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SEASONAL ABUNDANCE AND DAILY ACTIVITY OF HAWAIIAN STILTS
(Himantopus himantopus knudseni) at Paiko Lagoon, Oahu
By Gerald R. Allen* and Arnold L. Lum**

Introduction

The Hawaiian Stilt population, like many of Hawaii's native bird populations, has been adversely affected by reduction in the availability of suitable breeding and feeding habitat. The largest of the Hawaiian shorebirds, and the only resident shorebird species, stilts are found throughout the year in estuarine and marshy areas. These habitats have, however, often been sacrificed for development; one example is the filling of Kuapa Pond for the Hawaii Kai housing development. At present, the Hawaiian Stilt population is estimated to number about 1000 birds (Berger pers. comm.), but unless suitable habitats are preserved, the population may decline from its present level.

This study presents information gathered on the seasonal abundance and daily activities of Hawaiian Stilts at Paiko (Kuliouou) Lagoon, Oahu, Hawaii, during 1969-1970. Perhaps some of the data may be pertinent to developing guidelines for creation of permanent stilt habitats in Hawaii.

Materials and Methods

The study consisted of two parts. A weekly census of the stilt population at Paiko Lagoon was taken from April 1969 through May 1970. Counts were made of all birds present in the lagoon during morning low tides. A more intensive series of observations were made between 22 April and 2 May 1970. Ten visits were made to the study area, each visit lasting from 45 minutes to three hours. Observations were arranged so that all activities of the flock could be recorded during all portions of the day (i.e., from sunrise to sunset).

Observations of daily activity involved initially determining the activity phase of the flock and then selecting for more detailed observation an individual whose activity coincided with that displayed by the majority of the flock. Individuals were then observed for periods of 10 minutes to over two hours. The purpose of this type of observational scheme was to ultimately construct a composite picture of the total diurnal activity of a typical member of the flock.

Results

I. Seasonal Abundance of Stilts

Flocks of stilts are found throughout the year at Paiko Lagoon. There is, however, no breeding population; the lagoon is utilized only as a feeding site. The average number of birds present for each month of the 13-month census is given in Figure 1. The mean abundance of stilts over the entire period was 16.5 birds per census, indicating that at most visits, stilts were commonly seen. Stilts were,

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however, entirely absent during April and May 1969, and were only seen once during February 1970.

II. Flock Activity

A hypothetical pattern of flock activity as it might appear on a typical day was constructed from observations made at different times over a period of several days. In addition, several observations were made between 0700 and 1800 hours on 2 May as a check on the "fidelity" of the model. Flock-movement patterns and activities which were observed on that day were not much different from the model.

During the early morning, most of the flock is feeding and spread over the lagoon. At mid-morning feeding begins to taper off and resting congregations form, gradually increasing in size through late morning and early afternoon. By mid-afternoon the flock is generally concentrated in one or two resting congregations; these may include up to 40 birds. During late afternoon the resting congregations begin to disperse, birds walking or flying away individually or in small groups. Birds leaving the resting group then begin feeding. With approaching darkness the flock gradually ceases feeding and most of the birds are now scattered around the lagoon in resting positions.

One way in which the pattern of flock activity can vary is in relation to tide height and time of day. Paiko Lagoon is shallow (maximum depth at mean high tide is about 0.5 to 0.7 meters) and a large portion of the mudflats are exposed at low tides. Figure 2 represents the proportion of the flock feeding in relation to time of day, and Figure 3 the proportion feeding in relation to tide height. Each point on these graphs represents a separate observation. In general, there are more birds feeding during low tide, but during the daily activity phase of the study, low tides always occurred in the morning, with a rapidly rising tide in the afternoon. In order to assess the effects of tidal variation, comparisons should be made between feeding activity during low morning and during high morning tides.

III. Activity Patterns of Individual Birds

Activity patterns of individual birds observed during the study are categorized as follows: (1) resting; (2) foraging and feeding; (3) preening, scratching, fluffing, and bathing; (4) vocalization; (5) agonistic interaction; (6) flight. Some of the postures associated with these activities are illustrated in Figure 5. Based on the data collected during the study of daily activity, the amount of time spent in each activity phase during the day is given in Figure 4. Each activity is described below in detail.

Resting - Period during which the birds remain motionless for extended intervals are defined as resting. There were two basic postures observed, standing and sitting. Standing was the more common resting position; sitting was observed primarily during low tides. Birds rest in the standing position on one or two legs, the most common position being with the head tucked along the wing and one leg pulled up against the body. During one observation period (1 May 1970) 25 birds out of a flock of 34 exhibited this posture.

Following the general pattern of flock activity, resting occurs primarily in the afternoon, and may last three hours or more. Short resting periods of 10 to 15 minutes are, however, common during the morning. From the pooled data, it is estimated that an individual may rest an average of a little more than five hours per day. The pattern of resting activity is variable, and resting birds may be interrupted by new arrivals, or by gusts of wind which blow the birds off balance.

Foraging and Feeding - Stilts spend approximately six and a half hours per day foraging on the mudflats and in shallow water. Most birds feed individually, but pairs and small groups of three or four birds are sometimes encountered. A typical foraging bird walks along slowly with its neck extended; the head bobs up and down with each step and is methodically turned from side to side. When food is sighted, the bird takes several quick steps and probes into the mud or water; the head may be completely submerged when foraging in deeper water. When food is captured, the bird may bob its head two or three times; this behavior probably facilitates swallowing. If the food item is fairly large (2-4 inches) it is vigorously shaken and repeatedly dipped into the water before being swallowed. On four occasions, stilts capturing fish were noted to first place the fish cross-wise in the bill while shaking and

dipping it. Food may be repeatedly dropped and picked up, and in some instances stilts capturing large prey in the water moved to exposed ground and then picked it apart. At Paiko, stilts were seen capturing fish, crabs, and in one instance, polychaete worms.

During feeding, birds forage over areas of about 50 square meters; a bird may remain in such an area for 30 minutes to an hour before moving out of it. Stilts seem to prefer foraging in shallow water; of 75 birds observed, seven foraged on dry exposed mud, 18 on wet mud or intertidally, and 50 subtidally. During active feeding, stilts average approximately three probes per minute. This is based on the pooled observations, from which it was calculated that a typical bird would probe approximately 1200 times between 0530 and 1900 hours.

Preening, scratching, fluffing, and bathing - These activities may be integrated with the previously mentioned behavior and cumulatively occupy about 25 minutes per day. As an example, a foraging bird may stop for a few seconds to scratch itself or to preen its feathers. Bathing was, however, observed only among members of resting congregations, and usually just prior to dispersion of the group. Bathing birds squat in the water, alternately rocking forward and submerging the head. Fluffing the feathers of the wings and back usually follows bathing. The chest, wings, and back are the areas most often preened. Preening is common before afternoon resting congregations disperse. Preening activity seems to spread in a contagious manner; resting birds adjacent to a preening bird may begin preening a short while later.

Vocalization - A typical bird spends about 15 to 20 minutes per day vocalizing. Periods of vocalization may last less than 30 seconds, or may persist for several minutes. It occurs in conjunction with other activities, especially with agonistic behavior. The call of the stilt has been described as a sharp continual "twit" with an additional soft swan-like call sometimes heard at night (Hawaii Audubon Society 1967). During the present study three distinct calls were distinguished. Resting birds occasionally emitted a soft muted tone every few seconds. This is probably synonymous with the nocturnal call. Birds which were alarmed by humans responded with a guttural crow-like caw whose frequency increased as the intruder approached. The third type of vocalization is similar to the alarm call but sharper and of shorter duration. The call sounds similar to a small squeeze horn found on a child's bicycle. This sound is associated with agonistic behavior and is sometimes emitted during flight. The call may become more frequent and louder as agonistic activity increases.

Agonistic Interaction - Stilts spend about five minutes per day in agonistic behavior. Fighting outbreaks occur during feeding and may involve up to five or six birds. Most commonly, threatening and chasing followed by retreat of the other bird occurred. Agonistic behavior was also seen during formation of resting congregations. Although intraspecific encounters were the most common, stilts were seen to chase tattlers (Heterosculus incanum) four times, and a bristle-thighed curlew (Numenius tahitiensis) and turnstone (Arenaria interpres) once.

Encounters are usually initiated by vocalization, which continues throughout the encounter. The initiator hunches and the back feathers are ruffled; the other bird is approached at a slow walk, the pace gradually increasing. In most cases the encounter ended at this point; however, fighting does occur occasionally, the aggressor jumping and beating its wings. In addition, frontal combat may involve fighting with the feet.

Flight - Several minutes per day are occupied in flying about the lagoon. Birds take flight when disturbed and when moving to different feeding areas in the lagoon. Birds leaving the lagoon area were observed flying off in the direction of Koko Head-Kuapa Pond (five occasions). Once, a group of six birds left the lagoon, flying in this direction, and returned later in the day.

Discussion

Data collected indicate that Paiko Lagoon is visited by flocks of Hawaiian Stilts throughout the year, and that these birds spend most of their time in the lagoon foraging and resting. Paiko Lagoon and similar habitats provide stilts with a shallow-water foraging area where they can feed on aquatic prey, and it is essential that such habitats be preserved if the stilt population is to be maintained. (Turn-p.117)

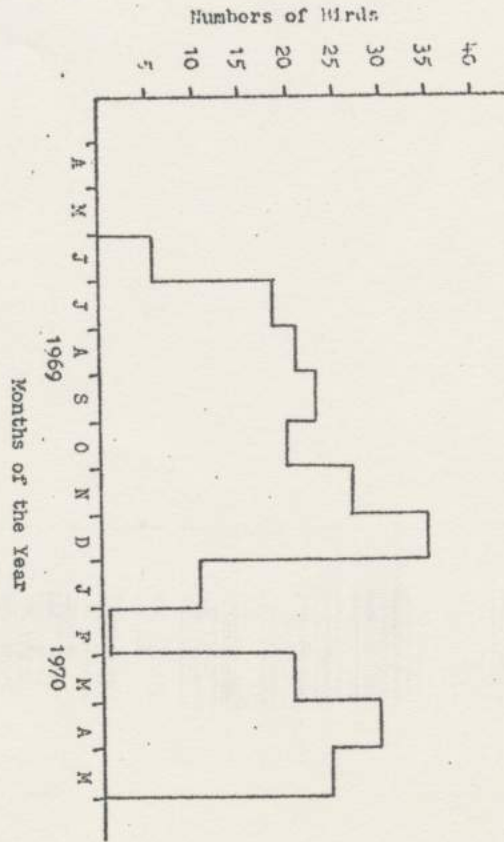


Figure 1- Seasonal abundance of Hawaiian Stilt at Paliko Lagoon, Oahu, Hawaii. April 1969 through May 1970.

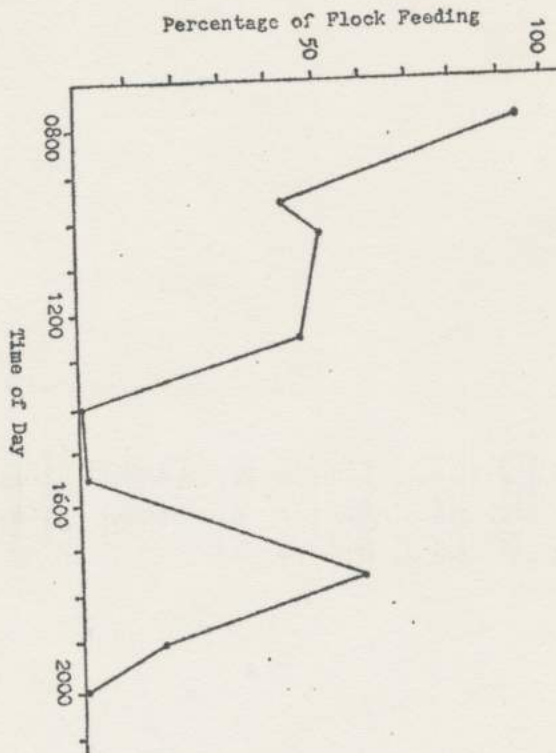


Figure 2- Percentage of the stilt flock engaged in feeding in relation to time of day. Points on the graph represent observations made on several different days.

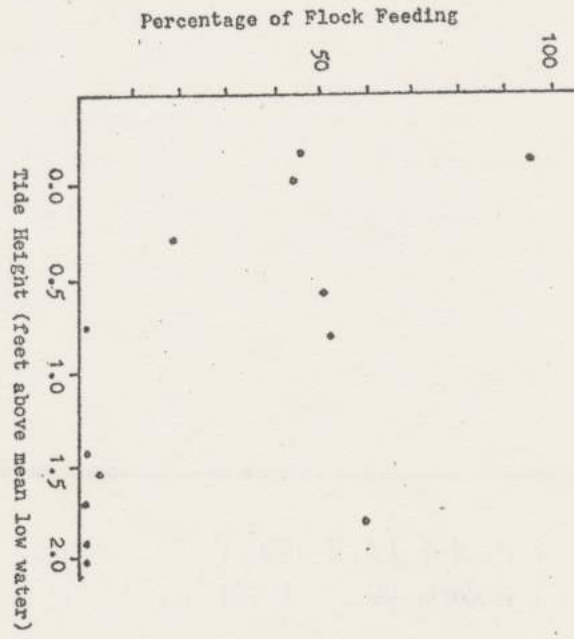


Figure 3- Percentage of the stilt flock engaged in feeding in relation to tide height. Points on the graph represent observations made on several different days.

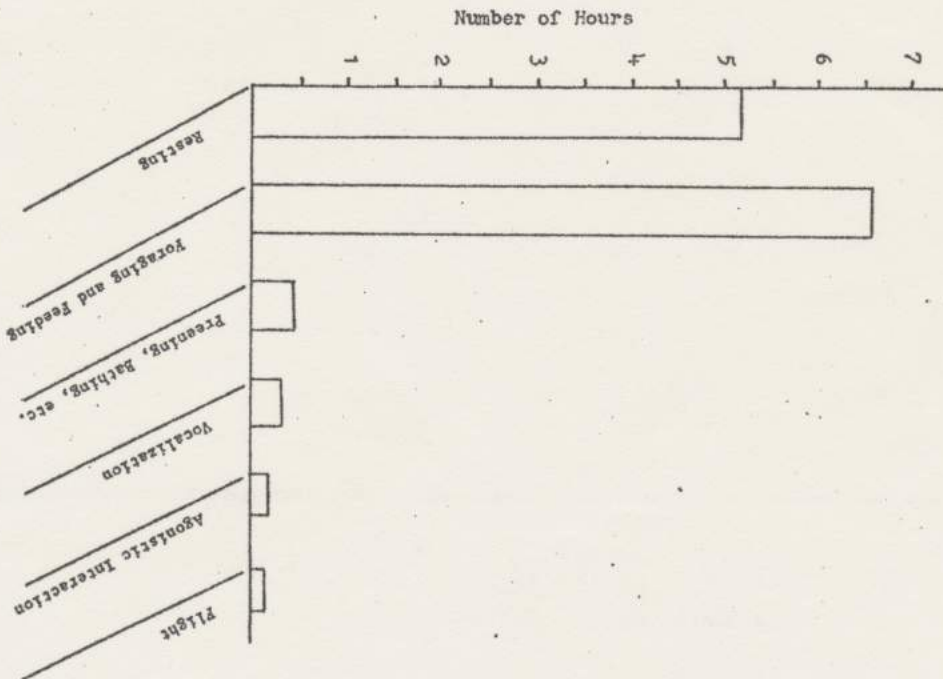
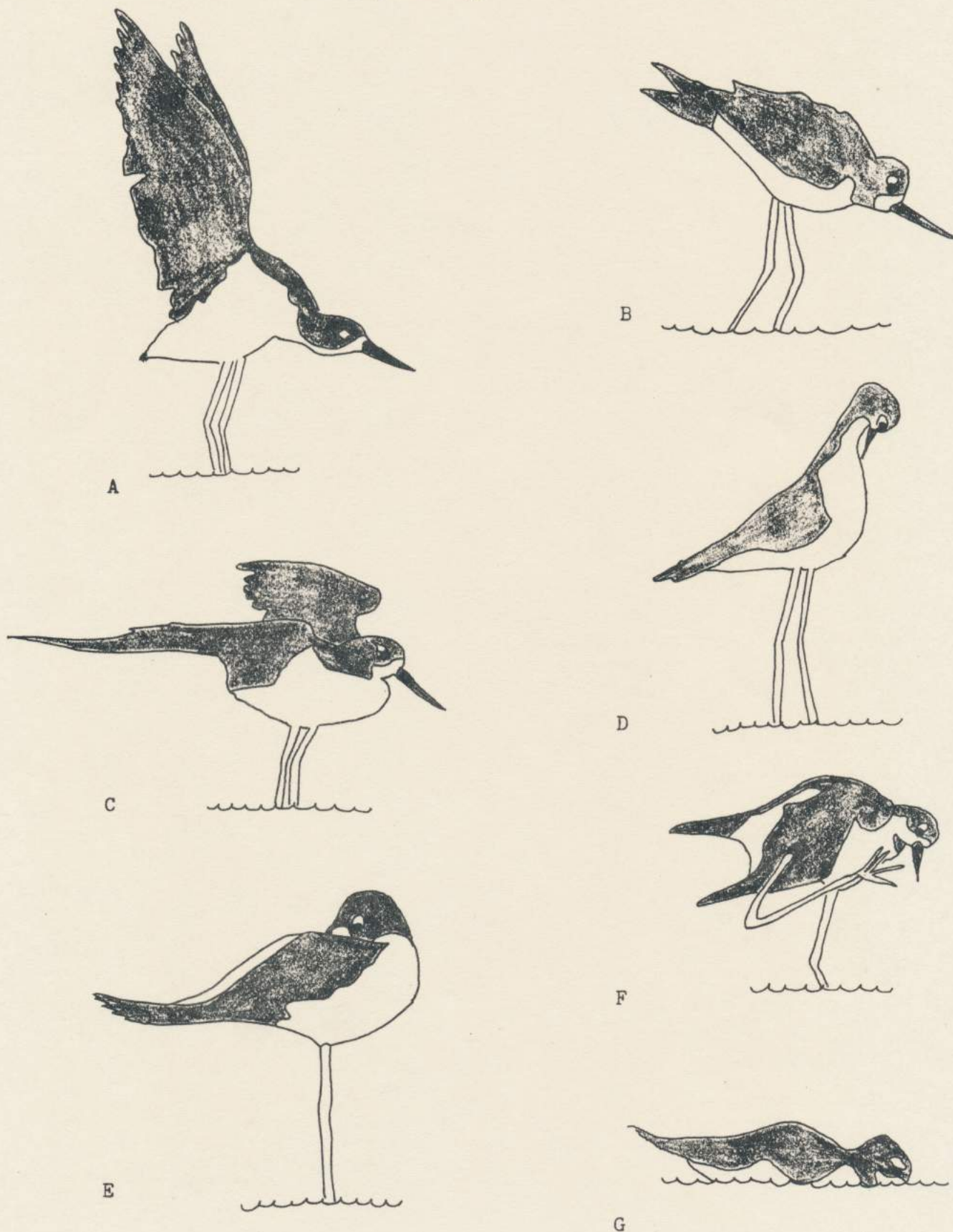


Figure 4- Primary diurnal activities of Hawaiian Stilt.

Figure 5. Certain behavioral postures exhibited by the Hawaiian Stilt. (A) Wing Flapping; (B) Hunching; (C) Wing Stretch; (D) Chest Preening; (E) Resting on one leg with head reversed; (F) Scratching; (G) Bathing.



Plans and funds have been made available for the creation of a stilt breeding habitat at Paiko Lagoon. The proposal involves shallow dredging and creation of permanently exposed "breeding islands" from the fill. Even if Hawaiian Stilts do not breed here, the area should be maintained as a permanent bird refuge, for it serves as a feeding area for stilts and for wintering migratory shorebirds. Tidal flats and marsh areas, even if they are not breeding areas, are essential in the life cycle of these birds.

References

Hawaii Audubon Society. 1967. Hawaii's Birds. Hawaii Audubon Society, Honolulu. 88pp.

POLLUTION OF THE OCEANS*

By Helen Delaney

Much has been said recently about the pollution of the oceans. Ocean explorer Jacques Piccard predicts that if man continues polluting the oceans, they will die within the next generation of 30 to 35 years. Jacques Cousteau warns that destruction of the oceans from pollution and other causes is 20 to 30 per cent complete. He said it is now unusual to find fish more than three inches long in the coastal water of the Mediterranean, which 20 years ago teemed with fish and sea life.

Leading men in the field are worried that pollutants will kill phytoplankton, the basic creature in the ocean's food chain. Without phytoplankton there will be nothing for zooplankton to eat, which in turn will mean that fish and larger sea animals will have nothing to eat.

Mr. Piccard, a speaker at the Innerspace Pacifica 1971 held in Honolulu last November, said, "I was terribly shocked to see miles and miles of your water here already dirty and black. He said he visited Hawaii several years ago when the water was especially clear. He said a recent British newspaper in London carried a headline, "Don't Go to Hawaii," and the article related the pollution problems of the Islands. He said that deterioration of the ocean's water is reversible and that Bermuda is solving its problem by forbidding the discharge of anything except pure water in the coastal zones.

Over three years ago I had an accident, severely injuring my back. To help heal the condition, I went swimming every day for many weeks at Ala Moana Park. The water then was clear. Recently, to keep my back in good condition, I started swimming there again and was surprised at how dirty the water is now. I have two friends who recently developed serious fungus infections while swimming.

Recently, I took a deep-sea fishing trip between Honolulu and the banks off Molokai. The water was dark - not green and blue as it used to be. We didn't get one bite. Even the birds were not working and were sitting on the water, evidently unable to find any fish. Last New Year's, because of the shortage of fish, the price of ahi went up to around \$8.00 a pound because of the demand for sashimi.

According to an article in TIME, August 16, 1971, a State report has warned that Florida could become uninhabitable within 30 years. Untreated sewage from Miami Beach and nearby communities is turning the coastal waters into a stinking mess that the people bitterly call "the Rose Bowl."

In the February 1971 issue of READER'S DIGEST, there is a condensed article entitled, "Stop Killing Our Oceans," by Senator Gaylord Nelson. He cites the alarming situation off the Florida coast, and also many similar situations along America's coastlines. For example:

"Filter-cigarette butts, bandages and bubble gum have been found in stomachs of fish caught near New York City's sewage-sludge dumping ground, as close as eight miles out in the Atlantic. Meanwhile, some beaches in northern New Jersey have been turned into a nightmarish scene of plastic bottles, broken dolls, tar and oil slicks, even dead animals.

"On Galveston Bay in Texas, people are sometimes driven from their waterfront homes by the stench from thousands of decaying fish, dead from pollution.

* Distributed to our elected officials and to other interested individuals.

"Around Panacea, Fla., on the Gulf Coast, crab fishermen are coming in with one tenth of their catch of five years ago.

"Rimmon C. Fay is a marine biologist who has been diving in the Pacific off Los Angeles for years. Now he finds the area a wasteland, and when he turns over rocks 'it's foul and putrid underneath.'

"Batches of mackerel caught off central California last year contained so much DDT that they were impounded by federal health officials as unfit for human consumption."

Senator Nelson further writes, "...almost 70% of all usable fish and shellfish spend a crucial part of their lives in the estuaries - the coastal bays, wetlands and river mouths....Cut the chain of life in these areas, destroy the myriad bottom organisms, pollute the continental-shelf waters and you also eliminate the vital ocean fisheries."

"The once-mammoth sardine fishery off California is now gone. The croaker, a popular food fish, has virtually disappeared from a large portion of its native East Coast waters."

"During his two papyrus-boat trips across the Atlantic recently, author-explorer Thor Heyerdahl sighted plastic bottles, squeeze tubes, oil and other trash that had somehow been swept on the currents to mid-ocean."

Two years ago I stayed at a hotel in Bombay on the Arabian Sea. The water was so dirty that the tourists didn't swim in it. The same condition prevailed at Bali in Indonesia. I stayed at Green Island at the northern end of the Great Barrier Reef. The reef was dead and I understand it was dead for about 200 miles. This was attributed to the Crown of Thorns starfish but, according to a recent study by several research firms, the reef has also been damaged by silt run-off from agricultural operations on the mainland, and it is now thought that the pollution of the water may have something to do with the depredation of the starfish.

Despite these dire warnings and the rapid increase of pollution of our sea water, Hawaii is still dumping raw sewage in the ocean. In a recent newspaper article, Dr. Nathan C. Burbank, environmental research director for R.M. Towill Corp., prime consultant for Honolulu's \$30 million primary treatment plant and deep ocean outfall on Sand Island, admitted, "The top water is going to look just like it did before we put the pipe in. Now if you have to go down 60 to 70 feet, then you'll encounter this diluted mass of sewage, but the seawater will probably not appear much different from the water surrounding it." This sounds to me as though we would not be much better off after installing this primary treatment plant.

Many communities are now doing something about these problems and much progress has been made in proper disposal of sewage. There is a condensed article in the June 1971 issue of Reader's Digest, entitled, "Breakthrough in Water Pollution." It describes the system they are using to keep Lake Tahoe pure - the raw sewage goes through primary, secondary and tertiary processes, with an end result of pure water. Official visitors from all over the U.S. and foreign countries - even the chief engineer from Moscow, Russia - have come to inspect Tahoe's newly developed project, and the process is already being imitated in Nassau County, N.Y., and a similar system is being designed for Denver.

Other communities are recycling sewage sludge and turning out fertilizer. Such a system has recently been installed at Winston-Salem, N.C., and Milwaukee and Houston also turn out such fertilizer.

At Disney World in Florida, vehicles in the park are propelled by pollution-free compressed gas. A trash disposal system pipes garbage and waste to an incinerator in which the smoke is washed. Another plant purifies sewage and sprays it on such water-hungry areas as the golf courses.

Now, in Hawaii, with the sugar plantations closing down one after the other, and pineapple's future uncertain, if we allow our water to become so contaminated that tourists stay away, what is going to happen to Hawaii? It is later than you think.

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Any comments? If you have any information on pollution, please share your experiences by writing to Kojima, 725-A 8th Avenue, Honolulu, Hawaii 96816.

HONOLULU STAR-BULLETIN, 6 May 1972, page A-14: Cave-Dwelling Insects Found by Isle Scientist by Helen Altonn

A Bishop Museum entomologist's hobby of cave biology has resulted in a significant discovery--the existence of cave-dwelling insects in the lava tubes of the Big Island.

Francis G. Howarth said he has identified up to 20 different species so far, including a tree hopper. "They have made quite a remarkable change in life style, going from trees to caves," he said.

Howarth said his explorations were "just for fun, and quite a surprise for me.

"It was assumed that nothing would be there," he said. "A few people had looked. But it takes quite a bit of looking--and luck--to find the first one."

His initial findings were reported in the January issue of Science magazine, and he said he has had numerous inquiries from other entomologists here and on the Mainland.

He said the insect cave-dwellers were unexpected for several reasons: "First, lava tubes usually are considered too young; they collapse and degrade. Second, we're an oceanic island and the soil and cave fauna isn't here except for a few things man introduced. None of the continental groups are here, so all of the things I found were native."

He said he believes the process of cave adaptation has been going along for a long time, with the insects moving through pores in the lava from one cave to another.

Among his most interesting finds in the lava tubes was a tree hopper. The previously known 17 native ones in Hawaii live in trees, as the family does all over the world.

He also found a fascinating plant hopper. He noted that of the 10,000 or more kinds of these insects in the world, only three are blind, white and flightless. One lives in ant nests in Africa; the other two occupy the lava tubes on the Big Island. The cave-living plant hoppers are nearly wingless, almost blind and almost totally depigmented, unlike their surface relatives which are fully winged, sighted and colorful.

Howarth also found a nearly eyeless, wingless water treader, which is the first representative in Hawaii of a relative known from sea caves in Japan. The water treader belongs to the order of true bugs and the Big Island resident is the first known cave-dweller in that category of insects in the world. Its closest continental kin live on or near water.

Howarth said almost all of the insects in the caves "had pretty much lost their sight. They are utilizing other senses to find food and mate. Sunlight acts as a time piece--a biological clock--for a good many organisms, so it's quite a change to live in the dark."

Howarth said he also has explored caves on Maui, Kauai and Oahu and has found a few insects of different groups on the Neighbor Islands. But Oahu has not yielded anything, he said, because "the historical caves now have the city on top."...

His find poses many questions, such as why these creatures abandoned sunlight, land and water to go underground? And how long did it take them? "But these are not easily answered," he said....

REVIEW of "Helminths from the Exotic Game Birds of the Puuwaawaa Ranch, Hawaii" by V. Lewin & J.C. Holmes. 1971. Pacific Science 25:372-381. By Wayne Gagne, Entomology Dept., Bishop Museum, Honolulu, Hawaii.

This paper has been reviewed because of the illustration it provides from the standpoint of man's biological tampering. When fauna and flora are moved about the world, this activity is not without its drawbacks, nor does this maneuvering benefit the biota native to an area, especially in ecologically fragile insular environments. Well-meaning though it may be, the efforts of a few misguided individuals to create "Noah's Arks" of wildlife about their abodes now surely belongs to a now infamous past era of acclimatization societies, hui manu, etc. The blunders committed by these individuals and groups have brought considerable expense to society because of introductions that have proven pestiferous and more importantly, degradation and sometimes extinction to portions of biotas having the great misfortune to have borne the brunt of a torrent of new stresses and strains. In Hawaii the introduction and spread of linnets, ricebirds, and white-eyes has given both the naturalist and agriculturist cause for concern. If the day ever comes when a thorough epidemiological assessment

is made of our native birdlife, it will in all probability demonstrate the sad remnant of survivors still able to adapt to or escape multifaceted aspects of human "biological pollution."

Lewin and Holmes' paper provides some ammunition for the indictment I've just made. The "Noah's Ark" they investigated was the exotic game birds of Puu Waawaa Ranch, Island of Hawaii. On that ranch alone, 33 species of game birds have been introduced. They examined the eyes and internal organs of 115 Galliformes of 7 species. In these they recovered 11 species of helminths including 1 species of trematode, 4 species of cestodes, and 6 species of nematodes, 4 species of which were never before found in the State and 2 of these "were apparently introduced with exotic Galliformes." So, uninvited into the Ark were flukes, tapeworms and eyeworms; 6 of 7 bird species were afflicted with the latter. One of the members of this rogues gallery was the economically important nematode, Heterakis gallinarum, a vector of "blackhead," an enterohepatitis frequently afflicting turkeys and chickens. And to judge from J.E. Alicata's recent book (1969) "Parasites of man and animals in Hawaii," all but one of these parasites were probably brought to the islands in infected exotic and domestic birds.

Those of us having the survival of native birdlife uppermost in our concerns have reason to be disturbed, because the intermediate hosts of many of these parasites are houseflies, beetles, amphipods, roaches, sowbugs, grasshoppers and earwigs. Several of these insects could easily be taken for food by native birds. For example, the intermediate host of the eyeworm, Oxyspirura mansoni is an introduced, widespread roach. Some of these parasites even have undetermined life cycles. The fact that these helminths can be transmitted between bird species is borne out by Lewin and Holmes' discovery that 13 host records, just among these 7 species of Galliformes had never before been recorded. "Newly introduced birds may bring new types of parasites with them and/or may acquire parasites from birds already established...this provided an opportunity to investigate the helminths to determine whether any have been successfully established into Hawaii and to what extent helminths are being exchanged among various species of Galliformes now found on the ranch." Later, they explain that in Galliformes "parasites tend to be less specific, and related wild Galliformes and domestic fowl provide a reservoir from which the introduced species can be infected." But what of the indigenous species? This activity comes in a time when hunting, on a Statewide basis does not even appear within the top 20 recreational activities, well below nature appreciation and nature walks.

Still, the intentional introductions continue to be made. The State proposes to introduce the Afghanistan white-winged pheasant and there is a bill in this legislature to appropriate \$25,000 for more of the same. Also, the proprietor of Puu Waawaa Ranch, industrialist Lowell S. Dillingham, a man instrumental in the activities of the now defunct Hui Manu, a society whose purpose was to introduce exotic birds--especially songbirds--for release into the State, is now a member of the Advisory Committee on Land Vertebrates of the Quarantine Branch of the Department of Agriculture. This position could give him, and the Director of the State Division of Fish and Game who is also a member, considerable leverage for advocating more exotic introductions, even over the objections of other Committee members from the scientific community.

Field Notes from Hildegard Kaigler on Fairy Tern

The fairy terns returned to Fort DeRussy this spring and were first observed on March 9, 1972, mating on the same limb of the same tree where they had previously nested. Successfully in 1970, unsuccessfully in 1971. The terns had been observed at intervals since the initial sighting, always in the same tree and obviously brooding an egg. The last sighting that we had of the bird sitting on the egg was April 2nd, Easter Sunday, in pouring rain. However, since that time, the tern has never been observed on the limb, although the egg is in easy view. To date, only two terns have been seen at any one time. It is an almost obvious conclusion that the tern has abandoned the nest because of the length of time (up to 1½ hours) that the egg has been unattended.

Field Notes from Mabel R. Becker on Red-vented Bulbul

March 27, 1972, while our family was gathered in the back yard of 614 Kaha St.,

Kailua, we noted two unusual birds in the palm trees next door. They turned out to be two Red-vented Bulbuls. We all viewed them with glasses. Later we verified the sighting by finding a picture in the encyclopedia. The birds remained for about one half hour chasing each other and at times lighting in the trees lower down. I feel sure they would have visited the bird feeding tray which is elevated and in clear sight if there had not been so much activity in the yard. They did not sing, but their notes were so unusual it attracted our attention. We had assumed they were mynahs which nest in our yard. Needless to say, we are watching hopefully for their return.

RECOVERIES

Banded under G.C. Munro's Permit No. 5738

Band No. 40-721 857

Species: Laysan Albatross (Juvenile)

Banded Date: June 1945 by Gail Morgan at Midway, Sand Island

Recaptured: 27 November 1968, 2 December 1970, and 18 November 1971 at Midway, Sand Island by H.I. Fisher

Banded under Grenville Hatch's Permit No. 6520

Band No. 44-725 382

Species: Laysan Albatross (Adult)

Banded Date: 28 January 1951 by W.E. Hewitt, Jr., at Midway, Sand Island

Recaptured: 8 December 1971 at Midway, Sand Island by H.I. Fisher

ALOHA to new members:

Junior - Hunter Johnson, 152-B N. Kalaheo Ave, Kailua, Oahu 96734
 Danny Skinner, 221 Belmar Ave, Oakhurst, N.J. 07755

Regular - Robert A. Brewer, 15 Castle Park Way, Oakland, Calif. 94611
 Dianne & James Coughlin, 4136-1 Keanu St, Honolulu, Hawaii 96816
 Mr. & Mrs. Robert C. Hanson, 2037 Aaniu Loop, Pearl City, Oahu 96782
 Dr. Spencer Malecha, Dept of Genetics, Sch of Med, UH, Hon, HI 96822
 Susan G. Monden, 6601 Hawaii Kai Drive, Honolulu, Hawaii 96825
 Mrs. George Murdock, 1447 Kewalo St, #604, Honolulu, Hawaii 96822
 William Neill, 2825 S. King St, #603, Honolulu, Hawaii 96814
 Mrs. Robert E. Zedekar, 3300 Moorewood Court, Sacramento, Cal. 95821

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JUNE ACTIVITIES:

- 11 June - Field trip to Poamoho Trail, weather permitting, to study the 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: William P. Mull, tel: 968-6798
- 12 June - Board meeting at McCully-Moiliili Library, 6:45 p.m. Members welcome.
- 19 June - General meeting at the Waikiki Aquarium Auditorium at 7:30 p.m.
 Speaker: Francis G. Howarth, Bishop Museum entomologist
 Topic: Biospeleology--Recent Discovery of Ecosystems in Hawaii's Lava Tubes. (color slides)

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