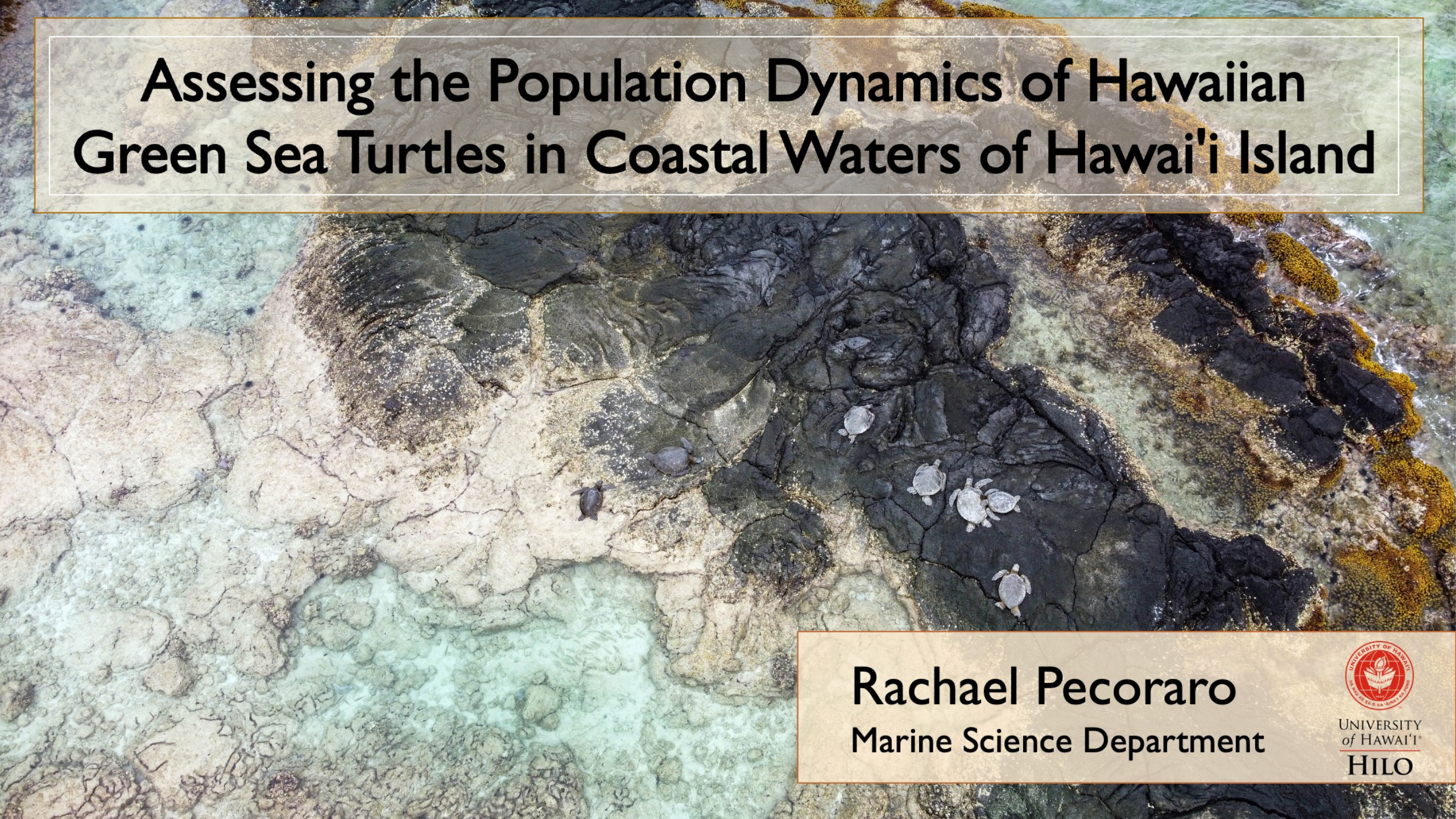
Assessing the Population Dynamics of Hawaiian Green Sea Turtles in Coastal Waters of Hawai'i Island



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Chelonia mydas

An indicator for assessing environmental stressors

Their absence can impact ecosystem ecology

Dependable population abundance estimates are important for recovery planning

Mark-Recapture Studies

Tag affixed to individual animals

Photo credit: Bettina Arrigoni

Recapture is completed in a series of surveys

Photo credit: Austin Colt

Effective for determining population trends and abundance

Photo credit: Sharks Pacific

Mark-Resight Studies

Mark individual animals with a unique tag number

Visual observation of the animal in situ

Photo Credit: NOAA Fisheries

Resight includes in-water and aerial surveys

Unmanned Aerial Vehicles

Photo credit: DJI

- Aerial surveys via drones
- Cost-effective compared to other aerial options
- Flexible and safe alternative
- Real-time surveys

Objectives

Tag Longevity

- Turtles scored every survey
- Determine longevity of tags
- Timescale of Roto-tag use

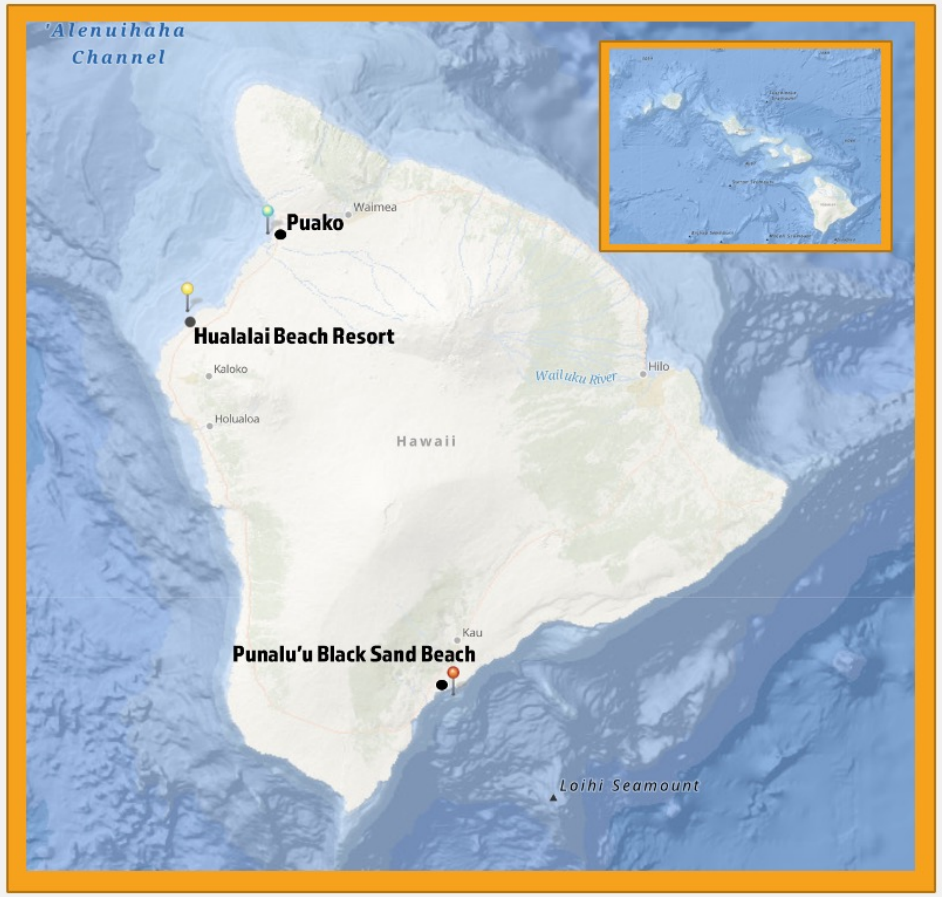
Turtle Abundance

- Turtle counts at each location
- Turtle size class
- Population Model estimates

Snorkel vs. Drone

- In-water snorkel surveys
- Aerial drone surveys

Health assessments



Punalu'u

- March 31, 2023
- n=15

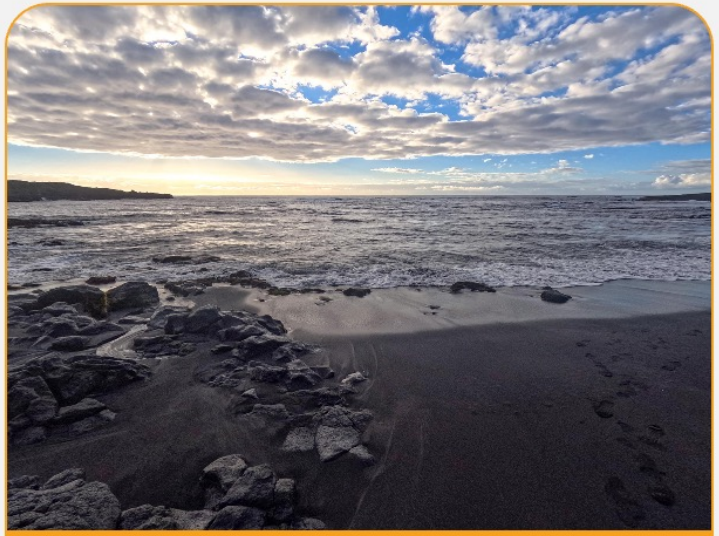
Puakō

- April 17, 2023
- n=12

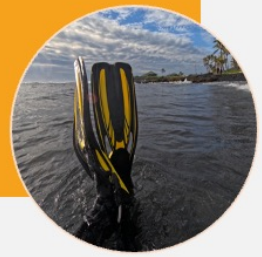
Hualālai

- May 2, 2023
- n=6

Population Surveys

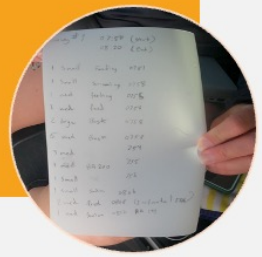


Bi-weekly surveys



Triplicate 30-minute snorkel surveys

15-minute beach surveys



- Tag identification
- Size of turtle
- Current behavior

Population Abundance

Population abundance estimate:

The Lincoln-Peterson Method is used to estimate populations with 2 capture occasions.

$$\hat{N} = \frac{nK}{k}$$

Where:

$\hat{N}$=population abundance estimate

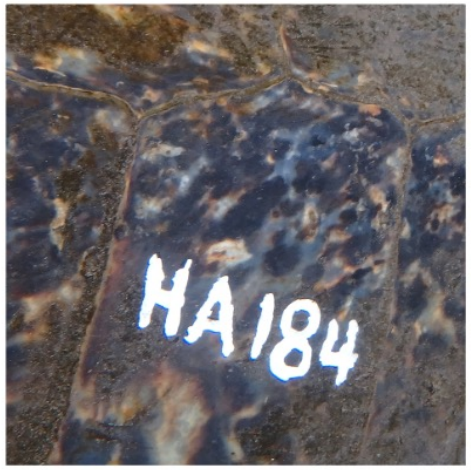
n= animals marked on the first occasion

K= animals encountered on the second occasion

k= marked animals on the second occasion

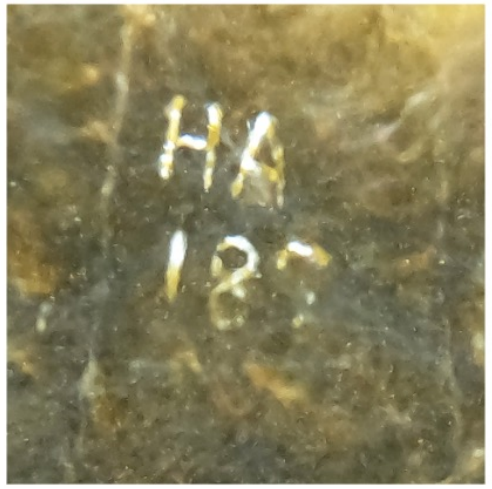
Tag Longevity Scores

5 = 0 algal coverage



4 = < 25% algal coverage

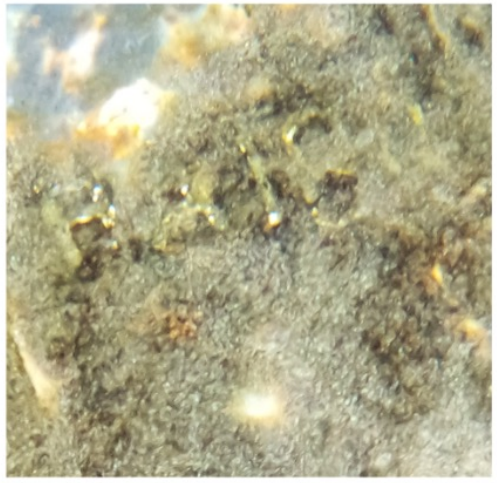
3 = > 25% algal coverage



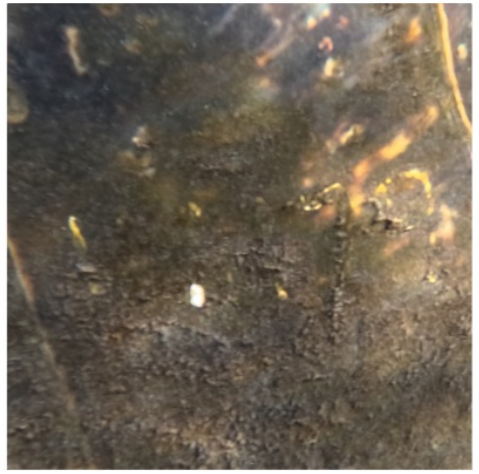
Silver tag

2 = > 50% algal coverage

1 = > 75% algal coverage



0 = unreadable



Drone Surveys

- Conducted in conjunction with snorkel surveys at Punalu'u and Puakō
- Launched from the shoreline to capture movement of green sea turtles
- Aerial videos were compared to in-water surveys

Tag Longevity at Punalu'u

Days	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2	5	5					5	5	5			5		5	5
16	5	5	5	2			5	5		3	5	5		5	
29	5	5					4	5		5	5	5		4	
44	4	4	3	4		5	4	3	4	4	5			3	
57	4	5		3			5	5	5	5	5	4		3	
73		5		3		3	2				5	5		5	
86		2		5											
100	2	3	2	5				3			3				
112	2	4			2			1			3			4	
129	1	5		1			1								
142		5			2		2			4	2				
157	1	2	4	4			2	1		4					
171								1							
185		2													
198		2					1	2						4	
212		1		2						2	2				
231		3			3			2			3				
240		1	3									2			1
254			2							1	1	1			
266	1	2					2			1	2	2		2	2
295		2					1				1	2			
309		1									1	3			
330		1	4								3				
344		1									1				
358		1	2							1					
Total:	11	24	9	10	4	3	13	12	4	11	17	11	1	10	4

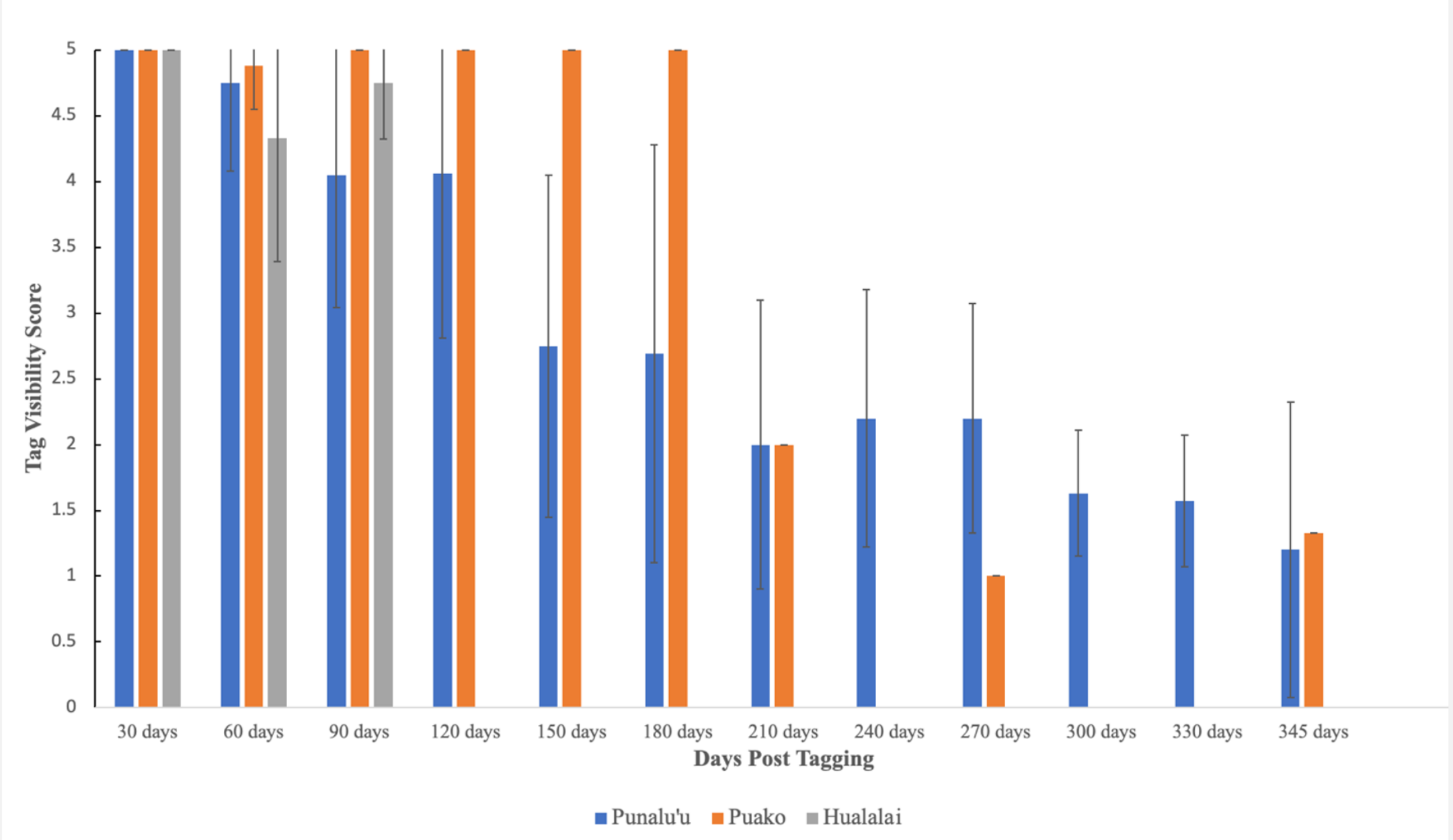
Tag Longevity at Puakō

Days	193	194	195	196	197	198	199	200	201	19	120	126
0	5	5	5	5	5	5	5	5	5	5	5	5
6	5						5	5				
20			5	5			5	5				
34				4				5	5	5		
48							5	5	5	5		
61							5	5				
76							5	5				
88	5											
104								5		4		
118	5											
132	5						5					
146								5				
160												
174							5					
187												
201												
216												
230												
244					1		2	1				
258												
286												
300							1	1				
321			1				1					
336												
349												
Total:	5	1	3	3	2	1	11	11	3	4	1	1

Tag Longevity at Hualālai

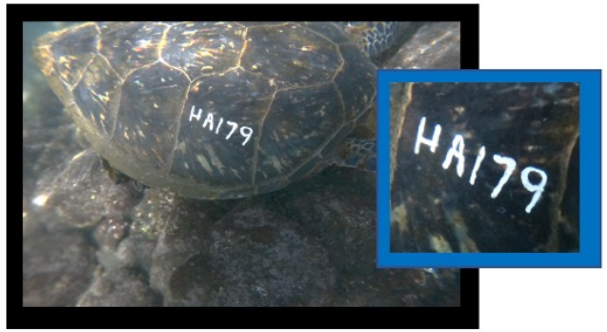
Days	203	204	205	206	207	113
0	5	5	5	5	5	5
5	5		5			
19	5					5
33	5					
46	5		3			
61	5					4
73						
89						
103						
117						
131						
145						
159						
172						
186						
201						
215						
229						
243						
271						
284						
305						
320						
333						
Total:	6	1	2	1	1	3

Average tag retention visibility

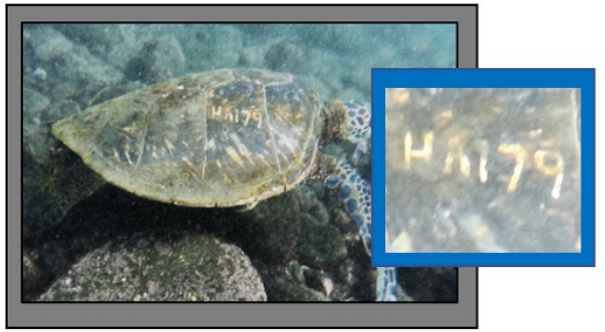


Tag Longevity of Individual HA-179:

April 2, 2023 (5)

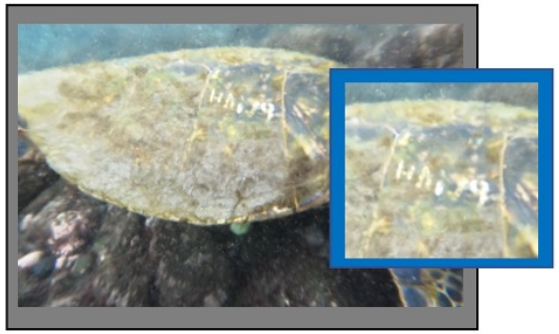


May 14, 2023 (5)

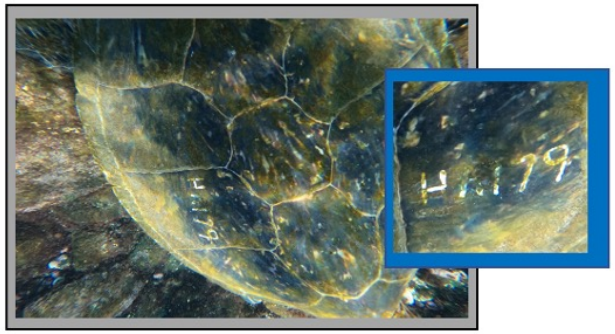


June 12, 2023 (4)

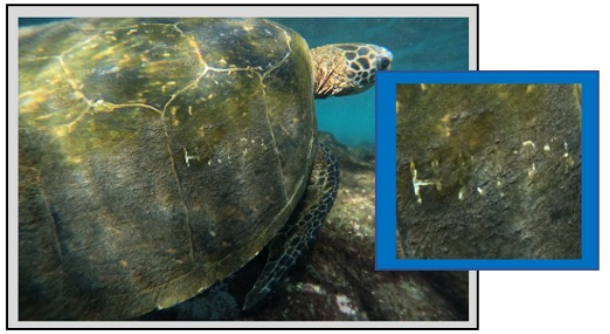
July 20, 2023 (4)



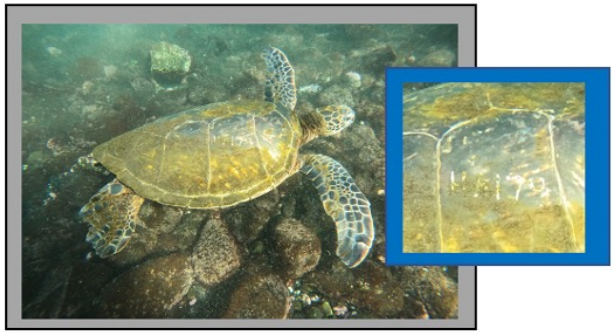
August 18, 2023 (4)



September 3, 2023 (3)

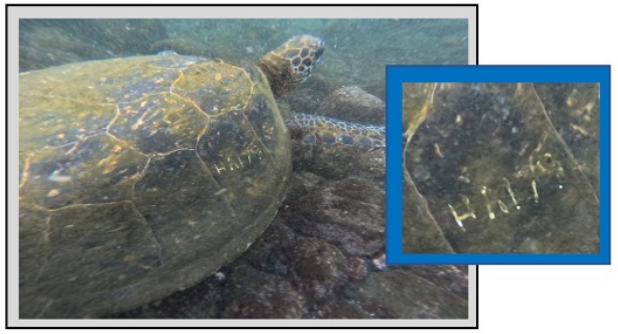


October 29, 2023 (1)

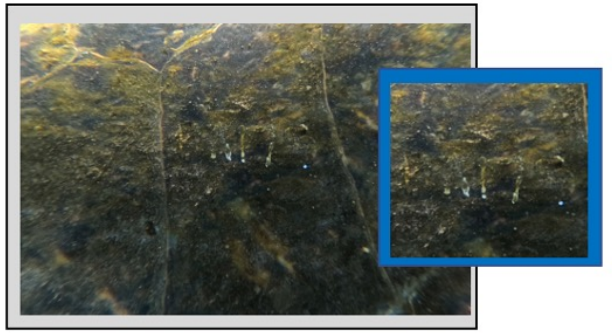


November 18, 2023 (3)

December 22, 2023 (3)



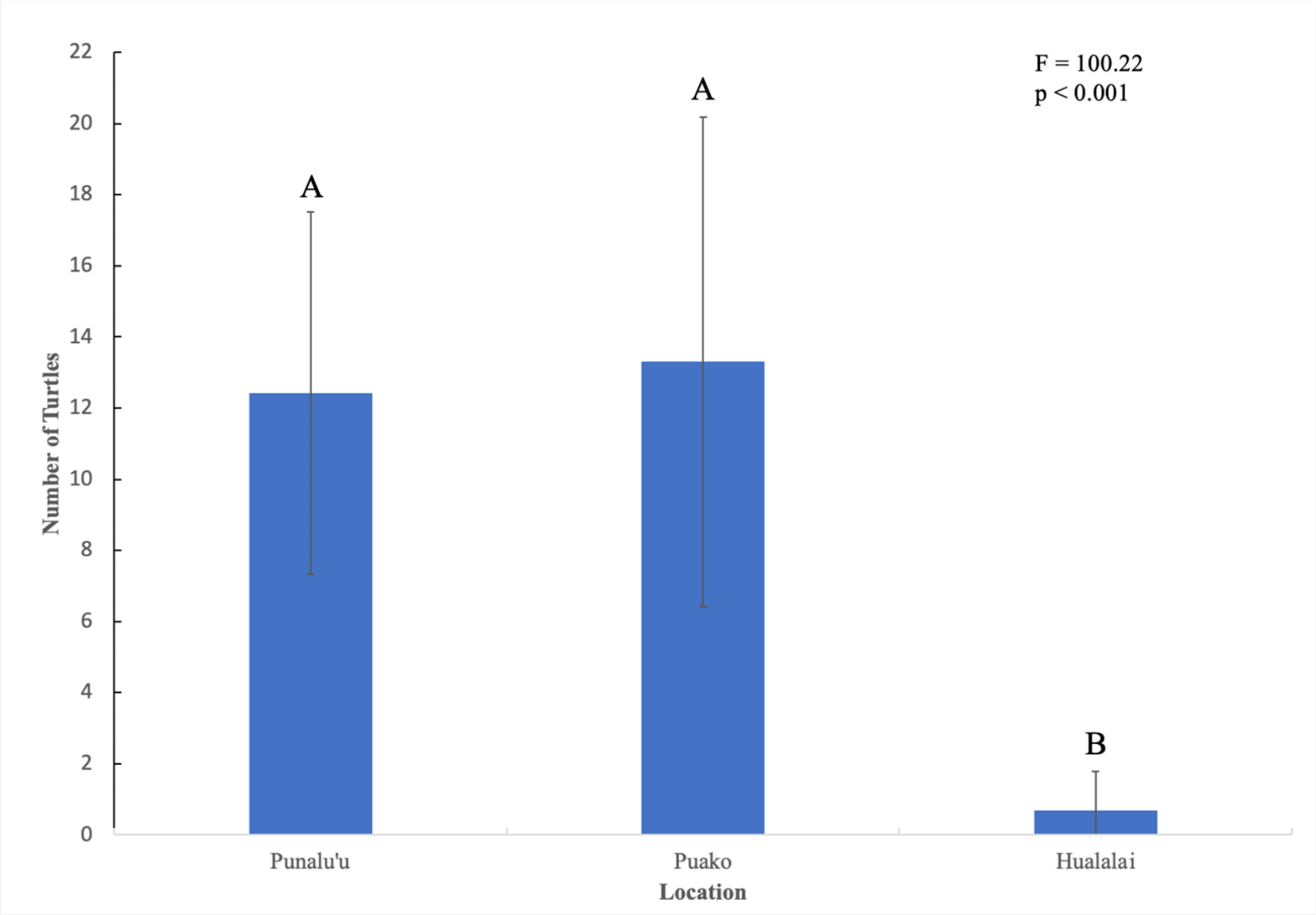
January 21,2024 (2)



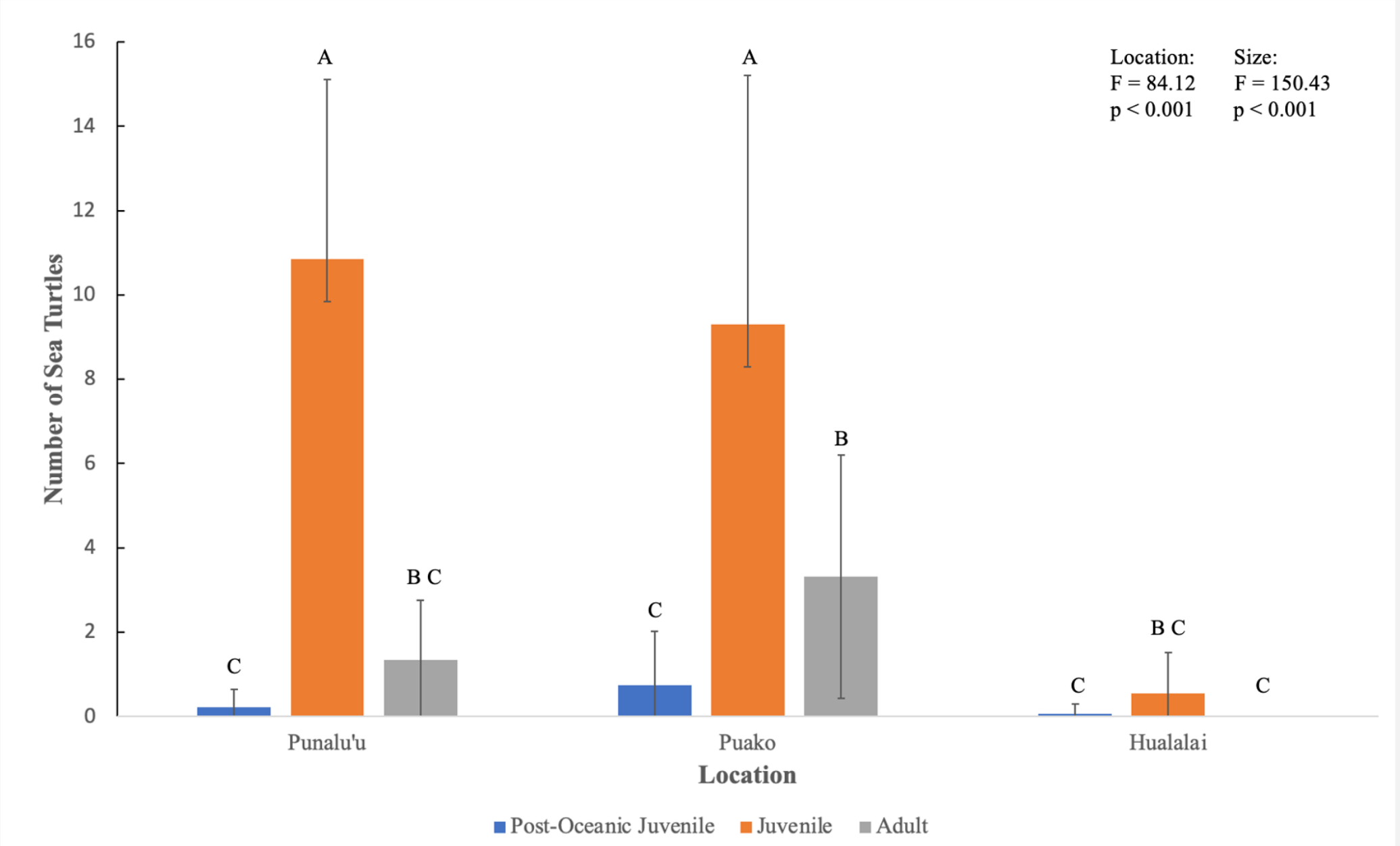
February 2, 2024 (1)

March 10, 2024 (1)

Average Number of Turtles Per Survey



Juvenile Size Class is Predominant

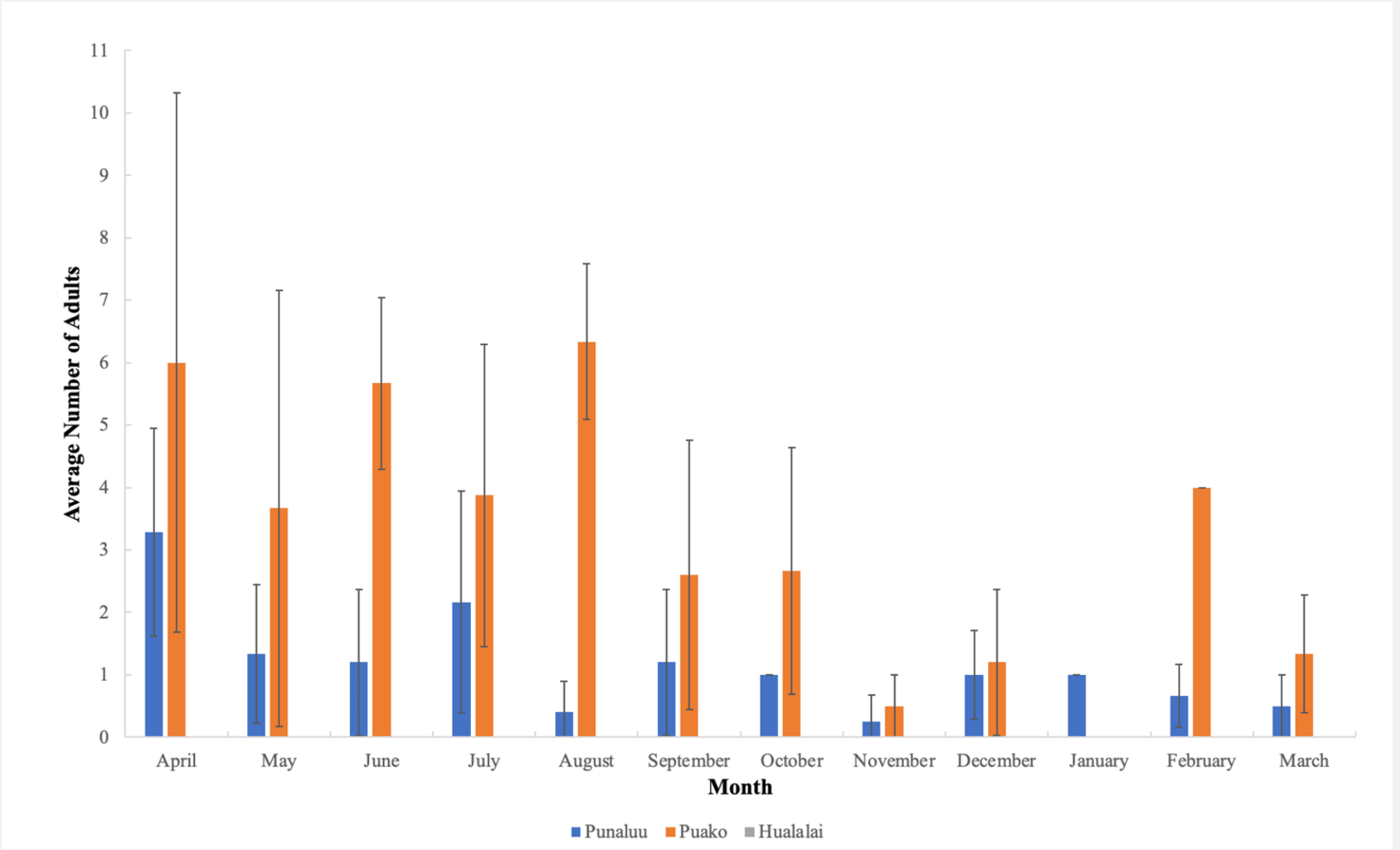


Population Abundance is Higher at Puakō

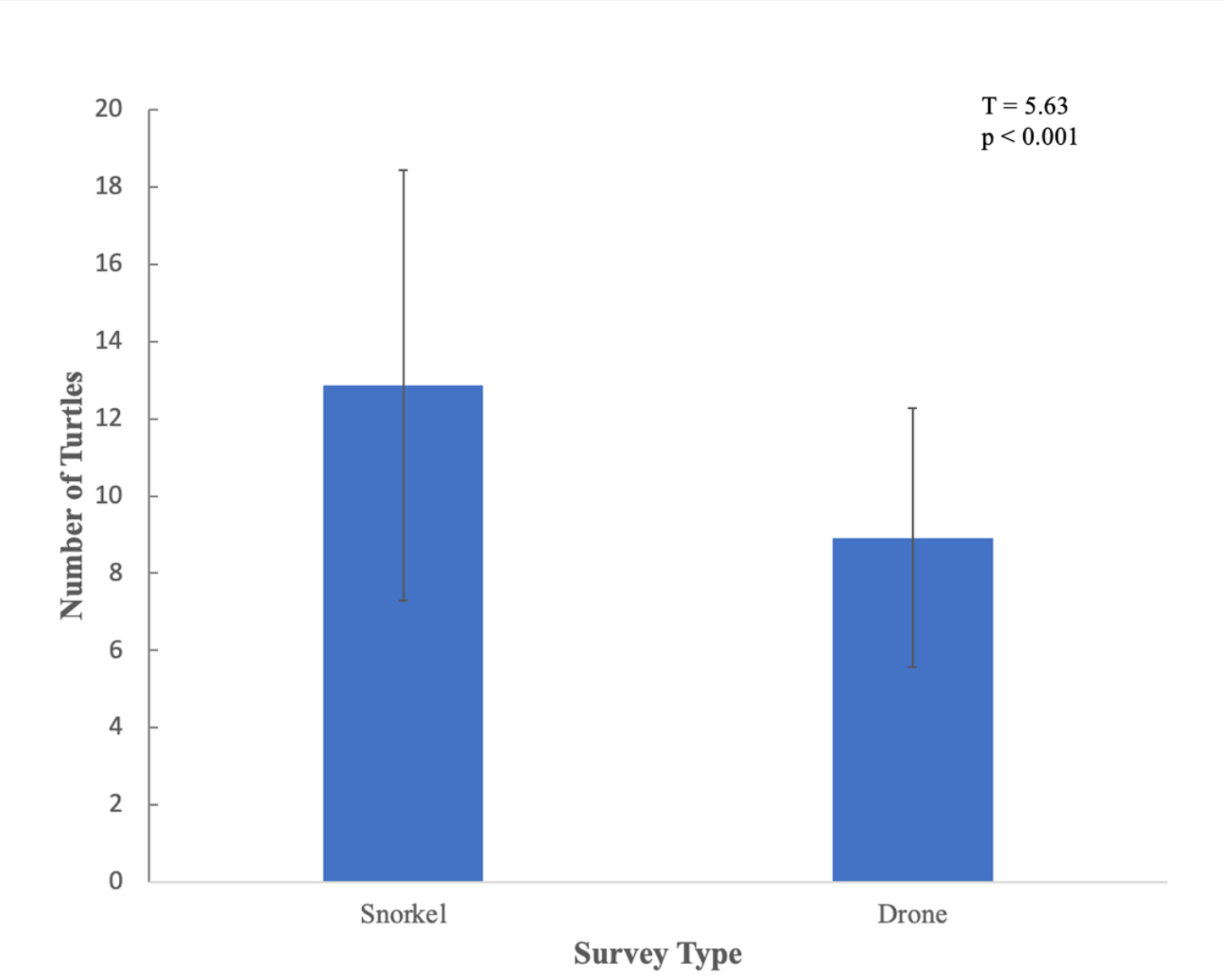
Photo credit: Dan Moore

Punalu'u	Puakō	Hualālai
Survey count:	Survey count:	Survey count:
12.42 ±5.10	13.10 ±7.03	0.68 ±1.10
L-P est:	L-P est:	L-P est:
53.46 ±19.49	142.08 ±64.97	7.17 ±2.32

Adults Did Not Emigrate



Snorkel Surveys more effective than Drones

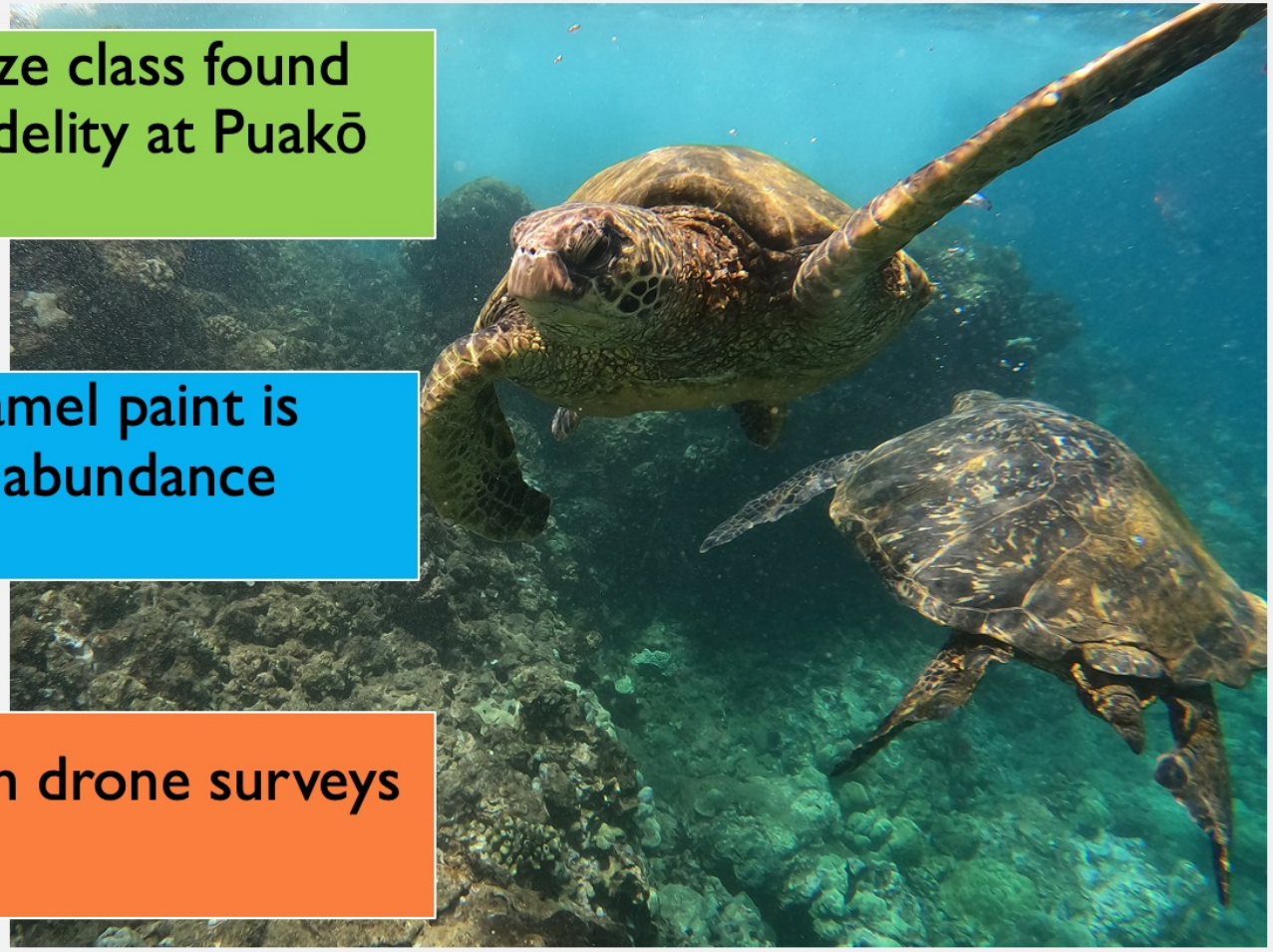


Conclusions

Juvenile sea turtles are the prevalent size class found across Hawai'i island, with a high site fidelity at Puakō and Punalu'u and minimal at Hualālai

Moto-tool tagging using a white enamel paint is effective for short-term population abundance estimates

Snorkel surveys are more effective than drone surveys due to external factors



Impacts on The Punalu'u-Puakō Populations

Snorkeling at either location

Average of 13 sea turtles

Puakō

Represents about 10%

Punalu'u

Represents about 25%

Small changes, substantial impacts

Acknowledgements

- Jason Turner, Ph. D, Thesis advisor
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THANK YOU

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