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Using time-specific samples to assess shifts in species distribution

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National Protected Species Assessment Workshop

12-14 February 2019

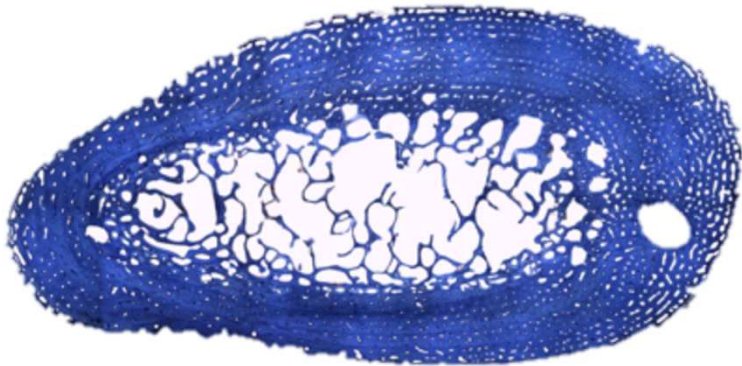
La Jolla, CA



Thank You!



Larisa Avens, Lisa Goshe, Dana Briscoe, Larry Crowder,
Juan Manuel Rodriguez-Barón, Victor de la Toba, Chuy Lucero,
Erin LaCasella, Brenna Groom, Gaby Serra-Valente, Joel Schumacher



CENTER FOR
OCEAN
SOLUTIONS



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Population assessment



Life history

- Life span
- Age-at-settlement
- Age at 1st reproduction



Distribution

- Key habitats
- Migration patterns
- Residency duration



Survival

- Habitat specific
- Life stage specific
- Risk assessment



Important to determine

Differential threats

Offshore

i.e. Longline and drift gillnet



CHRISTOPHER PALA

Nearshore

i.e. Trawl, gillnet, dredge



Creative Commons - ClifB

Complex life history

- Long-lived
- Migratory
- Occupy remote regions



NOAA NMFS Permit #1591

My research priorities

- **Demographic vital rates**
 - **Age**
 - **Growth**
- **Residency duration**
 - **High-risk habitats**
 - **Changes over time**



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Habitat use → Satellite telemetry

Satellite telemetry → few years

Life span → 50+ years



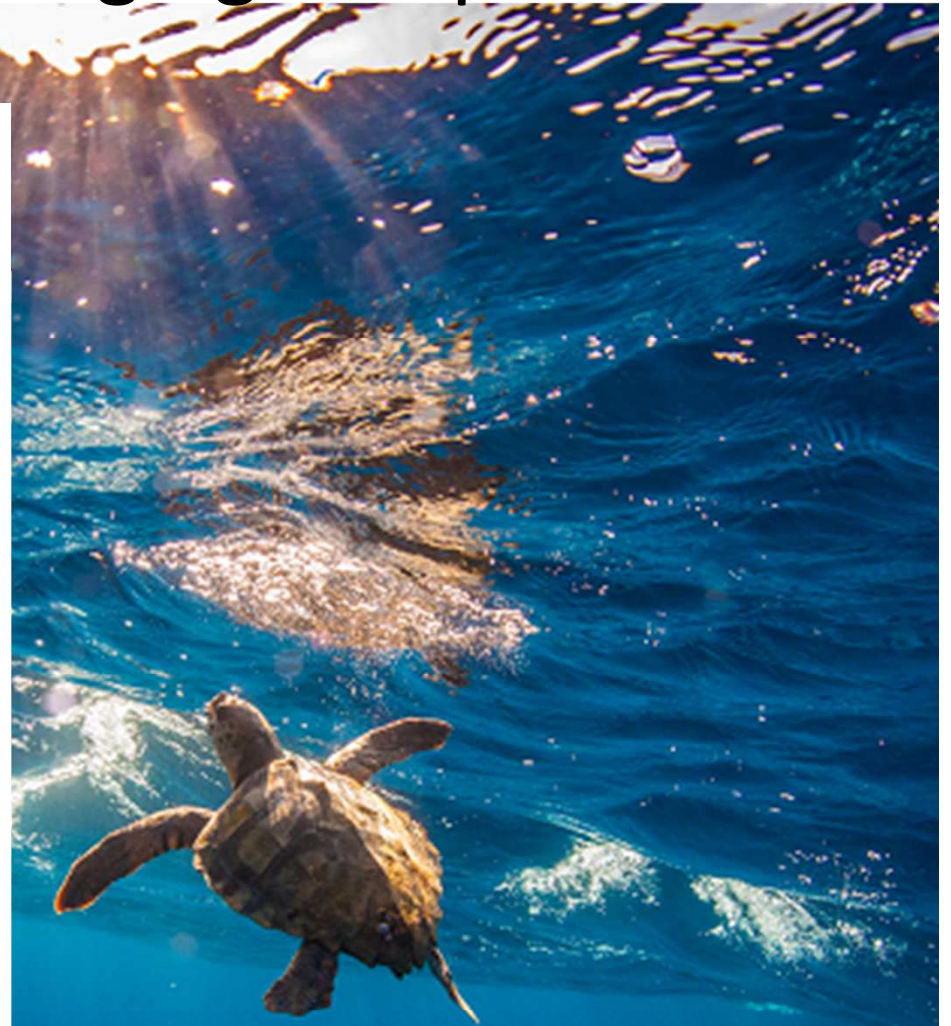
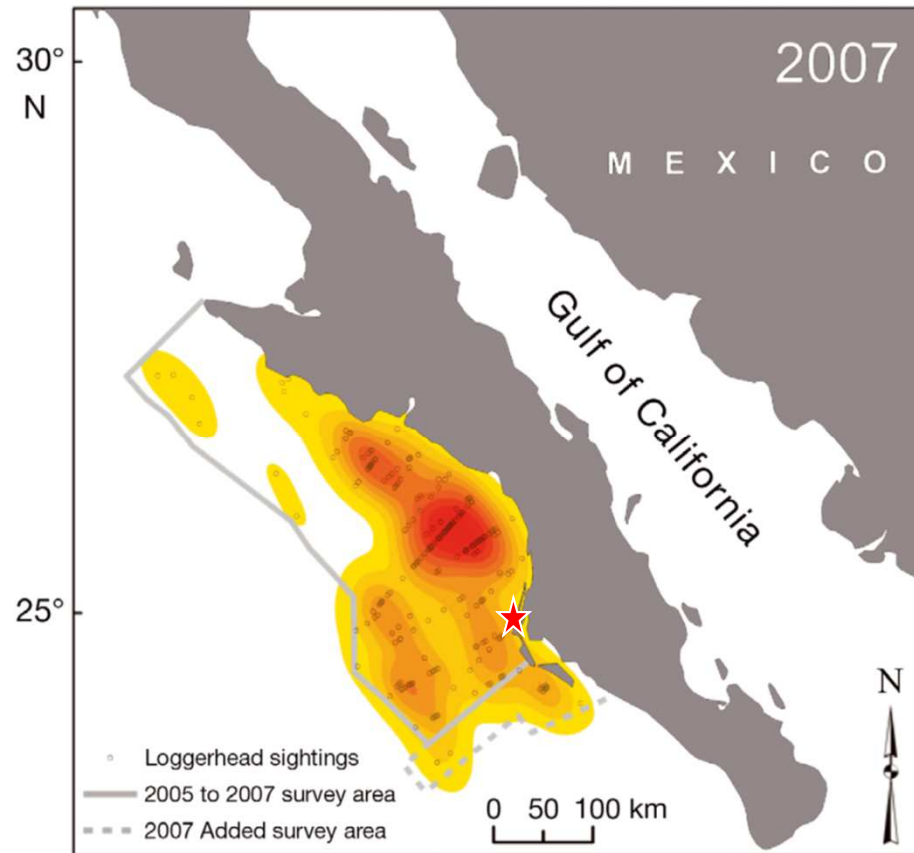
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NOAA Hawkes

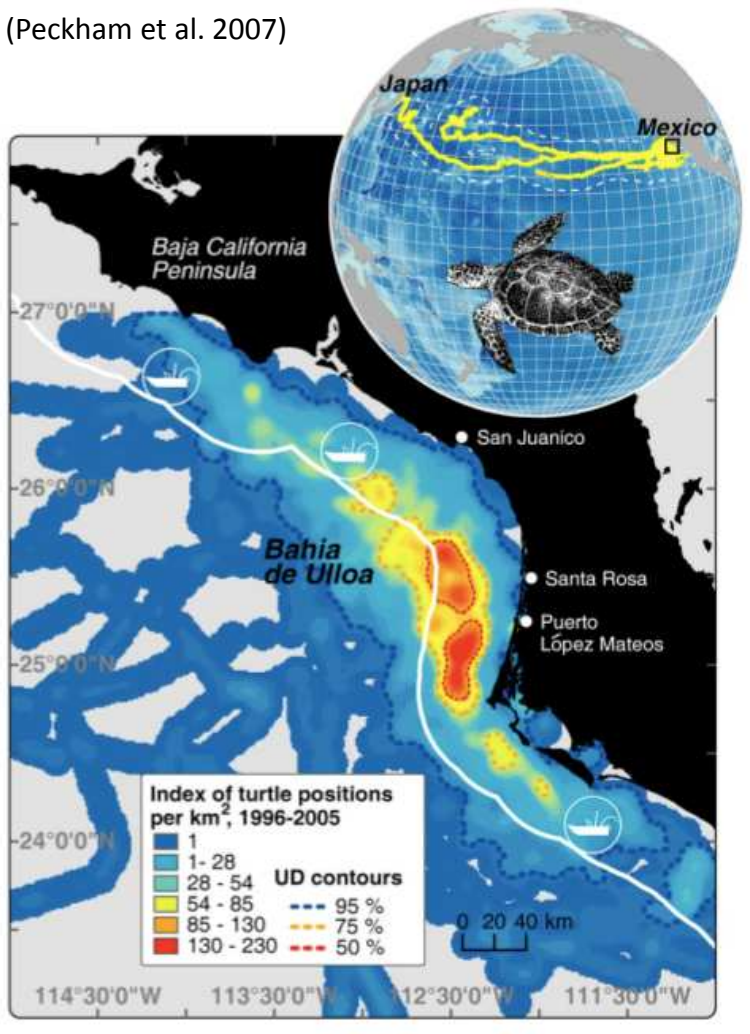
Eastern Pacific foraging hotspot

~ 43,000 loggerheads
(Seminoff et al. 2014)



Long-term patterns and changes?

(Peckham et al. 2007)



**Moratorium
Protection Act:
2015 Negative
Certification
2016 Certified**

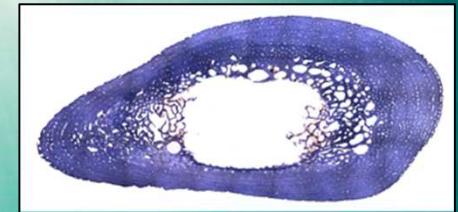
~1,000 mortalities annually



Track individual turtles for multiple years

Use stranded animals, inherently focus on at-risk populations and critical habitats

- What ages are found here?
- What is the residency duration?
- Is there variability in duration?
- What's the mechanism bringing turtles to this habitat?
- Is this distribution shifting?



Skeletochronology



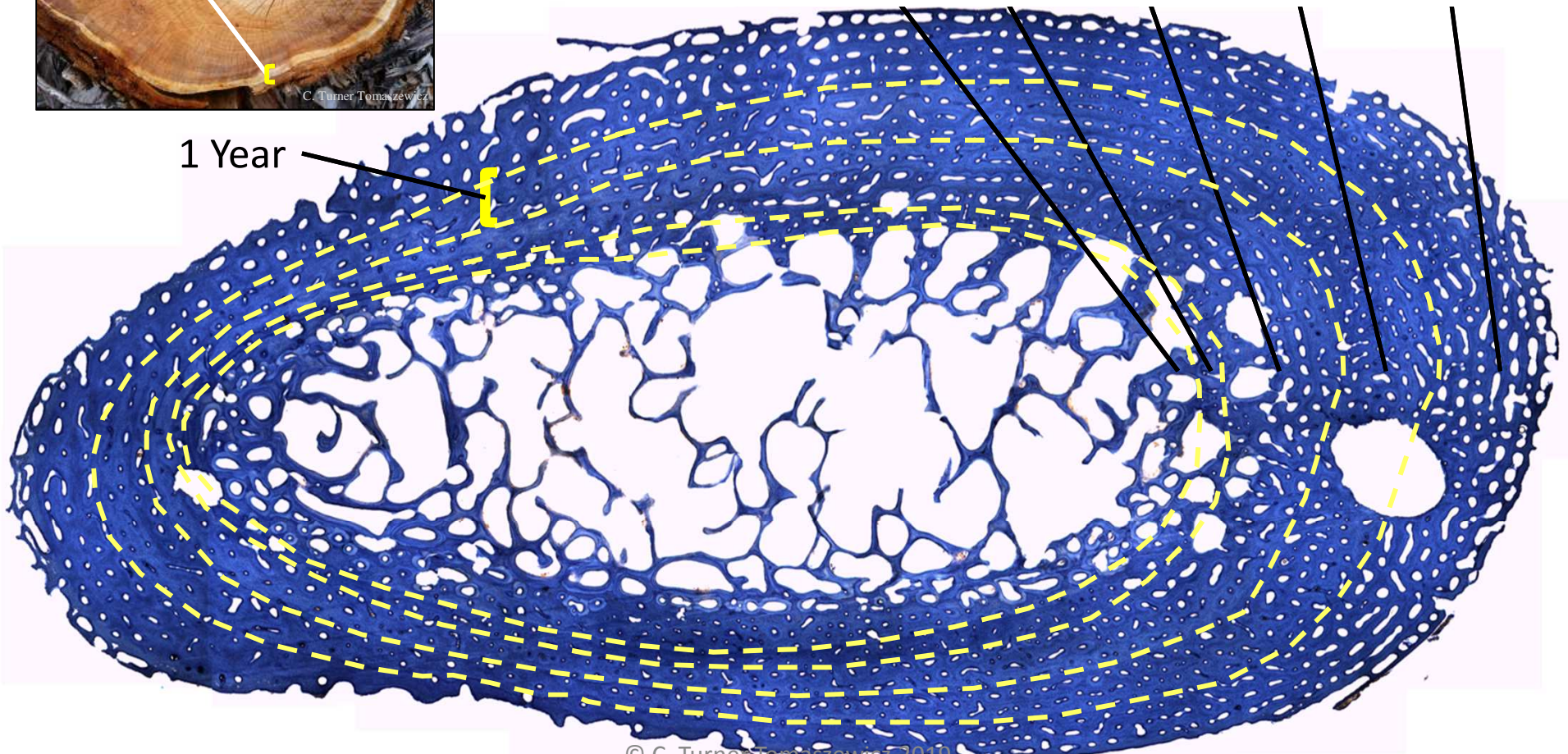
Stable Isotope Analysis



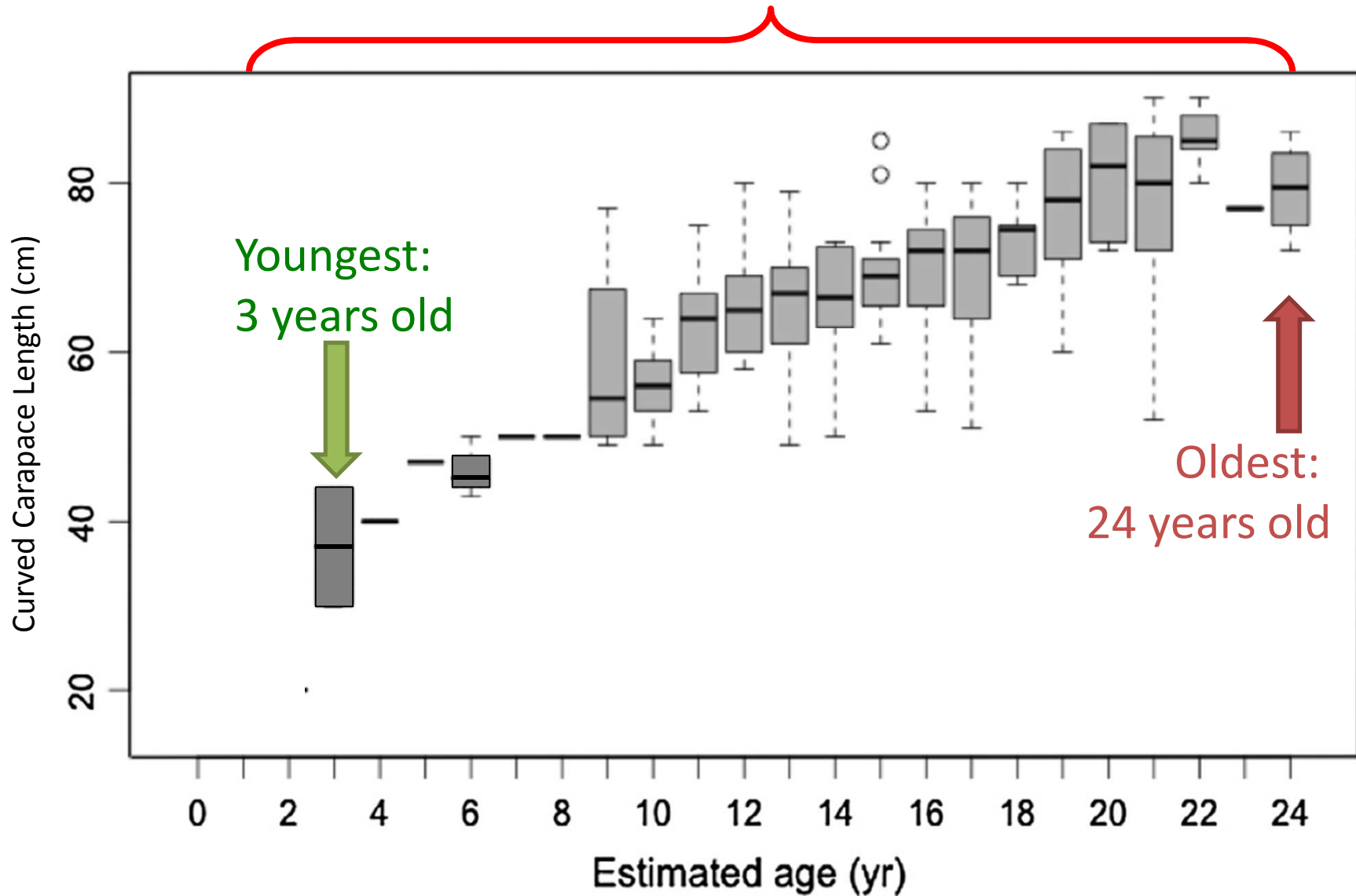
Skeletochronology: Multi-year demographic data



	2005	2006	2007	2008	Stranded: 2009
Est. CCL:	32 cm	33 cm	38 cm	43 cm	50 cm
Est. Age:	4 yrs	5 yrs	6 yrs	7 yrs	8 yrs



Spend ~20 years in high-bycatch area



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(Turner Tomaszewicz et al. 2015 Bio Con)

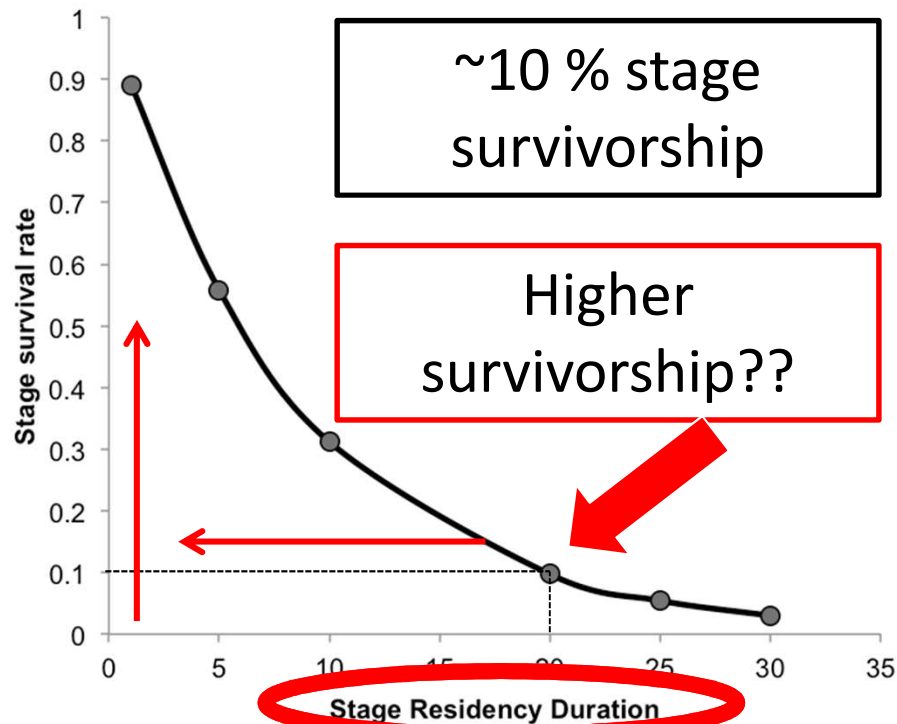
Is there variation in residency duration?

~ 43,000 loggerheads

(Seminoff et al. 2014)

Est. 11 % annual mortality rate

(Koch et al. 2013, Seminoff et al. 2014)



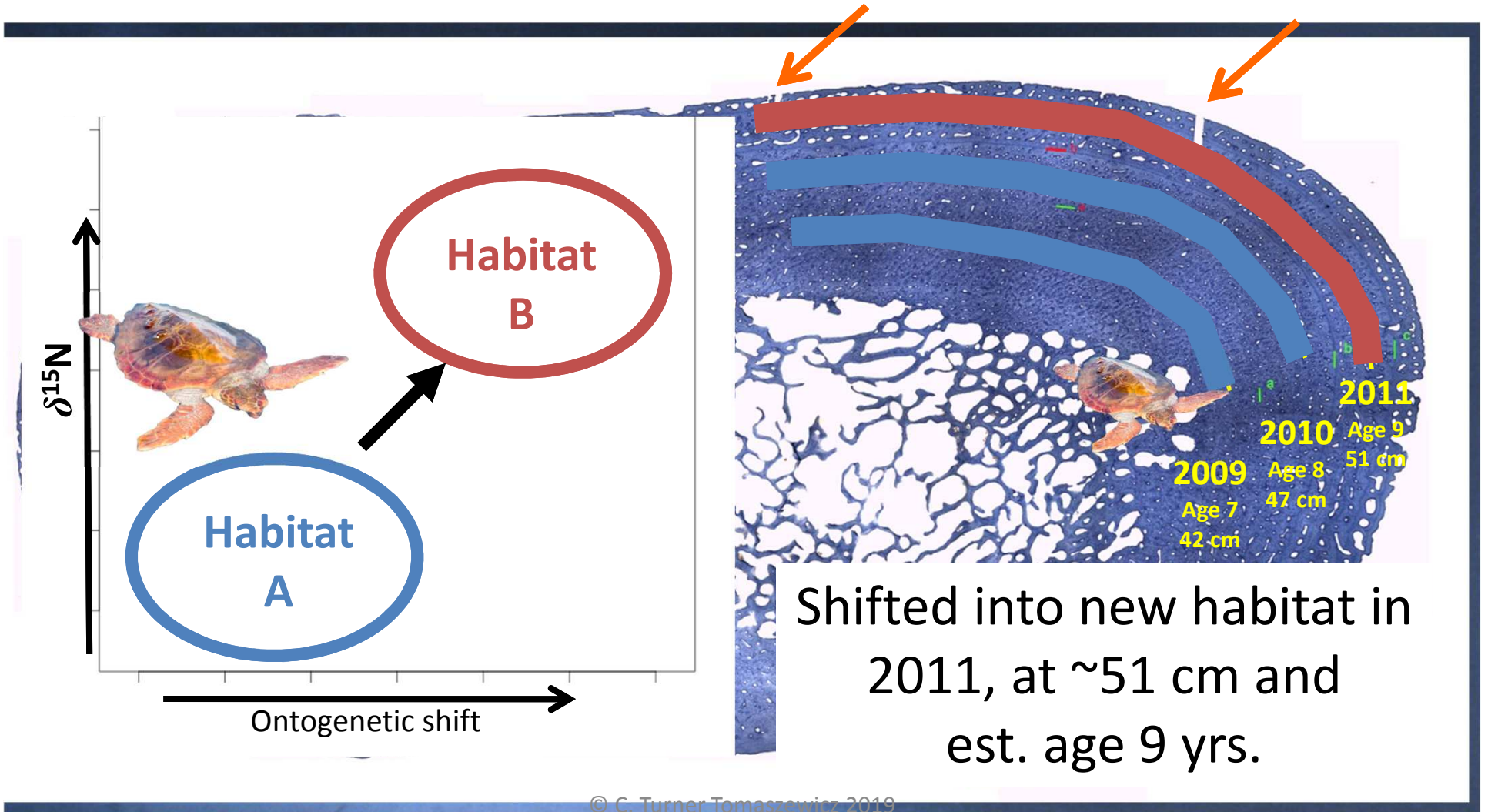
Playa San Lázaro, ★
BCS, Mexico



(Turner Tomaszewicz et al. 2015 Bio Con) © C. Turner Tomaszewicz 2019

Skeletochronology + Stable Isotopes

TIME in each LOCATION

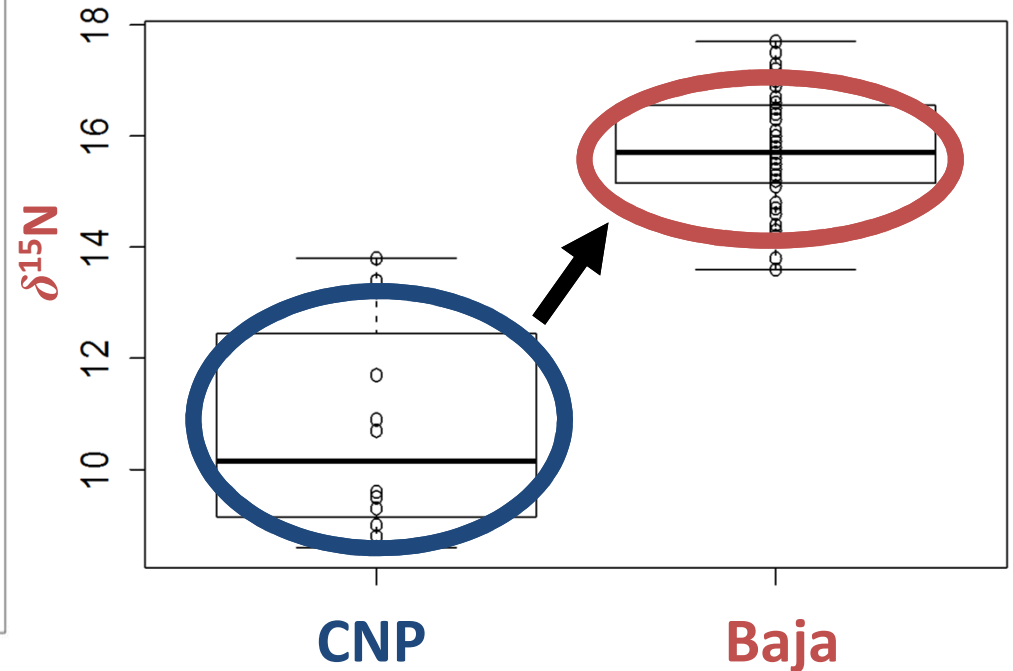
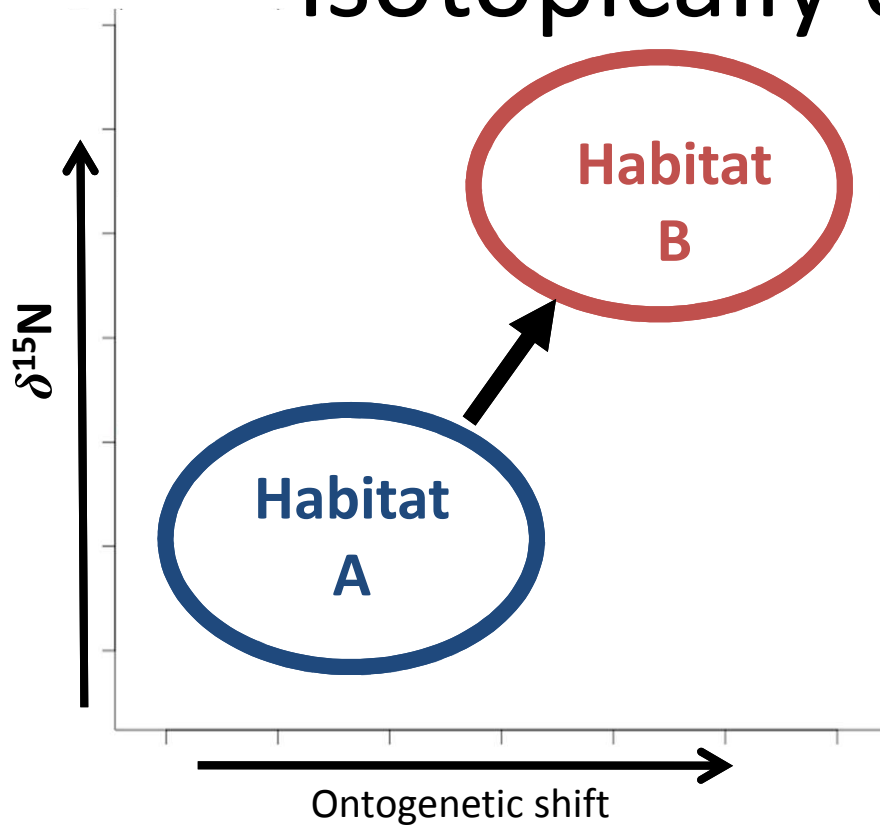


(ex: green turtle bone)

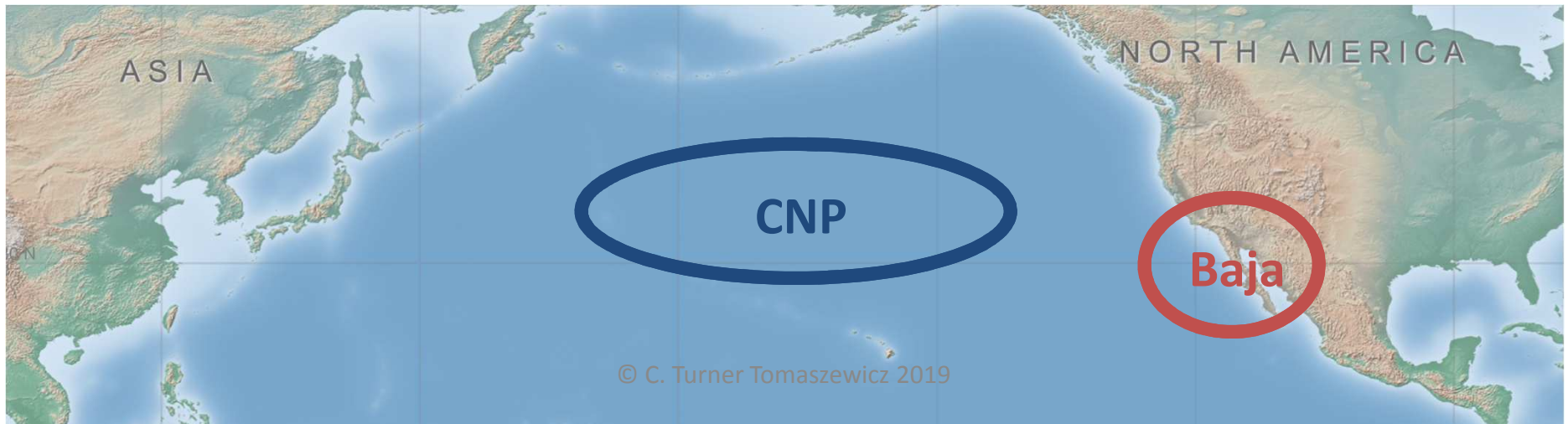
© C. Turner Tomaszewicz 2019

(Turner Tomaszewicz et al. 2015 RCMS; 2016 MEE, 2017 JAE, 2018 MEPS)

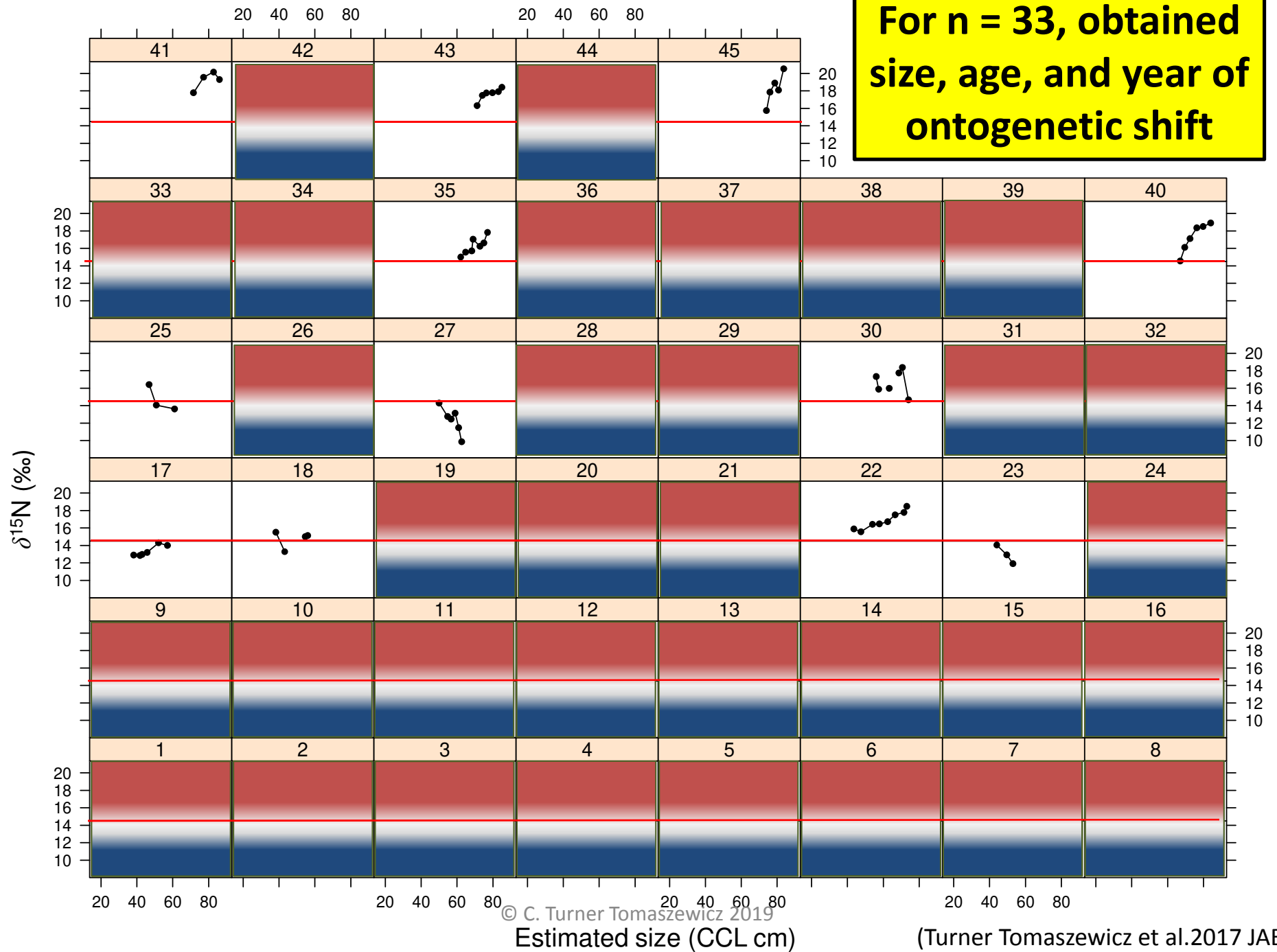
Isotopically distinct habitats



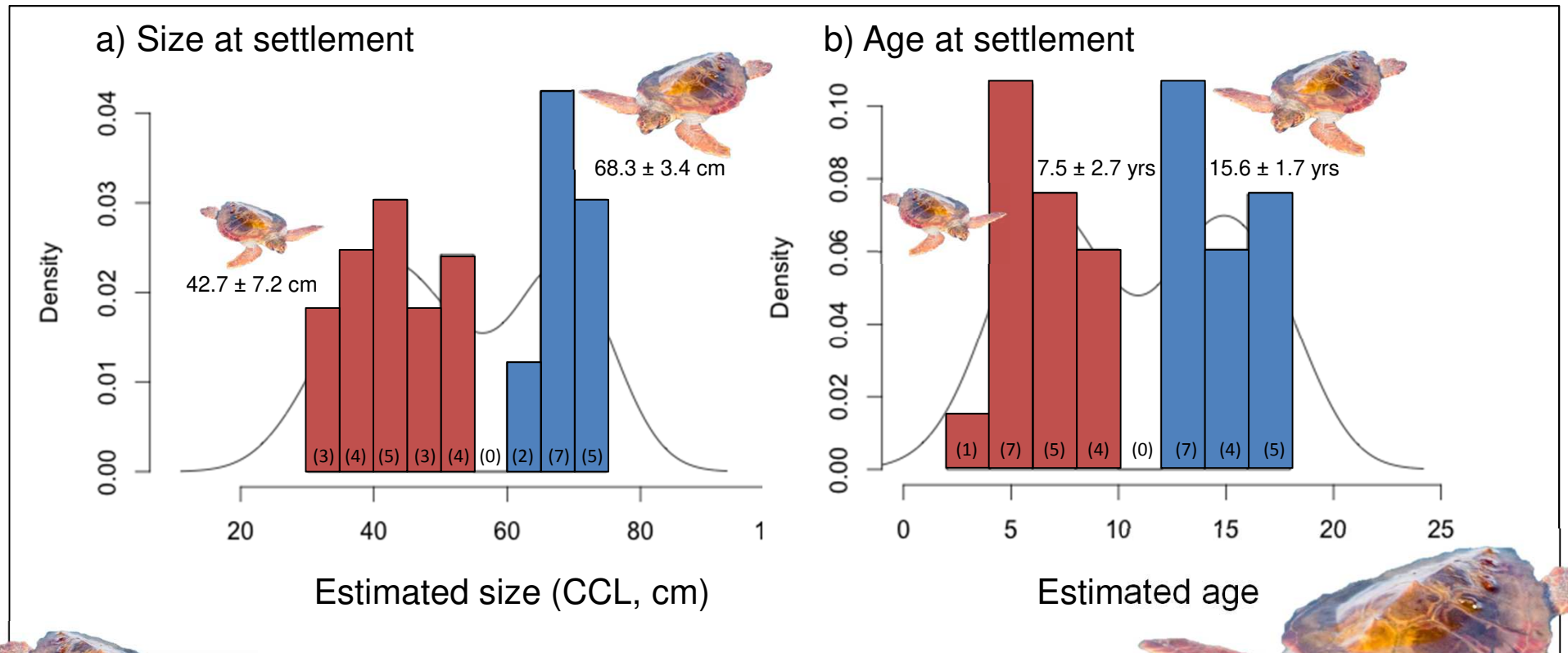
(Turner Tomaszewicz et al. 2017 , Journal Animal Ecology)



For n = 33, obtained size, age, and year of ontogenetic shift



Recruitment timing → Mechanism?



1) Small settlers shift ~43 cm and ~7 years

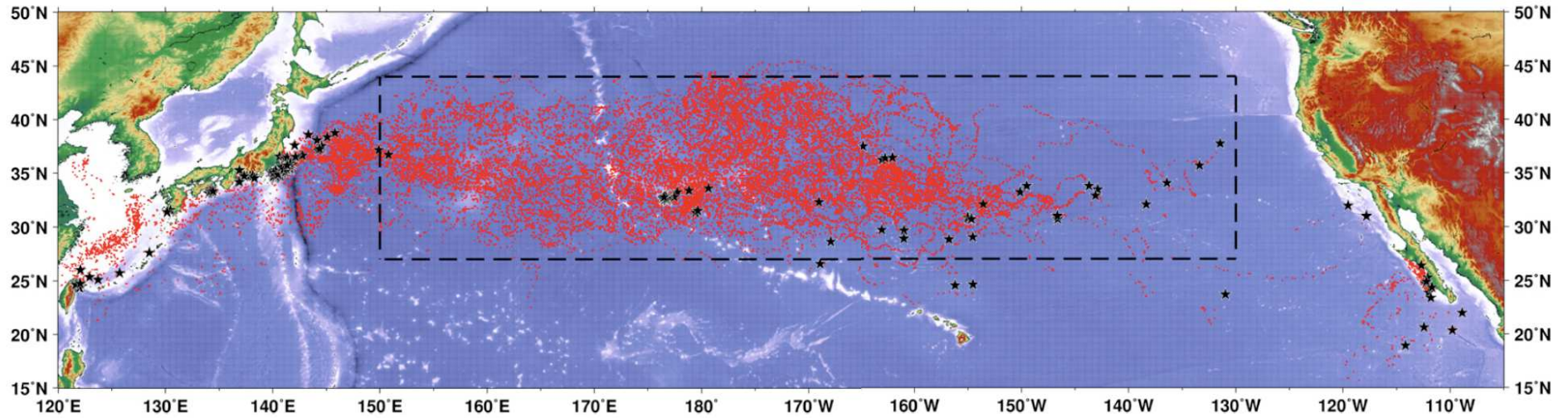
2) Large settlers shift ~69 cm and ~16 years

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(Turner Tomaszewicz et al. 2017, Journal Animal Ecology)

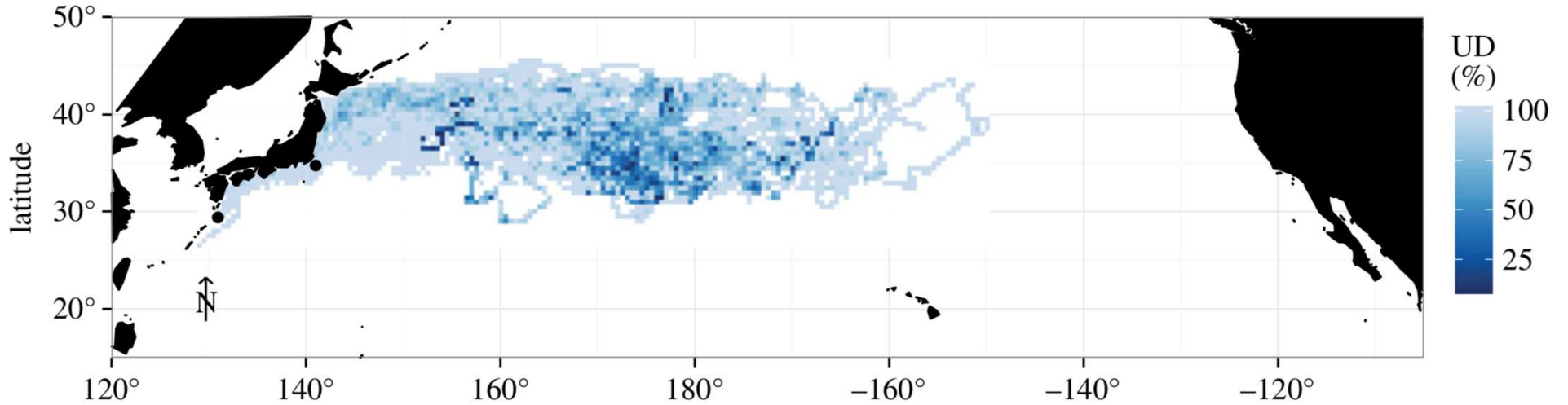
Habitat use by juveniles

1997-2006, n = 186



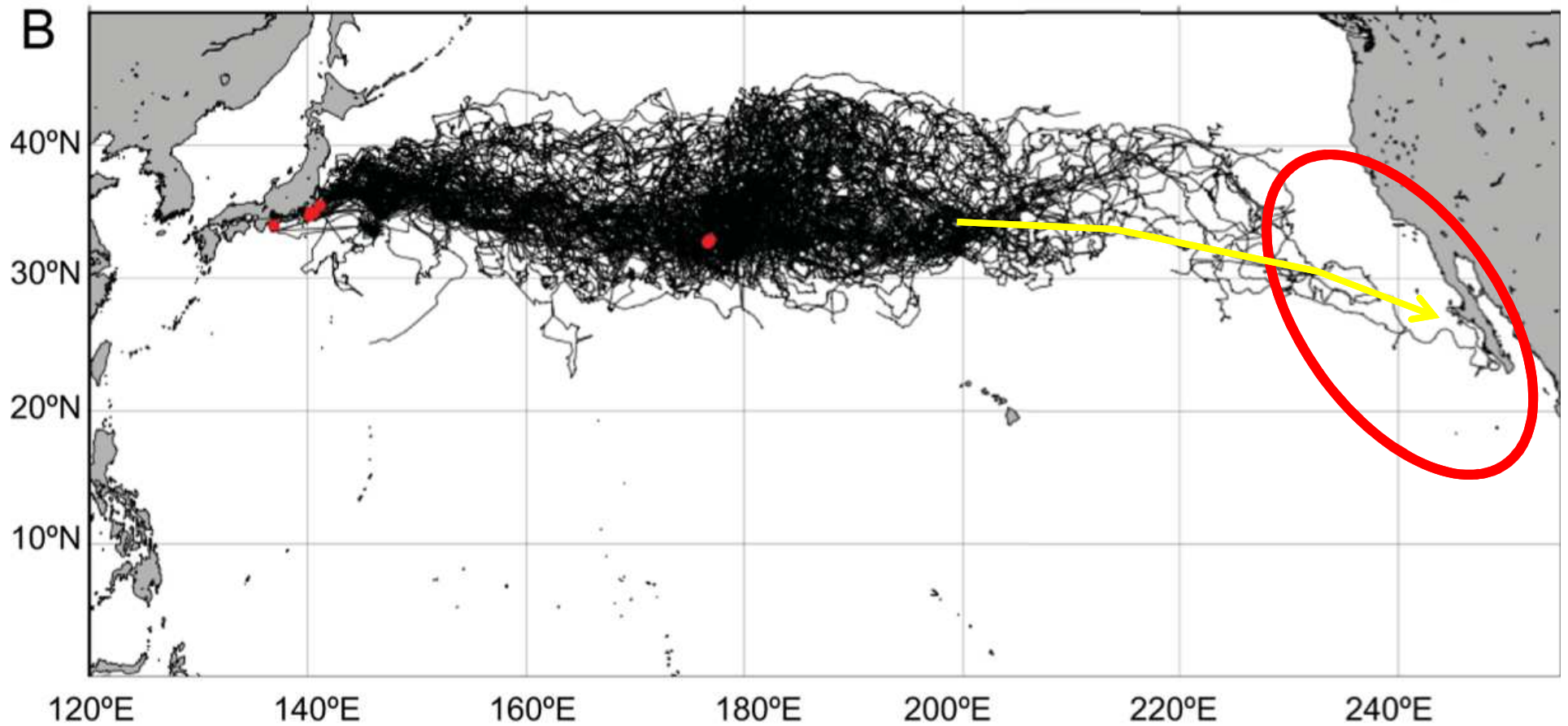
(Kobayashi et al. 2008)

2010-2013, n = 44



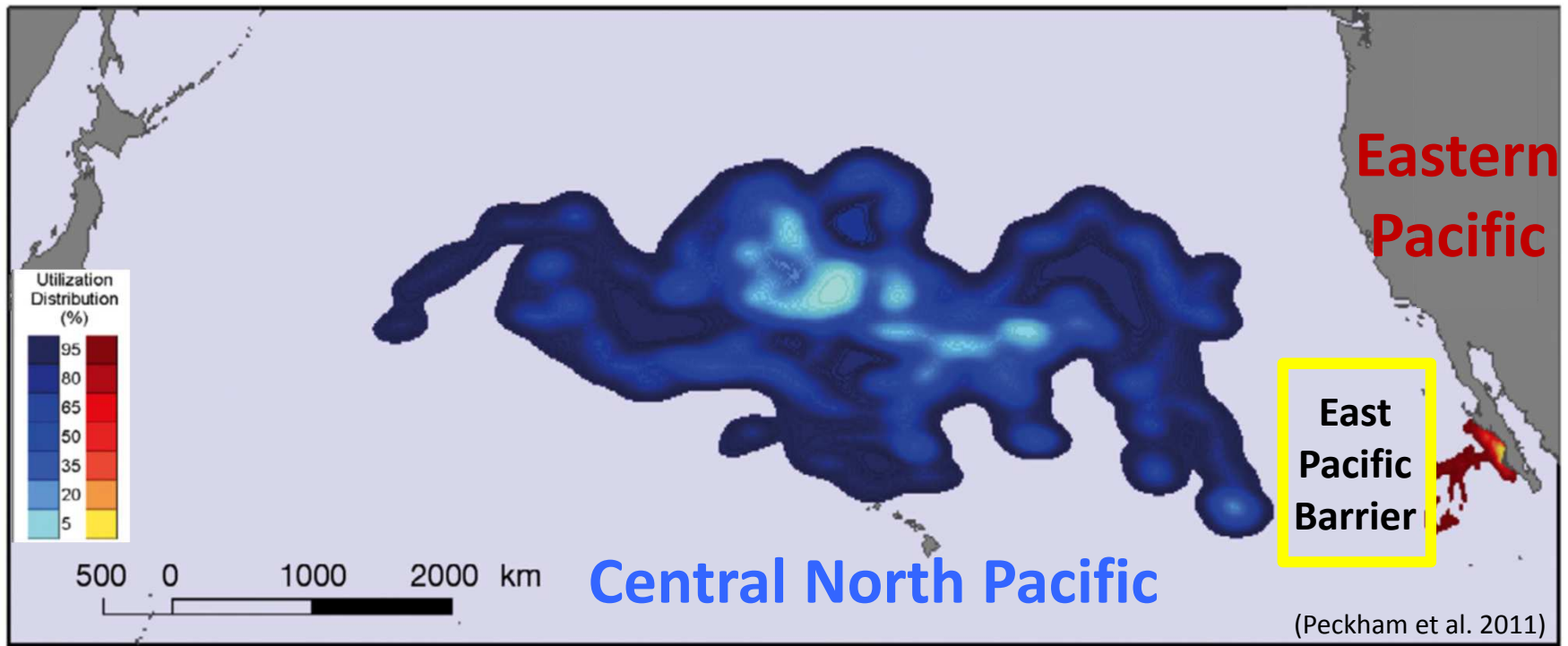
(Briscoe et al. 2016)

Habitat use by juveniles



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(Abecassis et al. 2013)



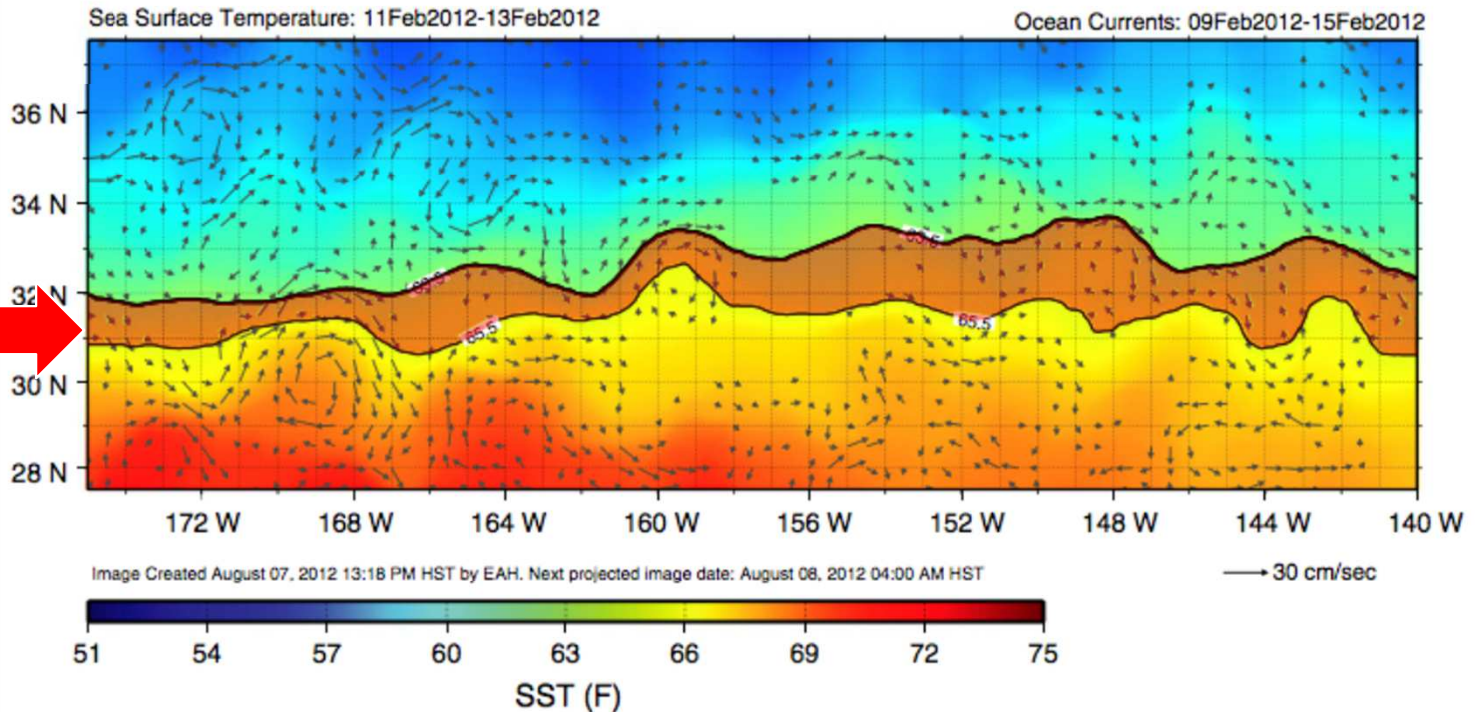
Fidelity to thermal gradients



(b)

EXPERIMENTAL PRODUCT

avoid fishing between solid black 63.5°F and 65.5°F lines
to help reduce loggerhead sea turtle interactions



AVOID FISHING

between
63.5 to 65.5 °F



PACIFIC ISLANDS FISHERIES SCIENCE CENTER
ECOSYSTEMS AND OCEANOGRAPHY DIVISION
2570 Dole Street, Honolulu, HI 96822
<http://www.pifsc.noaa.gov/eod/turtlewatch.php>
contact: Evan.Howell@noaa.gov
Data provided by Central Pacific CoastWatch node

TURTLEWATCH

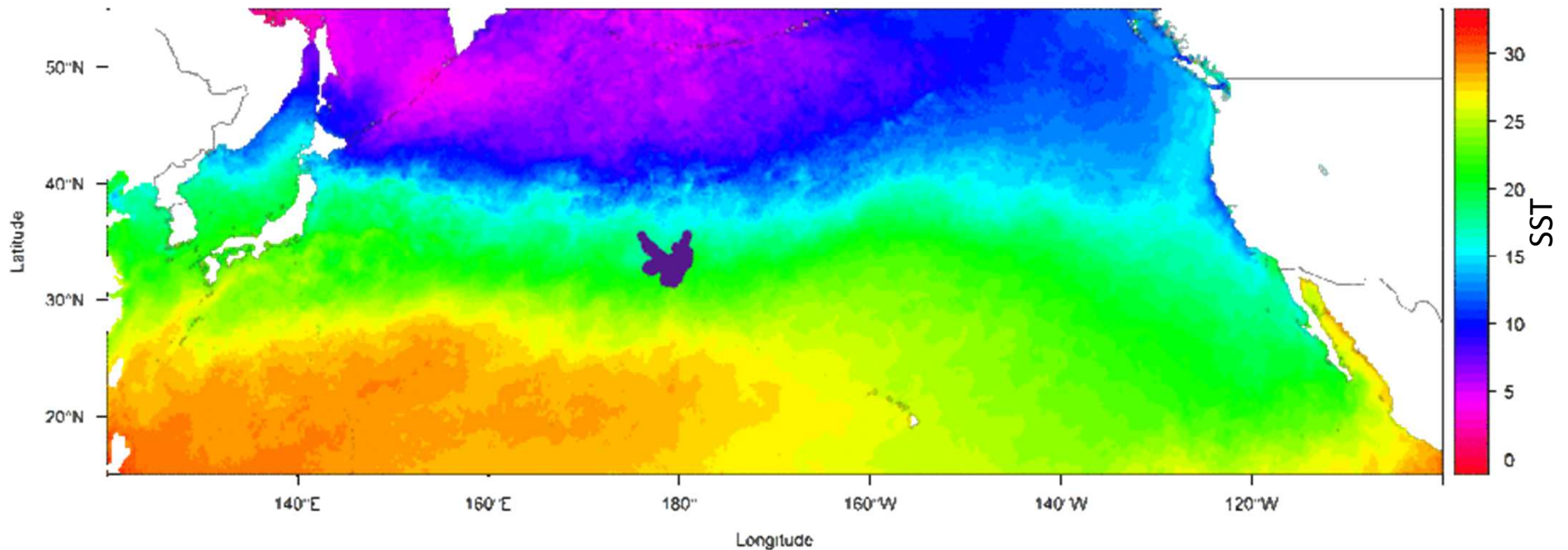


Fidelity to thermal gradients



May 2005 to August 2008

Month 5 : 2005



From Briscoe et al. 2016 ISTS Presentation

POTENTIAL CORRIDOR CONNECTS CENTRAL NORTH PACIFIC LOGGERHEAD SEA TURTLES TO BAJA CALIFORNIA, MEXICO

Dana K Briscoe^{1*}, Turner-Tomaszewicz C.², Balazs G.³, Bograd S.⁴, Hazen E.⁴, Kurita M.⁵, Kurle, C.², Okamoto H.⁵, Parker D.⁶, Polovina J.³, Rice M.⁷, Saito T.⁸, Scales K.^{4,9}, Seminoff J.⁴, Crowder L.B.¹

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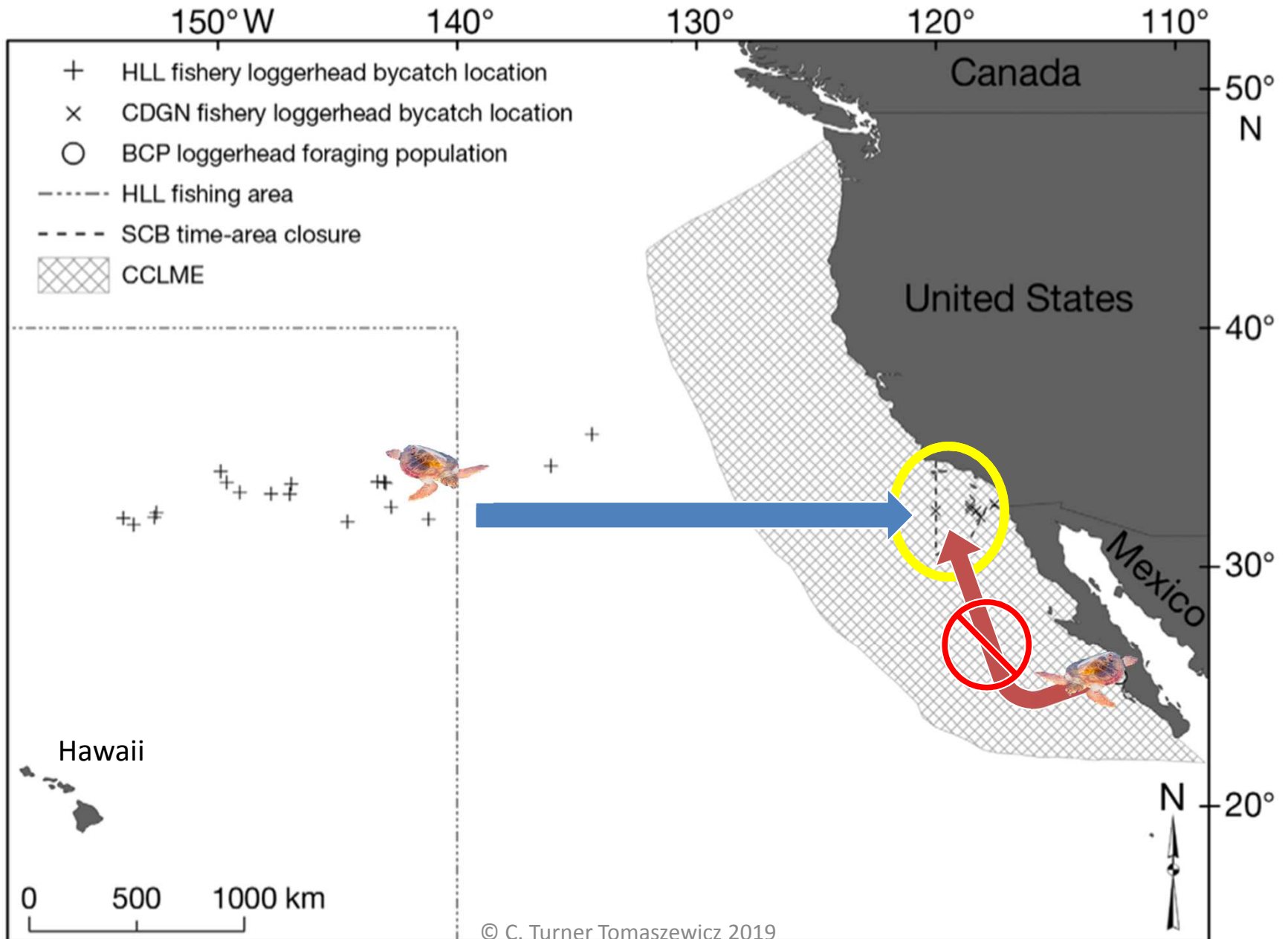
Also off the coast of Southern California!



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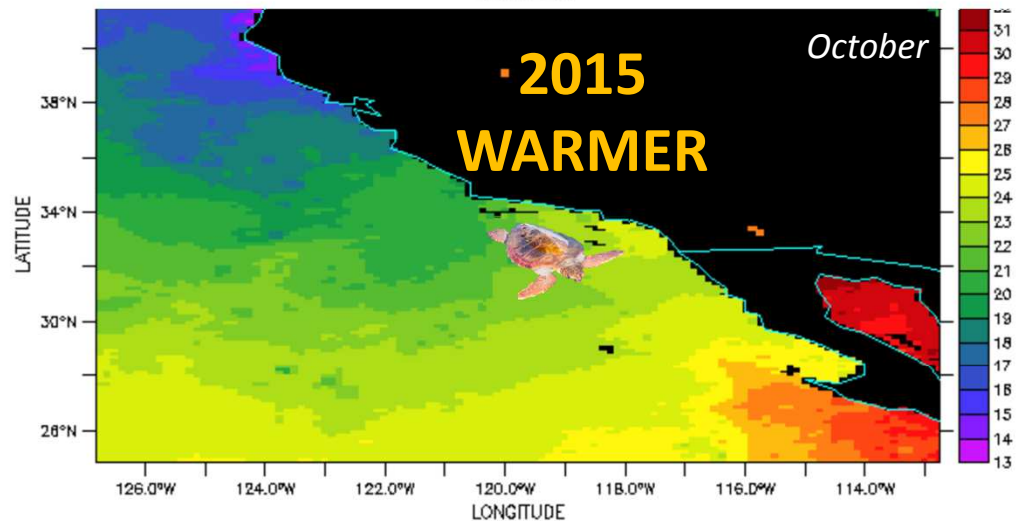
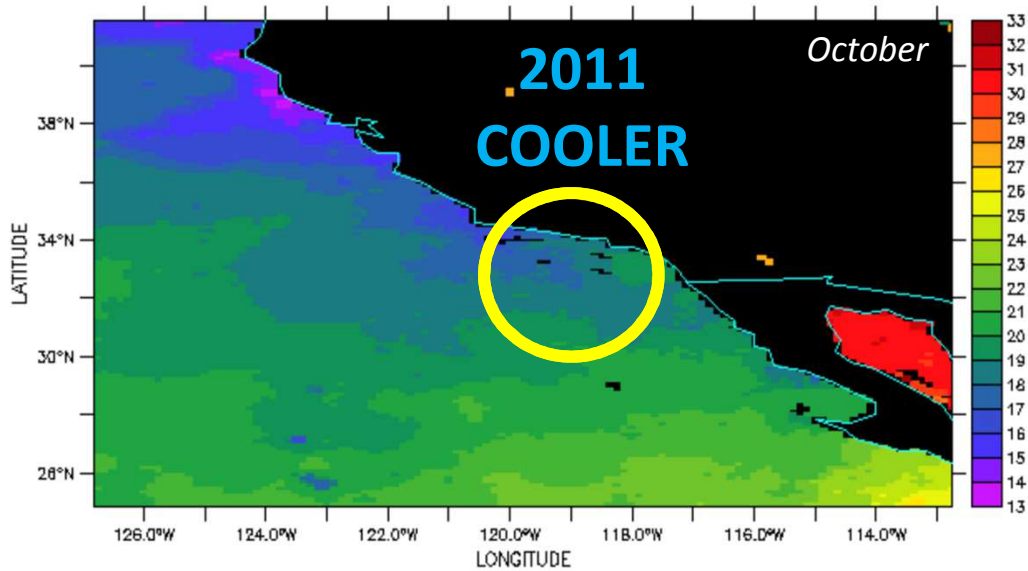
© C. Turner Tomaszewicz 2019

Southern California, USA



(Allen et al. 2013, Mar Ecol Prog Ser)

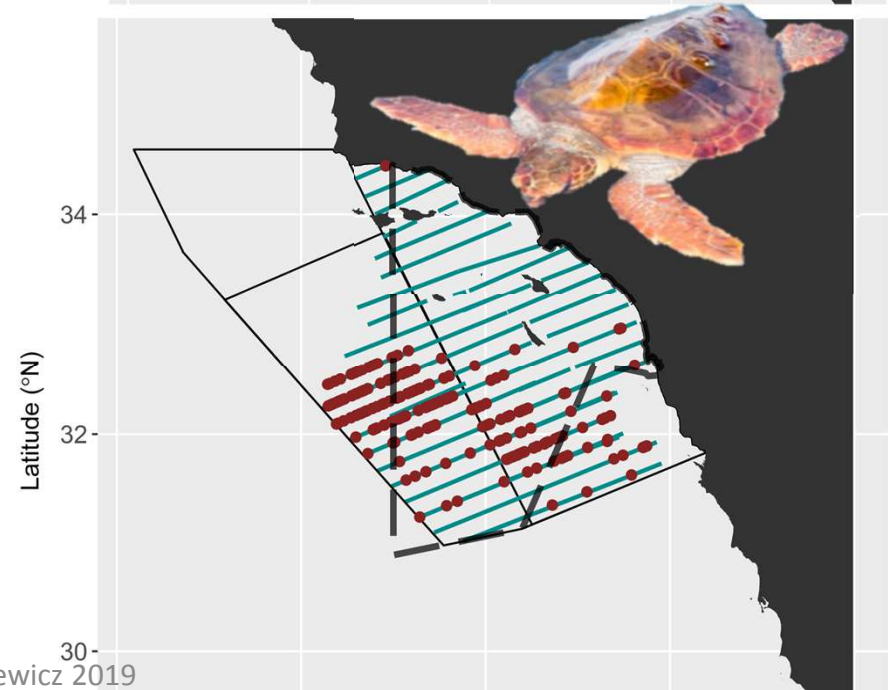
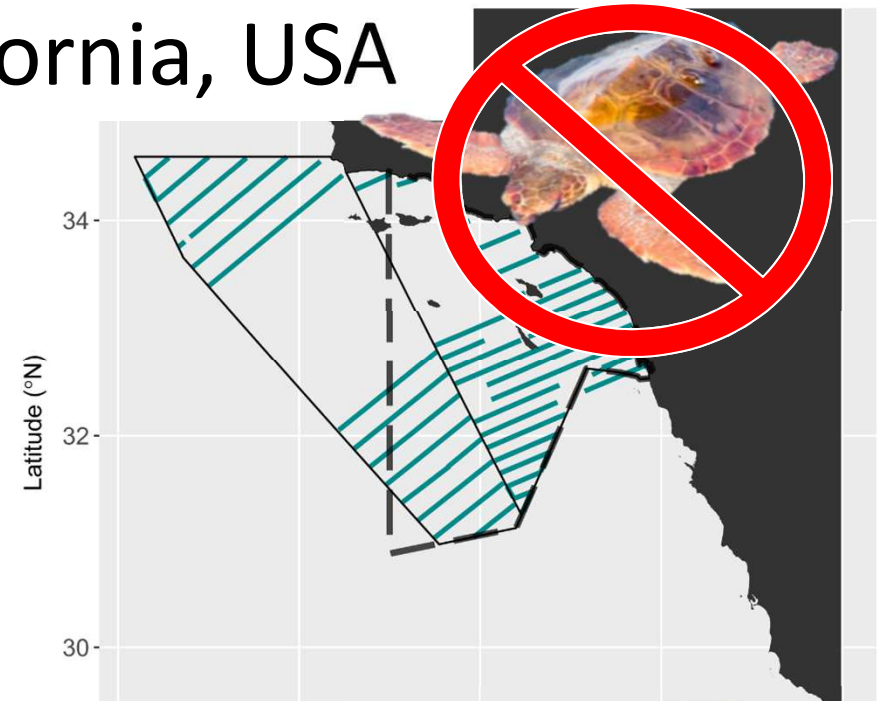
Southern California, USA



Analysis Temperature (Deg. C)



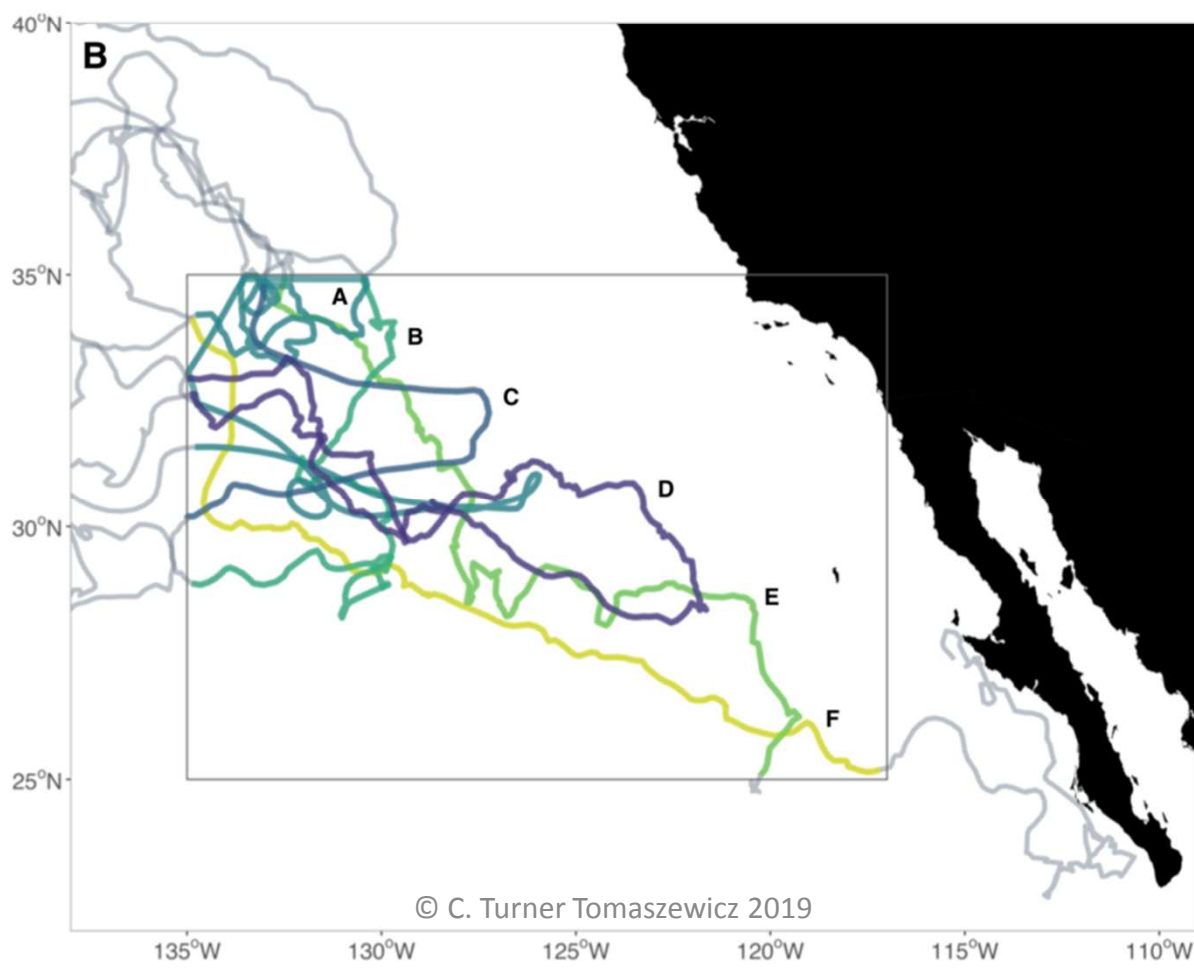
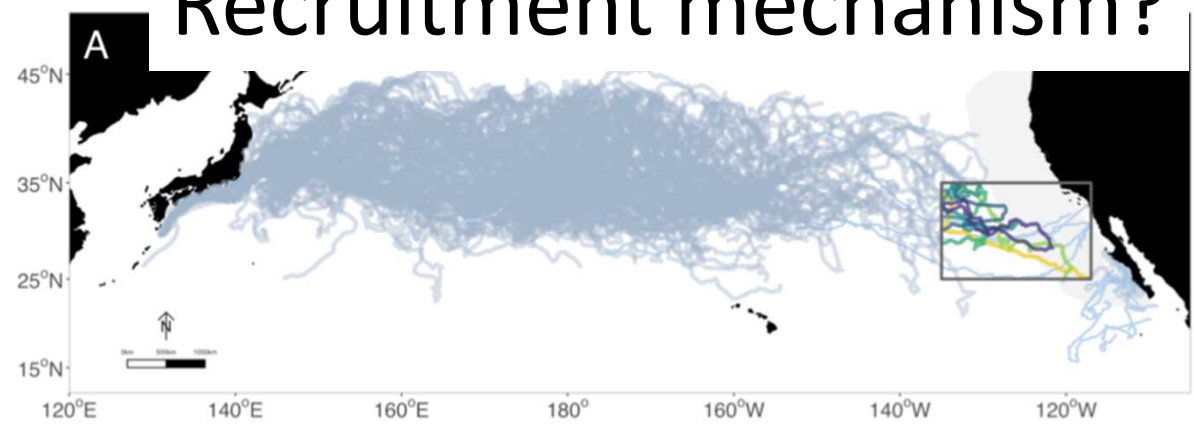
Comprehensive Large Array-data Stewardship Systems



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(Eguchi et al. 2018, *Frontiers in Marine Science*)

Recruitment mechanism?



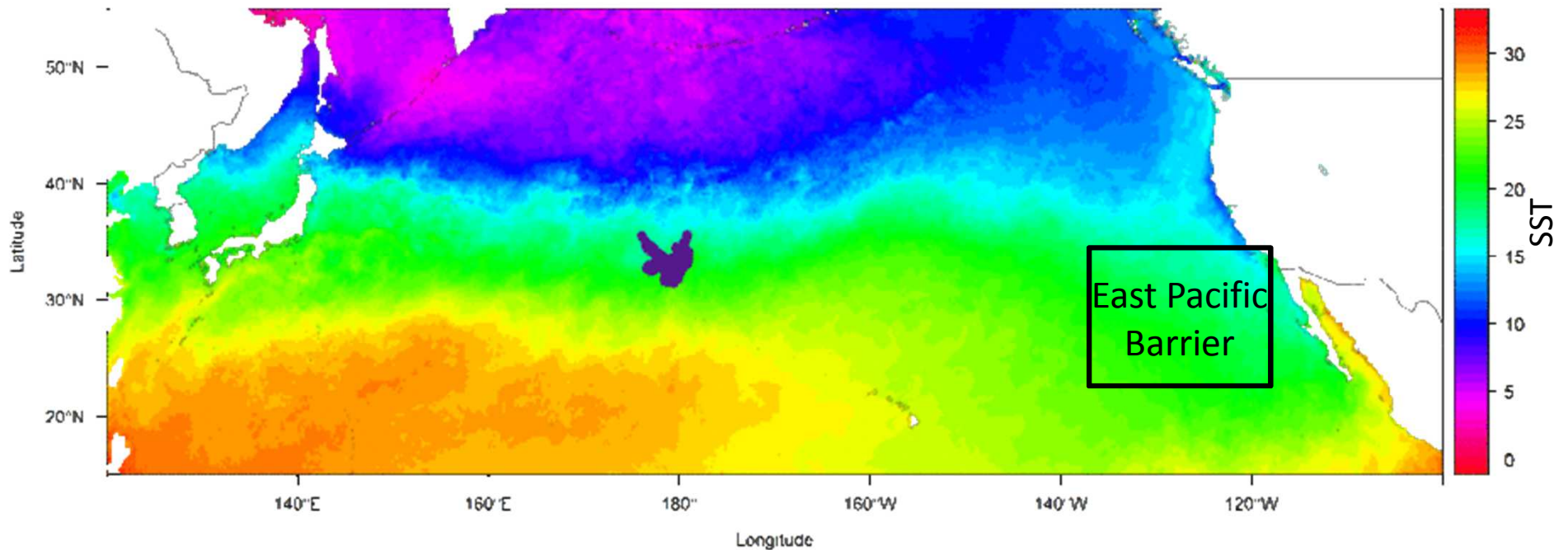
(Briscoe,
Turner Tomaszewicz,
et al. *in review*)

Thermal corridor facilitates recruitment



May 2005 to August 2008

Month 5 : 2005



From Briscoe et al. 2016 ISTS Presentation

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Population assessments



Life history

- Life span
- Age at settlement
- Age at 1st reproduction

Distribution

- Key habitats
- Migration patterns
- Residency duration

Survival

- Habitat specific
- Life stage specific
- Risk assessment

Contact Info:

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Thank you

Jeffrey Seminoff
Tomo Eguchi
Erin LaCasella,
Robin LeRoux
Garrett Lemons,
Joel Schumacher
Gaby Serra-Valente
Hoyt Peckham,
Victor de la Toba,
Chuy Lucero,
Catherine Hart,
Francis Kinney, Alex Gaos
& more with Grupo Tortuguero

NOAA NMFS #1951

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