

# The status of Kauai's endangered seabirds: trends, threats and the road to recovery

*DOFAW Seabird Workshop June 3<sup>rd</sup> 2021*



Dr. André Raine











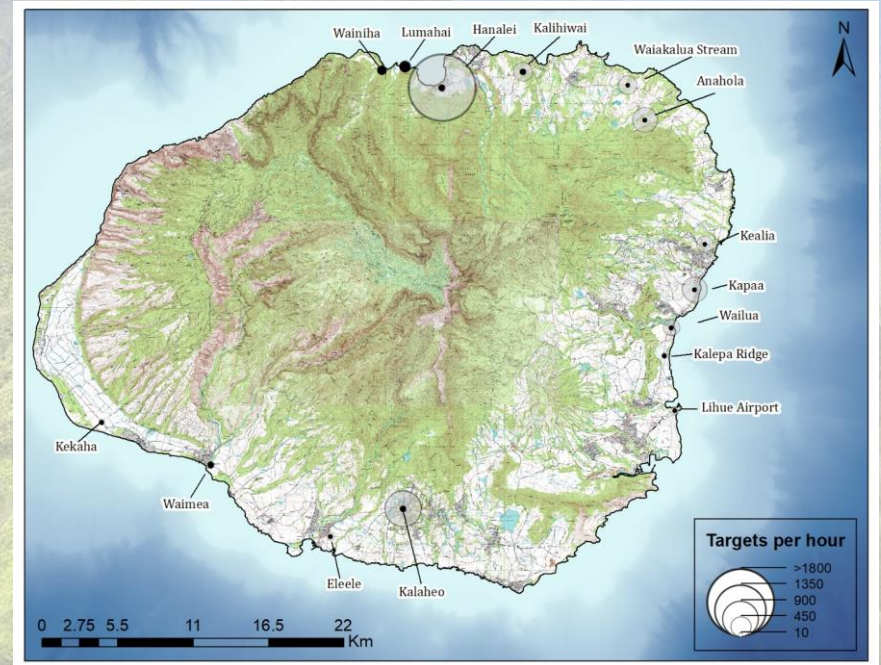
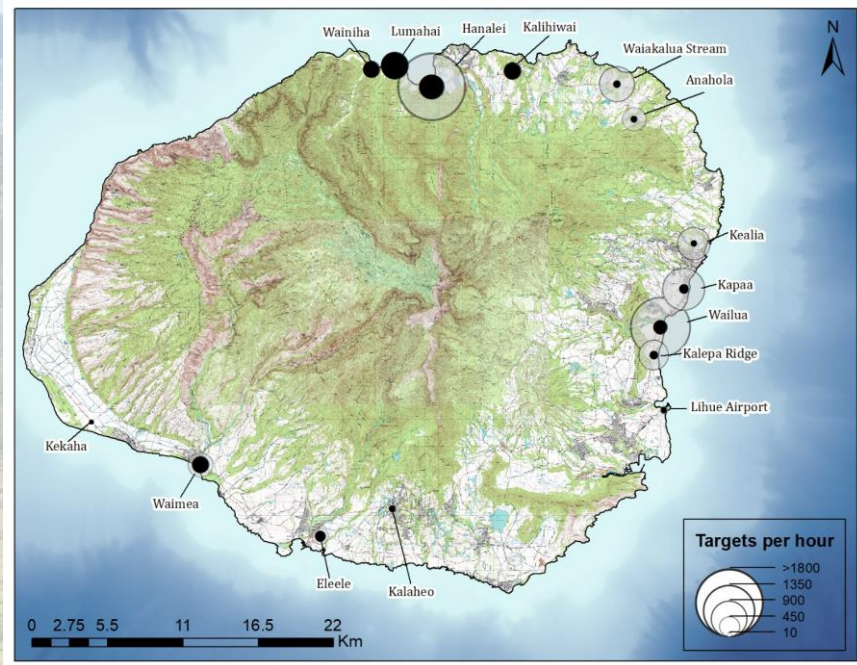




RESEARCH ARTICLE

**Declining population trends of Hawaiian Petrel and Newell's Shearwater on the island of Kaua'i, Hawaii, USA**

André F. Raine,<sup>1\*</sup> Nick D. Holmes,<sup>2</sup> Marc Travers,<sup>1</sup> Brian A. Cooper,<sup>3a</sup> and Robert H. Day<sup>4b</sup>

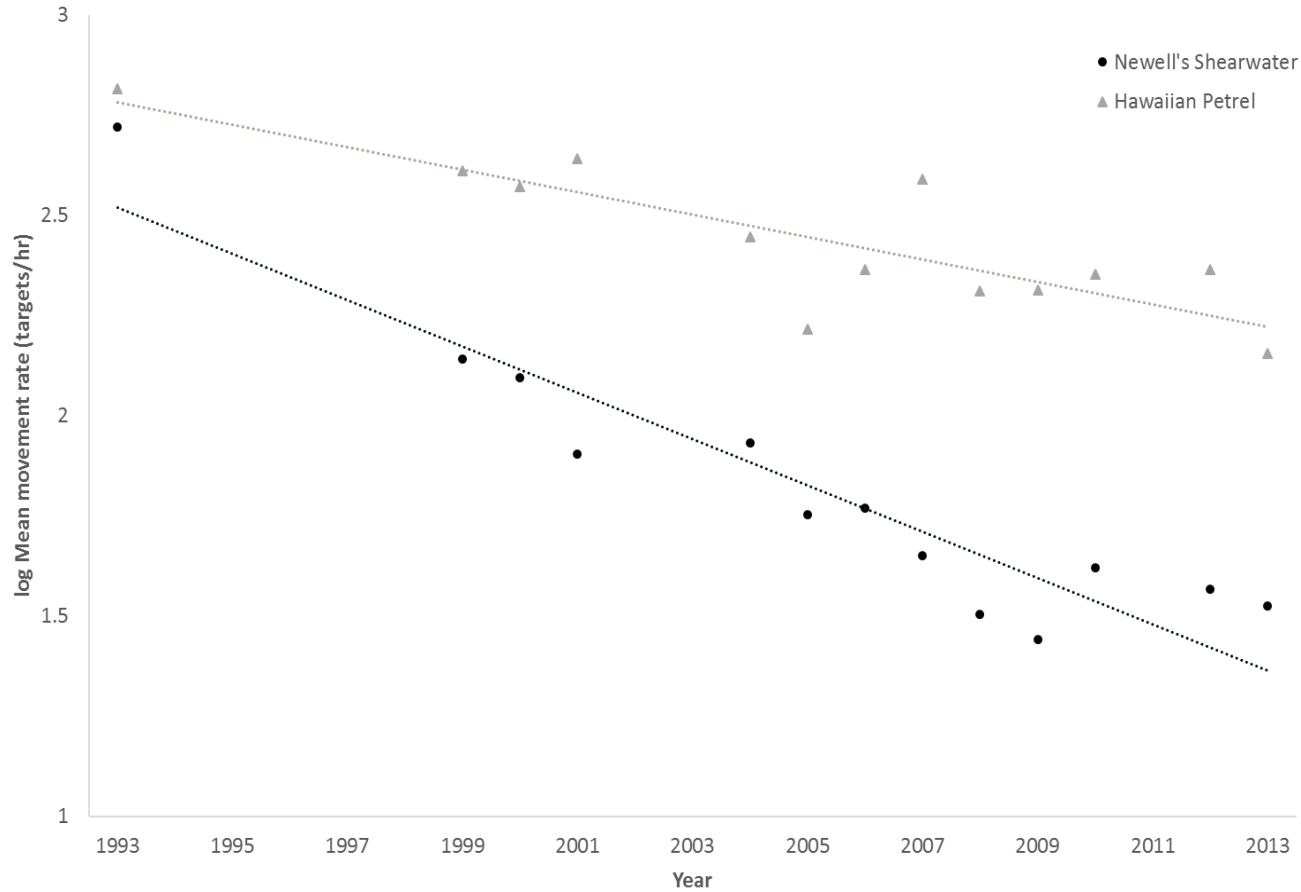




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1993-2013

NESH – 94%  
decline

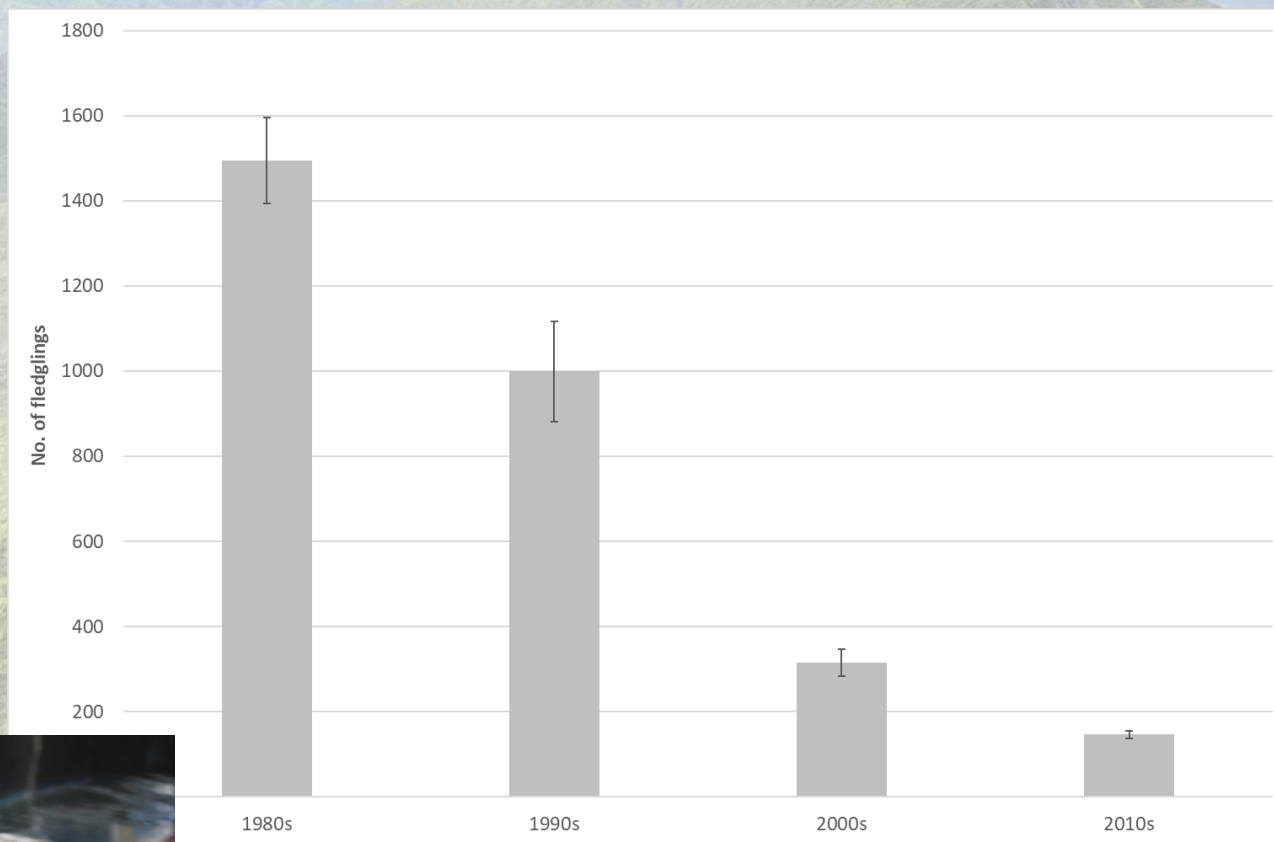
HAPE – 78%  
decline



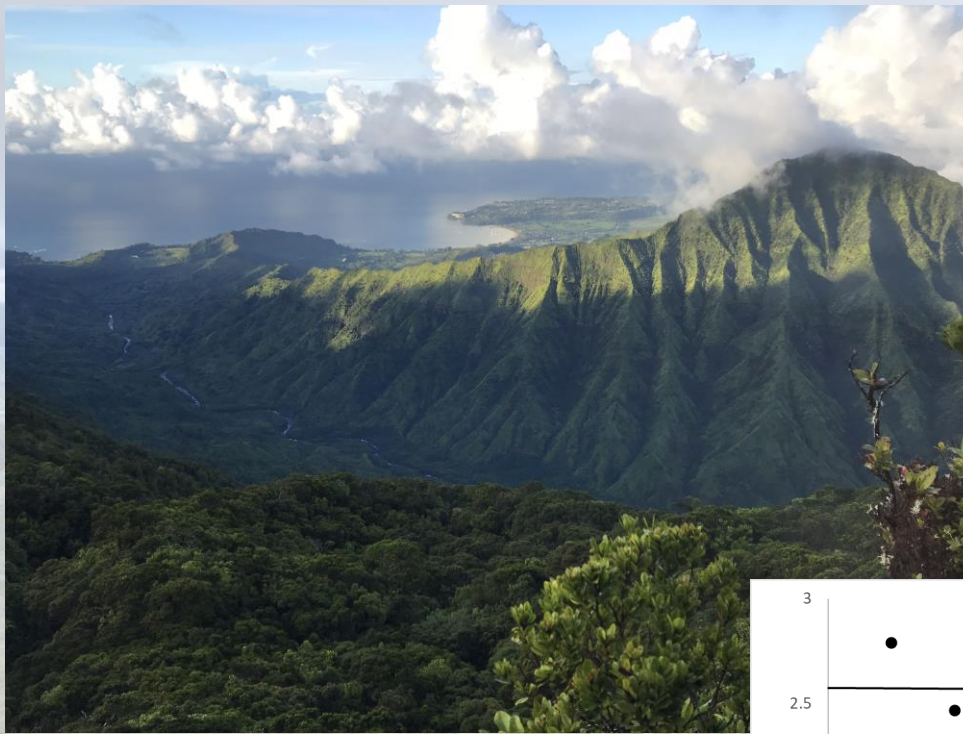
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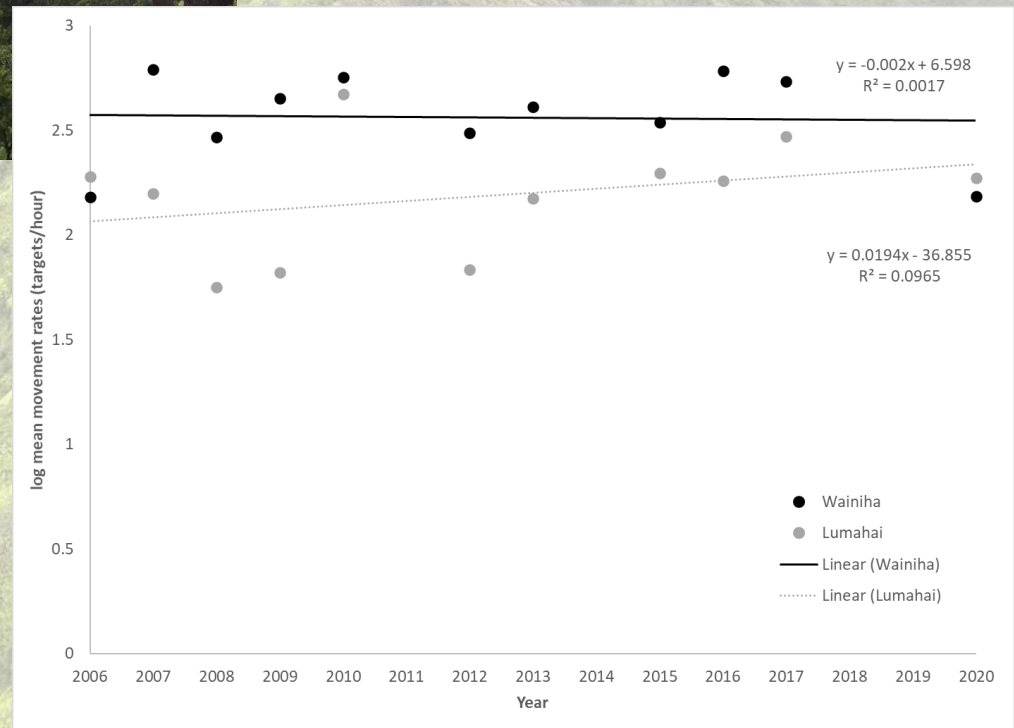




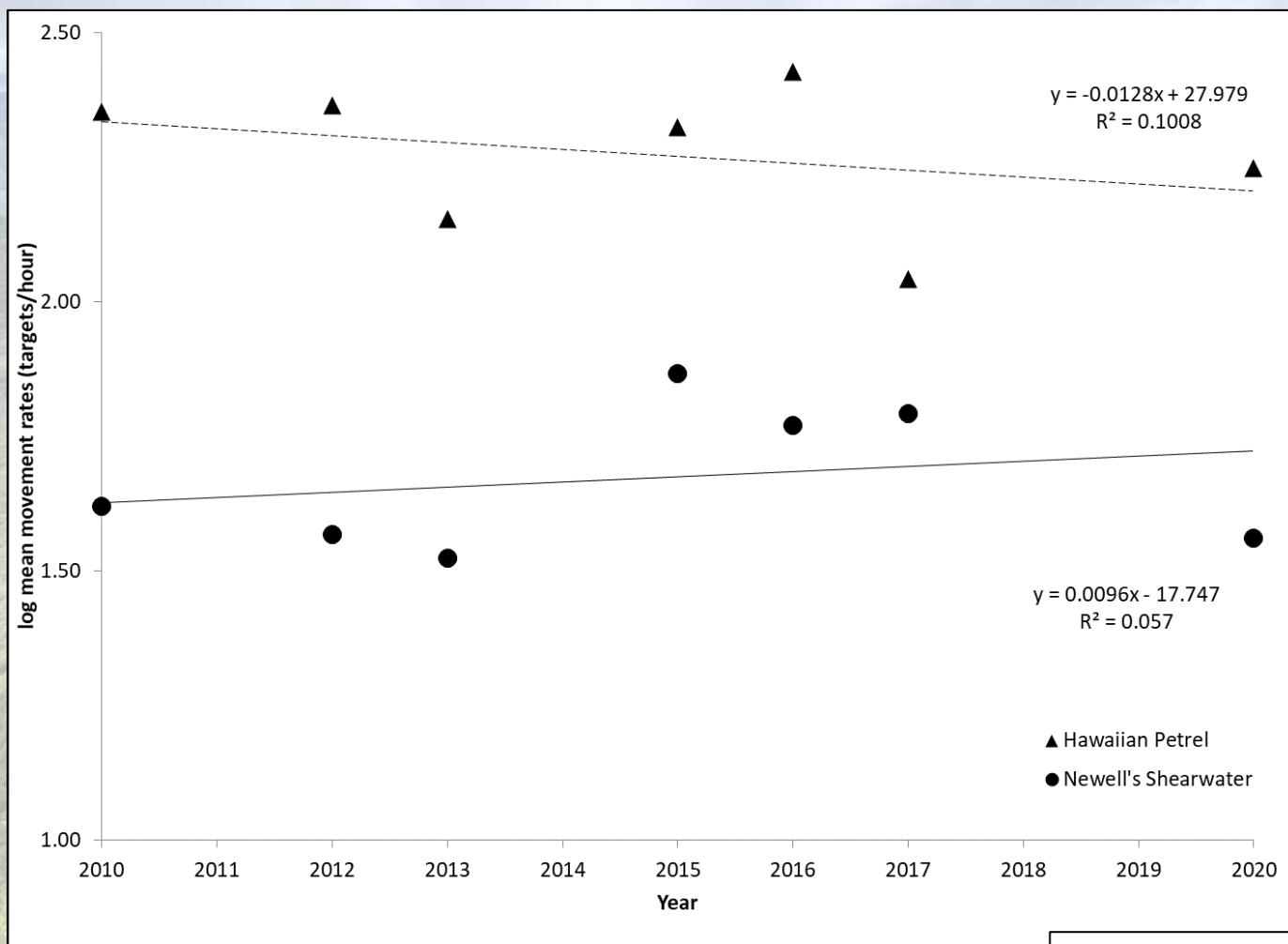
Wainiha & Lumahai

2006 – 2020

Flat line – i.e. no trend





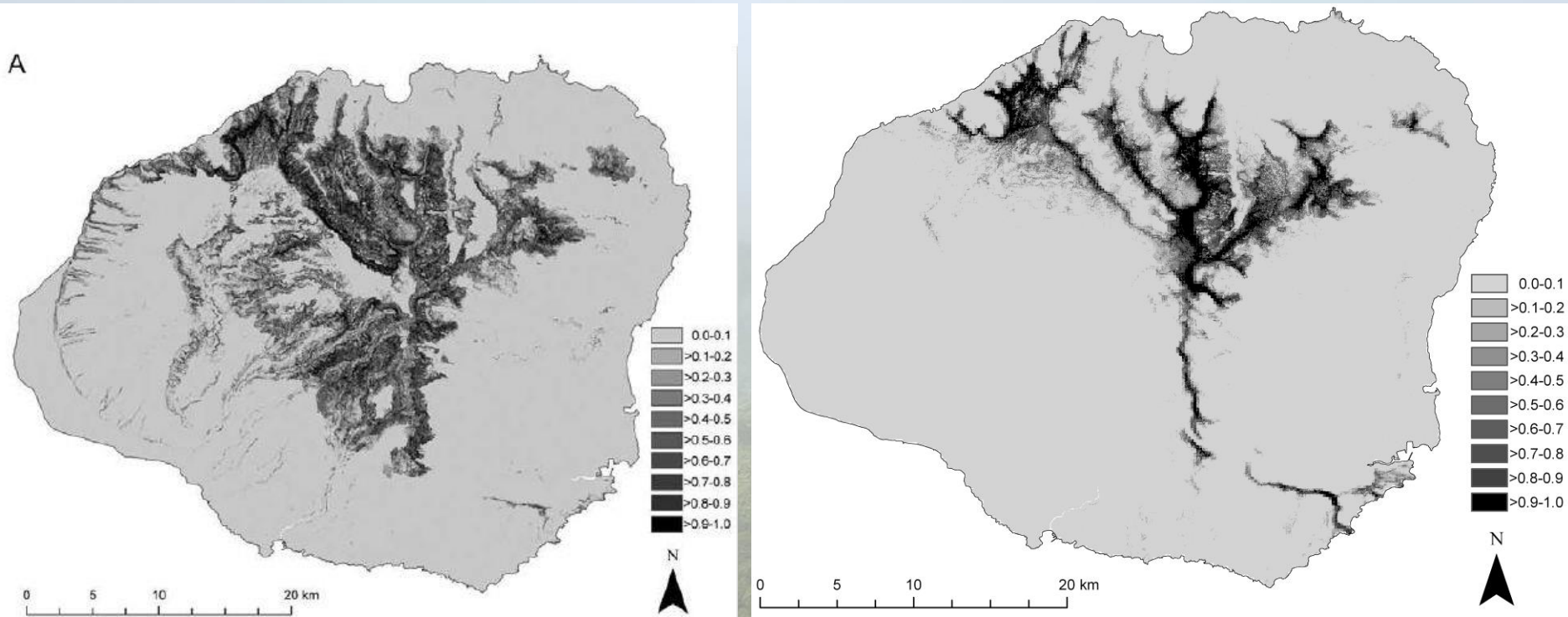


2010 – 2020

Flat line – i.e. no trend



# Modelling Breeding Distribution



## Articles

### Habitat Suitability Modeling for the Newell's Shearwater on Kauai

Jeff R. Troy,\* Nick D. Holmes, Joseph A. Veech, André F. Raine, and M. Clay Green



Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: <http://www.elsevier.com/locate/gecco>



Original Research Article

Habitat suitability modeling for the endangered Hawaiian petrel on Kauai and analysis of predicted habitat overlap with the Newell's shearwater

Jeff R. Troy<sup>a,\*</sup>, Nick D. Holmes<sup>b</sup>, Joseph A. Veech<sup>a</sup>, André F. Raine<sup>c</sup>, M. Clay Green<sup>a</sup>



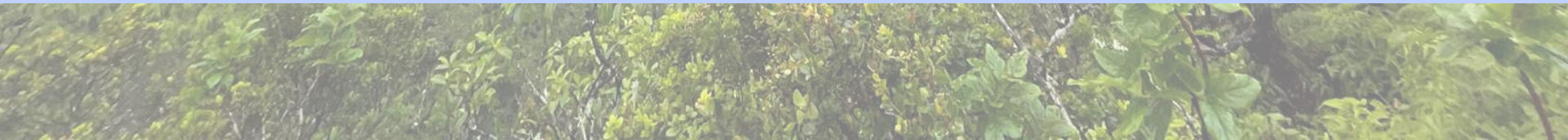
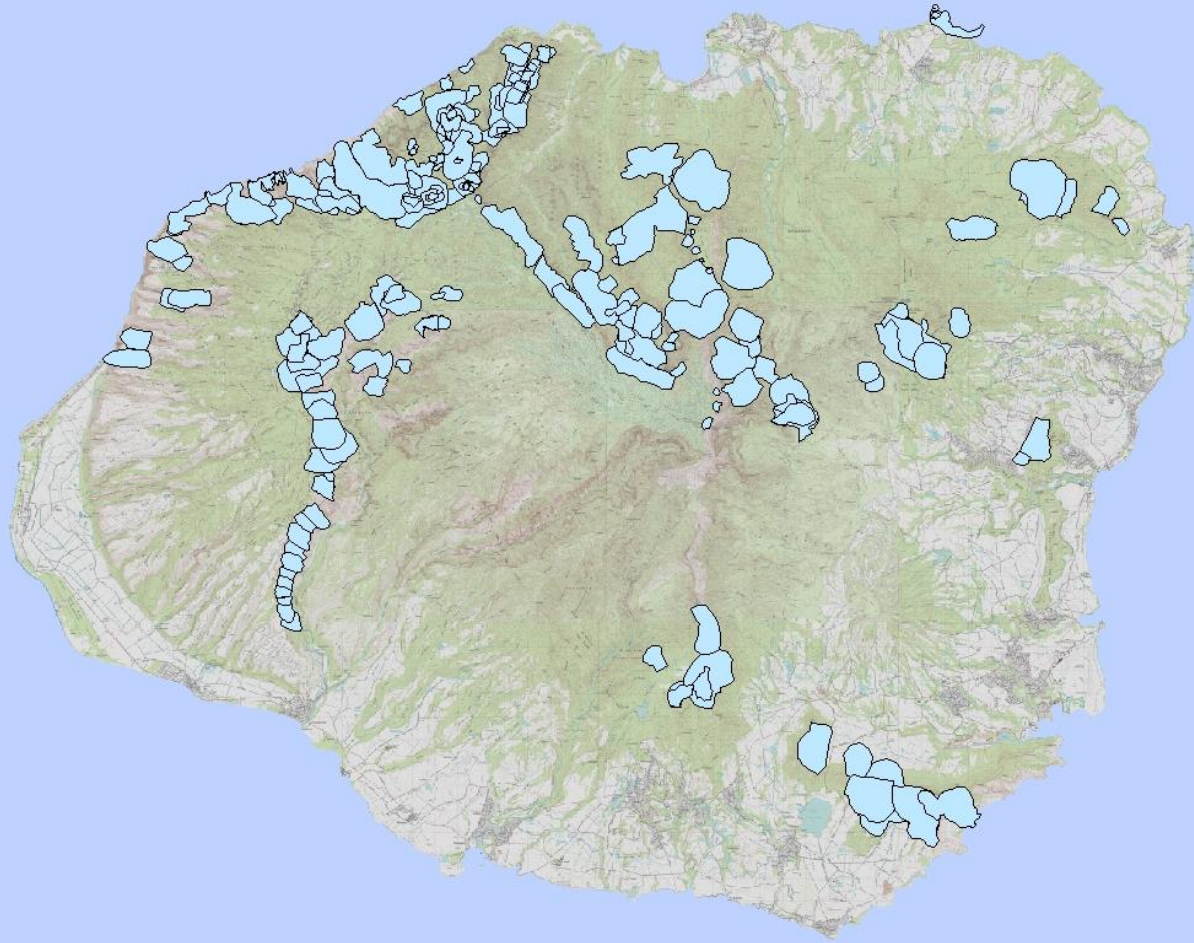


# Mapping Breeding Distribution

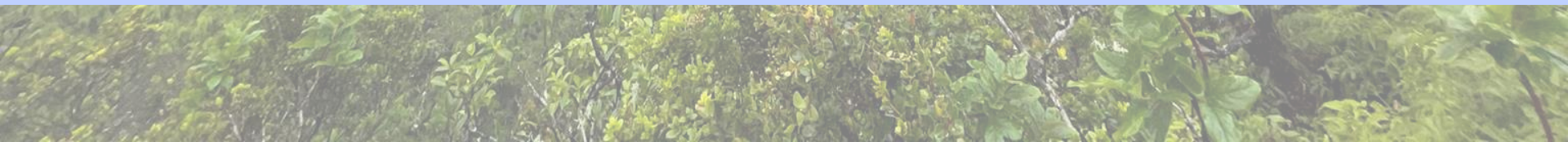
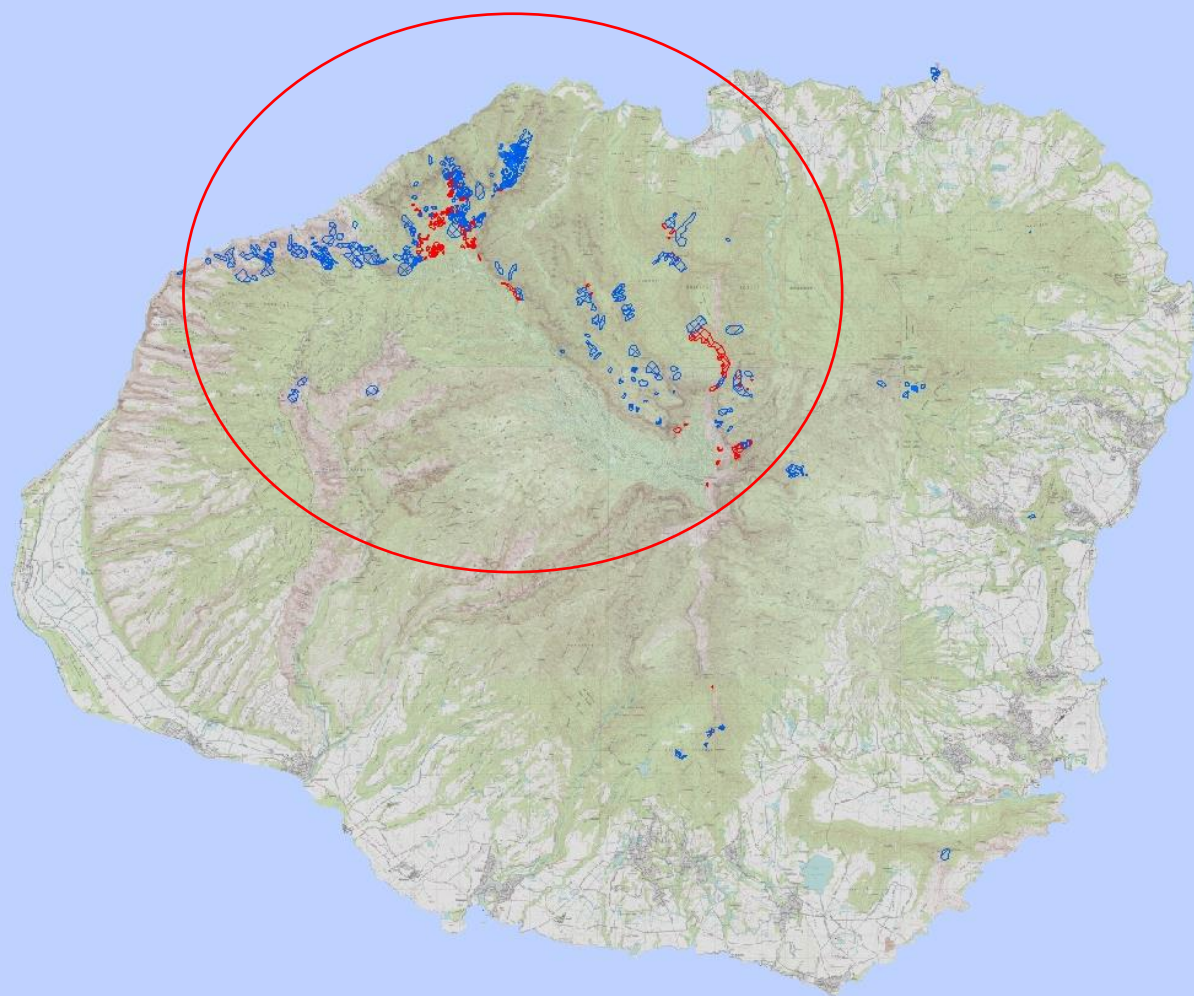




# Mapping Breeding Distribution







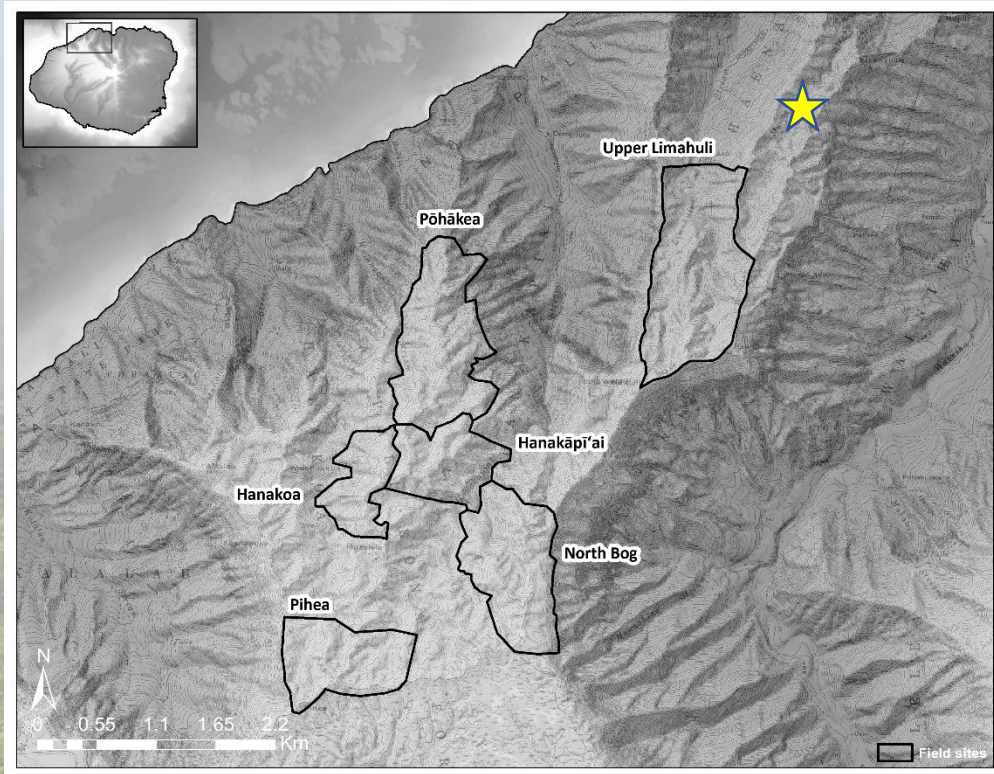


# Colony Management & Monitoring



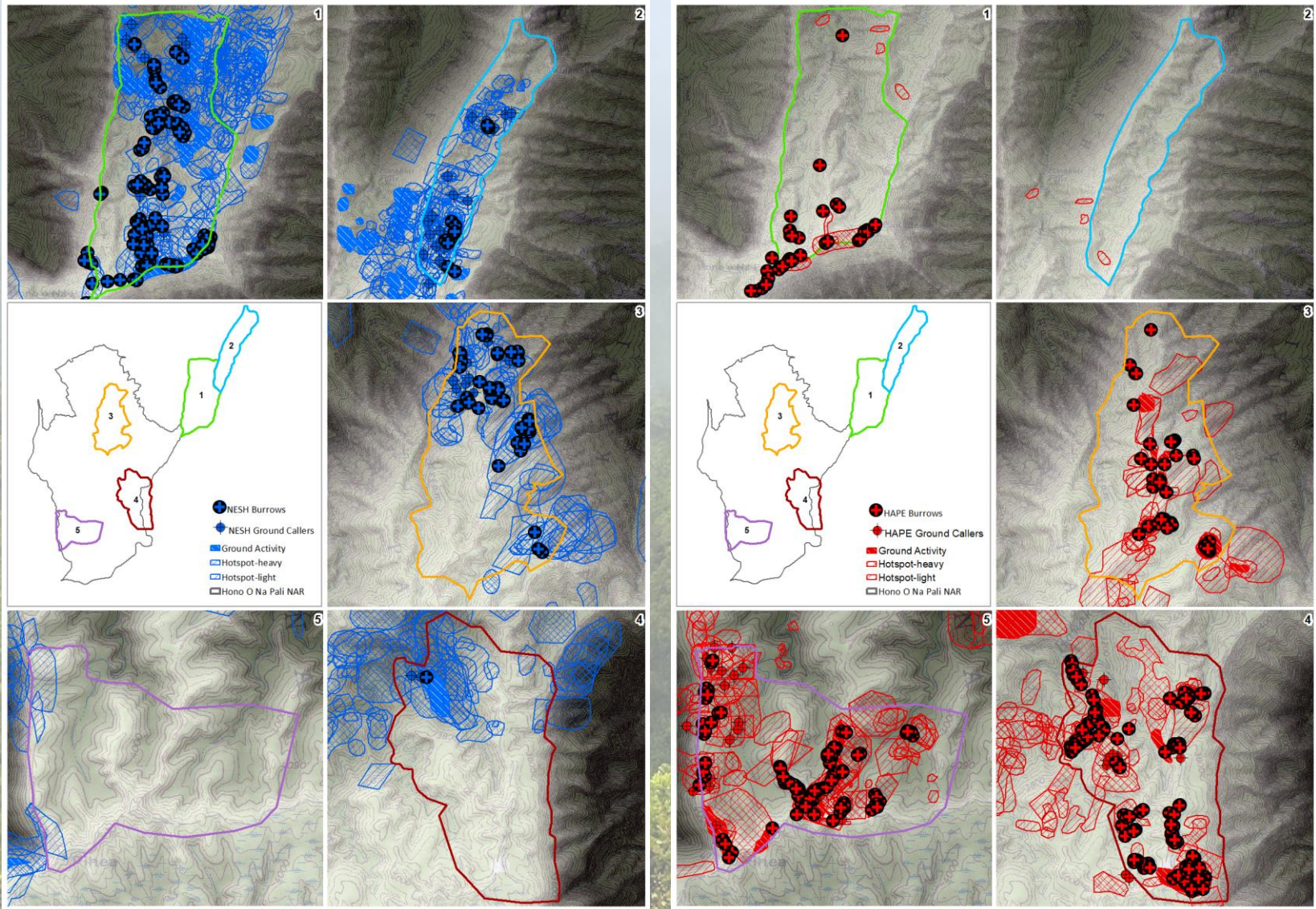


# Colony Management & Monitoring





# Colony Monitoring





# Colony Monitoring



281 burrows



917 burrows

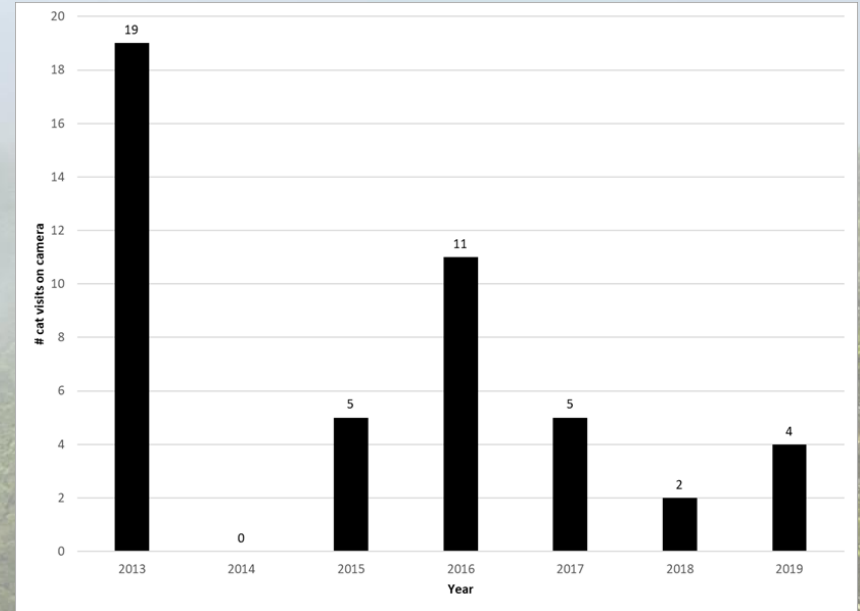
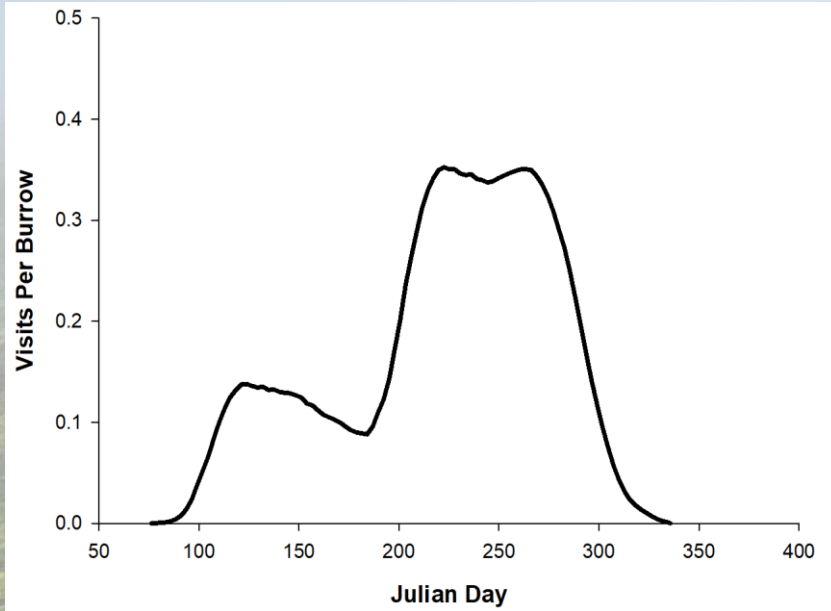


# Colony monitoring – Burrow Cameras



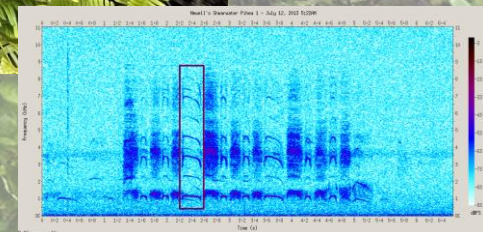


# Colony monitoring – Burrow Cameras



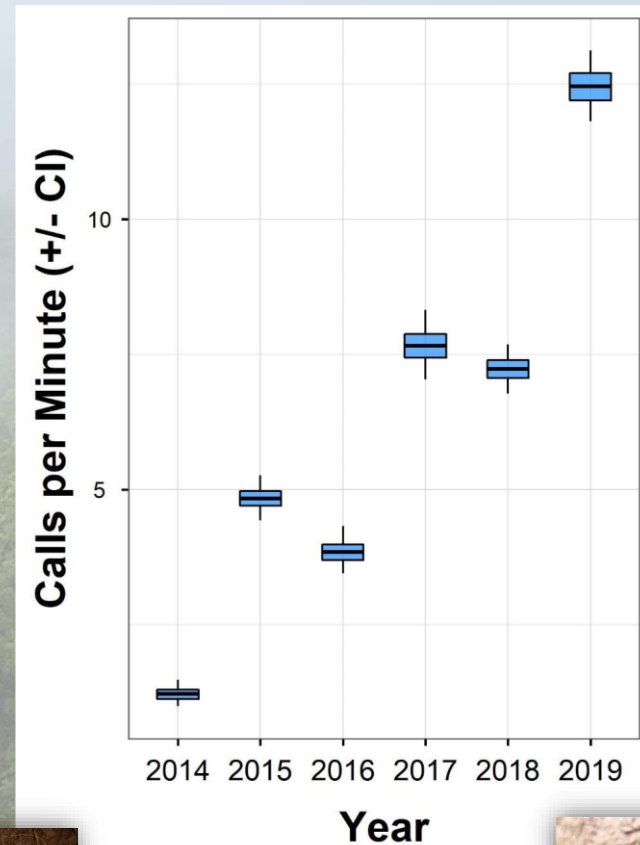
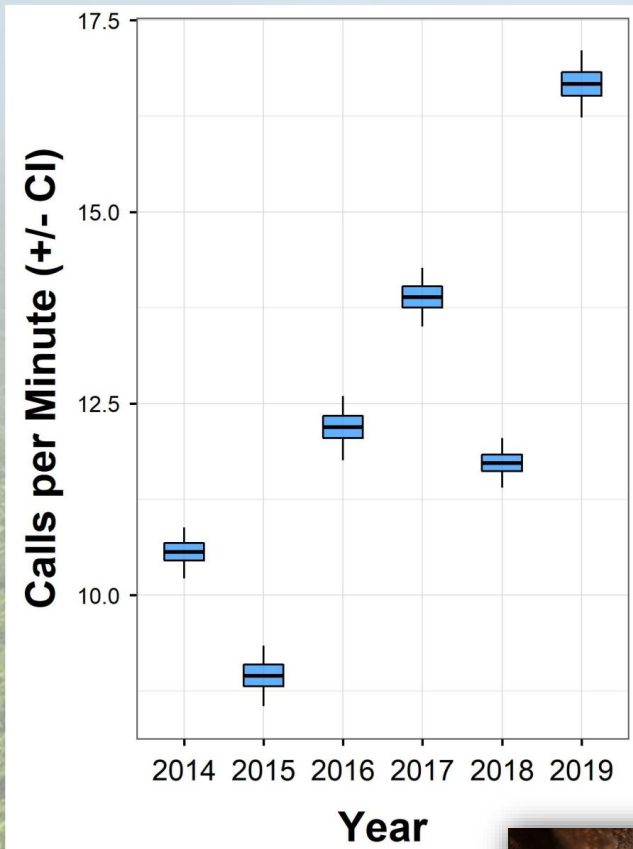


# Colony Monitoring – Song Meters

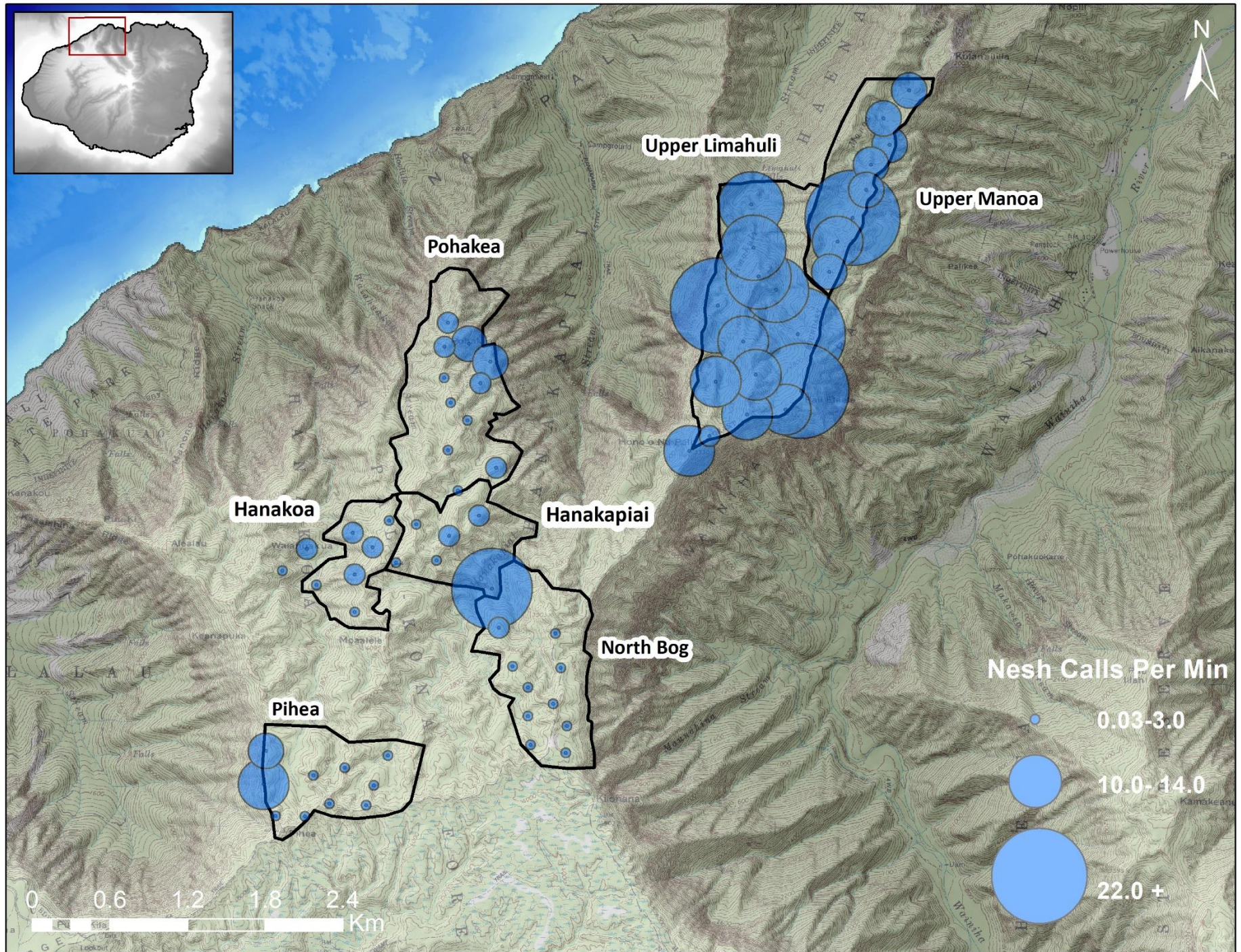




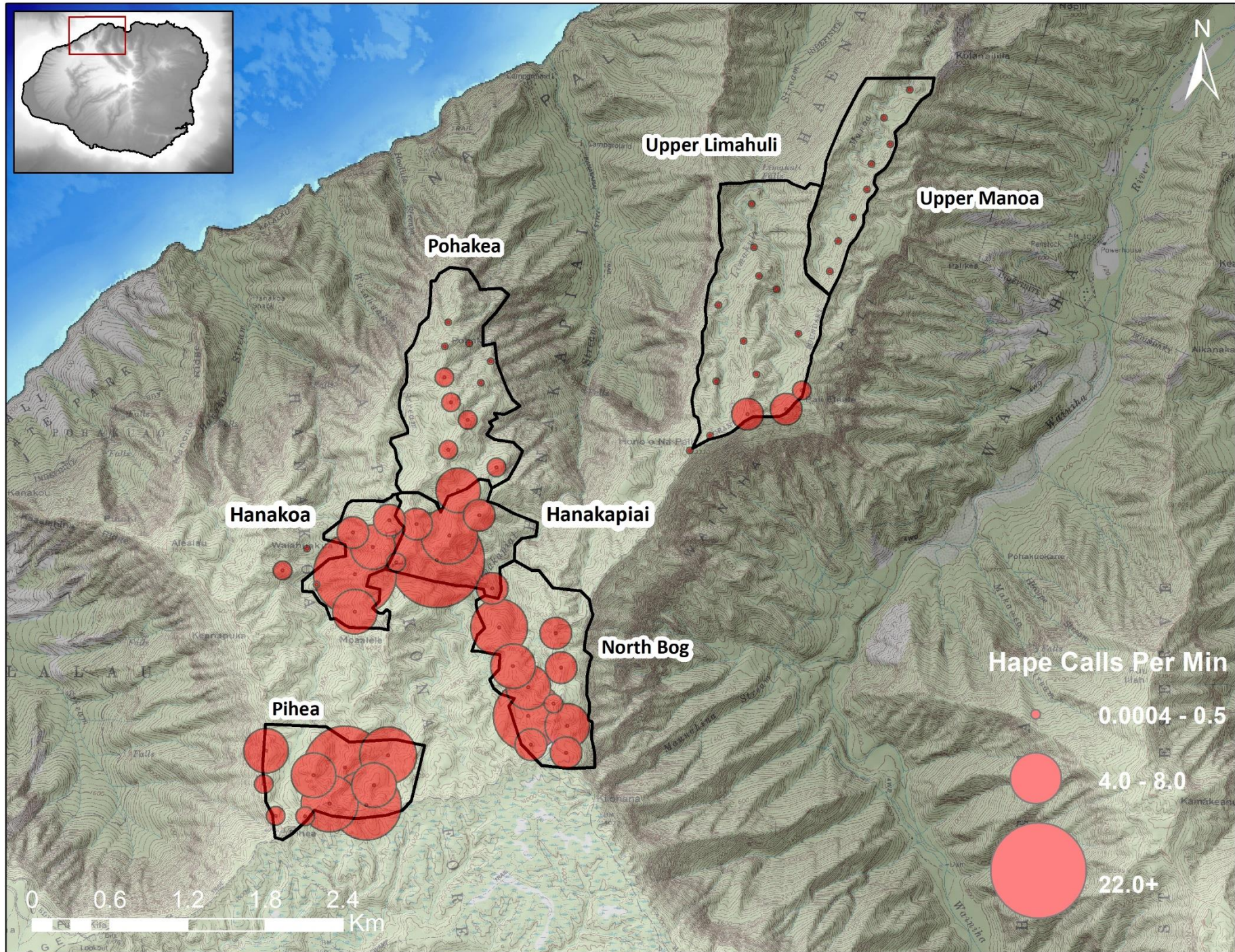
# Colony Monitoring – Song Meters













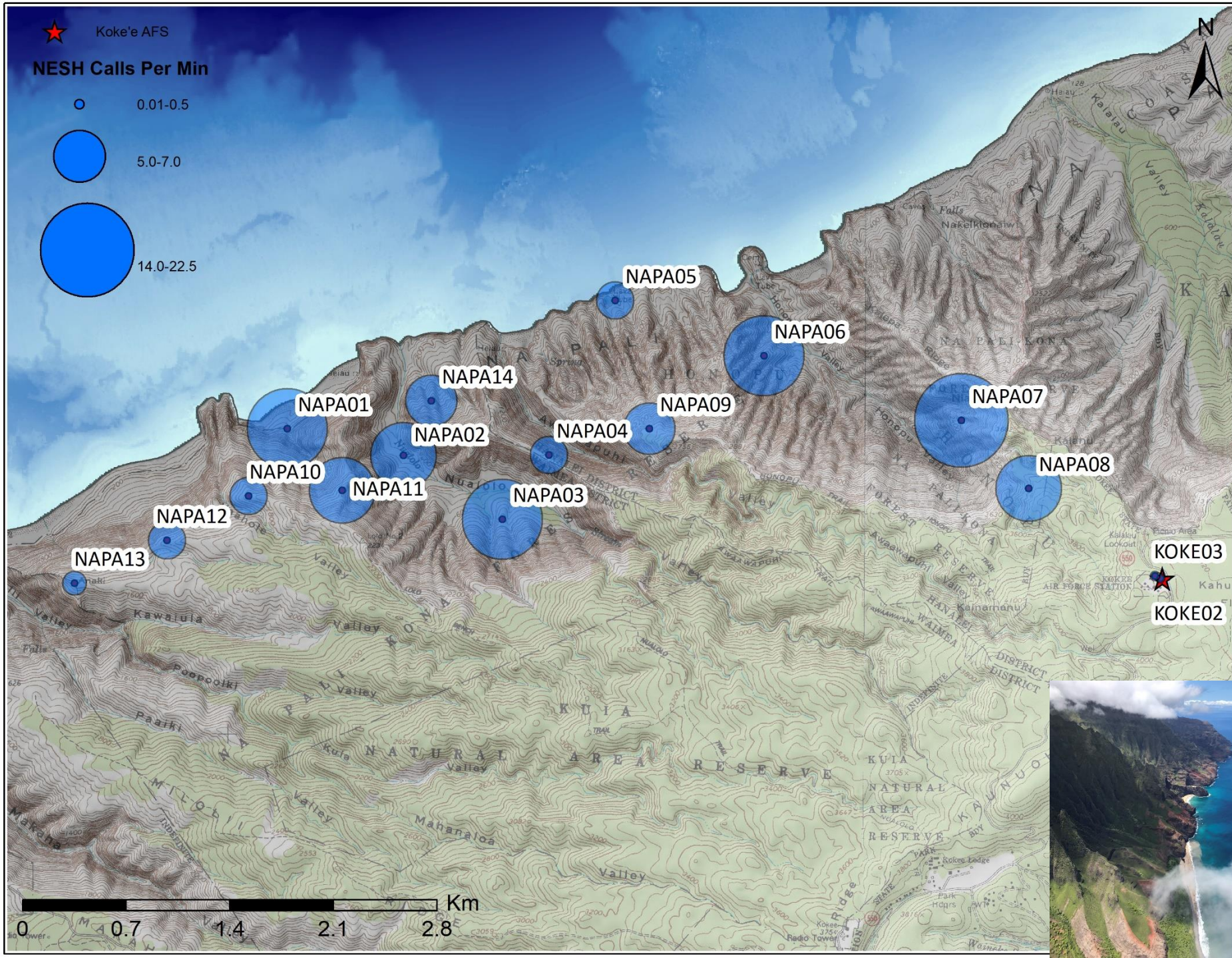
★ Koke'e AFS

### NESH Calls Per Min

○ 0.01-0.5

● 5.0-7.0

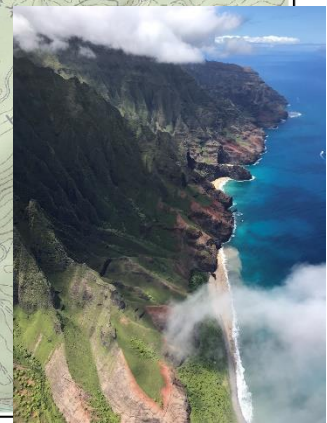
● 14.0-22.5



KOKE03



KOKE02



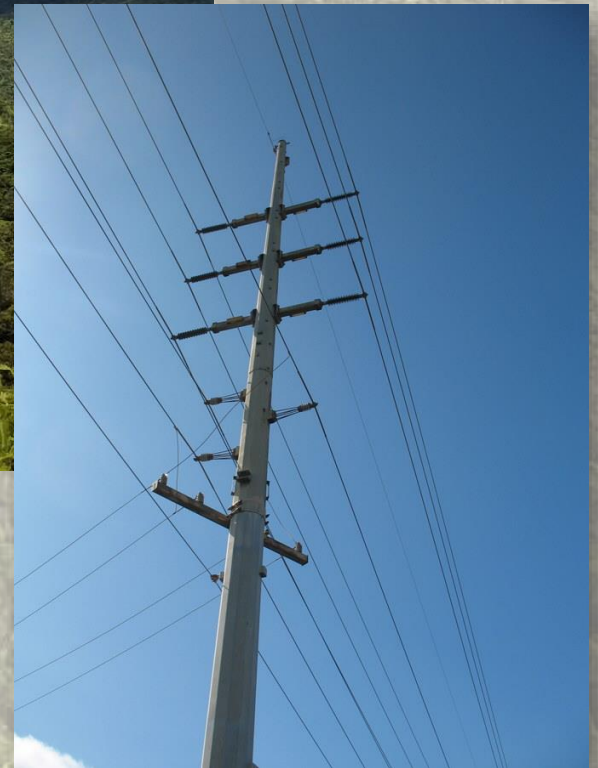


# Threats





# Threats – Powerline Collisions





# Threats – Powerline Collisions



89 grounded birds



# Threats – Powerline Collisions



6,484 hrs of  
observations

121+ collisions









2012





## Grounded Seabirds



## Observed Collisions



1



4

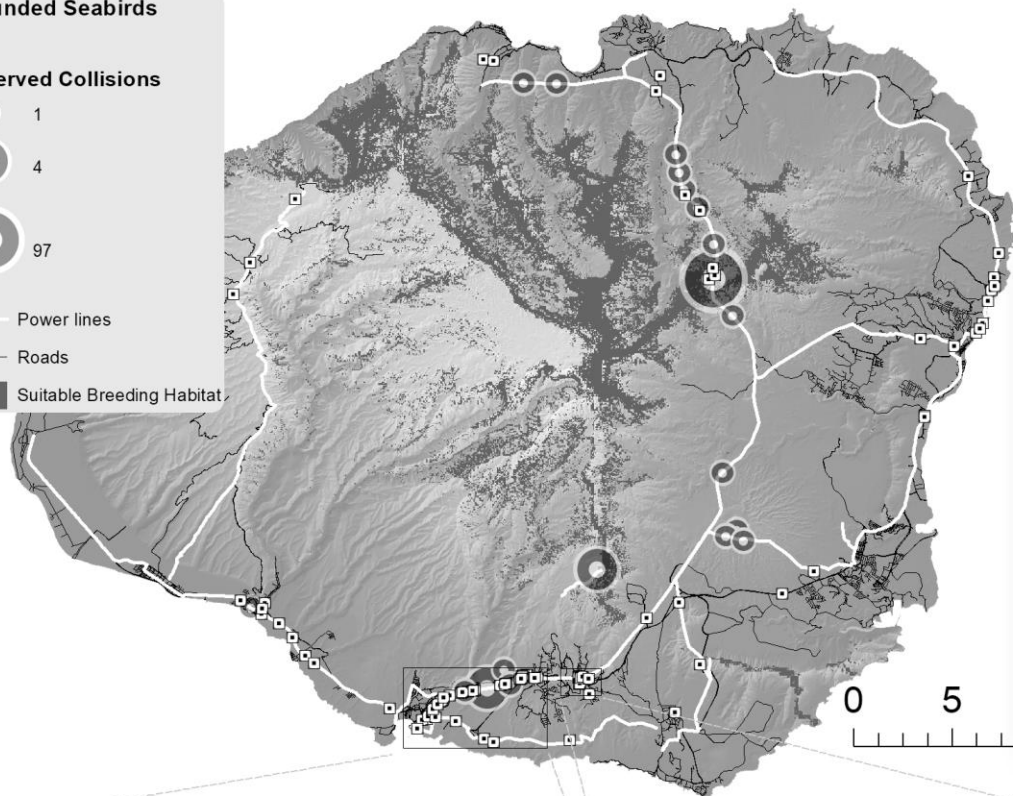


97

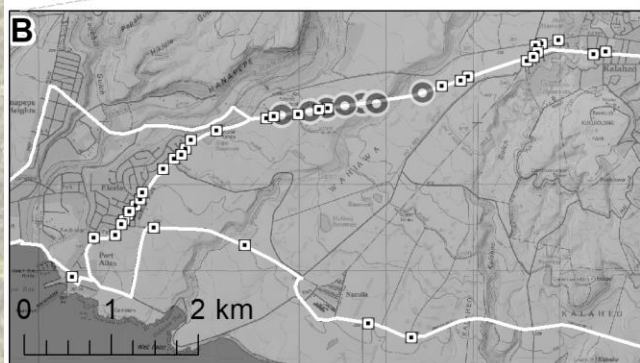
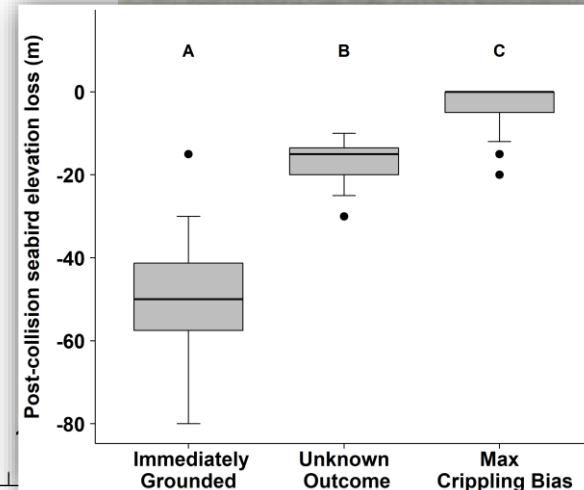
Power lines

Roads

Suitable Breeding Habitat



A



VOLUME 16, ISSUE 1, ARTICLE 15

Travers, M. S., S. Driskill, A. Stemen, T. Geelhoed, D. Golden, S. Koike, A. A. Shipley, H. Moon, T. Anderson, M. Bache, and A. F. Raine. 2021. Post-collision impacts, crippling bias, and environmental bias in a study of Newell's Shearwater and Hawaiian Petrel powerline collisions. *Avian Conservation and Ecology* 16(1):1-15. <https://doi.org/10.5755/ACE-01841-160115>

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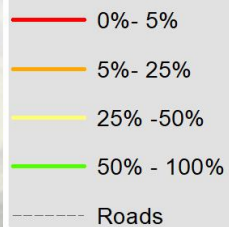
Research Paper

## Post-collision impacts, crippling bias, and environmental bias in a study of Newell's Shearwater and Hawaiian Petrel powerline collisions

Marc S. Travers<sup>1</sup>, Scott Driskill<sup>1</sup>, Angela Stemen<sup>2,3</sup>, Theresa Geelhoed<sup>2,3</sup>, David M. Golden<sup>2,3</sup>, Shiko Koike<sup>2,3</sup>, Amy A. Shipley<sup>2,3,4</sup>, Hannah E. Moon<sup>5</sup>, Tracy Anderson<sup>1,6</sup>, Molly Bache<sup>1,6</sup> and Andre F. Raine<sup>1</sup>  
<sup>1</sup>Archipelago Research and Conservation, <sup>2</sup>Kauai Endangered Seabird Recovery Project, Pacific Cooperative Studies Unit, University of Hawaii, <sup>3</sup>State of Hawaii Division of Forest and Wildlife, <sup>4</sup>University of Wisconsin-Madison, <sup>5</sup>Department of Biology, University of Hawaii at Manoa, Honolulu, HI, <sup>6</sup>Save Our Shearwaters, Kauai Humane Society



**Percent Searchable Area**



North

PL Trail

Waimea Canyon

Central

Kahili

East

West

0 2.5 5 10 km

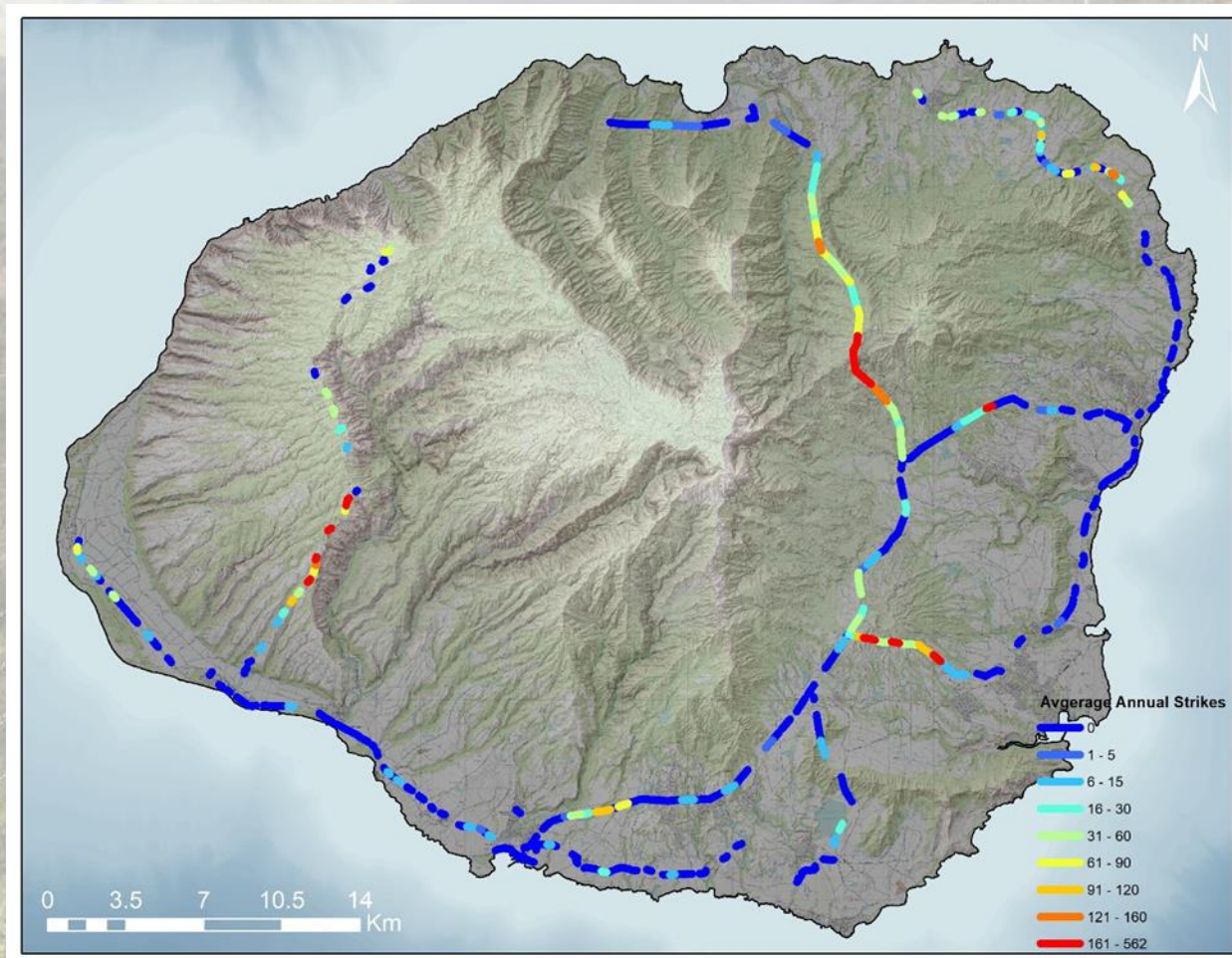
216km powerlines  
Nightly bird passage across island - Apr-Dec







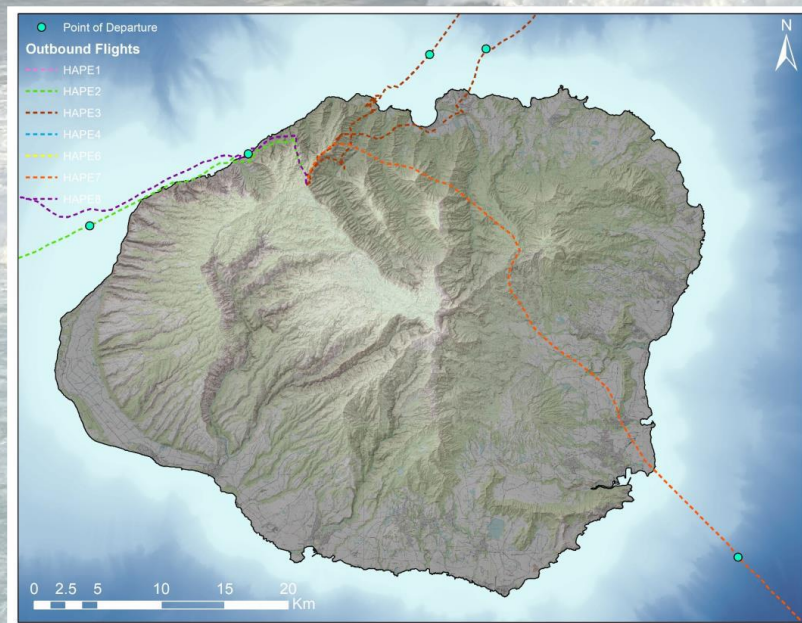
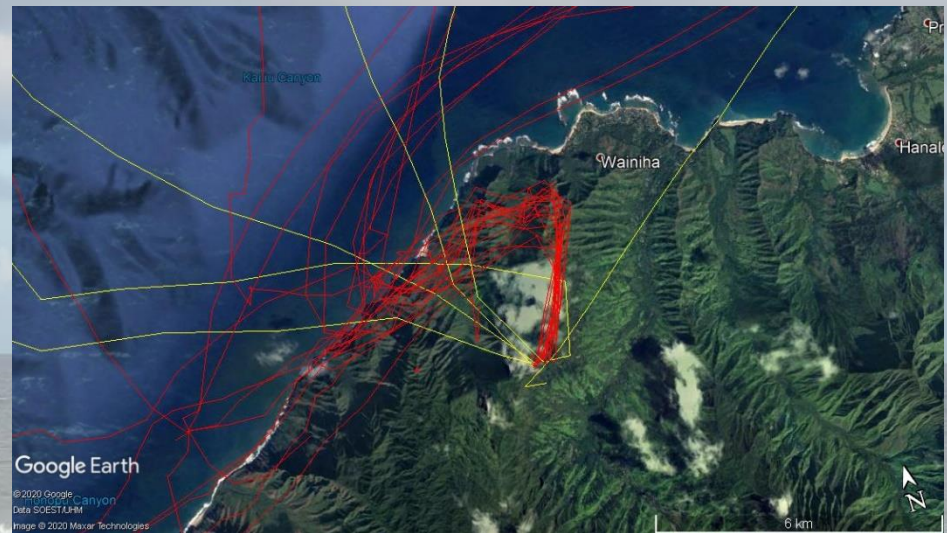




13,668 collisions annually  
13% immediate grounding

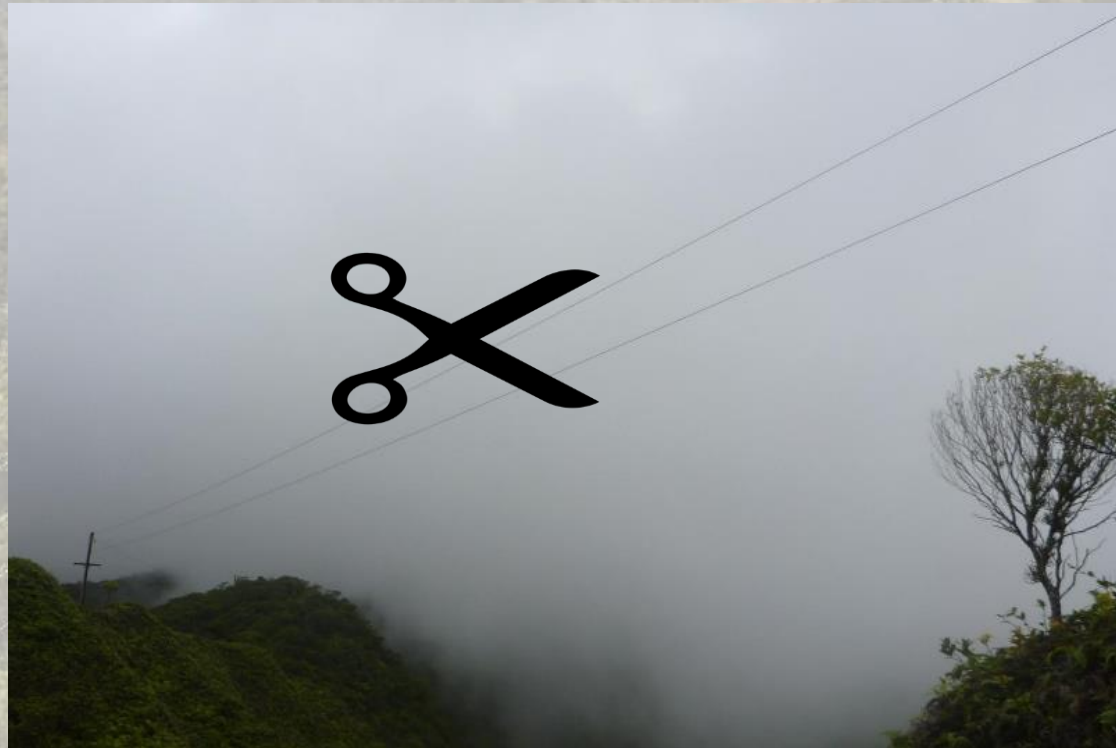


# Colony flyways in relation to powerlines



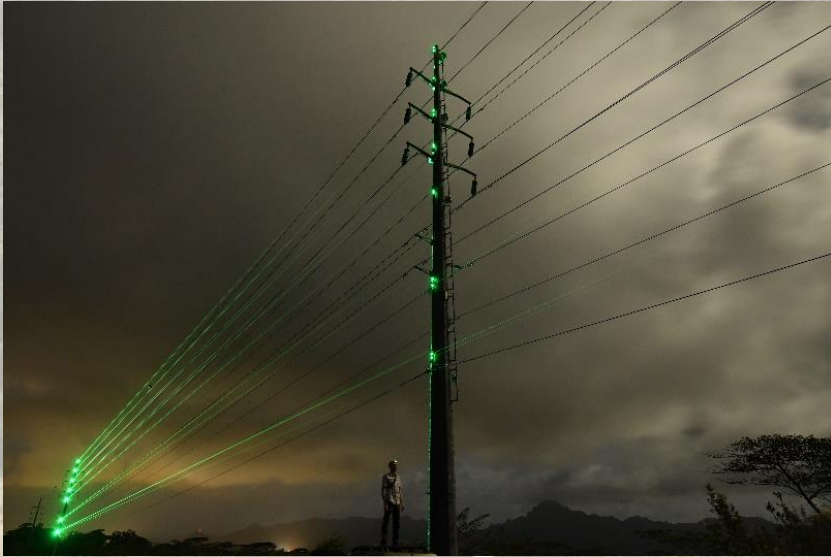


# Solutions – Powerline Modifications





# Solutions – Increase visibility



e.g. South Africa  
Blue Crane *Anthropoides paradiseus*  
Highly effective at reducing collisions



# Major Threats – Light Attraction (fledglings)



Kauai

1979-2019

- Newell's Shearwater  
31,812  
96% fledglings
- Hawaiian Petrels  
Small #s each year  
Less affected by light  
pollution

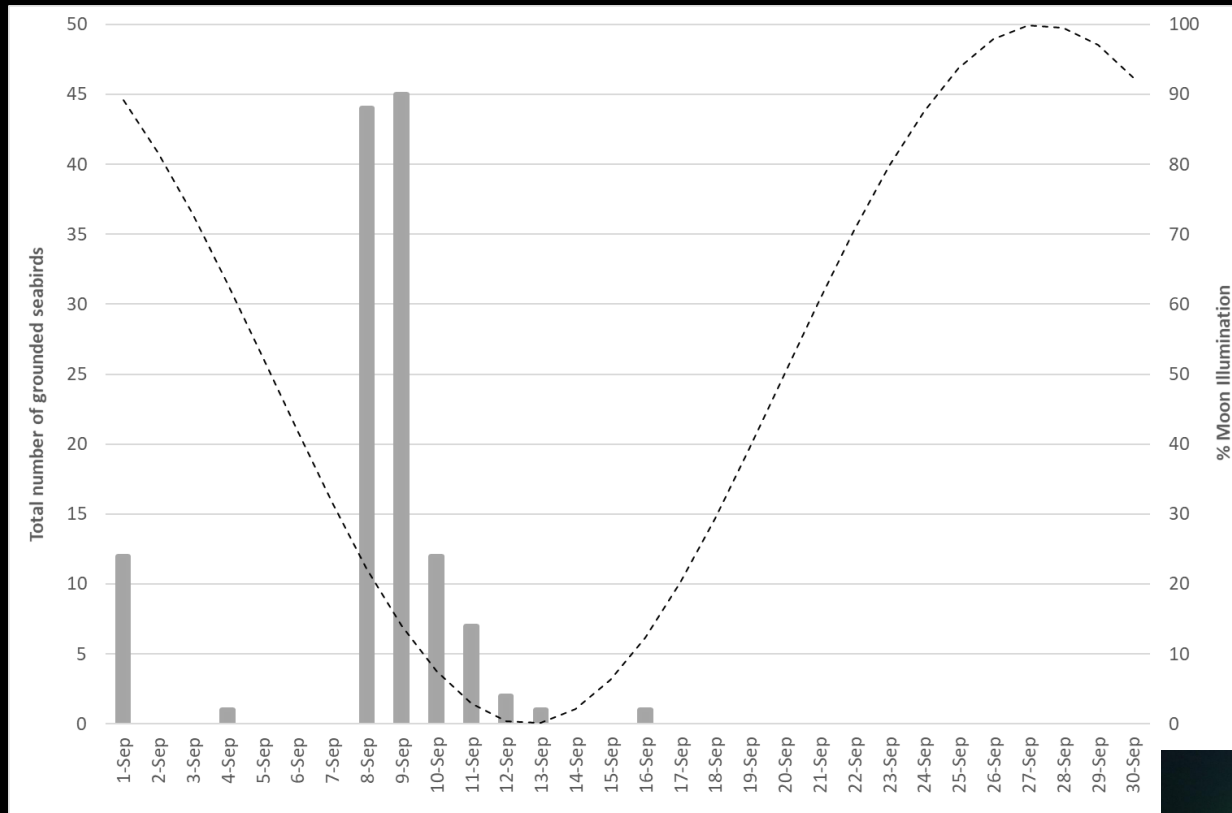


# Major Threats – Light Attraction (adults)





# Major Threats – Light Attraction (adults)



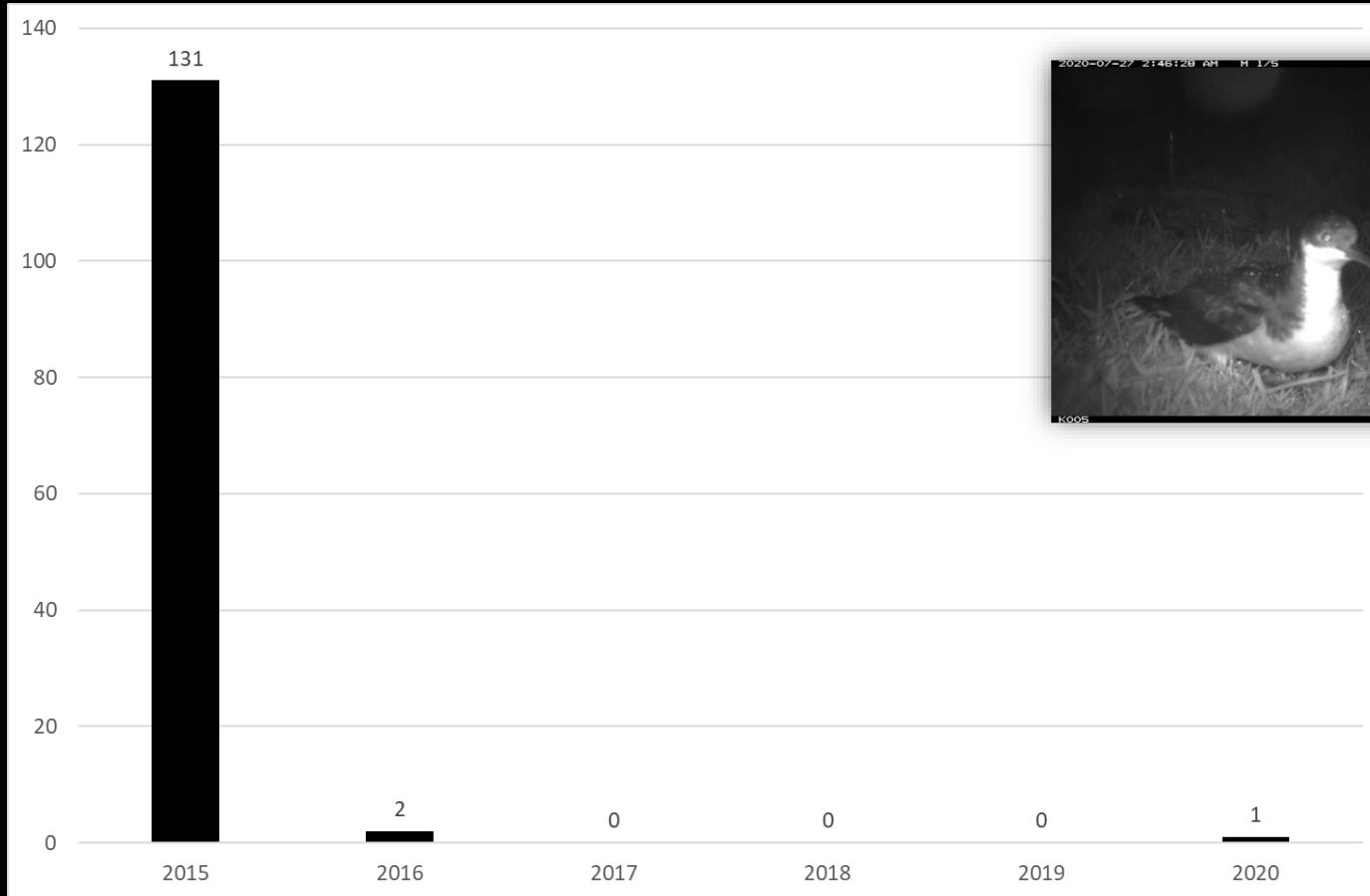


# Solutions – Reduce





# Solutions – Reduce





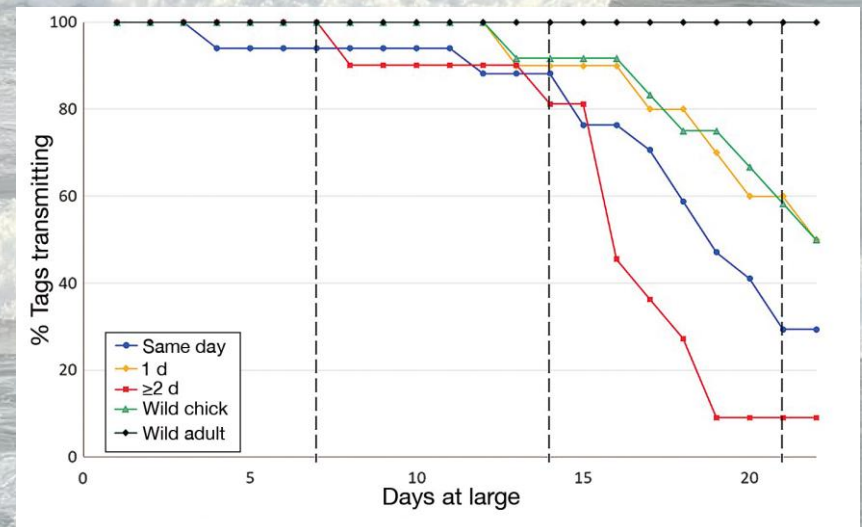
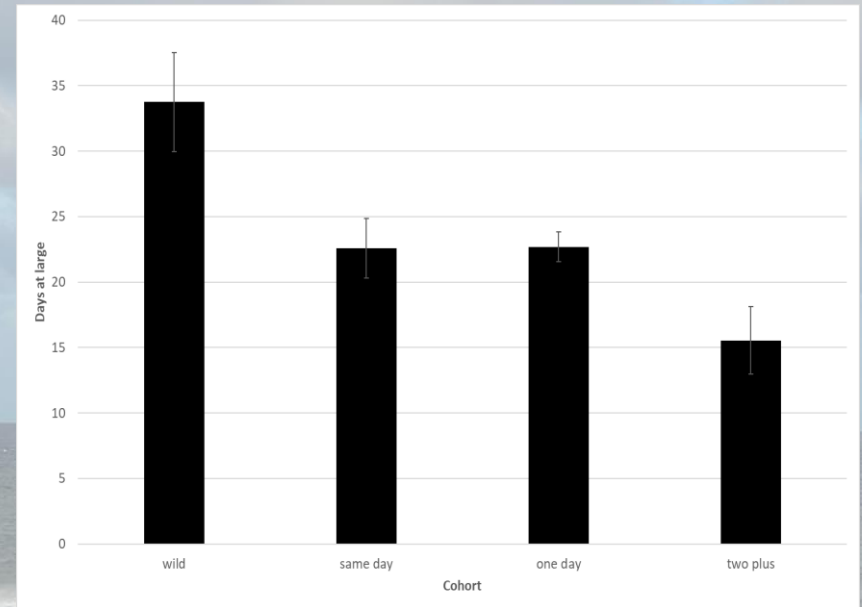




# Solutions – Rescue







Vol. 43: 39–50, 2020 <a href="https://doi.org/10.3354/esr01051">https://doi.org/10.3354/esr01051</a>	ENDANGERED SPECIES RESEARCH Endang Species Res	Published September 3
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### Post-release survival of fallout Newell's shearwater fledglings from a rescue and rehabilitation program on Kaua'i, Hawai'i

André F. Raine<sup>1,\*</sup>, Tracy Anderson<sup>2</sup>, Megan Vynne<sup>1</sup>, Scott Driskill<sup>1</sup>, Helen Raine<sup>3</sup>, Josh Adams<sup>4</sup>



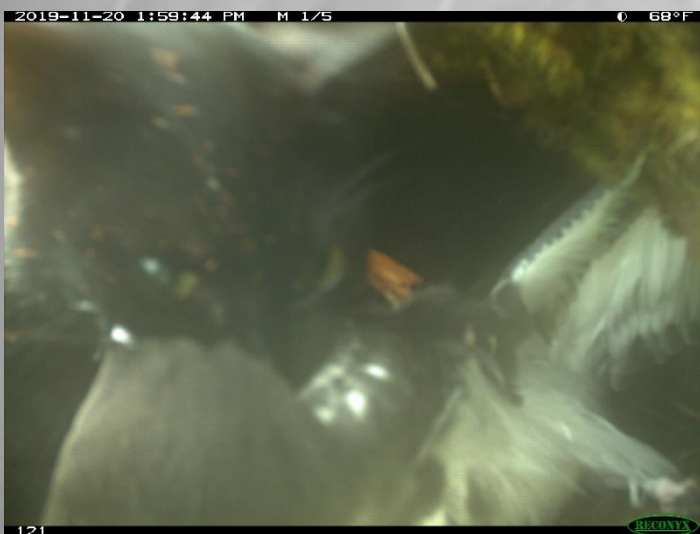
## Threats – Introduced Predators













# Solutions - Predator Control



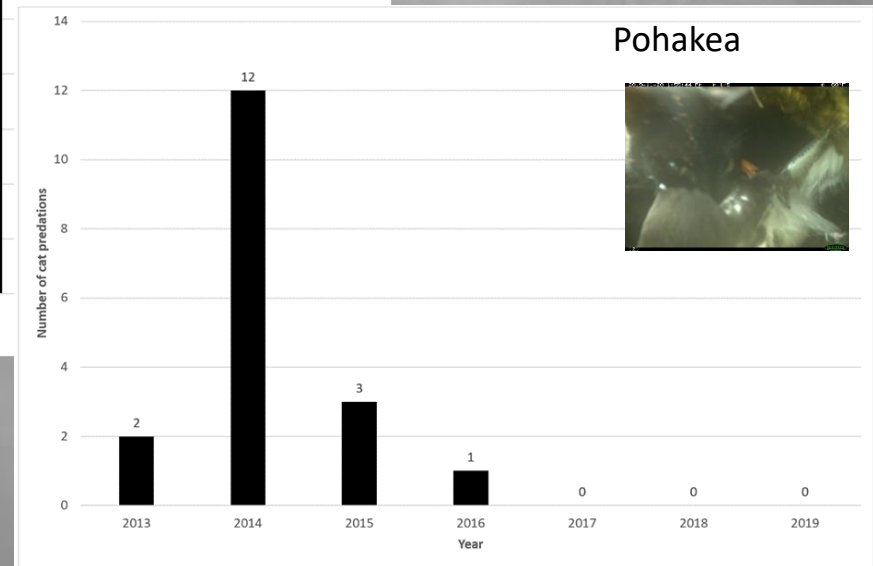
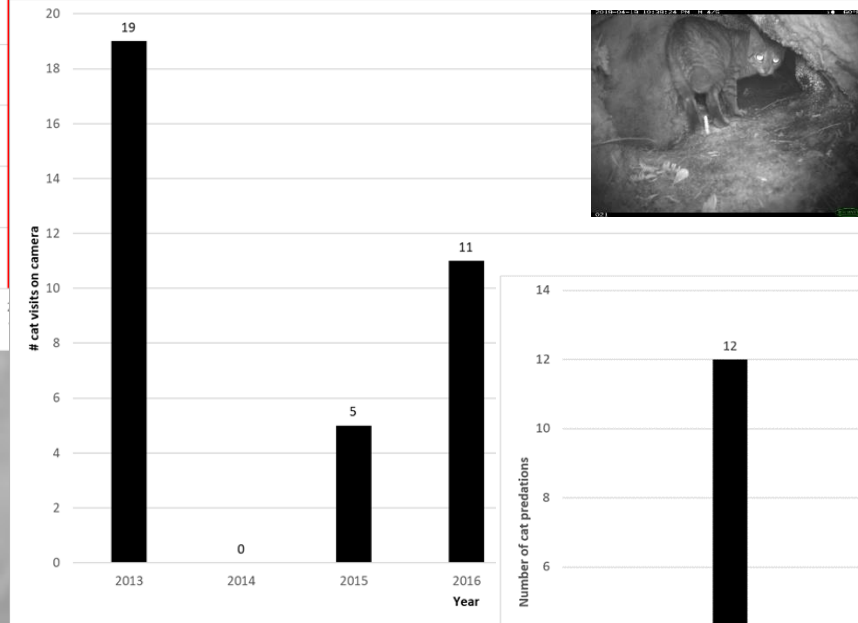
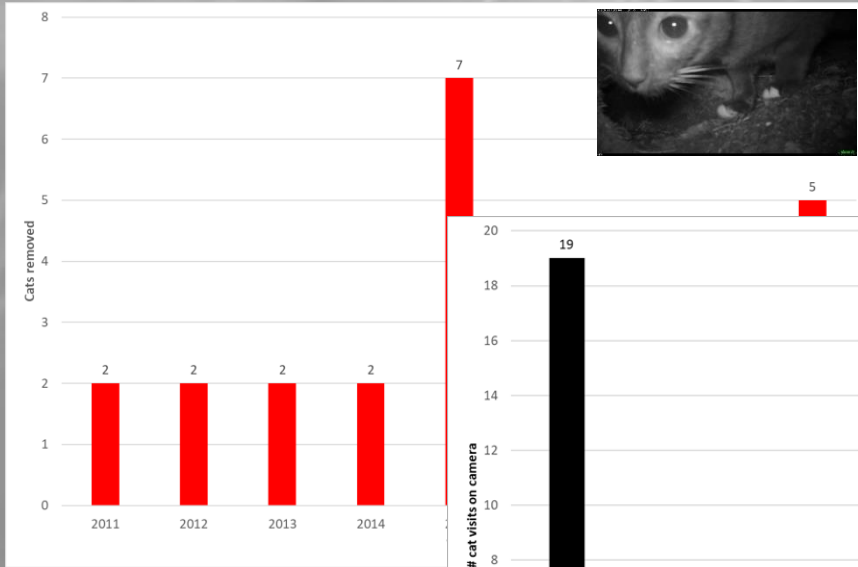


# Solutions - Predator Control



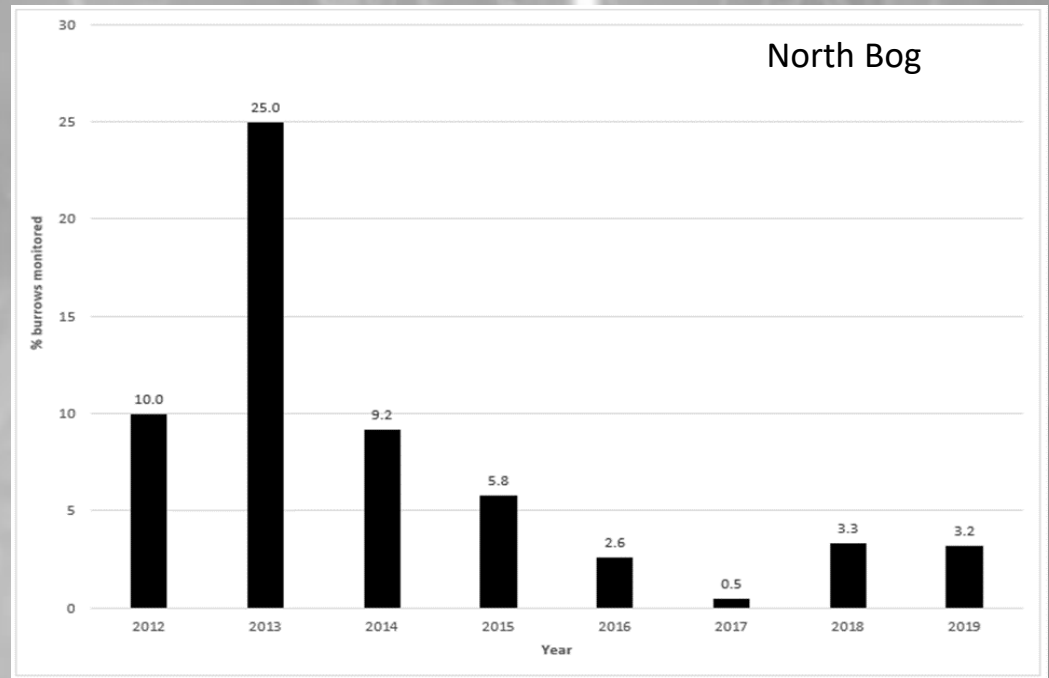
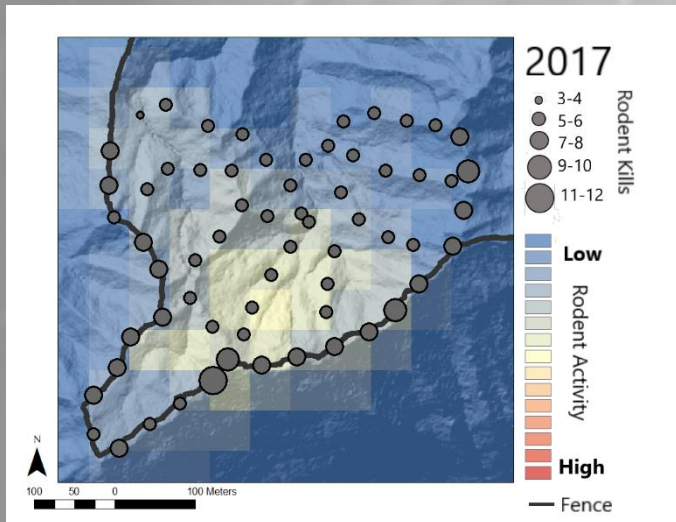
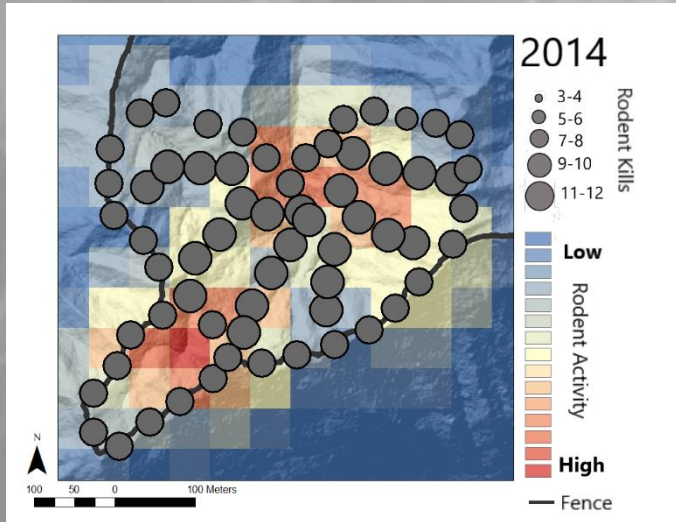


# Results : Cats



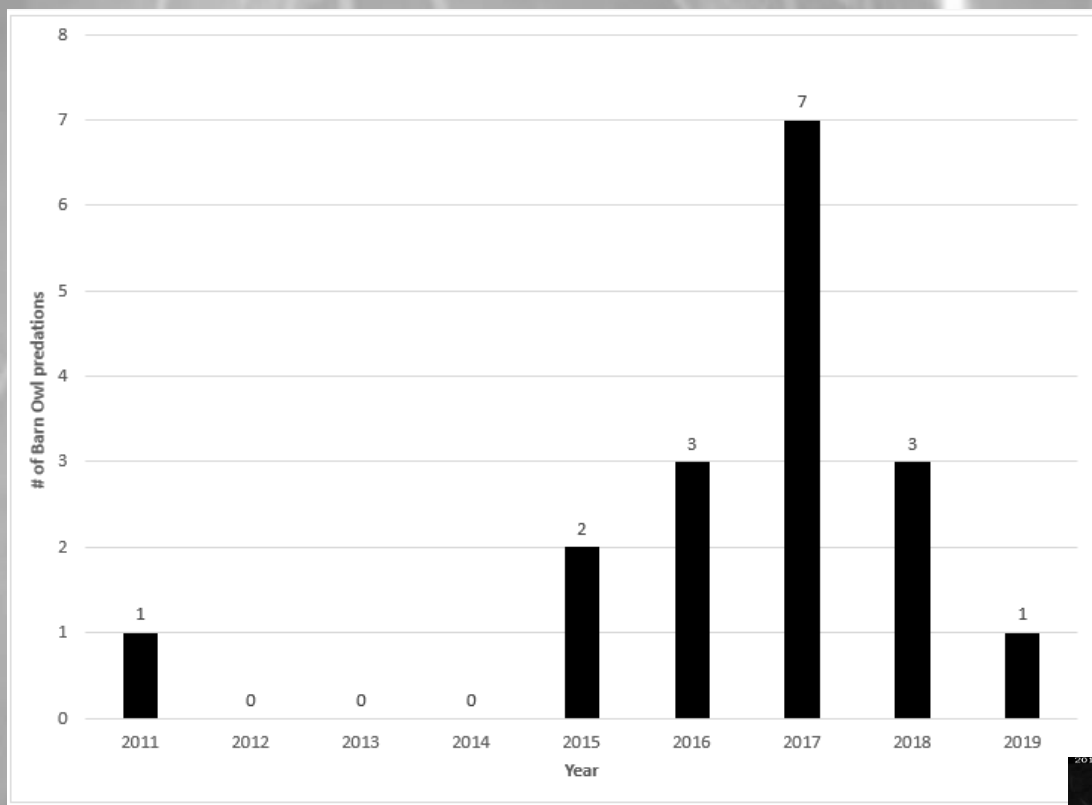


# Results : Rats



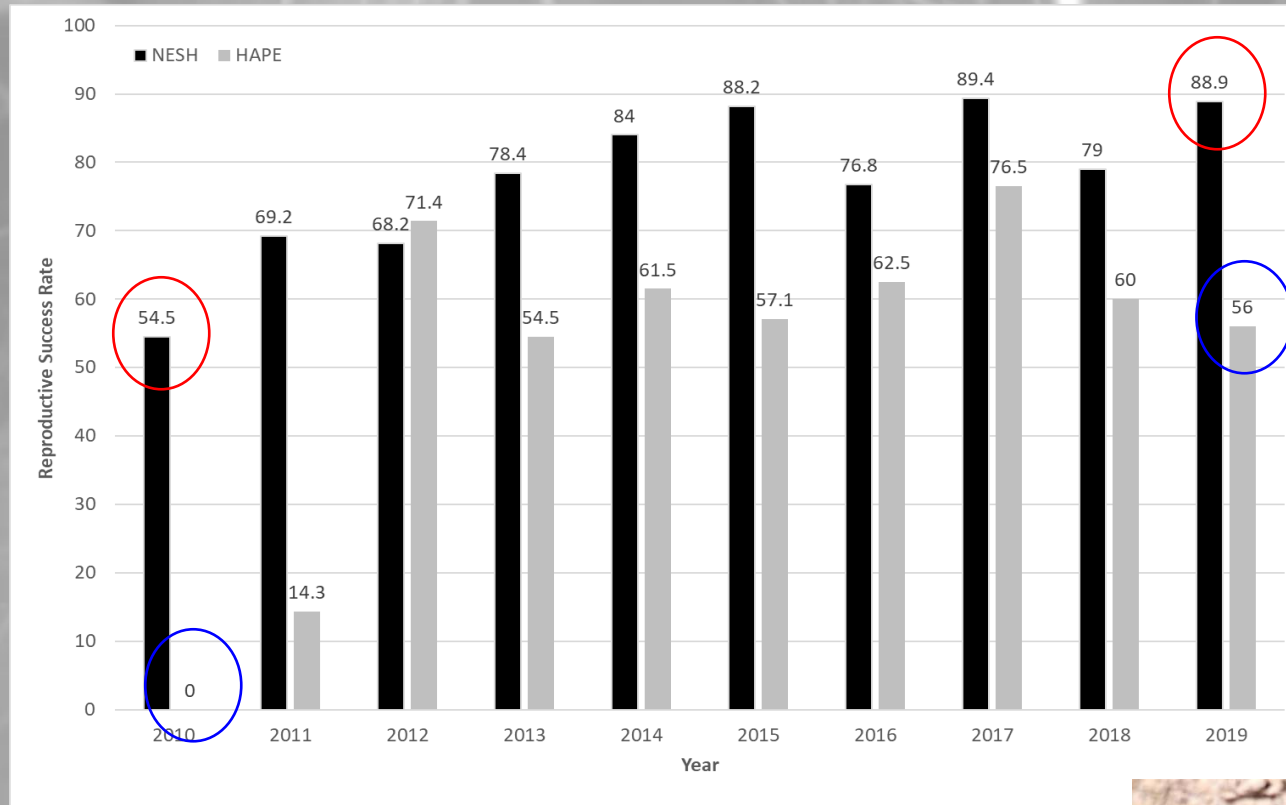


# Results : Barn Owl depredations





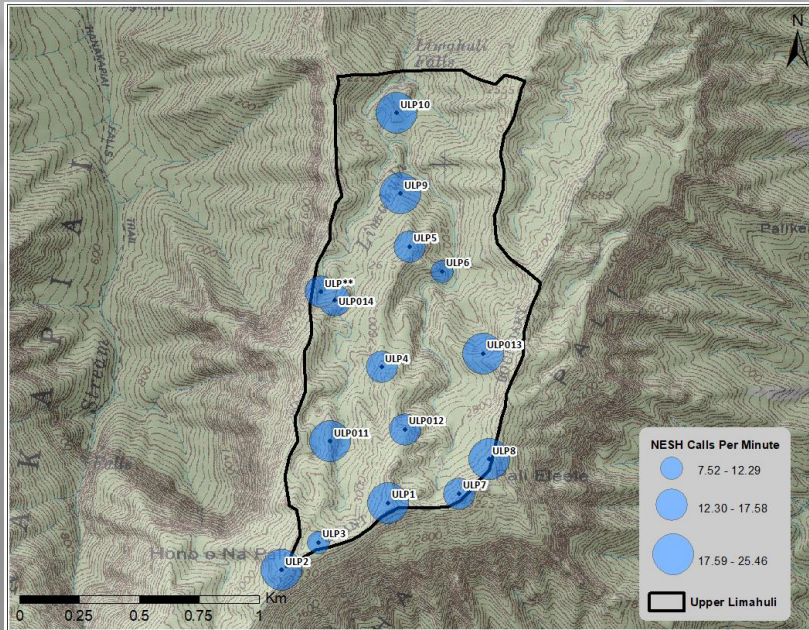
# Results : Reproductive Success Rates



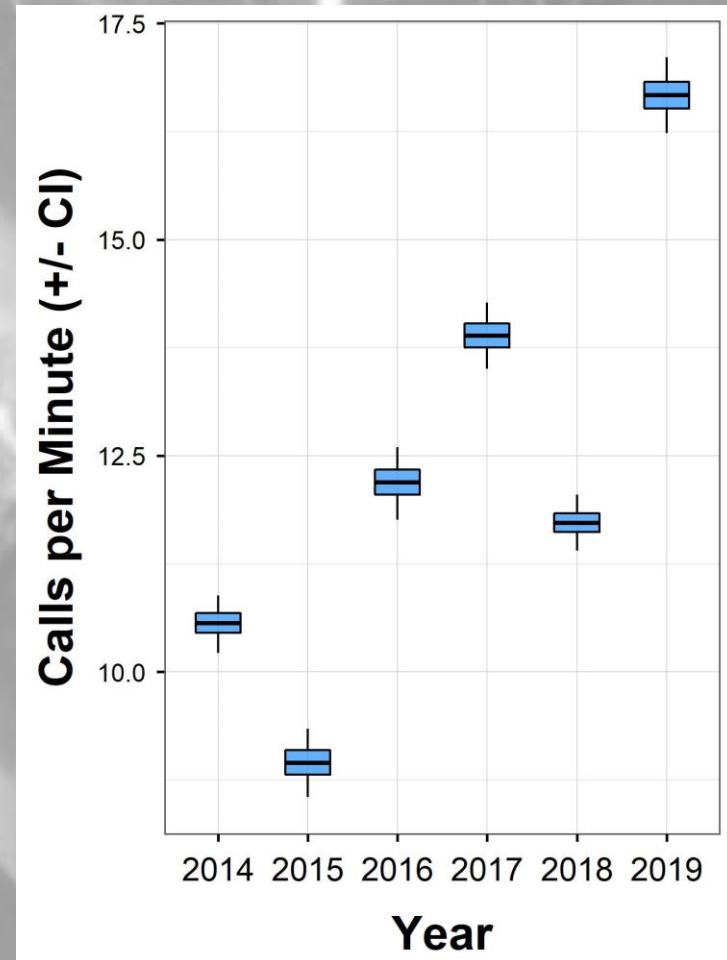
Andre Raine, KFSRP



# Results : Call Rates

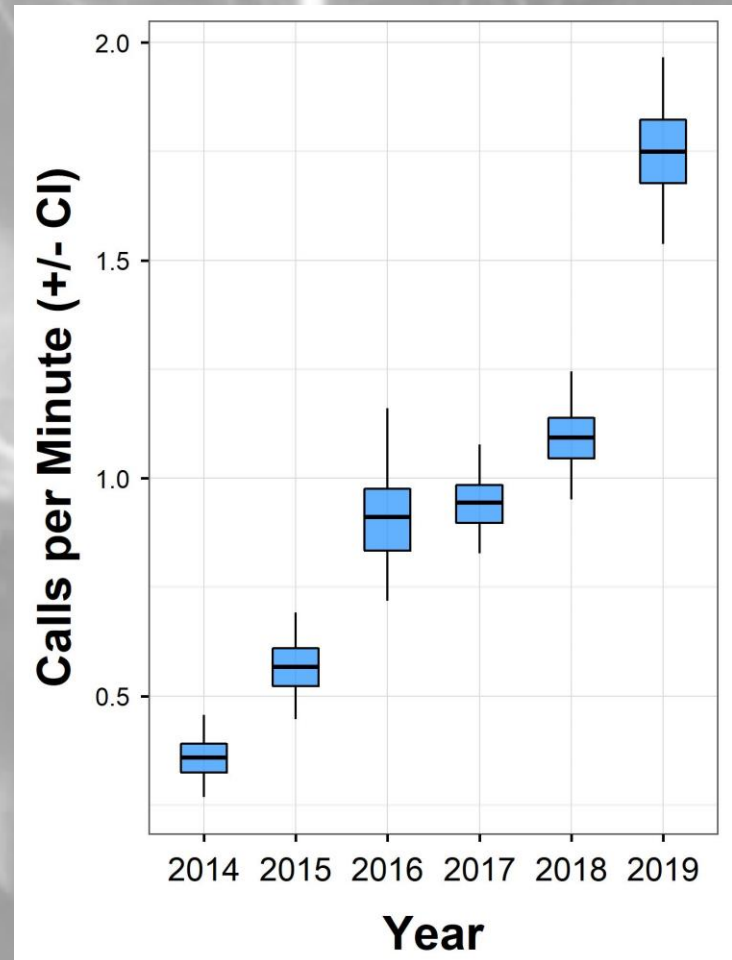
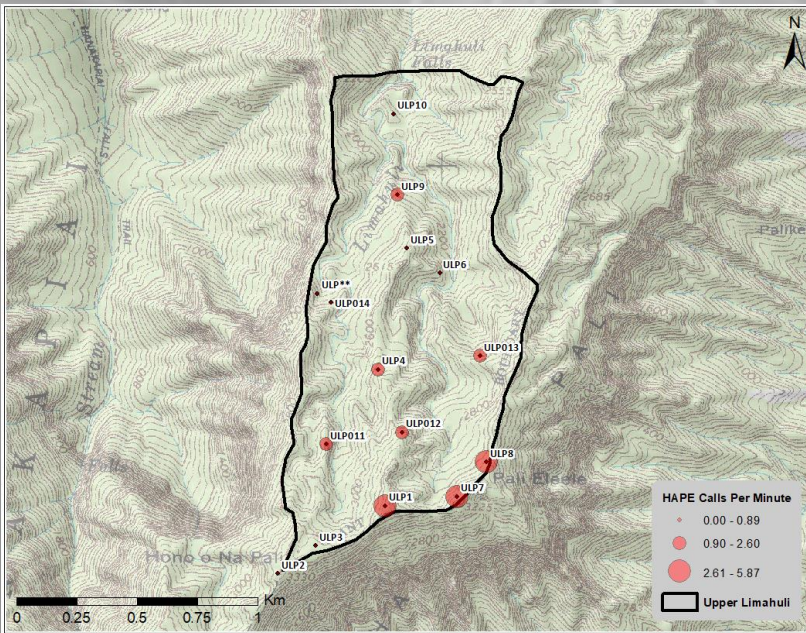


Call rates positively related to # of burrows;  
Measure of overall colony size



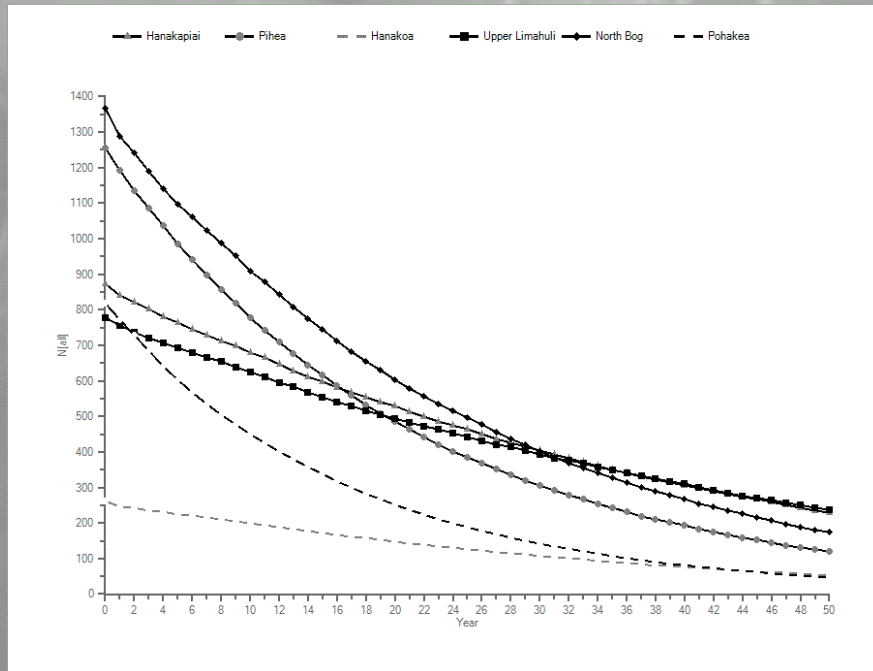


## Results : Call Rates

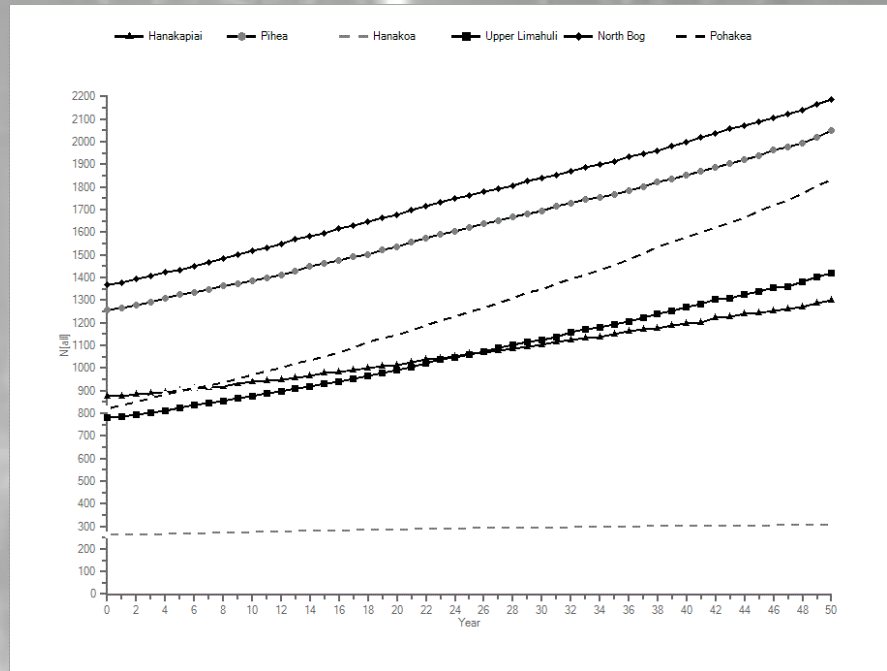




# Population Simulation Models (Vortex)



Inputs = first year; limited predator control



Inputs = current year; full predator control

The Journal of Wildlife Management 84(3):425–435; 2020; DOI: 10.1002/jwmg.21824

## Research Article

### Managing the Effects of Introduced Predators on Hawaiian Endangered Seabirds

ANDRÉ F. RAINE,<sup>1</sup> *Kaua'i Endangered Seabird Recovery Project (KESRP), P.O. Box 81, Hanalei, Kaua'i, HI 96716, USA*  
 SCOTT DRISKILL,<sup>1</sup> *Kaua'i Endangered Seabird Recovery Project (KESRP), P.O. Box 81, Hanalei, Kaua'i, HI 96716, USA*  
 MEGAN VYNNE,<sup>1</sup> *Kaua'i Endangered Seabird Recovery Project (KESRP), P.O. Box 81, Hanalei, Kaua'i, HI 96716, USA*  
 DEREK HARVEY,<sup>1</sup> *Kaua'i Endangered Seabird Recovery Project (KESRP), P.O. Box 81, Hanalei, Kaua'i, HI 96716, USA*  
 KYLE PIAS,<sup>1</sup> *Hallus Ecosystem Restoration, Lihue, Kaua'i, HI 96766, USA*



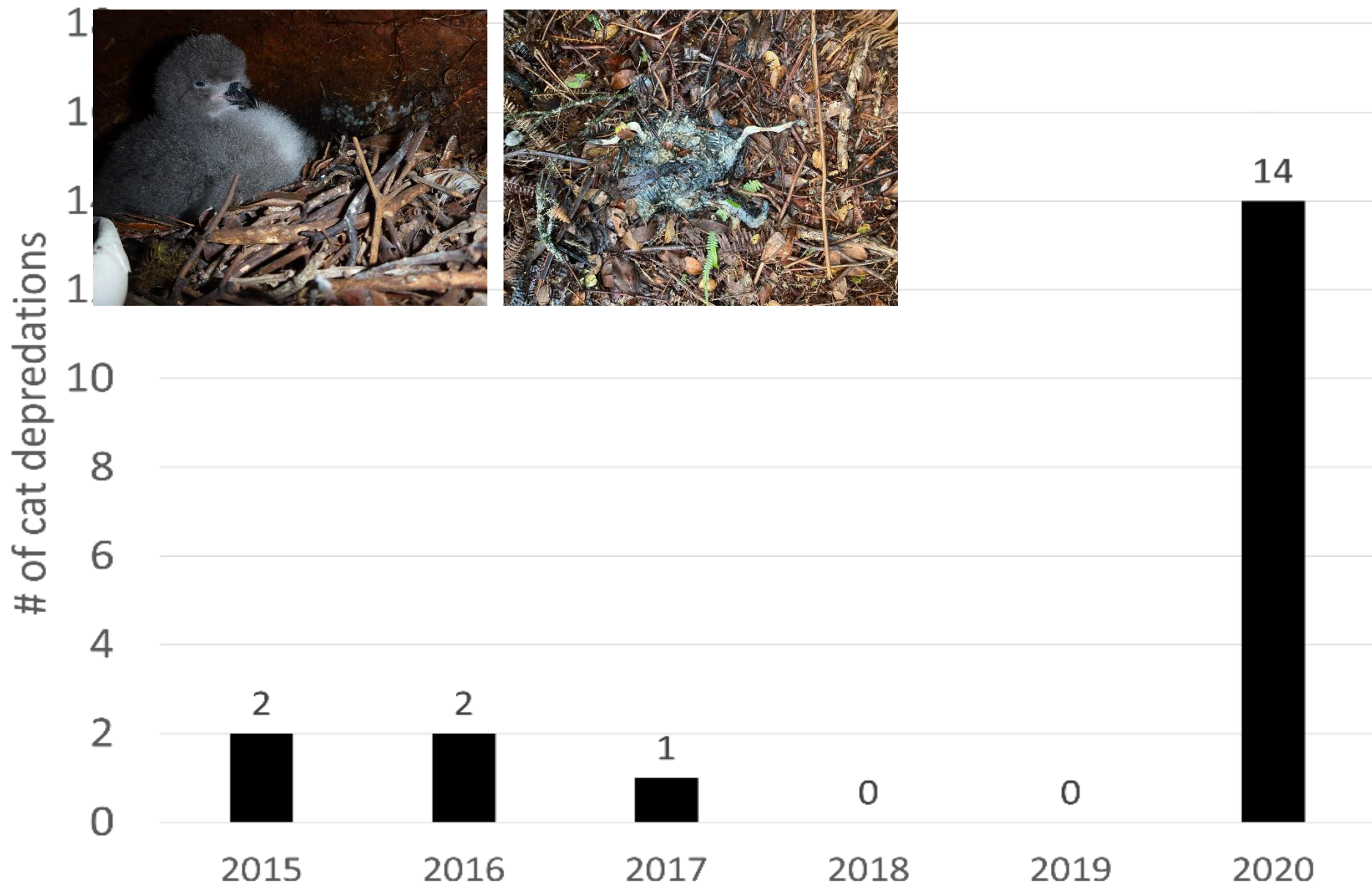


July 2020 – Hanakāpī'ai – at least 14 Hawaiian Petrel chicks killed by cat in three days.....





July 26<sup>th</sup> 2020 – Hanakāpīʻai – at least 14 Hawaiian Petrel chicks killed by cat in three days.....







# Predator Proof Fences & Social Attraction







# Upper Limahuli Preserve – NTBG



Planned – replace  
existing ungulate fence





# Upper Manoa Valley – private property



Planned – initial artificial nest boxes in place & restoration



# Pohakea – Hono o Na Pali NAR



Fence construction occurring





# Honopu



Fence construction occurring  
Artificial nest boxes in place





# Translocation



Nihoku – started translocation in 2015

110 Hawaiian Petrels (96.0% fledged)

85 Newell's Shearwaters (100.0% fledged)

Hawaiian Petrels started returning in 2020!

<https://www.nihoku.org/>









# Threats - Introduced plants

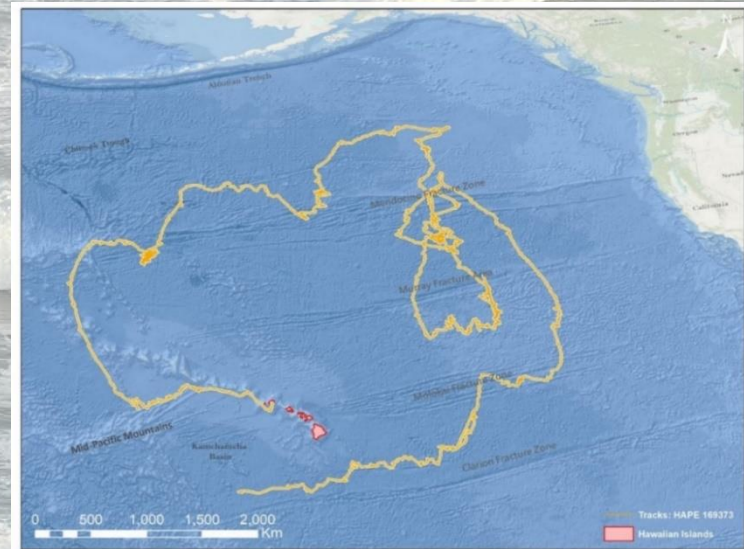
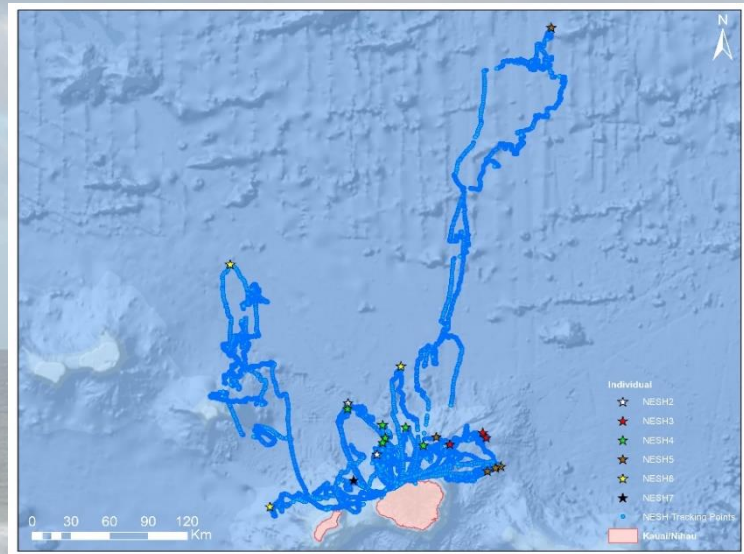
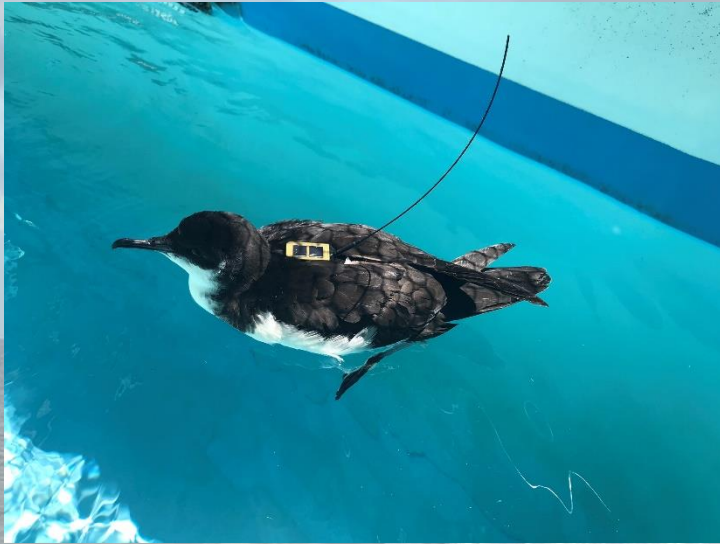






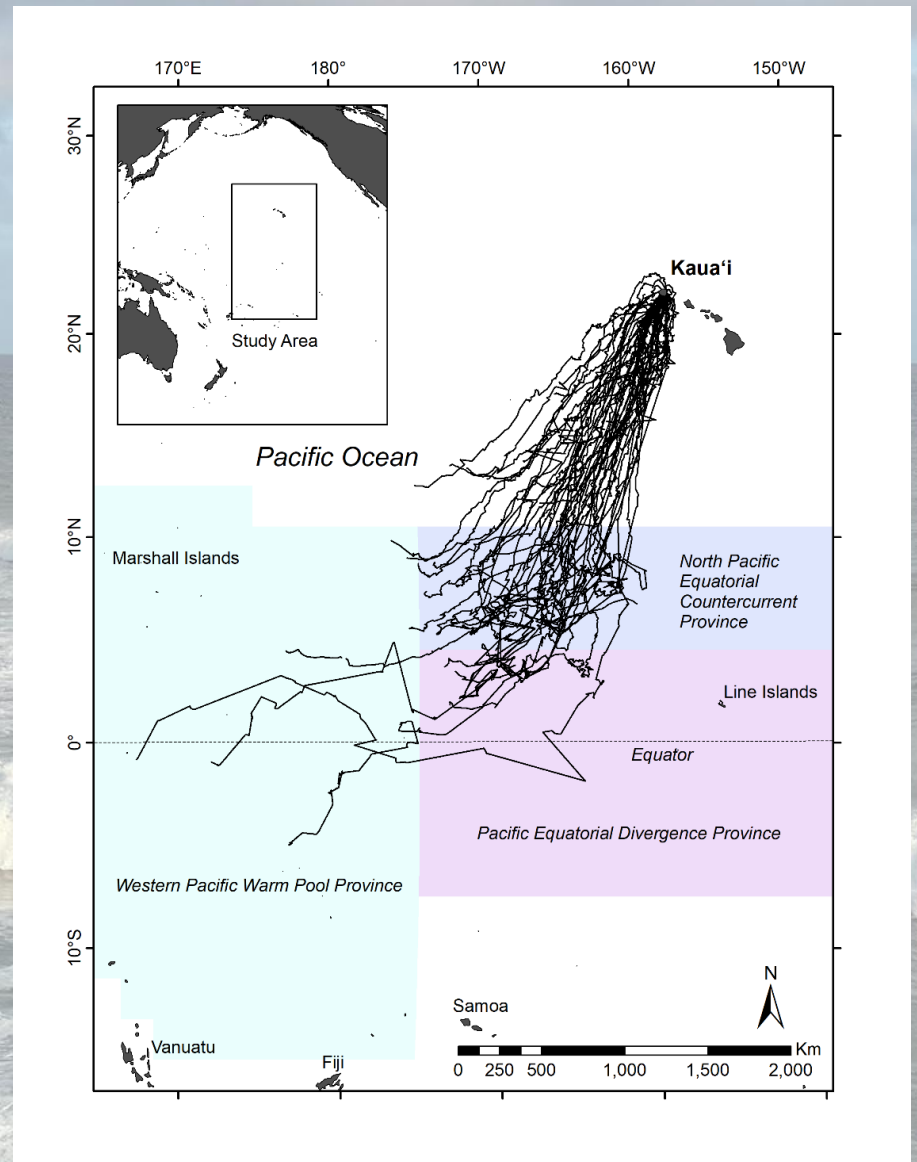
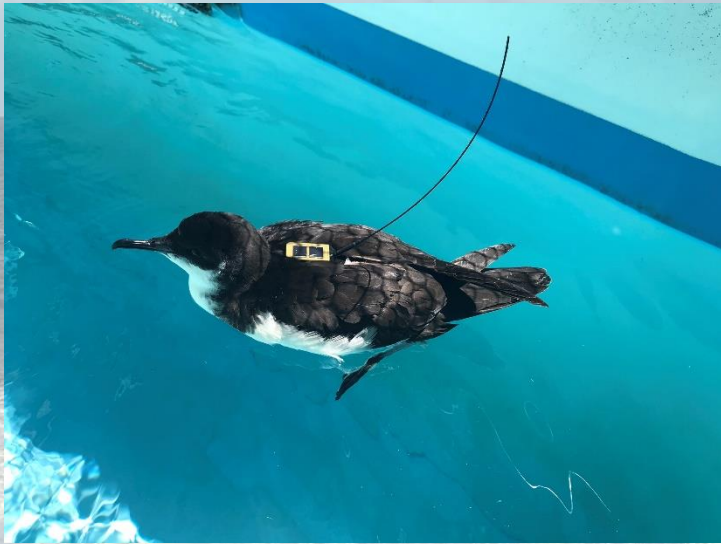


# Marine Distribution - foraging



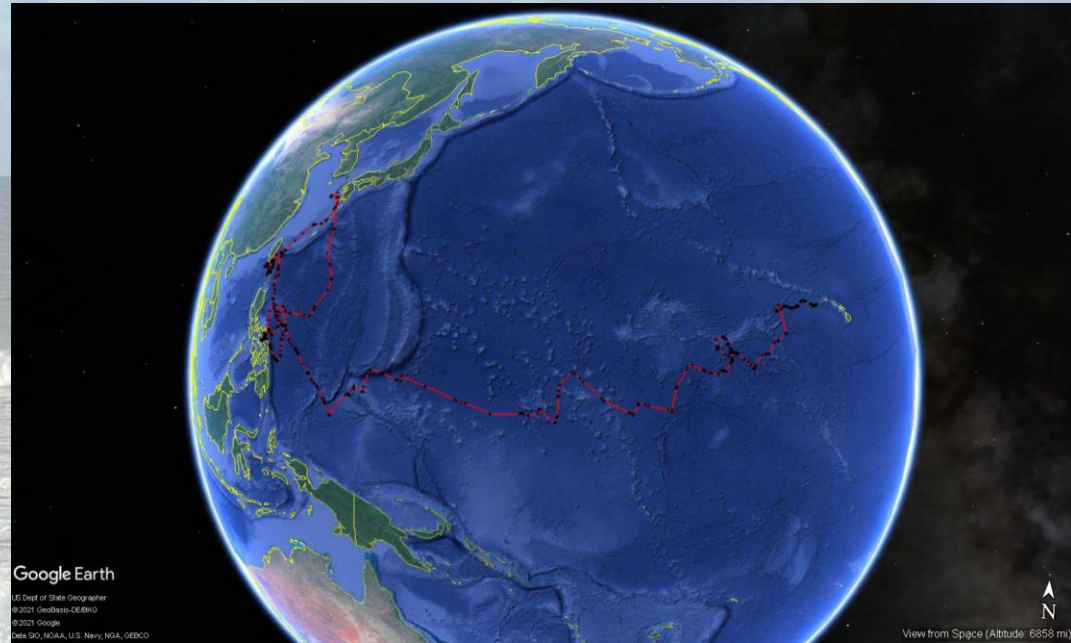


# Marine Distribution - wintering





# Marine Distribution - wintering





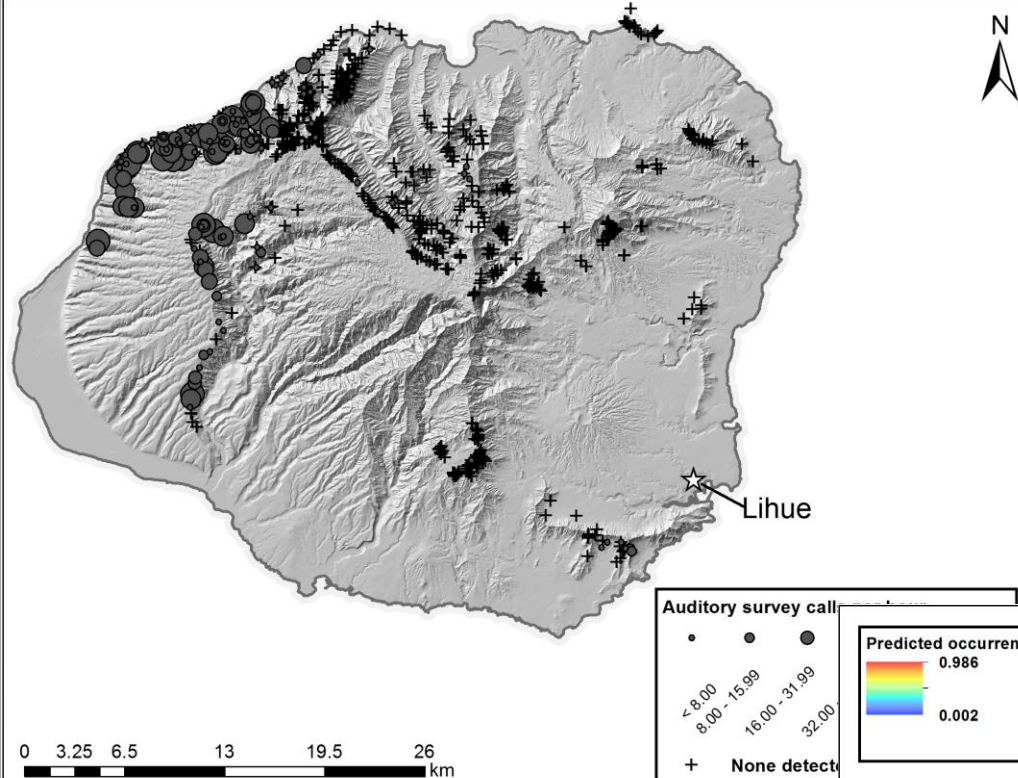
# Threats – at sea











# THE BREEDING PHENOLOGY AND DISTRIBUTION OF THE BAND-RUMPED STORM-PETREL *OCEANODROMA CASTRO* ON KAUAI AND LEHUA ISLET, HAWAIIAN ISLANDS

ANDRÉ F. RAINE<sup>1</sup>, MATTHEW BOONE<sup>2</sup>, MATTHEW MCKOWN<sup>2</sup> & NICK HOLMES<sup>3</sup>

<sup>1</sup>Kaua'i Endangered Seabird Recovery Project (KESRP), PO Box 81, Hanapepe 96716, Kauai, HI, USA (araine6@hawaii.edu)

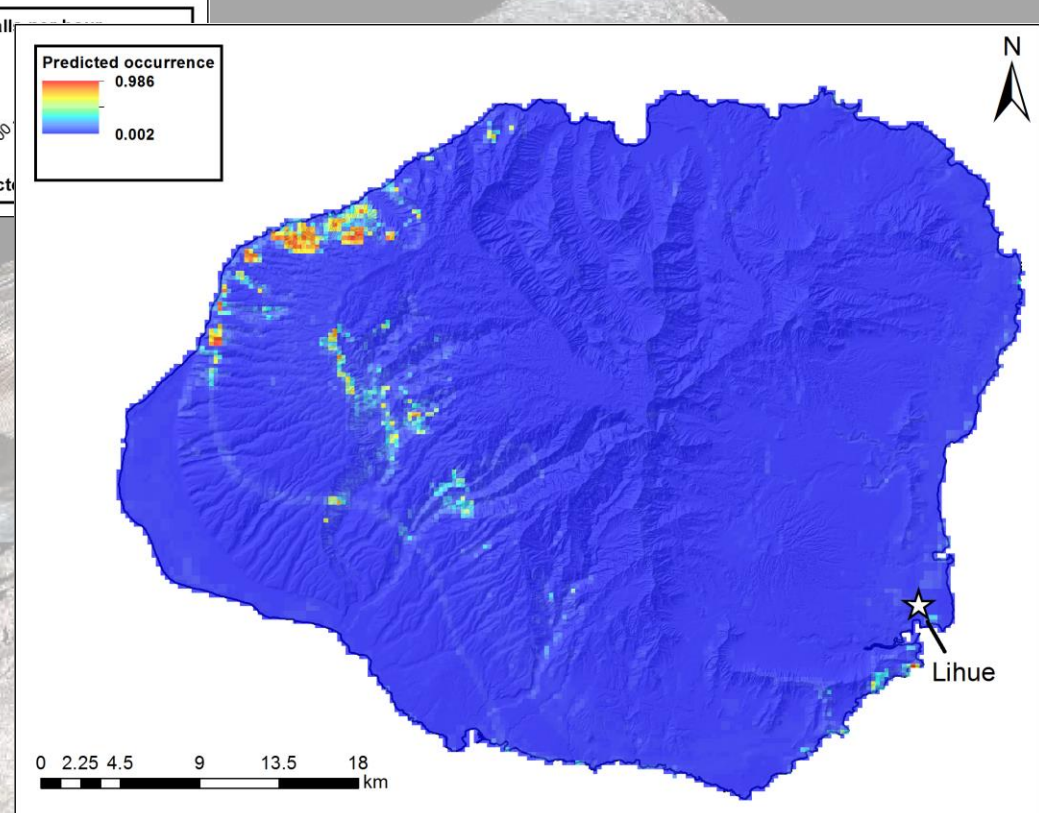
<sup>2</sup>Conservation Metrics, Inc., Center for Ocean Health, 100 Shaffer Rd., Santa Cruz, CA 95060, USA

<sup>3</sup>Island Conservation, 2100 Delaware Ave, Suite 1, Santa Cruz, CA 95060, USA

Received 8 November 2016, accepted 28 February 2017

## ABSTRACT

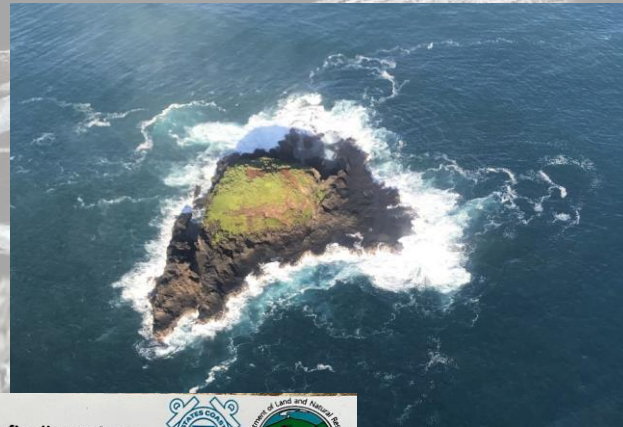
RAINE, A.F., BOONE, M., MCKOWN, M. & HOLMES, N. 2017. The breeding phenology and distribution of the Band-rumped Storm-petrel *Oceanodroma castro* on Kaua'i and Lehua Islet, Hawaiian Islands. *Marine Ornithology* 45: 73–82.














**Lehua Island is finally rat-free!**

Thank you for your continuous support and dedication, on the successful completion of this phase in Lehua's restoration.

