



Surveys of the Hawaiian Hoary Bat in the District of Puna, Hawai'i Island

Michelle H. Reynolds, Bonnie M. B. Nielsen, and James D. Jacobi

Abstract

We studied the distribution, abundance, and activity patterns of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the District of Puna, Hawai'i Island, August - December 1993. We made 173 bat detections during 162 survey hours over 730 kilometers traveled using echolocation detectors and spotlights. Fifteen percent of bats detected were traveling, 43% were foraging, and 42% were engaged in undetermined activity. We did not find any roosting bats during our surveys. Bats were found at 22 of 43 sites from 0 - 780 m elevation. The number of bats detected was not significantly different between dominant vegetation types (native, mixed, or introduced) or elevation. Bat detections declined from 2.38 per hour in August to 0.29 per hour in December. Peaks in bat activity occurred at sunset and 30 minutes before sunrise.

Introduction

The Hawaiian hoary bat, or 'ope'ape'a (*Lasiurus cinereus semotus*), is the only extant¹ land mammal native to Hawai'i. Hawaiian hoary bats have been recorded on all the main Hawaiian islands, with the largest populations on Kaua'i and Hawai'i (Tomich 1974).

The Hawaiian hoary bat is a subspecies of *Lasiurus cinereus* from North and South America. The Hawaiian hoary bat, like its mainland conspecific, is an insectivore, selecting prey primarily based on size, abundance, and ease of capture (Belwood and Fullard 1984; Jacobs 1993a).

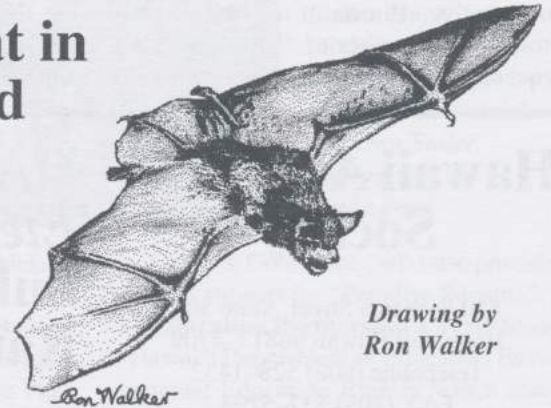
Surveys and radio telemetry indicate that these bats leave their roosts shortly before sunset and return within two hours of midnight (Kepler and Scott 1990; Jacobs 1993b). Dawn foraging activity has also

been observed (Duvall and Gassmann-Duvall 1991; Jacobs 1993a; Reynolds *et al.* 1994).

Little is known about the foraging or roosting behavior of the Hawaiian hoary bat. Jacobs (1993b) found, using radio telemetry, that bats displayed roost fidelity in native 'ohia (*Metrosideros polymorpha*) trees. A radio-tagged adult commuted to foraging areas greater than 13 km from its roost. Mainland hoary bats regularly roost in the same tree on the same twigs and leaves during the breeding season (McClure 1942). It is not known if Hawaiian hoary bats also exhibit this behavior.

The Hawaiian hoary bat was federally listed as endangered in 1970 (U. S. Fish and Wildlife Service 1992). Mainland bat populations are threatened by habitat loss, pesticides, and roost disturbance, and they suffer mortality due to habitat destruction, human disturbance, and avian, reptilian, and mammalian predators (Bat Conservation International 1991). Other endangered insectivorous bats (e.g., *Myotis grisescens* and *Tadarida brasiliensis*) have been found dead with lethal concentrations of pesticides (dieltrin) in their tissues (Clark *et al.* 1978). Hawaiian hoary bats are the dominant flying nocturnal insect predators in Hawai'i, thus occupying an important niche in the Hawaiian Island's ecosystem. Conservation efforts for the Hawaiian hoary bat are limited by the lack of information on their population status, life history, and habitat use.

The results reported here are part of a U.S. Fish and Wildlife Service report (Reynolds *et al.* 1994). We used echolocation and visual surveys to provide base-line information on distribution, abundance, and



Drawing by
Ron Walker

activity patterns of the Hawaiian hoary bat from August - December 1993 in the District of Puna, Hawai'i Island.

Methods

We surveyed the District of Puna, Hawai'i Island (Figure 1; Table 1, see pages 156-7) for Hawaiian hoary bat distribution, abundance and activity patterns. Surveys were conducted from 9 September to 12 December 1993, following a preliminary survey done on 10 August 1993. Evening surveys began about 1 hr before sunset and continued until approximately 4 hrs after sunset. Morning surveys were conducted from about 2 hrs before sunrise to 1 hr after sunrise. Most roads were sampled two or more times in reversed directions to reduce the effects of time differences on detection rates.

Tunable hand-held echolocation detectors (QMC Mini2 Bat Detector, QMC Instruments Ltd., London, England) were set at 25-30 kHz (Fenton 1981; Belwood and Fullard 1984; Jacobs 1993a) to detect Hawaiian hoary bat echolocation signals. Three methods were used to conduct surveys: 1) Walking surveys were timed searches conducted by one or more observers in areas generally only accessible by foot. 2) Point surveys were conducted on primary roads, where echolocation detectors were used for five minutes of sampling at every mile marker along a specified route. 3) Continuous surveys were conducted on secondary and tertiary roads. During con-

tinuous surveys, two observers, a driver and a "detector" wearing headphones, traveled 1.6 - 24 km/hr while an echolocation detector was held outside of the vehicle. The driver stopped when bats were detected, and used a spotlight to count the number of bats visible in the area.

We defined the number of "bats" as a count of bats visually located. This is a conservative estimate of the bats actually present. The number of "bat passes" is a sequence of two or more echolocation calls

detected when bats fly within range of the microphone on the echolocation detector (Thomas and West 1989). Each bat identified, either visually or with the echolocation detector, was counted as a "bat detection."

Bat activity was characterized as traveling, foraging, or unknown from the signal type or flight pattern. When bats are traveling, the echolocation signal rate is constant and slow, and their flight path is directional, whereas foraging bats emit an erratic high

pulsed signal and dart irregularly after prey (Thomas and West 1984). Unknown activity patterns were too brief or distant to identify whether they were traveling or foraging. We used spotlights (50,000 candlepower) to locate bats and observe their flight patterns after dark.

Data collected for each survey included: date, times of survey start and end, sunset and sunrise, echolocation detector on, echolocation detector off, survey distance (km), survey method (walking, point, or continuous), number of "bats", number of "bat passes", number of "bat detections", type of activity (foraging, traveling, or unknown), site description, and dominant vegetation type. We used Kruskal-Wallis test to analyze differences in bat abundances and vegetation type, and Spearman's Rank Test for relationships between elevation and number of bats detected ($\alpha=0.05$).

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Results

We recorded 173 Hawaiian hoary bat detections during 162 survey hrs for a detection rate of 1.07 per hr. The total number of bats seen during surveys was 129 (0.80 bats/hr) and the total number of bat passes was 315 (1.94 passes/hr). Of all bats detected, 43% were foraging, 15% were traveling, and the activity of the remaining 42% could not be determined. We did not locate any roosting bats during our surveys.

Figure 1 (see page 157) shows locations where Hawaiian hoary bats were detected during surveys of the Puna District, Hawai'i August-December 1993. Bats were seen foraging in stands of native vegetation, coastal areas with dense introduced vegetation, and areas of mixed (native and introduced) vegetation. The number of bats did not differ significantly between sites

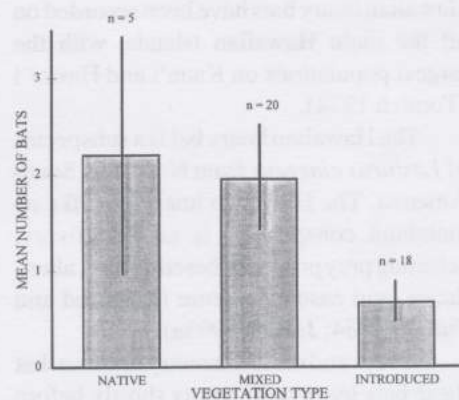


Figure 2. Mean number of bats (+/-SE) in survey locations with native, mixed, and introduced vegetation types.

classified as native, mixed, and introduced vegetation types (Figure 2; Kruskal-Wallis = 3.7, $df = 2$, $p = 0.15$). Sites ranged from 0 to 780 m elevation but most (74.4%) were below 200 m as were most bat detections (71.0%). There was no relationship between the number of bats and elevation at sites when all sites were included (Figure 3; Spearman's Rank: $R^2 = 0.00$, $p = 0.68$) nor when only sites with detections were included (Spearman's Rank: $R^2 = 0.11$, $p = 0.14$). Of the 173 bat detections, 57% were made in sites described as open or along forest edges. These sites included lava flows, volcanic pit craters, residential and agricultural clearings, and roads. Bats foraging over open water constituted 1% of our detections. Bats foraging in forested areas, both above and below the canopy, made up 25% of the detections. The remaining 17% of the bats detected could not be located visually.

The largest aggregation of bats seen consisted of eight individuals that were flying over lava fields (elevation 20 m) toward the ocean in the evening. The next largest group contained six bats foraging in and above a volcanic pit crater (elevation 183 m) in the evening. Most other observations were of 1-3 bats.

Bat detection rates declined from 2.38 per hr in August to 0.29 per hr in December (Figure 4). We also observed distinct daily peaks in bat activity (Figure 5). The percent of total bat detections was highest at sunset (15.0%) and decreased to 0.6% three hours after sunset. Activity peaked again in the morning approximately 30 min before sunrise with 8.1% of total bat detections.

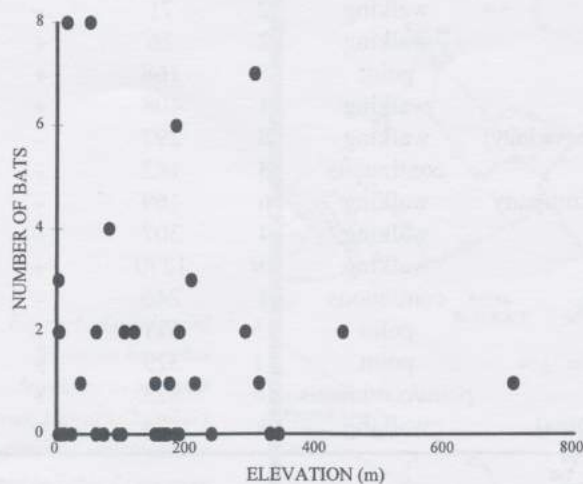


Figure 3. The number of bats and elevation at survey locations in the District of Puna, Hawai'i. Midpoint elevations were used for locations with altitudinal ranges.

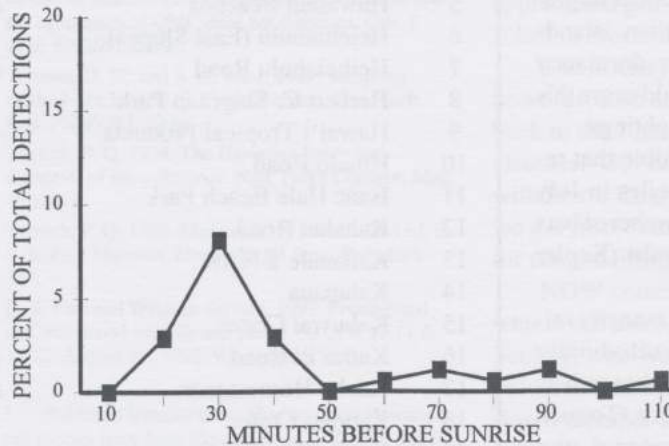
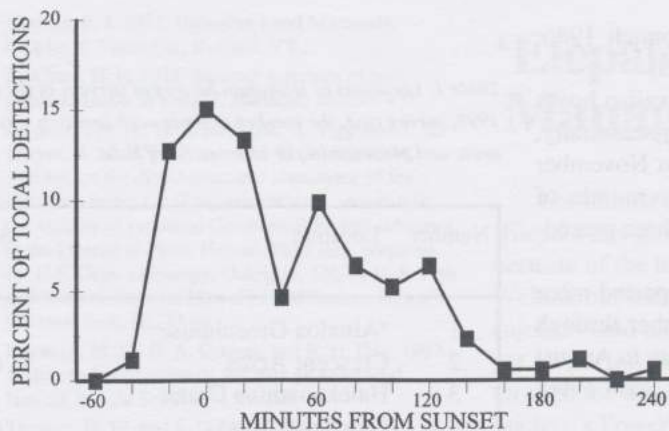


Figure 5. Evening and morning activity patterns of Hawaiian hoary bats. The percent of total bat detections is given for 20-minute intervals from sunset and 10-minute intervals before sunrise.

Discussion

Most Hawaiian hoary bats detected during our surveys were foraging in open areas and along forest edges, however our use of roads to sample large areas of the Puna District were likely to bias the percentage of detections from open (roadside) habitats. Hawaiian hoary bats have been previously documented foraging over open

ocean, streams, ponds, forest clearings and edges, lava flows, at the mouth of lava tubes and some agricultural fields (Baldwin 1950; Tomich 1974; Fujioka and Gon 1988; Kepler and Scott 1990) and in and above closed canopy forest (Jacobs 1993a; Reynolds *et al.* 1994). The distribution of bats is likely most influenced by the availability of insects and roosting sites. The availability of roosting sites is believed to be essential for

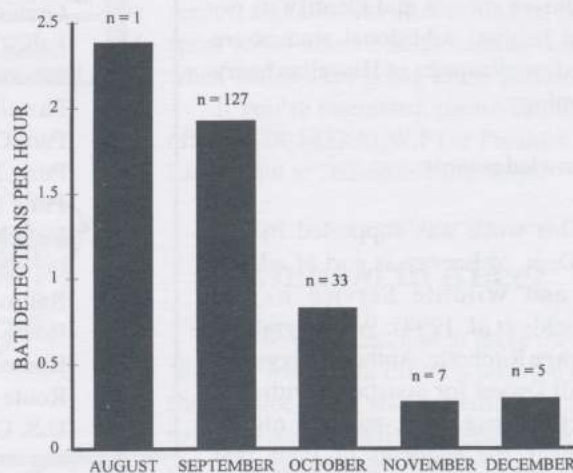


Figure 4. Mean monthly detection rates of the Hawaiian hoary bat (detections/hour) during August - December 1993. Sample sizes (n) indicate surveys per month.

survival of these bats (Tomich 1986; Fullard 1989; Jacobs 1993a).

The abundance of Hawaiian hoary bats in Puna appears to vary seasonally, with fewer bats detected in November and December, the last two months of our sampling, than in the three preceding months.

Previous researchers reported more bat sightings from September through December than from January to August (Kramer 1971; Kepler and Scott 1990; Jacobs 1993a).

It has been hypothesized that migration to other main Hawaiian islands (Kramer 1971) or winter dormancy (Kepler and Scott 1990) could cause this seasonal variation in bat sightings.

However, it is also possible that recruitment of fledging juveniles in July and August increases the number of bats sighted during the fall months (Kepler and Scott 1990).

Mainland *L. cinereus* seasonally migrate altitudinally and latitudinally (Jones 1965) and Hawaiian hoary bats may exhibit similar behavior (Tomich 1986; Jacobs 1991). Seasonal and elevational changes in bat activity should be considered when population studies are conducted on this subspecies.

Our surveys provide baseline data on the distribution, abundance, and activity patterns of Hawaiian hoary bats on the southeast portion of the island of Hawai'i. This study and recent pilot surveys using marine radar and night vision scopes (Reynolds *et al.* 1997) may help future researchers to locate this elusive species and identify its essential habitat. Additional studies are needed on *all* aspects of Hawaiian hoary bat ecology.

Acknowledgments

This work was supported by the U.S. Dept. of Energy as part of a U. S. Fish and Wildlife Service Report (Reynolds *et al.* 1994). We are grateful to George Ritchotte, Anthony Viggiano, and Jill Dwyer for assistance with data collection, data entry, and late nights. We thank the residents of Puna that provided private property access and helpful wildlife sightings. We would also like to thank Steve Fancy, Ken Clarkson, and Steve Hess for reviewing this manuscript.

Table 1. Locations of Hawaiian hoary bat surveys in the Puna District, Hawai'i during August - December 1993, survey type, the number of times each location was surveyed, the total amount of survey time per area, and presence (+) or absence (-) of bats.

Number	Location	Survey type	Number of times surveyed	Survey minutes ¹	Presence (+) or absence (-) of bats
1	'Ainaloa Greenhouse	walking	1	45	-
2	Crescent Acres	continuous	1	60	-
3	Halekamahina Crater	walking	1	53	-
4	Hawaiian Acres	continuous	2	66	+
5	Hawaiian Beaches	continuous	6	30	-
6	Heiehiahulu (East Slopes)	walking	12	744	+
7	Heiehiahulu Road	continuous	4	157	-
8	Herbert C. Shipman Park	walking	3	40	+
9	Hawai'i Tropical Products	walking	1	29	-
10	Hinalo Road	walking	3	104	+
11	Isaac Hale Beach Park	walking	5	98	+
12	Kahakai Road	point	3	55	-
13	Kahauale'a NAR	walking	10	691	+
14	Kalapana	walking	3	25	+
15	Kahuwai Crater	walking	1	337	+ ²
16	Kama'ili Road	continuous	6	255	+
17	Kaohe Homesteads	continuous	3	228	+
18	Kapoho Crater	walking	4	190	+
19	Kea'au Macnut Farm	continuous	2	111	+
20	Kea'au Plaza	walking	2	20	-
21	Kea'au School	walking	4	44	-
22	Kehena Vista Point	walking	4	20	-
23	Lava Trees State Park	walking	4	84	+
24	Leilani Estates	continuous	6	104	-
25	Kumukahi Lighthouse	walking	4	175	-
26	Kumukahi Lighthouse Road	continuous	5	31	-
27	MacKenzie Beach State Park	walking	1	10	-
28	Nanawale Forest Reserve & Homesteads	continuous	5	136	-
29	Orchidland Estates	continuous	2	226	-
30	Orchidland Wiki Wiki	walking	2	71	-
31	Pahoa High School	walking	2	26	+
32	Pahoa-Pahoiki Road	point	5	168	+
33	Pawai Crater	walking	4	408	+
34	Puna Geothermal Venture (vicinity)	walking	8	293	-
35	Puna Trail	continuous	3	142	-
36	Puna Biomass Power Company	walking	6	169	-
37	Pu'u Kali'u	walking	4	307	+
38	Pu'ulena Crater	walking	19	1270	+
39	Railroad Avenue Loop	continuous	4	246	-
40	Route 130	point	15	621	+
41	Route 132	point	11	329	+
42	Route 137	point/continuous	16	823	+
43	U.S. Cellular Tower (Puna)	walking	3	184	+

¹Number of minutes includes only survey time with echolocation detectors on.

²Incidental record. This observation was not made during the survey.

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¹ Subfossil remains of another (extinct) Hawaiian bat species have been identified (A. L. Ziegler and F. G. Howarth, unpublished data).

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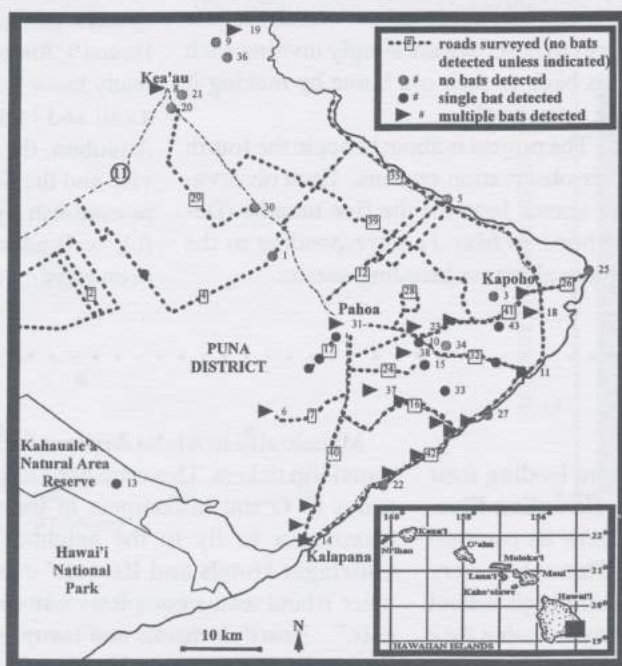


Figure 1. Locations of Hawaiian hoary bat detections in the Puna District, Hawai'i. Numbers correspond with locations listed in Table 1 (see page 156).

'Elepaio Seeks New Managing Editor

For almost two years now the 'Elepaio has arrived in your mailbox because of the hard work of Ronald Welton, our Managing Editor. He cajoled—and nagged when necessary—to get all the information and then put it through the magic of "PageMaker" on the Society's Power Macintosh (a continually appreciated gift from Sibyl Heide and son John) to create the journal you see.

The Society's luck has run out, however; Ron and his wife Roxita moved back to the Philippines at the end of October. Our deep appreciation goes with them; Roxita helped edit the labels we get from National Audubon Society for each mailing.

NOW comes the interesting part—who is out there, within or outside the Society, who would like to become the volunteer managing Editor of what HAS Board member John Harrison points out is "the only peer-reviewed scientific journal he knows of that's put out by a conservation organization"?

Writing and editing experience is important; the Society is willing to support upgrading "PageMaker" skills but would like to find someone with a basic knowledge of PageMaker 5.0 or 6.0.

Susan Miller will share what she knows about the scheduling (nine issues/year), working with the printer and mailer, and authors. Ron estimated he spent 15-20 hours a month during months when issues were going to the printer.

If you're interested, please call the office (528-1432 M,W,F) or President Linda Paul at 262-6859 other days.

Mahalo to Alice!

When Ron Welton had to leave the 'Elepaio Managing Editor's position on short notice, HAS was extremely fortunate that Alice Keesing agreed to help us out. She added preparing this issue to an already busy life as a University of Hawai'i student, editor of the Marine Option Program newsletter, and part-time staffer at the Honolulu Star-Bulletin. Three banzais for Alice!

It's Time for that Big Bird Again: Not Turkey — Albatross!

O'ahu's Laysan Albatross Recolonization Project Ready for 1997/8 Season

by Dr. Gail L. G. Kaaialii

It's that time of year again, the end of November; time for the big bird, only on O'ahu, to many bird-lovers that means Albatross! For the past three years O'ahu's Laysan Albatross Recolonization Project has commenced at the end of November and it will do so again this year.

The Project is an effort by a number of different wildlife organizations to get the Laysan Albatross (*Diomedes immutabilis*) back on O'ahu. Based on sub-fossil evidence these large, gliding sea birds used to breed on O'ahu but have apparently been dissuaded from doing so in the recent past — probably as a result of the introduction of mongoose, feral cats and/or the ever-growing number of humans.

The good news is that something *is* being done, through the Recolonization Project, to bring them back — and YOU can volunteer to join in the effort.

The O'ahu Laysan Albatross Recolonization Project was the brainchild of National Audubon bird biologists Dr. Richard Podolsky and Dr. Steve Kress as well as U.S. Fish and Wildlife biologist Dr. Ken McDermond.

The Project uses decoy albatross, arranged so as to mimic a Laysan albatross colony, to attract real albatross. Laysan albatross are gregarious birds, preferring to nest among crowds of their own kind. The decoys are set up at Kaohikaipu islet ("Black Rock") just off of Sea Life Park, O'ahu. The State has okayed the use of the islet for this wildlife restoration project.

Decoys have been used successfully by National Audubon's Seabird Restoration

Division to re-establish breeding colonies of puffins and a number of other sea bird species. Decoys have even been used successfully to re-locate a colony of Short-tailed Albatross which were nesting dangerously close to an active volcano in Torishima, Japan.

The effort on O'ahu is the first decoy-project to attempt to relocate Laysan albatross. The project here is a gutsy one since the "source" populations of Laysan albatross — those breeding populations from which an O'ahu colony will most likely be derived — are a very long way off. A number of the northern Hawaiian Islands support huge populations of Laysan albatross, and Kaua'i has witnessed the natural re-establishment of a breeding colony there during the past century.

In spite of the distance the project designers are hopeful that a colony can be started on O'ahu because the Laysan albatross breeding populations are currently growing.

This growth represents the recovery of populations in the northern Hawaiian Islands that were seriously culled earlier in this century by feather-traders and the military. Population growth means that some birds will inevitably have to search for new places to nest. We are simply inviting such birds back to their old home by making it look attractive!

The project is about to begin the fourth of six observation seasons. Each observation season lasts for the five months (December 1 to May 1) corresponding to the Laysan albatross breeding season.

During the season volunteers from Hawaii Audubon and the general public bird-watch for Laysan albatross and take behavioral data on what Laysan albatross do when they land on Kaohikaipu. Observers do this from Sea Life Park which has kindly provided us a place to observe from within the park.

Last year was the most successful year for the project in the past three years. There were numerous occasions when there were *two* Laysan albatross on Kaohikaipu. That's the magic number we need for reproduction. It's wonderfully close to a (tiny) breeding colony. (Unfortunately, since the Laysan albatross is without sexually dimorphic plumage we don't know how many of the pairs were of the opposite sex. But we're hopeful!) Perhaps this year we'll have our first chicks! That will give us something new to be thankful for come next Thanksgiving.

If you are interested in volunteering your time to watch for albatross on Kaohikaipu at Sea Life Park please call me (Gail Kaaialii) at 735-4807 (daytime) or 595-0331 (evenings). I need more volunteers this season and I prefer to have Hawai'i Audubon members since you already know how to spot birds! So give me a call and join National Audubon, Hawaii Audubon, the U.S. Fish and Wildlife Service and the State of Hawaii in an effort to re-establish a piece of nature: a big, graceful, well-adapted, "goony" bird that has been missing from here for too long.

Angels in Paradise

By Sylvianne Yee

Once again, the Paradise Pursuits "Angels" are lending their support and kokua for this, our seventh season. **Hawaiian Electric**, our main corporate sponsor, continues to show its commitment to Hawai'i's youth and the environment. Through its very generous monetary gift, HECO has enabled many high school students to learn more about our fragile ecosystems and what they can do to protect them.

Mahalo also to **Aloha Airlines** for their donation of inter-island round trip tickets. These are used to send the winning outer island teams to O'ahu to compete in the play off games and for the coordinator to fly to the neighbor islands to run the games. **Outrigger Hotels and Resorts'** donation of hotel rooms for the outer island teams completes our trio of "Paradise Pursuits Angels." Heartfelt thanks and many good holiday wishes to these wonderful and generous benefactors!

Annual Meeting Honors Volunteers and Supporters

by Susan Elliott Miller

After discovering the culinary talents of our members during a potluck dinner, attendees of the 1997 Annual Awards Dinner, applauded these volunteers and supporters for their contributions to HAS aims and activities:

• **President's Award:** William Devick, Administrator for DLNR's Division of Aquatic Resources, for helping clarify the aquatic resource issues at stake in the Wai'ahole Ditch contested case;

• **Conservation Award:** Betsy Gagnè, currently Executive Director for the Natural Area Reserves System Commission, whose tenacious advocacy within and without HAS for *active* involvement in protection of Hawai'i's flora and fauna has kept many peoples' feet to the fire;

• **Service/Volunteer Award:** Dan Sailer, current HAS Conservation Chair, who not only keeps after all those EISs but makes time to provide information on environmental issues to students and members of the community at workshops and fairs;

• **Program Award:** David McDonough, KITV-4 producer of the televised final games for "Paradise Pursuits," who put in



Recipients of this year's HAS awards (from left) William Devick, Betsy Gagnè, Julie King (Aloha Airlines), David McDonough, Collen Heyer (Outrigger Hotels), Bruce Benson (Hawaiian Electric), and Dan Sailer. Photograph by Linda Paul

countless volunteer hours to completely rebuild the sets;

• **Corporate Education Award:** Hawaiian Electric Company, who has provided major financial support to "Paradise Pursuits" since the program's beginning seven years ago;

• **Corporate Education Sponsor Awards:** Aloha Airlines, who has continued to provide tickets to bring members of the winning Neighbor Island teams to O'ahu for the final games;

Outrigger Hotels Hawai'i, who provides rooms for those team members; and

Castle & Cooke, Inc., who also provide financial support for "Paradise Pursuits";

• **Education Partnership Award:** State of Hawai'i Department of Education Environmental Education Branch, which continues to support "Paradise Pursuits" in many different ways; and

• **Government Partnership Award:** Gary Gill, Director of the Office of Environmental Quality Control, for his success in opening up the environmental evaluation process to more people and also helping to increase their understanding of that process.

Christmas Bird Count Opportunities on Every Island

by Arlene Buchholz, Organizer, Honolulu Count

Join our Christmas Bird Counts during the official count period, December 19, 1997 - January 4, 1998. If you want to do something good for birds and meet other "bird people", call one of the coordinators to sign up. There is a \$5/person charge to support compiling and publication of the nationwide results. NOTE: Special information is needed by the coordinator of the popular "Kulani Prison" count, so call the Big Island Volcano coordinator NOT LATER Than Dec. 12th to ensure your spot.

Kaua'i

Waimea	Saturday, 1/3/98	Koke'e Museum (Thorn Clark)	1-808-335-9975
Kapa'a	Sunday, 12/28/97	Barbara Stuart	1-808-826-9233(h)

O'ahu

Honolulu	Saturday, 12/20/97	David Smith, compiler Arlene Buchholz, organizer	HAS 1-808-528-1432, box 4, or 1-808-988-9806(h)
Waipio	Saturday, 12/27/97	David Bremer	1-808-623-7613(h)

Maui

Pu'u O Kaka'e	Sunday, 12/28/97	Renate Gassmann-Duvall or Fern Duvall	1-808-572-1584(h)
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Moloka'i

Kualapu'u	Date TBA	The Nature Conservancy (Joan Yoshika)	1-808-553-5236
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Hawai'i Island

North Kona	Saturday, 1/3/98	Reginald David	1-808-329-9141(w)
Volcano	Saturday, 12/27/97	Larry Katahira or Tanya Rubenstein	1-808-985-6088(w) 1-808-9678-7396 x 233 (w)

Calendar of Events

Monday, January 5

Regular monthly meeting of the **Conservation Committee** at the U.H. Environmental Center, Crawford Hall, Rm. 317, 2550 Campus Rd. All are welcome. (No December meeting.) Call chairperson Dan Sailer, 455-2311.

Thursday, December 4 and January 8

Monthly meeting of the **Education Committee**, 7 p.m., BaLe Sandwich Shop, Manoa Marketplace (near Safeway). All are welcome. Call chairperson Wendy Johnson, 261-5957.

Monday, December 1 and January 12

HAS Board meeting, always open to all members. 6:30 p.m. at the office.

Saturday, December 6

Our **field trip** will be a walk on the 'Aiea Loop Trail at Keaiwa State Recreation Area, led by Pete Donaldson. We are hoping to see some 'apapane feeding on the eucalyptus blossoms along the way. Binoculars are a must. We may also see 'amakihi and introduced forest birds such as white-rumped shamas and bulbuls. Come prepared for muddy conditions and possible rain. Suggested donation \$2. Limit 20. Call Mary Gaber, 247-0104 for registration and more details.

Saturdays & Sundays, December 6-7 & 13-14

Welcome to our annual **open houses** for holiday shopping, 10 a.m.-3 p.m. each day! Park-

ing (metered) at mauka-Diamondhead corner of Richards and Merchant Streets, just kitty-corner from 850 Richards. *Hawai'i's Birds, Voices of Hawai'i's Birds*, HAS, kolea, and Cooper T-shirts, and more will be available.

Monday, December 8

Bring your friends and join fellow HAS members at the **HAS Annual members' meeting and Program**, 7:30-9:30 p.m., Paki Hall Conference Room, Bishop Museum. Election results will be announced. Vida Yap, recipient of HAS' Rose Schuster Taylor Scholarship for Fall 1997, will show slides and talk about three mangrove research projects at He'eia wetland. Refreshments provided; HAS books, tapes, and T-shirts available for purchase.

December 19, 1997 - January 4, 1998

The annual **Christmas Bird Count** will be happening on all islands! See page 141 of October *'Elepaio* for general information and page 159 of this issue for updated information.

Sunday, January 18

Kaena Point with ethnobotanist Betsy Gagnè, who will lead a **walk and service trip** pulling noxious weeds. See albatross and rare plants, possibly monk seals & whales. Bring work gloves, hat, binoculars, water, lunch, and rain gear. Limit 20. Call Mary Gaber, 247-0104 for reservations and details. Suggested donation: \$2.

Table of Contents

Surveys of the Hawaiian Hoary Bat in the District of Puna, Hawai'i Island
by Michelle H. Reynolds, Bonnie M.B. Neilsen and James D. Jacobi 153

'Elepaio Seeks New

Managing Editor 157

Mahalo to Alice 157

It's Time for that Big Bird again:

Not Turkey — Albatross!

by Gail L. G. Kaaialii 158

Angels in Paradise

By Sylvianne Yee 158

Annual Meeting Honors

Volunteers and Supporters

by Susan Elliott Miller 159

Christmas Bird Count Opportunities

on Every Island 159

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