



# Through the Camera Lens: A Photo-Identification Catalogue (1998-2015) that Superbly Captures the Lives of Critically Endangered Hawaiian Hawksbill Sea Turtles (*Eretmochelys imbricata*)

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## Introduction

The Hawaiian archipelago, one of the most isolated island chains in the world, consists of eight populated "Main Hawaiian Islands" (MHIs) and the uninhabited Northwestern Hawaiian Islands (NWHIs). Critically endangered Hawaiian hawksbill turtles (*Eretmochelys imbricata*), or *honu*'ea in Hawaiian, inhabit nearshore habitats but are rarely seen compared to the threatened Hawaiian green sea turtle (*Chelonia mydas*), known as *honu*. The majority of the greens migrate up to the Northwestern Hawaiian Islands to nest, while hawksbills utilize the Main Hawaiian Islands for both nesting and foraging. Hawksbills predominantly nest on Hawai'i Island, with considerably lower numbers that nest on the islands of Maui, Moloka'i, O'ahu, and Kaua'i. Hawai'i and Maui Islands are the only two that have long-term nest monitoring programs, but the best statewide estimate is at ~100 reproductive females with typically fewer than 200 nesting each season. These are strikingly low numbers, making this one of the most critically endangered sea turtle populations in the world. Since sea turtles only spend a small fraction of their lives nesting, the in-water life stages need to be monitored in order to understand the population and to make effective management decisions.



**Long-Term Photo-ID Research Provides Insight Into:**

- Relative Distribution and Abundance
- Size and Sex Ratios
- Residency/Movements
- Daily and Seasonal Trends
- Resting and Foraging Habitats
- Health and Injuries
- Ecosystem roles

## Photo-ID Monitoring Approach

Since Hawaiian hawksbills can inhabit accessible, nearshore habitats, and snorkeling and SCUBA diving are very popular activities, these factors make this rare species an ideal candidate for a photo-ID research project. Juvenile and adult hawksbills can be non-obtrusively monitored long-term by matching photographs of their head and flipper scale patterns. Sampling effort by year, location and photographer ranged widely, so not analyzed statistically, but the compiled results still provide the greatest amount of information known about Hawaiian hawksbills in their marine environment.

Photographs were obtained opportunistically from 1998-2015 in several ways, but primarily from a network of personal contacts. Flyers (pictured on the right) were distributed to ocean recreation shops that illustrated the differences between greens and hawksbills and encouraged the reporting of hawksbill sightings. Requesting hawksbill photographs and finding incidental sightings on various websites, especially with the popularity of social media, also increased records. The higher prevalence of people with better quality underwater cameras has also improved and expanded this catalogue. Targeted in-water surveys were conducted on Maui, Lana'i and Moloka'i to assess habitats beyond popular snorkeling destinations. All individuals were numbered and named.

Photo-ID Catalogue Summary (1998-2015)						
Hawaiian Hawksbills	Confirmed Sightings from Photographs	Year Span	Juveniles	Females	Adults Males	Unknown
Kaua'i	5	2009-2015	5	0	0	0
O'ahu	16	1999-2015	9	1	1	0
Moloka'i	3	2015	0	1	1	0
Lana'i	4	2011-2015	3	0	0	0
Maui	654	1998-2015	27	16	4	0
Kaho'olawe	3	2007-2009	1	0	0	0
Hawai'i Island	22	2003-2015	11	0	1	1
TOTALS	707	18 years	56	18	7	1

Every sighting was insightful. Due to incomplete profiles (not photographed from all angles or low quality photos), some individuals could not be compared to all hawksbills, but these results reflect the best effort to do so. Sizes were estimated (juveniles=<70cm and adults=>70cm).

Since the authors reside on Maui, the majority of sightings and individuals have been documented there (Maui= 47, Hawai'i Island= 13, O'ahu= 11, Kaua'i= 5, Lana'i= 3, Moloka'i= 2, and Kaho'olawe= 1). Sightings of individual hawksbills ranged from 1-111 (mean= 8.5 ± 16.9 SD, mode= 1), within <17 year spans (mean= 3.1 ± 3.3 SD).

The sex couldn't be determined for the fifty-six (68.3%) juveniles. Twenty-six (31.7%) hawksbills were classified as adults (18 females, 7 males and 1 unknown due to photo angles).

No fibropapillomatosis (FP) tumors were documented except in one green hybrid documented by the Bennetts: [www.turtles.org](http://www.turtles.org).

Size and Sex Distribution of Hawksbills (n=82)

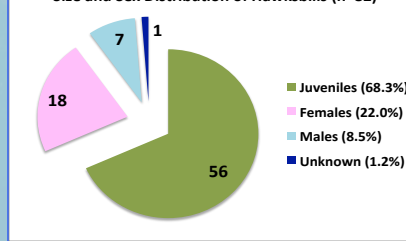
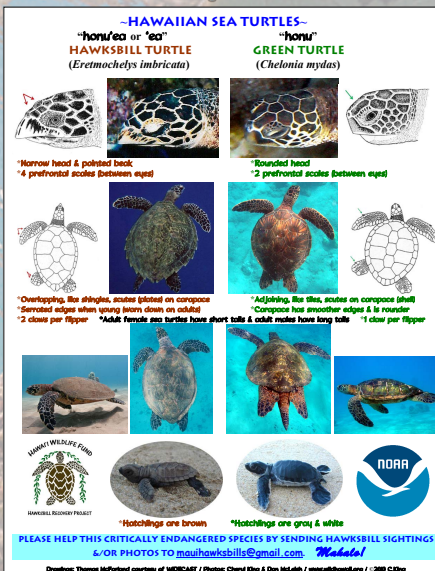


Photo credits: C.King, D.McLeish, M.Wakashige, T.Rollo, J.Anders & M.Rudenko



## Results

Over 200 photographers contributed to a total of 707 confirmed sightings of 82 MHI individuals, all with various metadata: date, time, location, depth, habitat, behavior, and reaction to human presence.

## Threats

Serious threats include boat strikes, interactions with fishing gear and marine debris, harassment from ocean goers, and coral reef habitat decline.

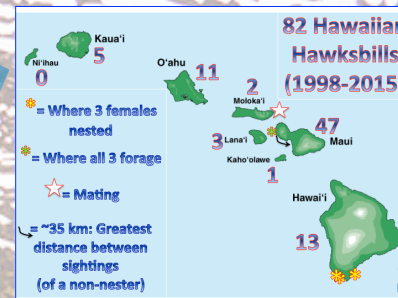
## Discussion

This project has gathered a rich history on the lives of known hawksbills, but many mysteries remain. Why do their numbers remain low compared to the Hawaiian green? Or, are these numbers and behaviors consistent with historic times? Their broad foraging choices may indicate that the "typical" hawksbill diet of sponges doesn't sustain them in Hawai'i, and therefore may impact their health and subsequent population success.

Despite not knowing the sex of the juveniles, the adult ratio appears very female biased (consistent with stranding records). Maui and Hawai'i Islands' nesting projects began in the 1990s, so the successes of these efforts may be noticeable soon. These females must be nesting in locations without monitoring programs since only 3 of the 18 have been flipper tagged. And, with over 100 nesting females tagged in Hawai'i and only 3 known to have been spotted in their foraging habitats, our search areas need to be expanded.

It seems unlikely that this Hawaiian population is sustainable with such a low number of individuals, but the more we look, the more we find. It is very likely that most sightings are going undetected/unreported, but reports have naturally increased over the years with our hawksbill network's growth and efforts. This important 18-year dataset (partially funded by NOAA from 2011-2015) provides a baseline before the launch of [www.HIhawksbills.org](http://www.HIhawksbills.org) in February 2016 that will raise more awareness to the plight of the Hawaiian hawksbill.

Since many potential hawksbill habitats are not often accessible due to challenging ocean conditions, movements and home ranges cannot be defined without satellite telemetry (research underway). Longest-term records of adult females indicate some site fidelity. One mating pair, which did not match individuals in this catalogue, was photographed off a Moloka'i nesting beach (pictured below). Three hawksbills that have utilized West Maui foraging areas have been tagged on Hawai'i Island nesting beaches. The maximum distance between sightings of a non-nesting individual was ~35km, around Maui.



Some hawksbills displayed no visible reaction to humans, while others exhibited flight behavior. Hawksbills were sighted in diverse habitats: coral reef, rocky, turf algae-dominated pavement, macro-algae dominated sand, and mixed habitats at depths from 1-28 meters plus 3 offshore (>1 km) sightings. Hawksbills were photographed foraging on many species: algae, coral, sponges, fish, and invertebrates.



Forage items (top left to bottom right): brown algae, red algae, unidentified, sponge, frogfish, and coral.

**Maalo nui loa to all of the photographers, snorkelers and divers who have contributed to this project!**

