

2013 MHI Hawaiian Monk Seal Population Summary¹

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2013 SURVEY EFFORT

Previous monk seal surveys in the main Hawaiian Islands (MHI) indicate that most seals on Kauai, Oahu, Molokai and Maui are documented and reported to NMFS through a volunteer and agency partner sighting network. There are, however, known monk seal “hotspots” that remain under-surveyed, including Kaula, Niihau, Lehua, and Kahoolawe. Due to budget constraints and competing priorities there was no focused effort for MHI population assessment activities in 2013. Opportunistic bleach marking and photo identification of seals occurred during activities such as emergency response and instrument (seal-mounted camera) deployment. Cooperating workers on Kauai and Molokai continued to bleach mark individuals and tag weaned pups on their own so that fewer inter-island trips were required by PIFSC staff. In a very promising development, the first ever collaborative surveys of Niihau were conducted in cooperation with Niihau Ranch, yielding the highest single day counts for a single island in the MHI. The data and photographs from these surveys were analyzed by the Hawaiian Monk Seal Research Program, and the results of these surveys are discussed below. The following highlight the 2013 effort in the main Hawaiian Islands:

- Continued bleaching effort across the islands to aid in identification of individual seals. Bleach marks were applied to 56 seals in 2013.
- 28 seals were flipper tagged in 2013, including five seals that were re-tagged.
- 10 seals were instrumented in 2013 (8-cameras, 8-cellphone tags, 2-spot GPS tags)
- Two monk seal surveys were conducted on the island of Niihau with counts of 43 and 69 seals, respectively.

NIIHAU SURVEYS

In 2013, two monk seal surveys were conducted along the shorelines of the island of Niihau. Both surveys were conducted in cooperation with Niihau Ranch and with Niihau Ranch serving as guides. Surveys were conducted on 20 August 2013 and 28 September 2013 by Naval Facilities Engineering Command Hawaii (NAVFAC) and the Hawaiian Monk Seal Research Program (HMSRP), respectively.

NAVFAC personnel documented 43 monk seals during their land-based survey of Niihau, including 8 nursing mother-pup pairs (Table 1). This survey covered most of the island, with the exception of areas inaccessible from land. HMSRP staff conducted a near complete survey of Niihau via foot, vehicle, horseback and, for inaccessible shorelines, by boat. A total of 69 monk seals were documented on this survey, including 3 nursing mother-pup pairs and 16 weaned pups (Table 1). Thus, at least 19 pups were born on Niihau in 2013. Five seals were identified as previously known animals based on applied bleach marks, flipper tags and natural marks or scars. Two of these known seals were mothers with nursing pups known to frequent the islands of Kauai and Oahu. A combined total of 31 newly identifiable seals (based on photo-documented natural marks) were seen between the two surveys. The 28 September count was the highest ever single island beach

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count in the MHI. The next highest count was 47 seals documented during an aerial survey of Niihau in 2008. Continuation of these surveys will greatly enhance estimates of abundance and trends in the MHI, while documenting the importance of Niihau to the overall MHI population.

Table 1. 2013 Niihau monk seal survey results by size class.

Age Class	August 20	September 28
	No. of Seals Sighted	No. of Seals Sighted
Adult	18	27
Sub-adult	2	15
Juvenile	5	8
Weaned pup	6	16
Nursing pup	8	3
Unknown	4	0
TOTAL	43	69

MINIMUM POPULATION SIZE

A total of 175 individually identifiable seals were documented in the MHI within the 2013 calendar year, including 31 seals (19 pups and 12 older seals with distinctive natural markings) seen only on Niihau (Table 2). This number represents our best minimum abundance estimate for the MHI. In past years, little or no information was available regarding seals on Niihau. Consequently, minimum population estimates have been based primarily on seals identified on the islands of Kauai, Oahu, Molokai, Maui, Lanai, Kahoolawe and Hawaii. Yet we know from past aerial surveys that Niihau hosts the greatest number of monk seals in the MHI. It is likely that many of the unidentified seals seen during the Niihau surveys were unique and not seen elsewhere in the MHI, but there was insufficient photo documentation to confirm whether they were documented and tallied at other sites.

Table 2. 2013 MHI monk seal minimum population estimate, by sex and size class. The numbers in parentheses include unique Niihau seals.

Age class	Male	Female	Unknown	Total
Adults	38 (41)	42 (48)		80 (89)
Sub-adults	8 (8)	9 (9)	(2)	17 (19)
Juveniles	11 (11)	15 (15)	(1)	26 (27)
Pups	11 (19)	10 (13)	(8)	21 (40)
Total	68 (79)	76 (85)	(11)	144 (175)

POPULATION GROWTH RATE

Because survey effort is not sufficient to characterize the abundance trends of MHI seals, the best available trend indicator is the intrinsic rate of population growth λ derived from a life-table populated with the reproductive and survival rates presented below. The estimated λ is 1.052, or 5.2% growth per year. However, without knowing the age structure of the MHI subpopulation, it is not possible to estimate the current *realized* growth rate. It does appear likely, nevertheless, that the MHI population is increasing robustly.

BIRTHS

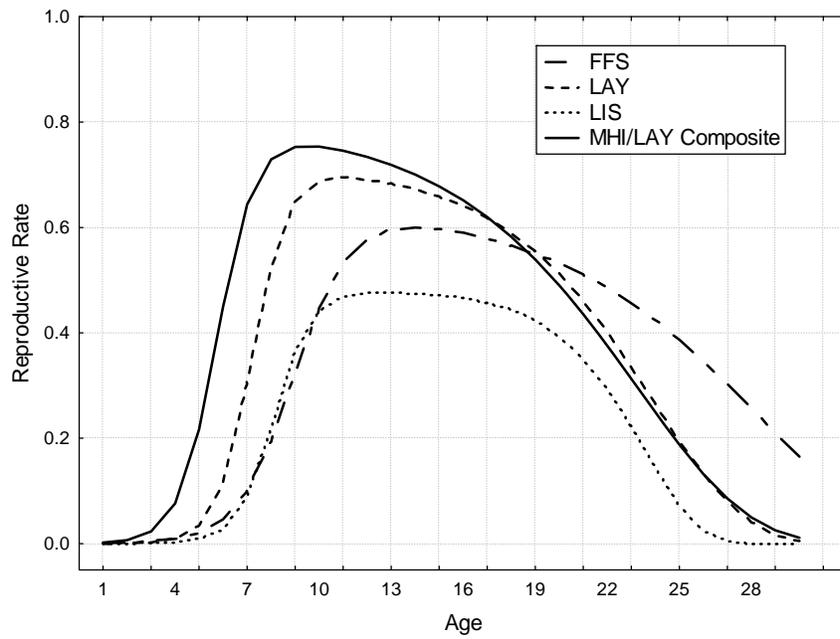
A total of 40 MHI births (21 excluding Niihau) were documented in 2013 (Table 3). An estimated 95% of pups born survived to weaning (one pup died prior to weaning). This estimate excludes pups born on Niihau, where survival to weaning could not be assessed.

Table 3. Number of MHI monk seal births documented in 2013.

Island	Number of Births
Niihau	19
Kauai	2
Oahu	5
Molokai	10
Kahoolawe	2
Hawaii	2
Total	40

Below is a plot of fitted age-specific reproductive curves for four monk seal subpopulations (Fig. 1). Three of the curves involve data exclusively from French Frigate Shoals, Laysan Island, and Lisianski Island in the Northwestern Hawaiian Islands (NWHI). The fourth curve involves a combination of data from the MHI and Laysan Island; because there are few old known-age females in the MHI, a composite curve using MHI data for ages 1-14 yr and Laysan Island data for older ages is shown. As noted previously, MHI females appear to mature earlier and achieve higher birth rates than those in the NWHI.

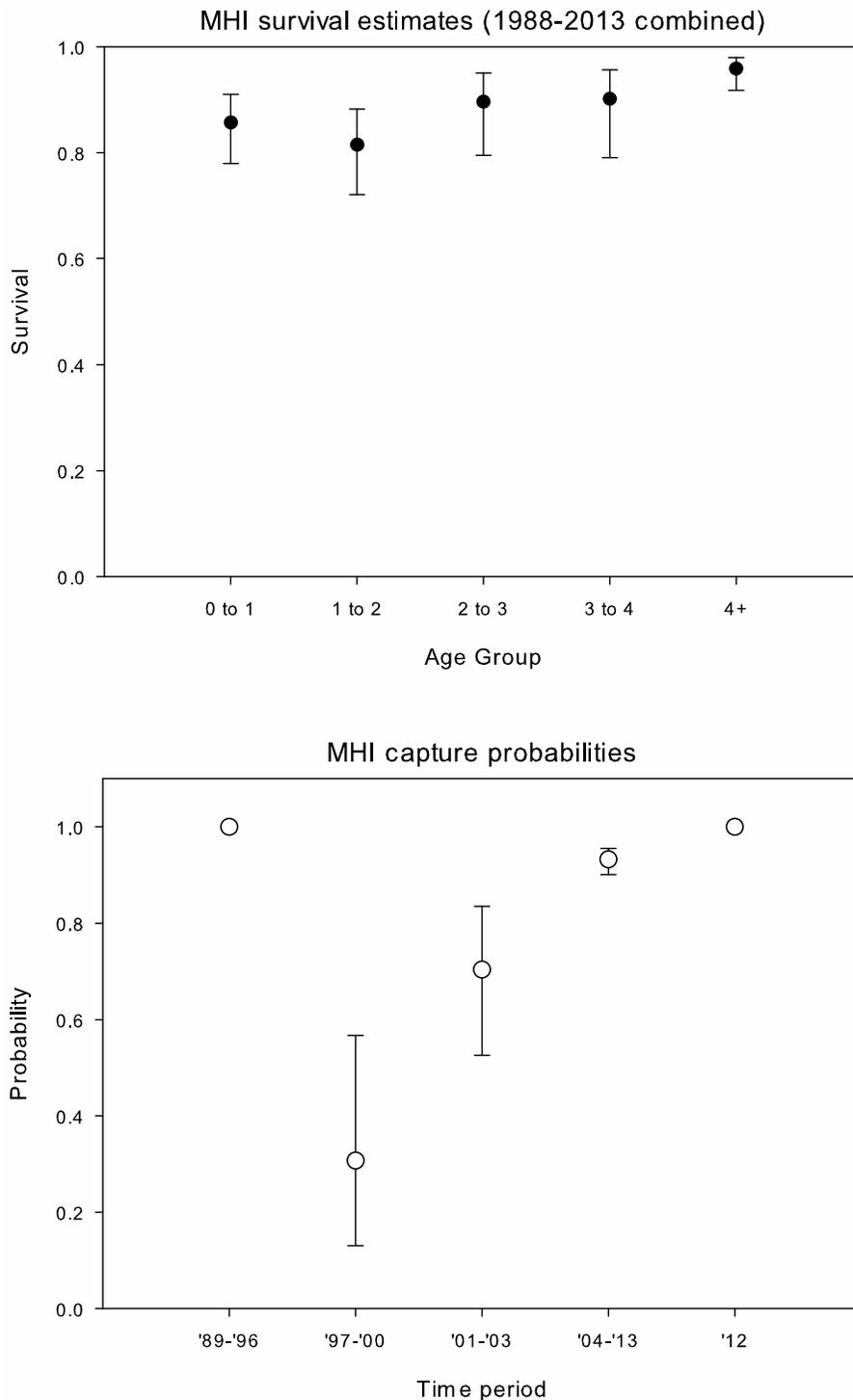
Figure 1. Fitted reproductive rates for monk seal subpopulations.



SURVIVAL

Post-weaning survival rates are estimated for the same age groups as in the NWHI, excluding the senescent (age 17 yr and older) class, as there are no known-age MHI-born seals of that age class. There are currently no statistically significant trends in MHI survival rates over time. Below (Fig. 2) are plots of estimated survival by age group (for all years combined) and capture probabilities by time period.

Figure 2. MHI survival estimates by age group. Capture probabilities by time period.



2013 MORTALITIES

A total of 7 seal mortalities were documented in the MHI in 2013 (Table 4). Of these, only one was clearly due to anthropogenic factors (ingested hook). Two juvenile animals died due to emaciation/malnutrition, but it is unclear if there were other factors that may have contributed to their deaths. Three of the carcasses were in severe decomposition so little information was available to aid in the identification of factors contributing to cause of death.

Table 4. MHI monk seal deaths documented in 2013. Codes: A=adult, S=subadult, J=juvenile, I = immature, P=nursing pup, F=female, M=male, U=unknown.

Island	Seal ID	Size/Sex	Cause of Death /Findings
Kauai	R321	S/F	Tissues autolyzed, no abnormalities identified
	R323	J/F	Malnutrition, marked parasitism. No evidence of underlying infectious disease
	KA130301	A/M	Severely decomposed carcass
Oahu	RL26	J/F	Emaciation. No evidence of underlying infectious disease. (Taken into captivity from Molokai for treatment)
	RK68	J/M	Ingested circle hook resulting in multiple chronic abnormalities (Taken into captivity from Hawaii I. for treatment)
	RNX1	P/M	Fetal stress; perinatal pup death; stillborn
Niihau	NI130302	I/U	Severely decomposed carcass
Total = 7 Deaths			

FISHERIES INTERACTIONS

A total of 13 known hookings of seals occurred in 2013 (Table 5). One hooking, from the island of Hawaii, resulted in mortality (see Table 4). A juvenile male seal was hooked three separate times on Kauai. The only known entanglement involved fishing line and the seal freed itself without harm. Finally, a juvenile female seal was observed with a spear prong pierced through the top of her head. Mitigation of these injuries is described below.

Table 5. MHI monk seal fisheries interactions documented in 2013.

Island	Hookings	Entanglements	Spear
Kauai	7		
Oahu	4	1	1
Maui	1		
Hawaii	1		
Total	13	1	1

INTERVENTIONS

In 2013, monk seal program staff and partners intervened on 12 separate occasions to assist 9 seals at risk from hooking, injury, or other threats (Table 6). Two of these seals were taken from the wild into captivity for assessment and care. Unfortunately both of these animals died in captivity due to the severity of their pre-existing conditions. One animal had ingested a circle hook and suffered from multiple chronic abnormalities due to the hooking. The other seal was found emaciated with multiple healing wounds (likely shark inflicted).

Table 6. Interventions to assist compromised monk seals in the MHI during 2013. Codes: A=adult, J=juvenile, F=female, M=male.

Activity/Intervention	No. of Interventions	Seals Involved
Dehooked	6	J/M (3), A/F (1)
Removed spear prong from seal (pierced through skin on top of head)	1	J/F
Treated with antibiotics in the field (for abscess wounds)	3	J/F (1), A/F (1)
Brought into captivity for assessment/treatment (ingested hook)	1	J/M
Brought into captivity for assessment/treatment (emaciation, wounds)	1	J/F
Total = 12 Interventions		