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Palila Population Estimate for 1997

Paul C. Banko, Steven C. Hess, Luanne Johnson, and Steven J. Dougill

Introduction

Managers attempting to recover endangered bird species require current information about population trends and annual variability. Long-term monitoring can reveal changes in numbers, distribution and effects of management on population growth. With counts beginning in 1980, the Palila *(Loxioides bailleui*), an endangered Hawaiian honeycreeper (Drepanidinae), has the longest history of annual monitoring of any forest bird in Hawai'i (Jacobi et al. 1996). The population status of the Palila is of great concern to conservationists interested in maintaining biodiversity in native Hawaiian forest ecosystems. In addition, there is persistent public controversy regarding judicially mandated eradication of feral ungulates to improve habitat conditions for the Palila (Pratt et al. 1997). Many people, therefore, are interested in the current status of Palila, and it is particularly important that population estimates are made available regularly.

Palila feed primarily on seeds, flowers, and insect resources from mamane *(Sophora chrysophylla* [Salisb.] Seem.) trees in subalpine woodlands of Mauna Kea volcano. Palila also depend on mamane for shelter and nesting sites (van Riper 1980a). Subalpine woodlands have been reduced and degraded by herbivorous feral mammals since the arrival of non-Polynesian cultures in Hawai'i (Warner 1960; Scowcroft and Giffin 1983). Mamane regeneration has recently improved after feral sheep *(Ovis aries*) and mouflon (O. *musimon*) were reduced beginning in 1981 (Hess et al., submitted). However, Palila have not recovered in much of their former range, despite improvement in habitat conditions around Mauna Kea. The 1980-1995 mean population of 3,390 Palila inhabited a 139 km² area that is less than 5% of their historical distribution on Hawai'i Island (Scott et al. 1984, 1986; Jacobi et al. 1996). Their population has been highly variable during this time, and has declined in areas of low density and on eastern Mauna Kea, but has not declined in areas of high density (Jacobi et al. 1996). In 1997, we conducted the 18th annual Palila count on established monitoring transects to assess the current status, trend, and variability in response to habitat recovery and management efforts.

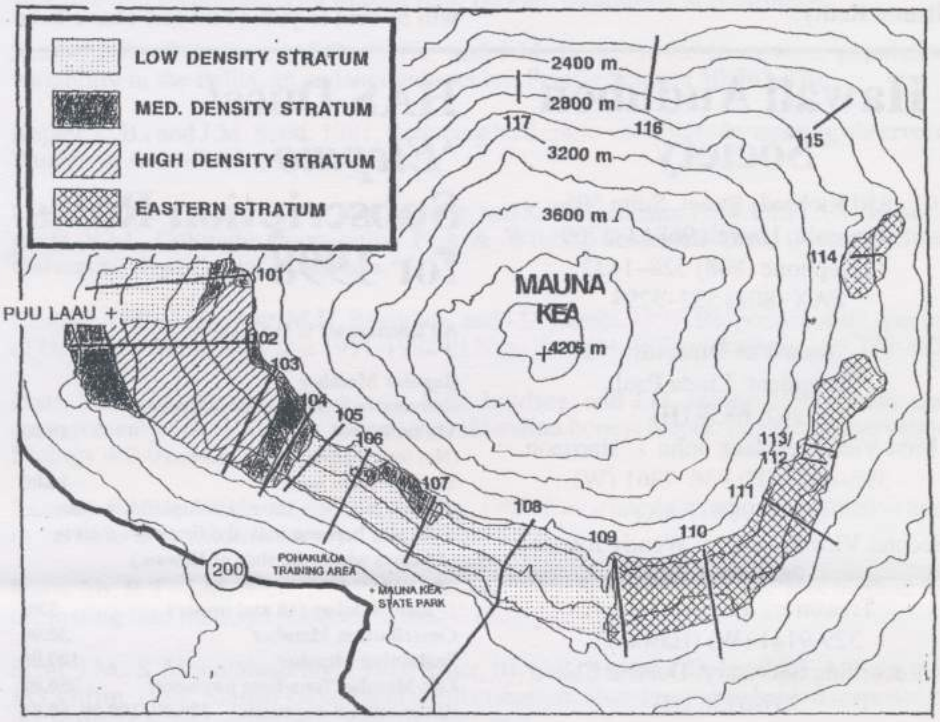

Figure 1. Location of 17 transects and four density strata used to determine population size and range of Palila on Mauna Kea, Hawai'i, 1980-1997. From Jacobi et al. (1996).

Methods

We used variable circular-plot (VCP) counts (Reynolds et al. 1980) during 28-31 January 1997 to estimate Palila population at 310 stations on the same 17 transects on Mauna Kea reported by Jacobi et al. (1996), except the lower half of transect 108 through Pohakuloa Flats (Figure 1). Seven observers received extensive training in identification of local bird vocalizations and distance estimation prior to the count (Kepler and Scott 1981). During 6 minute count periods between 05:45 and 11:00 hours, we recorded the distance to every bird seen or heard at stations located 150 m apart (Scott et al. 1984). Counts were not conducted when wind speed exceeded 30 km/hr or during rain. Cloud cover was recorded in 10% increments and wind speed was recorded on the Beaufort scale.

We analyzed pooled VCP data from the 1997 Mauna Kea count and 6 other counts from 1994-1996 at four study sites on the west slope of Mauna Kea, near Pu'u La'au, to determine the effective detection radius (EDR) and effects of 4 different observers, weather variables, and time of day on 895 Palila detection distances (Ramsey et al. 1987; Fancy 1997). Detection distances were adjusted

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April 25–BIRDATHON 1998—How many species will YOU see?

Saturday, April 25, 1998, you are invited to have some family fun at a fund-raiser! Birdathoners of all ages will ask sponsors to make monetary pledges for every species seen during one of several hikes being scheduled for that day: Kahuku-Kuilima shoreline with Phil Bruner, Kawai Nui Marsh with Ron Walker, and a forest trail in the Schofield-Waikane area with Sharon Reilly.

The annual Birdathon is a traditional Audubon Society activity in which half the proceeds support a National Audubon Society activity (in this case protection of Important Bird Habitats) and half the proceeds go to an activity of Hawaii Audubon Society.

Choose **your** trip, then call coordinator Linda Shapin at 263-5722 and pledge forms will be sent to you. (You don't have to be an Audubon member to be a Birdathoner.) Then the fun begins! Get your mother, your spouse, your neighbor, your boss, your co-workers to pledge. After you have enjoyed your chosen trip, your leader will sign a certificate as to the number of species you saw. Take that back to your sponsors, collect the money and turn it into the HAS office by the end of May.

Your support (and that of your sponsors) will be noted in the August September *'Elepaio* . Also, prizes will be offered for seeing the most species, raising the most money, being the oldest or youngest participant, and for the participant whose home is farthest from Hawai i.

Call NOW to sign up as a participant and get your pledge forms. Remember, the early bird gets the worm!

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Mahalo!

The Board of Directors of the Society extends its mahalo a nui loa to the following members who responded between November 1997 and March 1998 to the Fall 1997 Annual Appeal:

Dean Amadon, Marda J. Barthuli, Miriam Bennett and Patricia A. Souza, Susan L. Bradford, Phillip Bruner, D.T. Cheeseman, Thomas R. Chell, Mary M. Cooke, Evelyn F. Cox, Douglas M. Davidson, Eugene V. Donaldson, James R. Evans, Elaine F. Fessenden, Michael J. Fischer, Joel Fithian, Leonard A. Freed, William A. Friedl, Hubert and Mable Frings, Joe Fuchino, Harriet J. Gilbert, See Yin Goo, Thomas Goodier, William T. Gruenbaum, and Ann Guild.

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Report on Stormwater Pollution Levels Shows Need for New Regulations

A new report detailing the causes, extent, and consequences of stormwater pollution (also called "polluted runoff") in the nation's coastal waters has been issued by the American Oceans Campaign (AOC). The report's findings, according to the AOC, show the need for the adoption of new rules recently proposed by the Environmental Protection Agency to strengthen controls on stormwater pollution discharges in small urbanized municipalities and construction sites.

Stormwater (rain), washing over roads, rooftops, parking lots, construction sites, and industrial or commercial sites, becomes contaminated with oil and grease, heavy metals, vehicle pollutants, pesticides and litter, among other pollutants. It moves into streams, gulches, and storm drains, all of which discharge into coastal waters.

In the aggregate, polluted stormwater is the leading source of pollution in the country's estuaries, according to the AOC. In 1994, state water quality agencies surveyed 78% of the total estuarine waters and reported that 37% of those waters were impaired, with urban stormwater a factor in 46% of impaired waters. In 1995, polluted urban stormwater was a factor in 40% of areas where shellfish harvesting was limited.

[Editor's note: In Hawai'i, there are now 16 shoreline areas which are designated by the state Health Department as a "water quality limited segment", meaning that even if all point sources of pollution discharging to these areas are removed, they will still not meet state water quality standards. These areas are found off all islands except Ni'ihau.]

Source: "Ocean Update" (Vol. 3, No. 2, March 1998)

Mark Your Calendar– Field Activities for June-December 1998

June 28
Discover exotic birds at Hilton Hawaiian Village with Arlene Buchholz

July 18
Kahana Valley with Dan Sailer for damselflies and other wonders

August
Still a mystery...TBA

September 19
Find fossil birds at the Ewa sinkholes with Alan Zielgler

November 21-22
Island of Hawai'i, Kona side and more- a special trip with Rob Pacheco

A Year in the Life of a Paradise Pursuits Game

By Sylvianne Yee, Paradise Pursuits Coordinator

Many of you have read about the generous donors, volunteers, and participants who make the Paradise Pursuits games the success that they are. But many are unaware of what goes on behind-the-scenes to ensure that everything runs smoothly. Come along and experience *A Year in the Life of a Paradise Pursuits Game*.

Months before the first game, volunteers sign up to be timekeepers, scorekeepers, judges, and hosts. Prizes solicited and picked up. Letters soliciting funding sent out. Phone calls, memos, and e-mails go back and forth between coordinator and coaches to recruit and register teams. Game sites selected and confirmed. Liability waivers, game rules and format sent to registered teams. Question writers hired and begin writing 600+ questions. House starting to look like a warehouse with boxes and stacks of paper everywhere!

A month before a game: Competition schedules made by random drawings for pairings. Schedules sent to each team. Calls and e-mails made to those teams who have not yet turned in waiver forms. Eligibility of team members checked and double checked. Frantic calls begin coming from coaches whose teams are not able to compete on their assigned day or time (athletic events, quiz bowls, teacher workshops, etc.) or, heaven forbid, are dropping out of competition (not enough committed students, too many other things going on, etc.). Another round of scheduling changes begins with more phone calls and e-mails. Paradise Pursuits t-shirts ordered. Completed game questions sent to experts in various fields for revisions.

Two weeks before a game and things really heating up. Decisions on prizes to be awarded at each level of competition made and t-shirts folded and packed by schools. Final revisions to questions made. Reminders sent to all game personnel with when and where to report and a memo of guidelines for their specific task. Game packets containing scoring sheets, rules, and game questions put together.

A week to go and so much still to do. Cookies to be picked up and boxes of prizes, team signs, and game equipment to be packed. Last minute calls to coaches to check that all memos have been received and that everything's going okay. Game sites re-confirmed for set-up and actual games. Press releases written and sent. Computer in overdrive and so is the coordinator!

The day before and a calm has descended. Everything that needs to be done has been done. It's "cross-the-fingers" time that no last minute glitches occur. Pack the car and go to the game site. Sit on the cold floor in the freezing hallway waiting for a group to vacate the assigned room. Muscle the tables and chairs into a semblance of order for audience and participants. Lay out the pencils, packets, stopwatch, resource materials. Put up the signs. Organize the prizes and Certificates of Participation. Lock the door and go home for a good night's sleep.

The big day has finally arrived. Remember to take the cookies out of the refrig. Pick up cooler from McDonald's. Arrive at game site and welcome everyone. Go over last minute items with game personnel and teams. Make juice. Assemble and test buzzer system. Games begin. All goes well. Teams come and go - some tears, smiles of jubilation, "we'll be back next year", etc. Tired, happy, relieved coordinator goes home to get ready for another game, another year. Worth it? You'd better believe it!

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(Fancy 1997) as if all detections were made by an experienced observer (SCH) present during all counts at 0900 hours on a sunny day with no wind. Detection distances were adjusted by the regression coefficients of the pooled counts for the actual conditions of the Mauna Kea annual count. We analyzed adjusted distances with the program DISTANCE (Laake et al. 1994) to calculate EDR and its coefficient of variation (CV) surveyed under reference conditions. We calculated EDR and CV for the 5 observers who detected Palila in either the 1997 Mauna Kea count or the 6 west slope counts. We calculated variation in the effective area surveyed and population size with 5000 bootstrap samples from a random normal distribution centered on the mean effective area using the computer program VCPADJ (Fancy 1997). Density was calculated by dividing the number of Palila detected at each station by the effective area surveyed. Population estimates were derived by multiplying the area of each stratum by density.

Results

Most detections of Palila were recorded on transect 102, above 2,130 m elevation near Pu'u La'au, where most of the successful breeding occurs. Wind speed, and cloud cover did not have significant effects ($P > 0.05$) on detection area and were excluded from further analyses (Fancy 1997). Effective area decreased as time of day increased (94.9%, $P < 0.042$). Two observers differed from the reference observer ($n = 175$) in detection area (PCB, 126.4%, $P < 0.0001$, $n = 563$; LMJ, 65.1%, $P < 0.004$, $n = 80$). One observer did not differ from the reference observer (SJD 115.8%, $P > 0.24$, $n = 76$). Three other qualified observers did not detect enough Palila ($n < 2$) to determine differences in effective area from the reference observer. Detection areas were adjusted by observers and time of day. DISTANCE calculated the EDR under standard conditions of the pooled counts based on a half-normal model with hermite polynomial adjustments. The EDR of 68.579 m with a coefficient of variation of 5.69%, yielded a mean population estimate of 4.395 ± 625 SE Palila and a 95% confidence interval of 3,213 to 5,677. In comparison, Jacobi et al. (1996) calculated an EDR of 64.04 m and CV of 1.47 from the 1980-1995 data. About 90% of the population was found in the high and medium density strata west of transect 105 on the west slope of Mauna Kea (Table 1).

Table 1. Mean Palila population estimates, standard error of mean, 95% confindence interval, number os stations, area, and number of Palila detected by stratum in 1997 on Mauna Kea

Density Stratum	Area (km^2)	Stations Sampled	Palila Detected	Mean Population	SE	95% CI
Low	22.5	57	2	92.0	64.8	0 - 241.7
Medium	13.5	53	32	828.3	196.8	457.6 - 1233.5
High	20.5	40	69	3152.2	563.8	2088.8 - 4300.3
Eastern	21.0	49	8	323.1	154.4	59.9 - 664.5
Out of Strata*	--	111	0	0	0	0 - 0
TOTAL	77.5	310	111	4395.6	625.1	3212.6 - 5677.7

* Stations with no recorded Palila detections during 1980-1997.

Discussion

The 1997 estimate of 4,395 ± 625 SE Palila is higher than the mean estimate of 3,390 ± 333 for the period 1980-1995 (Jacobi et al. 1996) and similar to the 1996 estimate of 4,171 ± 515 (3,219-5.219 95% CI; Biological Resources Division, unpubl. data). The 1996 count was conducted on 29 April, early in the nesting season rather than during January or February as in other years, which may have resulted in higher vocalization rates and increased detectability. In 1996, seven observers covered 11 of the 17 original transects, including all transects in the high density stratum.

Annual estimates from 1980 to 1997 average 3,490 + 303 SE and suggest that Palila population size is highly variable (Jacobi et al. 1996). Despite some apparently large increases and declines in the population, there seems to be no prevailing trend upward or downward during the last 18 years (Figure 2). However, Palila continue to become dangerously concentrated on the dry, highly flammable west slope of Mauna Kea as their range contracts on the eastern and southern flanks. They are also vulnerable to annual variation in climatic conditions, especially drought (Lindsey et al. 1997). With the onset of the 1997 southern oscillation and anticipated unusually dry weather on western Mauna Kea, food resources are likely to decline with subsequent reduction in Palila reproduction and survival. The population may decline, therefore. until normal weather patterns resume and food becomes more available.

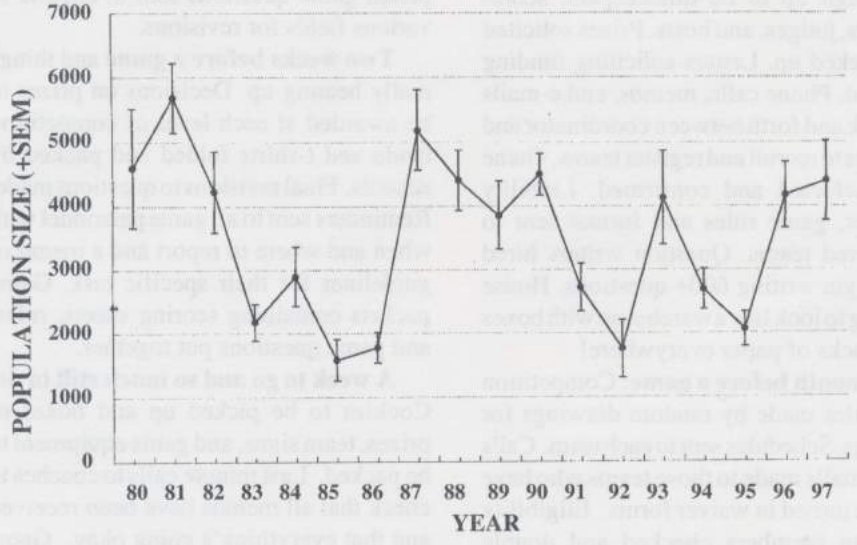

Figure 2. Population size (mean ± standard error of mean) of Palila on Mauna Kea, Hawai'i, 1980-1997. 1980-1995 data from Jacobi et al. (1996), and 1996 data from BRD (unpubl.).

If corridors of high-quality mamane habitat eventually connect the primary habitat on the west slope with relatively distant tracts of larger mamane woodland, such as the north and south slopes of Mauna Kea, Palila and other Hawaiian honeycreepers may be able to disperse longer distances, make seasonal use of other areas, and breed where there are sufficient food resources. Palila would benefit from increased elevational range of mamane woodland, where different phenophases of food resources may be seasonally abundant (van Riper 1980b; Scott et al. 1984, 1986; Fancy et al. 1993). They also will benefit from mamane regeneration occurring where feral ungulates have been reduced. However, browsing by feral *Ovis* spp. continues to reduce mamane regeneration in areas of importance to Palila (Hess et al., submitted). Scowcroft and Conrad (1988) predicted that recovery of mamane will not benefit Palila until the early part of the 21st century. Continued damage to mamane seedlings and saplings by *Ovis* spp. may further delay the recovery of Palila in some areas.

Palila continue to be at risk of extinction due to high annual variability in population size and restricted range on Mauna Kea. Nevertheless, there may be sufficient numbers of Palila and available habitat to achieve recovery if appropriate management action is taken immediately (Fancy et al. 1996). To assist recovery of the Palila, research and management efforts are underway to develop translocation and captive rearing and release techniques, enhance wild productivity, reduce numbers of predators, and improve habitat conditions.

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Calendar of Events

Saturday, April 25

Join the **1998 Birdathon**!!! See details-pg.12

Thursday, May 7

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

Tuesday, May 12

Monthly meeting of the **Conservation Committee** at the HAS office at 5:30 p.m. (Note new day, place, and time.) All are welcome. For more information, call chairperson Dan Sailer, 455-2311.

Tuesday, May 12

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

Tuesday, May 16

We will be visiting the tidepools at Makapuu Point at low tide with HAS Board Member Wendy Johnson as our leader. Volcanic rocks form a ledge where pools are created at the edge of the deep ocean environment there. Expect to see a variety of algae, small fish and reef creatures including mollusks, echinoderms and crustaceans. Bring field glasses, small nets for close-up observations, water and a snack or lunch, and plenty of sunscreen. Please bring a plastic bag to carry out trash left by others. Wear reef shoes or tabis and plan on a little climbing and a lot of scramble over rocks. We will meet at the gate to Makapuu Lighthouse road at 10am. Suggested donation -$2.00.Please call Wendy Johnson at 261-5957 for more information.

Monday, June 15

The HAS **membership meeting and program** will feature Patrick Ching, well-known Hawaiian wildlife artist and author, with a slide show about the wildlife of the of the Northwest Hawaiian islands. Author of four coloring books and the "Hawaiian Monk Seal." Patrick will also show slides of his work and have books available for signing. The meeting is from 7:30-9:30 p.m. at Bishop Museum, Paki Hall Conference Room. Refreshments provided; HAS publications, tapes, and t-shirts available for purchase.

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