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1998 Palila Population Census

Breeding and Nonbreeding Censuses of the 1998 Palila Population on Mauna Kea, Hawai'i

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INTRODUCTION

The Palila (Loxioides bailleui), an endangered Hawaiian honeycreeper (Fringillidae, Drepanidinae) currently found only in the subalpine woodlands of Mauna Kea, Hawai'i, has been monitored the most extensively of any forest bird in the state (Jacobi et al. 1996). Censuses of Palila population numbers on Mauna Kea have been conducted since 1980. Population size over the past 18 years has fluctuated tremendously, with estimates ranging from 1584 + 324 birds in 1985 to 5685 + 535 birds in 1981 (Banko et al. 1998). At present, the Palila population is largely confined to a small (< 139 km2) area on the west slope of Mauna Kea, which represents less than 5% of its original range (Scott et al. 1984, 1986). The historic decline in Palila numbers is believed to be caused by habitat degradation and loss, primarily by activities of introduced feral cattle (Bos taurus), feral sheep (Ovis aries) and mouflon sheep (Ovis musimon). These ungulates browse and prevent regeneration of mamane (Sophora chrysophylla) trees, which are the primary food source and nesting sites for Palila (van Riper et al. 1978). Since 1981, reduction of feral ungulates on Mauna Kea, as mandated by law, has resulted in initiation of forest recovery throughout much of the Palila's range (Hess et al. in press). Despite improving habitat conditions, however, the Palila population has continued to exhibit a great deal of variation in numbers, with no consistent increase or decrease in overall population size. In fact, a closer examination of trends suggests that Palila numbers are declining in areas of low population density, but not in areas of medium or high density (Jacobi et al. 1996).

One possible reason why improving habitat conditions have not yet resulted in a corresponding increase in Palila population size or distribution may be because mamane tree recruitment and growth on Mauna Kea is slow due to relatively harsh environmental conditions at high elevation. In addition, alien grasses may limit mamane recovery in some areas (Hess et al. in press). Palila rarely forage in sapling or young mamane trees (Biological Resources Division, unpubl. data); therefore, the cohort of young, growing trees generated from reduced ungulate browsing in the 1980s is not yet available as a food resource. As a result, it is critically important to continue monitoring the Palila population annually to determine how Palila are responding to management efforts. Specifically, continued monitoring is essential to increase our understanding of how mamane forest regeneration affects Palila population status and trends.

Our goal in this study was to continue censusing Palila population numbers throughout their entire range, using the same methodology that has been used in previous censuses to facilitate comparison between years. Our population census differed from previous ones, however, in several important ways. First, we expanded our analysis to include stations on the northern slope of Mauna Kea, where we have been reintroducing birds since 1997. In addition, we incorporated slight modifications of the procedure used to analyze point count data to increase the accuracy and precision of yearly population estimates.

Finally, because birds tend to be more vocal during the breeding season, we decided to census the Palila population during both the nonbreeding and the breeding season to determine whether estimates of population size were affected significantly by season.

METHODS

Our study area covered 250 km2 and extended from 1800 to 3000 m elevation. This subalpine woodland is dry (35 - 75 mm annual rainfall) and is comprised mainly of short stature (3 - 10 m) mamane and naio (Myoporum sandwicense) trees (Scowcroft and Giffin 1983, Scott et al. 1984). We used the variable circular-plot (VCP) method (Reynolds et al. 1980) to census the 1998 Palila population during both the nonbreeding and breeding seasons. During the nonbreeding season, Palila numbers on Mauna Kea were estimated from 16 January to 6 February at 536 stations on 25 transects, and during the breeding season, Palila numbers were estimated from 3 June to 10 June at 608 stations on 26 transects. For the 1998 censuses, we increased the number of transects monitored (from 17 transects in previous counts, see Jacobi et al. 1996) at both the north and the west sites to better estimate population numbers in these areas. We felt it was necessary to more closely monitor these two areas because of the high concentration of Palila in the west and our reintroductions in 1997 and 1998 of over 50 Palila to the north.

All observers (n = 9 in January; n = 8 in June) were trained to identify Palila by both sight and vocalizations. We calibrated distance estimation using visual and auditory cues for several days prior to the count. During the count, we recorded the distance to every Palila heard or seen for a 6-min time period at stations located 150 m apart along transects (Scott et al. 1984). Censuses began soon after sunrise. Thus, we censused birds during the nonbreeding season from 06:30 to 12:30 and during the breeding season from 05:30 to 11:30. We did not conduct counts during heavy rain or when wind speed exceeded 30 km/hr. We estimated cloud cover above count stations to the nearest 10% and recorded wind speed

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using the Beaufort scale.

For analysis, we placed each station into one of five areas: low density, medium density, high density, east slope, and north slope (Figure 1). In previous analyses (Jacobi et al. 1996, Banko et al. 1998), stations on northern transects 115 - 117 were excluded because Palila were absent from this area from 1980 to 1997; however, we included these transects in our analyses because of our recent translocations of Palila to the north slope. Assignment of low, medium and high density areas on the west and south slopes was determined by the total number of Palila detected in those areas from 1980 to 1995 (per Jacobi et al. 1996). We distinguished areas in the core population by density to determine whether Palila numbers in low density areas continued to decline while numbers in higher density areas remained stable. Although Palila densities also are low on the east and north slopes, we analyzed population density separately for these areas for historical reasons, and so that we could track changes in Palila numbers as we continue to translocate birds to the north and monitor predicted population expansion as recovery efforts continue.

We determined the effect of different observers, time of day, cloud cover, wind speed, and rain on population estimates using multiple linear regression of pooled VCP data from the 1998 counts and from seven other Mauna Kea counts conducted from 1994 to 1997 (Ramsey et al. 1987, Fancy 1997). Using regression coefficients from the pooled counts, we adjusted detection distances for the 1998 nonbreeding and breeding season censuses to reference conditions so that data were analyzed as if all detections were made by an experienced observer (PCB) at 08:30 (nonbreeding season) or 09:00 (breeding season) on a sunny day with no wind. Because reliable adjustments could not be made for observers with < 25 Palila sightings (n = 2), we combined detection distances for these observers with PCB to establish the reference condition (Jacobi et al. 1996). We determined the effective detection radius and its coefficient of variation (CV) during reference conditions using the program DISTANCE (Laake et al. 1994). Using the computer program VCPADJ, we calculated variation in the effective area surveyed by sampling from a random normal distribution centered on the mean effective area (Fancy 1997). VCPADJ also allowed us to calculate confidence intervals for population size using 5000 bootstrap samples.

We analyzed the data in two ways: each area contained only stations on transects used historically in other Palila censuses (Jacobi et al. 1996, Banko et al. 1998) and each area contained both the historical transects plus the new transects we added this year. We calculated density at each station by dividing the number of Palila detected by the effective area surveyed. We determined population estimates by multiplying density by the total number of square kilometers in each area. All means are reported as means + standard error (SE).

RESULTS

The DISTANCE program revealed

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an effective detection radius for Palila under standard conditions of 61.35 m and a coefficient of variation of 5.14%. Data were analyzed ungrouped for distances estimates (S.T. Buckland, K. P. Burnham and J. L. Laake, pers. comm.), and we obtained the best fit to the data using a half-normal model with hermite polynomial adjustments ($X2 = 3.56$, $df = 2$, $P = 0.17$). Wind speed ($P = 0.60$), cloud cover ($P = 0.21$) and rain ($P = 0.27$) did not significantly affect detection area and as a result were not included in the analysis of population size. We observed a significant effect of observer and time of day, and therefore these variables were used to adjust detection areas to reference conditions.

A comparison of population estimates using the old, historical transects versus the historical plus new transects revealed no significant difference in total mean population size for either the nonbreeding season census (paired t-test $t = 0.45$, $df = 4$, $P = 0.68$) or the breeding season census (paired t-test $t = 0.46$, $df = 4$, $P = 0.67$; Table 1). In addition, we found no significant difference in mean population size per area when we compared population estimates from the nonbreeding season with estimates from the breeding season (all $P > 0.05$; P values adjusted using Rice's (1988) correction).

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(a) **Nonbreeding season**

Area	Area (km^2)	Transect Category	No. Stations Sampled	No. Palila Detected	Mean Population Size	SE	95% CI
Low Density	22.5	Old	188	21	270	86	122-456
	"	All	221	61	605	124	376-872
Medium Density	13.5	Old	53	46	1059	211	669-1491
	"	All	62	55	1064	184	715-1428
High Density	20.5	Old	41	88	4107	590	2965-5297
	"	All	122	187	2904	309	2322-3516
East Slope	21.0	Old	49	0	0	0	0-0
North Slope	14.7	Old	8	0	0	0	0-0
	"	All	82	12	238	106	63-472
TOTAL	92.2	Old	339	155	5436	638	4192-6730
	"	All	536	315	4811	395	4041-5601

(b) **Breeding season**

Area	Area (km^2)	Transect Category	No. Stations Sampled	No. Palila Detected	Mean Population Size	SE	95% CI
Low Density	22.5	Old	188	15	189	66	83-705
	"	All	241	53	543	125	551-1510
Medium Density	13.5	Old	53	29	876	246	439-1401
	"	All	77	52	951	196	592-1355
High Density	20.5	Old	41	71	4454	735	3087-5965
	"	All	159	271	4265	419	3452-5121
East Slope	21.0	Old	49	5	276	143	47-590
North Slope	14.7	Old	23	1	49	49	0-166
	"	All	82	1	14	14	0-45
TOTAL	92.2	Old	354	121	5843	790	4490-7646
	"	All	608	382	6048	498	5444-7589

Table 1. Size of census area, number of stations sampled, number of Palila detected, mean population estimates, standard error of mean and 95% confidence intervals during the 1998 (a) nonbreeding season (16 Jan—6 Feb) and (b) breeding season (3 Jun—10 Jun) censuses. Transect category represents analysis done using old (historical) transects or all (historical plus new, additional) transects. Note that no new transects were added to the East Slope.

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Inclusion of the new transects, however, reduced the standard error of the total mean population estimates (Table 1). Therefore we report here only the results from the analyses of the historical plus new transects combined.

Transect 102 in the Pu'u La'au region on the west slope of Mauna Kea contained the greatest number of Palila detections; a considerable number of Palila (n > 50) also were detected on new adjacent transects 124, 125 and 126 (Figure 1). During both counts, 96% of all Palila were found on the west slope between transects 101 and 105.

The nonbreeding season census yielded a mean population estimate of 4811 + 395 Palila, with a 95% confidence interval of 4042 to 5602 birds. In comparison, the breeding season census yielded a mean population estimate of 6048 + 498 Palila, with a 95% confidence interval of 5445 to 7590 birds. These estimates were unaffected by the inclusion of stations on transects 115 - 117, which traditionally have been ignored (t-test for unequal variances t = 1.61, df = 995.5, P = 0.11). Although estimates of mean population size were higher during the breeding season, this difference was not statistically significant (paired t-test t = - 0.85, df = 4, P = 0.44).

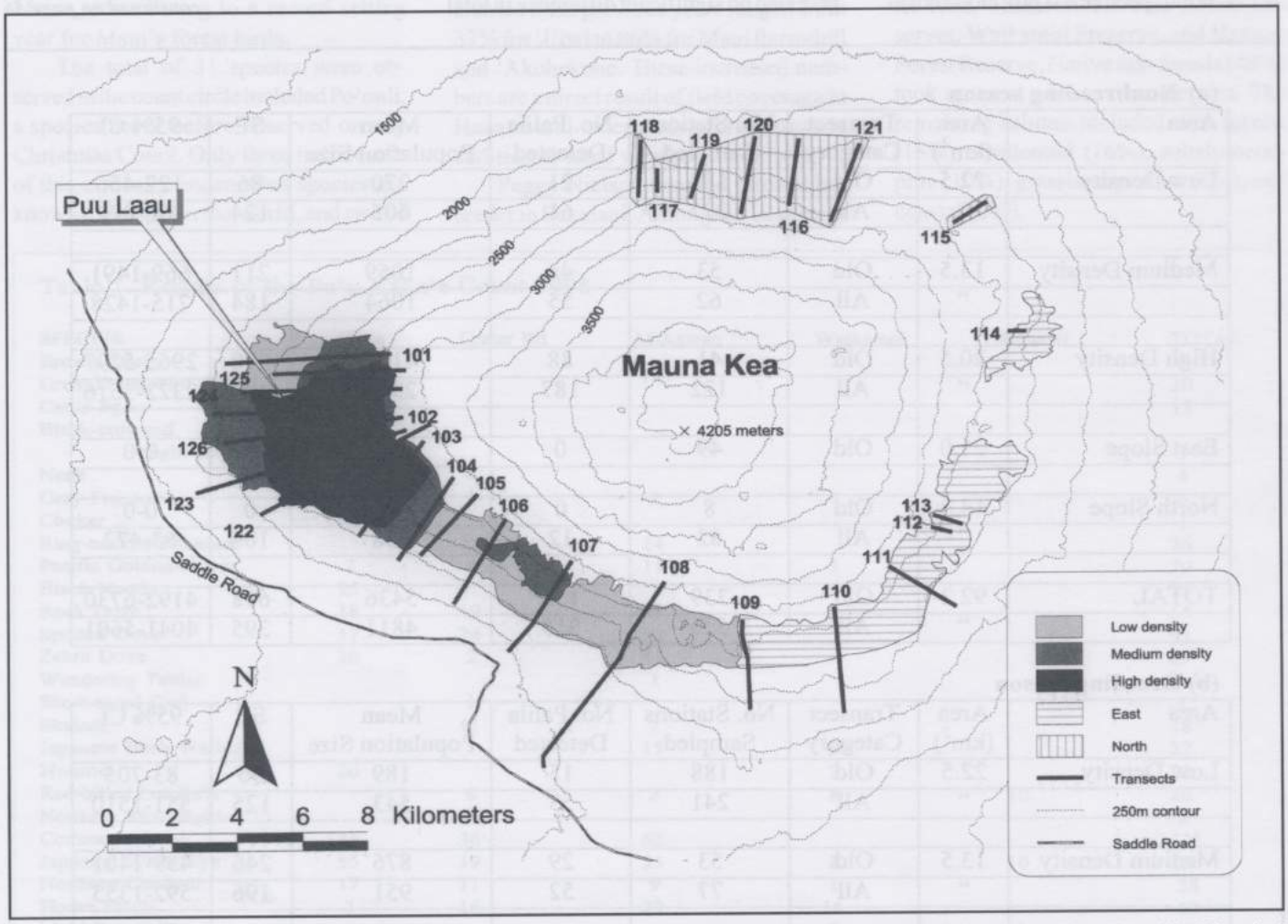

Figure 1. Location of 26 transects and five areas used to determine population size and range of Palila on Mauna Kea, Hawai'i. Historical transects range from 101—117: new, additional transects range from 118—126.

DISCUSSION

Since 1980, Palila censuses have been conducted primarily during the nonbreeding season (Jacobi et al. 1996, Banko et al. 1998). Our estimate of Palila population size for the 1998 nonbreeding season is comparable to the estimated population size for the previous two years (1996: 4171 + 515, Biological Resources Division unpubl. data; 1997: 4395 + 625, Banko et al. 1998) and greater than the mean estimate of population size for 1980 - 1995 (3390 + 333, Jacobi et al. 1996). Over the past 18 years, however, there has been considerable variation in Palila numbers (Figure 2). Such large annual fluctuations for birds typically are caused by changes in survival, breeding success, recruitment, or dispersal. In the case of the Palila, these annual fluctuations are likely to result from environmental factors that affect survival and reproduction, such as variable resource abundance and climate, rather than a shift in range.

The Palila population has experienced three large declines over the last two decades: 1981 - 1986, 1990 - 1992 and 1993 - 1995 (Figure 2). Although we have no data on breeding and recruitment before 1987, these declines generally correspond to years when food resource availability was low due to dry weather or to periods when fewer nestlings fledged due to unfavorable weather conditions or food availability. In the first two declines, the final year corresponded to drought conditions during an El Nino event (Trenberth 1991, Fancy 1997; Lindsey et al. 1997); in

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the third case, conditions during the final year were dry but not unusually so (Banko pers. obs.). Surprisingly, all three of these declines were followed by an immediate and rapid increase in population numbers. The reason for these sudden rebounds in population size is unclear, but they may reflect very successful breeding attempts the previous summer or perhaps more likely, increased detectability of birds after a drought. This effect of sudden apparent recovery following several unusually dry years may have been magnified by yearly methodological differences in observer training and calibration, which are now much more standardized and rigorous.

The first evidence of possible stabilization in population numbers has occurred over the past three years, when the population has remained level or increased slightly. We need several more years of censuses, however, before we can be confident that this trend is real. In fact, we anticipate that population numbers may decrease slightly for the January 1999 count, due to a poor 1998 breeding season (Biological Resources Division, unpubl. data). In any event, despite a possible recent stabilization in numbers, the small size and isolated nature of the Palila population continue to make it vulnerable to future crashes if a catastrophe or event such as a prolonged drought occurs again.

Although the population has not exhibited a consistent increase or decline, a comparison of Palila densities on individual transects revealed that Palila numbers are becoming increasingly concentrated on the west slope of Mauna Kea, with very low numbers in the south, east and north. Historically, Palila ranged throughout the mamane and mamane-naio forests of Mauna Kea, Hualalai, and the southwestern slope of Mauna Loa, but they had essentially disappeared from Hualalai and Mauna Loa around the turn of the century (Perkins 1903). Contraction of the species' range on Mauna Kea started in the mid-1900s, as birds became more rare on the east and north slopes (Walker 1968). Presently, 90 - 96% of the total Palila population exists near Pu'u La'au on the west slope of Mauna Kea (Figure 1). This area has the greatest expanse and elevational range of mamane forest, which Palila use for foraging, nesting and roosting (Scott et al. 1984).

Because mamane phenology varies with elevation, Palila survival and reproduction is dependent on areas containing forest that covers a large elevational gradient so that birds can exploit shifts in pod and flower abundance (Fancy et al. 1993, Lindsey et al. 1995). In previous censuses, Palila densities were positively correlated with the number of mamane pods at different elevations (van Riper et al. 1978; Hess et al. in press). Thus, most Palila were found in areas with stands of large mamane trees and relatively few were located in areas with many young or widely scattered trees.

The relative scarcity of Palila in the south, east and north may reflect more limited food resource availability in these regions due to smaller forest area, limited elevational gradient, more fragmented landscape, and the small size of regenerating trees. In fact, because Palila rarely use young, small mamane for foraging or nesting (Biological Resources Division, unpubl. data), it is predicted that slow forest recovery will delay natural expansion of the Palila's current range until early into the 21st century (Scowcroft and Conrad 1988). As a result, we have been attempting to reintroduce Palila to a site on the north slope. This recovering forest contains an elevational gradient of large, mature mamane trees and therefore should be able to support a viable population once it becomes established. Thus although population numbers on the north currently are low, we anticipate that they will increase with additional reintroductions and successful reproduction of translocated birds. In contrast, the eastern slope is unlikely to be able to sustain a population of Palila over the long term because the existing forest consists only of a narrow elevational band with few seasonal phenological differences (Jacobi et al. 1996).

In addition, mosquitoes (Culex quinquefasciatus) have been found in cattle ponds below transect 114, which may limit existing bird populations in the area through the transmission of avian malaria (Plasmodium relictum) and pox (Poxvirus avium).

Our estimate of population size tended to be higher during the breeding season compared with the nonbreeding season, although not significantly so. This trend probably reflects higher vocalization rates and thus increased detectability during breeding (but see Morin and Conant 1994). A similar result was obtained by van Riper et al. (1978), and they concluded that Palila densities varied seasonally, with greater numbers in the breeding season resulting from current reproductive effort before over-winter mortality of newly fledged young. In our case, however,

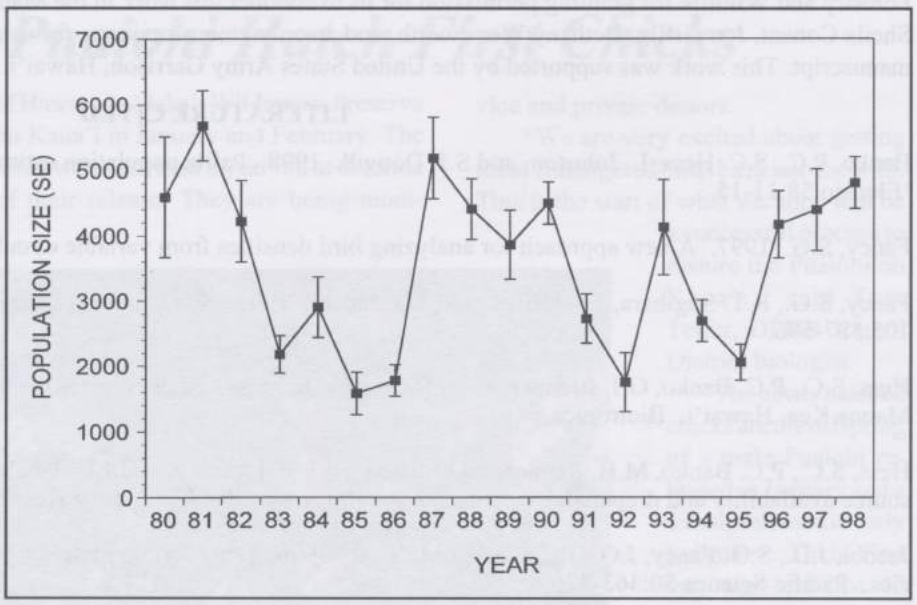

Figure 2. Estimates of Palila population size (mean plus or minus standard error of mean) during nonbreeding season censuses on Mauna Kea, Hawai'i from 1980—1998, 1980—1995 data from Jacobi et al. (1996); 1996 data from BRD (unpubl.); and 1997 data from Banko et al. (1998).

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this is unlikely because reproduction and hatchling survival was low in the summer of 1998 (Biological Resources Division, unpubl. data). As a result, we believe that the elevated population numbers during the breeding season census were a consequence of increased detectability due to higher vocalization rates rather than a true increase in population numbers from January to June.

Although numbers currently are not declining, Palila still face imminent risk of extinction. Only a single viable population exists, and it occupies a dry, flammable habitat where a catastrophe such as a fire could destroy areas essential to the persistence of the population. In addition, large annual fluctuations of this small population have the potential to reduce numbers below a recoverable limit, especially when declines occur for multiple years. This vulnerability illustrates the critical importance of annual monitoring to aid population recovery efforts and to prevent sudden and irreversible population decline.

Because the Palila's persistence depends on regeneration of mamane forest throughout its range, habitat management and annual population monitoring will be needed for many years. As mentioned above, we currently are experimenting with the establishment of a separate breeding population on the north slope using reintroduction techniques. In addition, habitat conditions will improve with the continued removal of browsing animals and the creation of corridors between primary habitat on the west and distant tracts of larger forest in the north and south. Finally, our removal of introduced mammalian predators such as feral cats (Felis catus), black rats (Rattus rattus) and mongooses (Herpestes auropunctatus) should increase Palila breeding success and survival (Pratt et al. 1997), which should cause a corresponding increase in annual recruitment and population size.

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LITERATURE CITED

Banko, P.C., S.C. Hess, L. Johnson, and S.J. Dougill. 1998. Palila population estimate for 1997. 'Elepaio 58:11-15.

Fancy, S.G. 1997. A new approach for analyzing bird densities from variable circular-plot counts. Pacific Science 51:107-114.

Fancy, S.G., R.T. Sugihara, J.J. Jeffrey, and J.D. Jacobi. 1993. Site tenacity of the endangered Palila. Wilson Bulletin 105:587-596.

Hess, S.C., P.C. Banko, G.J. Brenner, and J.D. Jacobi. In press. Factors related to the recovery of subalpine woodland on Mauna Kea, Hawai'i. Biotropica.

Hess, S.C., P.C. Banko, M.H. Reynolds, G.J. Brenner, L.P. Laniawe, and J.D. Jacobi. In press. Seasonal changes in food resource availability and drepanidae densities in subalpine woodland on Mauna Kea, Hawai'i. Studies in Avian Biology.

Jacobi, J.D., S.G. Fancy, J.G. Giffin, and J.M. Scott. 1996. Long-term population variability in the palila, an endangered species. Pacific Science 50:363-370.

Laake, J.L., S.T. Buckland, D.R. Anderson, and K.P. Burnham. 1994. DISTANCE user=s guide V2.1. Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University, Fort Collins, Colorado.

Lindsey, G.D., S.G. Fancy, T.K. Pratt, K.A. Wilson, M.H. Reynolds, P.C. Banko, and J.D. Jacobi. 1995. Population structure and survival of Palila. Condor 97:528-535.

Lindsey, G.D., T.K. Pratt, M.H. Reynolds, and J.D. Jacobi. 1997. Response of six species of Hawaiian forest birds to a 1991-1992 El Nino drought. Wilson Bulletin 109:339-343.

Morin, M.P., and S. Conant. 1994. Variables influencing population estimates of an endangered passerine. Biological Conservation 67:73-84.

Perkins, R.C.L. 1903. Vertebrata (Aves). Pp. 368-465 in Fauna Hawaiiensis, vol. 1, part 4. (D. Sharp, editor). Cambridge University Press, England.

Pratt, T.K., P.C. Banko, S.G. Fancy, G.D. Lindsey, and J.D. Jacobi. 1997. Status and management of the Palila, an endangered Hawaiian honeycreeper, 1987-1996. Pacific Conservation Biology 3:330-340.

Ramsey, F.L., V. Wildman, and J. Engbring. 1987. Covariate adjustments to effective area in variable-area wildlife surveys. Biometrics 43:1-11.

Palila citations continued on page 39

Reynolds, R.T., J.M. Scott, and R. Nussbaum. 1980. A variable circular-plot method for estimating bird numbers. Condor 82:309-313.

Rice, W.R. 1988. A new probability model for determining exact p-values for 2 x 2 contingency tables when comparing binomial proportions. Biometrics 44:1-22.

Scott, J.M., S. Mountainspring, F.L. Ramsey, and C.B. Kepler. 1986. Forest bird communities of the Hawaiian Islands: their dynamics, ecology and conservation. Studies in Avian Biology 9:1-431.

Scott, J.M., S. Mountainspring, C. van Riper III, C.B. Kepler, J.D. Jacobi, T.A. Burr, and J.G. Giffin. 1984. Annual variation in the distribution, abundance, and habitat response of the palila (Loxioides bailleui). Auk 101:647-664.

Scowcroft, P.G., and J.G. Giffin. 1983. Feral herbivores suppress mamane (Sophora chrysophylla) and other browse species on Mauna Kea, Hawai'i. Journal of Range Management 36:638:645.

Scowcroft, P.G., and C.E. Conrad. 1988. Restoring critical habitat for Hawai'i's endangered Palila by reducing ungulate populations. Transcript of the Western Section of the Wildlife Society 24:72-79.

Trenberth, K.E. 1991. General characteristics of El Nino-Southern Oscillation. Pg. 13-42 in Teleconnections linking worldwide climate anomalies (M.H. Glantz, R.W. Katz, and N. Nicholls, editors). Cambridge University Press, England.

van Riper III, C., J.M. Scott, and D.M. Woodside. 1978. Distribution and abundance patterns of the Palila on Mauna Kea, Hawai'i. Auk 95:518-527.

Walker, R.L. 1968. Field notes from Ronald L. Walker, February 12, 1968: Mauna Kea, Hawai'i. 'Elepaio 28:98-99.

Recently Released Puaiohi Hatch First Chicks

Efforts to save the endangered Puaiohi or small Kaua'i Thrush - and perhaps other native forest birds as well - took a giant leap forward this week with the hatching of two small chicks in the Alaka'i Wilderness Preserve. The two young birds are the first endangered Hawaiian forest birds hatched in the wild by captively bred parents.

"To say we're ecstatic is an understatement," said Alan Lieberman, co-director of The Peregrine Fund's captive breeding program in Hawai'i. "We are extremely pleased with how well the release has gone, and thank the U.S. Geological Survey's Biological Resources Division crew, the State's Department of Land & Natural Resources biologists on Kaua'i, and the veterinary staff from the San Diego Zoo for their valuable contributions."

Fourteen young Puaiohi, the offspring of birds being maintained at The Peregrine Fund's Keauhou Bird Conservation Center, were released into the State of Hawai'i's Alaka'i Wilderness Preserve on Kaua'i in January and February. The birds were less than a year old at the time of their release. They are being monitored by Biological Resources Division biologists, who also conduct ecological research on the wild population. The Hawai'i Department of Land & Natural Resources' Division of Forestry & Wildlife administers and manages the habitat in which the Puaiohi project is being conducted, and funding is being provided by the U.S. Fish and Wildlife Service and private donors.

1981 photo of Puaiohi hatchlings

"We are very excited about getting these endangered birds back into the wild. This is the start of what we hope will be a successful process to restore the Puaiohi on Kaua'i," said Tom Telfer, DLNR Kaua'i District biologist.

The newly hatched chicks are the offspring of a male Puaiohi released in January and a female released in early February. Their first egg was laid just 45 days after her release. Another pair formed of birds released this year also built a nest and produced two eggs but did not incubate the eggs.

Three other females released early this year have paired with wild males. One is incubating eggs, one completed a nest with her mate but abandoned it before egg-laying, and the third is believed to have completed a nest with the assistance of her mate.

"When we began this program, the estimated population of Puaiohi in the

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wild was about 200 birds," Lieberman said. "Thanks to the efforts of the State and Biological Resources Division in controlling introduced predators and improving forest bird habitat, the Puaiohi we produced in captivity have had an excellent start in the wild. I know everyone involved in this project is excited that our efforts appear to be successful."

"The ultimate measure of success of this recovery effort will be whether the birds re-establish a self-sustaining population in their former range," said Bethany Woodworth, research biologist for Biological Resources Division. "We will continue monitoring for survival, dispersal, foraging, and breeding behavior of the reintroduced population. Although it's too soon to predict the fate of this population, the results of this year's release look very promising!"

Source: joint news release dated 04/16/99 by The Peregrine Fund, U.S.Geological Service, Biological Resources Division, Hawai'i State Department of Land & Natural Resources, Division of Forestry & Wildlife, and U.S. Fish & Wildlife Service.

Contacts:Alan Lieberman, The Peregrine Fund:808-985-7218 Bethany Woodworth, Biological Resources Division: 808-967-7396, ext. 237. Tom Telfer, Kaua'i Division of Forestry & Wildlife: 808-274-3433 Barbara Maxfield, USFWS: 808-541-2749 or 342-5600

Paradise Pursuits—Words from the Winners

by Cory Yap and Nick Alexander, 'Aiea High School Co-captains

Cory Yap writes:

Ever since I was young, I was always interested in the ocean and its marine life. Visits to the aquarium and fishing with my grandfather gave me more inspiration to pursue a career in Marine Biology. Also, different courses in summer school and in high school have kept up this interest. But most of all, Paradise Pursuits has given me the opportunity to utilize my interest (and perhaps talent) and knowledge in this field.

Since November the team has been working very assiduously with the coaching of our advisor Mr. Jason Brennan. Evening studies, after work, band practice, or sports, were often times put aside by team members for Paradise Pursuits practice. Sometimes, we fought with each other over the correct answers and disagreed on a handful of subjects, but practice was still a learning environment. This experience has brought us together and the overall outcome gave us knowledge of Hawai'i's natural ecosystems.

Our major goal at the beginning of the year was mainly to have fun and to learn as much as we could before competition. One important factor to achieve this goal was to maintain time schedules for practices. Determination for winning helps to set a certain attitude that contributes a positive effort and keeps one open minded. Rumor has it that many of the other teams couldn't compete with the knowledge we obtained - and the speed of our hands (hitting the buzzers)! Our team practiced many months before the first match. About five hours of our time during the week was put into regular team practice. Other studying times were conducted during school or at home. Practices generally increased to every day a couple of weeks after the quarter final competition and produced a total of about 15 hours a week. This is why determination and a positive attitude would help, otherwise we would have been bored out of our minds.

Another factor is to have a dedicated teacher who put more effort into the team than the students. Science teacher Mr. Jason Brennan did this for us. It is obvious that he spent almost all of his free time coaching the team. Pushing us to the limit, packing us with information, making us stay awake, and keeping us on track, Mr. Brennan built a team that even Hilo couldn't stop.

I appreciate the opportunity to be involved with Paradise Pursuits competition for the last two years. Participating in Paradise Pursuits is not only hard work and studying but is fun and gives challenges to students who are willing to learn about Hawai'i's natural environment.

Nick Alexander writes:

Learning about Hawaiian ecosystems was a difficult and stressing task, but the overall effort and achievement we gained made it worth it. We appreciate everything the Hawaii Audubon Society and the Paradise Pursuits program have done for us. Aloha and Mahalo Nui Loa.

Welcome to New Paradise Pursuits Coordinator

by Sylvianne Yee

June 1995 found me, a newly retired teacher, looking for new adventures and experiences. By September, I had begun what turned out to be a most challenging, interesting, and satisfying phase of my life - that of Paradise Pursuits Coordinator. I have watched the program mature and grow and guided it through many ups and downs and twists and turns. Along the way I have made life long friends that include Audubon members, coaches, students, and business people. I am going to miss interacting with and learning from all of these special individuals. However, it is time to move on to other pastures and let someone with new ideas enter the picture.

That person is Suzan Harada, a personal friend and someone to whom I am delighted to introduce you. Suzan has been a Sierra Club member since she was 14 years old and a hike leader since 1977. She has worked for Moanalua Gardens Foundation, the National Park Service, DLNR's Department of Forestry and Wildlife, and the University of Hawai'i system. Armed with a liberal arts degree in the Hawaiian Environment, she is eminently qualified to be the next Paradise Pursuits Coordinator. In our chats, Suzan mentioned that she is excited about going back to the field for which she was trained. Welcome aboard, Suzan!

Kawai Nui Marsh Service Projects

Kawai Nui Heritage Foundation, in cooperation with Aha Hui Malama I ka Lokahi, Hawaii Audubon Society, Hui Lama - Kamehameha Schools, Hawaii Service Trip Program - Sierra Club, High School Hikers - Sierra Club, and Kailua and Kalaheo High Schools, invites you to kokua and malama Kawai Nui Marsh through service trips to the following places:

Na Pohaku O Hauwahine (The rock formation of the Hawaiian Mo'o Goddess and guardian of Kawai Nui Marsh) is located on the right-hand side of Kapa'a Quarry road at the Y-intersection before entering the Kapa'a Landfill transfer plant. It offers a panoramic view into the "piko" of Kawai Nui Marsh where one can observe in tranquillity the wetland birds and marsh vegetation. Recent brush removal and trail construction has revealed an ancient Hawaiian terrace that aligns the massive rock outcrops. We will be clearing alien vegetation and continue with the loop trail construction and landscape the area with native plants to recreate a dryland forest and marsh ecosystem.

Holomakani Heiau (The running wind) was presumed to be destroyed according to McAllister's account in 1933, but was rediscovered in 1987. Archaeological surveys suggest that this site may be a "possible prehistoric heiau or large terrace structure of some significance." It may have been associated with other heiau sites and important events in the Kailua Ahupua'a. This site is located on the mauka side of Kapa'a Quarry road about 0.7 miles from the intersection of Kalaniana'ole Highway. A short hike of 15 minutes from the Quarry road along roadways created by off road vehicles will lead to the site. Off road trucks have damaged the rock wall of the heiau in recent years. We have cleared the heiau terraces and posted a sign to inform others about the significance of this Hawaiian cultural site and to respect its Hawaiian religious values. We are in the process of creating a view plane into Kawai Nui Marsh and maintaining the site.

SERVICE PROJECT DATES

Saturday, June 12, 1999
Na Pohaku O Hauwahine 8:30am-2:30pm

Saturday, July 10, 1999
Holomakani Heiau 8:30am-2:30pm

Saturday, August 14, 1999
Na Pohaku O Hauwahine 8:30am-2:30pm

What to bring: Backpack, lunch, 1 qt. water, sunscreen, hat or cap, rain gear, mosquito repellent, gloves.
Tools (if you have them): Sickles, pruners, hand saws, machete, powered tools - weed whacker, chain saw.
Contact: Chuck "DOC" Burrows for more information and to sign up for these service projects at: 595-3922 (home) or 581-2922 (pager), or email cburrow@aloha.net

Tours—Natural and Cultural History of the Kailua Ahupua'a and Kawai Nui Marsh

These educational tours of the Kailua Ahupua'a and Kawai Nui Marsh are a general introduction of the natural and cultural history of the Kailua Ahupua'a and Kawai Nui Marsh. The purpose of these tours is to develop a training program for volunteers to become docents for the Kawai Nui Heritage Foundation and lead school and community groups to various archaeological, historic and ecological sites in the marsh and surrounding areas.

The tour group will meet at the Kailua YMCA (just off Kailua Road) at 8:30 a.m., and walk as well as car pool to the following sites as time permits. Return trip should be back at the Kailua YMCA by 12 noon.

1. Ulupo Heiau
2. Kukanono Historical and Hawaiian Sites
3. Na Pohaku o Hauwahine
4. Pahukini Heiau
5. Oneawa Estuary
6. Kaelepulu Pond - Wetland birds

Dates of the tours:
1. Saturday, June 5, 1999
2. Saturday, August 7, 1999

Bring: Backpack or fanny-pack, water, mosquito repellent, sunscreen, raingear, hat or cap, sunglasses, camera and notebook.
Contact: Chuck "DOC" Burrows for more information and to sign up for these educational tours at 595-3922 (home) or 581-2922 (pager), or email cburrow@aloha.net

Upcoming Field Trips

So far there are two firm dates for other field trips this year: On Saturday, October 23 we'll be visiting James Campbell National Wildlife Refuge, and on Saturday, November 20 we'll be looking for bird fossils at 'Ewa Plains Sinkholes. Other 1999 trips still in the planning stages include a Mt. Ka'ala service trip and another trip to Marine Corps Base Hawai'i's Booby Colony. Check the 'Elepaio or call the office for updates.

HAS Awards Undergraduate Scholarship

by Dr. Phil Bruner, Chair, Grants & Scholarships Committee

Cory Yap of 'Aiea High School has been awarded the Rose Schuster Taylor Scholarship for the 1999-2000 school year at the University of Hawai'i. Cory has a strong background in hydroponics and aquaculture. He led 'Aiea High School to the state title in Hawaii Audubon Society's Paradise Pursuits competition for the 1998-1999 school year (see related article, page 40). His goal is to pursue a career in marine science. We wish Cory well as he begins his college life and are confident he will make many important contributions to Hawai'i's environment in the years ahead.

East Maui (Pu'u Kaka'e) Christmas Bird Count 1998

by Lance Tanino

Clear skies and light winds provided near perfect conditions for the 23 participants in this year's East Maui Christmas Bird Count on Saturday, December 19, 1998. They came from as far away as California, Washington, New Jersey and Maine, contributing to a record setting year for Maui's forest birds.

The total of 31 species were observed in the count circle included Po'ouli, a species never before observed on any Christmas Count. Only three individuals of this critically endangered species are known to remain in the world, and two of them were observed on count day. James Bruch, Jen Fry, Justin Schoffer, and Valerie Stein, members of the Maui Forest Bird Recover Project, were the fortunate ones to have found this special species.

New high count records were made for Maui Parrotbill, Maui 'Amakihi, Maui 'Alauahio, 'I'iwi, and 'Akohekohe. Increases from previous years ranged from 37% for 'I'iwi to 86% for Maui Parrotbill and 'Akohekohe. These increased numbers are a direct result of field coverage in Hanawi and other native forest areas in addition to ideal weather conditions.

Peggy Nielson counted birds at her feeder in Pukalani. Among the 10 species she encountered during the day was a pair of Saffron Finches nesting in a nest box located no more than 10 meters from her front door. These are the only Saffron Finches known on Maui.

For the first time on the Maui count, an estimated habitat coverage was determined this year for the following sectors: Hana highway, Haleakala highway/Crater road, Makawao/Ko'olau Forest Reserves, Waikamoi Preserve, and Hanawi Forest Reserve. Native rain forests (48%) took up most of the coverage area. The remaining habitats included alien forests (18%), residential (16%), subalpine/alpine (10%), grassland/pasture (6%), and coastal (2%).

Table 1. Results of the Pu'u Kaka'e Count 1998

SPECIES	Hana	Crater Rd	Makawao	Waikamoi	Hanawi	TOTAL
Brown Booby	9					9
Great Frigatebird	30					30
Cattle Egret	15					15
Black-crowned Night-Heron	1					1
Nene		4				4
Gray Francolin		1	3			4
Chukar		1				1
Ring-necked Pheasant		12	14			26
Pacific Golden-Plover	2	4	11	3		20
Black Noddy	25					25
Rock Dove	18	19	28			65
Spotted Dove	17	24	50			91
Zebra Dove	26	2	11			39
Wandering Tattler			1			1
Short-eared Owl		1				1
Skylark		11	7			18
Japanese Bush-Warbler	7		15	5		27
Hwamei	20			2		22
Red-billed Leiothrix		6	2	8	10	26
Northern Mockingbird		2				2
Common Mynah	35	36	62			133
Japanese White-Eye	55	19	55	8	10	137
Northern Cardinal	17	11	9	1		38
House Finch	2	16	29	16		63
Maui Parrotbill				3	4	7
Maui 'Amakihi	1	23	34	79	111	248
Maui 'Alauahio			2	43	88	133
'I'iwi			8	36	99	143
'Akohekohe				4	54	58
'Apapane		10	105	125	166	406
Po'ouli					2	2
House Sparrow	2	40	52	6		100
Nutmeg Mannikin	33	13	6			52
Total INDIVIDUALS	315	255	504	339	544	**1957**
Total SPECIES	18	20	20	14	9	**31**
Party hours by FOOT	4	3.75	4.5	6	13	31.25
Party hours by CAR	1.75	2	1.25			5
TOTAL HOURS	5.75	5.75	5.75	6	13	36.25
Party miles by FOOT	1.75		12.5	5.5	6	25.75
Party miles by CAR	26		7			33
TOTAL MILES	27.5	unavailable	19.5	5.5	6	58.75

Hawai'i's 1999 Federal Duck Stamp Contest Winner Selected

Thirteen year old Cherry Ulep's Nene painting will proudly represent Hawai'i in June's national Federal Junior Duck Stamp Contest to be held in Washington, D.C. Ulep's artwork will compete with other state entries for a prize of $2,500 and a trip to our nation's capital.

The Kalakaua Middle School (O'ahu) student used a combination of oil pastel and color pencils for her trio of Nene. Ulep's artwork was chosen from 11 other first-place winning entries in four, age categories. A repeat winner, Upel won a first place ribbon in her age class in the 1997 Hawai'i contest.

Celestino Matutino, Jr., a 14 year old also from O'ahu's Kalakaua Middle School, won second place in the local contest for his drawing of two Nene. Third place was awarded to 15-year-old Jordan Bautista of Farrington High School on O'ahu.

As State Best of Show, Ulep will be awarded a duck woodcarving donated by Ducks Unlimited. Sixty-seven qualifying entries were received for Hawai'i's fourth annual Federal Junior Duck Stamp contest. All entries will receive a certificate of appreciation and a ribbon.

Additional contributions to the local program have been made by the Honolulu Academy of Arts, Lahaina Arts Society, Hakalau Forest National Wildlife Refuge, Kilauea Point Natural History Association, artists Patrick Ching and Mike Furuya, Dr. Sheila Conant of the University of Hawai'i at Manoa, and U.S. Fish and Wildlife Service Mike Silbernagle and Ron Walker.

Hawai'i's 1999 winning duck stamp designs will be exhibited throughout the state during the year. Scheduled exhibit sites include the Honolulu Academy of Arts during April, the Honolulu Zoo during May, Kahului Public Library on Maui during June, Kealia Pond National Wildlife Refuge on Maui during July, and Kilauea Point National Wildlife Refuge on Kaua'i during September.

All students from the kindergarten to high school levels, including homeschooled students, may enter artwork in the state-level contest. Entry forms for the year 2000 contest will be mailed in October 1999. For more information, call the U.S. Fish and Wildlife Service's Honolulu office at 808-541-2749 or visit the website at www.fws.gov/r9dso.

source: U.S. Fish & Wildlife Service News Release dated 04/06/99

contact: Amy Tse (US Fish & Wildlife Service) 808-541-2749

The Audubon Society Has a Night Out

(from August/September 1940, Vol. 1, No. 6) by Grenville Hatch

The August field trip of the Honolulu Audubon Society took the form of an overnight trip to Rabbit Island, with eleven members and friends participating in what proved to be one of the most successful and pleasant trips yet made by the Society.

On Saturday, August 17th, the members were ferried across by Hawaiian fisherman from Waimanalo. Before they reached the island, Noddy Terns were circling about their heads fearlessly, and as they approached the shore, the terns could be seen in such great numbers upon the rocky headland that areas appeared quite black from their dusky plumage.

Upon reaching the island, all members of the party climbed the slope which leads to the side of the crater. The lower, comparatively level surface is loose earth, covered with a growth of sandbur grass and forms, with the crater itself, the breeding area of the Wedge-tailed Shearwaters. The birds dig a burrow, at the end of which they deposit their egg. Toward dusk we had a demonstration of how rapidly they can dig, when returning Shearwaters sent earth flying into the air so rapidly and continuously that it looked as though a cloud of smoke was rising. Probably this outlay of energy was necessitated by the party's earlier ascent of the slope, for the burrows are so close together that it is difficult to traverse the area without disturbing them. Many of the burrows contained young Shearwaters, and some a single adult with either an egg or immature young, for until the young are fairly well developed one parent remains in the nest during the day. The young are attractive, with an alertly lifted round head and soft gray down.

The Noddy Terns, leaving the lower sections to the Shearwaters, lay their eggs in slight hollows on the bare rock of the higher slopes. The adults remain with the egg and the immature chick until it is able to shift for itself, staying, not to warm, but to protect it from the intense heat of the sun. A number of eggs were found, as well as young birds. One egg had a hole in it about the size of a pea, through which the chick could be heard making surprisingly loud remarks about its situation. The next morning some of the members returned, to find the chick safely out of the shell and very lively.

At dusk the Shearwaters began to return from the day's fishing to feed the young, who early learn to live upon one meal a day, and for the last few weeks of their immature life upon none, for the adults leave them to subsist upon their own fat for several weeks just before the young take to the air.

After dinner the party returned to the crater, where they watched the Shearwaters return each to his own burrow to sing to their young. "Singing" is a trifle inaccurate, since the sound resembles somewhat like that made by a gentle but unhappy pet confined to the kennel. The evening is one that few who were present will forget, with hundreds of birds soaring overhead in the moonlight, and fearlessly alighting nearby. There was a continual chorus; the moaning of the Shearwaters, the croaking calls of the Noddy Terns; a faint whistling sound from the young Noddies, while occasionally the call of a Sooty Tern or of a Wandering Tattler could be heard.

About dawn the next morning, most of the members of the party rose to watch from the cliff the most impressive sight of the trip, as the Shearwaters and Noddy Terns rose by the hundred, wheeled about their nests, then flew out to sea, over Ka'ohikiapu Island, past Makapu'u Lighthouse, still burning in the gray dawn. At the same time, the Red-Footed Gannets, or boobies, which nest upon Bird Island, flew past in the same direction, sailing majestically by in the higher air. A few Frigate birds soared very high in air, but apparently decided that it was too early to start the day's career of robbery, and vanished without coming closer.

While the Shearwaters and Terns abounded, there were a few nests of Bulwer's Petrels in the rocky crevices of the lower cliffs. No adults were seen, but several young were found. A few Turnstone were also seen upon the makai side of the island.

Those making the trip were, J. d'Arcy Northwood (leader), Charles Dunn, Ferris F. Laune, P.D. Steele, Mr. and Mrs. George Krall, and the Misses Katherine Laune, Mary Laune, Patricia Weatherby and Robert Lambert.

'ELEPAIO

JUNE/JULY 1999

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Calendar of Events

Thursdays, June 3 and July 1 Education Committee monthly meeting, 7 p.m. at BaLe Sandwich Shop in Manoa Marketplace (near Safeway). For more information, call chairperson Wendy Johnson, 261-5957.

Mondays, June 14 and July 12 Conservation Committee monthly meeting at the HAS office at 5:45 p.m. For more information, call chairperson Dan Sailer, 455-2311.

Mondays, June 14 and July 12 HAS Board meeting, always open to all members, 6:30 to 8:30 p.m. at the HAS office.

Sunday, June 27 Reef walk at Kualoa Beach Park in Ka'a'awa led by Laura Krupp. This will be especially good for the kids. Laura is a Girl Scout leader who knows how to let kids discover the interesting reef-dwelling critters. We'll let the grownups participate too. Wear reef walkers or old tennis shoes - we're going to wade. Bring gloves for turning over those rocks. Bring sunscreen, hat, water, picnic lunch, camera, binoculars for spotting shore birds. Adults may contribute $2.00 to HAS, but the kids are free. Call Laura Krupp at 247-6226 to sign up and get further information.

Sunday, July 11 Field trip to Ka'ena Point to search for albatross, monk seals, and rare Hawaiian plants. Meet at the Hawai'i State Library (King and Punchbowl) at 9:00am. We will carpool to Mokule'ia from there. Ka'ena Point is very hot and sunny, so bring sunscreen, hat, lots of water, a picnic lunch, camera, and binoculars. Please call the HAS office (528-1432) to register for this trip. A $2.00 donation per participant will be appreciated.

Saturday, July 31 Something more for the kids. HAS in conjunction with the Windward Girl Scouts will give a slide presentation on Hawaiian birds at Ho'omaluhia Botanical Garden in Kane'ohe. After looking at the slides and discussing the birds, we'll talk about keeping a life list of the birds we see, and then start our list by taking a walk through parts of the Garden. No charge for girls who have signed up for the "Come Shine With Us" summer fun program. Girls will receive a list of things to bring. Parents are welcome too. Call Mary Gaber at 247-0104 for more information.

Monday, June 21 Program Meeting Dr. Kim Holland will speak on "Tiger Shark Research in Hawai'i." The meeting is from 7:30-9:30 p.m. at Bishop Museum, Paki Hall Conference Room. Refreshments provided. HAS publications, tapes, patches and T-shirts available for purchase. See you there!

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