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Excerpts from the PRELIMINARY REPORT ON THE BIRD LIFE IN WAIHOI VALLEY, MAUI, 1972

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(From SCIENTIFIC REPORT OF THE WAIHOI VALLEY PROJECT, pages 216-228,
sponsored by the National Science Foundation)

Bird Life

The avifauna in Waihoi Valley is not particularly abundant for the size of the valley, but is quite diversified. There are endemic species present; the 'Apapane (Himatione sanguinea), the 'Amakihi (Loxops virens wilsoni), the Creeper (Loxops maculata newtonia), and the 'I'iwi (Vestiaria coccinea). ...Some of the infrequently seen birds are also endemic to Hawaii. These are the Hawaiian Owl or Pueo (Asio flammeus), and the Dark-rumped Petrel (Pterodroma phaepygia sandwichensis). The other species found in the valley are either migratory or introduced. The Wandering Tattler (Heterosceulus incanum), and Golden Plover (Pluvualis dominica), are known to be migratory and were seen at different times of the year. The Christmas Shearwater (Puffinus nativitatus) and the White-tailed Tropicbird (Phaethon lepturus) were seen during the summer, but not again in October. Their breeding season ends in October and they probably returned to the ocean.

The rest of the species in the valley are introduced. Some are known to nest in the valley, because old nests have been found. These species include the Leiothrix (Leiothrix lutea), White-eye (Zosterops japonicus), and Ricebird (Lonchura punctulata). The other species that were seen are the Pheasant (Phasianus colchicus), the Cardinal (Richmondia cardinalis), the Chinese Dove (Streptopelia c. chinensis), and the Chinese Thrush (Garrulax canorus).

Background Information

Waihoi Valley and the areas below it to the sea, illustrate three types of botanical zones. The first zone consists largely of guava (Psidium guajava). It extends from sea level to 1600' elevation. From 1600' to 3000' elevation, slightly below and up into the valley proper, scrub 'ohi'a (Metrosideros collina var. polymorpha) is the dominant species. Above this level to the back of the valley and up the slopes 'ohe (Tetraplasandra sp.) and 'olapa (Cheirondendron sp.) cover the area in equal abundance. Uluhe or false /staghorn/ (Dicranopteris sp.) densely covers most of the floor of Waihoi Valley from the 1600' elevation upwards.

Because of the presence and density of uluhe, the expedition members were forced to use stream beds as trails throughout the valley. The transects at 2000', 2700', and 3400' were eventually laid out and used.

Waihoi Valley is classified as a rain forest, though most of the trees of Waihoi do not exceed 25' in height with trunks of 2 to 3 inches in diameter. The trees are not dense and,therefore, there is no canopy. Although Waihoi has an intricate web of small streamlets and several larger streams, the moisture tends to stay, and this causes an extremely mucky situation under the uluhe. This, combined with the density of the uluhe, makes stream traveling the desirable method.

For the study of birds this is not really advantageous. The streams are most often running, and this makes hearing almost impossible. The birds are scarce enough that they are not often seen, and most population calculations were made on call notes and song. If there happened to be an 'ohi'a tree in bloom along the river, it was possible

to glimpse a few birds. Walking in streams also made the study of nests very difficult. The trees were often very high on the banks of the stream bed and impossible to reach and see very well. It was also necessary to watch every footstep; looking for nests can be painstakingly slow when you have to stop all the time. Weather conditions also tended to be unfavorable, as fog and rain were very common to the valley.

Geographical Distribution and Population Studies

Most of the birds in Waihoi were distributed uniformly throughout the area, though a few species live only at the lower elevations, below 2300'. The Pheasant, for instance, was seen only in the cow pasture area; the Ricebird, the Cardinal, and the Chinese Dove were not seen above the 2300' elevation, but the reasons for this are not clear. In the case of the Ricebird, it may be that their feeding habits have restricted their spread. The Ricebird is generally a seed eater and uluhe restricts the growth of grasses.

The other species were seen and heard throughout the valley. There distribution was surveyed by transects and trails; the perimeter of the valley seems to harbor most of the population. (See following charts) The abundance of the species may fluctuate, but not enough work has been done to prove this. Future counts in the spring months will strengthen any summer counts because of such factors as nesting seasons, therefore frequency of song; bloom of the 'ohi'a trees; and the possibility of seasonal movement.

Number of Individuals Recorded During Each Census Count, 1972

Table 1: Transect Number 1

Species	June 10	June 22	June 23	October 21
White-eye	25	.	1	.
Ricebird	.	2	.	12
Leiothrix	.	2	1	1
'Amakihi	.	2	2	.
'Apapane	.	.	2	1
Tattler	.	1	1	1

Table 2: South Baseline Trail

Species	June 14	June 21	June 28	July 18-19	July 20	July 21	Oct 24-26
White-eye	.	5	8	55	92	17	9
Ricebird	.	.	.	2	.	.	2
Leiothrix	.	1	.	15	30	.	2
'Amakihi	2	2	.	1	6	.	12
'Apapane	.	8	.	33	48	2	11
Tattler	.	.	.	4	.	.	.
'I'iwi	.	.	1	.	21	.	8
Chinese Thrush	.	.	.	1	.	.	.
Shearwater	1	.	.	1	.	.	.

Table 3: North Baseline Trail

Species	June 22-24	July 11-12	July 23	Oct 21-23
White-eye	20	20	12	37
Ricebird	.	.	.	4
Leiothrix	1	9	7	6
'Amakihi	.	5	3	4
'Apapane	4	14	.	7
Tattler	1	1	.	5
'I'iwi	.	6	.	3
Plover	.	.	.	2

Theoretical Reasons for the Limited Bird Population

The first and most outstanding limiting factor of birds in Waihoi Valley is the vegetation andits direct effect on food for the birds. During the summer months, the main food source for the endemic birds, 'ohi'a, was not in bloom with the exception of a few scattered trees. In October, the count was slightly higher but not significantly so. This means that most of the birds have to depend on insects for food. Specific counts of the availability of the resources are not tabulated, and there is no way of telling how much of a bird population these sources could support, but it is seemingly very small.

There are several other factors that may play a role in limiting bird populations. One is the weather conditions. Waihoi Valley is not particularly favorable because of

its high rainfall and openness. It is extremely wet and there is no overhead cover for the birds. Waihoi is also fairly low in elevation; this presents the possibility of avian malaria transmission; a disease whose vector is the night flying mosquito (Culex quinquefasciatus). Our entomologist found this species; therefore, we cannot eliminate the possibility of the disease. Ali Navvab (1970) found the vector and malaria blood parasite. Unfortunately, we did not have a permit to mistnet, so we have no blood smears to back up this theory.

A third factor possibly limiting bird life involves the high rat population of Waihoi Valley. Rats have been known to attack the birds, young, and eggs in the nest (Eddinger, 1970). This usually happens while the birds are brooding at night, as rats tend to be nocturnal. The zoologist, Pat Conant, found a few birds' feathers in 3 of his rats' stomachs. This at least proves that rats eat birds. It cannot be said for certain, though, that the birds were killed by rats; the birds may have been dead.

Nesting Data

Few nests were found in Waihoi Valley. This is probably due largely to the inaccessibility of many areas; trees were hard to see, other than those directly along a stream bed or transect trail. All the nests found were inactive; many of them fairly old. Four White-eye nests were discovered; all of them were constructed entirely of moss, and hanging suspended at the end of a lateral branch. Each nest was in a different kind of tree. The first one found was on July 20 at 3500' elevation, 11' off the stream bed in a Broussaisia sp. The second was found at 2700' on July 21 in a 7' small-leafed kolea (Myrsine sp.)hanging from a lateral branch about 3' off the ground. Another was found at 4300', 20' high in a 30' Cheirondendron sp., again far towards the end of a lateral branch. The last observed was about 7' off the stream bed in a 9' Perrotettia sp., fixed in a manner similar to the rest.

Two Ricebird nests were found in lower Waihoi, both in Perrotettia sp., and mostly composed of Lycopodium sp. and grasses, again suspended on the end of a branch. Two Leiothrix nests were found well hidden in Tetraplasandra about 5' from the ground. These nests had the characteristic structure of a Leiothrix nest; they often put leaves in the bottom of the nest. (Fisher and Baldwin, January 1947) Only one nest of an endemic bird was seen; this one was an 'Amakihi nest. It was found at 3150' along the Waiohonu River on July 20, 22' high in a lateral fork of a 35' 'ohi'a tree. It was made of moss, roots, and a little grass.

Immatures

Finding only one endemic nest was odd because of the presence of immatures of the other species, 'Apapane and 'I'iwi. There may have been some immature 'Amakihi, but sighting of this bird was more infrequent; their coloring is often dullish green, and indistinguishable from the tree. Immature 'I'iwi were often bright yellow on the head with mixed yellow and green plumage on the breast. Some in July were noted with red feathers beginning to cover the breast area. The 'Apapane were often mottled grey and red on their breast, some very immature ones were seen that were almost completely grey.

Feeding Habits

In a Hawaiian rainforest the dominant food sources for many birds is the nectar of the 'ohi'a. This is usually a major component of the native species diet, although this does not seem to be the case in Waihoi Valley. I mentioned earlier that the 'ohi'a did not bloom much from June to October; it will be interesting to see if it ever does, in much abundance.

The 'Apapane, 'Amakihi, and 'I'iwi are also known to be insectivorous (Munro, 1944); insects are probably their main source of food in Waihoi Valley. I observed these three species seeking nectar from a few flowers that were in bloom. Many birds were also noticed foraging for insects along branches. I also observed an adult 'Apapane foraging in a Broussaisia sp. inflorescense on June 22. While at the 4000' elevation, I also observed an 'Amakihi feeding on the fruit of Tetraplasandra sp. A White-eye was feeding on another bloom in the same tree close by. I also saw a White-eye going from flower to flower on Clermontia sp.; perhaps after nectar or insects. This occurred at a relatively low elevation of 2100' just off Transect 1.

The Hawaiian Owl was observed several times soaring close over the uluhe and diving into it. This procedure was probably a scanning technique for its principal source of nourishment, the rat. Two regurgitated pellets were found, one at 2700' along a transect

trail, and one at about 3600' in a stream bed on a rock ledge. The pellets consisted largely of pieces of skin andhair and a few bones.

Notes on the Seabird Population

The presence of seabirds in Waihoi Valley was a surprise. The first sighting of one, a Christmas Shearwater, on July 20 occurred long after we knew they were there. We had previously heard the birds; usually more than one, at dusk and at dawn. This particular bird circled Charles van Riper, III and myself at 3050'; where we were camped very close to a 300' waterfall on the Waiohonu River. This sighting and a few others after it gave us good reason to believe the birds came up into the Waihoi Valley to ride the air currents that occur over the waterfalls and along the steep walls of the valley, although there also is thepossibility of their breeding in the area. The bird circled our campsite 12 times and soared continually, using only air currents for flight.

John Kjargaard, while climbing a steep wall over the Waiohonu River, also reported sighting a bird that streaked downward past him and suddenly swooped up just above the stream bed, apparently riding a swift air current. Glenn Lum and Jack Peyton as well as Betsy Harrison also reported seeing soaring Shearwaters at various times, while they were camped atop the south ridgeline east of Puu Hoolio. On our last day in Waihoi, Betsy Harrison observed a White-tailed Tropicbird circling above her. When I reached her a few minutes later, the bird was nearly invisible, soaring skyward.

As I mentioned previously, we knew the birds were there before we saw them because we heard their calls at dawn and dusk. Their cries were almost uncanny in timing; nearly always occurring very close to 8:00 p.m. and 4:00 a.m. Their calls varied from a series of blood-curdling moans and raucous screeching to calls that were similar to that of a hen mallard being repetitious. Unfortunately the birds were never stationary, always flying up and down stream; sometimes they were heard well, sometimes they were quite far away. We could never observe them while they were calling, as it was always night or pre-dawn. This leaves the identity of the birds unknown; their calls have been described, but I am not personally familiar with these species.

Actually, the sighting of the Christmas Shearwater is unusual. It breeds on Moku Manu, an island off Oahu, and on the north-western islands past Kauai. Its breeding season is from March through October. It would be extremely interesting to know if it is breeding in the vicinity. The Dark-rumped Petrel which is known to nest in Haleakala Crater is an endemic species which is listed as endangered (Berger 1970).

The Sighting of the Rare 'Akepa in the Upper Hana Forest Reserve

John Kjargaard and I hiked from the Base camp in Waihoi to the Kaupo Ranch by following a trail opened by Richard H. Davis through Waihoi and the Upper Hana Forest Reserve. We left Waihoi on Monday, June 12, 1972 and came down through Haleakala Crater on Sunday, June 18, 1972. The first two nights were spent in the valley. The third day was spent climbing the back wall of Waihoi, and we camped at 5400' elevation that night. The bird life was more numerous almost immediately. The trees were far more dense, although we had not yet come to the double canopied forest.

On the sixth day, after spending the night among the trees at 6700' on a ridge above Kipahulu Valley, I spotted a male 'Akepa (Loxops coccinea ochracea). I was standing just outside the tent looking around with my binoculars. ...Most of the birds were 'Apapane and 'Amakihi. I saw the bird; it was very orange and had a smaller beak than an 'Apapane which is closest in color range, being red. It was preening itself on the branch of an 'ohi'a tree and stayed there for about 60 seconds after I first saw it. I did not see another. In a report to the Governor for the Fiscal 1970/1971, from the Department of Land and Natural Resources, it is stated, "...an 'Akepa was observed in the Koolau Forest Reserve on the north slope of Haleakala on Maui. This small Hawaiian Forest bird, which is classified as endangered, had not been reported by scientists for twenty-one years," Paul H. Baldwin (1953) describes, "On November 24, 1950, three small orange birds were seen in an Acacia koa growing in a gulch at an elevation between 2000-3000' between Kipapa and Nakaaha areas, Hana District, on the south slope of Haleakala Volcano, Maui, by Amy B.H. Greenwell. These very probably were individuals of this form, which has not been reported since 1894. (Munro, op.cit., 1944: 111)."

Conclusion

The birds in Waihoi Valley are few in numbers, but not in diversity. Waihoi had 14 species of birds, ranging from endemic forest species to introduced species, to

seabirds, to migratory birds.

The most obvious factor involving the small population of any one species is probably lack of food. During the summer months, the main source of food for the endemic species, 'ohi'a was not in bloom with the exception of a few scattered trees. In October the count was slightly higher but not significantly. This means that most of the birds have to depend on insects for food, which may have a direct effect on population density. Two other factors, that of inclement weather and an extremely high rat population may also limit population numbers.

The seabird population in Waihoi was unexpected. That they were there emphasizes the lack of knowledge about migration and breeding areas of these birds. The Dark-rumped Petrel, an endangered species, was observed and could be nesting in the area.

In these aspects Waihoi is unique. Because of its openness it attracts seabirds, and because of its vegetation, forest birds both endemic and introduced. Hopefully, further study in the spring months will throw some light on a few facts that are not clear: when the 'ohi'a blooms, and if the population density fluctuates with the blooming of the 'ohi'a, and if the seabirds come back.

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Hawaii Audubon Society's comments on the Draft Environmental Statement for Wailuku-Kahului Wastewater Treatment and Disposal System to Paul De Falco, Jr., Regional Administrator, Region IX, U.S. Environmental Protection Agency from Mae E. Mull, 18 June 1973:

The Hawaii Audubon Society has reviewed the above draft statement and raises the following points for consideration in the final statement:

(1) An obvious conflict exists for EPA to recommend the siting of a sewage disposal system at Kanaha Pond, Maui, which has status as a key State refuge for endangered Hawaiian waterbirds and as a National Natural Landmark. EPA recognizes well its responsibilities to stop offshore dumping and to support funding for a sewage plant for the Wailuku-Kahului area. Noticeably lacking, however, is acknowledgment of EPA's obligation to protect the habitats of threatened wildlife. One official charge to EPA to protect wildlife and to prevent degradation of wildlife habitat is contained in "Guidelines: Statements on Proposed Federal Actions Affecting the Environment," issued by the President's Council on Environmental Quality and published in the Federal Register on April 23, 1971. In that document under Appendix II - Federal Agencies with Jurisdiction by Law or Special Expertise to Comment on Various Types of Environmental Impacts, the first-named agency under the category WILDLIFE is the Environmental Protection Agency, followed by branches of the Department of Agriculture and the Department of the Interior.

EPA is reminded of its prominent responsibility under the National Environmental Policy Act to avoid adverse environmental impact to our nation's wildlife. This includes the two native species, the Hawaiian Stilt and the Hawaiian Coot, at their major breeding grounds, Kanaha Pond. The Society requests that equal treatment be given in the final statement to EPA's wildlife protection mission as it concerns the vulnerable Kanaha Pond habitat.

(2) Approval of the Kanaha Pond site is given in the draft through statements such as "...the Kanaha Pond site must be favored because it is the least expensive" (p.54) and "...we believe the choice of the Kanaha site is justified" (p.55). This would appear to be a foreclosing of options and not in compliance with the CEQ Guidelines mentioned above. In those Guidelines, under 2. Policy:

> As early as possible and in all cases prior to agency decision concerning major action...that significantly affects the environment, Federal agencies will, in consultation with other appropriate Federal, State, and local agencies, assess in detail the potential environmental impact in order that adverse affects are avoided, and environmental quality is restored or enhanced, to the fullest extent practicable. In particular, alternative actions that will minimize adverse impact should be explored and both the long- and short-range implications to man, his physical and social surroundings, and to nature, should be evaluated in order to avoid to the fullest extent practicable undesirable consequences for the environment. (emphasis added)

Since a decision cannot be made in advance of full environmental assessment and evaluation of comments from relevant agencies and the public, it would appear prudent for EPA to remove itself from the brink of decision-making at this point in the review process.

(3) While it is essential to eliminate direct sewage disposal in the coastal waters and thus restore water quality with judicious speed, the potential degradation of a major wetland refuge is an unacceptable trade-off for reduction of such pollution.

(4) In its superficial treatment of alternate sites in the draft, primary emphasis is given to cost factors. Costs certainly are an important element in a public works project, but the mandate of NEPA, under which the draft statement was prepared, is to insure impartial investigation of environmental factors. The intent of NEPA would be properly met by a detailed assessment of costs to the environment of sites and systems other than at Kanaha Pond, rather than saying it would cost too much to find out what the environmental impact of alternate sites would be.

(5) Concerning those economic costs already assumed by the County of Maui for design and testing at the Kanaha site, it is irrelevant to use those costs as an argument for not testing alternate sites. Yet, this is exactly what is done in the draft statement on page 53. The suitability of the Kaa site for deep well injection has not been determined, but, nevertheless, that site apparently is ruled out because it would cost money to find out! The draft statement is not in compliance with NEPA on this point, which requires the responsible agency to (Section 102, (2)(D)):

> study, develop, and describe appropriate alternatives to the recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.

In addition, it is misleading and deceptive to treat the Kanaha site as accomplished in fact and frozen in concrete when this is not true. These quotations from the draft statement cannot be permitted to stand:

> At this time, it is estimated that moving the plant and injection wells to this /Kaa/ site would add more than $2.5 million to project cost. (p.53)
>
> Relocation of the injection wells would add a more modest $700,000 to project cost. (Modified Kaa site, p. 54) (emphasis added)

Since a site decision has yet to be made and no plant is under construction, it is fallacious to speak of $2.5 million in costs for "moving the plant."

It is equally deceptive to talk of costs for "relocation of the injection wells," when the site of those wells has not even been decided. The one test well at the Kanaha site was a bare-minimum necessity whether or not the disposal system was to be finally located there or elsewhere.

(6) There is sharp disagreement between the draft text, which finds a "nearly impermeable clay caprock" (p.28) over the ground water underneath, and several speakers at the public hearing who declared that the pond is fed by ground water springs. This important conflict should be resolved promptly by objective testing since the fresh water effluent will naturally rise to ground water level.

(7) There is no mention in the text of possible harmful effects on pond ecology from use of the State well, which will pump ground water from below the caprock to recharge the pond--although this question was raised by several speakers. Since the

State well draws from the same ground water lens that the effluent will occupy, the possibility of pond contamination exists. If the State well cannot be used because that water would threaten the pond's ecosystem, then the long-existing plans by the State to retard pond degradation, improve circulation, maintain a stable water level, and make other improvements to the pond would be drastically altered. Will pump operations be foreclosed?

If this is the case, the significant impact of not maintaining the pond as viable habitat for waterbirds should be thoroughly discussed in the final statement.

(8) Notably absent from the two sections, "Relationship between the Local Short-term Uses of the Environment and Maintenance and Enhancement of Long-term Productivity," and "Irreversible and Irretrievable Commitments of Resources Which Would be Involved in the Proposed Action Should it be Implemented," is any discussion of Kanaha Pond as a singular wildlife refuge. These sections were specifically designed by Congress for disclosure of long-term environmental effects and potential loss of natural resources by a proposed project. These sections should discuss potential project influences upon Kanaha Pond as a singular natural environment, which produces unique Hawaiian wildlife resources. These resources enrich the nation's avifauna, and their survival depends upon the maintenance of Kanaha Pond as viable breeding habitat.

(9) There should be a careful plan, with funding, for continuous monitoring of effluent migrations whether the effluent is disposed of through reclamation operations or deep well injection. In this connection, Appendix A recommends twice (pp. A7-8) that the State well be converted to an observation well for continuous data-gathering on the movement of effluent water at the Kanaha site. Would this use preclude use of the State well to recharge the pond?

(10) The draft states with brash confidence that "it is EPA's conclusion that the operation of the proposed disposal system will not damage Kanaha Pond or its wildlife" (p.25), and "injected effluent will not find its way into Kanaha Pond" (p.27). Nowhere in the text or in Appendix A is there scientific validation of those conclusions. They are better called biased opinions--in the absence of confirming data. Several speakers presented contrary opinions. This issue must be resolved in an unprejudiced manner through scientifically controlled testing.

(11) The Montgomery Report is less than adequate, considering the mishaps in drilling, pumping and measuring at the test well injection site, the uncertain data obtained from using sea water (instead of fresh water) as a test effluent and an unstable dye, and the questionable interpretation of findings in the Montgomery Report--as noted in Appendix A of the draft statement.

In addition, can EPA give blanket assurance that there will be no effluent spills into the pond from improper construction, mechanical malfunction or human error? Oil spills from underwater drilling are a calculated risk, and at least immediately discernible. Are effluent injection wells immune to breaks and leakage? There is a permanent risk involved that should be recognized, including the time lapse for discovery, repair problems, and effluent storage during cessation of operations. What would be the effects on Kanaha Pond biota of inadvertent effluent discharge under pressure over a period of time at some point in the 56' between ground surface and the clay caprock?

(12) It is incongruous that one federal agency, the Bureau of Sport Fisheries and Wildlife, is spending millions of dollars in Hawaii to acquire permanent waterbird refuges of far lesser ecological value than Kanaha Pond, while another federal agency, EPA, has focused on the most valuable refuge in the State, Kanaha Pond, as the site of a sewage plant and under-pond disposal system. Rather than work at cross-purposes, federal agencies are required under NEPA (Section 102,(2)(A)) to:

> utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment.

Since preservation of native wildlife species and their essential habitats is statutory policy of both the federal (Endangered Species Conservation Act of 1969) and Hawaii State (Act 49, Indigenous and Endangered Species Conservation Act of 1972) governments, and not just the whim of environmentalists, the Society expects positive, cooperative efforts by agencies to conserve and enhance Kanaha Pond.

(13) In contrast to the above expectation, EPA reaches this astounding, negative

conclusion (p.27):

> Many environmentalists are anxious to see existing water quality conditions maintained and the pond's viable ecological system left undisturbed. After a thorough analysis of geo-hydrological conditions in the area, it is EPA's conclusion that this goal can be met by the proposed method of disposal at the proposed project site.

We recommend that this contradictory conclusion be re-examined. It doesn't make sense to say that the way to save the pond's ecosystem is to put sewage effluent under it! What would make good environmental sense is to locate the disposal system far away from the pond. Then the pond's "viable ecological system" would certainly be "undisturbed" by effluent.

EPA should be reminded that Kanaha Pond is an immovable site, and its ecosystem has flourished for a long time where it is. On the other hand, the siting of a new sewage plant and choice of disposal method are flexible, man-made decisions in the offing. Therefore, alternate locations must be considered seriously.

(14) The summary statement that prefaces the text must necessarily be brief. However, the location of the proposed project immediately seaward of Kanaha Pond on a narrow strip of sand dunes above the shoreline should not be omitted. Unnecessary space in the summary is given to short-term construction effects. CEQ Guidelines, Appendix I (3) calls for a "summary of environmental impact and adverse environmental effects." The following long-term adverse impacts on the human environment should, at least, be listed: restricted public access and use of the site, aesthetic pollution of the sand dunes, tsunami danger, shore erosion problems, closing off the only remaining open-space side of the pond, and reduction of public beach area.

The summary sentence (p. i) that "the disposal of effluent by deep well injection is not expected to affect Kanaha Pond," is equivocal, misleading and raises grave questions about the environmental speculations in the whole statement.

The summary admits that the sewage plant "may encourage population growth in the area during its design period" (p. ii). Will population growth stop when the design period ends? A puzzling sentence then follows in the summary: "It is likely that this growth will have an adverse impact on water quality and some forms of wildlife (excluding Kanaha Pond which will be protected." How will Kanaha Pond be excluded and protected from the adverse impact of population growth? Kanaha Pond does not exist in a vacuum. The pond cannot be excluded--even on paper--from the adverse influences of the increasingly dense urban-industrial environment that presently surrounds it on three sides.

(15) The draft fails to mention the existing value of Kanaha Pond as an informal nature education center for school children, Maui residents and visitors. Thousands of people stop there every year to observe Hawaiian birds in a natural setting close at hand: Hawaiian Stilt (Ae'o), Hawaiian Coot ('Alae Ke'oke'o), Black-crowned Night Heron ('Auku'u), Pintail (Koloa Mapu), Shoveler (Koloa Moha), Golden Plover (Kokea), Ruddy Turnstone ('Akekeke), Sanderling (Hunakai), Wandering Tattler ('Ulili), and other shorebirds and ducks.

Kanaha Pond functions now as an outdoor natural resource library that is consulted, studied, enjoyed and appreciated in all seasons by all age groups. To watch and study wildlife close by is an adventure for children and adults. It enriches people's lives and relates man to his natural environment. The Hawaii Audubon Society questions whether these existing values can remain intact if Kanaha Pond has a sewage plant on its shore and effluent pumped under the pond. What will be the judgment of our children and future generations if we, as trustees of a unique natural resource, intentionally despoil it?

The Hawaii Audubon Society requests that the final environmental statement incorporate the concerns presented in this critique, that Kanaha Pond be ruled out as a proposed site, and that other locations and systems be fully considered.

On 20 June 1973 information copies were sent to (1) Council on Environmental Quality, (2) Administrator, Environmental Protection Agency, (3) Hawaii's Congressional delegation, (4) State Office of Environmental Quality Control, (5) U.S. Bureau of Sport Fisheries and Wildlife, (6) State Department of Land and Natural Resources, (7) Mayor, County of Maui, (8) County of Maui, Department of Public Works, (9) Conservation Council for

Hawaii, Maui Chapter, (10) National Wildlife Federation, (11) National Audubon Society, and (12)Life of the Land.

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Take a Guess !

Frequently, the serious biologist working with a group of animals must consult the available literature for information on related species. Often one can learn a great deal from such a literature search. Yet, all too often, we must rely heavily on the casual notes of untrained observers, particularly with animal groups in which rigorous scientific inquiry has been limited. I found this to be the case with a recent literature search I made on vocal communication patterns on a widespread but poorly studied group of animals. In the interest of preventing some of this sort of thing in THE ELEPAIO, and to tax your ingenuity, I've included a representative sample of quotations taken directly from the scientific literature on this group of animals. It's your job to identify the animal group, and then to try and figure out why in the world someone would want to study them.

"...a turmoil of screeches, calls and cooings."
"...a deafening concert of witches, burning at the stake."
"...a bedlam of weird screaming, wild howling and the crying of insane spirits."
"...like the crow of a throaty rooster whose head is chopped off before the last long note."
"...series of gasping, wheezy cries, resembling somewhat the escape of steam through a partially clogged pipe..."
"...groans of a man in great pain."
"...gave the impression that a hundred children were loose in a doll shop, all squeezing the mama dolls simultaneously."
"...hoarse asthmatical croonings."
"...growls and snarls of fighting cats."
"...like a caterwauling, a howl, a low moan, and during fighting, like a snarl."
"...like a combination of the north wind blowing through a knot hole, a wild cat's growl and the screech owl's call."

GOOD LUCK! (Answer on page 55) Robert Shallenberger

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Abstract of the Dissertation: Breeding Biology, Homing Behavior, and Communication Patterns of the Wedge-tailed Shearwater (Puffinus pacificus chlororhynchus) by Robert J. Shallenberger, Doctor of Philosophy in Zoology, University of California, Los Angeles, 1973, Professor Thomas R. Howell, Chairman

The Wedge-tailed Shearwater has received minimal attention by investigators in the past, despite its widespread distribution. Preliminary investigation of the biology of this species at Manana Island, Hawaii, provided enough comparative information to conclude that ecological conditions in the immediate study area affect the habits of this and related species in a predictable manner. Predation levels, cloud cover and insolation, moon and sun cycles, and the distribution and behavior of other nesting species, all influence the biology of P. pacificus in different colonies. Occasional surface nests, frequent daylight colony occupation and limited defensive behavior, all appear related to a lack of predation in the Manana Island colony. Yet this species still retains many of the biological characteristics of the genus at this location: site tenacity, mate fidelity, pre-laying colony exodus, low re-laying capability, single clutch and typically nocturnal colony return. The variation in behavior exhibited by this species in different colonies is further evidence of the influence of conditions in the specific nesting area.

Experimental and observational investigation of homing behavior in this species provided some clues as to the sensory cues involved and suggested further lines of investigation. In the return trip from feeding areas to the Manana Island colony, shearwaters have a combination of visual, auditory and olfactory cues available, and probably rely on a combination of these cues during this phase of the homing process. The direction of approach onto the island, the number of circuit patterns flown and the location and direction of landing in the colony are all related to topography and wind conditions on theisland, but appear unrelated to the distribution of airborne odor cues. Transection of olfactory nerves lowered homing success, but did not eliminate it, suggesting that other cues are important and that further investigation of the

physiological and behavioral effects of nerve transection is needed. Routes taken after landing were unrelated to wind direction, although birds landed closer to their burrows during wind than in still air. Homing birds utilized a variety of preferred landing sites, pathways and takeoff sites in the vegetated areas of the colony. Experimental releases of temporarily blinded birds and the use of pathway and burrow odorants provided evidence that visual cues were important to successful burrow location. Nest material was shown to be important to the nesting process, but not critical to specific burrow recognition. Released chicks showed a significant preference for their own burrows, but exhibited no ability to home successfully from any distance. Experimental manipulation of landmarks in the burrow area suggested that homing birds can successfully respond to cues other than those in the immediate burrow area, although success in homing was reduced in proportion to the amount of alteration. In egg recognition tests, birds displayed a tendency to retrieve displaced eggs, and to incubate artificial eggs or eggs of other species. Choice tests indicated that color and size were important in egg selection. Shearwaters showed no ability to distinguish between their eggs and other shearwater eggs or between artificially odorized and normal eggs.

Investigation of communication patterns in Wedge-tailed Shearwaters was divided into a consideration of each major sensory modality. The mechanisms of sound production and call repertoire of this species are described. Field playback tests were used to investigate the communicative function of specific calls. Sound spectrographic analysis of chick and adult calls provided evidenceof individual and specific identity in vocalizations, and laboratory playback tests verified the use of auditory cues in parental and mate recognition.

Switching, doubling and odorization experiments provided no evidence of overt chick discrimination by parents or mate recognition by odor cues in adults. However, olfactometer tests in the laboratory suggested that respiratory rate changes in response to mate vs. non-mate odors can be a useful indicator of recognition.

Visual communication in P. pacificus appears restricted largely to the use of exaggreated postural display at close quarters, with the combined use of other sensory channels. Head, neck and body position are all important indicators of motivation and future behavior. Other possible visual releases are discussed.

Several forms of tactile communication are described for this species. The importance of the bill in greeting ceremonies, allopreening, copulation and aggression is discussed.

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Answer to Take a Guess, p. 54: Shearwaters and petrels

Reason for study--To investigate the role of nocturnality in the evolution of behavior patterns in seabirds. The Wedge-tailed shearwater is a widely distributed member of a large genus of marine birds, whose courtship and communication patterns have been largely unstudied. Using a variety of night viewing and recording devices, Dr. Shallenberger conducted his study primarily on Manana Island.

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Observations of Bird Activity on Southeastern Island, Pearl and Hermes Reef, 11 June 1973

By John A. Wilder

After a 30 minute helicopter ride from Midway Island we had minimum time on the ground which limited my observations to a rather quick walk around the island staying on the beach most of the time.

Grey-backed Terns: Several hundred observed incubating eggs or with young chicks on the hard coral areas.

Fairy Terns: A few individuals with eggs or small chicks nesting on the bare ground or coral. These birds nest in the ironwood trees at Midway Island.

Frigatebirds: Many birds nesting, some with chicks, some with eggs. Chicks were in all stages of development with many newly-hatched chicks. One chick/juvenile in white plumage was seen to fly from the nest at my approach. All nests were on the sparse and low scaevola. The scaevola on Southeastern Island is under 3 feet high and there are no trees whatsoever.

Red-footed Boobies: Only two nests ovserved but limited time prevented any detailed observations other than the areas near the beach. These nests were in the scaevola with several Frigatebirds.

Masked Booby: An actual count was made of 12 masked booby chicks, most were well

developed (one had its first feathers) and as large as the single parent usually found in company with each chick. All were on or very near the beach. I also observed two nests on the open sand and was able to examine the eggs close-up and see for myself the thick chalky coating on the eggs.

Red-tailed Tropicbird: Only one observed during my stay. It was nesting on the north side of the island in a shaded area formed by several wave-tossed planks well in from the waters edge. One plank had been tossed up over two others and formed a shaded and protected area that the bird had found suitable for a nest site.

Black-footed Albatross: The majority of the Goonies on Southeastern Island are the Black-footed Albatross. Observed one chick with Droop-wing. This was the first Black-footed Albatross that I had personally observed with Droop-wing. Perhaps this was due to the Black-footed Albatross on Midway staying well away from areas frequented by humans. Thus I don't have as much opportunity to observe them as closely as the Laysan Albatross.

Sooty Terns: Two distinct colonies were observed incubating eggs, both were composed of approximately 1000 birds.

Common Noddy: Fifty to one hundred birds seen, but I do not know if they were nesting as I did not observe any nest which I could positively identify as belonging to the Common Noddy.

Ruddy Turnstones: Two groups seen with 3 and 4 individuals respectively, both groups were foraging on the beach.

Laysan Finches: Twelve birds seen; could not find a nest although two birds seemed to remain in the vicinity of one scaevola bush as though they had an interest there, but I could not find a nest. These birds are nearly tame and slightly curious, and with a little patience will eat out of your hand.

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READERS NOTES:

HONOLULU STAR-BULLETIN, 15 September 1973, page A-10: Rewarding Hana Expedition by Harry Whitten

"We were probably the only persons on Maui who profited from the drought," John Kjargaard, Jr. commented concerning the Hana Rain Forest Project that he led this past summer.

Kjargaard and seven other university graduate and undergraduate students spent what he termed a "very successful" two and a half months studying the total eco-system of the upper Hana and Koolau Forest Reserves on the slopes of Haleakala, Maui.

During that time they discovered several new species of insects and plants and also sighted several species of native forest birds so rare that years elapse between the time they are sighted.

The rare birds were the 'akepa, nuku-pu'u, crested honeycreeper or 'akohekohe, and Maui parrotbill. The Maui creeper was also seen, but it is not as rare as the others. The rarity of some of the other birds is noted by Andrew J. Berger who says in his book HAWAIIAN BIRDLIFE that the last Maui sighting of the 'akepa was in 1953. The crested honeycreeper was reported in 1950 and not reported again until 1965. The first sighting of the Maui parrotbill in this century was in 1950, although it was seen again on the Kipahulu Valley expedition of 1967, Berger says. The nuku-pu'u, he says, was uncommon even in the 1890s, although it was also seen in 1967.

The Hana expedition members found summer was not the best time to do research on the breeding biology of the birds. Four expedition members, with permission of the Department of Land and Natural Resources and the National Park Service, will continue their work in the area until the end of the year.

Expedition members also studied such matters as blooming and fruiting time of plants and did research concerning soils, entomology and meteorology. Expedition members were Kjargaard, meteorology studies; Charles Whittle, entomologist; Betsy Harrison, botanist; Alvin Yoshinaga, plant ecologist; Tonnie Casey, ornithologist; James Jacobi, biologist; Heather Fortner, soil scientist; and Grant Merritt, photographer. All are University of Hawaii students except Yoshinaga, a graduate student at the University of Wisconsin. ...

Kjargaard pointed out that the area studied is in extremely dense jungle, that summertime temperatures dropped to the 30s each night, and that rain was unpredictable, even though it was less than usual this past summer. If there was no rain, there was fog.

...He said the studies were conducted in an extremely delicate and fragile area; expedition members were careful with trails and campsites to minimize damage.

Entry was by written permission only, as the State land was in a closed watershed and the National Park Service restricted entry to the federal land. ...

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RECOVERIES

Band No. 697-75639
Species: Laysan Albatross (Too young to fly when banded)(Sex: Unknown)
Banded Date: 25 February 1962 at Near Eastern Island, Midway by C.S. Robbins
Recaptured: 12 May 1973 at Eastern Island, Midway by Mae E. Mull

The following information accompanying the band was sent to the Bird Banding Office, Patuxent Wildlife Research Center, Laurel, Maryland, by Mae E. Mull:

...The enclosed leg band 697-75639 was found by the writer unattached and lying on the ground in a nesting colony of predominately Laysan albatrosses and a few Black-footed albatrosses, in a grassy area in the center of Eastern Island just inland of the principal runway on May 12, 1973, at about 2:30 P.M. Unfledged Laysan albatross young were in the immediate area. I looked for but did not find a carcass or bird parts. The scattered white feathers in the area seemed to be no more than are found generally in Laysan albatross nesting grounds. The enclosed band is exactly in the form in which it was found. (Additional information to the editor from Mae E. Mull: The band was bright and clean, and I am puzzled as to where it had been for the 11 years(?). It was closed together as a band, but how did it get off the bird's leg?)

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ALOHA to new members:

George-Ann Davis, #2304 - 1717 Ala Wai, Honolulu, Hawaii 96815
Ruth A. Gay, 1626 Ruth Place, Honolulu, Hawaii 96816
Lawrence K. Katahira, 84 Kukuau St, Hilo, Hawaii 96720
John C. Kay, 563 Kamoku St, Honolulu, Hawaii 96814

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Bill and Mae Mull have moved to the Volcano area on the Big Island where they'll be with the native flora and fauna and will continue their work in conservation and natural history as part of the native ecosystem.

MAHALO NUI LOA for the tremendous work accomplished and the fondest ALOHA to the Mulls.

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HAWAII'S BIRDS, a field guide, is available for $2.50 postpaid, Airmail 50¢ extra. Send in your orders to: Book Order Committee, Hawaii Audubon Society, PO Box 5032, Honolulu, HI 96814

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NOVEMBER ACTIVITIES:

11 November - Field trip to study forest birds. Bring lunch, water, and if possible your car. Transportation cost ($1.00) to be paid to the drivers. Meet at the State Library on Punchbowl Street at 8:00 a.m. Leader: Wayne C. Gagne, telephone 847-3511 (business) or 941-4974(home)

12 November - Board meeting at McCully-Moiliili Library, 6:45 p.m. Members welcome.

19 November - General meeting at the Waikiki Aquarium Auditorium at 7:30 p.m. Program: Natural History of the White-eye (color slides) by Sandra Guest

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HAWAII AUDUBON SOCIETY EXECUTIVE BOARD:

President: William P. Mull
Vice President: Wayne C. Gagne (program)
Secretaries: Recording - Laura C. Casey
Corresponding - Mae E. Mull
Treasurer: C. Florence Hendrycy
Board Member: Steven L. Montgomery (conservation)

Following members offered to help until the end of the year:

Dr. Robert Shallenberger (education)
Sandra J. Guest (recording)
George-Ann Davis (corresponding)
Kammy Wong (books) MAHALO

DUES:
Regular-$3.00 per annum
Junior (18 years and under) -$1.00 per annum
Life-$100.00

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