HAWAII AUDUBON SOCIETY

'ELEPAIO

Journal of the Hawaii Audubon Society

For the Protection of Hawaii's Native Wildlife

VOLUME 55, NUMBER 9 SEPTEMBER 1994

Hawaiian Monk Seal Observations at Necker Island, 1993

by Michele A. Finn[1] and Marc A. Rice[2]

The Hawaiian monk seal, *Monachus schauinslandi* Matschie 1905, has been described as the most primitive of all extant pinniped species (Repenning and Ray 1977). Populations are found primarily in the Northwestern Hawaiian Islands: Nihoa Island, Necker Island, French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, and Kure Atoll. A few individuals have been sighted around the main Hawaiian islands, and in recent years, births have occurred on O'ahu (1991) and Kaua'i (1988 and 1991). Human interactions, both direct and indirect, are known to have affected Hawaiian monk seal populations on breeding islands as early as 1824 (Bailey 1954, Kenyon 1973, Gilmartin 1983). As a result of a 50% decline in beach counts between 1958 and 1975 (Johnson et al. 1982, Gilmartin 1983), the Hawaiian monk seal was listed as "endangered" in 1976 under the Endangered Species Act of 1973. In cooperation with the Hawaiian Monk Seal Recovery Team, the National Marine Fisheries Service Honolulu Laboratory (NMFS) developed a Hawaiian Monk Seal Recovery Plan (Gilmartin 1983) and initiated a population monitoring effort in 1981.

Necker Island (lat. 23°35'N, long. 164°42'W) is located 380 nautical miles northwest of Honolulu, within the Hawaiian Islands National Wildlife Refuge (Fig. 1). This small, 19-hectare rocky island is composed mainly of basaltic rock and supports very little vegetation. The island's history, geology, and biodiversity are described in Clapp and Kridler (1977).

This island is visited only on an opportunistic basis by NMFS, because Necker Island hosts a relatively small population of Hawaiian monk seals and landing on the island is limited to periods of optimal weather conditions. Historical information describing the Hawaiian monk seal at Necker Island between 1886 and 1983 is limited to unstandardized beach counts (Hiruki and Ragen 1992). Standardized seal counts were made by NMFS in 1983 (Morrow and Buelna 1985), 1985, and 1989 (Hiruki and Ragen 1992). In 1993, research objectives for Necker Island were limited to resighting tagged seals, tagging weaned pups with plastic identification tags, identifying seals with scars or natural markings, documenting injuries, conducting standardized island censuses, and assessing interisland movement.

Methods

As part of the ongoing NMFS research effort directed toward recovery of *M. schauinslandi*, a two-person field party con-

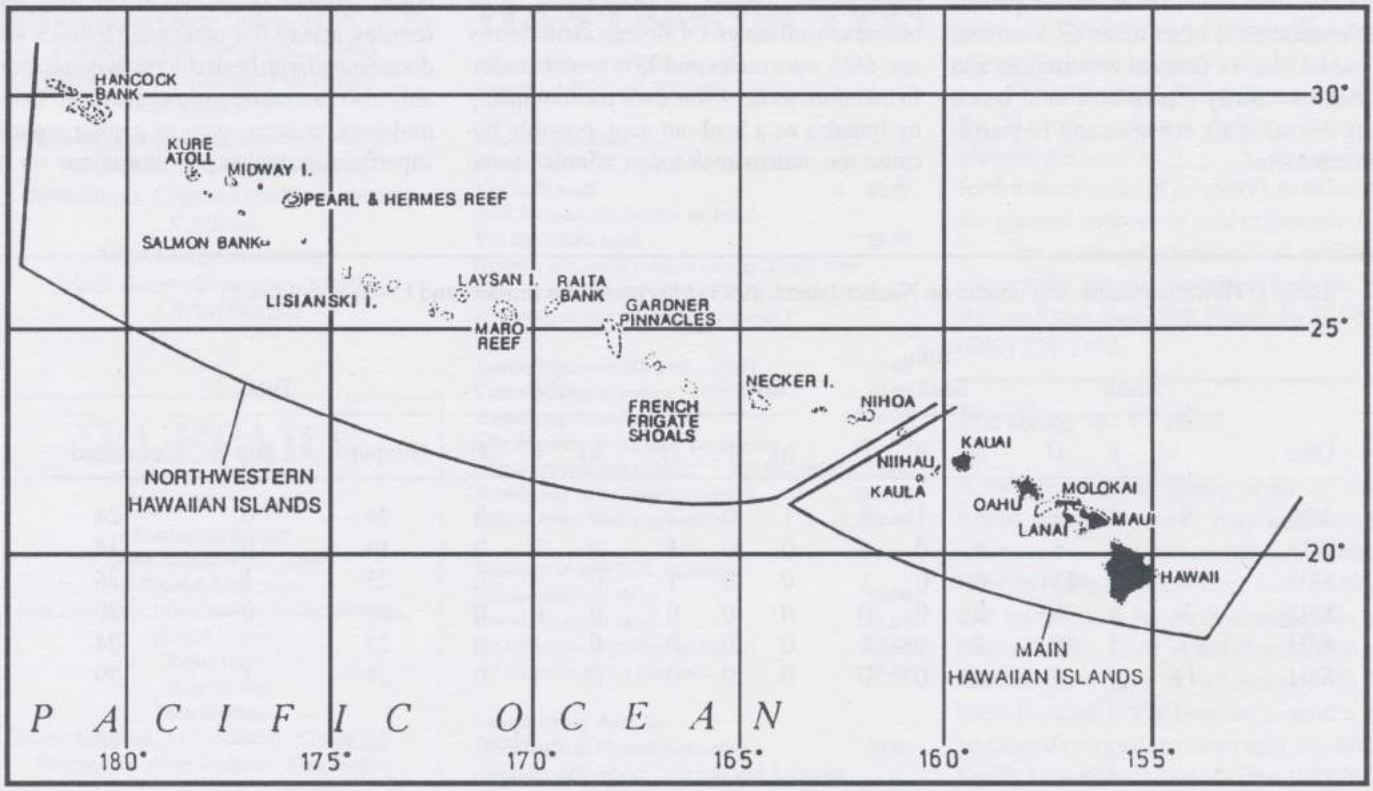

Fig. 1. Map of Hawaiian Archipelago. © National Marine Fisheries Service, Southwest Fisheries Center, Honolulu Laboratory.

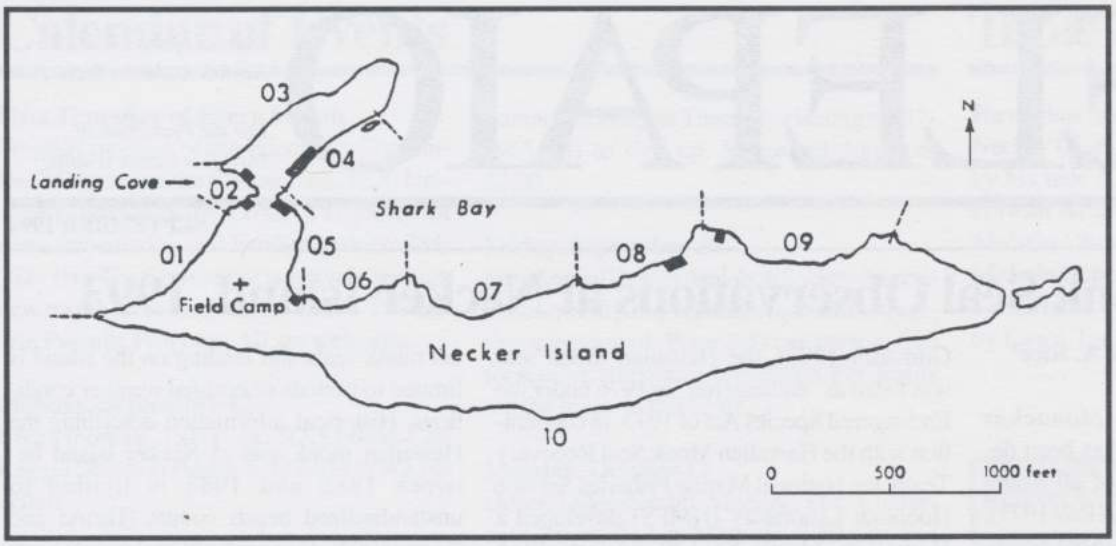

Fig. 2. Sector map of Necker Island. © National Marine Fisheries Service, Southwest Fisheries Center, Honolulu Laboratory.

ducted seal surveys on Necker Island on 26 April and between 30 July and 5 August 1993. Because monk seal activities vary by location, the island was divided into 10 sectors which are delimited by natural features (Fig. 2). Potential haul-out areas are located in sectors 1, 2, 4, 5, 6, 8, and 9. The remaining sectors were unsuitable for haul-out because of their sheer rock faces and lack of shelf area. Individual seals were identified by existing hind flipper tags, scars, or natural markings. To standardize data collection between islands and years, censuses of the entire island were initiated at 1300 Hawaii Standard Time to obtain a total beach count. Island patrols were conducted at other times to document individual seals or unusual occurrences and did not necessarily represent a total beach count. A total of six censuses and 19 patrols were conducted.

Results and Discussion

Population Assessment

Census counts, which represent only a portion of the total island population, ranged from 14 to 29 seals ($\bar{x}$ = 22.8, SD = 4.8; Table 1). In 1983, a similar field effort resulted in beach counts ranging from 24 to 32 seals ($\bar{x}$ = 27.0, SD = 3.5; Table 2; Morrow and Buelna 1985). Preferred haul-out areas in 1993 were located in sectors 2, 4, 5, and 8 which is consistent with hauling behavior previously reported (Morrow and Buelna 1985, Conant 1985). Most animals sighted were adults, and for both adult and immature size classes, the sex ratio appeared to be biased toward males. Of all seals identified by sex, 56% were males and 43% were females. In addition, sector 4 was used predominately by females as a haul-out area, possibly because the narrow rock ledge afforded some protection from aggressive males. At least one female pup, initially sighted in sector 6, was born in 1993 and tagged postweaning on 31 July.

Injuries

Hawaiian monk seal survival is often affected by injuries caused by shark attacks, adult male aggression, and entanglement in marine debris. Five recently injured seals were observed during this field season, four adult females appeared to have male-inflicted injuries, and one adult male may have been wounded as a result of a fishery interaction.

In addition to recently acquired gaping dorsal wounds observed on the four adult females, at least five other adult females were documented with healed dorsal wounds, probably also caused by male aggression. Dorsal mid-back injuries, such as gaping wounds, superficial scratches, or lacerations on the

Table 1: Hawaiian monk seal counts on Necker Island, 1993 (M = male, F = female, and U = unknown sex).

	Adult			Sub-adult			Juvenile			Pup			Total		
Date	M	F	U	M	F	U	M	F	U	M	F	U	Nonpup	Pup	Combined
4/26	9	4	1	3	1	3	1	0	2	0	0	0	24	0	24
7/31	3	4	6	0	0	0	0	0	1	0	0	0	14	0	14
8/01	6	6	11	0	0	1	0	0	1	0	1	0	25	1	26
8/02	5	5	6	0	0	0	0	0	0	0	0	0	20[a]	0	20
8/03	7	5	10	0	0	1	0	0	0	0	1	0	23	1	24
8/04	14	9	5	0	0	0	0	0	0	0	1	0	28	1	29
											Mean		22.3	—	22.8

[a]Total includes some seals which were not placed in any size class.

Table 2: Hawaiian monk seal counts on Necker Island, 1983 (M = male, F = female, and U = unknown sex) (Morrow and Buelna 1985).

	Adult			Sub-adult			Juvenile			Pup			Total		
Date	M	F	U	M	F	U	M	F	U	M	F	U	Nonpup	Pup	Combined
4/20	5	0	13	0	0	7	0	0	4	0	0	0	29	0	30[a]
7/28	8	9	1	0	0	1	2	0	1	1	0	1	22	2	24
7/30	13	6	3	1	2	1	0	0	1	0	0	2	27	2	24
8/01	13	8	3	0	0	1	4	0	0	1	0	2	29	3	32
8/03	12	7	0	2	1	0	2	1	0	1	1	1	25	3	28
8/05	7	5	3	3	1	1	1	0	0	1	0	2	21	3	24
												Mean	25.5	—	27.0

[a]Total includes some seals which were not placed in any size class.

skin are characteristic male-inflicted injuries (Fig. 3). Agonistic behavior between males and females was prevalent during the field period, resulting in the reopening of one dorsal wound on an adult female. On the last day of field activities, an unidentified adult male was observed harassing the weaned female pup. Evidence of adult male aggression was described at Necker Island in 1983 (Morrow and Buelna 1985) during that population assessment. An increase in the wounding of females by adult males results in part from a sex ratio biased toward males (Hiruki et al. 1993). Because of the limited haul-out area on Necker Island, seals are forced into closer proximity to one another than is the case at other Northwestern Hawaiian Islands, and this situation appears to intensify male aggression.

One emaciated adult male seal was first observed on 2 August in sector 2 with a fresh laceration that affected the left corner of the mouth and extended approximately 13 cm down the neck. This injury may have been inflicted by some type of fishery interaction and could threaten the survival of the seal. The male seal was resighted three more times and each time appeared lethargic and weak.

Interisland Movement

Interisland movement has been suggested as a possible factor contributing to a recent decline in the number of immature seals at nearby French Frigate Shoals (Gilmartin 1993). Flipper tag sightings during censuses and patrols revealed 14 seals had moved, at least seasonally, from French Frigate Shoals to Necker Island. Eleven of the 14 seals were sighted at French Frigate Shoals in 1992 indicating the movement to Necker Island occurred within the last year. Although 8 of the 14 seals were immature individuals, this number does not explain the 64% decrease in the number of immature seals at French Frigate Shoals since 1989 (NMFS unpubl. data).

Fig. 3. Typical male-inflicted injury. This gaping dorsal wound is beginning to heal. Photo © Greg Spencer, Naational Marine Fisheries Service.

Conclusion

Necker Island continues to be used by monk seals at about the same level as a decade earlier. Our observations suggest that male aggression may be a significant cause of injury and, possibly, mortality for females at this site. Immigration of seals to Necker Island does not account for much of the decline in the immature population at French Frigate Shoals. The Necker Island Hawaiian monk seal population does not appear to be growing nor does it make a significant contribution to the total breeding population. This may be partially explained by the limited haul-out areas.

Acknowledgments

We thank the captain, officers, and crew of the NOAA Ship *Townsend Cromwell* for their assistance and support. Additionally, we appreciate Dr. Sheila Conant and Ms. Elizabeth Flint providing manuscript reviews.

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Chevron USA Products Company has awarded the Hawaii Audubon Society $5,000 to continue designing and implementing an oiled wildlife rehabilitation program. This project is overseen by Linda Elliott, a wildlife biologist who was formerly wildlife manager and environmental programs coordinator at the Hyatt Regency Waikoloa, where she was involved with environmental education and endangered species rehabilitation.

This is the second grant HAS has received from Chevron for this project. In 1993 we received $7,500.These funds will help make sure we are ready when an oil spill occurs in Hawaii.

Mahalo Donors!

The Hawaii Audubon Society thanks the following for their generous donations:

Betty Johnson, Satoru Doi, Susan Hower, Marianne Long, Jane Mitchell, Lloyd Moore Foundation, Joan C. Pratt, Hazel Valier, and E. Pauahi Vincent.

Ewa Plains Trip

by Lance Tanino

On a hot and humid 17 July, 14 people braved 92 degree temperature to learn about sinkholes and search for bird bones on the Ewa Plains at Campbell Industrial Park.

Dr. Alan Ziegler presented an interesting and exciting lecture on the geological and archaeological history of the sinkholes. Everyone had a great time sifting through soil, finding mostly Dark-rumped Petrel bones.

It makes one wonder and imagine what the Ewa Plains must have been like when Dark-rumped Petrels, two species of raven, two species of flightless rail, Long-legged Owls, and even eagles at one time inhabited what is now Campbell Industrial Park.

Mark Your Calendar
Friday, September 30, 6:30 p.m.

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Come Join the Hawaii Audubon Society for Dinner, an Update on the 'Alala, and the Presentation of Awards to Hawaii's Environmental Stars

The Hawaii Audubon Society invites you to join us at our First Annual Awards Dinner, where we will honor Society volunteers, corporate leaders, and public servants who have contributed to protecting our environment.

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In addition, the U. S. Fish and Wildlife Service and the Peregrine Fund will give us an update on this year's 'Alala recovery program.

To make your reservations, please complete the form below and send it with your check no later than Friday, September 23, to Hawaii Audubon Society, 1088 Bishop Street, Suite 808, Honolulu, HI 96813. Telephone reservations cannot be accommodated because we have to pay for the number of people we guarantee will attend.

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Number of reservations at $10 (seniors, students, and children only)_____

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'ELEPAIO

ISSN 0013-6069
Managing Editor:
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The Hawaii Audubon Society has a stock of T-shirts designed to spread the Audubon message. Not only are they attractive personal apparel, but they make excellent presents as well.

T-shirts bearing the Society's 'Elepaio logo are available in blue spruce and mountain rose with a black design. We also have a few in ash (gray). In addition, the "hot" Kolea (Pacific Golden Plover) T-shirts are also available. This T-shirt is white with a three-color design of the Kolea and native hibiscus. Proceeds from the Kolea T-shirt go to help HAS fund research on shorebirds in Hawai'i and elsewhere in the Pacific region.

T-shirts are $12 each, plus $2.00 per shirt for postage. They are available in medium, large, and extra large adult sizes only. When ordering T-shirts, be sure to list size and first, second, and third choice of color. To order T-shirts send your check, payable to the Hawaii Audubon Society, to Yvonne Izu, 1957 Alai Place, Wahiawa, HI 96786. Don't forget to add $2.00 per shirt for postage. Insufficient postage will delay your order until the proper amount is remitted. T-shirts are not available at the HAS office.

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The deadlines for receipt of grant applications are 1 April and 1 October. For an application form send a self-addressed stamped envelope to Grants, Hawaii Audubon Society, 1088 Bishop Street, Suite 808, Honolulu, HI 96813. For more information, call Phil Bruner, (808) 293-3820 (W).

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Calendar of Events

First Thursday of Every Month
Monthly meeting of the Education Committee, 7:00 p.m., at the Coffee Line, 1820 University Avenue (in the YWCA). To join or for more information call Emily Gardner, 734-3921 (H). The Committee is actively seeking new members to work on the 1994-'95 Paradise Pursuits Program. All are welcome.

Monday, September 12
Board meeting, 7:00 p. m., HAS office. Call Reggie David on Hawai'i, 329-9141 (W), for details.

Sunday, September 18
Field trip to Kii Unit, James Campbell National Wildlife Refuge, led by Johnny Beall, refuge manager. This is your opportunity to see native waterbirds as well as migratory shorebirds and waterfowl. Meet at the State Library on Punchbowl Street at 7:30 a.m. or at 8:45 a.m. in the parking lot next to First Hawaiian Bank at the Kahuku Sugar Mill Shopping Center. Bring binoculars, spotting scopes, water, and sunscreen. Call Lance Tanino, Monday or Thursday evening at 247-5965 (H) to sign up. Suggested donation: $2.00.

Friday, September 30
First Annual Hawaii Audubon Society Awards Dinner, 6:30 p.m., Waikiki Aquarium. Reservations required. Price $20 per person, $10 for seniors, students, and children. For details see the insert in this issue.

Monday, October 17
General Membership Meeting, Paki Conference Room, Bishop Museum, 7:30 p.m. See the October *'Elepaio* for more details. Refreshments will be served.

Table of Contents

Hawaiian Monk Seal Observations at Necker Island, 1993.....55
by Michele A. Finn and Marc A. Rice
Hawaii Audubon Society Publications.58
Mahalo Chevron!.....58
Mahalo Donors!.....58
Ewa Plains Trip.....58
by Lance Tanino

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