Sharing the Shore: Galapagos Sea Lions Amid Human Encroachment

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Talk Outline

- History of the Galápagos
- Sea lion facts
- Known threats
- Thermoregulation
- Current observations
- Future directions


CARIBBEAN SEA
VENEZUELA
PACIFIC OCEAN
COLOMBIA
Quito
ECUADOR
Galapagos Islands
BRAZIL
PERU
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GALAPAGOS
NO DRONE


SE VENDE
ESTA
PROPIEDAD
Bakery
Cafe
Panes
Sandwiches

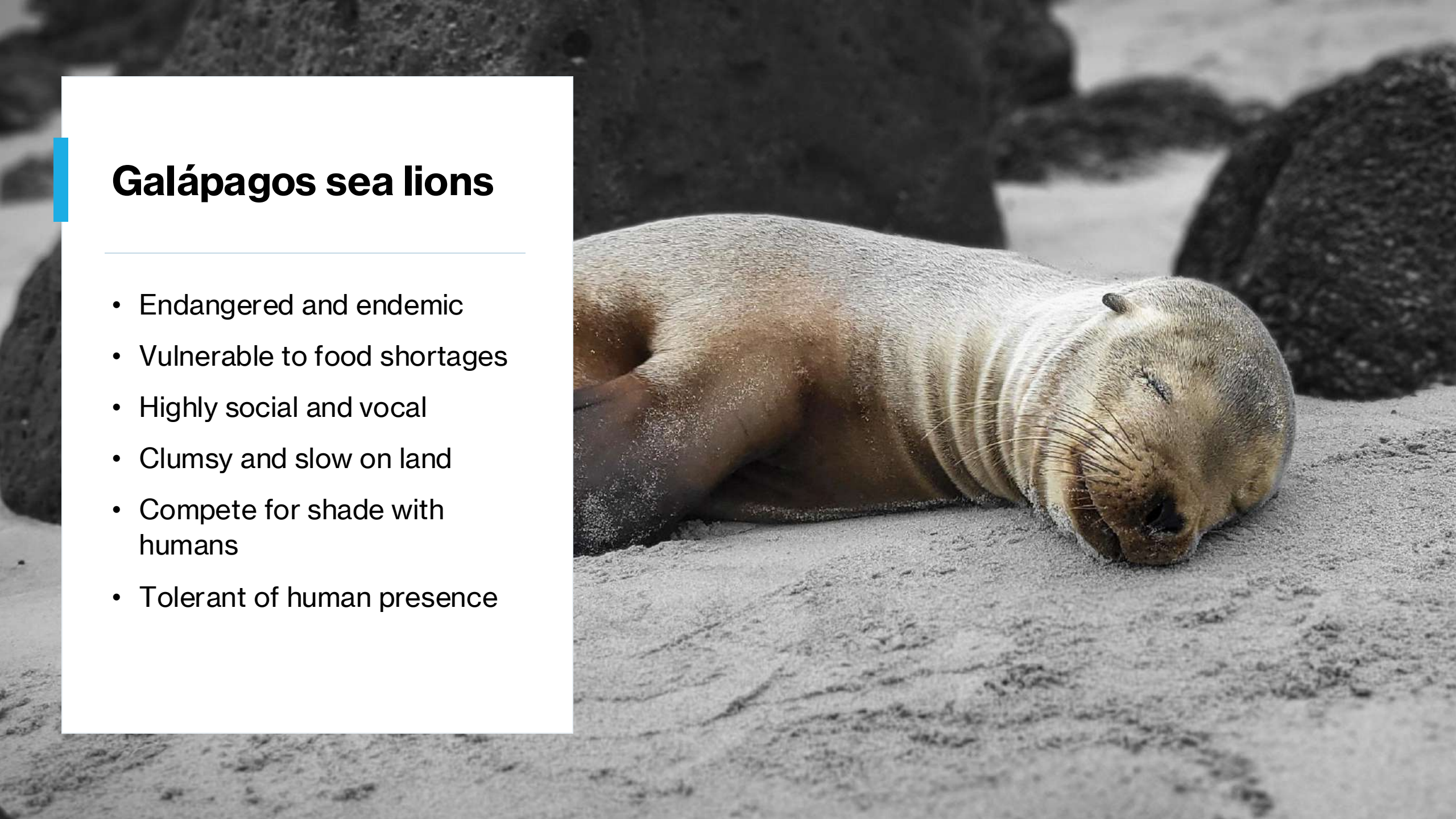

GALAPAGOS
SAN CRISTOBAL

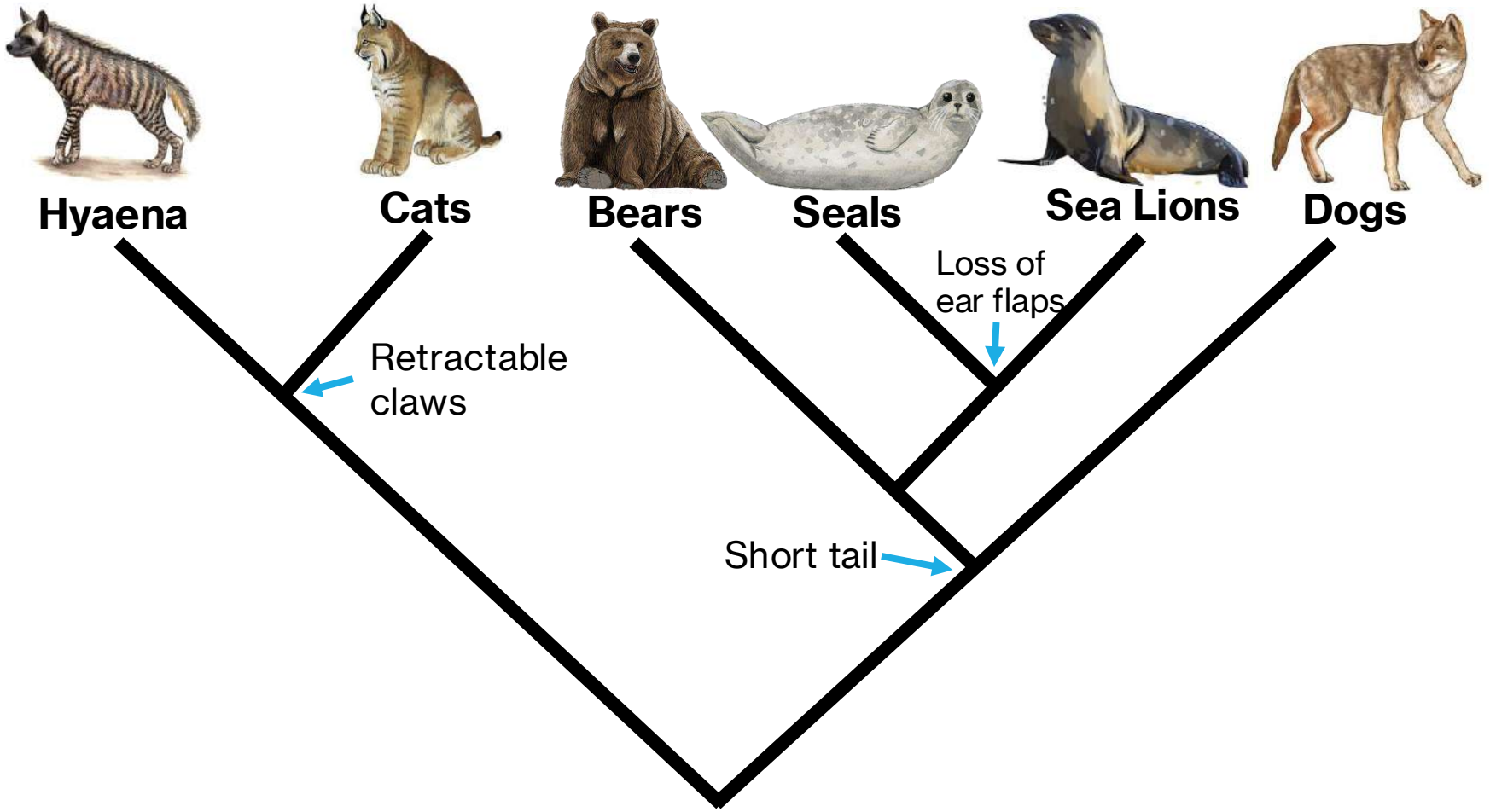
The changing Galápagos landscape

- Permanent settlements since 1832
- 35,000 permanent residents
- 250,000 visitors per year
- Tourism comprises 70% of economy
- Population drain from rural highlands to coastal towns
- Rapid urban sprawl
- Climate change

Galápagos sea lions

- Endangered and endemic
- Vulnerable to food shortages
- Highly social and vocal
- Clumsy and slow on land
- Compete for shade with humans
- Tolerant of human presence





The Family Tree of Sea Lions


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Photo credit: Rita Walsh

Observations

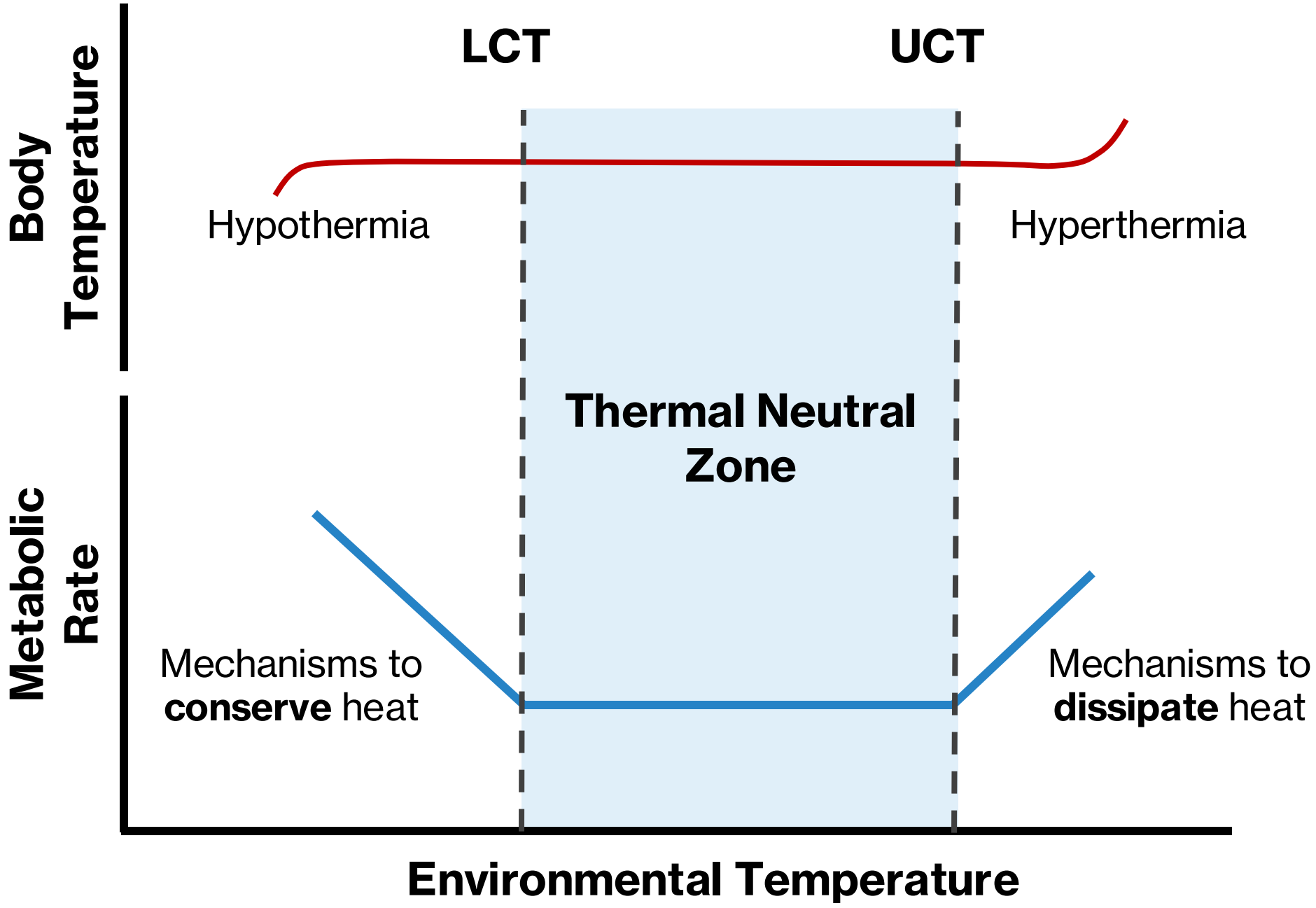
- Sea lions show aggression toward each other, and sometimes humans, in pursuit of shady resting spots
- Sea lions seem to cluster more tightly when humans are present
- Sea lions seem to vocalize less frequently when anthropogenic noise levels are high

Known threats to sea lions

- El Niño food shortages
- Collisions with boats
- Diseases from dogs
- Habitat loss
- Climate change

Sea lions are mammals!

- Sea lions are **endothermic**, which means they produce their own internal heat source
- Sea lions are also **homeothermic**, which means their body temperature needs to be maintained and stable


LCT
UCT
Body Temperature
Hypothermia
Hyperthermia
Thermal Neutral Zone
Metabolic Rate
Mechanisms to **conserve** heat
Mechanisms to **dissipate** heat
Environmental Temperature

Conduction: direct contact between solid materials

Convection: movement of fluids or gases

Radiation: emission of electromagnetic waves

Evaporation: heat loss due to liquid changing to a gas

What is thermoregulation?

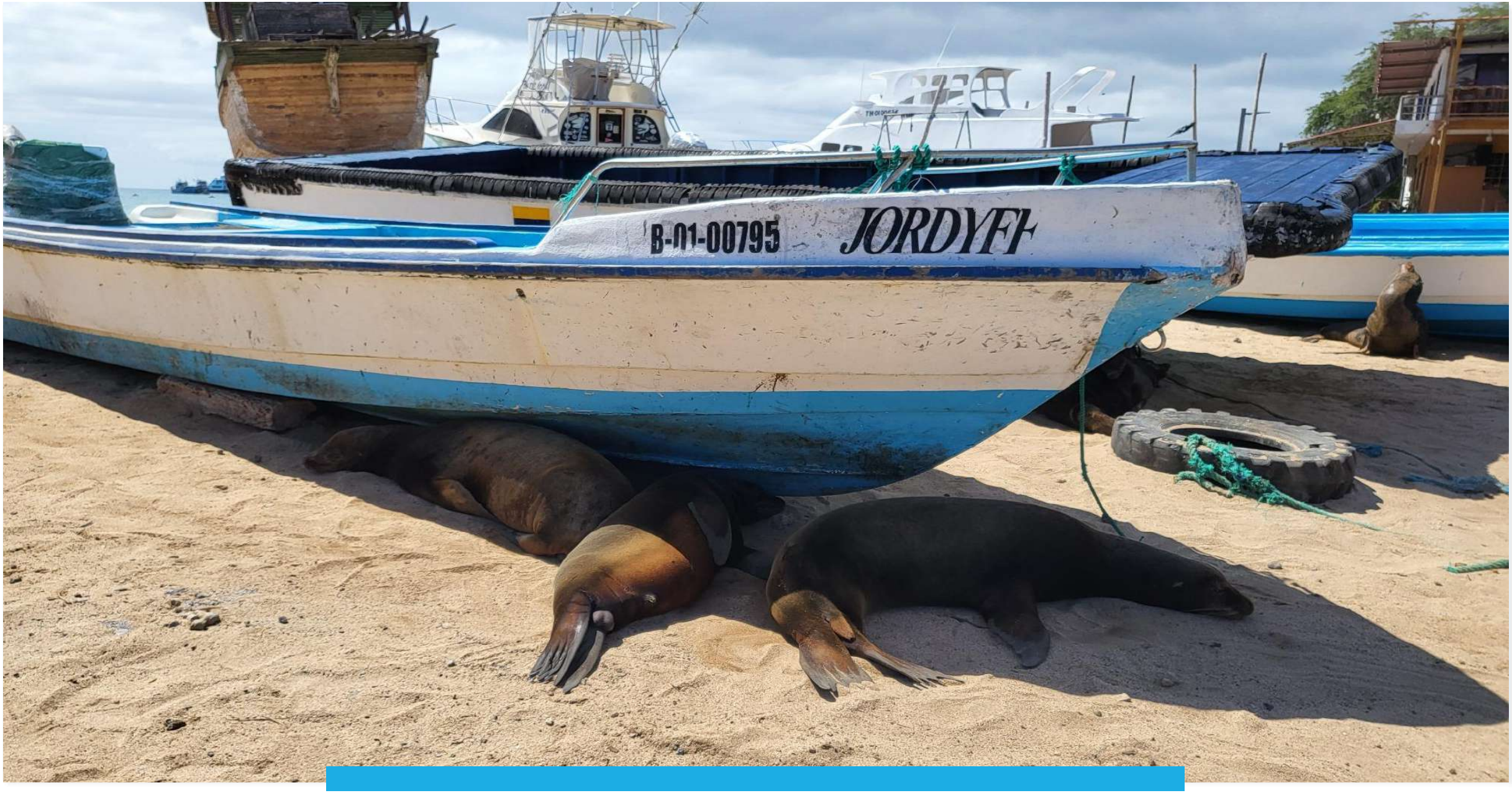
- Mammals use **thermoregulation** to balance heat loss or heat gains from the environment to maintain body temperature

$$\text{Heat transfer rate} = \frac{\text{Surface Area} \times \text{Difference in Temperature}}{\text{Thermal resistance of Skin, Fur, Blubber}}$$

- Strategies include **morphology, physiology, & behavior**

Thermoregulatory Strategies

- Seek shade
- Postural changes
- Limit physical activity to reduce heat generation
- Swim in water!
- Little to no blubber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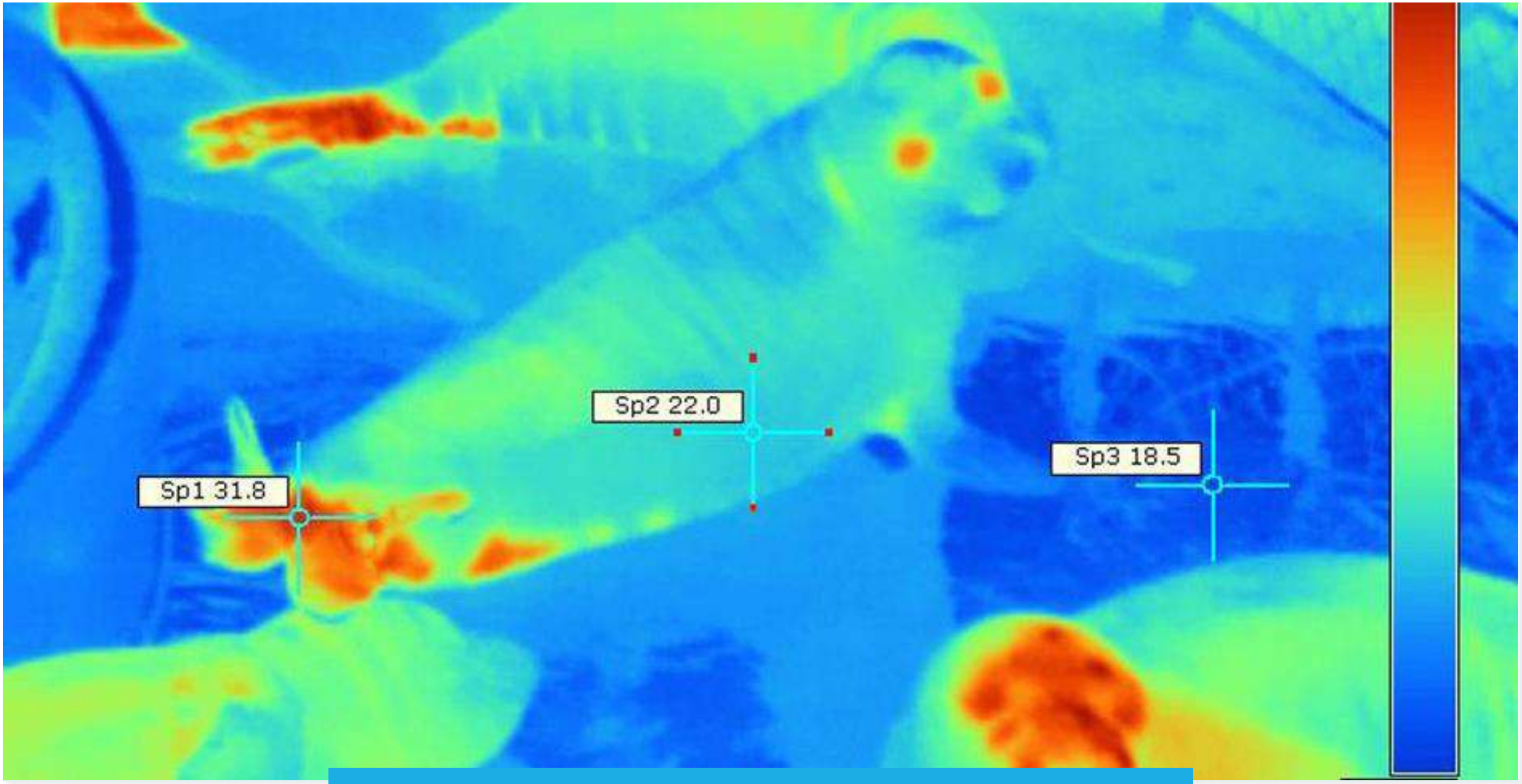

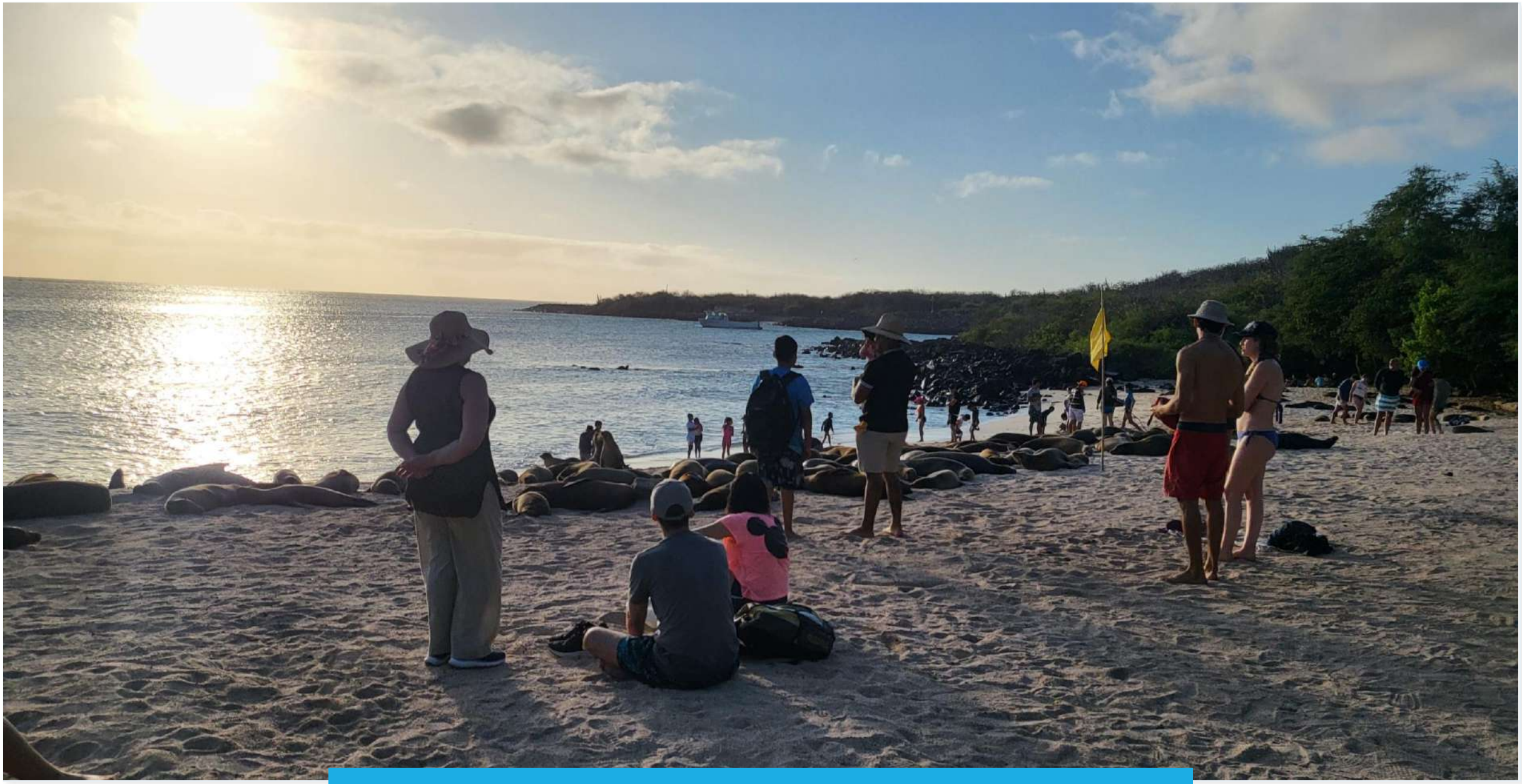

What we found

- Clustering at Playa de Oro (low human presence) remains consistent throughout the day
- Clustering at Playa Mann decreases from early morning to midday, then increases throughout the afternoon
- **Interpretation**: Sea lions spread out as the day warms up, but cluster together as humans show up

Other questions

Does human crowding affect frequency of aggression?

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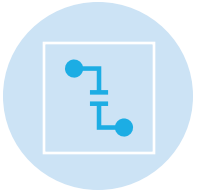

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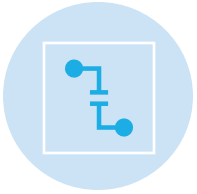

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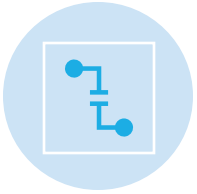

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Does human presence affect frequency of thermoregulatory behavior?

Does human presence impact stress levels?

Implications for Conservation

- Research can inform management practices and policy in terms of human development
- Broader implications for marine mammals facing climate change