Annual Activities Report for 2017

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 **TE829250-9**
Hawai'i Department of Land & Natural Resources Permit **SAP 2017(45)/2018(56)**

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Introduction

The Hawaiian Islands contain one of the smallest and most isolated populations of hawksbill sea turtle (*Eretmochelys* imbricata) in the world. Little was known of this critically endangered population before the nesting conservation program began on Hawai'i Island in 1989. Although most hawksbill nesting in the archipelago occurs there, a nesting hawksbill was first documented at Kealia Beach on Maui in 1991. Two nesting hawksbills were killed on the nearby highway in following years, leading to the involvement of Hawai‘i Wildlife Fund (HWF) in the Hawksbill Recovery Project in 1996, in collaboration with the National Marine Fisheries Service (NMFS) and Hawai‘i Department of Land and Natural Resources Division of Aquatic Resources (DLNR/DAR) with the U. S. Fish and Wildlife Service (USFWS). This project aligns with the NMFS/USFWS Hawksbill Recovery Plan of 1998 to continue efforts to monitor, research, and protect hawksbill sea turtles in their nesting and marine habitats, involve and educate the community about the threats and status of sea turtles, and collect and share data for informed management decisions. While HWF monitoring activities originally focused on hawksbills, they now also include occasional green sea turtle (*Chelonia mydas*) nests on the North Shore of Maui and the possibility of olive ridley (*Lepidochelys olivacea*) nesting.

Since HWF began monitoring in 1996, ten nesting hawksbills have been tagged on Maui and 99 nests have been protected, resulting in around 9000 successful hatchlings reaching the ocean. Although only a few hawksbills may nest on Maui each year, this contribution is still critical for the isolated Hawaiian population of hawksbills, with an average of 20-25 known nesting females per year in the state. HWF has also collaborated with NMFS in satellite tracking nesting females to their foraging grounds around Hawai‘i Island, Maui, O‘ahu, Moloka‘i, Kaua‘i, and off Johnston Atoll. In addition to satellite tracking, in-water surveys and photo-identification have contributed to records of over 100 hawksbills across the state, identifying movement patterns and important foraging grounds. HWF involves and educates thousands of individuals around Maui each year, from local residents to international tourists, removing threats to sea turtles and preventing harmful human behavior, while building public understanding about hawksbill and environmental conservation. HWF has built invaluable connections with agencies and communities, refined research protocols, collected data and knowledge of individual turtles and their locations, and proved the value of their experience and the work of the Hawksbill Recovery Project for years to come.

Methods

Nest Monitoring: HWF monitors most sea turtle nesting activity that occurs on Maui, including possible hawksbill, green, and olive ridley sea turtle nests. Green turtles that nest in west Maui are monitored by DLNR/DAR and hawksbills nesting in east Maui are not actively monitored, although HWF responds to opportunistic reports from this area. Olive ridleys do not typically nest on Maui, but may be monitored by HWF under the terms of this permit. Dawn patrols are organized in collaboration with a USFWS volunteer team to check Maui nesting beaches for fresh turtle activity every morning during nesting season. When tracks are found by volunteers or reported by the public in any location, HWF staff confirms and protects the nest in consultation with our agency contacts and under the terms of our research permits. This can include 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 in danger of being inundated by high tide.

After the first nest of the season is confirmed, HWF staff and volunteers monitor the beach at nesting intervals when the female may return. 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 24/7 around the expected emergence date. This creates opportunities to educate the public around the nests and while preventing threats to the hatchlings, including predation by invasive species, entanglement in vegetation and marine debris, disorientation, and desiccation. Following the main emergence, nest excavation is planned and carried out with Hawai'i DLNR/DAR biologist Skippy Hau and USFWS representative Courtney Brown. Throughout the season, all participating volunteers are trained for possible scenarios and proper behavior at the nest and provided with brochures and information to distribute to the public. All nesting and hatching activities are monitored and documented according to established protocols and in active consultation with USFWS.

Personnel and Agency Coordination: HWF staff involved this season included authorized individuals Hannah Bernard, Suzanne Canja, and Luke Sundquist, partnering with Skippy Hau and Courtney Brown. HWF also consulted and worked with Jon Sprague, Bill O'Neill, and Michelle Bogardus of USFWS for specific scenarios and responses, including a nest relocation during the season. Nesting female handling and observation, including tagging and measurements, was carried out by HWF staff after nesting or as females returned to the water, using red light only when necessary. Hatchlings were observed and protected during their emergence and crawl, and transported to the high tide line using gloves or buckets if they became stranded, disoriented, or were at risk of desiccation. Excavations were carried out in collaboration with Courtney Brown and Skippy Hau, who collected and sent samples of dead hatchlings and unhatched eggs NOAA/NMFS/PISC in Honolulu. Live hatchlings found during excavations were allowed to acclimate on the sand after rescue from the nest, then released at the high tide line. All data including carapace measurements, tag numbers, nest locations, hatchling numbers, times of activity, and behavior notes were collected in the field notebook, then checked, stored, and shared with the team via email and Google Drive. HWF staff remained in contact with Courtney Brown, Skippy Hau, and Dawn Patrol Coordinator Rick Long using a text group to update on nesting activity and plan excavations, and consulted USFWS representatives via email, text, and phone calls when appropriate. Human interaction with sea turtles was minimized effectively throughout the season.

Volunteer Involvement: HWF staff was present with volunteers every night that nesting or hatching activity was expected. Volunteers were trained and managed by staff to stay dark and quiet on the beach and maintain distance from nesting females during any activity. Volunteers were also prepared for emergences during the day watches, and in ready contact with HWF staff when any activity occurred. All volunteers received protocols for nesting patrols and nest watch and had access to additional hawksbill information to release to the public. Volunteers and members of the public present at excavations and emergences received explanations of sea turtle life histories and our responsibilities and practices. They were also instructed 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 and protected species to social media.

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 and gear for each nesting season.

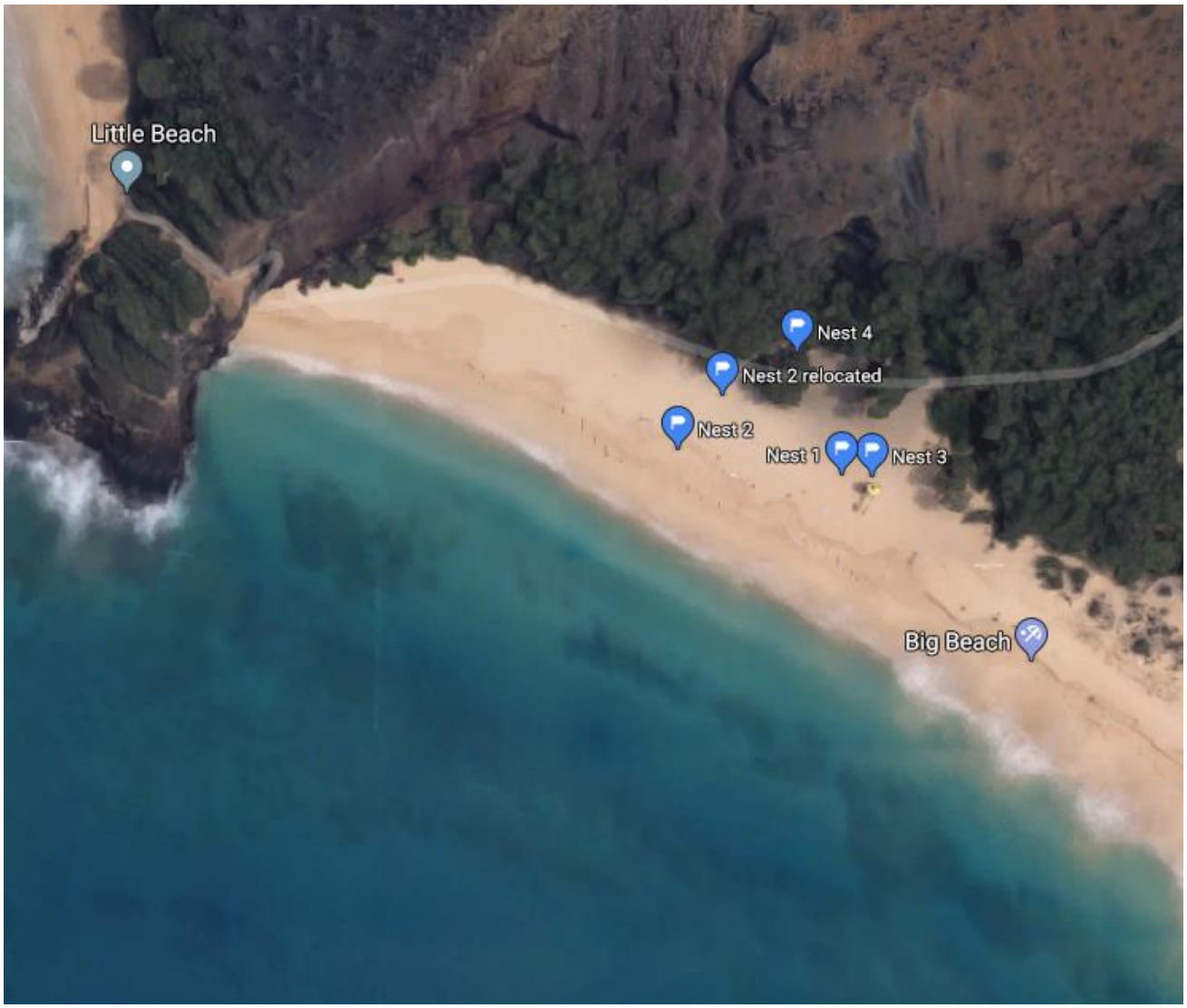

Figure 1. Nesting Activity in 2017. All activity by hawksbill sea turtle "Kāloa Pau" (PI2453), on the north end Oneloa Beach in Makena State Park. Image by Google.

Table 1. Date and GPS coordinates for all 2017 nesting activity.

Nest	Date	GPS point
Nest 1	6/19/17	20.63345, -156.44925
Nest 2	7/7/17	20.63353, -156.44980
Nest 3	7/23/17	20.63344, -156.44916
Nest 4	8/9/17	20.63374, -156.44941
Nest 2 Relocated	8/18/17	20.63370, -156.44965

Results

No nesting green sea turtles or olive ridley sea turtles were reported or observed. Volunteers patrolled known hawksbill nesting beaches throughout the season, while HWF staff responded to all crawls and nesting reports. Four hawksbill nests from one female were found on Oneloa Beach in 2017 (Figure 1, Table 1–2). The first nest was discovered and reported by the USFWS dawn patrol team on June 20 (Figure 2). This nest was confirmed to be a hawksbill nest and HWF staff and volunteers monitored the beach for the return of the female. She was observed nesting a second time on July 7th and was confirmed as a new female with no tags. During her third nesting event on July 23rd, she was measured and tagged with two Inconel and two PIT tags (Tables 3–4). No satellite tags were used this year. Her fourth nesting event was also observed on August 8th. Although nest 2 was not at risk of inundation when it was laid on July 7th, it had to be relocated on August 18th to 20 meters away from to high tide line (new GPS 20.63370, -156.44965) due to erosion from storm surges and king tides. This relocation was conducted with USFWS staff after monitoring erosion daily and consulting on the best course of action. The scarp had reached within 31 inches of the eggs and the entire bank was completely washed out the next day (Figures 3–5). Although patrols were conducted, this female was not observed for a 5th nest, and no other green or hawksbill nests were seen or reported on Maui in 2017. The nesting hawksbill female was named "Kāloa Pau" according to the Hawaiian moon calendar name for the night of her first nest.

Table 2. Nesting data for 2017, all nests laid by Kāloa Pau on Oneloa Beach.

Date	spotted	time seen	digging	laying	covering	crawling	in water	GPS point
6/19/17	not seen							20.63345, -156.44925
7/7/17	laying	2:35			2:45	3:10	3:12	20.63353, -156.44980
7/23/17	crawling	22:05	22:15	22:40	23:09	23:30	23:50	20.63344, -156.44916
8/9/17	crawling	2:00	2:35	3:15	3:58	4:18	4:36	20.63374, -156.44941

Table 3. Measurements for Kāloa Pau, taken after nest 3 on July 23rd, 2017.

CCL notch min	95.2
CCL notch max	97.2
CCW	88.7
SCL notch min	87.4
SCL notch max	89.6
SCW	68.8

Table 4. Tags for Kāloa Pau, applied after nest 3 on July 23rd, 2017.

RFF	PI2453 (inconel)
LFF	PI2452 (inconel)
RRF	982.000190656870 (PIT)
LRF	982.000190556713 (PIT)

All four nests were marked the day after nesting and monitored 24/7 around the expected emergence date (Figure 6). Over 130 individuals volunteered for nest watch this year for over 3500 hours. Each nested was treated with pepper powder (*Capiscum chinense)* on the surface of the sand after nesting to prevent predation. Nest 4 was also screened, as it was closer to the vegetation and considered at a higher risk for mammalian predation. While

nests were not visibly disturbed by any predators, ghost crabs were a common threat to hatchlings as they made their crawl. Multiple hatchlings were rescued from the grasp and burrows of crabs and released at the high tide line. Vegetation did not present as much of a challenge this season as last year, since all 4 nests were in open sand environments. Nest 4 was in hard packed substrate under a tree and sticks and debris had to be cleared from the area. Nest 3 was laid under the lifeguard stand, but this did not present any issues to the hatchlings and monitoring was conducted with the support of the lifeguards.

As hatchlings emerged, holes and crab burrows were filled in and any people and obstructions on the beach were moved to create an open path from the nest to the water. Staff and volunteers also prevented human disturbance at the nest by educating fisherman and recreational beach users about threats to sea turtles, especially the impacts of noise and light at night. Hatchlings were only assisted when necessary in the event of disorientation, entanglement, or other imminent threats to their survival. Emergences at night or during cooler parts of the day often did not require any intervention, only watching to ensure the hatchlings crawled safely to the water. However, several groups and lone hatchlings emerged during the day again this year and required relocation to the high tide line to prevent desiccation. One hatchling from nest 3 emerged alone around 11am but was missed by volunteers and expired on the beach 10 feet from the nest, confirming the necessity of intervention during other high temperature emergences.

Excavations were conducted with USF&W and DNLR partners between 7 and 8 am, 2 to 4 days after the initial emergence depending on hatchling emergences and nest conditions (Figures 7-11). Nest 2 was excavated 48 hours after the depression was observed to release trapped hatchlings since none had been able to emerge naturally, possibly due to complications from water damage and the relocation process. 90 unhatched eggs were collected during excavations, distributed throughout each of the four nests. 36 hatchlings were found dead in the nest, leading to discussion of when the best time frame is to excavate. 11 hatchlings were still absorbing their yolk sacks and were kept in a dark moist environment for 12–36 hours until they were ready to be released, with consultation from Skippy Hau. Nest 2 had the lowest survival (51.7%) with a high portion of pipped dead hatchlings, as has been observed in literature for relocated nests. Nest 4 also had a decreased survival (64.7%), possibly due to its hard packed and rocky substrate under the tree. 205 total hatchlings were released from the four excavations, contributing to the total of approximately 649 successful hatchlings into the water from 907 eggs, or 71.6% success (Tables 5–6). No sea turtles were harmed or killed by activities conducted under this permit.

Table 5. Emergence data for 2017, all nests on Oneloa Beach.

Date laid	Date of first activity	depression	visible hatchling	emergence	reach water	# hatchlings	# in later emergences
6/19/17	8/17/17	21:15	22:20	22:26	22:40-22:55	~110	8/17 (45) 8/18 (18)
7/7/17	8/29/17	<12:00	N/A	N/A	N/A	N/A	NA
7/23/17	9/21/17	20:30	22:37	22:35	23:15-23:25	3	9/22 (217) 9/23 (3)
8/9/17	10/1/17	<20:30	21:45	0:10	0:40-1:20	~30	10/2 (6) 10/3 (13) 10/4 (24) 10/5 (1)

Table 6. Excavation data and final hatchling success for 2017.

excavation	total eggs	empty shells	unhatched	dead in nest	pipped dead	pipped live	live in nest	total hatchlings	success %
8/20/17 8:00	223	186	34	3	2	1	3	184	0.82511211
9/1/17 8:00	232	122	29	2	81	0	121	120	0.51724138
9/24/17 7:00	231	218	9	16	4	0	12	202	0.87445887
10/5/17 7:30	221	158	18	15	48	1	69	143	0.64705882
TOTALS	**907**	**684**	**90**	**36**	**135**	**2**	**205**	**649**	**0.7159678**

Photo Documentation of Nesting Activities

Figure 2. Hawksbill track and nest 1 on Oneloa Beach, June 20th, 2017.

Figure 3. Erosion and scarp at nest 2, August 14, 2017.

Figure 4. Erosion and scarp at the edge of nest 2 just four days later, August 18th.

Figure 5. Relocation of nest 2, back 20 meters from high tide line, August 18th.

Figure 6. HWF staff and volunteers monitoring nest 4, September 2nd.

Figure 7. Part of the Maui Hawksbill Team, Luke Sundquist and Suzanne Canja of HWF and Bill O'Neill and Courtney Brown of USF&W talk to the public as they prepare for the excavation of nest 1, August 20th.

Figure 8. Luke Sundquist and Bill O'Neill measure the depth after reaching the top of nest 1, August 20th.

Figure 9. Luke Sundquist and Skippy Hau prepare hatchling for release during the excavation of nest 4, October 5th.

Figure 10. Hatchlings are released at the high tide line after the completed excavation of nest 4, October 5th.

Figure 11. Released hatchlings begin to reach the ocean, October 5th.

Conclusion

Hawksbill nesting numbers on Maui have remained low since monitoring began in 1996. Each year is extremely variable, ranging from 0–4 females and 0–15 nests per year. Nesting activity has been observed on 6 different nesting beaches on the south coast of Maui, including a new beach identified in 2015. 2016 and 2017 both included observations of only 1 nesting female on Oneloa Beach, a remigrant in 2016 and this new female in 2017. The nesting beaches are spread along nearly 15 miles of coastline, with each nest posing unique challenges to volunteers and threats to nesting females and hatchlings.

Oneloa Beach, also known as Big Beach at Makena State Park, is one of the best-maintained and protected nesting habitats of this coast. However, threats there still include invasive mammalian predators, ghost crab, human beach modification, lights of fisherman and illegal campers, impacted sand, natural and artificial debris, invasive vegetation, and changing temperatures and tide patterns. All of these risks may be encountered and mitigated by HWF staff and volunteers throughout the year. Without their protection and intervention, including the nest relocation, excavations, and protection on the beach, hatchling production may have been as low as half of the impressive total of 649 hatchlings and 71.6% success.

Other nesting beaches have even more pressing issues. The highway traffic, lights, and beach erosion at Kealia have led to the disorientation and death of multiple females and clutches in the past. While dune restoration and the turtle fence exist to address these issues, they require yearly maintenance and can never totally remove the danger. Some suitable habitats are rapidly disappearing under a dangerous combination of beach erosion and invasive vegetation, including the nesting beach at Kawililipoa. These changes can make nesting and hatching nearly impossible, leading to false crawls and failed nesting attempts or necessitating rescue for nests and hatchlings trapped in the roots. Almost the entire stretch of coastline has some degree of human traffic and predator presence, requiring protection for every nest. As development continues to spread, risk of artificial light, pollution, and suitable habitat loss increases as well.

Fortunately, many of these problems can be solved through preparation and protection by dedicated staff and volunteers. Rick Long and USFWS coordinated dawn patrols by over 100 volunteers that discovered the first nest of this season and monitored other nesting beaches. Hundreds of HWF volunteers dedicate thousands of hours each year to nest watch. Their diligence in 2017 ensured that we encountered the only known nesting female, protected each of her nests and emergences, and gave each hatchling the greatest chance of survival. Skippy Hau and Courtney Brown conducted excavations and nest screenings with HWF, Jon Sprague, Bill O'Neill, and Michelle Bogardus consulted on monitoring activities and completed the excavation, Larry Pacheco and Justin Kikiwi supported our camping permits and activities in the state park, and so many others contributed their time and efforts towards protecting this species.

We advise to continue the ongoing communication and collaboration between Hawai‘i Wildlife Fund, Hawai‘i Department of Land and Natural Resources Division of Aquatic Resources, U.S. Fish and Wildlife Service, and our community of volunteers. We will continue to share our data and plans, collaborating with our partners and communicating as nesting events occur through text and email. We hope to continue to discuss scenarios and responses with USFWS to work towards a “best practices” document as discussed this season. It can be difficult to predict or imagine what threats will arise during each hatching event, so this will remove confusion and allow HWF staff to clearly know and direct their responses during the season. Excavations timing and planning should also be addressed before next season to prevent the confusion and conflict that arose from different opinions and historical practices this year.

Each nest should be marked, peppered, and screened against predation as needed as soon as possible due to extensive mongoose presence and other mammalian predators along the coast. Screens will be removed when 24/7 watch begins before the expected emergence date. Since this is a low density nesting population in a highly developed area, other threats will need to be addressed as they arise. Specific nests and areas may require short term or long term solutions, including monitoring foot or vehicle traffic, erecting barriers between nests and roads or potentially hazardous areas, and dimming or covering lights close to nests on a case by case basis. The dunes and fence along Kealia require regular attention and repair before nesting season begins. HWF assisted USFWS in preparing the fence and beach for nesting in 2017 and will remain committed to ensuring safety on that nesting beach.

HWF will also continue its hawksbill education programming through social media, special events, distributing information, and answering questions during excavations and nest watches. This allows us to address potential anthropogenic threats, build the understanding of hawksbills and awareness of their recovery program in the community, and recruit new volunteers. HWF is continuing to recruit new volunteers and pursue additional funding sources for 2018 in order to prepare, monitor, and preserve habitat and hatchlings for the critically endangered hawksbill sea turtle population. With new females in 2015 and 2017, consistently remigrating females like Orion in 2016, and high hatching success, this small nesting population remains resilient. Hawksbills’ high age at maturity and low survival rate necessitate continual research and protection for their gradual recovery. Hawai‘i Wildlife Fund and all the Hawksbill Recovery Project Partners around Hawai‘i must continue their work for the survival of the species.