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Human and Bird Interactions at Feeding Sites in Waikiki, Hawaii

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INTRODUCTION

Several species of birds, including the Rock Dove *(Columba livia)* and the House Sparrow *(Passer domesticus)*, have a long history of association with humans and are generally recognized as pests (Long 1981). Both of the above species have been implicated in property damage, safety hazards and disease transmission (Weber 1979). These two species, and a third, the Zebra Dove *(Geopelia striata)*, are abundant and widespread throughout the Waikiki area of Oahu Is., Hawaii. Numbers of the three species combined constitute about 80% of all the birds in Waikiki (Fleischer and Williams 1987).

Our recent observations of these three species indicate a high level of human and bird interactions in Waikiki, especially at the Honolulu Zoo. For example, we have occasionally observed Rock Doves perched on the arms and heads of humans while being fed picnic scraps or grain. People were also observed catching and handling Rock Doves for short periods of time. Concern about the potential for disease transmission led the Department of Land and Natural Resources (DLNR), State of Hawaii, to contract R. Fleischer to conduct demographic and behavioral studies of the three species in Waikiki (see Fleischer and Williams 1987). Additional DLNR-funded studies are now underway in order to assess the level of infectious disease in these birds in Waikiki and ultimately the exact magnitude of risk to humans.

In this paper, we identify the extent and pattern of interactions of these birds with humans at three types of feeding sites in Waikiki. We further document the foraging and defecation rates of the birds, the types of foraging substrates and foods, and the rates of feeding and chasing of birds by humans. We *speculate* on the potential of these birds to transmit disease to humans via defecation and direct contact should the birds prove to have transmittable diseases.

METHODS AND MATERIALS

Observations were conducted at 14 feeding sites in Waikiki, including five picnic areas, five restaurants where food is served at tables, and four fast-food restaurants (Fig. 1). Observations were limited to the area of the tables and about 5 m around them. Birds were observed during a 30 min period within each site. Each 30 min period began and ended with a 5 min count period. During this period, individuals of all species seen within the restaurant or picnic area were counted. In addition, the number of humans was scored as follows: **0** = 0 people; **1** = 1-5 people; **2** = 6-10; **3** = 11-25; **4** = 26-100; **5** = >100.

A mean of 6.5 focal bird observations were made during the 20 min period between the two five min counts. During these focal bird observations, a single House Sparrow, Rock Dove or Zebra Dove was unsystematically selected and watched for 1 minute. Variables assessed include the following: the number of seconds (to the nearest 5 s) that the focal bird spent on each of four substrates: ground, building, furniture, or vegetation; the number of pecks to the substrate to pick up food; the number of defecations; the number of times a human *actively* fed a bird; the number of times a human purposefully chased a bird; and the type of food, if any, eaten during the observation.

RESULTS

Census Results: Birds and humans were significantly more common at picnic areas than at either fast-food or served-food restaurants (Table 1). Rock Dove and House Sparrow numbers at feeding sites were correlated with human numbers (Spearman $r = 0.33$, $p = 0.01$ for Rock Dove; Spearman $r = 0.29$, $p = 0.03$ for House Sparrow). The correlation was not significant for Zebra Doves (Spearman $r = 0.22$, $p = 0.12$). There were also no significant relationships when the samples were divided by feeding site type.

Focal Observation Results: Table 2 includes means and standard deviations for the four behavioral variables. The data were divided by feeding site type (i.e., fast, picnic, and served) and by species (House Sparrow, HS; Rock Dove, RD; and Zebra Dove, ZD). Means were compared in a two-way analysis of variance. Substrate use varied among feeding site types and species (Fig. 2).

The English Sparrow—a familiar commensal of man at Waikiki.
Photo by Greg Vaughn

Table 1. The average scores of human number (HN) and numbers of Rock Doves (RD), Zebra Doves (ZD) and House Sparrows (HS) in total and divided among feeding site types.

	FEEDING SITE TYPE:				
	Total	Fast-food	Served-food	Picnic Areas	F/X²
n	52	21	12	19	-
HN	2.6 ± 1.6	1.7 ± 1.2	2.8 ± 1.3	3.3 ± 1.7	[a]9.5**
RD	21.9 ± 49.1	11.7 ± 32.4	3.2 ± 4.5	45.1 ± 68.8	[b]3.8*
ZD	8.4 ± 13.0	3.8 ± 6.5	5.7 ± 7.5	15.2 ± 17.9	[b]4.8**
HS	4.9 ± 6.6	2.8 ± 4.2	3.0 ± 2.5	8.5 ± 8.8	[b]5.2**

$p < 0.05$*; $p < 0.01$**.
[a]Differences among means tested by Kruskall-Wallis test. Tabulated is the X^2 value and its associated significance level.
[b]Differences among means tested by one-way analysis of variance. Tabulated are values of F and their associated significance levels.

Birds occurred most often on the ground (mean of 45.2 s of a 60 s observation), especially at picnic areas. Both dove species used the ground to a much greater degree than the House Sparrow. House Sparrows spent more time on furniture than the other two species, and birds overall spent more time on furniture at both types of restaurants than at picnic areas.

Bird peck rate averaged 15.2 pecks per minute and varied significantly by feeding site type and species (Table 2). House Sparrows and Zebra Doves pecked at significantly higher rates than Rock Doves (Table 2), and peck rates were lower at fast-food restaurants than at served-food restaurants and picnic sites. Peck rates were lower at fast-food restaurants mainly because less feeding was done there (34.4% of the observations at fast-food restaurants involved no feeding versus 17.4% and 17.6% at picnic areas and served-food sites, respectively; G = 12.0, $p < 0.005$). Peck rate was positively correlated with time spent on the ground (Table 3): most feeding by all species was on the ground.

Birds defecated an average of 0.13 times per minute. House Sparrows consistently had higher defecation rates than both Rock and Zebra Doves. Peck rate was significantly correlated with defecation rate for all species, all feeding site types, and overall (Table 3). The correlations strongly suggest that defecation rates are proximately controlled by the rate of food intake.

Humans interacted with birds at fairly high rates, but more often fed than chased the birds (Table 2). There were no significant differences in feeding or chasing rate either among feeding site types or among species. The average feeding rate was 18.6 feeds/bird/hour. The McDonald's restaurant on Kalakaua (MC in Fig. 1) has a sign requesting people not to feed birds. The average feeding rate for this site was 0.48 ± 1.43 (n = 31 observations) versus 0.32 for all the other fast-food sites (t = 0.6, n.s.). This indicates that the sign has not reduced the rate of bird feeding by customers.

Peck rate was consistently related to the rate at which birds were offered food by humans (Table 3). This makes intuitive sense in

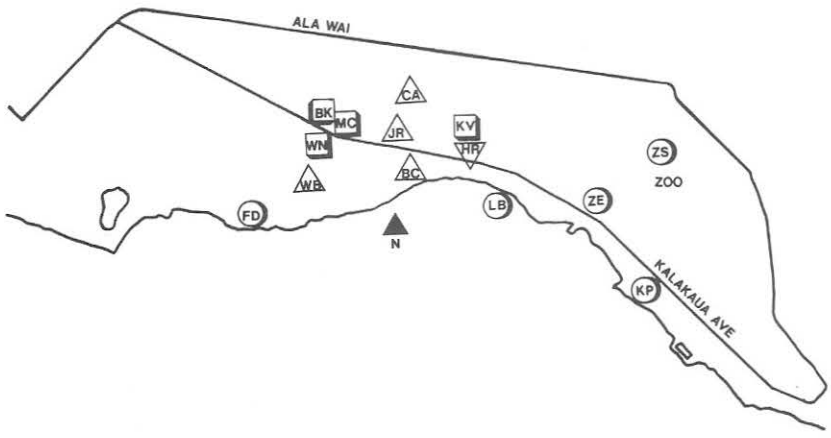


Figure Legends

Figure 1. Map of study area showing location of feeding sites. Acronyms are as follows by type. Picnic sites: FD, Fort DeRussy picnic area; KP, Kapiolani Park; LB, Liliuokalani Beach Park picnic area; ZE, Honolulu Zoo front entrance; ZS, Honolulu Zoo Snack Bar. Fast-food Restaurants: BK, Burger King (intersection of Kalakaua and Lewers Avenues); KV, King's Village (Kanekapolei and Koa Avenues); MC, McDonald's (Kalakaua and Lewers Avenues); WN, Wendy's (on Lewers near Kalakaua Avenue). Served-food Restaurants: BC, Banyan Court; CA, Maurice's Cafe (intersection of Kuhio and Nahua); JR, Jolly Roger (Kalakaua Avenue and Duke's Lane); WB, Waikiki Broiler (Lewers and Kalia Road); HR, Hyatt Regency courtyard.

Table 2. Mean rates for two bird (peck and defecation) and two human activities (feeds and chases). Means were compared by two-way analysis of variance. Sample sizes are given in the first comparison but are identical for the remaining comparisons.

PECK RATE: (pecks/min)

	Fast-food	Picnic Areas	Served-food	All
HS:	16.3 ± 27.5	21.1 ± 22.7	23.0 ± 29.9	19.7 ± 26.5
n:	35	32	24	91
RD:	8.0 ± 15.2	14.0 ± 23.2	8.6 ± 14.6	10.5 ± 18.8
n:	52	51	25	128
ZD:	9.9 ± 19.7	18.9 ± 22.5	20.6 ± 21.1	16.8 ± 21.6
n:	35	49	36	120
All:	10.9 ± 20.7	17.5 ± 22.9	17.8 ± 22.9	15.2 ± 22.3
n:	122	132	85	339

ANOVA: 2-way, F = 2.4*; interaction F = 0.5; by site type, F =23.6*; by species, F = 4.8*.

DEFECATION RATE: (defecations/min)

HS:	0.31 ± 0.63	0.16 ± 0.51	0.21 ± 0.41	0.23 ± 0.54
RD:	0.04 ± 0.19	0.06 ± 0.24	0.16 ± 0.47	0.07 ± 0.29
ZD:	0.06 ± 0.24	0.14 ± 0.35	0.17 ± 0.38	0.12 ± 0.33
All:	0.12 ± 0.40	0.11 ± 0.36	0.18 ± 0.41	0.13 ± 0.39

ANOVA: 2-way, F = 2.0*; interaction F = 1.3; by site type, F = 0.7; by species, F = 4.5*.

FEEDS BY HUMANS: (feeds/min)

HS:	0.46 ± 1.17	0.19 ± 0.47	0.21 ± 0.51	0.30 ± 0.82
RD:	0.37 ± 1.14	0.75 ± 4.34	0.04 ± 0.20	0.45 ± 2.83
ZD:	0.26 ± 0.85	0.10 ± 0.31	0.17 ± 0.38	0.17 ± 0.54
All:	0.36 ± 1.07	0.37 ± 2.71	0.14 ± 0.38	0.31 ± 1.82

ANOVA: 2-way, F = 0.6; interaction F = 0.6; by site type, F = 0.5; by species, F = 0.7.

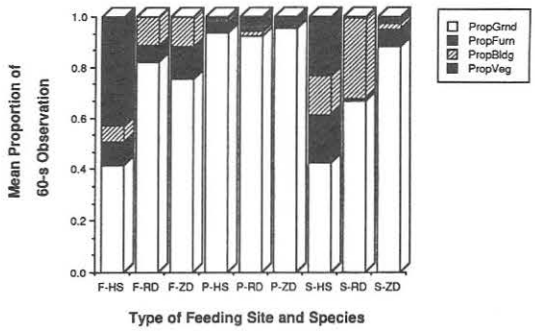
CHASES BY HUMANS: (chases/min)

HS:	0.09 ± 0.28	0.44 ± 1.62	0.17 ± 0.48	0.23 ± 1.01
RD:	0.08 ± 0.27	0.16 ± 0.37	0.12 ± 0.33	0.12 ± 0.32
ZD:	0.20 ± 0.53	0.12 ± 0.39	0.17 ± 0.38	0.16 ± 0.43
All:	0.12 ± 0.37	0.21 ± 0.87	0.14 ± 0.38	0.16 ± 0.62

ANOVA: 2-way, F = 1.0; interaction F = 1.2; by site type, F = 0.8; by species, F = 1.0.
$p < 0.05$*; $p < 0.01$**; $p < 0.001$***.

that birds being fed will eat more than those not being fed. Feeding rates by humans are mostly related to human number (Table 4), although in the case of picnic areas the relationship is negative. The rates at which doves were chased exhibited negative correlations with time spent on the ground (Table 3), because doves often flew after being chased.

Figure 2. Substrate use by House Sparrows (HS), Rock Doves (RD) and Zebra Doves (ZD) in each of three foraging site types: picnic areas (P), fast-food restaurants (F) and served-food restaurants (S). Plotted are the mean proportions of the 60 sec period during which the bird was on the ground, furniture, buildings, or vegetation. Values of F from a two-way analysis of variance comparing time spent on the ground are 11.6, $p < 0.001$ for two-way; 6.0, $p < 0.001$ for interaction; 16.7, $p < 0.001$ by site type; and 17.9, $p < 0.001$ by species. Values of F comparing time spent on furniture are 4.2, $p < 0.001$ for two-way; 2.5, $p < 0.05$ for interaction; 7.7, $p < 0.001$ by site type; and 4.0, $p < 0.05$ by species.



DISCUSSION

The feeding site surveys provide basic information on the levels and patterns of interaction of three species of urban birds and humans at restaurants and picnic areas in Waikiki. Relevant variables of bird and human densities, bird feeding and defecation rates, substrate use, human interaction rates, and food types were assessed and found to be highly intercorrelated.

The scenario indicated by these relationships is expected and obvious. In general, the more people at a site, the more that birds are fed by humans (at least for Rock Doves and House Sparrows). The more often they are fed, the faster they eat (i.e., peck) and defecate. Defecation is one of the more likely mechanisms of transmission of disease to humans (Weber 1979). The finding that House Sparrows occur more often on furniture and defecate more often than the other two species suggests that this species would be more likely to spread disease via contact with droppings. This assumes that there are similar levels of infectious disease among the three species, which may not be the case (Weber 1979:12-13).

Differences Among Feeding Site Types: The picnic areas generally had more birds and people than the restaurants. The larger size and more open habitat of these sites may have allowed more birds to physically use the sites. Alternatively, birds may prefer these habitats, as was suggested by Fleischer and Williams (1987). Birds overall fed less at fast-food restaurants than at picnic and served-food sites. They spent more time on the ground and less time on furniture at picnic sites than at restaurants. This may have been because there were generally fewer tables at picnic sites, or because leftover food was more often left unattended at restaurants than at picnic sites (where people tend to take their remaining food with them).

Table 3. Spearman rank correlations between selected variables by feeding site types and species.

	Defecations	Feeds	Chases	PropGround
FAST-FOOD RESTAURANTS: n = 122				
Pecks:	0.33***	0.53***	0.28**	0.44***
Defecations:		0.31***	–0.01	0.02
Feeds:			0.32**	0.06
Chases:				–0.14
PICNIC AREAS: n = 132				
Pecks:	0.24**	0.15	0.13	0.05
Defecations:		0.09	0.24**	–0.13
Feeds:			0.16	0.00
Chases:				–0.31***
SERVED-FOOD RESTAURANTS: n = 85				
Pecks:	0.29**	0.49***	0.36***	0.47***
Defecations:		0.01	0.10	0.06
Feeds:			0.04	0.19
Chases:				–0.09
HOUSE SPARROWS: n = 91				
Pecks:	0.30**	0.40***	0.18	0.58***
Defecations:		0.29**	0.11	0.06
Feeds:			0.15	0.20
Chases:				0.02
ROCK DOVES: n = 128				
Pecks:	0.31***	0.28**	0.24**	0.38***
Defecations:		0.18*	0.11	0.09
Feeds:			0.15	0.12
Chases:				–0.19*
ZEBRA DOVES: n = 120				
Pecks:	0.23**	0.43***	0.31**	0.18*
Defecations:		–0.06	0.15	–0.10
Feeds:			0.24**	–0.02
Chases:				–0.31***

$p < 0.05$*; $p < 0.01$**; $p < 0.001$***.

Table 4. Spearman rank correlations between human number and feeding by humans.

	Fast-food	Picnic Area	Served-food
HS:	0.51**	–0.15	0.14
RD:	0.35*	–0.18	0.00
ZD:	0.57***	–0.21	0.30
All:	0.48***	–0.18*	0.21*

$p < 0.05$*; $p < 0.01$**; $p < 0.001$***.

Differences Among Species: House Sparrows pecked and defecated at significantly faster rates than both Zebra and Rock Doves. Rock Doves had significantly more observations in which no feeding occurred than the other two species ($G = 5.9$, $p < 0.05$). House Sparrows also spent significantly more time on the furniture and less on the ground than the more terrestrial doves. The smaller sparrows may have more opportunities to feed, especially on tables, than the larger and slower doves. Alternatively, energetic needs may require the sparrows to feed at higher rates than the doves. No differences were found in the human chasing or feeding rates among species. This indicates that humans are not cueing in on any one species in particular.

ACKNOWLEDGEMENTS

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RECENT OBSERVATIONS MARCH - MAY 1988

(Editor's note: This article is excerpted from Bob Pyle's record of bird observations for the Hawaiian Islands. Refer to future issues of American Birds for a full account.)

ABBREVIATIONS: FFS = French Frigate Shoals; H = Hawaii Is.; K = Kauai Is.; M = Maui Is.; Mo. = Molokai Is.; O = Oahu Is.; JCNWR = James Campbell Nat. Wildl. Ref. on Oahu; KMCAS = Kaneohe Marine Corps Air Station on Oahu; PHNWR = Pearl Harbor Nat. Wildl. Ref. on Oahu; HRBP = prefix for Hawaii Rare Bird Documentary Photograph numbers.

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WEATHER: The heavy rains this winter let up by March. Rainfall this spring was above normal on Kauai but was generally below normal elsewhere.

SEABIRDS -- Laysan Albatrosses continue their search for new nesting grounds on the main islands. An unexpected potential nesting site was discovered by AE and RC at 1400 feet elevation above Kaena Pt., O. on 9 April. Here 4 albatrosses engaged in the comical courtship displays typical of this species, while 4 others flew overhead. Two other exciting records were of single birds flying over Manana Is. off O. (3 Apr. by RC and 27 Apr. by JL). Manana, which is free of predators such as dogs that have devastated new colonies on the main islands, would provide a safe nesting area within sight of Oahu's human residents.

Each fall, a few fledgling Dark-rumped Petrels are turned over to shearwater aid stations on Kauai. Despite this tantalizing evidence for nesting on Kauai, any location of a suspected colony has remained a mystery. This May, a Nature Conservancy field party camping at 4,050 ft. elevation on the rim of Wainiha Valley heard 5-10 petrels calling in the air above the camp site after dark (SG), strongly indicating a colony nearby; details of the discovery will be forthcoming in a future issue of *'Elepaio*. Also, two rare observations of this species at sea were reported by RD: 2 birds seen from shore at South Pt., H. on 23 Apr., and one seen closely and photographed from a boat within 3 mi. of the Kona Coast, H. on 29 May.

Unknown to most of us is that the massive autumnal fall-out of fledgling Newell Shearwaters on Kauai is presaged by a much smaller spring fall-out of adults returning to the island (for the first time?) for nesting. Between 1 May and 15 June, 20-25 adult shearwaters were picked up on highways and parking lots in the Kapaa and Lihue sections of Kauai (TT). Surprisingly, none wore bands, despite more than 12,000 bandings of fledglings in the fall rescue program over the past 15 years. No Newell Shearwaters have been reported from Molokai since the forest bird surveys of 1979/80, when night flying birds were heard at several sites at or near the rims of Pelekunu and Wailau valleys. Continued existence of these presumed colonies was indicated when one or probably 2 Newell Shearwaters were heard calling as they flew up Kamalo Gulch near Kaapahu Cone on Molokai during the May forest bird survey (JE, RD). No nocturnal seabirds were heard by survey parties camped at Puu Alii on the previous and following weeks.

A tight flock of at least 30 Great Frigatebirds circling high over Honomalino Bay, H. on 29 May (TP) was an unusual concentration at an unusual locality.

Another Long-tailed Jaeger, the third state record, was photographed at sea, 2 mi off Kahaluu Beach on the west coast of Hawaii Is. on 29 May.

The outstanding birding event of this season was the big influx of Franklin Gulls to the region. First reports were of 2 at Waipio, O. on 5 Apr. (PD), and one across the island at Heeia Marina near Kaneohe, where it caught the eye of local boatmen and was seen regularly during 8-19 Apr. (SC). Up to 4 birds were present at JCNWR and adjacent Amorient Aquafarm on 2-13 May (PC,DW), with one still there on 9 June (DW). On Hawaii Is. individuals were still there on 9 June (DW). On Hawaii Is., individuals were reported in Hilo on 1 May (GV) and 16 May (GC), and at South Pt. on 4 May (BM). Many were reported on the west side of the island, mostly along the highway between Kailua-Kona and Waikoloa. Largest count was 5 or so together on 17 May with suspicion that more may have been present. Some of the birds were hawking for insects where the highway passes through hot, dry lava fields. Single birds also turned up near Molokini Is. off Maui Is. on 14 April (DP) and twice in late May near Kaunakakai, Mo. (JJ, JA). One bird was seen out at Laysan Is. on 3, 4 and 12 May (JM). Outside Hawaii, single birds were reported at Johnston Atoll on 8 Apr. (KG) and at sea on 30 May from a research vessel on station at 9 N 140 W (KH).

All of these observations were of adults in full breeding plumage, some reported with a noticeable rosy tinge. Prior records from Hawaii are few. They include a specimen collected in 1902 (present whereabouts unknown), another collected offshore in 1958, and about 10 sightings since 1953. One sighting was in June; all others were in May. Franklin Gulls winter mainly on the west coast of South America and migrate north in spring to central North America. They have occurred widely as vagrants. What caused the invasion of 1988 is unknown.

Two Glaucous-winged Gulls seen repeatedly throughout March along the north coast of Lanai Is. (AM, HRBP 769 *et seq.*) can be added to the list of gull species reaching Hawaii after last winter's storms. A winter-plumaged Gull-billed Tern seen at Kualapuu Res., Mo. on 26 Apr. (AE) and one seen at the NW end of Kealia Pond, M. on 5 June (FD) and 6 June (RLP) could all have been the same individual that established the first state record when it was seen on Oahu for one day in January.

WATERBIRDS -- Two Great Blue Herons in breeding plumage at Kanaha Pond, M. on 9 Mar. (DP) were the final report from the unusual invasion of this species to Hawaii last fall and winter. A Snowy Egret associating with some Cattle Egrets was reported at Lokoaka Pond, H. on 1 May (JL). A straggler Cattle Egret was seen at Johnston Atoll, 900 mi. SW of Honolulu, during the second week of April (KG).

A nest of Fulvous Whistling-Ducks with 10 eggs at Kii Ponds, JCNWR found 9 Mar. was apparently flooded out before the eggs could hatch (GH). However, two adults with two small chicks were seen at adjacent Amorient Aquafarm on 3 Apr. (RC). One adult was observed again at Kakahaia NWR, Mo. on 26 Apr. (AE), where a single bird. has been seen irregularly in recent years.

A Brant seen near Princeville, K. on 26 Mar. may have been the same bird observed through the winter on Oahu. Groups of Nene that regularly frequent Puu Lani Ranch at Puu Anahulu this spring included 6 adults with 9 juv. on 1 Apr. (RD) and 15 mixed

adults and imms. on 14 May (BM). Two more juveniles spotted at Kipukai, K. raise to 10 the total of fledglings produced there this year (TT).

A count of 224 Laysan Ducks around the lake on Laysan Is. on 17 Apr. (JM) was a low total. That only adults were present may be due to the dry year on Laysan. The female Common Merganser at Kealia Pond, M. this winter was last seen there 12 Mar. (DP) and 30-31 Mar. (GH).

RAPTORS -- Upon her arrival (2 Mar.) at Laysan Is., BB discovered a straggler **Rough-legged Hawk**, the first valid state record for any migratory *Buteo* species. Frequently mobbed by angry Sooty Terns, the hawk was probably subsisting on tern chicks in lieu of its usual rodent fare. The hawk was photographed (HRBP 762 *et seq.*); it was last seen on 12 Apr.

Single unidentified falcons, probably peregrines, were observed in Honolulu: one at the start of the Lanipo Trail on 17 Apr. (JL) and another flying over Kapiolani Park while being chased by 3 White Terns on 11 May (MC).

(To be continued next issue.)

Thane K. Pratt

CONSERVATION NEWS

SIERRA CLUB LEGAL DEFENSE FUND HIRES ARNOLD LUM -- Arnold Lum, formerly an attorney with Case and Lynch in Honolulu, has been hired by SCLDF to staff its Hawaii office. Before returning to Hawaii, Lum practiced law for ten years in Boston, where he held various positions with the Commonwealth of Massachusetts Department of Environmental Management, the U.S. Department of the Interior, and the Massachusetts Hazardous Waste Site Safety Council. The SCLDF office will open in the Arcade Building in Honolulu on 1 August 1988.

NATURAL RESOURCES DEFENSE COUNCIL ESTABLISHES HAWAII OFFICE -- Thanks to a grant from the John D. and Catherine T. MacArthur Foundation, the New York-based Natural Resources Defense Council (NRDC) has established an office in Honolulu. NRDC has hired Susan Miller as its Hawaii consultant and will open its offices this summer in the Arcade Building between Merchant and King Streets in downtown Honolulu. NRDC's Hawaii strategy will include:

1) improving implementation of the state and federal endangered species acts;

2) advocating revisions to the state-wide land use plan to ensure conservation of important state and private lands;

3) lobbying for increased funding and better management of the National Parks and National Wildlife Refuges in Hawaii; and

4) monitoring implementation of the state's coastal zone legislation, the new water code, and other relevant environmental statutes.

Craig S. Harrison

HAWAII AUDUBON RESEARCH GRANTS, SUMMER 1988

The Hawaii Audubon Society annually awards several grants for natural history research in Hawaii and the Pacific. These awards are small-scale grants to help defray research costs such as equipment and travel. Four research grants were awarded in June 1988.

Marie Morin, Ph. D. candidate at the University of Hawaii, was awarded $500 for her study on the breeding ecology of Laysan Finches. Ms. Morin will be working on Laysan Island, monitoring nests and adults.

Ronald Dunn, Graduate Assistant in physiology at the University of Hawaii, was awarded $475 for his study on the basal metabolic rate of the Hawaiian Monk Seal. Mr. Dunn will build a special chamber in which it will be possible to place a seal and measure the animal's metabolic rate.

Geoffrey Hill, Ph. D. candidate at the University of Michigan, was awarded $500 for his study on the origin of geographic variation in male plumage pigmentation in the House Finch. Mr. Hill will be collecting and studying House Finches from four different populations, including the local Hawaiian population.

Justine B. de Cruz, M.S. candidate, University of Connecticut, was awarded $300 for her investigation into the incubation, chick growth, and feeding in the Dark-rumped Petrel of the Galapagos Islands. The award will help Ms. de Cruz cover the cost of prey species identification needed for this study.

Hawaii Audubon Society congratulates these recipients and hopes that their research is successfully completed as scheduled. For information about the HAS awards program, write or call John Engbring, Awards Committee, P.O. Box 4443, Honolulu, HI 96812. Phone (business) (808) 541-2749.

John Engbring

HAS hikers at the summit of Waialae Iki Ridge, Oahu.
Photo by Bruce Eilerts

JUNE 19th FIELD TRIP REPORT: WAIALAE IKI RIDGE

The Hawaii Audubon field trip in June was a hike along Waialae Iki Ridge to the top crest of the east Koolau Range. Over twenty participants turned out for the outing, which began around 9:00 AM. The beginning of the hike traversed through an introduced forest which merged into a higher elevation native forest consisting primarily of Ohia, Koa and Uluhe. A few lobelias were encountered along with other native plants. A

variety of introduced and native species of birds were observed: 'Amakihi, 'Apapane, Japanese Bush-Warblers, White-rumped Shamas, Red-vented Bulbuls, Northern Cardinals, House Finches, Barred Doves, Japanese White-eyes, Nutmeg Mannikins, Red-billed Leothrix, and a White-tailed Tropicbird. Two Melodious Laughing-thrush and a Yellow-faced Grassquit were heard along the upper ridge-line and were first records for the area. The group ate lunch at the Koolau summit, and an incredible view of windward Oahu was enjoyed by all. The trip ended around 12:30 PM.

Bruce D. Eilerts

JUNE 19TH PROGRAM: ENDANGERED SPECIES RECOVERY PLANS

At the June membership meeting, Peter Luscomb introduced our speaker, Mr. William Kramer of the U.S. Fish & Wildlife Service. Mr. Kramer holds degrees in Resource Management and Wildlife Management, both from the University of Maryland. Before coming to Hawaii in 1980, he was with the Smithsonian Institution, but is now with the U.S. Fish & Wildlife Service working on recovery plans for Hawaii's endangered species. The U.S. Fish & Wildlife Service office here includes not only Hawaii but Palau, Guam, and American Samoa.

With a warning not to expect a slide show on Hawaii's birds and scenery, he showed a thick, loose-leafed volume, which listed the endangered species and plans for recovery. It is not enough, he said, to save or preserve endangered species, for the recovery plans are based on restoring and returning to their natural habitat the plants and animals treated by the plans.

While the Endangered Species Act was passed in 1973, implementation has been an even greater problem, mainly hampered by limited funding.

Priorities are set on which species to work on with restricted funds. There are 4 main criteria: (1) degree of threat of extinction, (the 'Alala is an example); (2) control needed for threat; (3) ways other than funding to preserve species; and (4) prognosis for recovery. With these criteria, recovery plans for 31 species (detailed in the hefty loose-leafed volume) have been laid out. The Mauna Kea silversword and Oahu tree snails are two recovery plans recently written by the U.S. Fish & Wildlife Service. Plans are structured and in general similar in over-all outline. Plans review factors limiting the species population, such as predators, disease, and pesticides. Goals are also set for a viable population: Hawaiian Stilt is 2,000 or more, after which it can be removed from the endangered list. These goals must also consider the size of the habitat for a minimum population, and large enough to maintain a genetic pool.

One person is contracted to be responsible for preparing a report, but the report is passed around among experts and specialists. Since the plans and data can become dated, an update is supposted to be made every 5 years.

There has been close cooperation with the Nature Conservancy for land acquisition. Ten areas in Hawaii are listed for priority management; wetland areas are under severe pressure and threat from development.

Mr. Kramer encouraged questions during his talk and passed this thick volume around so the audience could see the plans. Hawaii now has highest priority due to lobbying by the Nature Conservancy and other environmental groups and organizations. Refreshments of cookies and punch were served following Mr. Kramer's presentation.

Betty L. Johnson

HAWAII AUDUBON SOCIETY PHOTO AND ART EXHIBIT AND CONTEST

The next HAS Photo and Art Exhibit/Contest will be held in conjunction with National Wildlife Week during March 1989. Next year's exhibit/contest will feature two themes: Hawaii and Islands of the Pacific. Categories for both themes will include wildlife, plants, natural landscapes, and man and nature. The location of the upcoming event will be announced later in the year. Anyone interested in participating should get out their cameras, brushes and pencils, **now!** For further information, please write the Hawaii Audubon Society, P.O. Box 22032, Honolulu, Hawaii 96822, and include a telephone number.

HAS NOMINATING COMMITTEE

The nominating committee has been appointed for the upcoming elections for the 1989 HAS Board of Directors. Bruce Eilerts will head this year's committee, and other members include Sheila Conant, Craig Harrison, and Robert Pyle. Hawaii Audubon members are invited to submit nominations for 1989 Board of Directors positions. Nominations should be submitted to the nominating committee by September 1988.

NEW LOCAL MEMBERS

We welcome the following new members and encourage them to join in our activities:

New Life Members:
Susan Scott, Honolulu, HI

New Local Members:
Frank Antram, Manly, Australia; Noreen Bautista, Kilauea, HI; Bruce Black, Waialua, HI; David Bremer, Mililani, HI; Frani Cross, Belmont, MA; W.G. Davis, Hanalei, HI; Ken Eslinger, Terre Haute, IN; Kate Farris, Marion, MA; Judy Gardner, Hanalei, HI; Vikki Greive, Kula, HI; Jeff Holm, Honolulu, HI; Dave Howard, Honolulu, HI; Gwendolyn Ihrig, Honolulu, HI; Tom Jacobsen, Sitka, AK; Eloise Johnson, Kaneohe, HI; Don King, Kailua, HI; Ha Nul Lee, Honolulu, HI; May Legro, Santa Rosa, CA; Tim Manolis, Sacramento, CA; Joseph Matuga, Haleiwa, HI; E.H. Myers, Moraga, CA; J.T. Penniman, Haiku, HI; Sue Fair Ryan, Oklahoma City, OK; W.K. Salisbury, Honolulu, HI; Elaine M. Shinagawa, Honolulu, HI; Ann Synder, Honolulu, HI; Arthur Solomon, Kailua, HI; Peg Sullivan-Miller, Honolulu, HI; Gloria Tiedeman, Kailua, HI; Anthony Vierra, Waianae, HI; Fred Wagner, Kailua, HI; Julie Williams, Volcano, HI; Tom Wood, Costa Mesa, CA William Woods, Honolulu, HI; Doug Wright, Jackson, MS Robert Zedekar, Kirkland, WA.

AUGUST PROGRAM: PALMYRA ATOLL

At the 15 Aug. 1988 general meeting of the Hawaii Audubon Society, Stewart Fefer from the U.S. Fish & Wildlife Service will be giving a slide presentation on Palmyra Atoll. Palmyra Atoll, the most northerly member of the Line Islands, is approximately 700 miles south of Hawaii. This Island was at one time a part of the territory of Hawaii. When Hawaii gained statehood, Palmyra remained independent and became an

unincorporated territory. This atoll is privately owned by a family living in Hawaii.

Palmyra Atoll is known for its huge seabird colonies, green sea turtles, and extensive reefs. Because of the limited human contact, Palmyra is one of the few areas where an intact atoll forest can be found. Palmyra is said to be "the forgotten gem of the Pacific."

The meeting place will be the Atherton Halau, B.P. Bishop Museum at 7:30 PM. Refreshments will be served.

AUGUST FIELD TRIP: KOKO HEAD REEF WALK

Back by popular demand, the next Hawaii Audubon field trip will be a night-time reef walk along a Koko Head lava bench on Saturday, August 27th. This outing will coincide with a low tide, and participants will be given the opportunity to encounter reef fishes, invertebrates, molluscs, and many other types of colorful and fascinating marine life. Anyone interested in attending should meet in front of the Hawaii Kai Baskin & Robbins at 7:30 PM. Be sure to bring old tennis shoes or tabbies, a flashlight, and a sweat shirt in case it's windy. For more information call Bruce Eilerts at 599-4795.

EDITOR NEEDED FOR *`ELEPAIO*

After three years as managing editor of the *`Elepaio*, I now wish to move on to other projects. Sheila Conant will be staying as Scientific Editor, but we need someone to take responsibility for production of the journal. Therefore, we are now searching for a new Managing Editor. The job entails a wide range of responsibilities: interacting with the printers, editing and laying out the journal, organizing and working with volunteers who enter text on a computer and assist in proof reading and paste up, and coordinating various aspects of production. The only skills the applicant must possess are an ability to write clearly (and therefore edit), meet deadlines, and be successful at working with people. The rest is easy enough to learn. Those interested should call me at 548-8850.

Thane K. Pratt

FREE ICE CREAM!

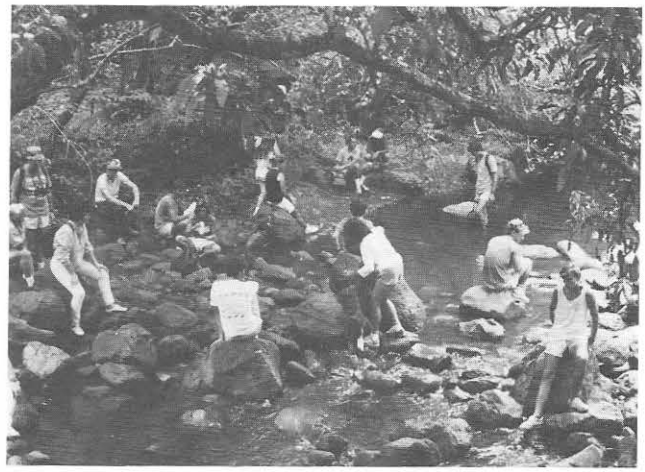
Ice cream will again be served to those volunteering for paste-up of the *'Elepaio* at Thane Pratt's house on Saturday, 20 August, beginning at 1:00 PM. Thanks to Sheila Conant, Lynne Matusow, Susan Schenck, and Leann Syrotuck for helping with the paste-up of the current issue! Sheila Conant will be organizing the paste-up of next month's issue; for more information contact her at 948-8241 or, on paste-up day, at 524-8464.

TKP

NOTICE TO AUTHORS

The *'ELEPAIO*, Journal of the Hawaii Audubon Society, invites authors to submit scientific articles on natural history of Hawaii and the Pacific. Scientific articles are subject to peer review. The *'ELEPAIO* also serves as a newsletter to inform members of conservation issues, Society events, and other subjects of interest to members. Manuscripts of articles and newsletter items may be sent to Thane Pratt at 1022 Prospect St., Apt. 1103, Honolulu, HI 96822. Articles not subject to peer review MUST BE RECEIVED BY THE 15TH OF THE MONTH to be considered for publication in the next month's issue.

SCIENTIFIC ARTICLES should be typewritten and double-spaced, and three copies should be submitted. Any photographs should be submitted as photographic prints, in color or black and white (they will appear in black and white). The prints should be 3.5 X 5 inches, or larger, and should be adequately cropped if cropping is required. Original copies of figures (e.g., maps, graphs) should be clear and clean, with lettering large enough to remain legible upon reduction to fit the newsletter format. Authors are advised to design their illustrations with the *'ELEPAIO's* columnar format and size in mind (please look at a copy of the journal).



HAS hikers search for o'opu and opae in Kaluanui Stream.
Photo by Bruce Eilerts

Hawaii Audubon's July field trip to Sacred Falls. Trip leader Andy Yuen (upper right, holding net) searches for *'o'opu* and *'opae* during rest stop.

HAWAII AUDUBON SOCIETY

BOARD OF DIRECTORS - 1988

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	Philip Bruner, Andy Engilis, Bob Pyle	
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Kauai	Dan Moriarty	1-828-1431 (wk)
Maui	Fern Duvall II	1-572-1584 (hm)

----------*'ELEPAIO*----------

Managing Ed. Thane Pratt 548-8850 (wk), 524-8464 (hm)
Scientific Ed. Sheila Conant 948-8241 (wk)
Editorial Committee: Marie Morin, Bob Pyle, Leann Syrotuck
Mailing: George Campbell, Elizabeth Edwards, Susan Schenck, Alan Ziegler, Marjorie Ziegler

IF NOT A MEMBER, PLEASE JOIN US

JOINT MEMBERSHIP -- National and Hawaii Audubon Societies

Individividual	$30.00
Family	38.00
Sustaining	50.00
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Donor	500.00
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Students and Senior Citizens may apply for discounted rate.

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Regular	$6.00
Junior (19 years and under)	3.00
Subscriber (off-island residents)	6.00
Life (payable in three equal annual installments)	150.00

All local memberships and subscriptions are for the calendar year.

PUBLICATIONS OF THE SOCIETY

HAWAII'S BIRDS by H.A.S. (1984, revised 1987). An excellent, pocket-sized fieldguide to all native and well-established introduced birds. $4.95 plus $0.89 surface mail or $1.07 air mail. Hawaii residents add $0.20 State excise tax.

FIELD CHECKLIST OF BIRDS OF HAWAII by R. L. Pyle and A. Engilis, Jr. (1987). Pocket-sized card listing 125 species, with space for field notes. Post paid. $0.25 or $0.10 for 10 or more. (NEW!)

GUIDE TO HAWAIIAN BIRDING by H.A.S. and C. J. Ralph, ed. (1977). Where to go, what to see. All regularly visited islands. Post paid. $1.50.

CHECKLIST TO THE BIRDS OF HAWAII by R. L. Pyle (1983). Our reference for avian nomenclature in Hawaii. All naturally occurring birds, plus introduced species well-established. Post paid. $2.00.

CHECKLIST TO THE BIRDS OF MICRONESIA by P. Pyle and J. Engbring (1985). Similar to preceding but covers Micronesia. Post paid. $2.00.

BACK ISSUES OF *'ELEPAIO* and INDICES TO *'ELEPAIO*:
Vol. 1-40 -- $1.00 per issue, $10.00 per volume
Vol. 41 to present -- $0.50 per issue, $5.00 per volume
Complete set (Vols. 1-43) -- $350
INDEX Vols. 36-40 -- $2.50
INDEX Vols. 41-45 -- $2.50

Overseas orders cost more. Contact the Society for added cost.

CALENDAR OF EVENTS

Aug. 8 (Mon.) Board Meeting at Bishop Museum at 7:00 PM. Call Bruce Eilerts (599-4795) for details.

Aug. 15 (Mon.) General Meeting at Atherton Halau, Bishop Museum at 7:30 PM. Program: Palmyra Atoll, by Stewart Fefer. Announcement on page 67.

Aug. 20 (Sat.) *'Elepaio* paste-up at Thane Pratt's house, 1:00 PM. Call Sheila Conant at 524-8464 or 948-8241.

Aug. 27 (Sat.) Field trip to Koko Head for night reef walk. **Meet at Hawaii Kai Baskin & Robbins at 7:30 PM.** Announcement on page 68.

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