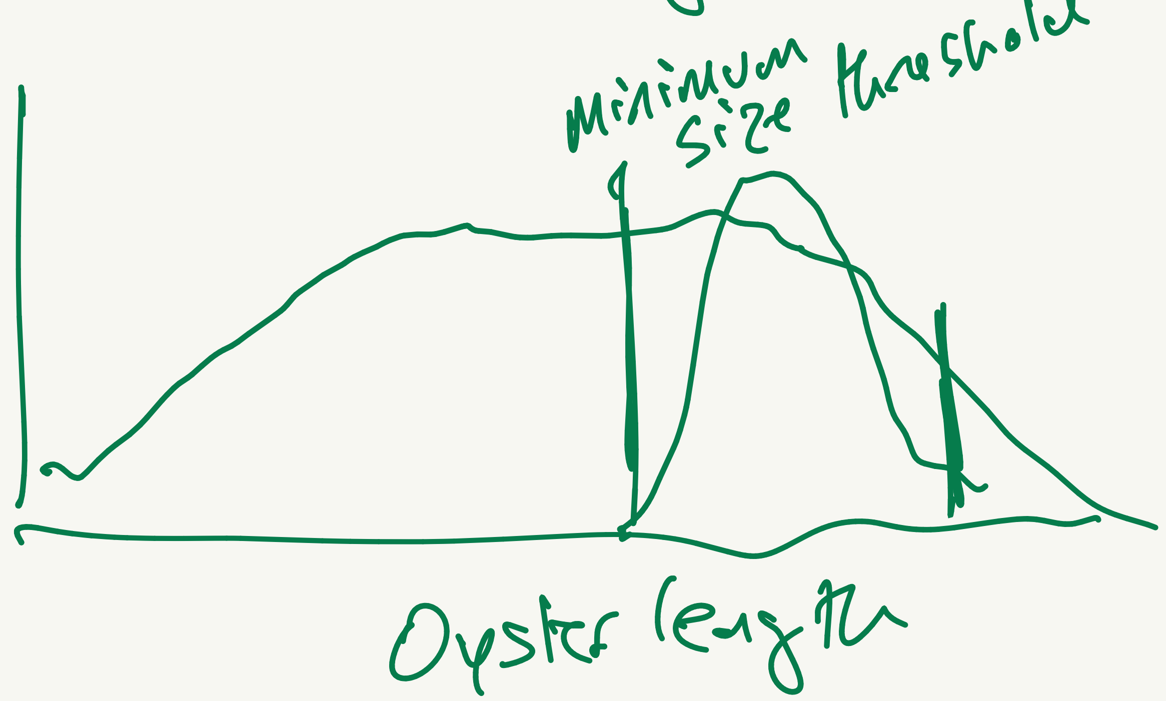
Organisms that forage in a way that their net energy gain is maximized will be selected for

Clams / Crows



foraging decisions find the minimum viable clam size.

Oystercatchers



Decapod crustaceans

$$P = \frac{E_{gained} - E_{lost}}{T} \quad \Big\} E$$ (net energy gain

$$P = \frac{\sigma E}{\sigma H + (1-\sigma) W}$$

σ = probability of success

H = Handling time

W = Wasted time

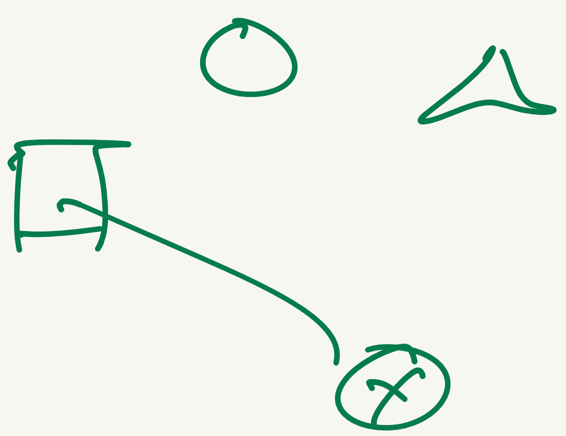
- Directly incorporate different temporal costs into our estimation of profitability

(central place foraging)

Failure is a risk

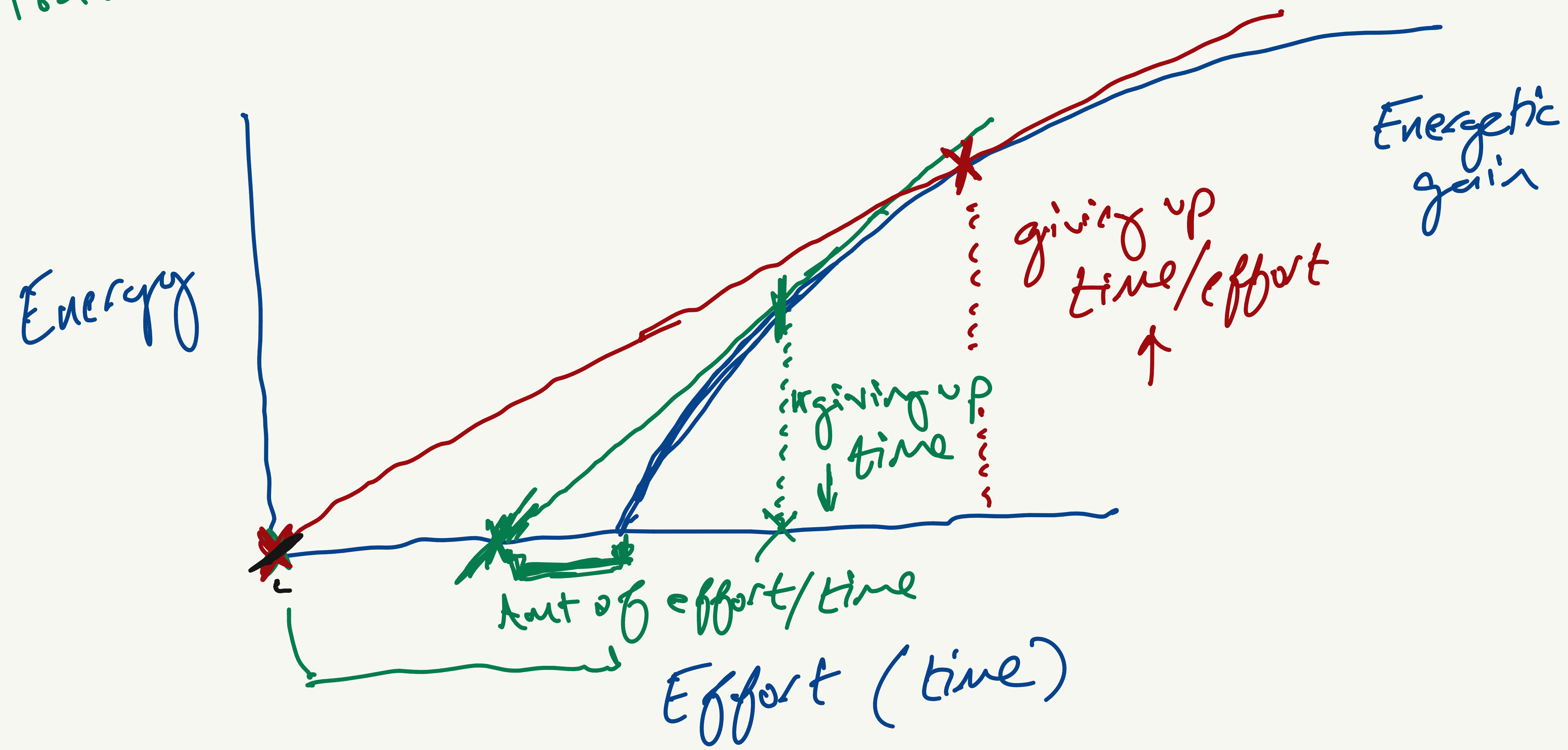
Marginal Value Theorem (Charnov 1976)

- Habitat is a heterogeneous landscape with different amounts of food that requires different amts of foraging effort to extract

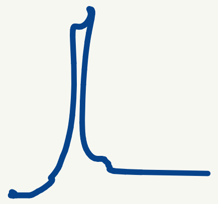


- Optimal Foraging: organism must forage in the most profitable patch

- A foraging animal should stay in a patch until the time when the rate of energy gain has declined to the average rate of energy gain in the habitat
- The "giving-up time" should vary as a function of the travel costs



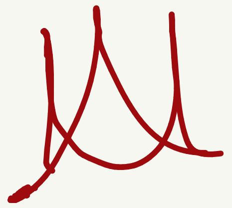
Risk: Do animals gamble



- 2 scenarios

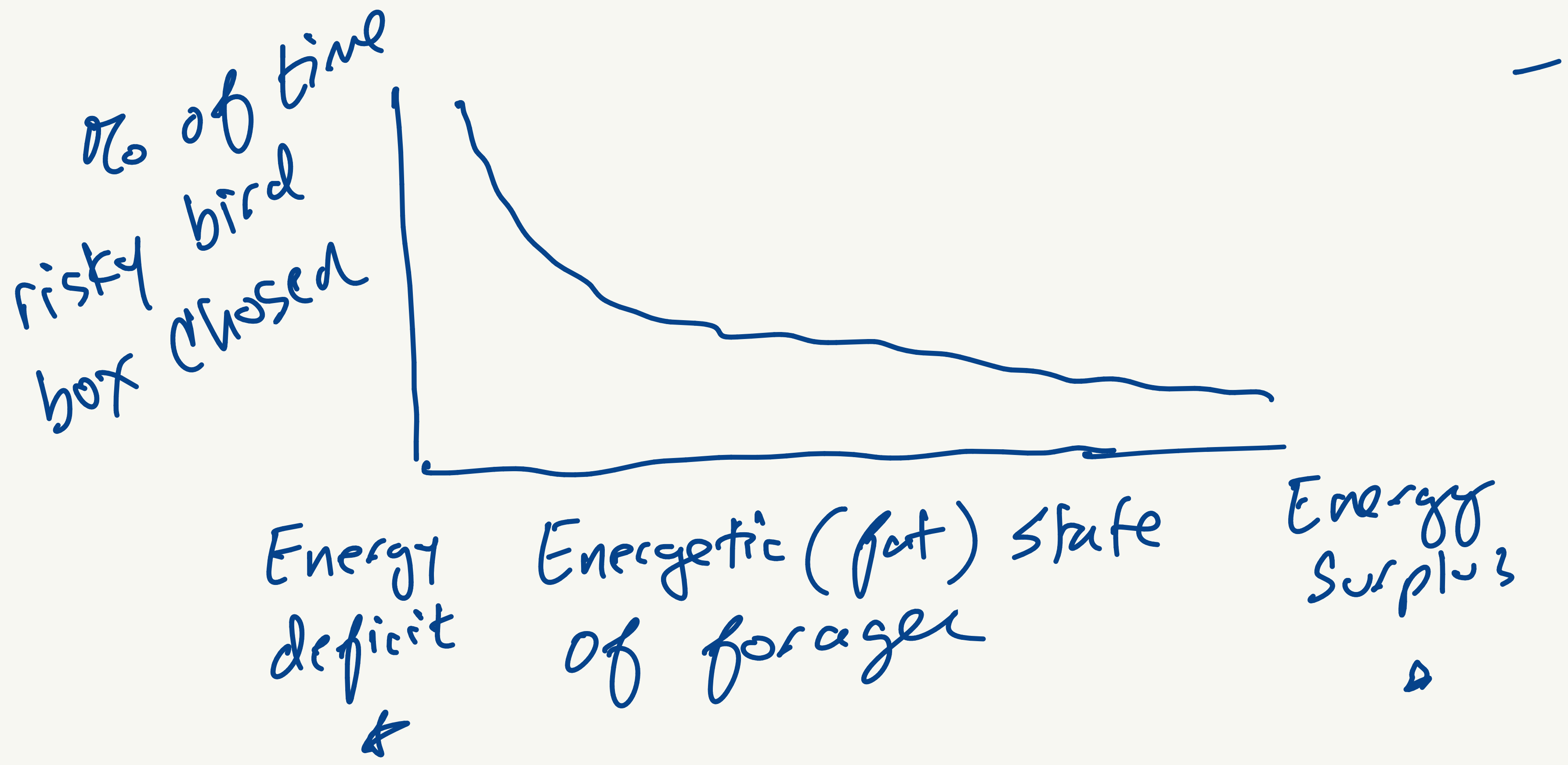
(constant) Blue bird box 1 1 1 1 1 1 1 1 1 $\Sigma x = 9$ $\bar{x} = 1$

(risky) Red bird box 0 0 3 0 0 3 0 0 3 $\Sigma x = 9$ $\bar{x} = 1$



- If you are risk-sensitive, these 2 scenarios are different

risk-insensitive both scenarios are the same



- When organisms are near starvation they tend to chose riskier strategies (if they are risk sensitive)

Game Theory

Prisoner's Dilemma

PAYOFF Matrix

		PB	
		Cooperate	Defect
PA	Cooperate	R	S
	Defect	T	P

What strategy
Maximizes Fitness
PAYOFF

R = Reward
S = Sucker's Payoff
T = temptation payoff
P = punishment payoff

$$\underbrace{T > R > P > S}$$

NASH Equilibrium : strategy where no player can do better by changing their strategy

Fitness as the result of interactions

Beetle population: Large Morph   Small Morph

A   B

Small morph: lower energetic requirements

large morph: ↑ E requirements

Competitive advantage against small morphs

		Beetle 2	
		A	B
Beetle 1	A	3	8
	B	1	5

How do we determine the Fitness of $\begin{cases} A \\ B \end{cases}$