CLIMATE MEDIATES THE COSTS AND BENEFITS OF SITE FIDELITY IN A MARINE PREDATOR

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UNDERSTANDING CHANGES IN TRANSITIONAL AREAS OF THE PACIFIC 2018
ANIMAL HABITAT SELECTION STRATEGIES BALANCE NUMEROUS TRADEOFFS

High quality or quantity resources

Search and travel costs

Predation or Competition risk
HOW WILL SPECIES RESPOND TO ENVIRONMENTAL CHANGE?

Habitat Selection → Food, Shelter & Mates → Survival & Reproduction → Population Dynamics
HOW WILL SPECIES RESPOND TO ENVIRONMENTAL CHANGE?

Environmental Change

Habitat Selection → Food, Shelter & Mates → Survival & Reproduction → Population Dynamics
SITE FIDELITY IS THE REPEATED USE OF THE SAME AREA FOR FORAGING, BREEDING OR SHELTER
ELEPHANT SEALS DISPLAY INDIVIDUAL SPECIALIZATION IN SITE FIDELITY
ELEPHANT SEALS DISPLAY INDIVIDUAL SPECIALIZATION IN SITE FIDELITY

Tracks of same individual female elephant seal 11 years apart

SITE FIDELITY CAN PROVIDE LONG-TERM BENEFITS IN UNPREDICTABLE ENVIRONMENTS...

Yep, I’d come back here.
... BUT MAY BE MALADAPTIVE IN ENVIRONMENTS EXPERIENCING CLIMATE CHANGE.

Woodworth-Jefcoats et al. 2016, *Global Change Biology*
CHANGING CLIMATE CONDITIONS CAN ALTER...

Abundance
CHANGING CLIMATE CONDITIONS CAN ALTER...

Abundance

Community composition
CHANGING CLIMATE CONDITIONS CAN ALTER...

Abundance

Community composition

Distribution

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KEY QUESTIONS

Q1: Which strategy wins in the long run?

Q2: How do different environmental conditions affect strategic trade-offs?
SATELLITE TRACKED 30 ADULT FEMALES OVER MULTIPLE YEARS
QUANTIFIED SPATIAL CONSISTENCY BETWEEN MIGRATION TRACKS

Weak site fidelity

Strong site fidelity

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QUANTIFIED SPATIAL CONSISTENCY BETWEEN MIGRATION TRACKS

Weak site fidelity

Overlap Index = 0.5

Strong site fidelity

Overlap Index = 0.9
MEASURED WEIGHT GAINED OVER EACH MIGRATION

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CLIMATE CONDITIONS IN NORTH PACIFIC MEASURED BY PACIFIC DECADAL OSCILLATION INDEX

Positive Phase

Negative Phase

Departures from average ocean temperatures (°C) associated with the warm and cool phases of the PDO

-0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8

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THE NORTH PACIFIC CLIMATE IS BECOMING MORE VARIABLE


Increasing variance in North Pacific climate relates to unprecedented ecosystem variability off California

WILLIAM J. SYDEMAN*, JARROD A. SANTORA*, SARAH ANN THOMPSON*, BALDO MARINOVIC† and EMANUELE DI LORENZO‡

Continued increase of extreme El Niño frequency long after 1.5 °C warming stabilization

Guojian Wang1,2, Wenju Cai1,2*, Bolan Gan1, Lixin Wu1*, Agus Santoso2,3, Xiaopei Lin1, Zhaohui Chen1 and Michael J. McPhaden4
KEY QUESTIONS

Q1: Which strategy wins in the long run?

Q2: How do different environmental conditions affect strategic trade-offs?
OVER 10-YEAR PERIOD, STRATEGIES BALANCE OUT

p = 0.4

Percent Mass Gained

Strong  Weak

Site Fidelity

Abrahms et al. 2018, Ecology Letters
KEY QUESTIONS

Q1: Which strategy wins in the long run?

Q2: How do different environmental conditions affect strategic trade-offs?
CLIMATE CONDITIONS IMPACT THE RELATIVE SUCCESS OF SITE FIDELITY STRATEGIES

Abrahms et al. 2018, Ecology Letters
CLIMATE CONDITIONS IMPACT THE RELATIVE SUCCESS OF SITE FIDELITY STRATEGIES

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Abrahms et al. 2018, Ecology Letters
INDIVIDUALS WITH STRONG FIDELITY HAD MORE CONSISTENT WEIGHT GAIN BETWEEN YEARS

![Graph showing interannual change in mass gain vs. site fidelity index with strong and weak fidelity data points.](graph.png)

**Interannual change in mass gain**

**Site Fidelity Index**

- Strong Fidelity
- Weak Fidelity

R² = 0.58

p < 0.05

INDIVIDUALS WITH STRONG FIDELITY USED AREAS WITH GREATER HABITAT STABILITY

Abrahms et al. 2018, Ecology Letters

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IN SUMMARY...

Strong site fidelity

Stable rewards & habitat

Weak site fidelity

Variable rewards & habitat
IN SUMMARY...

Strong site fidelity
Stable rewards & habitat
Best in average climates

Weak site fidelity
Variable rewards & habitat
Best in anomalous climates
IN SUMMARY...

Strong site fidelity
Stable rewards & habitat
Best in average climates

Weak site fidelity
Variable rewards & habitat
Best in anomalous climates

Adaptive under past stable conditions?
IN SUMMARY...

Strong site fidelity

Stable rewards & habitat
Best in **average** climates

Adaptive under past stable conditions?

Weak site fidelity

Variable rewards & habitat
Best in **anomalous** climates

Adaptive under increasingly variable conditions?
THANK YOU!

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