

**Behavior 'Goals':**

Primary: Increase genetic representation  
in following generations relative to other individuals

Maximize:

Offspring number

Offspring survival rate

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**Maximize Offspring Number**

1. Increase number of matings or mates

Lifespan (sometimes)

Keep competitors from access to mates

2. Increase number of offspring per clutch or litter

Maximize Energy Intake

Physiological Limits?

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**Maximize Offspring Survival Rate**

1. Increase Parental Investment

Maximize Energy Intake

Territoriality?

Increase Learning Ability

2. Time Season of Reproduction

Maximum Resource Availability

Minimal Predation Risk

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Optimality Theory: Behaviors should evolve that maximize benefits and minimize costs

Territoriality:

Benefits:

Costs:

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### Golden-Winged Sunbird

- feed on nectar producing mint flowers
- sometimes defend mint patches, sometimes do not

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Activity	Expense (calories/hr)
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Perching	400
Foraging	1000
Chasing Intruders from Territory	3000

Nectar production (microliters/blossom/day)	Hours Required of feeding/day
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1	8
2	4
3	2.7
4	2

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### Nectar Production

Undefended Site	Defended Site	Calories Saved
1	2	2400
2	3	780
4	4	0

Prediction: When defensible sites are no more productive than indefensible sites, Sunbirds should not be territorial

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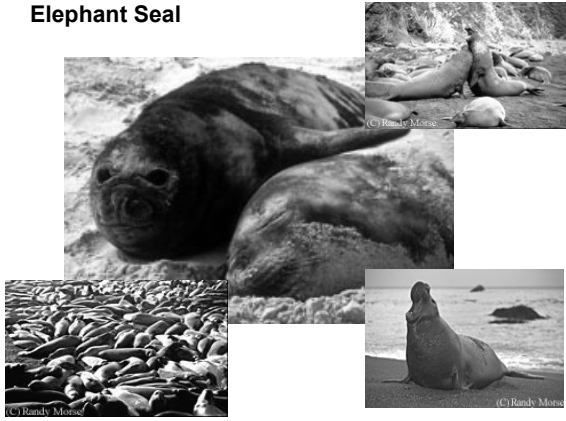
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### Elephant Seal



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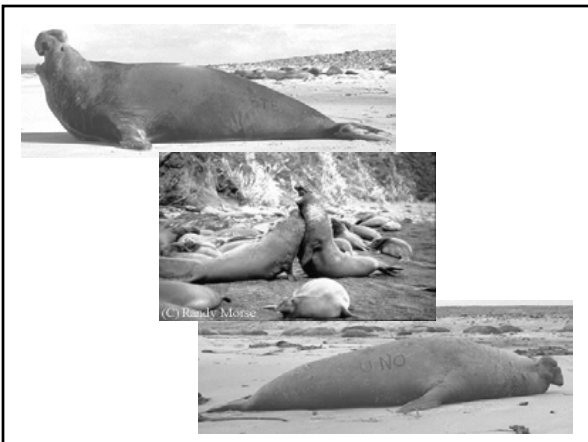
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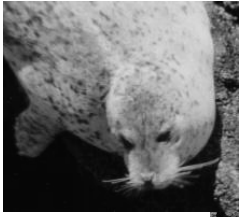
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Harbor Seal



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Spotted Sandpiper



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