



## Annual Activities Report for 2023

Native Endangered and Threatened Species Recovery  
Surveys, Monitoring, and Research on the Hawksbill Sea Turtle (*Eretmochelys imbricata*), Green Sea Turtle (*Chelonia mydas*), and Olive Ridley Sea Turtle (*Lepidochelys olivacea*)

Federal Fish and Wildlife Permit **ES829250**  
Hawai'i Department of Land & Natural Resources Permit **SAP No. SAP 2023-47**



Principal Officer: William G. Gilmartin  
Authorized Individuals: Hannah Bernard, Jessica Batista, and Cheryl King

Hawai'i Wildlife Fund  
P.O. Box 760637  
Pā'ia, HI, 96779

## Introduction

In partnership with National Marine Fisheries Service (NMFS), Hawai'i Department of Land and Natural Resources Division of Aquatic Resources (DLNR/DAR), and U.S. Fish and Wildlife Service (USFWS), Hawai'i Wildlife Fund (HWF) initiated the Hawksbill Recovery Project in 1996 in efforts to continue the monitoring, research, and protection of hawksbill sea turtles in their nesting and marine habitats. Though HWF's monitoring efforts are primarily focused on the endangered hawksbill turtle (*Eretmochelys imbricata*), monitoring activities can also include occasional green sea turtle (*Chelonia mydas*) and olive ridley (*Lepidochelys olivacea*) nesting when they nest on Maui. HWF works to involve and educate the community on sea turtle status and threats while utilizing research findings to aid in informed policymaking. The program aligns with the NMFS/USFWS Hawksbill Recovery Plan of 1998 that focuses on the conservation of endangered hawksbill sea turtle populations. In addition, HWF has conducted satellite-tracking of nesting females to their foraging grounds around Hawai'i Island, Maui, O'ahu, Moloka'i, Kaua'i, and off Johnston Atoll in collaboration with NMFS to provide insight into the nesting and foraging patterns and spatial distribution of these species. HWF has also contributed to the database of over 357 hawksbills across the state (C. King pers. comm.), identifying movement patterns and important foraging grounds.

Since the inception of HWF's Hawksbill Recovery Project in 1996, 12 nesting hawksbills have been tagged on Maui and 136 nests have been protected and/or monitored, resulting in approximately 12,177 hawksbill and green turtle hatchlings successfully reaching the ocean. Green sea turtles nest less frequently on Maui and were monitored by HWF under the direction of DLNR/DAR in seven seasons: 2007, 2012, 2014, 2019, 2020, 2021, and 2022 (officially added under the terms of this permit in 2016). Olive ridley nests have been known to nest on Hawai'i, Maui, and O'ahu, but occurrences are uncommon. During the 2023 nesting season, 10 hawksbill nests were identified and monitored with 1,299 live hatchlings. Hawksbill hatchlings were observed in the ocean by a beachgoer, so one additional hawksbill nest is assumed to have been laid but was never found. One nesting hawksbill was a remigrant, and several others were not encountered during nesting. There were no known green sea turtle or olive ridley nests.

## Methods

**Nest Monitoring:** Dawn patrol volunteers patrol known nesting beaches at sunrise (approx. 0530 – 0700hrs) looking for sea turtle tracks or an indication that a nest has been laid, allowing for early detection, protection, and monitoring of the potential nest site. When signs of nesting are found by volunteers or reported by the public in any location, HWF staff confirms and protects the nest in consultation with our partnered agency contacts and under the terms of our research permit. This included taping off the nest in areas with human traffic, screening nests in areas of possible predation, spreading pepper powder to deter predators, or relocating nests that are vulnerable to erosion or being inundated by high tide. While HWF has identified 23 beaches of Maui as nesting habitat, priority was given to 14 beaches, primarily in South Maui, that are known to have had regular nesting hawksbills or green sea turtles in the past. These beaches were patrolled daily, when possible, whereas other beaches were patrolled at least weekly.

Hawksbill and green turtles can lay 5 - 7 nests in a season, typically returning to the same

beach. Once the first nest is confirmed, HWF staff and volunteers monitor the beach at interesting intervals when the female may return. On Maui, the mean interesting interval for a hawksbill is 19 days while greens are 14 days, with monitoring beginning at least 3 days prior to the mean interval to increase chances of locating the nesting female. This allows the team to directly observe nesting activity, tag, measure, and identify females, and mitigate disturbance or endangerment of nesting females by monitoring human activity on the beach at night. Nests are checked regularly during incubation for disturbance or erosion and monitored around the clock as the expected emergence date approaches. This human presence also creates opportunities to educate the public around the nests while preventing threats to the hatchlings including predation by invasive species, entanglement in vegetation and marine debris, disorientation, and desiccation.

All nesting and hatching activities are monitored and documented according to established protocols and in active consultation with DNLR and USFWS. Following the main emergence, nest excavation is planned and carried out with Hawai'i DLNR/DAR biologist Sierra Ondo with notification to USFWS representatives Bret Wolfe and James Yrigoyen. At a time designated by the research permit, typically 24-48 hours after the main emergence, the nest is excavated to recover dead hatchlings and rescue live hatchlings that were not able to emerge on their own. Live hatchlings found during excavations are allowed to acclimate in a bucket after rescue then released at the high tide line. Nest locations, hatchling numbers, times of activity, and behavior notes were collected in a field notebook, stored, and shared with the team via email and Google Drive.

**Personnel and Agency Coordination:** Hannah Bernard coordinated all activities with HWF's 2023 Turtle Team staff- Cherly King and Jessica Batista. Handling, observation, tagging and measurements were carried out by HWF in collaboration with agency personnel. Excavations were carried out by HWF in collaboration with Sierra Ondo with DNLR and James Yrigoyen with USFWS. HWF collected samples of dead hatchlings, empty shells, and unhatched eggs and transferred them to MOCMI to transport to NOAA/NMFS Marine Turtle Biology and Assessment Program in Honolulu. HWF notified and consulted with DNLR and USFWS representatives regarding nesting and monitoring activities via email, text, and phone calls as needed. Human interaction with sea turtles was minimized effectively throughout the season.

**Volunteer Involvement:** Formal volunteer training was conducted at the Keālia Pond National Wildlife Refuge Center beginning mid-May prior to the start of dawn patrol. Information included reviewing how to identify green and hawksbill sea turtle tracks, potential nest sites, and contact personnel. Additional in-person training was conducted by Hannah Bernard or a member of the Turtle Team for day and night nest watches upon arrival to the beaches and as the season progressed. Protocols and communications were distributed to volunteers via email. Volunteer participation was controlled, tracked, and managed using SignUp Genius. This application was used to confirm coverage of each dawn patrol and nest watch shifts and identify any gaps so that additional coverage could be provided.

Once a nest is identified and 24-hour nest watches begin, HWF staff accompany all volunteers throughout overnight camping shifts to ensure volunteer safety and to be present for nesting activity. Volunteers were also prepared for emergencies during the day watches and instructed to contact HWF staff if this occurred. Volunteers and members of the public present at excavations and emergencies received information on sea turtle life histories and our

responsibilities and practices. They were also instructed in the context of our work, to maintain space from the hatchlings especially as they reached the water, to turn off any lights and flash photography, and to not post the locations of nests to social media.

All volunteers are provided with dawn patrol and nesting protocols prior to starting their shifts to ensure all participants are aware of procedures, HWF contact information, and information for educational outreach. Volunteers were trained and managed by staff to stay dark and quiet on the beach and maintain appropriate distance from nesting females and hatchlings if there was activity.

**Additional Activity:** Beyond monitoring of nesting and hatching activity, the nesting project includes continuous protection of nesting habitat, including beach cleanups, fence repair, and dune restoration as necessary. During the offseason, HWF checks beach habitats, trains volunteers, and prepares the necessary permits, reports and gear for each nesting season.

## Results

**Volunteer Activity:** Approximately 293 volunteers contributed a total of 6,367 hours during the 2023 nesting season. Volunteer hours do not include commute time to sites and there were instances where additional volunteers showed up for both daytime and nighttime shifts that were not originally signed up.

HWF staff responded to all crawls, nesting, and hatchling reports. Dawn patrol volunteers regularly patrolled the nine known hawksbill nesting beaches in south Maui and five known green turtle nesting beaches in west Maui throughout the nesting season. Additional beaches in north Maui and south Maui were also patrolled occasionally, however west Maui patrols were suspended after the August 8<sup>th</sup> fire for the safety of volunteers and inability to access spans of beaches. Once nests were identified, overnight camping was conducted with a group of volunteers when the nesting female was expected to return so that nests could be located, and tagging could take place as needed. When hatchling emergence was expected, 24 hours shift watches occurred at each known nesting location in preparation for emergence.

**Nesting:** No nesting olive ridley or green sea turtles were reported or observed by HWF in 2023. A total of ten hawksbill nests were identified and monitored in 2023. Four hawksbill nests were confirmed on Palau‘ea Beach from a previously identified nesting female. Two nests were identified at Kawililipoa Beach Zone 2 and two nests at Kawililipoa Beach Zone 3 near Halama Street all by unknown female(s). Kapalua Bay had two nests from an unknown female, though the first nest was never located and was only known due to reports of hatchlings located at the beach reported by a visitor. The second nest was presumed and monitored, but only confirmed at the time of excavation.

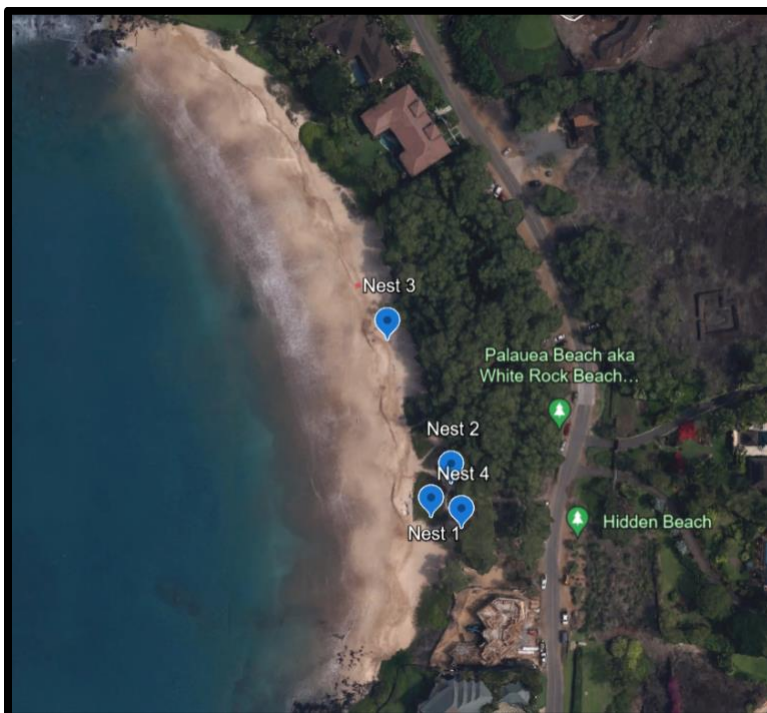


Figure 1. Hawksbill nesting activity at Palau'ea Beach in 2023. Four nests laid by Ole Pau (LFF PI2460) in Kihei. Image by Google Earth. The Google Earth satellite image displayed in Figure 1 was last taken on 4/3/13 resulting in slight discrepancies of topography. Nest 3 displays the nest laid in sand; however, the nest was laid in vegetation. Nest 1 = PalN1Ei; Nest 2 = PalN2Ei; Nest 3 = PalN2Ei; Nest 4 = PalN4Ei.

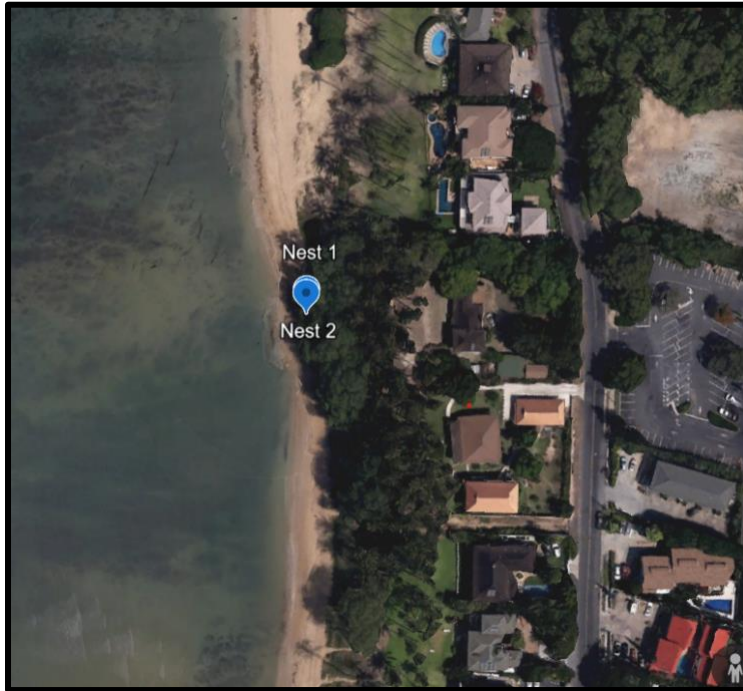


Figure 2. Hawksbill nesting activity at Kawililipoa Beach Zone 2 in 2023. Two nests laid by an unknown female observed at Kawililipoa Beach, Kihei Nest 1 = KawN1Ei ; Nest 2 = KawN2Ei. Image by Google Earth.

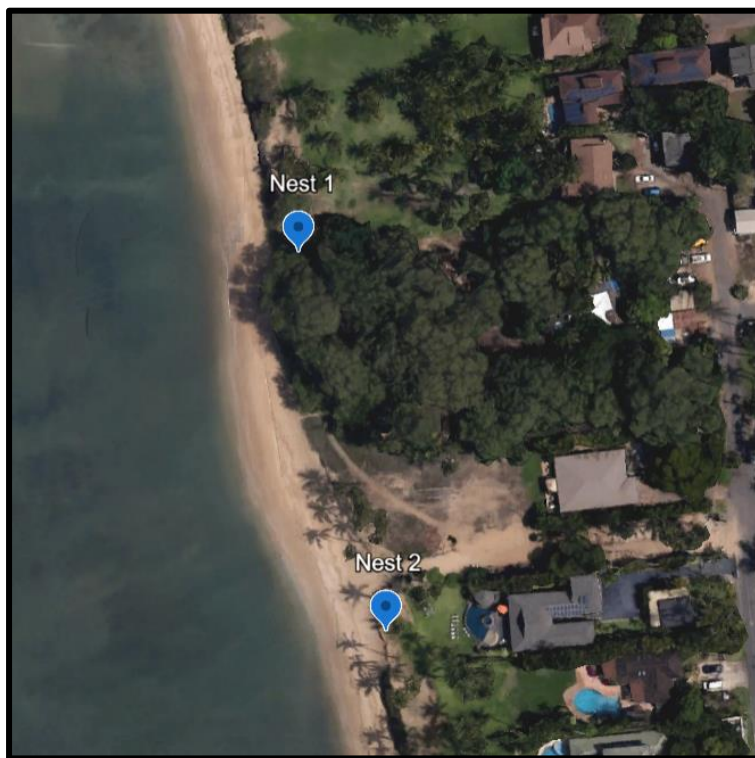


Figure 3. Hawksbill nesting activity at Kawililipoa Beach Zone 3 near Halama Street in 2023. Two nests laid by an unknown female observed south of Lipoa Street Beach, Kihei. Nest 1 = KawN3Ei ; Nest 2 = KawN4Ei. Image by Google Earth.



Figure 4. Hawksbill nesting activity at Kapalua Bay in 2023. One site (Nest 2 = KapN2Ei) was identified but the first nest (Nest KapN1Ei) was not found. Both nests laid by an unknown female at Kapalua Bay on the west side of Maui. Image by Google Earth. The Google Earth satellite image displayed in Figure 4 was taken before the seawall was removed in this image. See Figure 11 for before and after imagery of this site.

**Palau‘ea Beach:** Four nests at Palau‘ea Beach were laid by Ole Pau (LFF PI2460), a female HWF/NOAA tagged and attached a satellite transmitter to in 2018. The first nest of the season was identified by a dawn patroller who identified tracks on Palau‘ea Beach the morning of 6/13/23. The presumed nest was located and fenced off. Overnight patrols were conducted at the next expected interesting interval to track and locate additional nests laid by Ole Pau.

On 6/30/23, Ole Pau was spotted digging on the beach at 11:00 PM, ultimately resulting in a false crawl and her returning to the water around 11:10 PM. Overnight volunteers indicated the presence of bright lights, noise, and a large group of fishermen likely prompting the false crawl. The evening of 7/1/23, Ole Pau returned to Palau‘ea Beach at approximately 11PM and at 3:20AM on 7/2/23 she laid her second nest. HWF staff were able to verify Inconel and PIT tag of Ole Pau on 7/2/23 and document updated measurements shown in Tables 1 and 2. It was also discovered that the RFF tag was missing.

The third nest was laid on 7/18/23 but was not observed due to severe weather. Camping was canceled that night due to threats of hurricane Calvin which deteriorated into a tropical storm. Tracks were found by dawn patrol the morning of 7/19/23 and volunteers camped later that night to ascertain if the observed tracks were a false crawl. Since the turtle did not return, it was assumed nesting had occurred the night prior during the storm and the third nest was roped off.

On 8/4/23 Ole Pau laid her fourth nest in kiawe brush on Palau‘ea Beach. At 10:00PM

she was observed emerging from the water and at 10:36PM began digging before returning to the water at 1:00 AM. After Ole Pau laid her fourth nest, and in consultation with Alexander Gaos of PIFSC, HWF staff removed Ole Pau’s satellite transmitter that we originally attached in 2018 and replaced a missing flipper tag that was discovered on 7/2/23 (Table 1). Ole Pau was the only observed nesting female in the 2023 nesting season, and morphometrics were conducted (Table 2) after Nest PalN2Ei, and she was observed several times throughout the season (Table 3). No new nesting females were taken for handling, observation, tagging or measurements.

Table 1. Inconel and PIT tag numbers for Ole Pau, checked after nest PalN2Ei on 7/2/23. Missing PIT tag identified on 7/2/23 was replaced on 8/4/23 when Ole Pau’s fourth nest was laid (PalN4Ei).

Flipper	Tagged 7/4/2018	Inspected 7/2/23	Re-Tagged 8/4/23
RFF	PI2459	Missing	PI2461
LFF	PI2460	Present	n/a
LRF	98200019053926	Present	n/a
RRF	982000190552533	Present	n/a

Table 2. Measurements for Ole Pau, taken after Nest PalN2Ei on 7/2/23.

Measurement	cm
CCL	93.2
CCW	87
SCL	87.5
SCW	66.6

**Kawililipoa Beach:** This beach is separated into three zones. Two nests were laid in Kawililipoa Zone 2, and two nests were laid in Zone 3 near Halama Street, all by an unknown female(s). (It is possible all four nests were laid by the same female.) Nest 1 (KawN1Ei ) at Kawililipoa Zone 2 was found when the second nest (KawN2Ei) at Kawililipoa was located on 8/22/23. Volunteers and HWF staff assumed the location of Nest 2 (KawN2Ei) after finding indications of nesting activity along the vegetation line. When this nest was roped off, an evaluation of the site was conducted, and Nest 1 was located in proximity (less than 30 feet). Both nests were roped off at this time (Table 3).

Similarly, the first nest laid at Kawililipoa Zone 3 near Halama Street was located when HWF staff were roping off Nest KawN4Ei on 9/8/23. When HWF staff responded to reports of a crawl and potential nest, it was unknown at the time another nest had been laid previously. Beachgoers alerted HWF staff onsite of hatchlings that were spotted up the beach earlier in the day when staff were responding to Nest 2 (KawN4Ei). The first Halama Street nest was then located by tracking hatchlings emerging from the nest site. Nest KawN3Ei was found in vegetation and a mat of fallen trees causing challenges for emerging hatchlings (Table 3).

**Kapalua Bay:** A report of hatchlings spotted at Kapalua Bay on 8/5/23 was mentioned to a dawn patrol volunteer on 8/12/23 by beachgoers, indicating a nest (KapN1Ei) had emerged though was never observed or identified by HWF. Since the first nest was unable to be located, an excavation did not occur. The second hawksbill nest (KapN2Ei) was identified shortly after, although the nesting female was never observed, so the date laid remains unknown (Table 3).



All identified nests were peppered and roped off to protect the nests from predators, foot traffic, and human disturbance. No nests were screened as the actual epicenter was not known and can often interfere with emergence.

Table 3. Hawksbill nesting data for 2023 at Palau‘ea, Kawililipoa zone 2, Kawililipoa zone 3, and Kapalua Bay.

Date laid	Nest no.	Female	Beach	GPS points	Observed activity	Time
6/13/23	PalN1Ei	Ole Pau	Palau‘ea	N 20.669722 W -156.4425	Crawl found	6:00 AM
7/1/23	PalN2Ei	Ole Pau	Palau‘ea	N 20.669722 W-156.442778	Digging, False Crawl	11:00 PM
7/2/23	PalN2Ei	Ole Pau	Palau‘ea	N 20.67 W -156.4425	Emerging	11:00 PM
7/18/23	PalN3Ei	Ole Pau	Palau‘ea	N 20.670556 W-156.442778	Crawl found	Unknown
8/4/23	PalN4Ei	Ole Pau	Palau‘ea	N 20.669722 W -156.4425	Emerging Digging	10:00 PM 10:36PM
Unknown	KawN1Ei	Unknown	Kawililipoa Zone 2	N 20.749167 W-156.458611	Nest located while evaluating nest 2	Unknown
8/22/23	KawN2Ei	Unknown	Kawililipoa Zone 2	N 20.749167 W-156.458611	Crawl found	Unknown
Unknown	KawN3Ei	Unknown	Kawililipoa Zone 3	N 20.7444 W -156.458	Nest located while evaluating nest 2	Unknown
9/8/23	KawN4Ei	Unknown	Kawililipoa Zone 3	N 20.743333 W-156.457222	Crawl found	Unknown
Unknown	KapN1Ei	Unknown (likely June)	Kapalua Bay	Unknown	Hatchlings observed in water by visitor (video)	Unknown
Unknown	KapN2Ei	Unknown	Kapalua Bay	N 20.99870 W -156.66680	Nest located while evaluating hatchling report	Unknown

### Hatching:

24-hour nest watches occurred for all identified nests around the expected emergence date, incubation typically averages 60 days, so monitoring began just prior to ensure emergences were not missed. Predators were not found to be an issue for any of the observed emergences and no nests were disturbed throughout incubation, however feral cats, rats, and mongoose were sometimes seen in the area in addition to off-leash dogs. Ghost crabs are common predators for hatchlings as they make their way to the water and required constant vigilance with intervention and protection for hatchlings during emergences. Vegetation was another threat to hatchling survival (due to entanglement after hatching/emergence), since Palau‘ea and Kawililipoa Beaches have very little suitable habitat between the high tide line and vegetated areas.

As hatchlings emerged, HWF staff and volunteers filled in crab holes, divots and other obstructions to create a path of travel for the hatchlings. Seawater was poured over hot sand when emergences occurred during the day to prevent desiccation. A sand slope was created for Nest KawN4Ei to support hatchlings emerging on cliff edge (Fig. 7). Emergences at night or during cooler parts of the day did not require any intervention, only monitoring to ensure the

hatchlings crawled safely to the water. Hatchlings were only assisted, when necessary, in the event of disorientation, entanglement, or other imminent threats to their survival.

Table 4. Hawksbill nest emergence data for 2023 at Palau‘ea, Kawililipoa zone 2, Kawililipoa zone 3, and Kapalua Bay.

Date laid	Nest no.	Female	Beach	Date of first Activity	Date/Time of first emergence	# in first emergence
6/13/23	PalN1Ei	Ole Pau	Palau‘ea	8/9/23	8/10/23 4:56 AM	1
7/2/23	PalN2Ei	Ole Pau	Palau‘ea	8/28/23	8/28/23 11:00PM	Mass emergence Morning of 8/29
7/18/23	PalN3Ei	Ole Pau	Palau‘ea	9/12/23	Unknown	Unknown
8/4/23	PalN4Ei	Ole Pau	Palau‘ea	Unknown	Unknown	Unknown
Unknown	KawN1Ei	Unknown	Kawililipoa Zone 2	10/2/23	10/2/23 10PM-7 AM hatchling tracks were observed	Unknown
8/22/23	KawN2Ei	Unknown	Kawililipoa Zone 2	10/17/23	10/17/23 Many hatchling tracks observed at 5:45AM	Unknown
Unknown	KawN3Ei	Unknown	Kawililipoa Zone 3	9/8/23- Hatchlings observed by beachgoers	9/8/23 7:00 AM	Unknown
9/8/23	KawN4Ei	Unknown	Kawililipoa Zone 3	10/30/23	NA 6:33 PM	11
Unknown	KapN1Ei	Unknown	Kapalua	8/5/23	Unknown	Unknown
Unknown	KapN2Ei	Unknown	Kapalua	Unknown	Unknown	Unknown

### Excavations:

All excavations were completed after consulting with DLNR either first thing in the morning or in the evening with hatchlings released at sunset or after dark, to minimize the heat and crowds on the beach during the excavation and release. Nests were excavated 2–4 days after the first emergence and at least 24 hours after the main emergence, with exceptions on a case-by-case basis according to the nest conditions, pace of nest activity, and number of hatchlings emerged or expected in the nest. This allowed most hatchlings to emerge naturally on their own but rescued those that couldn’t to increase the success of each nest due to their critically endangered status. Hatchling emergences, excavation results, and overall hatching success varied widely between nests based on conditions (Tables 5 - 7).

Table 5. Excavation summary and hatching success for 2023 hawksbill nests at Palau‘ea, Kawililipoa zone 2, Kawililipoa zone 3, and Kapalua Bay.

Nest no. / Beach	Excavation Date/Time	Total Eggs	Empty Shells	Undeveloped	Dead Hatchlings	Pipped Dead	Pipped Live	Live in nest
PalN1Ei Palau‘ea	8/12/23 7:09 AM	209	187	11	6	11	0	29
PalN2Ei	8/30/23	201	183	6	3	12	0	19

Palau'ea	6:50 AM							
PalN3Ei Palau'ea	9/14/23 5:00 PM	225	202	16	9	7	0	24
PalN4Ei Palau'ea	10/2/23	208	126	69	4	11	2	101
KawN1Ei Zone 2	10/4/23 5:12PM	198	144	54	1	0	0	29
KawN2Ei Zone 2	10/19/23 7:13AM	184	116	58	3	9	1	45
KawN3Ei Zone 3	9/10/23 5:03PM	192	112	70	11	9	1	89
KawN4Ei Zone 3	11/3/23 5:34PM	185	115	56	4	14	0	40
KapN1Ei Kapalua	10/8/23 8:27AM	165	162	3	11	0	0	0
TOTAL		1767	1347	343	52	73	4	376
AVG.		196.3	149.67	38.11	5.78	8.11	0.45	41.8

Table 6. Hatching success and emergence success for 2023 hawksbill nests at Palau'ea, Kawililipoa zone 2, Kawililipoa zone 3, and Kapalua Bay.

Nest no. / Beach	Hatching Success %	Emergence Success %
PalN1Ei Palau'ea	89.47%	72.73%
PalN2Ei Palau'ea	91.04%	80.10%
PalN3Ei Palau'ea	89.78%	75.11%
PalN4Ei Palau'ea	60.58%	10.10%
KawN1Ei Zone 2	72.73%	57.58%
KawN2Ei Zone 2	63.04%	36.96%
KawN3Ei Zone 3	58.33%	6.25%
KawN4Ei Zone 3	62.16%	38.37%
KapN1Ei Kapalua	98.18%	91.52%
Average	77.48%	46.87%

Table 7. Total live hatchlings and average hatching success of each nesting site in 2023 on Maui.

Beach	Female	Total Live Hatchlings	Hatching Success Average	Emergence Success Average
Palau'ea	Ole Pau	678	82.73%	59.51%
Kawililipoa Zone 2	Unknown	257	67.85%	47.27%
Kawililipoa Zone 3	Unknown	213	60.25%	22.31%
Kapalua Bay	Unknown	151	98.2%	91.52%

GRAND TOTAL ALL NESTS		1299		
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## Conclusion

The 2023 nesting season resulted in over 1,299 hawksbill hatchlings returning to the ocean. One remigrant female was encountered several times during nesting on a south Maui beach (Palau‘ea), and her satellite transmitter that HWF had attached in 2018 was removed.

No other species of sea turtle are known to have nested on Maui during this season. Maui experienced a year of intense environmental conditions, including severe storms and historic wildfires (Lahaina Aug 8 and Kihei Aug 9) fueled by climate change. These climate related disasters resulted in a significant decline in visitors to the island over part of the nesting season which may have encouraged at least one new beach (Kapalua) to be added to known nesting beaches. After 27 years of monitoring, the first hawksbill nest was identified on west Maui at Kapalua Bay, west Maui. Kapalua Bay is a recovered beach that has undergone dune restoration including native planting by UHMC for several years <https://dlnr.hawaii.gov/wp-content/uploads/2021/04/D-1.pdf>. This example of recovery of a highly eroded dune being restored and then resulting in successful endangered sea turtle nesting habitat is an important milestone of success for dune restoration efforts on Maui. Restoration activities coupled with a reduction in human visitation and beach disturbance due to the Lahaina wildfire on Aug 8 could have resulted in a more successful habitat for nesting.

Beach habitat in south Maui continues to experience episodic erosion with one nest laid on a severely undercut dune. The successful nest at Kapalua serves as an example of the value of restoring beach dune habitat for nesting turtles, and we support the expansion of these efforts to known nesting beaches.

No predators disturbed any of the known nests which could be a result of the pepper powder placed to deter them, coupled with human presence near hatching dates.

However, all nesting beaches contain human or natural impacts that cause challenges for hatchlings to overcome to ensure their survival. Our team of volunteers and staff are essential in the success rate for these critically endangered hawksbill hatchlings and green hatchlings. HWF has been able to manage this program for 27 years through the committed staff, countless volunteers, and supportive partners that allow the project to continue. Volunteers contributed 6,367 hours for the 2023 season, up from approximately 2,000 hours the previous season that saw significant reductions in volunteers due to COVID-19. HWF continues to recruit new interns and volunteers and pursue additional funding sources for next season to prepare, monitor, and preserve habitat and hatchlings for the critically endangered hawksbill and green sea turtle populations. With community awareness, new and remigrating females, and increased hatchling success, the hawksbill population is at least holding ground on Maui.

Since the beginning of systematic nest monitoring on Maui in 1996, hawksbill nesting numbers have remained low compared with Hawai‘i Island. Green nesting, though far less common in the Main Hawaiian Islands than French Frigate Shoals, does still occur on Maui. Range of nesting activity on Maui for hawksbill nesting = 0-4 nesting females and 0-12 nests annually with 21 known nesting years since 1996. Green turtle nesting on Maui is less frequent with 2022 adding the 7th known nesting year since 1996 and ranging from 0-3 nesting mothers and 0-5 nests per year. There were no known green sea turtle nests for the 2023 nesting season.

Education about the nesting habitat of sea turtles on Maui is essential. HWF has developed strong relationships with the local community and visitors through education and

outreach. HWF has educated numerous individuals on environmental stressors, habitat encroachment, and human threats to sea turtle populations while building public understanding of sea turtle conservation efforts and goals. Additionally, the Hawai'i Wildlife Discovery Center highlights HWF's work in protecting native flora and fauna through fieldwork, education, marine debris removal, conservation, and research. Since its opening in late 2021, more than 55,000 people have visited the Hawai'i Wildlife Discovery Center, which hosts numerous exhibits and videos on Hawai'i's sea turtles and other species. HWF continues to foster invaluable connections with agencies and communities, refine research protocols, collect species-specific data, and prove the value of the organization's collective experience and the work of the Hawksbill Recovery Project. These efforts continue to protect these females and their nests we will continue to strive for an increase in successful hatchlings and newly mature females coming to nest.

## Photo Documentation of Permitted Activities

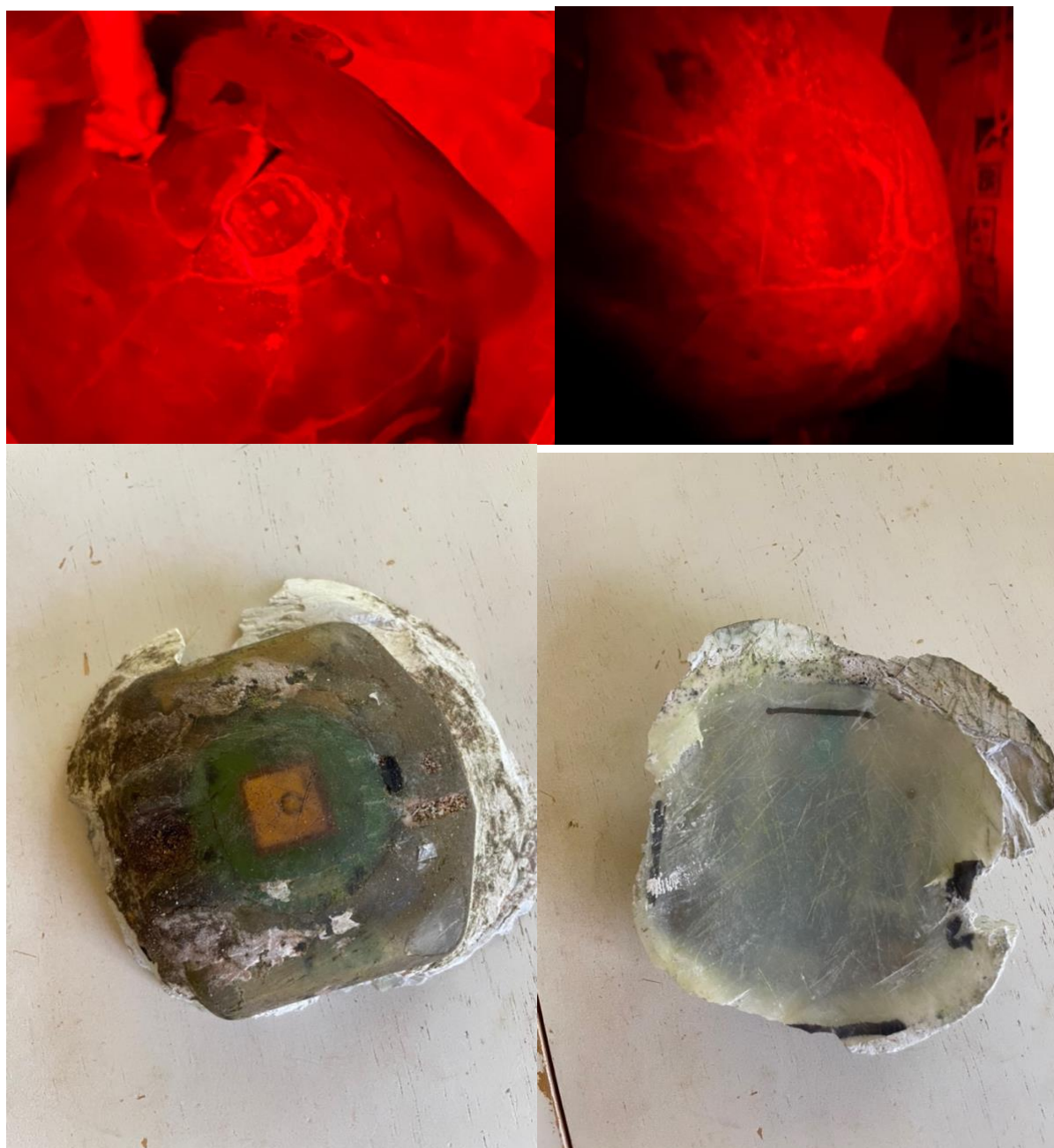


Figure 5. Satellite transmitter removed from carapace of Ole Pau 8/4/23, five years after attachment. Transmitter removal with flat spatula, top left. Carapace after transmitter removal, top right. Transmitter top view, bottom left. Transmitter, ventral view, bottom right. The transmitter was shipped to NOAA/PIFSC.



Figure 6. Second nest (KawN4Ei) at Kawililipoa Zone 3 (Halama Street) laid on severely eroded dune. The female was able to access site from a lower slope nearby.



Figure 7. Sand slope prepared at second nest (KawN4Ei) to support the emergence of hatchlings.

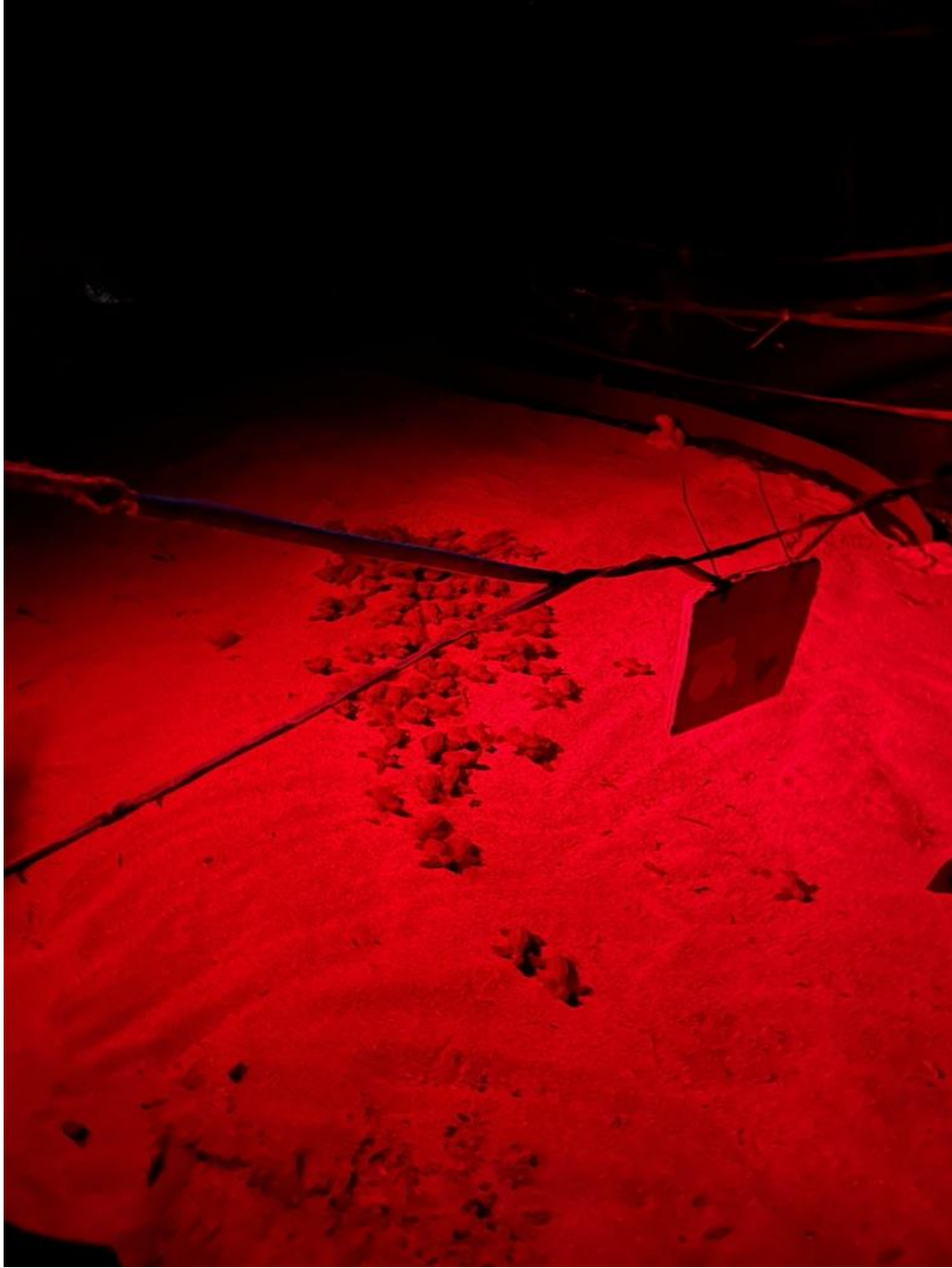


Figure 8. Mass emergence of hawksbill hatchlings from Nest PalN2Ei 8/28/23.





Figure 9. Top photo: Some of HWF core Turtle Team staff and volunteers after nest excavation on Palau‘ea Beach south Maui. Bottom photo: Core Turtle Team staff Magdalena Teritua Cary and Cheryl King oversee HWF interns and local youth at excavation of Nest PalN1Ei on 8/12/24.



Figure 10. Kapalua Nest KapN2Ei emergence pit. First documented turtle nesting at Kapalua Bay, west Maui. Nest laid on the edge of vegetation line in a recovered dune habitat. Native pohinahina (*Vitex rotundifolia*) planted by UHMC to support dune restoration efforts.

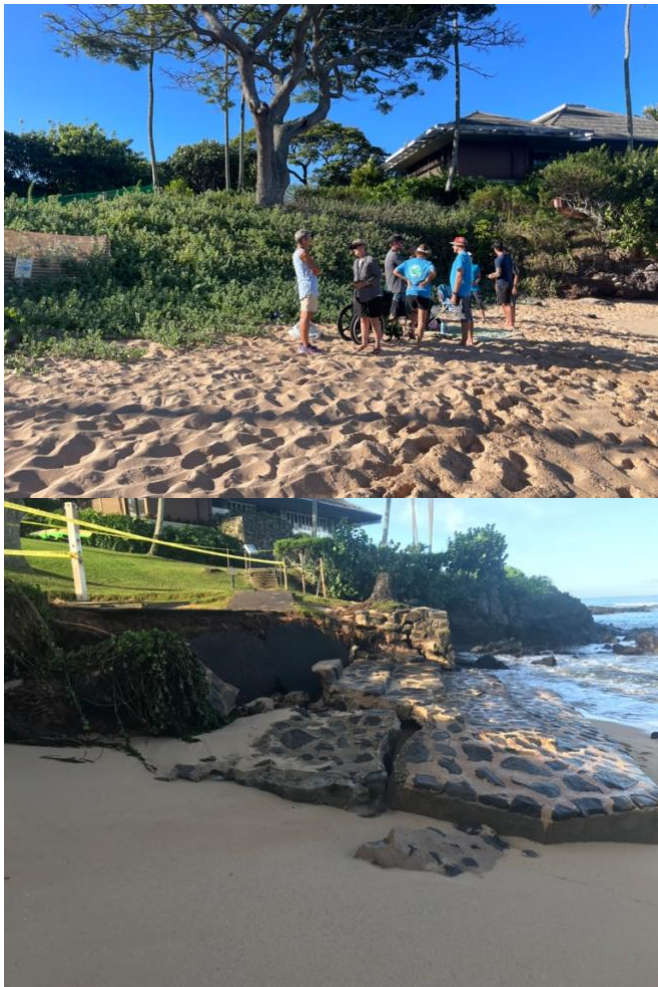


Figure 11. Before and after imagery of Kapalua Beach. Top photo: HWF volunteers standing in front of Nest KapN2Ei after excavation 9/8/23. Bottom photo: same site before seawall and cement stairs were removed from the beach to restore dune habitat. See <https://dlnr.hawaii.gov/wp-content/uploads/2021/04/D-1.pdf>.