

# **Hungry Hungry Honu:**

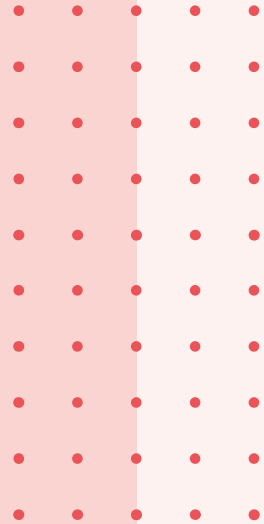
## **A look at the feeding ecology of Hawaiian green turtles (*Chelonia mydas*) utilizing stable isotopes ( $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ )**



UNIVERSITY of HAWAII<sup>®</sup>  
**HILO**

Bella Chapman

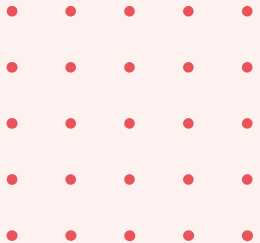
Marine Science Department  
University of Hawai'i at Hilo



# 01.

## Introduction

- Stable isotopes
- *Chelonia mydas*
- Research Question



# Stable Isotopes:

## <sup>13</sup>Carbon and <sup>15</sup>Nitrogen

- Utilized in diet studies since the late 1970's
- Consumption of organic materials allow for isotope deposition in tissue
- $\delta^{13}\text{C}$  (<sup>13</sup>C:<sup>12</sup>C) and  $\delta^{15}\text{N}$  (<sup>15</sup>N:<sup>14</sup>N) can provide a fingerprint for diet profiling



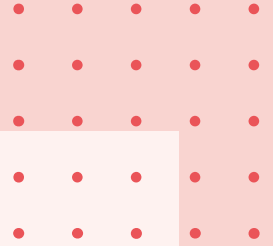
## $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$

- $\delta^{13}\text{C}$  identifies primary producers
- C can be used to trace a flow in the food chain
- $\delta^{15}\text{N}$  enriched in organisms higher in the food chain
- $^{14}\text{N}$  isotopes excreted preferentially, leaving higher  $^{15}\text{N}$  levels in relation to diet and trophic level of feeding

# Hawaiian Green Turtles (*Chelonia mydas*)



- Spend first 3 - 5 years in open sea; opportunistic feeders
- Juveniles migrate to coastal environments; herbivorous (Arthur et al. 2008)
- Diet primarily macroalgae and seagrass (Limpus et. al 2005)
- Occasional tree leaves, land plants, incidental invertebrates



## Previous Studies

- Diet selection is driven by availability (Forbes 1996)
- Primarily consume Rhodophyta based on abundance (Arthur & Balazs 2008)
- O'ahu turtles consume substantial amounts of seagrass (Russell et al. 2003)

# Source of Turtles in this Study



- 17 stranded turtles
- Found on East Hawai'i coast from March 2020 to June 2022
- Carcasses frozen until transport to National Marine Fisheries Service on O'ahu
- Skin samples taken from hind flippers
- Samples transported to University of Hawai'i at Hilo



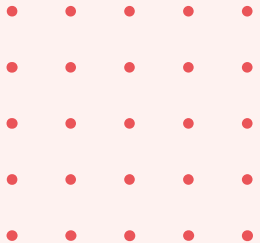
**Purpose: To investigate the diet of East Hawai'i stranded turtles through stable isotope analysis of skin tissue samples**



# 02.

## Methods

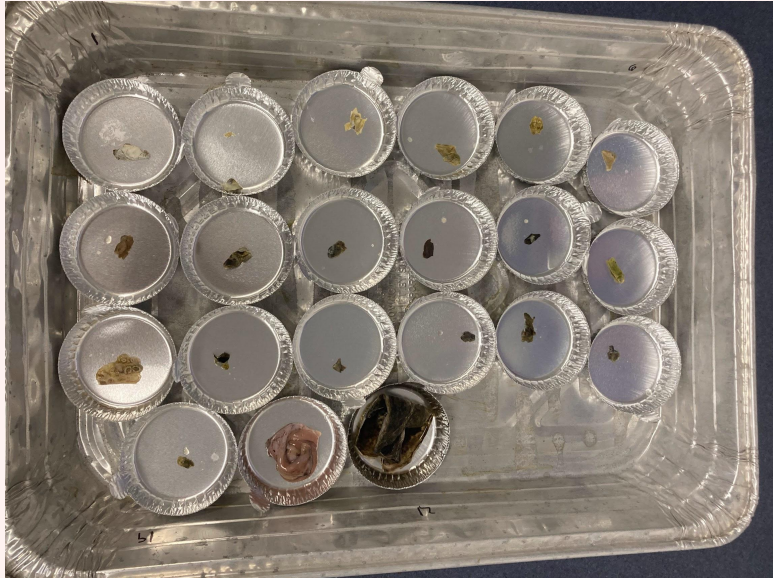
- Locations of stranding
- Skin Sample Processing



# Turtle stranding sites on Hawai'i island



HERE, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, EPA, US Census Bureau, USDA

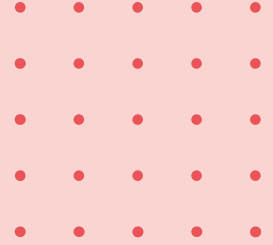


# Skin Sample Processing

- Sorted and labeled
- Rinsed with deionized water
- Weighed and recorded as wet weights
- Placed in labeled aluminum weigh boats



# Skin Sample Processing



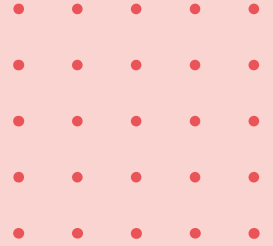
- Dried at 60°C for minimum of 24 hours
- Ground with mortar and pestle or Wig-L-Bug grinding mill
- Returned to weigh boats, and stored in oven
- Loaded into tin capsules
- Analyzed at UHH Analytical Laboratory

# 03.

## Results

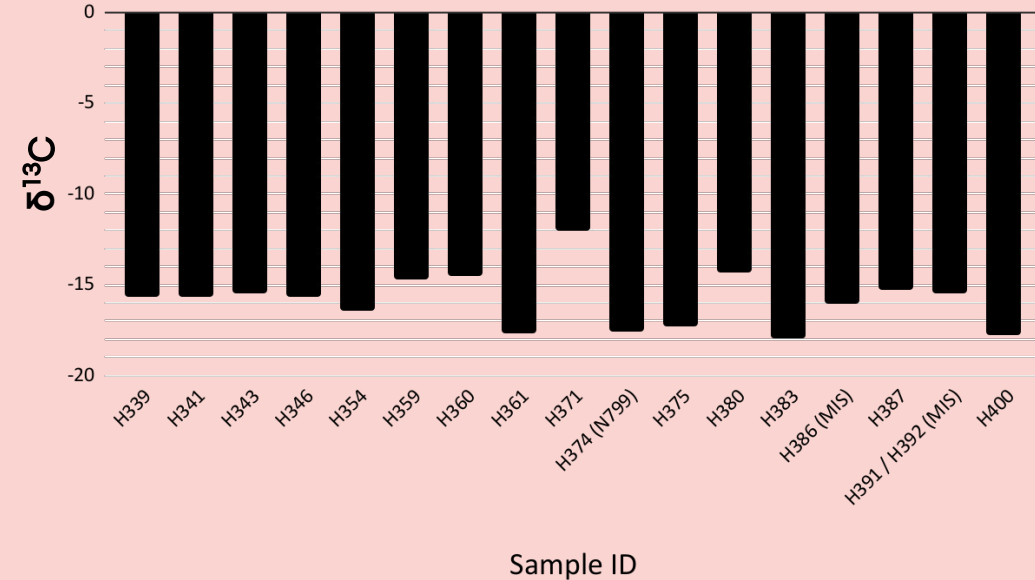


# $\delta^{13}\text{C}$ In Skin Tissue Samples

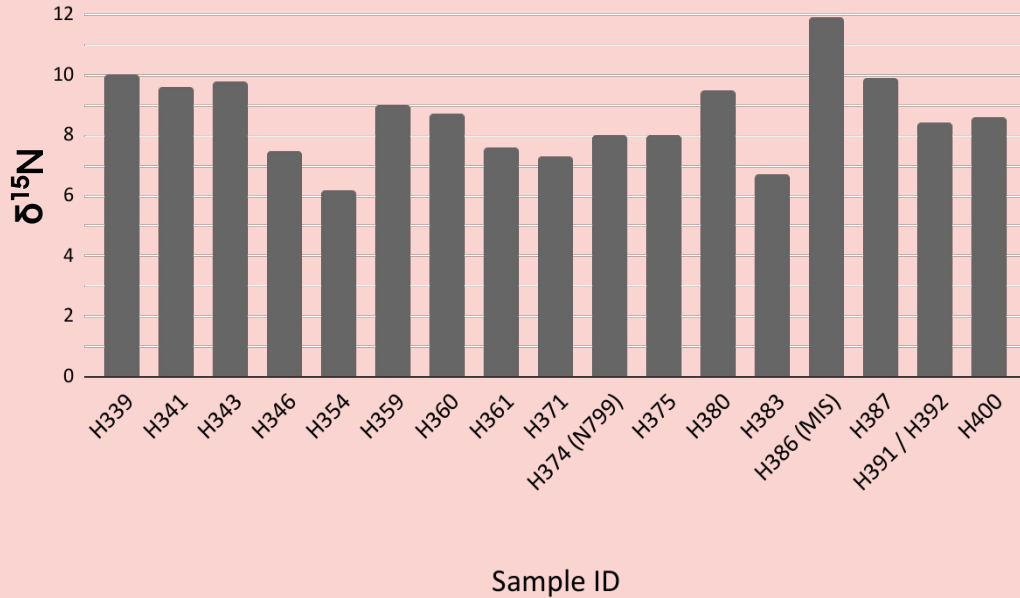
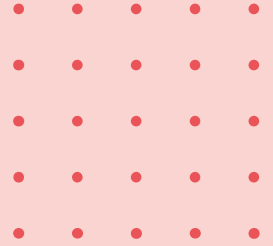


$$\bar{x} = -15.9$$

Values ranged from -12 to -18.0  
Standard Deviation of 1.55



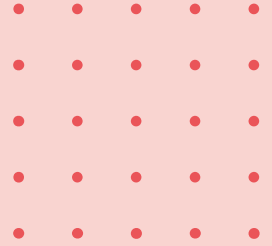
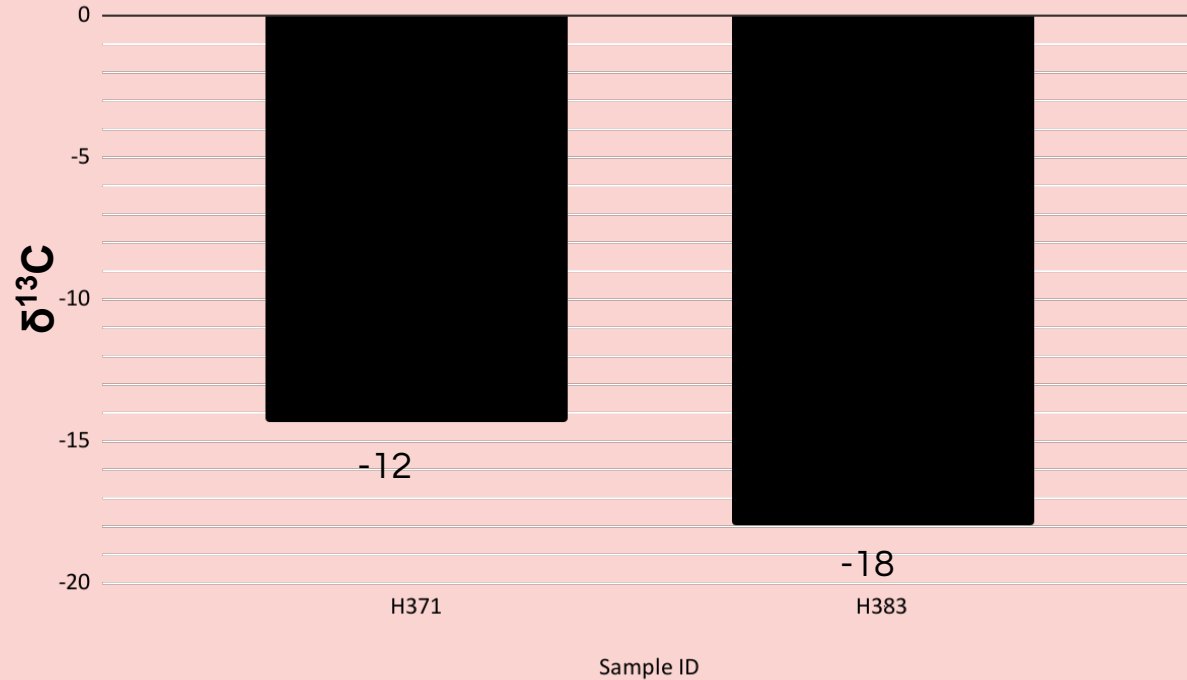
# $\delta^{15}\text{N}$ In Skin Tissue Samples



$$\bar{X} = 8.63$$

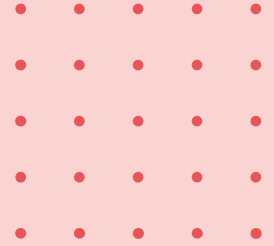
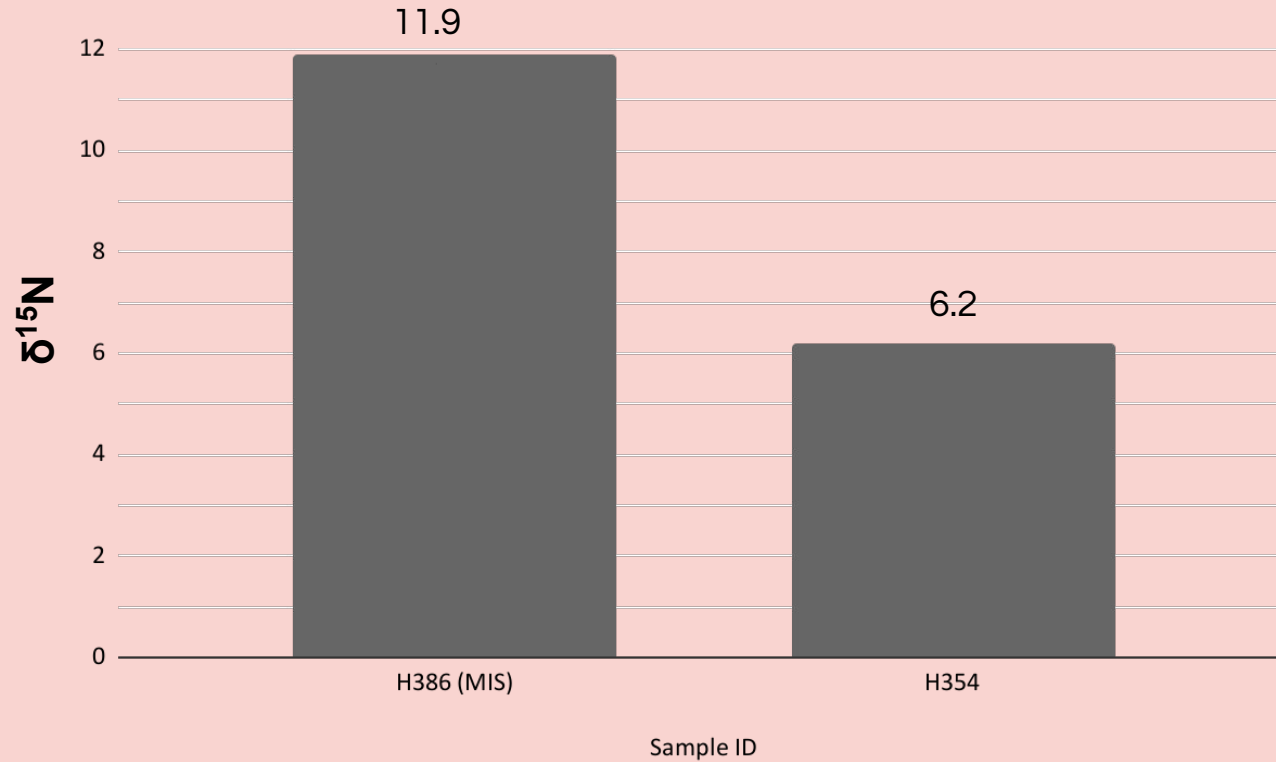
Values ranged from 6.2 to 11.9  
Standard Deviation of 1.41

# Turtles with the highest and lowest value of $\delta^{13}\text{C}$





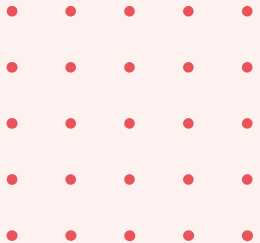
# Turtles with the highest and lowest value of $\delta^{15}\text{N}$



# 04.

## Conclusions

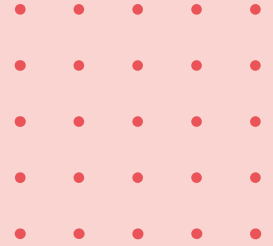
- Primary consumer on a marine plant-based diet





Picture credit: *Turtles.org*

## Conclusions



- Depleted values of  $\delta^{15}\text{N}$  indicative of a primary consumer
- Low  $\delta^{15}\text{N}$  in sub-adults
- Enriched  $\delta^{15}\text{N}$  in juveniles
- $\delta^{13}\text{C}$  values consistent with literature values of red, brown, and green algal species (Arthur et al. 2008, Kelly 2012)



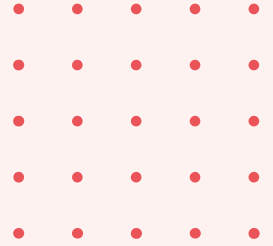
## Conclusions



- Depleted  $\delta^{13}\text{C}$  levels compared to other populations of turtles (Arthur et al. 2008, Kelly 2012)
- Physiological factors can affect isotope distribution
- Protection of *limu* is critical for well-being of species

# Future Research

- Long-term repeat sampling
- Comparison of values to local macroalgal populations
- Implications for population growth
- Comparison of values to upper digestive tract samples



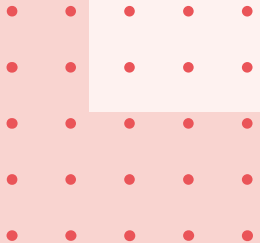
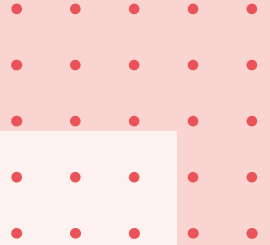


# Acknowledgements

- **Karla McDermid** - UH Hilo
- **George Balazs** - NMFS, retired
- **Etta Karth** - UH Hilo
- **Erik Johnson & Jaz Panelo** - UHH Analytical Lab
- **Summer Martin** - NMFS, Marine Turtle Biology & Assessment Program (Honolulu)
- **Brittany Clemans** - NOAA Affiliate
- **Jen Sims & Volunteers** - UH Hilo MOP Sea Turtle Stranding Response Team



**MAHALO**



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