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HISTORY OF EXOTIC BIRDS IN HAWAII

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Are Introduced Birds "Good" or "Bad?"

The apparent advantages of introducing exotic birds to an island habitat with a scarcity of native birds are obvious: we need more songsters; we need more game birds; we need more birds to destroy the insect (or weed) pests that reduce our cattle and agricultural profits. However, problems often result that are not anticipated by those who proclaim such simple and "meritorious" reasons for introductions.

Unfortunately, evidence of the detrimental results of introductions is primarily circumstantial. The reason is that, with the possible exceptions of the mule deer and the mouflon sheep, there apparently has never been a thorough follow-up study conducted on any animal that has been released in Hawaii, and, for most birds and other animals, there has been no study at all. The animals were released--with appropriate newspaper publicity--and then promptly forgotten. Nevertheless, there are some examples of results that were not anticipated.

1. The Common Mynah, as already mentioned, was introduced in 1865 in order to aid in controlling army worms, which were preying on pasture lands. Fisher (1948) had the following to say about interrelationships among Mynahs, doves, and lantana:

"Lantana camara was brought in as an ornamental plant. Mynahs (Acridotheres tristis) were imported especially to aid in controlling the army worm (Laphygma exempta). Various species of doves were established for sundry reasons. Lantana in its native Mexico is not a pest and mynahs and doves are not undesirable in their original homes. The individual importations of these three organisms seemed harmless. Each importation was made for specific reasons, and each might not have been so detrimental had not the others also occurred. This is what happened in Hawaii. The mynah fed on army worms as was expected, but it also began to feed on lantana berries, so much so that correlative fluctuations in the abundance of berries and mynahs were observed. The army worm is now seemingly a secondary food item, subject to selection on the basis of relative abundance. Although doves may feed on lantana berries to only a limited extent, it is enough to have been a factor in spreading the seeds. The seeds pass through the digestive tract of birds and are viable. Experimentation with various other seeds has shown that viability is often actually increased by the passage of a seed through a bird. This might be true with lantana. It is known that other factors were of importance in spreading lantana, but in this review we are interested in birds primarily, and they did have a part in the dissemination of the seeds. As a result of all factors lantana spread widely and became one of the most noxious of plants in the Territory. To curb the spread of lantana certain insects were brought in. They were successful in part, but it is reported that in areas where the lantana was eradicated or greatly reduced another undesirable exotic plant took over."

Fisher also noted that the Mynah served as a host for a number of parasites.

"Thus, there is the possibility that species already present in a region may be infected when the mynah is transplanted there, subject, of course, to the degree of host specificity of the parasites. Moreover, on the offshore bird islands of Oahu the author and his students have found the mynah pecking open the eggs of Sooty and Noddy Terns."

In their study of the game birds of Hawaii, Charles and Elizabeth Schwartz reported that the Mynah "is known to pilfer both lace-necked and barred dove nests." Both species of doves are listed as game birds in Hawaii.

2. Dr. Hillebrand also is thought to have brought the Ricebird (Lonchura punctulata) to Hawaii about 1865. William Alanson Bryan wrote in his Natural History of Hawaii in 1915 that as much as 10 million pounds of rice were raised annually in Hawaii. He wrote that the combined damage done by the Ricebird, House Finch (Carpodacus mexicanus), and House Sparrow (Passer domesticus) "to the growing grain from the time the kernels of rice begin to form in the heads until the crop is finally harvested, amounts to many thousands of dollars annually. The rice farmers patrol their fields during this season, from early morning until sundown, discharging 'rice guns,' shouting and conducting a general crusade against the birds."

Fisher noted that, as of 1948, the proclivity of Ricebirds for rice "is a minor discredit now because of the decline of rice as an important crop in the islands and not because of any foresight at the time it was introduced."

Rice is no longer grown commercially in Hawaii, but, because the life history of the Ricebird has never been studied, we do not know what adverse effects it may be having on either native or introduced birds.

3. The House Finch or Linnet was introduced to Hawaii many years ago, "certainly prior to 1870, probably from San Francisco" (Caum 1933). This species is sometimes called the "papaya bird" because of its fondness for papaya in some areas. There seems to be no published report on how much damage the birds do to this fruit. In general, the birds are reported to eat fruits that are overripe for human use.

Sugar cane production is being phased out in certain areas in Hawaii, and sorghum already has been planted as a replacement crop. Serious problems with Ricebirds, Linnets, and other seed-eating birds have been encountered on Kauai and Hawaii, and the 1972 Legislature appropriated $25,000 for the establishment of a system of protection and control of "pestiferous wildlife in the State." The Chairman of the Board of Agriculture reported to the Senate that a study of "the bird problem in sorghum fields at Kilauea reveals that Metcalf Farms, Inc., is experiencing 30% to 50% losses due to feeding by large flocks of ricebirds and linnets. Kohala Corporation similarly reports that, because of bird predation, they were able to harvest only 10 tons of sorghum from a 30-acre planting, which was supposed to produce at least 60 tons of grains." This is a very serious loss because of the "implications it holds for the establishment of a major grain production industry in Hawaii. If the grain production industry is successful in Hawaii, it will help expand the livestock industries and eventually result in greater agricultural self-sufficiency for the State" ("Honolulu Advertiser," March 14, 1972).

The spokesman for the Board of Agriculture acknowledged that he knew of no "universally accepted and proven methods for controlling crop damage by birds." The $25,000 would enable the Board to begin a "crash program aimed at finding and implementing effective methods for reducing grain crop loss by selective control of pestiferous wild birds that are destructive to sorghum and other grain crops." During the same legislative session, the Division of Fish and Game requested additional monies to import still more seed-eating game birds. Apparently, little was accomplished with the $25,000, and the establishment of the Warbling Silverbill (Lonchura malabarica cantans) on Hawaii adds another granivorous bird to that island (Berger, 1975).

4. The European Skylark (Alauda arvensis) apparently was first released in Hawaii in 1865. Caum wrote that "the skylark is a valuable addition to the island avifauna, both economically and esthetically." Fisher believed that it was unlikely that the skylark would "become a major nuisance as long as it continues to frequent open grassland; on most of the islands the area of suitable habitat is relatively small and is not in juxtaposition to truck farms. However, on the island of Kauai this species is regarded as a scourge to newly planted lettuce in the truck farming country. If the skylark should become more and more reliant on seeds of cultivated plants, or if the truck farms should expand to include part of the range of the skylark, or even extend to the edge of the range, it seems likely that the species will be on the pest list."

5. The Barn Owl (Tyto alba pratincola) was first imported and released on the island of Hawaii in 1958 in order "to combat the rats" in sugar cane fields. In a paper published in 1971, P. Quentin Tomich reported on a study of the feeding habits of Barn Owls on Hawaii from 1959 to 1970. He found that 91 of a total of 104 regurgitated pellets contained only

the remains of house mice, and, even though the Barn Owl occasionally eats rats, he believed that it is not a significant factor in the control of rats. Moreover, as was true of the mongooses, the owls did not remain in the sugar cane fields, but, within a period of four years, had moved as much as 30 miles from the release site into dry cattle country.

The only follow-up study of the Barn Owl by State personnel covered the period of 1959 to 1965 on the island of Kauai. Steven Au and Gerald Swedberg reported that, of the 28 owls released between 1959 and 1963, 27 dead, sick, or injured owls had been recovered by June 30, 1965. They added that "observations of individual birds in some instances showed apparent weakness and lethargy; which indicates the possibility that there may be predisposing factors contributing to deaths as road kills, and that there may be a great deal more mortality occurring unnoticed in areas away from highways." Whether or not the "apparent weakness and lethargy" were due to disease, parasites, or chemical poisoning is unknown. Any additional studies, if conducted, have not been published. However, the "Honolulu Advertiser" of March 9, 1972, reported that "even the Barn Owl could not control the rat problem" on Kauai, and, moreover, that the owls "seem to be dying off." The wildlife biologist on Kauai "would not speculate on the cause of the deaths, although it is suspected the use of pesticides might be involved."

6. Although there have been speculative charges that the Cattle Egret (Bubulcus ibis) may carry parasites and diseases detrimental to domestic animals, neither the Division of Fish and Game nor the Department of Agriculture have conducted any research on this successful introduction.

7. Lewin (1971) called attention to a different kind of problem when he wrote that "the avifauna of Hawaii has been increased by the importation program but an immediate problem, with regard to possible deleterious effects on native birds, arises from the practice of liberating mainland-type mallards. The mainland mallard (Anas platyrhynchos) is closely related to the koloa or Hawaiian duck (A. p. wyvilliana) and poses a distinct genetic threat to the endemic form through hybridization."

The unanticipated results mentioned above are not, in any sense, unusual. It has been demonstrated repeatedly in many parts of the world that no one has yet been able to predict with any degree of accuracy what an introduced plant or animal will do when released in a foreign environment (Laycock, 1970; Wodzicki, 1965). Were profits in cattle or agriculture actually increased by introducing any of the above-mentioned species of birds?

Do we need more game birds? According to the 1969-1970 Report to the Governor by the State Department of Land and Natural Resources, 9,773 hunting licenses (including 361 non-resident and 349 duplicate licenses) were issued during that fiscal year. Those licenses, therefore, were issued to about one percent of the approximately 770,000 people who lived in Hawaii, and, if one considers also the one million tourists who visited Hawaii during that same period, the percentage is only 0.5. Nevertheless, the small number of resident hunters wield so much political power that, on more than one occasion, they have been able to dictate to professionally trained personnel of the State Division of Fish and Game whether a hunting season would be opened or closed.

Introduced Parasites and Diseases

It is reasonable to assume that at least some of the birds and other animals that have been introduced to Hawaii harbored some parasites and diseases, and we know, in fact, that such has been the case. It is well known, also, that certain bird and other lower animal parasites and diseases can be transmitted to man. It is conceivable, therefore, that such parasites and diseases could have an important effect on the endemic birds, on introduced species (such as game birds and commercial poultry), on cattle, goats, or pigs, and on man himself. Relatively little attention has been paid to this subject in Hawaii, however, so that many of the problems must be viewed as potential, rather than as actual, problems, even though both human sickness and death have been traced to animal infections in Hawaii. Because of its potential significance, the information available on introduced parasites and diseases as of 1974 is included here.

To be fully meaningful, this subject must be considered under three headings: endemic birds; introduced birds; and man. One must note at the outset, however, that so little research has been done on bird diseases in Hawaii that it is possible only to tell something of what has been discovered and to point to some of the implications for endemic and introduced birds and to presumed potential public health problems. Of one thing we can be certain: the parasites and diseases will not go away merely because State and City

officials pretend that they do not exist.

A. Introduced diseases and the endemic birds: Apparently the first information on any diseases of the native forest birds was obtained in the 1890s by R.C.L. Perkins and others who found a number of birds afflicted with growths on the head and feet. Called "blumblefoot" or birdpox, it was learned later that the disease is caused by a virus. In 1968, Richard E. Warner described experiments with Laysan Finches (Psittirostra c. cantans) that suggested that these honeycreepers were highly susceptible to birdpox, as well as to avian malaria.

Although Warner (1968:107) "searched in vain" for evidence of bird malaria in wild honeycreepers during his studies (1959-1961), Ali Navvab Gojrati diagnosed malaria in one 'Apapane (Himatione sanguinea) examined during 1969 at Volcanoes National Park (elevation 4,000 feet), Hawaii.

Winston Banko, a biologist from the Bureau of Sport Fisheries and Wildlife, found two sickly young crows on Halalai during 1970. Both birds had growths on the head; analysis of the growths and blood revealed infections of birdpox virus and bird malaria. One of the birds died even though given medication.

This is meager evidence, indeed, for the numerous assertions in the literature that the extinction of so many native forest birds was due to introduced bird diseases. It may have been so, but no trustworthy evidence had been published as of 1974.

Only a few internal parasites have been reported for the endemic marsh and pond birds: a tapeworm in the Koloa or Hawaiian Duck, an eye fluke in the Coot, and three species of intestinal worms in the Black-crowned Night Heron (Alicata 1969). It should be noted, however, that neither the State Division of Fish and Game nor the U.S. Bureau of Sport Fisheries and Wildlife have ever conducted a thorough study of diseases and parasites of either endemic or introduced birds in Hawaii. By contrast, Alicata (1969) listed 34 different external and internal parasites of domestic chickens; he tabulated 6 protozoans, 9 species of roundworms, 4 species of tapeworms, and 2 flukes that parasitize man in Hawaii.

George Chu reported in 1952 that the Ruddy Turnstone (Arenaria interpres), a migratory shorebird, serves as a host for a fluke (Austrobilharzia variglandis). This parasite requires an intermediate host, the littorine snail (Littorina pintado). The larval stages of similar flukes in North America cause a very uncomfortable dermatitis in man, although natural infection with this marine parasite apparently has not been reported in Hawaii. Chickens, ducks, and two species of Hawaiian terns have been infected experimentally with Austrobilharzia.

B. Diseases and parasites of introduced birds: Fisher and Baldwin (1947) were the first to report the occurrence of avian malaria in an introduced species: Plasmodium vaughani was found in the blood of one Red-billed Leiothrix (Leiothrix lutea) taken near Kipuka Puaulu in Volcanoes National Park.

In writing of lowland populations on Kauai, Warner (1968) reported that "of seven White-eyes examined, all had mild infections of avian malaria; of 10 House Finches examined, all had avian malaria, and three possibly contained Haemoproteus."

The first thorough study of certain bird blood diseases was initiated by Navvab Gojrati in 1968. Most of his blood samples were taken from wild birds that frequent the grounds of the Honolulu Zoo, which would appear to be a "hotbed" for bird diseases. He found four species of Plasmodium, the protozoan parasite that produces avian malaria; none had been reported in Hawaii previously, and two species represented new records for an oceanic Pacific island. Chickens, pigeons, Common Mynahs, House Sparrows, and White-eyes were found to be infected. He also found one 'Apapane and three out of nine White-eyes from Volcanoes National Park to be infected with the malarial parasites.

Navv$_a$b Gojrati found 65 percent of 924 pigeons or Rock Doves at the zoo infected with Haemoproteus, another protozoan blood parasite of birds. Perhaps of more significance, however, was the discovery that a small percentage of the pigeons, Barred Doves, and Lace-necked Doves were infected with Leucocytozoon, also previously unreported from Hawaii. Some species of Leucocytozoon are markedly pathogenic, and one investigator reported mortalities between 35 and 85 percent among young ducks over a three-year period in North America. Hence, the spread of this disease to the Hawaiian Duck could have disastrous results.

Not infrequently one sees doves in Honolulu that have lost one or more toes (and sometimes the entire foot and leg), but whether this is the result of birdpox or some other disease has not been determined.

The eyeworm (Oxyspirura mansoni) is a common parasite of some introduced birds. These roundworms live between the eyeball and the nictitating membrane at the inner corner of the bird's eye. The eggs released by adult worms pass through the tear ducts and into the throat of the bird and thence through the digestive tract to be eliminated with the bird's feces. The eggs or newly hatched larvae are then eaten by the burrowing roach (Pycnoscelus surinamensis), which serves as the intermediate host for the parasites. Birds presumably become infected by eating roaches. Infected birds blink their eyes and scratch them with their feet. The toes sometimes tear the eyeball, which then is subject to secondary infection by viruses and bacteria.

Alicata (1969) reported eyeworm infections in chickens, Ring-necked Pheasants, Japanese Quail, Lace-necked Doves, Common Nynahs, and House Sparrows. H. Edward Smith found eyeworm infestation in 74 percent of 532 Lace-necked Doves at the zoo in 1970. He found no infection in 395 doves examined on the campuses of Chaminade College and the University of Hawaii. C.R. Eddinger and I found an acute infection in a fledgling Red-crested Cardinal (Paroaria coronata) in 1966. We tried to hand raise the young bird, but it died eight days later.

Lewin and Holmes (1971) found the eyeworm to be the most prevalent of the parasites found in their study of introduced game birds on the Puuwaawaa Ranch on Hawaii. They found eyeworms in "six of the seven species and from 28 percent of the 115 birds examined." Two birds were infected with more than 60 worms in their eyes. Lewin and Holmes found four new host records for the eyeworm: Barbary Partridge, California Quail, Gray Francolin, and Bare-throated Francolin. In one Bare-throated Francolin and two California Quail, Lewin and Holmes also found a second species of Oxyspirura which had not been reported previously in Hawaii.

Alicata and Lewin and Holmes believed that wild birds serve as reservoir hosts from which eyeworm infection can be acquired by chickens and turkeys. Lewin and Holmes found "no obvious symptoms" in the game birds that Lewin collected. However, nestling Common Mynahs with acute eyeworm infections refuse to eat in captivity and probably die in the wild.

In a 16-month study of introduced birds on Diamond Head, Smith and Guest (1974) found four species of parasites that had not previously been reported in Hawaii.

The only systematic study of the game birds on all of the Hawaiian Islands was published by Charles and Elizabeth Schwartz in 1949. They were not prepared, during their 18-month study, to conduct a thorough analysis of the parasites and diseases of the introduced game birds, nor of the native Nene, Koloa, Coot, Gallinule, and Stilt that, only a few years earlier, had been classified as game birds. They did, however, present some data on parasites. In Lace-necked Doves, they found a previously undescribed species of louse (Columbicola), the first reported occurrence in this dove of an intestinal roundworm (Ascaridea columbae), eyeworms, a cecal roundworm (Subulura brumpti), and the first reported occurrence in this dove of a tapeworm (Davainea crassula). They found 16 different parasites in Ring-necked Pheasants; 7 in California Quail; 6 in the Common Pigeon; 5 in Japanese Quail; and 5 in the Jungle Fowl.

Charles and Elizabeth Schwartz reported five species of lice but no internal parasites in Barred Doves. H. Edward Smith, however, found two species of intestinal roundworms and one species of tapeworm in Barred Doves at the Honolulu Zoo in 1970.

The most significant report on the parasites of introduced game birds in Hawaii was published by Victor Lewin and J.C. Holmes in 1971. Lewin studied on the Puuwaawaa Ranch on the island of Hawaii in 1966 and 1967. He reported that more than 2,600 game birds belonging to 33 species had been released on this ranch during the preceding decade; he did not state whether or not any of these birds had been subjected to quarantine before release. Of these, 13 species had become established as breeding birds. Eleven different species of worm parasites were found among 115 game birds examined. Lewin and Holmes reported 13 new host records for these parasites, and four species of parasites were recorded for the first time in Hawaii. One of the latter is a common parasite of wild and domestic turkeys. About another previously unreported parasite (Aulonocephalus pennula) for Hawaii and for the California Quail in its native range, Lewin and Holmes wrote that "the existing host records suggest that this parasite was introduced with other quail, which did not become established, and transferred to the more successful California quail." Hence, an introduced species that does not survive may still prove harmful by infecting other species with its parasites. The authors noted that "vertebrates introduced into new areas typically lose many of their parasites and gain a few others. The net result is usually a reduction in

their parasite fauna.... Galliformes may be an exception since their parasites tend to be less specific, and related wild Galliformes and domestic fowl provide a reservoir from which the introduced birds can be infected. An example of this may be the parasite fauna of the California quail. We found seven species of helminths in 82 birds...."

Another serious parasite (Dispharynx nasuta) was found in California Quail and the Barbary Partridge on the Puuwaawaa Ranch; this parasite, which had been reported earlier in chickens by Alicata, causes a high mortality in the Ruffed Grouse (Bonasa unbellus) and pigeons in parts of North America. What will happen in Hawaii remains to be learned. As Lewin (1971) wrote: "Exotic species pose a great threat to the native fauna of any area but especially in tropical environments that provide unusually favorable conditions for introduced species. The ultimate effects of the introduction of these exotic game birds will not be known for some time."

C. Introduced diseases and man: Hull (1963) discussed 27 different diseases that can be transmitted from birds to man. Among these is one formerly known as parrot fever or psittacosis, a form of atypical pneumonia; it is now generally called ornithosis because it is not limited to the parrot family but can be carried by many kinds of birds. In fact, Hull noted that "it is probable that more human cases of this disease are contracted from non-psittacine birds than not. In the U.S.A., at least, most cases probably are now of non-psittacine origin." The State epidemiologist in Hawaii issued a warning to island physicians in 1968 to be alert for ornithosis in humans, and noted that the disease is present in commercial poultry as well as in both pet and wild birds.

Among the many species of birds that have been shown to carry the virus responsible for ornithosis are chickens, turkeys, pigeons, canaries, and the Red-billed Leiothrix. Also of interest in Hawaii is Hull's (1963:365) statement that the Java Sparrow (Padda oryzivora) is particularly susceptible to the disease, and that "they are used as sentinels in aviaries to detect the presence of the psittacosis virus among apparently healthy parakeets." A single Java Sparrow was observed at the Bernice P. Bishop Museum in 1964; two were seen at Fort Shafter during August 1965; and there is a report that a pair raised young on Diamond Head during late 1968 or early 1969. The Java Sparrow is now a common species in several areas on Oahu and is increasing its range on that island.

Although frequently an occupational risk among those dealing with birds, it is not necessary to handle birds in order to become infected with ornithosis. Man usually is infected simply by inhaling dust from dried droppings that are contaminated with the virus. Bisseru (1967) characterized the disease in man as "a severe febrile viral infection involving the lungs, with a fairly high mortality rate; the disease can also occur in a mild or even subclinical form."

Several viral diseases that typically cause meningitis in man have been of considerable concern to the World Health Organization and the United States Public Health Service for some years. These include St. Louis encephalitis, Japanese B encephalitis, Murray Valley encephalitis, and West Nile fever. Mosquitoes are the vectors which usually spread the diseases to man, but wild birds serve as reservoirs for the virus, and, in Japan, the pig is thought to be important in the maintenance of the Japanese B encephalitis virus. In view of the intensive air travel between Hawaii and other parts of the world, there would seem to be a good chance for the introduction of any of these, and other, viral diseases to the State. Several species of mosquitoes already found in Hawaii are potential vectors for infecting man (Joyce and Nakagawa, 1963).

Four fungous diseases (Aspergillosus, Cryptococcosis, Histoplasmosis, ringworm) can be transmitted from birds to man, but little is known about these in Hawaii. The subject deserves brief mention because of the large flocks of pigeons in Waikiki and the large roosting flocks of Common Mynahs in Honolulu and other lowland areas. Human infection by these diseases typically results simply by inhaling the spores that are produced by the fungous that grows luxuriantly in the accumulated droppings of the birds, especially in relatively dry areas.

Cryptococcosis has been reported throughout much of the world, most frequently in milk cattle, domestic cats, and many other mammals, but it has been demonstrated repeatedly since 1959 in the nests and droppings of pigeons and European Starlings (Sturnus vulgaris), which now are found throughout much of North America. Bisseru (1967:136) pointed out that Cryptococcus neoformans "has been found in pigeon droppings in New York, London and in almost every city where the search has been made for the organism, which is widely distributed in nature, particularly in soil and in dust to which dried droppings of birds,

especially pigeons and starlings have contributed." Whether or not this fungus is found in the droppings of the Common Mynah (a relative of the Starling) in Hawaii has not been determined.

Kishimoto and Baker (1969) found 11 species of fungi pathogenic to man in beach sands, soil, and bird droppings on Oahu. They found Cryptococcus neoformans in 13 out of 17 samples taken from pigeon droppings and in the droppings of chickens in Waipahu. They found this fungus in droppings from 14 of 21 locations sampled.

Hull (1963:468) wrote about Cryptococcus that, in man, "the most common form is chronic cerebrospinal meningitis which must be distinguished particularly from tuberculous meningitis. Many cases have remained undiagnosed during life because cryptococcosis was not suspected.... The meningitis may run a chronic course of months and even years before terminating fatally.... In all but the cutaneous form the prognosis is very grave."

That histoplasmosis was caused by a fungus was not proven until 1934. Histoplasma capsulatum, the causative agent, occurs in the soil in many areas, "the higher percentage being found in those frequented by birds, bats, and chickens" (Hull 1963:482-483). Most of the early cases in man were not diagnosed until autopsies were performed on the cadavers, but the infection also occurs in a benign, self-limiting form. In serious cases, however, calcified lesions in the lung often were diagnosed erroneously by physicians as evidence of tuberculosis. Despite the mild (asymptomatic) form of the disease, Bisseru (1967:141) stated that "while a few primary lesions may heal on their own, recovery from generalized histoplasmosis in people without treatment, is rare."

Four species of Aspergillus are pathogenic to animals in general, and three occur in man. Chicks, ducklings, squabs, and cage birds are especially susceptible to the disease.

Potential public health problems, however, are not limited to diseases of introduced birds but also include those presently found in exotic mammals in Hawaii (Bergin and Bergin, 1970). Among these are tuberculosis (axis deer and some cattle on Molokai), bubonic plague and murine typhus (ectoparasites of rats and mongooses), leptospirosis (pigs, rats, mongooses), brucellosis (cattle, pigs) and trichinosis (pigs, mongooses). The Division of Fish and Game distributes a written warning about brucellosis, leptospirosis, and trichinosis to hunters on the island of Hawaii.

Even some invertebrate introductions pose problems to man. Ill-advised State introductions of two predator snails (Gonaxis quadrilateralis and Euglandina rosea) failed to control the giant African snail (Achatina fulica), and the snails proved to be intermediate hosts for the rat lungworm (Angiostrongylus cantonensis), which is a normal parasite of rats but also causes eosinophilic meningoencephalitis in man, and has done so in Hawaii (Alicata 1969, Char and Rosen 1967, van der Schalie, 1969, Wallace and Rosen, 1969).

The State Division of Fish and Game first introduced freshwater prawns of the genus Macrobrachium in Hawaiian streams in 1956. These large prawns from Guam, Tahiti, and the Marquesas were released without an adequate knowledge of their life history, but they proved to be a "very successful" introduction. They now exist in such large numbers that an open season has been declared. There has been little publicity about this new game animal, however, because it was discovered that these prawns also serve as hosts for the rat lungworm, and anyone eating the animals raw (as some ethnic groups are prone to do) probably would develop eosinophilic meningoencephalitis. The effects of the introduced prawn on the much smaller endemic prawn remain to be determined.

An average of 16 new species of insects reach Hawaii accidentally every year (Beardsley 1962). The potential exists, therefore, for the introduction of insect vectors that could spread either new diseases, or those already known in Hawaii, to the native birds and to other animals, including cattle and man. The threat would appear to be obvious in view of the heavy air traffic between Hawaii and the entire Pacific Basin.

This summary demonstrates the need for intensive research into the parasites and diseases of birds in Hawaii and for a far more effective quarantine program than has existed in the past. In fact, most pet store birds were subjected to no quarantine at all!

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Reviews from E.H. Bryan, Jr.: Birds of the Palau District of Micronesia

Robert P. Owen, Chief Conservationist of the Trust Territory of the Pacific Islands, has produced a list of the birds of the Palau Islands including Helen, Sonsorol, Tobi, Pulo Anna and Mirir Islands. He lists the English common name, the scientific name, and the native Palauan name of 118 species of birds, sea, land and migratory species. The list is based on "The Avifauna of Micronesia," by Rollin H. Baker, other publications, and recent sight records. A copy is available in the files of the Pacific Scientific Information Center, in Bishop Museum.

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Field Notes from Kojima: Has anyone seen a red-whiskered bulbul in Kaimuki-Kapahulu area? One flew into a Christmas berry tree at 725-A 8th Avenue on 9 October and pecked at few berries, then headed toward Diamond Head. On 18 October I saw one in Manoa (Loulu & Huelani).

From Adele M. Christian: Miss Christian from Manoa (Loulu near Huelani) reported that Java Sparrows are using her feeding tray. She noticed as many as five at one time (gray colored) visiting her during November.

From G.L. Bolander, Santa Rosa, California, 22 November 1974: Green Heron

...I was in Hawaii with a tour group which was preparing to leave the island of Hawaii at about 9:30 a.m. on the morning of November 11. We had been guests of the King Kamehameha Hotel at Kona and I was watching the construction activities on the replacement buildings, when a Green Heron flew over the structure and descended abruptly to disappear behind some nearby trees. I walked over and found the bird standing in some low growth at the edge of a small pond in private grounds immediately adjacent to the hotel property. It was approximately 30 yards from me as I observed it with 8x binoculars. It was an immature bird as was evidenced by the brown streaking on the neck and the brownish areas on the back. I have long been familiar with the species and had immediately recognized it in flight. Because it was such a familiar bird, and because our bus was soon to leave, I made no further observations. It seemed to be quite normal in all respects. It was alert and displayed no evidence of fatigue. ...

Editor's note: If you know about this green heron, please share your information by writing to Kojima, 725-A 8th Avenue, Honolulu, Hawaii 96816. MAHALO.

From Erika Wilson: Northern Waianae Mountains--On Thanksgiving morning (November 28, 1974), while hiking with friends in the northern Waianae mountains above Dillingham Field, I saw a number of birds. In the scrub forest at the foot of the mountains there were many Japanese White-eyes, Cardinals, and Red-crested Cardinals. As we climbed we heard a number of francolins "laughing" but, try as we might, never saw one. House Finches were numerous along the trail, the males pouring out their cheerful primary song. At higher elevations we saw Golden Plover scattered about in open areas, a few Mockingbirds, and more Red-crested Cardinals. In a draw below us we heard a Shama Thrush calling.

Waipio Peninsula--On the afternoon of November 28, 1974, friends and I made a quick check of the new duck area in flooded sugar cane fields. Over a hundred ducks took wing during our visit; most of them were Pintails. However, we did see a dozen Northern Shovelers and twenty teal of undetermined species. Also feeding in the area were a few Hawaiian Stilt and Golden Plover.

Over a week later, on December 8, 1974, I took a spotting scope to this same area. Again a majority of the ducks were Pintails, the males still showing much of their breeding plumage. The Northern Shovelers' wide bills and more squat appearance on the water made it easy to separate them from the Pintails. A small group of teal took off, again without my getting a solid species identification. In addition to the ducks there were a dozen noisy Hawaiian Stilt and numerous Golden Plover.

At Walker Bay, where the tide was out, there were Black-crowned Night Heron-3, Hawaiian Coot-1, Golden Plover-30, Wandering Tattler-5, and Hawaiian Stilt-13. In the scrubby growth nearby over two dozen Black-headed Mannikins, a dozen Ricebirds, and half a dozen Strawberry Finches came in to a water drip there. Other birds seen on the peninsula

included Cattle Egrets, Spotted Doves, Red-crested Cardinals, and Cardinals.

Aiea Trail--On the morning of December 8, 1974, a visiting birder and I walked the upper part of the Aiea Loop Trail. Strong winds reduced our ability to hear birds calling; later the wind dropped and we had better luck. We spotted a "chipping" female Cardinal in the introduced evergreens. Japanese White-eyes and House Finches were common along the trail. In a section of koa trees we heard the characteristic call of the 'Amakihi. We could distinguish several individuals calling, but never even caught a glimpse of them among the greenery. A Shama Thrush flying across a clearing was our last sighting before we turned around to return. Happily for us an 'Elepaio came down to check on us; it cooperatively stayed well in view, cocking its tail pertly and giving us every opportunity to enjoy its antics.

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Field Trip to Kaneohe Marine Corps Air Base by Erika Wilson

Twelve people met on Sunday morning, November 10, 1974, to birdwatch at the Kaneohe Marine Corps Air Base; a pass was kindly arranged by Sgt. Johnson of the Joint Public Affairs Office. The major purpose of our visit was to check on the Koloa maoli (Anas wyvilliana) being released by the State Division of Fish and Game. At our approach one took flight from the open water near the release pen. Inside the pen there were more ducks, all dyed red! The dye is part of the Division's program to trace Koloa maoli movements from the different release sites. Ducks released at Kawainui Swamp will be dyed yellow; people seeing any of the dyed ducks are urged to report their sightings to the Society or the State Division of Fish and Game.

Shorebirds on the mud flats included at least two dozen Hawaiian Stilt, innumerable Golden Plover, a scattered group of Sanderlings, several individual Wandering Tattlers, a small group of Ruddy Turnstones, and several feeding Black-crowned Night Herons.

Seabirds were represented by two White-capped Noddies fishing low over the water and a group of eight Great Frigatebirds sailing high overhead. The tide was in; consequently, there weren't many birds at the outer pond, but botanists in the group were enthusiastic about the flowering Ilima and Naupaka forming a carpet over the dunes.

I noticed, as we drove in and out of the base, that the mowed grass road borders supported the usual Golden Plover, Barred Doves, Common Mynahs, Red-crested Cardinals, and, to my surprise, small groups of Ruddy Turnstones. Also seen were Ricebirds, in the taller grasses behind the ponds, and Red-vented Bulbuls in the urban area immediately outside the base gate.

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What is in a name? (THE ELEPAIO, Vol. 35, No. 4, October 1974, page 47)

From Andrew J. Berger: The Christmas Shearwater was first described from specimens collected on Christmas Island on December 24, 1877, and both the island and the bird were named for that reason. The Christmas Shearwater has a much wider distribution, of course, so that the preferred name is Christmas Shearwater. I think I have explained the usage of the other bird names (for example, Laysan Honeycreeper vs Laysan Honeyeater; the latter of which is totally wrong because honeyeaters belong to a different family) in my book HAWAIIAN BIRDLIFE. As for the difference between "noddy" and "tern" see...A NEW DICTIONARY OF BIRDS...

From Robert L. Pyle: ...I have never liked "Noddy Tern" as used in the AOU checklist. To me it's like saying "Robin Thrush" or"Cardinal Finch". Noddy, Robin, and Cardinal are all good names in themselves. It's redundant and unnecessarily complicated to add the family name, especially when there are more than one species. "Common Noddy" isn't a particularly good name either, because the other species may be more common in other places. "Hawaiian Noddy" isn't good because that species occurs widely in the tropical Pacific. "Brown Noddy" isn't ideal, but at least it's descriptive and distinctive. ...For the other species either "Black Noddy" or "White-capped Noddy" would be adequate. "Blue-gray Noddy" is fine for the little one. ...

From THE ELEPAIO, Vol. 33, No.8, Feb.1973, pp. 85-86:(American) Common gallinule, American coot, Black-necked stilt--Preferable Hawaiian gallinule, Hawaiian coot, Hawaiian stilt.

Suggested: American golden plover--Preferable Pacific golden plover. Please send in your reasons for your choice to Kojima, 725-A 8th Avenue, Honolulu, Hawaii 96816.

Have you other suggestions? What about the firefinch and strawberry finch, which are waxbills? Please find out and share your findings with other members. MAHALO.

Comment on Regulation 29, Draft #3 (4/30/74), Concerning Game Mammal Hunting on Kauai to Michio Takata, Director, State Division of Fish and Game and members of the Animal Species Advisory Commission from President Wayne C. Gagne, 9 May 1974

Revision of this regulation should be postponed until: (1) there is a review of the State's fishing and hunting programs with respect to the Endangered Species Act of 1973 (Public Law 93-205), especially to acertain the present distribution of threatened species on the Federal list as to whether the proposed regulation and others run counter to the provisions under Section 7 of this law; (2) a program is developed, funded and carried out for the protection of indigenous birds and mammals and endangered species as stipulated under Section 191-56 of State Act 49 of 1972; and (3) the carrying capacity of the ecosystem(s) for each of the three hunted species (goats, pigs and black-tailed deer) in each unit is determined as stipulated in the proposed "Environmental Policy Act" of 1974 which was passed by the last legislature and is now before the Governor for his signature. /Act 247 (HB 2547, HD 1) State Environmental Policy; Established. Effective 15 June 1974/

We find the following shortcomings in the proposed regulation: (1) Section 14-1 does not allow the taking of live goats. We see no reason for this. (2) The hunting season for pigs is shortened in Units A-D. This should be the same as is proposed for Unit E, and the latter should provide for daily hunting. (3) The hunting season for goats is shortened. The present stipulations for Unit C should apply. (4) The hunting season for black-tailed deer is effectively shortened. We prefer that this animal be managed as provided for in the present regulation in Unit C for feral goats, i.e., year-round, either sex, with dogs.

The shortening of the hunting seasons for these animals is politically shortsighted. This was one of the primary arguments that hunter spokesmen used in testimony before the last legislature in an attempt to amend the act which established the Animal Species Advisory Commission. The proposed regulation gives them more grounds for arguing this viewpoint.

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Comment on requests for land use changes on Oahu for 5-year Boundary review to Chairman, Land Use Commission from President Wayne C. Gagne, 24 October 1974

We wish to specifically offer our strongest endorsement to the request of the Board of Water Supply's to redistrict, from Agriculture to Conservation, 25,673 acres in the north and west portions of the Koolau Mountains. We understand that a primary intent of this request is to regain for watershed portions of those lands presently in pineapple, sugar cane, grazing, military training, forest reserve and other uses that are occurring in areas receiving 50 or more inches of rain per year as this is considered by the BWS to be prime water recharge area.

From an ecological standpoint, much of this area which is presently in native forest is essential habitat for endemic forest birds. In fact, the primarily undisturbed portions of it are part of the only remaining suitable habitat for all of Oahu's native forest species--'amakihi, 'apapane, 'i'iwi and the endangered Oahu creeper. This island has suffered the most severe loss of species and subspecies of forest birds of any of the major islands because the 'o'o, 'o'u, 'akepa, 'akialoa, nuku-pu'u, 'oma'o and apparently the moho have become extinct within about the last 150 years. Additional extinctions among what little remains can be assured if their essential habitat continues to be degraded or decreased. From this standpoint, however, we see little merit in putting pineapple and sugar cane lands into watershed unless the eventual intent is to reforest these lands with native trees.

We think that a redistricting decision of the proposal of Mokuleia Ranch and Land Company for 2,568 acres from conservation to grazing in the west end of the Waianae Mountains should be held in abeyance pending a survey of this area by the State Natural Area Reserves Commission. The Waianae Range is known to harbor a great number of threatened and endangered native plant species of limited distribution. None of these, should they occur in the area to be redistricted, would withstand grazing. A poor alternative would be to propagate such species that might be found there in botanic gardens to save a portion of the gene pool, but this would mean extinction of their associated biota such as land-shells and other invertebrates. So, it would be best to strive to preserve the ecosystems within which such plants and their associated biota occur.

Finally, we support the redistricting of Heeia Fishpond to conservation. The non-wildlife benefits of this move have been adequately outlined by others. There is a tragic aspect where endangered wildlife are concerned here. This is because the most important

part of the ecosystem for endangered birds at Heeia Fishpond lies mauka of the pond in the less saline marshlands and along the inner edges of the mangrove. The endangered species in question are the 'alae 'ula (Hawaiian gallinule) and the 'alae Ke'oke'o (Hawaiian coot). (According to Hawaiian legend, the 'alae 'ula brought fire to the Hawaiian people.) Both birds have been observed in the marshes mauka of the fishpond in recent weeks and both species probably forage in portions of the pond which are not excessively saline for their food needs, while they are probably nesting and finding shelter in the mauka areas. Suffice to say that redistricting of the pond will not be of any consequence if the mauka marshes and mangrove are to be dredged or otherwise altered. Alternatively, if the mauka areas are left alone, but the makai portion is subjected to intensive recreation activities, this would mean probable excessive disturbance unless people and pets were kept away from the marshes and mangrove.

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Amendments to the Constitution--At the December 1974 meeting of the Hawaii Audubon Society the constitution of the Society was amended to read:

Article 3. Officers: The officers of the Society shall be a president, two vice-presidents, two secretaries, a treasurer, and two Executive committee members.

Article 5. Committees: Section 1. A standing committee, known as the Executive committee shall be composed of the regularly elected officers. An Executive committee meeting shall be called by the president when deemed necessary and it shall be the duty of the committee to direct the general policies of the Society. At least four Executive committee members shall be present at a meeting of the said committee to vote on financial or policy motions. The decisions of this committee are subject to approval of the membership of the Society at any regular or special meeting. Section 2. Such other committees may be appointed from time to time as deemed necessary by the president. In addition, the president may appoint persons to officially represent the Society and its policies on the different islands.

BY-LAWS--Article 7. Finances: All checks drawn on the Society's accounts shall be signed by at least two members of the Executive committee having their signatures on file at the appropriate bank. A financial statement, duly audited by an auditing committee of three members appointed by the president shall be presented at the December meeting.

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To the outgoing and incoming officers and members who actively participated in the Society's activities: MAHALO NUI LOA!

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HAWAII'S BIRDS, a field guide, is available for $2.50 postpaid, AIRMAIL 65¢ extra. Send in orders to: Book Order Committee, Hawaii Audubon Society, PO Box 5032, Honolulu, HI 96814.

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JANUARY ACTIVITIES:

12 January - Field trip to St. Louis Heights 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--Mrs. Erika Wilson, telephone 523-1843.

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

20 January - General meeting at the Waikiki Aquarium Auditorium at 7:30 p.m. Program: Nesting Biology of the House Finch in Honolulu by Larry Hirai / (color slides)

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THE ELEPAIO: Editors--Charlotta Hoskins and Unoyo Kojima
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DUES FOR 1975 ARE NOW PAYABLE: Regular - $3.00 per annum
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