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THE ELEPAIO

Journal of the
Hawaii Audubon Society

For the Better Protection
of Wildlife in Hawaii

VOLUME 25, NUMBER 7 JANUARY 1965

ABSENCE OF GULLS ON PACIFIC ISLANDS -- SOME SPECULATIONS

By Hubert Frings
(University of Hawaii)

In the Elepaio (May, 1964), E. H. Bryan, Jr., noted the scarcity of records of gulls on Pacific Islands, and remarked the singular nature of this fact. As he suggests, the answer that gulls are "associated with continents" is no answer at all. Cardinals too were originally continental, but they are doing well here.

I would like to suggest some possible reasons why gulls are not found on Pacific Islands, in the hope that these may incite further thought and possibly investigations, for obviously the ultimate answer must come from observations and experiments on these birds.

First of all, it is obvious that gulls can get here. Certainly the arrivals are few, and the birds are usually young and often in very poor condition. Since gulls are long-lived birds, however, even a few arriving now and then could easily build up a population, if they could become established. So the islands are open to colonization by gulls; the trouble is that they do not establish themselves.

Perhaps the fact that these birds usually arrive in poor health gives some clue to the reason for their non-establishment. If one thinks of it, it is strange that they should be in poor health, for the ocean, over which they come, abounds in their natural foods. They certainly fly equally long distances along the shores of continents, and they do not mind settling on the sea to rest, if needed. Why then should they not be in excellent health when they reach the islands? I believe that, if we knew the answer to that, we would know why they do not establish themselves afterward. And my purpose here is to suggest two reasons why gulls, unlike albatrosses let us say, do not survive well over the open ocean.

First, they may not be able to take advantage of the available foods. Along the coasts, gulls are characteristically scavengers, picking up bits of dead fish, clams, or other tidbits along the water's edge. They seem able to catch living fish only if these are injured or caught in nets. A look at the beak of a gull, in contrast with that of an albatross, will show the difference in instrumentation. The beak of an albatross is long and hooked. Just exactly how this sharply hooked beak aids the albatross in feeding is not known, but certainly the gull has a much shorter bill and lacks the hook. Perhaps this is significant.

This may explain why the creatures arrive on the islands in bad condition, but it certainly does not explain why they cannot after that return to good health. Once again, however, food habits could be important. Gulls are chiefly scavengers, depending upon a rather rich source of dead or easily obtainable food. Islands,

such as Hawaii, do not have this. Typically the productivity of our seas is low. There are relatively few fish, and these are mostly near the reefs, where, they are quickly eaten after death by other fish or crabs. The rocks and beaches are not covered -- as they are along the coasts of North America -- with barnacles, clams, refuse, and other easily available items of diet. In short, a gull arriving here in miserable condition from an ocean crossing would face an immediate revision of feeding habits, involving sudden development of new and highly efficient means to capture food. This the gull is in no condition to do.

Yet, I am not too convinced that this is right. Gulls are marvellously adaptable birds, and it would certainly seem that some time in the distant past some gulls could have arrived in not too poor condition and modified their habits. So what else?

The second idea I would like to suggest appeals to me much more; in fact, I am ready to believe that research might prove it to be right. This is based on the ability of sea birds to drink sea water, using the nasal gland as a rectification device for the production of fresh water from the sea water. So let us look at the nasal gland and its actions.

Birds have a series of glands near the eye -- lacrimal glands for tear production, Harderian glands whose function is still unknown, and nasal glands. The latter were named this, because in the birds that were studied, their ducts led into or near the nose. In sea birds, these are very large and prominent. In gulls and albatrosses, for instance, they are kidney-shaped organs lying over the eyes, in deep excavations in the skull.

These glands have been known for a long time. They were first described scientifically by Steno in 1664, and were noted by many others. During the Nineteenth and early Twentieth Centuries, ornithologists speculated upon their function. Anything this large and specialized was assumed to be important. It was known, furthermore, that the glands were tiny, or even absent, in terrestrial or fresh water birds. Gradually the idea that they secreted a mucous-like substance to protect the nose when the birds dove or dabbled in sea water was accepted.

No one thought of these glands as related to another question that vexed ornithologists at the same time -- could sea birds drink sea water and survive? In all vertebrates studied, the kidneys regulated the salt content of the blood, and it was known that vertebrate kidneys, in general, produced urine with less salt in it than sea water. Obviously, if a vertebrate drank sea water, it would have to use reserve water to get rid of the excess salt it had taken in, and so it would dehydrate itself and die. A man can live longer by not drinking at all than by drinking sea water. And this seemed to be true for all vertebrates. Even marine fish do not drink sea water. They get their water by eating other animals with about the same salt content as they and secreting the little excess of salt through their gills. But birds do not have gills. So the final conclusion was that sea birds -- in spite of the fact that they seemed to be drinking sea water -- did not do so, for their kidneys could not take care of it.

Apparently no one thought to try the simple experiment called for to answer this question -- give a sea bird some sea water, and make sure that it drinks it. In 1957 this was done, at last, by Professor Knut Schmidt-Nielsen of Duke University, working at the Mount Desert Island Biological Laboratory in Maine, using cormorants as experimental animals. To his surprise, the birds shortly began to drip what looked like water from the end of the beak. It was thus that he found that, when salt water entered the blood stream of the bird, either from the digestive tract or by injection, the naval glands removed the salt by producing a salty solution which was carried through ducts which led it ultimately to the end of the beak from which it dripped away. In brief, the bird could drink sea water because the

nasal glands -- which Schmidt-Nielsen renamed salt glands -- could selectively remove the salt in less water than was present in sea water, thus leaving a remainder of fresh water in the body. The kidneys of birds could be incapable of handling sea water; the nasal glands did the job.

Schmidt-Nielsen and others immediately started looking for nasal gland activity in other marine birds, in marine amphibians and reptiles, and later in non-marine birds. They found it in cormorants, gulls, pelicans, albatrosses, petrels, herons, ducks, sea turtles, and Galapagos marine iguanas, among others.

So far, it might seem that gulls and albatrosses are equally well equipped; but this is not so, and to see why, we must look at a key point in all this -- how concentrated is the salt water excreted? First of all, we should note that the concentration of sodium chloride in sea water is about 0.5 Molar. Now, how does the nasal gland solution compare with this? In albatrosses and petrels, the secretion is much more concentrated -- 0.8 to 1.3 Molar. Take 1 Molar as a useful and median figure. This would mean that the solution produced by the nasal gland is twice as concentrated as sea water. Put another way, for every unit of sea water taken in, these birds can discharge all the salt in half that volume of water, thus leaving half as pure water. Now look at the gull. The secretion here is only 0.5 to 0.7 Molar. The first obviously is the same as sea water, so discharging this would save nothing. The second is only a little higher; it would take great quantities of sea water to furnish much fresh water.

How, then, does the nasal gland operate in gulls? By secreting a solution a little more concentrated than sea water, it can give the gull a source of water for emergencies. Gulls typically visit fresh water lakes, or ascend rivers to get into brackish water. There has never been any question that they drink this. It seems probable, therefore, that gulls use their nasal glands to assist in excreting excess salt in foods and in emergencies to get a little fresh water from sea water. It seems doubtful whether they could continue to use them for a long time.

Just another note. Albatrosses and petrels are tube-nosed birds. The nostrils emerge from the upper surface of the bill as little tubes. Where the tubes and bill meet, the ducts from the nasal glands open, and from them gutter-like arrangements lead the fluid away over the surface of the bill to drop off at the tip. Obviously this arrangement keeps the fluid out of the nostrils in flight. In gulls, however, there is no such provision. The ducts open into the nasal cavity, and the excretion runs forward and ultimately through the beak to the outside. This would work fairly well for a bird when still so that it can control air currents. But, in flight, air coming through the nose could carry some of the fluid back to the throat to be swallowed. Thus, part of the excretion is fed right back to where it creates a problem. One can watch albatrosses soaring along dripping neatly from the beak; I have seen it many times. I have never seen this in gulls.

The picture for gulls is, therefore, that of partial use of the full potential of the nasal glands. These birds, by staying near continents did not need to evolve the tremendously efficient apparatus that the albatrosses and petrels developed. Gulls have a wide selection of foods with varying water contents; large bodies of fresh water, and estuaries are freely available. It is interesting, in this regard, to note that gulls differ from species to species in degree of development of the nasal glands. The Great Black-back Gull (*Larus marinus*), most marine of gulls, has the largest nasal glands, while the European Black-headed Gull (*Larus ridibundus*), which ascends rivers, has the smallest of those studied, with a size series between correlated with the degree of life at sea.

Now we are ready to look at a gull newly arrived on a Pacific island. If our idea is true, it is suffering from ionic imbalance and thirst, both of which cause

it to be much less adaptable and coordinated than usual. The average island which it reaches has nothing to help it. Most of the islands of the Pacific are low islands, with little or no fresh water. Where fresh water is available, it is not generally in large lakes or rivers which are familiar to the birds. In other words, the gull would have to develop entirely new behavior patterns, and these while under extreme stress. If, with all these factors against it, it did manage to find some fresh water, it would be on an island that undobtedly was populated with natives who were feather collectors, and the gull's natural inquisitiveness and comparative boldness would make it easy game. Maybe today, with protection and artificial feeding, gulls could survive on islands such as Hawaii or Kauai, but it is hard to see how they could survive under natural conditions.

At any rate, these are two possible answers, it seems to me, to the question: Why have gulls not established themselves on Pacific islands? We need not believe that one reason only was responsible, nor that there may not be other factors as yet unknown. Our knowledge of the basic life habits and physiology of marine birds is so rudimentary that we may be said to know almost nothing. We may hope that future research will give us the answer.

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A QUESTION OF VALUES

By P. Quentin Tomich

This brief report was prepared in January, 1964, in order to open discussion among students of Hawaiian flora and fauna on the program directed toward eradication of rabbits from Manana Island.

Rabbits have inhabited Manana for more than 60 years and undoubtedly were the greatest factor in the extirpation of nearly all the original vegetation. Present thinking encourages destruction of the rabbits so the surviving plants can recover and so additional species can be established. Absence of rabbits also would presumedly increase colonization of the island by sea birds. While this approach is logical and direct, it overlooks important points in the choice of criteria for directing the use, conservation, and scientific inquiry into Hawaii's varied biological phenomena.

We cannot turn time backward, nor can we speed up its measured pace. Manana reportedly now supports larger numbers of birds than in its historic past. In addition, there is a depauperate vegetation and a depauperate mammal fauna including mice and rabbits. We cannot deny the catastrophic consequences of the introduction of rabbits, but let us observe that through time a comparatively stable balance has evolved among the various biological components of the island. Is it not remarkable that the rabbits have survived at all? As ecologists we should carefully evaluate this fact. Perhaps the loss of an irreplaceable flora can be compensated for in part by learning what we can from this hardy unique product of many generations of isolation on an essentially desert island. What of its genetic character, its physiology, its morphology, its behavior, and its parasites? Could they not give us some insight into the processes of evolution, adaptation, and domestication?

Our obligation at this time is surely not to disrupt the steady state of Manana by destroying what has been many years in the making, but to study it intensively. Mammal ecologists have been too few in Hawaii and all phases of mammalogy need an accelerated rate of study. The Manana rabbits have interested me since my arrival here in 1959, but conditions have permitted little active field work on them. Dr. K.A. Wodzicki secured several specimens during the Tenth Pacific Science Congress in 1961. He says of this species in a recent note, "It would be of great importance for all students of Oryctolagus cuniculus, perhaps the most important lagomorph in the world, to have this population preserved - there is no other European rabbit population comparatively so handy in sub-tropical conditions that could be studied by an experienced ecologist..."*

My recommendation is that we should carry out a full-scale ecological study of Manana to include all the elements of its extremely valuable plant and animal life, before altering conditions as they are today.

*Dr. Wodzicki is an internationally known animal ecologist. He is Director, Animal Ecology Division, Department of Scientific and Industrial Research at Lower Hutt, New Zealand, author of many research papers on non-native mammals, and of "The Introduced Mammals of New Zealand", published in 1950. In February he spoke at the Bishop Museum on "The Status of Some Exotic Vertebrates in the Ecology of New Zealand."

As a consequence of this report, a trip was made to Manana on February 29 - March 1, 1964, by several members of the scientific community of Hawaii, under auspices of the Division of Fish and Game. Results of this short expedition are in preparation for publication, and should provide a basis for proceeding with an orderly inquiry into the ecology of Manana, stressing in particular the relationships between birds and rabbits.

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READERS' NOTES

ARIZONA HIGHWAYS, August, 1964, (Contributed by: Ruth R. Rockafellow & Hubert Frings)

This issue is titled "The Birds of Arizona" and dedicated "to bird lovers everywhere and especially to those members of the National Audubon Society who will meet in annual convention in Tucson in early November...."

WONDERFUL! There is no word to describe the page after page of excellent color photographs of the birds. You must see for yourself to realize the superb life-like pictures of the birds and their habitats.

HONOLULU STAR-BULLETIN, October 3, 1964, page 9, Moanalua Valley Trail is Sunday's Outing for Hikers by Harry A. Whitten

"...The Army had been engaged in much training lately in the Poamoho Trail area. Under an agreement with the State, the Military gets maneuver rights in the Poamoho and other Koolau Mountain areas, but the agreement provides that the areas shall be open to the public when not scheduled for military use.

"Persons who are thinking of going into the Poamoho, Kawailoa, or Pupukea-Kahuku complex are advised to check first to be sure no military exercises are planned. The number to call is 620-655236 (at Schofield Barracks) and ask for Sergeant Harvey."

Unfortunately, the State felt necessary to lease Poamoho, one of the best habitat for the forest birds on Oahu. We beg the responsible officials to please consider the flora and fauna and consciously preserve the existing ecology of this area, so that sometime in the very near future when Poamoho is opened again to the public without any reservations, we will be able to find not only the handsome stand of the native trees but also the native birds and the garrulax, which is

found only in this area.

BUSINESS WEEK, October 31, 1964, page 34, Hot Foot for Birds on Inaugural Route. Starlings that perch in trees in Washington are being routed for the peace of mind of parade spectators. Cost of security: $10,000.

The National Bird Control Laboratories of Skokie, Ill. under a $10,000 contract will spray 85 to 100 trees from the White House to the Capitol with a gooey chemical called Roost No More. The chemical gives birds a mild hot foot when they attempt to perch.

The article says that "similar treatment of the trees at two previous inaugurations was deemed successful,...and the innovation had encouragement from public health authorities, since bird droppings carry traceable virus and parasitic diseases.... The best customers for special contracts are owners of grandstands, government and other buildings, churches, public utilities (birds sometimes cause short-circuits by landing on transformers,for example), and theaters. Homeowners apply Roost No More to exposed air conditioners, beams, dormers, cornices, and downspouts. Contact with the goo doesn't injure birds, only annoys them.

"Before Roost No More took hold, all sorts of techniques were used to frighten birds away from roosts: several kinds of noisemaker including firecrackers, cannon shots at intervals, recordings of distress calls; variations on the scarecrow theme, such as two-faced stuffed owls and snakes on springs; electrical shocks from wires strung along roosts. None of these methods won a high rating.

"Defying ornithologists who contend that most birds have little or no sense of smell, Fink, (president of the laboratories), believes that Roost No More's odor as well as its viscosity repels birds. Moreover, he insists that one reason birds don't return to a treated spot is that 'the word gets around--they communicate like humans do.'"

HONOLULU STAR-BULLETIN, November 3, 1964, page 21: Mynahs and Hotels No Longer Enemies.

The Sheraton Hotels management reports that mynahs despite the efforts of water hoses, firecrackers, stuffed owls, and supersonic sound to discourage them continued to roost around the Royal Hawaiian Hotel, so the management decided to change the hotel's policy to peaceful co-existence. It is encouraging to read the following: "We not only are not doing anything about mynah birds, we kind of like them." This attitude is wonderful, because now the birds will bring entertainment and enjoyment instead of irritation.

HONOLULU STAR-BULLETIN, November 26,1964, page 2: Bird Control.

If anyone knows anything about the following new chemical product, please share your knowledge with other members by writing to the editor, THE ELEPAIO, P.O. Box 5032, Honolulu, Hawaii, 96814.

"TULSA, Okla. (UPI)...Tests conducted by a Tulsa pest control firm and the zoology department at Oklahoma State University indicate a dose of the chemicals in grain sends birds flying drunkenly away. They don't come back and they warn their feathered friends. The new chemicals were developed by Philips Petroleum Company of Bartlesville, Oklahoma."

HONOLULU STAR-BULLETIN, December 3, 1964, page D-5: Two Zoologists Study Animal Communications As of Value to Man by Helen Altonn.

The two zoologists are none other than Dr. Frings, one of the most valuable contributors to THE ELEPAIO, and Mrs. Frings. After years of research they have recently published a book on ANIMAL COMMUNICATION.

At least three major reasons are given for studying animal communication. They are as follows:

First is the hope that understanding of animal communication might lead to management of useful species and control of pests.

Second is that the studies might disclose the biological origins of human communication and suggest new methods of communication.

Third is to understand animals better.

Unoyo Kojima

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LETTERS: From C.M. Fennell, Seoul, Korea, December 2, 1964.

"...Having our first cold snap of the season with a predicted low tonight of 12 above. No snow yet, however, except for light flurries in the mts. Perhaps this will finally bring in the ducks, geese, and cranes....Hunters are bringing me in many interesting specimens again this year including a fine Purple Heron, an Osprey, and a Blue Magpie....

"Dr. McClure of Japan, a good friend and ornithologist, is currently engaged in a massive 6-country bird banding program,in Korea, Japan, Formosa, Malaya, Borneo, and Thailand. Another few years should amass a most interesting lot of migratory information never before known. He's also trying to establish reporting relations with the Russians in order to trace the more northerly breeders...."

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ALOHA to our new members:

Life: Mrs. Melvin Gallagher, P.O. Box 636, Kalaheo, Kauai, 96741
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Eugene Kridler, 835 Akumu St., Honolulu, Hawaii
Carroll E. Lindley, P.O. Box 577, Kahului, Maui, 96732
Mrs. Paul M. Scheffer, 4184-1 Keanu St., Honolulu, Hawaii, 96816

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JANUARY ACTIVITIES:

January 10 - Field Trip to Poamoho if the weather permits. Bring lunch, water, and if possible, your own car. Transportation cost (75¢) to be paid to the drivers. Meet at the Library of Hawaii at 8:00 a.m. Leader: W.M. Ord, telephone: 587-328.

January 11 - Board meeting at the Honolulu Aquarium Auditorium at 7:30 p.m. Members are always welcome.

January 18 - General meeting at the Honolulu Aquarium Auditorium at 7:30 p.m. Program for the night: Paul M. Scheffer will play some tapes of songs of North American and British birds. (Mr. Scheffer was scheduled for December meeting, but unforseen circumstances kept him out of town, so we are scheduling him for this month.)

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