



RADAR AND VISUAL OBSERVATIONS OF TRANSPACIFIC MIGRANTS

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The Hawaiian Islands are wintering grounds for several species of shorebirds and ducks which migrate from the Arctic and the northern portions of North America and Asia. Of these migrants, the American Golden Plover (*Pluvialis dominica*), Ruddy Turnstone (*Arenaria interpres*), Wandering Tattler (*Heteroscelus incanum*), Sanderling (*Calidris alba*), Pintail (*Anas actua*), and Nothern Shoveler (*Spatula clypeata*) are the most numerous. The four species of shorebirds also winter on other Pacific islands and atolls, as well as in other regions of the southern hemisphere (AOU 1957). It is not known whether these shorebirds overfly Hawaii in direct flight to the south, or whether they stop on the islands and then continue south at a later time. The ducks do not appear to proceed beyond the Hawaiian Islands, although other migrant ducks are recorded in areas of the western Pacific. Radar has been used in the Atlantic to show non-stop flight from North to South America (Williams et al. 1977). Observations on Bermuda and Antigua revealed migrants overflying those islands at altitudes of 3 to 6 km. In 1979 we used radar and ground counts on the Hawaiian Islands to observe whether the migration patterns in the Pacific were similar to those in the Atlantic.

•METHODS

We made visual and radar observations of fall bird migration on both Oahu and Maui. On Oahu we used the FAA-National Guard long range surveillance radar at the summit of Mt. Kaala (elevation 1.2 km, peak power 8 megawatts, 5 rpm) from 5 September through 27 October. On Maui we used the ASR-7 traffic control radar at the airport in Kahului (elevation 6 m, peak power 425 kilowatts, 15 rpm) from 27 August through 2 September and from 9 October through 27 October.

The Maui radar at 3 to 20 km range (where migrants were detected) was sensitive to birds flying at altitudes ranging from sea level to 1500 m (see Gauthreaux 1974). Wind velocities relevant to data from Maui therefore, were averaged over these altitudes. The radar at Mt. Kaala, Oahu, due to its elevation, was insensitive to even small aircraft

flying below 1200 m and, thus, wind data for this radar were averaged for altitudes between 1200 m and 3000 m. The difference in sensitivity of these two radars to birds flying at different altitudes also was used to roughly estimate the altitude of birds. In simultaneous observations at both radars, only the Maui radar detected birds approaching the islands, thus suggesting relatively low altitude flight.

Data were recorded from the radar Plan Position Indicator (PPI) display using a modified super 8 mm camera as described by Williams and Mix (1973). To analyze the movement of birds, we projected each film on a large white sheet of paper, traced the tracks, and measured the direction and speed of the movement.

Sea return from large waves and rain clouds produced large echoes on the radar displays which prevented detection of birds. Such conditions were transitory, lasting a maximum of 7.5 hours.

To correlate ground observations with the radar data, we made bird counts on both Oahu and Maui nearly every day. On Oahu, counts of shorebirds were made at a settling pool of the Oahu Sugar Refinery on Waipio Peninsula and at Kalua Puii Pond at Kaneohe Marine Base during September. In October counts of ducks were made at the Waipio Peninsula and at two wildlife refuges near Pearl Harbor. During October both the shorebirds and the ducks were often disturbed by earth moving operations at Waipio, preventing a consistently accurate count.

On Kanaha and Kealia Ponds in Maui, daily counts of shorebirds were made from 27 August to 3 September and of ducks throughout October. During October at least 90% of all migrant ducks on the island could be censused on the two ponds. These counts on Maui constitute the first complete daily counts of migrants made in Hawaii. On Kealia Pond, which consistently held a greater population of ducks, it was possible to stand on the west shore and see almost all of the ducks on the pond. On Kanaha Pond the ducks were spread out in several lagoons, but by observing from five separate points, all the water could be censused.

RESULTS

Visual Counts

Between 27 August and 3 September, the counts of shorebirds made on Maui showed a fairly constant number of Golden Plover (approximately 60 to 85 birds) seen on the two ponds. The Ruddy Turnstone, however, increased from 15 birds on 30 August to 132 birds on 2 September on both ponds. The numbers of Sanderling and Wandering Tattler remained approximately constant at about 30 to 45 and 10 to 22 respectively.

On Oahu, counts were made at Waipio on 25 September, at which point 250 to 300 Golden Plover, 75 Ruddy Turnstone, 2 Wandering Tattler and no Sanderling were seen. These numbers of Golden Plover remained approximately the same at Waipio throughout September. The numbers of Ruddy Turnstone, however, increased markedly on 17 September with the arrival of several hundred immatures. These immatures, in flocks of 40-60 birds, with several mature birds scattered throughout each flock, remained at Waipio throughout September. The immatures had not been seen on 16 September by R. L. Pyle (pers. comm.).

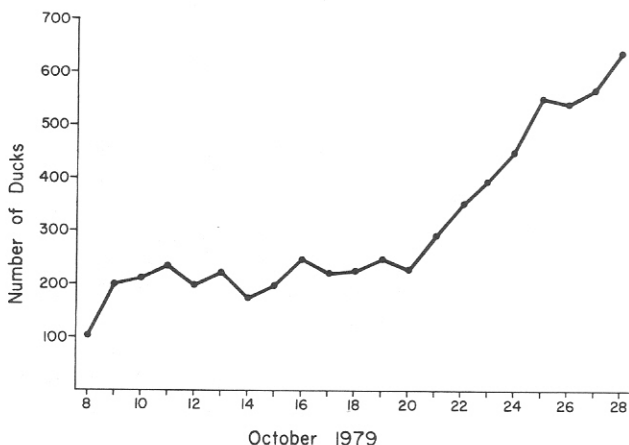


Figure 1. Total number of ducks seen each day on Kanaha and Kealia Ponds, Maui, between 8 and 28 October, 1979.

At Kaneohe Marine Base, we observed a decrease in the numbers of both Golden Plover and Ruddy Turnstone from 658 and 109 respectively on 5 September to 14 and 9 on 24 September. These changes, however, particularly in the case of the Golden Plover, could be due to daily population shifts to tidal flats for feeding and/or to flat-roofed buildings for diurnal resting and preening (Johnson and Nakamura, 1981). Observations were not made at Kaneohe during October. During the same time period, O. W. Johnson (pers. comm.) observed that the plover population at Bellows Air Force Station remained relatively stable, with no significant fluctuations that would have marked the arrival or departure of any migrants. The majority of adult migrants had arrived by the end of August (Johnson et al. 1981), and the arrival of the juvenile plovers did not begin until 26 September.

During October, as daily counts were made of ducks on Maui, we did not make counts of shorebirds on a regular basis. We noted, however, that the numbers of Golden Plover had increased on the two ponds, that the numbers of

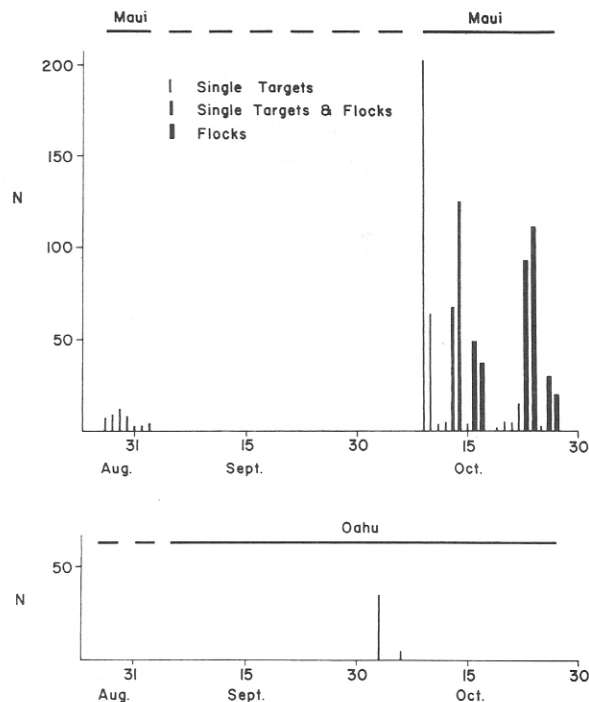


Figure 2. Number of bird targets seen on the Oahu and Maui radar PPI during observation periods. Solid lines (—) under Maui and Oahu indicate the days of observation at each radar. Dashed lines (----) represent no observations.

Ruddy Turnstones had decreased, and that several of the less common shorebirds, such as Sharp-tailed Sandpiper (*Calidris acuminata*), Pectoral Sandpiper (*C. melanotos*) Ruff (*Philomachus pugnax*) and Long-billed Dowitcher (*Limnodromus scolopaceus*) had appeared. Perhaps these more unusual species came in with the large numbers of immature birds arriving on Oahu during the month of September.

The results of our visual observations of ducks on Maui are summarized in Figure 1. On 5 October C. J. Ralph (pers. comm.) had seen 22 ducks on Kealia Pond; three days later on 8 October we saw 92 on Kealia Pond and 11 more on Kanaha Pond: a total of 103 for the day. On 9 October there was another increase in the Maui duck population to a total of 198, of which 184 were on Kealia Pond. The population then stabilized, remaining around 225 ducks until 21 October when it increased to 294. Thereafter, we observed increases of 50-100 ducks a day until our last count on 28 October totaling 640, of which 574 were Shovelers and 66 were Pintails.

U. S. Weather charts of the northern Pacific for October indicated that clear weather with northerly (320°-350°) winds in the area of the Aluetian Islands preceded the duck influxes on Maui by three and four days. Clear weather predominated the North Pacific on 4 and 5 October and again for a ten day period from 17 to 27 October. Between these two clear periods, stormy conditions with southerly (180°-220°) winds prevailed. These data suggest, therefore, that the successful migrant ducks leave the coast of the North Pacific with strong tailwinds of 37 to 74 km/hr and clear

skies and take three to four days to arrive at the islands.

Visual observations were also made on board ships. On board the NOAA Surveyor, P. B. Pyle sailed south out of Kodiak, Alaska from 4 to 14 September, and P. K. Stoddard sailed from Kodiak to Seattle, Washington, from 18 September to 3 October. They saw few passerines (mostly warblers and sparrows), usually flying to the SE toward the North American coast, taking a "short-cut" across the Gulf of Alaska. Sightings of shorebirds (plovers, turnstones, dowitchers, and sandpipers) were more numerous, with the birds heading a more southerly direction (115°-220°) toward the Pacific Islands. P. D. Kloeckner was on board the U. of Hawaii's R/V KANA KEOKI from 29 October to 20 November. This boat sailed from Honolulu due south, through Washington, Christmas, Palmyra, and Fanning Islands and returned via Johnston Island to Kona, on Hawaii. During this time, no landbirds were seen, although seabird sightings were numerous.

Radar Observations

Radar echoes of birds were detected by both the Oahu and the Maui radars. These were echoes from small objects which moved at between 20 and 100 km/hr and were not moving at the direction and speed of the prevailing winds. There were fewer bird echoes on the Hawaii radars than at any other radar installation we have used. Similar radars at sites along the Atlantic coast would almost always detect five or ten birds on the PPI display at a given time, and during heavy migrations the display would become saturated with radar echoes (see Williams et al. 1977). At Hawaii, most observation periods showed no birds, and the greatest

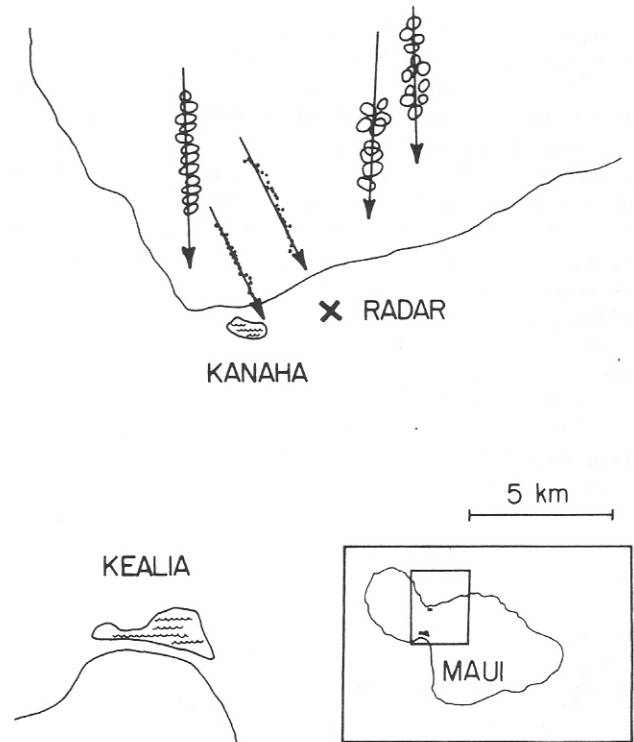


Figure 4. Reproduction of several traced tracks of migrants seen on the Maui radar PPI. The tracks comprised of rough ovals are attributed to the flight of flocks of ducks; the tracks comprised of small dots are attributed to shorebirds or individual ducks. The different type of tracks remained consistent along any given track.

number of birds detected on the display at one time was 20 small echoes on Maui.

At no time during our observations in Hawaii did we detect a fine scintillating "mist" of echoes attributed to passerine migration at continental radar sites (see Eastwood 1967). Most of the echoes we detected were small, relatively bright echoes similar to those attributed to shorebird or waterfowl migration at coastal sites (see Eastwood). During the later observations at Maui we also detected large targets approaching Maui from the north. Williams et al. (1976) report similar echoes from groups of waterfowl approaching a wildlife refuge.

The number of migrants detected on the radar films and the corresponding dates are shown in Figure 2. The only migratory movements seen on the Oahu films appeared on 3 and 6 October flying south (180° mean) away from the island at a mean ground speed of 63 km/hr (see Figure 3). During this period winds aloft averaged 28 km/hr toward 270° (see Methods). The lack of birds observed approaching Oahu, even when large numbers of migrants were detected approaching Maui, may be explained by low altitude flight for birds approaching the islands; this would place the migrants below the radar horizon for the Oahu installation (see Methods). Conversely, those migrants seen on the Oahu radar would be at relatively higher altitude.

The mean ground speed of the migrants seen on the Maui radar was 43 km/hr. These birds were observed arriving from the north and northwest, moving toward the

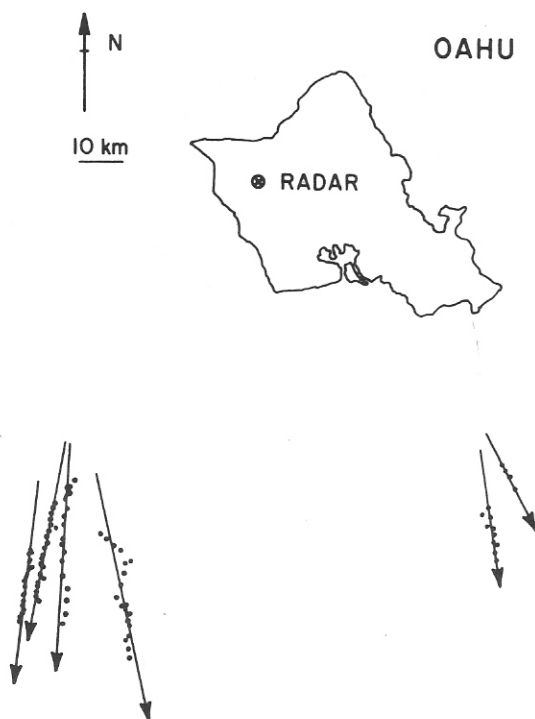


Figure 3. Reproduction of several traced tracks of migrants seen on the Oahu radar PPI. Each dot indicates the position of the migrant during the exposure of one frame of film. Arrow indicates direction of travel.

north shore of Maui (158° mean) (see Figure 4). During our observation period on Maui the winds averaged 19 km/hr toward 230°, although on 9 and 10 October, migrants to Hawaii flew through winds which blew from the south toward 024° and 010°. Migrants arriving in the Hawaiian Islands, as seen on our radar films, seemed evenly distributed throughout the day with no specific period of peak influx.

As Figures 2 and 4 show, there is a change in the character of the echoes seen on the Maui radar display as the observation period progressed. The change in size and definition of the radar echoes corresponds to the influx of ducks observed visually in October. It is probable that migrants seen on the Maui radar at the beginning of October were either shorebirds or individual ducks.

To determine whether constant compass orientation alone would be sufficient to guide birds from Alaska to Hawaii, we simulated several migrations from the Aleutian Islands to Hawaii using geostrophic wind velocities measured from Northern Pacific surface weather charts made during our observation period. Assuming an airspeed of 60 to 100 km/hr (a characteristic range for migrating shorebirds and ducks) and a 180° heading for a hypothetical migrant, we added the velocity of the wind at 12 hour intervals and found the resultant track and ground speed. In each simulation, under favorable and unfavorable conditions, the birds flew over some point in the chain of Hawaiian Islands.

DISCUSSION

The low altitude and slower speeds of the birds arriving from the north at Maui suggest birds preparing to land on the islands. It is improbable that the birds drop in altitude while passing over Hawaii, thus missing detection by the higher elevation Oahu radar. If they were making a continuous flight to the South Pacific, the birds would expend less energy by taking advantage of the stronger winds at higher altitudes over the islands thus, a reduction in altitude and speed over the islands would be disadvantageous for any other reason than to land.

We believe that the echoes on the Oahu radar moving SSE away from the island were birds initiating the second leg of their transpacific flight at an altitude much higher than their flights arriving at the island. Similar high altitude departures are reported from the North American Atlantic coast (Richardson 1979).

As the results of our simulation suggest, it is unlikely that Pacific migrants following a 180° heading could miss the Hawaiian Islands. Although a Hawaiian Island may only be a pinpoint in the vast Pacific Ocean, the chain of islands extends some 1600 km in a ESE-WNW direction. In addition clouds tend to constantly build up, especially over the larger islands, reaching altitudes of up to 10 km. Such cloud formations can be seen from 320 km by aircraft pilots, and thus the island chain with its clouds above provides a large visual target for the migrant birds.

ACKNOWLEDGMENTS

We received the generous assistance of numerous people both in our field observations and in our radar work; to list all their names would be impossible. We would like to give special thanks to many of the people who helped make the whole project possible: C. P. Ralph, C. J. Ralph, R. L. Pyle,

E. T. Kaneko, Mr. Park, K. Foreman, R. Gilroy, W. Lober, R.L. Walker, K. Kepler, C. Kepler, O.W. Johnson, D. W. Crawford, B. Keating, D. Morrell, A. Cox, T. Cajski, V. Tam, E. Cummings and C. Harrison. The Federal Aviation Agency, the National Oceanic and Atmospheric Administration, and the University of Hawaii all gave us unlimited use of their services and time, for which we are deeply grateful. C. J. Ralph, R. L. Pyle and O. W. Johnson made many helpful suggestions on the manuscript. This research was supported by the National Geographic Society, The Explorers Club, the American Philosophical Society, Sigma Xi, and Swathmore College. Travel funds for P. D. Kloeckner, P. K. Stoddard and P. B. Pyle were supplied by The Explorers Club Education and Youth Activities Fund.

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ALOHA AND THANKS

This is the last issue of the 'Elepaio that I will be editing. Since August 1977 I have had the privilege of working with a very dedicated and talented group of people who have helped me in the enjoyable tasks of editorial processing and production. Marie Morin and Peter Galloway will be taking over as co-editors for the next issue and those beyond. I am sure that they will have as much fun as I have had over the past 55 issues.

Several people contributed many, many hours over the past few years to help produce the 'Elepaio. Among the most important of these, and the least acknowledged, are the reviewers. These people carefully read the manuscripts promptly and with good insight. This benefits the authors as well as the members with improved quality of articles. Many have helped on this, but the bulk of the work has fallen to just a few people: George Balazs, Phil Bruner, Tim Burr, Vern Byrd, Sheila Conant, Cam Kepler, Doug Pratt, Bob Pyle, Charles van Riper, Mike Scott, Rob Shallenberger, Dave Woodside, Fred Zeillemaker, and Al Ziegler. Others, whom I have temporarily forgotten, will, I hope, forgive me.

Production has benefited from the many people whose names have appeared in each issue as the 'Elepaio Committee members. I won't repeat the names of these dozens of people, but my gratitude to them is unbounded. They always responded to a telephone call with the offer of cheerful help in getting together for paste-up, typing, or proof reading...all the things that make it possible for the 'Elepaio to come out on time. Many thanks to all of them.

It is important to remember the whole reason for all of this effort, and that is to protect Hawaii's native wildlife. I'm not sure how much progress has been made in the past few years, but certainly some. A few conflicts have been resolved, but many more remain if our islands' heritage and relatively few remaining treasures are to be retained for the enjoyment, education, and benefit of my children and yours. I truly hope that the major landowners of the state, and especially the state itself, will soon see their way clear to begin this important work in earnest.

Finally, I would like to thank my wife Carol, who spent so much time on the 'Elepaio, reading manuscripts, calling up volunteers, and being supportive of the many hours I spent immersed in 'Elepaio business. Sometime over the coming summer, we will leave Hawaii to move back

to our native Northern California. We will take up our research there among the redwoods in Arcata. We will be spending the next couple of years writing up our work on Hawaii's native and endangered birds, and we will often think of all the friends we made here and especially those who helped us with so much devotion in producing the 'Elepaio. Many thanks and a fond Aloha.

C. J. Ralph

REVIEW OF HAWAIIAN ANIMAL LIFE COLORING BOOK

BY SEAN MCKEOWN

P.O. Box 22162, Honolulu, HI 96822
Oriental Publishing Co., \$4.95

When is the last time you saw a coloring book with a glossary and a bibliography? I venture to guess that you haven't opened a coloring book in a long time unless you have bought a gift for a young child. However, I recommend highly that you buy for yourself a copy of the *Hawaiian Animal Life Coloring Book*.

The name is deceptive. It is indeed a coloring book, but it has a wealth of information about 44 species of Hawaiian animals of land and sea. Many of these are common species that you see every day but probably know little about.

Take those green lizards that live in most Hawaiian yards, for example--did you know that they are really natives of Cuba and that the males have a pink or lavender throat that can be inflated when impressing their girlfriends? The book covers some less commonly seen animals too, such as the Brush-tailed Rock Wallaby, a diminutive kangaroo that lives in a single valley on Oahu.

Sean McKeown provides a well-written and well researched text. He has drawn upon the knowledge of biologists and researchers in Hawaii to present accurate and interesting material.

Even if you don't follow the excellent color guide, the book is a useful addition to your coffee table or library shelf. I recommend that you forget the crayons, buy a nice set of felt-tip pencils, and make yourself a color copy. It is certainly a more educational and creative beach activity than crossword puzzles. But--remember to stay in the lines!

Leighton Taylor

OBSERVATIONS OF WHITE-FRONTED GEESE AT WAIPIO, OAHU

by Bruce L. Bickle

On Saturday, October 24, while on patrol of the Waipio Peninsula area with fellow DLNR Conservation enforcement Officer Gary Moniz, we observed two large waterfowl in the "central" settling pond at about 8:30 a.m. We drove to a closer position about 80 m from the birds and were able to observe them with 6x30 binoculars and a 20x spotting scope. The birds were of a dull-brown color with extensive white under the tail. The bills were orange-pink. The birds were feeding for the 20 minutes we watched them, and we were unable to see their feet.

I later described these birds to Tim Burr, Marie Morin and Tim Sutterfield, Staff Biologists with the DLNR Division of Forestry and Wildlife. They suggested the birds might be White-fronted Geese (*Anser albifrons*). White-fronted Geese are occasional visitors to Hawaii (Berger 1981). Until one was reported in January to mid-March 1979 (Pyle and Ralph 1981), no other records are in the literature that we can find for Oahu.

On the 28th, Burr, Morin, Sutterfield and I went to the Waipio area to observe the birds. Arriving at 1:30 p.m. we soon spotted the two birds sitting on a small island near the west edge of the "central" pond. Using a Questar scope and binoculars at a distance of about 80 m we were to see with some detail the dull dark orange feet of the birds, their orange-pink bills, with a small amount of black on the tip, and extensive white coloration under the tail.



Figure 1. "White-fronted Geese at Waipio Oahu, October 1981." DLNR photo by Tim Burr

After ten minutes, the birds entered the water and swam to a small pile of vegetation where they began to feed. Photos were taken with the aid of the Questar and a 400 millimeter lens (Fig. 1.) The feeding continued for another 30 minutes, when the birds returned to the small island. I was able to approach to within about 30 m of the birds, who noticed my presence, and kept an eye on me, but did not move away.

With the aid of field guides, we were all able to agree that these were White-fronted Geese in juvenile plumage.

John Engbring, Wildlife Biologist with the U.S. Fish and Wildlife Service informed me he had seen the two birds in the same location on October 12, at about 9:00 a.m.

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Pyle, R.L. and C.J. Ralph. 1981. Winter Season-Hawaiian Islands Region. Am. Birds 35:337.

SCHOLARSHIPS ANNOUNCED BY THE NATIONAL AUDUBON SOCIETY

A scholarship program for high school, college and graduate school students has been announced by the National Audubon Society Expedition Institute. The 1982 scholarships are designed to defray a student's expenses while attending school, or for a project or summer program of the student's choice. Application forms and instructions are available until August 15, 1982 by sending a self addressed stamped #10 envelope to: Scholarship Committee, National Audubon Society Institute, RFD #1, Box 149B, Lubec, Maine 04652. The financial aid and multiple scholarship grants, ranging in amounts from \$100 to \$200 are made available by Audubon to help young people take advantage of learning opportunities throughout the nation.

Recipient's reactions to the financial assistance has been positive. They report that the Audubon Expedition Institute scholarships have made possible the fulfillment of their immediate education and career goals such as attending schools, summer camps, workshops and travel programs, photographing endangered Alaskan wildlife, interning in conservation organizations, or participating in the Expedition Institute.

TELEVISION SPECIAL

Tuesday March 16th & Saturday March 20th; "The Hawaiian Wilderness," a 1977 production of Time/Life Films will be shown for the first time in the Islands by KHET-TV during Wildlife Week. In recognition of the aid given by Island Wildlife, Time/Life has generously donated the rights of the "Wild, Wild World of Animals" episode for local showings on March 16th at 9:30 PM and March 20th at 5:00 PM. The film may be borrowed from the Conservation Council (P.O. Box 2923 Honolulu, HI. 96826) Steve Montgomery.

LIHUE, KAUAI CHRISTMAS COUNT

by Winona Sears

Areas	1	2	3	4	5	6	7	Total
Great Frigatebird	-	-	-	4	-	-	-	4
Cattle Egret	78	11	274	1782	31	10	194	2280
Bl.-cr. Night Heron	-	-	-	-	2	-	-	2
Mallard	-	-	1	-	-	-	-	1
Hawaiian Duck	-	-	2	-	-	-	-	4
Pintail	-	-	2	-	-	-	-	2
Red Junglefowl	4	-	1	-	11	1	-	17
Ring-necked Pheasant	6	1	6	-	-	1	2	16
Japanese Quail	-	-	-	-	6	-	-	6
Com. (Hawaiian) Gallinule	16	-	8	1	4	-	-	29
Com. (Hawaiian) Coot	6	-	26	2	2	-	-	26
Am. Golden Plover	69	6	28	6	10	1	3	123
Ruddy Turnstone	42	-	-	-	-	-	-	42
Rock Dove	1	-	-	-	-	-	-	1
Spotted Dove	3	-	36	13	37	-	-	89
Barred Dove	51	11	282	38	53	40	20	495
Short-eared Owl (Pueo)	-	-	-	-	-	-	1	1
Mockingbird	-	-	-	2	7	-	1	10
Hwa-mei	2	-	6	-	3	-	-	11
Shama	3	-	7	6	9	9	3	37
Com. Myna	174	36	136	90	49	23	45	553
Japanese White-eye	13	12	31	29	80	18	4	197
Spotted Munia	49	-	72	2	4	-	-	127
House Sparrow	54	15	-	45	30	39	9	192
Meadowlark	1	-	15	3	3	-	1	23
Red-crested Cardinal	3	5	2	7	3	2	1	23
Cardinal	36	-	10	8	7	4	4	69
House Finch	11	-	12	-	10	-	52	85
No. of Species	21	8	20	16	20	11	14	28
No. of Individuals	624	97	957	2023	376	148	240	4465

Areas covered

1. Wailua River to north side of Lihue, including airport road and holding ponds west to Lihue.
2. Nawiliwili Harbor, Huleia Stream, Puhi and KCC grounds.
3. South of Lihue to Knudsen Gap Road, including Kipu Ranch and Waita Reservoir.
4. Omao Road, Koloa Town and Poipu.
5. Pacific Tropical Botanical Gardens.
6. Lihue Town.
7. Kalaheo, one feeding area plus Kukuiolono Park.

Twenty three observers participated in the Lihue count on 19 December 1981 in eleven parties, plus three at feeders. Seen in count area during count week but not on count day was a barn owl.

Participants: Stuart Bradley, Sr. and Jr.; Sophie Cluff; Richard Cohen; Zipporah Douglas; Madeline Emrick; Donald and Leilani Fehr; Janice Fryant; Alton Fujita; Mary and

Tony Guerrero; Eleanor Humfreville; Gilbert and Muriel Parfitt; David and Winona Sears (compiler); Virginia Siewertsen; Reva Stiglmeier; William Theobald; Ken Tokita; John Townsend; Leopold Valdez.

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EPITAPH: FIRE AT PULEHUA

Anyone who is in the least bit curious about the Palila, Greater Koa Finch, Lesser Koa Finch, and the Grosbeak Finch, most certainly has heard of Pulehua. This is the area in Kona, Hawaii where all of these birds could be found in fair to common numbers in the early 1890's. Though these birds have long since disappeared from here, at least the forest held on a bit longer, despite the continued grazing of cattle. Although not much of the forest remained on December 13, 1981, it is now totally gone due to a fire which burned up an area of perhaps 250 acres, including Pulehua house, which was built mostly of Koa back in the 1850's. It was from this very house that Henry Palmer walked out of on September 28, 1891 and collected the first Greater Koa Finch known to Western man. This area now is just an open black field, smouldering. In this fire too, the last of the lobelia, *Delissea undulata*, protected in a small enclosure on Pulehua hill burned up. This plant is most certainly extinct in this area now. Though thousands of acres of similar forest still survive around this particular area (in a very bad state, however) it is shocking to think that in less than a century, this particular forest has literally vanished forever.

Nicholas Mitchell

NOTE TO CONTRIBUTORS TO THE 'ELEPAIO

All contributions concerning natural history and conservation are welcomed, especially those pertaining to the Pacific area. The Editorial Committee wishes to encourage especially material from the various Pacific Islands, such as the Trust Territories, Guam, Samoa, and other areas. Articles on all natural history subjects are solicited.

It would facilitate the processing and review of your contribution if it could be submitted typewritten and double spaced, although this is not a requirement. All articles of a scientific nature are sent out for comments to at least two reviewers familiar with the subject.

To insure proper handling and rapid publication of your contribution, it should be mailed to the co-editors, and sent to Marie Morin, 1415 Victoria St., #1515, Honolulu, HI 96822.

ALOHA TO NEW MEMBERS

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

Joint: Janet Black, Honolulu; Martin Bock, Honolulu; T. Thompson Bosworth, Honolulu; Mrs. Helen M. Brown, Honolulu; Ens. Bruce Buhler, FPO San Francisco; Michael Gordon, Pearl Harbor; R. Greenfield II, Honolulu; Michael G. Hadfield, Honolulu; Pauline Hadley, Honolulu; Robert C. Holt, FPO San Francisco; Ralph E. Hurst III, FPO San Francisco; Nobuyoshi Jio, Pukalani; Mr. and Mrs. Linnae Kauwe, Pahoia; Mrs. W.C. McDermid, Kailua; D.J. Miller, Hauula; L. Cpl. L.E. Molineaux, FPO San Francisco; Kathryn A.N.H. Opedal, Honolulu; Richard Paskiewicz Family, Honolulu; Chuck Rice, Lihue; Mrs. H.S. Roberts, Honolulu; Marion G. Saunders, Honolulu; Clyde L. Sussex, Hanalei.

Kammy Wong

SAVE AN EAGLE: SAVE YOUR STAMPS!

Any stamps (especially commemorative and foreign) can help save the American Bald Eagle. The Florida Audubon Society saves stamps for resale to collectors to help fund the Society's raptor research and rehabilitation program. These stamps are collected through Audubon's bald eagle and birds of prey program which is directed by Doris Mager, the nation's best-known bald eagle advocate.

Readers who want to save their foreign and U.S. stamps to help save the Southern Bald Eagle should write to Florida Audubon Society Stamp Program, P.O. Drawer 7, Maitland, FL 32751 for an informative brochure about the project.

'ELEPAIO VIA AIRMAIL

Members and subscribers wishing to have the 'Elepaio sent by airmail to addresses outside Hawaii may now obtain this service by remitting the additional amount needed to cover airmail postage costs. These amounts, for 12 monthly issues, are:

U.S. and Canada	\$4.25
Central America, Caribbean	9.00
South America, Europe,	
Mediterranean Africa	11.50
USSR, Asia, Africa,	
Pacific Area	14.00

BIG ISLAND PROGRAM:
HIGH WINDS AND HEAVY RAINS

Dr. Charles M. Fullerton, meteorologist, will present an illustrated program on "High Winds and Heavy Rains in Hawaii" on Saturday, March 20, at 7:30 p.m. in the Hawaii Volcanoes National Park Auditorium.

Fullerton will relate Hawaii's weather patterns to its tropical climate and focus on such powerful natural events as hurricanes, high winds, torrential rainfall and floods. He is the director of the Cloud Physics Observatory of the University of Hawaii at Manoa, with offices located on the Hilo College Campus.

This is the eighth program in a Hawaiian natural history series jointly sponsored by the Hawaii Audubon Society and Hawaii Volcanoes National Park. These programs feature up-to-date information and insights about natural Hawaii, presented by specialists involved in current field work. The programs are for the public and everyone is invited.

Appropriately, this program is on the eve of the vernal equinox--time for celebrating the arrival of spring.

BISHOP MUSEUM
HAWAI'I AND POLYNESIA

THURSDAY NIGHTS at 7:45 p.m. in the Atherton Halau at Bishop Museum. Admission by voluntary donation.

This month's topics are as follows:

Mar. 11 ORIGINS OF THE POLYNESIANS;
Dr. Patrick V. Kirch, Anthropologist,
Bishop Museum.

Mar. 25 MARQUESAN AND TAHITIAN PREHISTORY;
Dr. Yosihiko H. Sinoto, Chairman,
Department of Anthropology, Bishop
Museum.

MARCH PROGRAM:
WILDLIFE OF THE IVORY COAST

The March 15 general meeting at McCully-Moiliili Library will be given by Timothy Sutterfield, a Wildlife Biologist with the Hawaii State Division of Forestry and Wildlife. His talk on *Wildlife of the Ivory Coast* will feature his experiences as a wildlife preserve manager in the Ivory Coast of Africa during the late 1970's.

WAIKIKI AQUARIUM:
MAN AND THE BIOTA

WEDNESDAY NIGHTS at 7:30 p.m. at the WAIKIKI AQUARIUM. \$1.00 per adult.

This month's topics are as follows:

Mar. 3 AQUACULTURE IN THE PACIFIC
The raising of marine and freshwater organisms for food is practiced throughout the Pacific from subsistence cultures to market economies. Dr. William Brewer from the State's Aquaculture Development Program talks about the importance and techniques of aquaculture throughout the Pacific.

Mar. 17 MARINE MAMMAL DISEASES AND MAN
Dr. Murray Daily of California State University Long Beach discusses certain diseases that can be transmitted between human beings and our marine mammal relatives.

Mar. 31 TUNA AND MARLIN - HIGH SPEED NOMADS OF THE HIGH SEAS
These oceanic fishes, so important to sport and commercial fisheries the world over, roam great distances across the Pacific Ocean. Dr. Richard Brill of the National Marine Fisheries Service examines these 'nomads of the high seas.'

FIELD TRIP
TO THE BISHOP MUSEUM

Sunday, March 14, Maile Stemmermann will lead a trip into the Museum's bird collection which is not regularly open to the public. This collection features extinct and endangered bird specimens which are generally too old and fragile for routine display.

This is certain to be an intriguing trip. Please call Maile at 949-3430 (evenings) prior to the trip, since she needs a fairly accurate head count.

MEMBERS WELCOME AT BOARD MEETINGS

The Board encourages members to attend and participate in the monthly Board meetings. It is a good way to get more involved in conservation issues and in the workings of the Society.

CALENDAR OF EVENTS

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March 8 (Monday). Board meeting at the home of Bob Pyle, 741 N. Kalaheo, Kailua, at 7 p.m. (262-4046). All members are welcome. (Park in the driveway or on the lawn under the coconut trees, not on the shoulder of the road.)

March 14 (Sunday). Field trip to Bishop Museum with Maile Stemmermann. Meet in the front parking lot of the Museum at 9:00 a.m. Call Maile at 949-3430 in the evening to reserve your space.

March 15 (Monday). Regular meeting, featuring a talk on "Wildlife of the Ivory Coast" with Timothy Sutterfield. McCully-Moiliili Library, 2211 S. King St., 7:30 p.m.

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