2006 Report on Maui's Hawksbill Sea Turtle Activities

USFWS Permit TE-829250-4

Trapped hatchling in roots of dune vegetation

Hawai'i Hawksbill Recovery Project

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Introduction

In the Pacific, little is known about the abundance and distribution of critically endangered hawksbill sea turtles (*Eretmochelys imbricata*). Within the Hawaiian Archipelago, hawksbills predominately nest on Hawai'i Island. Lower numbers are also known to nest on the islands of Maui, Moloka'i and O'ahu, with a statewide estimate thought to be at least fifty reproductive females with only 6-20 of these nesting each year. Hawksbill nesting activities were first documented on Maui in 1991 at Kealia. Hawai'i Wildlife Fund organized a community-based effort to systematically monitor these occurrences in 1996 after a passing car killed a second gravid female when she wandered onto North Kihei Road, either seeking suitable nesting habitat or disoriented by headlights.

The primary objectives of this research are to identify individual nesting hawksbill turtles, determine sizes of these females, the sites they use for nesting, the internesting intervals, the number of nests laid in a season by each female, to relocate nests that may be threatened by tidal flooding, and to attach transmitters to post-nesting females to track them to their long-term foraging/resting areas. During the course of this research, nesting females, nests and hatchlings are protected against dangers caused by human disturbance, coastal lighting, non-native vegetation, predators, and vehicular traffic.

Methods

Nesting season can begin as early as mid-May, with hatching events stretching into December. During these months, the Dawn Patrol, a community group of approximately 30 volunteers, walks Maui's three known nesting beaches (Kealia, Kawililipoa and Oneloa) early each morning looking for evidence of nesting. Once this has been discovered, a phone tree is activated to advise the Department of Land and Natural Resources Division of Aquatic Resources (DLNR DAR), the United States Fish and Wildlife Service (USFWS), and the Hawai'i Wildlife Fund (HWF). Each subsequent nesting and hatching event is intensely monitored by HWF. This typically entails all-night vigils waiting for the females to nest successfully, and guarding the nests during the course of hatching to ensure each hatchling reaches the ocean safely. Three days after the first major emergence of each nest, the nest is excavated to release any trapped hatchlings and to determine overall nest success.

The real concern, as it has been every season, was that turtles would crawl onto North Kihei Road and get run over again by passing vehicles. The dune fence that is supposed to keep turtles off the road was not completely replaced (as it still desperately needs to be), and the newest areas already had large missing pieces in which a turtle could easily have crawled through and reached the road. Since this land is Alexander and Baldwin's, the only action that HWF could take was to try to repair the fence as much as

possible. We are still awaiting an agreement with USFWS Kealia National Wildlife Refuge and A&B to erect a permanent fence made from recycled plastic.

Activities under this permit in 2006 were conducted only on the island of Maui, where a single hawksbill utilized Kawililipoa Beach for four nests. Kawililipoa is located in central Kihei, behind Azeka's Marketplace. It is primarily a residential neighborhood with the VFW Hall marking the northernmost end and the Leilani Kai Resort marking the southernmost end of where known nesting has occurred. Thirteen nests have been documented in the 1997, 1998 and 1999 seasons, and due to their success one nest from Kealia Beach was relocated here in 2005 (Fig 1). This stretch of coastline is State Beach Reserve Land, so the structures are set back from the shoreline by ~50 yds. The actual property lines are unclear though, as all residents have finely groomed and maintained these parcels out to the beach as if they were their own. There is a large remnant fishpond that protrudes from the shoreline fronting the VFW, and the nearshore reef is very shallow up to 100 yds offshore. The shorebreak is usually very weak, and invasive algae tend to pile up on the shore.

Results & Discussion

The Dawn Patrol first discovered tracks from the evening of June 21st at Kawililipoa, and it was confirmed to be a nest. Ironically, this location was <2 ft away from where the 2005 Kealia nest was relocated to. Nineteen nights later she made one false crawl just to the north of the first nest. Through the tall torpedo grass on one property, she crawled to another property that had short but thick manicured grass. She spent nearly two hours wandering around and attempting to dig in a few different places, but the grass was too thick. The very next night she returned to nearly the same area, but this time stopped right at the top of the dune where the grass started. We watched her through a night vision scope, and it took her nearly an hour just to dig her egg chamber through the roots. While she was laying her eggs, Cheryl King approached her and read her left and right front flipper tags: H330 & H331.

This is the third hawksbill known to return to Maui in a subsequent year to nest since the establishment of Hawai'i Wildlife Fund's Hawksbill Recovery Project and the associated tagging that began in 1997. This hawksbill, named "*Hōkūlele*" (shooting star or meteor in Hawaiian), was not seen since 1999, which would equate to a seven-year remigration interval. She laid 5 nests in 1999 and 4 this season, with 1 "false crawl" both years. Her first nest that was found was laid on June 29th in 1999, compared to June 21st this season. Her internesting intervals in 2000 were 19, 20, 21, and 22 days, and 20, 18 and 19 days this season. Her curved carapace length (CCL) measurements increased from 89 cm to 90.7 cm. Her curved carapace width (CCW) measurements increased from 82.7 cm in 1999 to 84.3 cm in 2006. Her straight carapace length and width (SCL and SCW) measurements were taken for the first time this season: 86.5 and 67.1 cm. Her metal flipper tags were secure and in good condition. No signs of fibropapillomatosis or external injuries were detected.

Movements

No tracking research was conducted in 2006. In 1999 she was equipped with VHF radio and satellite transmitters, and while her internesting location was not discovered, her post-nesting location was determined to be offshore of Pelekunu Valley, Moloka'i (Fig 2.).

Nest Success

HWF permittees and volunteers conducted nightly vigils at each of her four nest locations from day 53, 54 or 55 until they were excavated. Mid-morning and late afternoon watches were also conducted as much as possible in case hatchlings emerged at these times. Even this coverage wasn't enough though. Two hatchlings, from two different nests, emerged some time in the middle of the day and died of dehydration when they became entangled in vegetation. It was demonstrated upon emergence by every hatchling that they were unable to crawl through the non-native and native grasses to get to the sea. Once they were taken over the berm of vegetation, they were able to make it to the water unless they encountered piles of invasive algae. Again, they had to be assisted and the area cleared. Large crab holes and footprints were also a concern, and they were filled in.

Beachfront lighting was also an issue, as hatchlings find the sea by orienting away from tall dark silhouettes and towards the brighter, open horizon. Hatchlings were confused when lights from nearby houses (mostly interior) and the Leilani Kai Resort were on, in combination with the streetlights. New property owners, to increase their ocean views, illegally cleared large, fallen trees on the State Beach Reserve Land that had once blocked these lights from being seen from the beach. Three hatchlings, from nests one, two and four that must have emerged before our nest watches began, were found dead inland of the nests. This implies that lights along nearly the whole stretch of beach were bright enough to cause misorientation. The slopes that these hatchlings had to crawl over to get to the ocean may have confounded the confusion, as these large dunes became tall dark silhouettes.

HWF retrofitted the lights from this neighborhood in 2003. The most drastic improvement was made to the Leilani Kai Resort, which had been brightly lighting the whole lawn (which is State Beach Reserve Land) extending out onto the beach. Our changes, funded by a USFWS grant, greatly minimized their wattage and pointed fixtures downward, towards their building only. The lawn and beach were no longer illuminated. The success of this retrofitting project was demonstrated when Hōkūlele came ashore and laid her 3rd nest right along the southern edge of the resort property. This is the furthest south of any recorded nest at Kawililipoa, and would undoubtedly not have occurred unless the lighting had been diminished substantially.

The problem with the location of Hōkūlele's third nest was that a new house had just finished being built next to the resort. Their lighting was an issue when their interior lights were on. They were also using a sprinkler system that ran on timers just like the

resort's, to irrigate and propagate vegetation where nearly bare sand had been. The sprinklers were shooting water onto the nest, so we eventually disassembled them after the owner failed to take them out. Then the State Land Agent, who was visiting the property because of an encroachment violation, removed them altogether (since they were illegally installed on State Beach Reserve Lands). The watering may have slowed development slightly, as the first emergence wasn't until day 56 (compared to on or before day 53 for the first 2 nests, and day 55 for the last nest).

A major obstacle for these hatchlings was the thick roots that grew over and into each nest (see cover page). We conducted invasive dune species removal, but it seems that natives also posed a problem. Three of the nests were fairly free of surface vegetation, but root systems were extensive. Only 28 hatchlings emerged on their own and made it to the ocean (with our assistance). Another 5 emerged (before we began our watches or did so during the day), but died of entanglement and/or dehydration. The effects of roots became apparent during the excavations when over 53 dead and 97 live hatchlings were recovered. Although not quantified, many were trapped in the roots and unable to escape the egg chamber. Theoretically, once layers of hatchlings died near the surface, they created another barrier for the remainder of the nest inhabitants, compounding the problem. Realizing this was probably occurring; nest excavations were scheduled 4, 8, 5, and 5 days after the first emergence of each nest, since major emergences were not happening. Going in earlier than day 61 may have saved some of the 28 that died in nest #2, but only one hatchling had emerged. A season total of five weak hatchlings were held instead of being released, but none survived.

The majority of every nest contained eggs that apparently had not fully developed: 78.0%, 80.3%, 66.4%, and >43.3%. A number of hatchlings per nest were very far along in development, but dead inside their eggs (which were sometimes torn open, but not necessarily pipped): 13, 1, 18, and 21. These two groups of eggs from the last two nests were reburied in buckets after the excavation on the off chance that they were still viable. They were monitored until the 70th day of incubation, but none of them ever hatched or survived.

Since none of the eggs were opened during the excavation, it is unclear what stage of development the hatchlings reached before dying. These unopened eggs were sent to NOAA/NMFS for analysis. Until verified, all nest numbers stated above are preliminary. No information from NOAA/NMFS is available on the stages of development that the hatchlings died in 1999 for comparison, but nest success was significantly higher: 52%, 4%, 61%, 89%, and 92% (Fig 1). None of the 224 eggs that were relocated to Kawililipoa from Kealia in 2005 hatched, but upon initial inspection appeared to be infertile. Reviewing footage of Kawililipoa in the late 1990s, the percent coverage of vegetation has increased. These plants/roots may have adversely affected development within the egg chamber. No other information that may have influenced development, such as sand temperature or precipitation data, is available for either year.

Conclusions & Future Conservation Recommendations

Orion (Oneloa 2001 and 2004) was the first, Lele (2000 and 2005) was the second, and now Hōkūlele is the third known tagged hawksbill to return to Maui for another nesting cycle since 1997 when tagging began. Three tagged nesters, from 1997, 1998 and 2002 have not returned that we know of. This could be partly due to the fact that there are barely enough people to reliably patrol the three known nesting beaches in the mornings, and nests are going undetected and/or unreported on other beaches. Hawksbills have been known to nest in sporadic locations elsewhere in the world, which may be the case for Hawaiian hawksbills as well. Larry Katahira of the National Park Service has reported that a handful of Big Island hawksbills have switched nesting beaches within and among seasons, to beaches that are sometimes 11 miles apart. The south shore from Kihei to Makena should be prioritized for the expansion of these patrols due to the proximity to the other nesting beaches: Kealia and Oneloa.

The State Beach Reserve Land issue at Kawililipoa may be coming to an end. A notice was submitted to all adjoining property owners on Feb 12th 2006 stating that they had 30 days to remove all watering systems, lighting and delineating/obstructing vegetation on these lands. The letter mentioned that the area was important to nesting turtles. Essentially, the State is reclaiming this land, and wants to build a boardwalk along the whole stretch. It will be located closer to the houses than the ocean so shouldn't affect nesting, but it will advertise this area as public land. Foreseeable problems with this plan are increased foot traffic to the area, losing vegetation that blocks lighting, and bitter feelings towards us "turtle people" from the property owners (although we did not initiate this). The Leilani Kai Resort is hiring a lawyer to negotiate these terms. We are involved to help the transition. Hopefully the State will have a dune restoration plan that will incorporate our ideas. Including a turtle friendly lighting stipulation will also help.

Figuring out why the hatching success has been so low for so long at Kealia, and now Kawililipoa, should be a priority. Receiving feedback on the eggs from NOAA/NMFS is essential and ideally would be standard protocol in the future. Sand samples from each nest have been collected since 1997. Having these samples analyzed is the other phase of this project, which will be completed if funding is secured.

Determining the sand incubation temperature of each nest laid on Maui would be an important project to undertake. Placing a number of small temperature data loggers into the sand surrounding each nest can accomplish this. Information obtained from these loggers throughout the duration of incubation coupled with genetic analysis can determine the sex ratio, which is temperature-dependent, of hatchlings produced. This pivotal temperature has not been determined for Hawaiian hawksbills. Predicting whether the majority of hatchlings are males or females would provide insight into the reproductive potential for the future population.

Again, the urgent and critical priority for the upcoming nesting season must be the completion of the Kealia fence replacement or repair to keep nesting hawksbills from

being run over on North Kihei Road. Not only does it need to be replaced with the recycled plastic fence (that Kealia National Wildlife Refuge has had since the late 1990s), it ideally should be relocated mauka of the existing location of the sand fence, which is too close to the high tide line in many areas. This will increase the available nesting habitat as much as possible on this highly eroded beach. Unfortunately, this is Alexander and Baldwin land, and we presume the negotiations by USFWS Kealia Pond National Wildlife Refuge continue. The idea of rerouting the road around the Kealia Refuge, obviously the best solution, should be proposed again.

A tremendous effort is ongoing to understand and protect Maui's few nesting hawksbills, and without it the survivorship of these turtles would certainly be jeopardized further. This community-based project has saved adults and hatchlings from a gauntlet of threats. The intensified monitoring of each nesting and hatching event has also greatly improved the dataset for these occurrences. But, the actual numbers of nesting hawksbills on Maui are not increasing (Fig. 3). And the annual mean hatching success for Maui's nesting beaches remains low with a range of 0% to 72.3% (Fig. 1). With a critically endangered species at such risk, more resources need to be funneled in this direction. And innovative research methodologies should be explored to further our knowledge of all aspects of this species' life history to aid in its protection.

List of Figures

We certify that the information in this survey report and attached exhibits fully and accurately represent our work. Excavation nest success numbers still must be verified by NOAA/NMFS, so the ones used here are unofficial.

William Gilmartin — Date: 3/28/07

Cheryl King — Date: 3/28/07

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Figure 1. Mean Hatching Success of Maui's Hawksbill Nests (1996-2006)

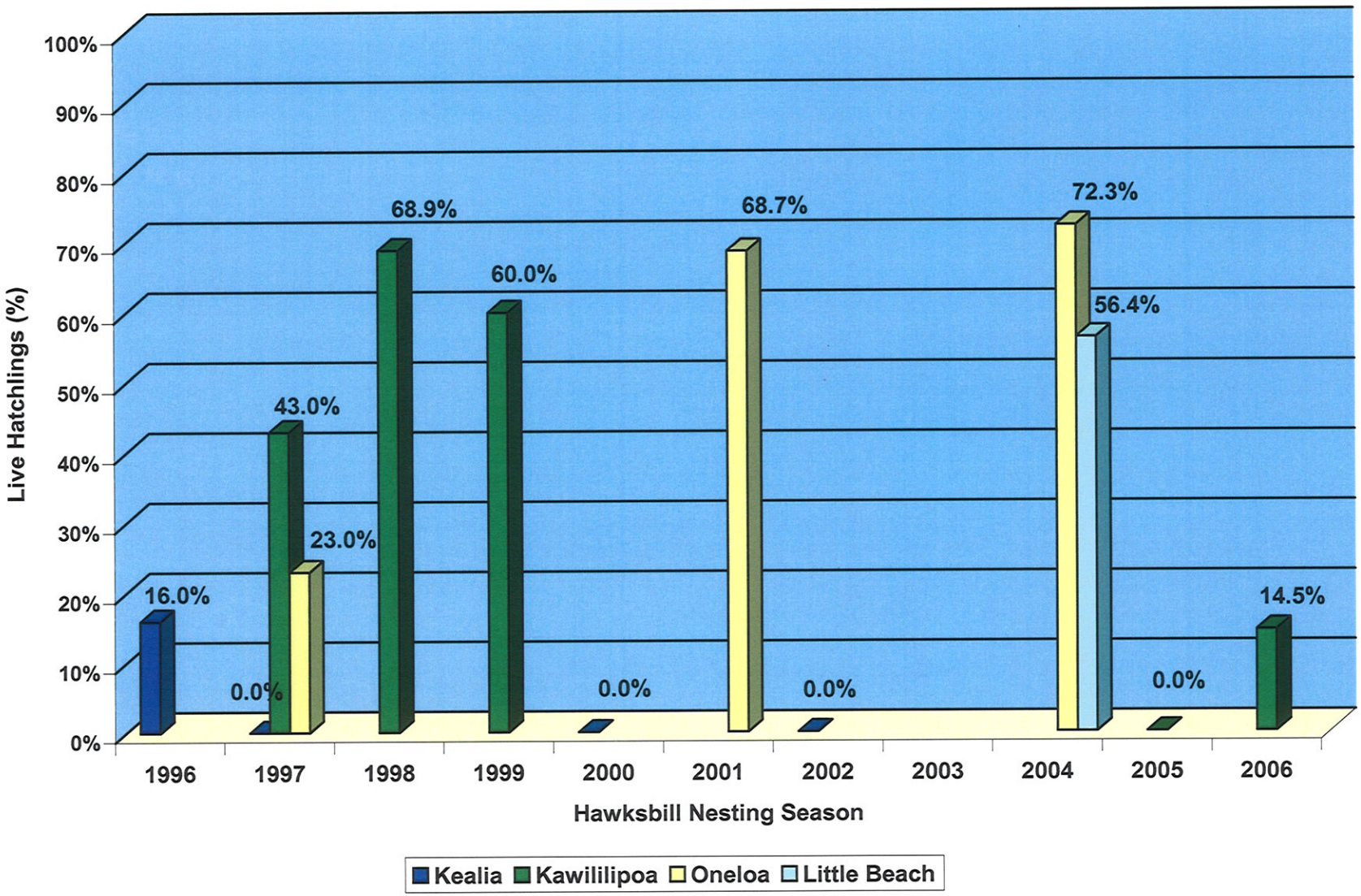

Figure 2. 1999 Post-nesting movement of Hawksbill 25692
from Waiohuli, Maui to Pelekunu, Molokai
Distance Traveled: 76 km Days Transmitting: 322 days

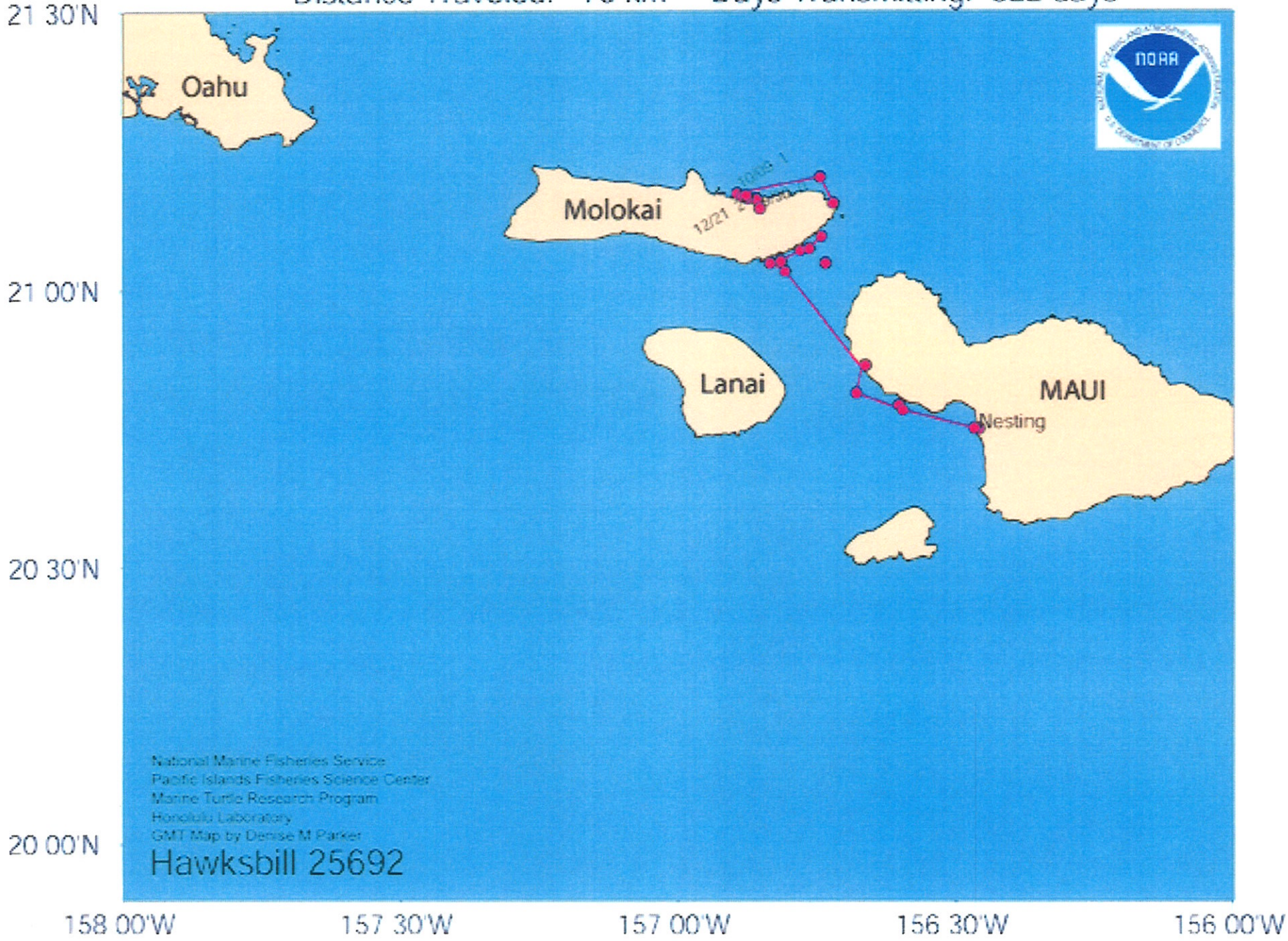

Figure 3. Summary of Maui's Hawsbill Nesting Activities (1991-2006)