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THE KOLOA RESTORATION PROJECT* By Gerald E. Swedberg Wildlife Biologist, Hawaii Division of Fish and Game

The Koloa, or Hawaiian duck, (<u>Anas wyvilliana</u>), is one of the three endemic members of the family Anatidae to be found in the Hawaiian chain of islands. It was the most widely distributed of the three species. The others, the Nene inhabited the island of Hawaii and probably Maui, and occurred on other islands only as a straggler and the Laysan duck was apparently limited to the island of Laysan. According to Munro (1944) the Koloa was found on all eight of the main islands of the state except for Lanai and Kahoolawe.

Koloa is the Hawaiian word for "duck". The Hawaiians called the species "Koloa maoli" meaning native duck, to differentiate between it and the various species of migratory ducks, which visit Hawaii each winter.

Though no early population estimates are known, the Koloa were apparently common enough to be considered a worthwhile food item in the diet of the native Hawaiians. According to Schwartz (1953), Mr. Eric Knudsen, a long time resident of Kauai, mentioned that the Hawaiians at one time made annual trips to certain mountain regions of Kauai to catch flightless Koloa for food. Since the trip to these areas is no easy task even today, their trips would have had to be productive to be worth the effort.

Despite this harvest by the natives, population numbers were apparently high, at least on Kauai, until the 1920's. Kauai residents recall areas such as the 3,000 acre Mana Swamp, prior to its drainage, when Koloa were there "by the thousands". Large numbers of migratory ducks also used the area during the winter each year.

In the 1920's, Koloa numbers began to decline. While the Koloa was closed to hunting by the Territorial Fish and Game Commission in 1925, the hunting of migratory wild ducks was still permitted, with seasons on the different islands varying from two to six months in length until 1939. Because of the similarity of the Koloa to both the female mallard (<u>Anas p. platyrhynchos</u>) and the female pintail (<u>Anas acuta</u>), it is doubtful that the Koloa received much protection from the closed season. In 1939, the Territorial Legislature passed Act 197, which prohibited the hunting of migratory ducks for a period of two years.

World War II, which resulted in restrictions on firearms and ammunition and the adoption of Regulation 9 which closed all hunting probably played a part in

^{*}Abstract from paper presented at the 47th Conference of the Western Association of State Game and Fish Commissioners - Honolulu, Hawaii, July 1967.

slowing the forces which were driving the Koloa toward extinction. After the repeal of Regulation 9, the Territory was again free to set hunting seasons. No season for duck hunting has since been opened.

Conservationists had long been concerned with the plight of the Koloa, but other than closing the season on hunting, no organized attempt was made to save the species until recent years.

Some attention was focused on the Koloa during the survey of the game birds in Hawaii (Schwartz and Schwartz 1949). Schwartz listed the Koloa as only occasional visitors to the islands of Hawaii, Molokai, and Maui. According to his estimate, the population on Oahu was down to thirty birds or less, and the population on Kauai was about five hundred birds. He, as well as others, recommended that something be done before it was too late.

The Koloa Restoration Project began in the fall of 1962. It is a cooperative effort, conducted by the Hawaii Division of Fish and Game and financed largely by the World Wildlife Fund. The U.S. Fish and Wildlife Service, the Delacour World Waterfowl and Gamebird Preservation Center, and the Honolulu Zoo have assisted in the various phases of the project.

The specific objectives of the project are to:

- (1) Determine the life history and habitat requirements of the Koloa throughout the annual cycle.
- (2) Determine the abundance, distribution and seasonal movements of Koloa on the island of Kauai.
- (3) Propagate Koloa in captivity for release, and to insure survival of the species by distribution of breeding stock to selected zoos, avaries and trusts throughout the world.
- (4) Determine the measures necessary to preserve the population of Koloa on Kauai, and to determine the extent and location of habitat suitable for restocking, on islands from which the Koloa has been extirpated.

The Koloa is a small duck, with adults ranging in weight from 14-26 ounces. There is a great deal of plumage variation among individual birds, though the overall coloration is brown with adult drakes usually somewhat darker than the ducks. Most individuals present the appearance of a small hen mallard, in all phases of the molt. A notable exception to this is the first pre-nuptial molt of many of the young drakes. This plumage often shows the typical mallard drake characteristics; recurved upper tail coverts, dark green head, and a partial white neck ring.

Koloa breed all year round on Kauai, though the months from December through May appear to be the most important breeding and nesting months. The extended breeding season of the Koloa on Kauai is apparently due to the minimal variation in climate and day length throughout the year, since captive birds held in temperate areas such as Pohakuloa, Hawaii (elevation 6,500') and Utah show a sharp spring breeding season.

On Kauai, nests or broods have been found from sea level to 3,550 feet elevation and in areas ranging in rainfall from 35" to 125". Nests are near water often an isolated rain puddle will suffice. They are usually associated with, and often made of Honohono grass (<u>Commelina diffusa</u>). Eggs per clutch range from two to ten; the mode being seven. The nests are approximately $1-l_2^1$ feet in diameter, four inches deep, and are well hidden on the ground. Nests and broods have been found in all vegetative zones on Kauai. The incubation period is twenty-eight days with only the duck incubating.

The natal down is a light buffy yellow with chocolate brown markings. The ducklings greatly resemble mallard (<u>Anas p. platyrhynchos</u>) young. Shafts of the tail feathers are normally the first to appear and begin replacing down at about

three weeks of age. Juveniles have replaced their down and are normally able to fly at nine to ten weeks of age.

The eclipse molt of the Koloa on Kauai occurs from March through October. The flightless period of the individual bird is about $6\frac{1}{2}$ weeks, or about $2\frac{1}{2}$ weeks longer than that reported for the mallard. The eclipse apparently occurs a given period after mating, rather than being triggered by seasonal climatic change.

Koloa are willing and able fliers. They have been clocked at from 45-50 miles per hour. Flight is silent and usually at low (75 ft. or less) elevation.

Man is the most important predator of adult Koloa. The predation is generally limited to shooting and occurs when unsuccessful bird hunters chance upon Koloa during the upland gamebird season and shoot them out of frustration, or when taro farmers shoot flightless adults in the taro patches to prevent dogs from chasing them through the crop and upsetting the plants.

The Black-crowned night heron (<u>Nycticorax nycticorax</u>), Mynah bird (<u>Acridotheres</u> <u>tristis</u>), dog (<u>Canis familiaris</u>), Largemouth bass (<u>Micropterus salmoides</u>), Bullfrog (<u>Rana spp</u>.) are predators of Koloa ducklings. Though no observations have been made, the feral house cat (<u>Felis domesticus</u>) is probably also an important predator.

Natural flooding from seasonal heavy rains, and the flooding of irrigation ditches are also mortality factors, as well as the burning of sugar cane fields prior to harvest.

Two external and one internal parasites have been found on Koloa: the louse (<u>Trinoton querquedulae</u> L.), the louse (<u>Anaticola crassicorne</u> Scop.) and a tapeworm (Hymenolepis megalops).

Foods of the Koloa are not well known; however, the following items have been reported: three snails (<u>Hydrobia porrectamigh</u>, <u>Melania mauiensis</u>, and <u>Melania newcombii</u>), earthworm (<u>Lumbricus spp</u>.), dragon-fly larvae (<u>Anisoptera</u>), Vasey grass (<u>Paspalum urvillei</u>), Barnyard grass (<u>Echinochloa crus-galli</u>), Rice (<u>Oryza sativa</u>) (Schwartz, 1953) and various types of freshwater algae.

In order to arrive at a preliminary population estimate, the island of Kauai was divided into thirty blocks of approximately equal size. There are 1,147 permanent streams (including all branches and tributaries) on Kauai with a total linear map distance of some 1,537 miles. There are 194 intermittent streams, with a total linear distance of approximately 320 miles. There are also some 235 miles of permanent irrigation ditches. Selected samples (10% of mileage) of the streams or ditches in each block were or will be walked.

There are some 79 Reservoirs and 11 swamp areas as well as a number of areas which are unique, such as sugar mill basins for settling silt from water used in the mill.

Marshes, ponds, and reservoirs are treated separately with observations at sample areas made repeatedly throughout the year.

The ratio of ducks per mile of stream and ditches times the number of miles of stream on Kauai plus the sum of the mean numbers of ducks seen at all lowland areas is being used to arrive at this total population estimate.

To date, slightly more than 1/3 of the total samples of upland habitat have been walked and we have encountered an average of two ducks per mile. If the trend continues as it has, the population estimate will approach 3,000 birds.

Along with gathering information about the life history and abundance of the Koloa, birds have been captured from the wild, or obtained from private individuals, zoos and avaries, and sent to Pohakuloa, Hawaii (where they are being propagated along with the Nene) and to the Jean Delacour World Waterfowl and Gamebird Preservation Center in Utah. This was done with the intent of providing brood stock for the eventual liberation of birds in suitable habitat on various islands within the

state.

Koloa are successfully being reared in captivity. In April 1967 fifty-three pen-reared Koloa were marked and released in three areas on Kauai. This was an experimental measure to:

- 1. Make general observations on the adptability of pen-reared birds in the wild.
- 2. Determine if the methods of marking* are suitable for use in later attempts at re-establishing the Koloa on other islands.

*The birds were marked with circular plastic nasal discs (5/8' in dia.) attached on opposite sides of the bill by a monofilament line through the nares. The discs were color coded by sex and by areas. In addition, the underwings of the birds were dyed (color coded to areas only).

> 3. Obtain some idea of the movement to be expected with pen-reared birds in later attempts at re-establishing the Koloa on other islands, and if the birds adapt well, mingle with wild Koloa and retain their markings: To use the marked birds as an aid in estimating the total population of wild Koloa on Kauai (as a counter-check against the current method of population estimation).

Follow-up studies of this release are currently in progress.

Summation

The status of the project is as follows:

- 1. The preliminary life history and habitat study of the Koloa has been completed.
- 2. The population survey is underway.
- 3. Koloa for breeding stock have been obtained and are reproducing well in captivity.
- 4. One release of Koloa has been made (on Kauai) in order to develop methods and techniques for future re-introductions to other islands.

Future Plans

Portions of the preliminary life history study pointed out certain specific areas which will be studied in detail by specialists.

Efforts will be made to enter into cooperative agreements with landholders in order to preserve and properly manage choice areas of Koloa habitat.

One additional release is planned for Kauai, in order to test minor variations in marking techniques.

Habitat suitable for restocking will be located on other islands. Releases and follow-up studies will be made.

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1953. Notes on the Hawaiian Duck. The Wilson Bulletin, Vol. 65, No.1, March.

Field Note from Ronald L. Walker, February 12, 1968: Mauna Kea, Hawaii

On J_anuary 23rd, 24th, and 25th, 1968, the writer participated in an inventory of wildlife on Mauna Kea on the Island of Hawaii, and again had an opportunity to observe bird life in this remote area. The area covered included a band of habitat between 8,000 and 9,000 feet in elevation approximately at tree line from the Halepohaku area, counterclockwise around the mountain on the contour to Puu Laau above the Waimea plains. As the main purpose of the survey was to enumerate feral sheep, there was little time to study birds at any length, but a few observations may be noteworthy.

Chukar partridge were relatively common all along the line of travel, and the density was computed at between 52 and 65 birds per square mile. This is a "normal" population for this area. California Valley Quail were particularly abundant in the lower areas between Puu Laau and Puu Mali and as many as 35 were seen in a single covey. Although no ring-necked pheasants were actually seen, early in the morning of each day many could be heard "crowing" at the lower elevations in the grass zone. Golden plover were particularly abundant in the upper areas where there was bare cinder or sand, and seemed to be resting rather than feeding. On January 23rd while I was resting on a lava ridge above Kahinahina hill, a Hawaiian hawk was spotted at a distance of one mile in a grove of mamane trees. It flew to a dead snag where it perched for several minutes. Although at that distance it was difficult to see clearly through the binoculars, it was apparent in the white phase of plumage - the contrasting dark back feathers and light buff underparts showed clearly.

On January 24th while walking just above Puu Kihe hill, which is located below the Forest Reserve boundary fence, several species of introduced songbirds were noted including the skylark, white-eye, linnet, and ricebird. Later in the day just above Puu Mali two 'i'iwi were heard "conversing" in the mamane tree which was in full bloom. They eventually flew off together and occasionally appeared to be "dogfighting" in mid air. 'Amakihi and white-eyes were quite common in the mature mamane trees, and did not appear to be competing with each other for food. At about noon a few miles further on, the familiar single syllable "tweet" of the palila was heard and after some searching this individual and one other were noted in a spectacularly blossomed mamane. Both were feeding actively, ripping out the succulent portions of the blossoms with their bills, occasionally giving the two note "wolf whistle" call. A total of three individuals were identified before it was necessary to move on, but in view of the abundance of trees in flower, it is highly likely that there were many others on this face of the mountain.

Although there were hundreds of mature, healthy mamane trees here suitable for feeding and nesting by this species, there were virtually <u>no</u> seedlings or young in the vicinity. If there is ever to be any sprouting or reproduction of these vital trees to provide the proper habitat for future populations of palila, it is imperative that feral animals which are the prime feeders on this tree be reduced considerably by constant hunting. Fortunately, roads recently built through the area have provided hunters with better access, and the forest has recovered considerably, at least along the road.

Later in the day a bird was noted in a mamane which at first glance appeared to be a creeper. A closer look revealed it to be an immature 'amakihi - it had a less pronounced black eye streak, and there was just a hint of yellow on the forehead which suggested that it was perhaps an immature male. Soon the two parents appeared and they seemed to be concerned about their progeny's lack of fear before the observer.

Just before arriving at Kaluamakani hill in a dense fog, one Hawaiian owl was seen sweeping low over a grassy area on the lookout for rodents.

LETTERS from Frank Richardson, Seattle, Washington, January 30, 1968:

My congratulations to you all on the fine new HAWAII'S BIRDS booklet of our society. Mr. Ord's photographs are an excellent feature and are well reproduced. I hope he can next get pictures of the native forest birds especially where their colors have not come out well from the original paintings, as the 'O'o'a'a. Is the 'Akialoa now to be the 'Akaialoa?* I should be interested to know the authority for this change, or if it may be a mistake. The maps are a good feature but are big enough to have a good deal more helpful detail added, and even some indication of relief. Anyway, I am very much pleased with the booklet and realize how much painstaking work went into it.

Editor's note: *A typographical error. It is 'Akialoa.

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From Janet Bell, Honolulu, 22 March 1968:

The Pacific Travel News for February 1968 has a long illustrated article, "Consider the Pacific for birdwatching tours. Travelers with this special interest can find superb birding both on and off the beaten path." Discusses various guided tours offered by companies from Montreal, West Virginia, San Francisco, etc. The tours described in some detail cover Alaska, Australia, Ceylon, Fiji, Guam, Hawaii, Hong Kong, India, Indonesia, Japan, Malaysia, Nepal, New Caledonia, New Guinea, New Hebrides, New Zealand, Okinawa, the Philippines, Singapore, Thailand. (Pacific Travel News, V. 12, No. 2, pp 68-94) The Birdwatchers Bibliography, Hawaii section does not include the Hawaii Audubon Society's HAWAII'S BIRDS.

The South Pacific bulletin for 4th quarter, 1967 has an article by Janice J. Beaty called "Guam's Remarkable Birds." Covers pp 37-40 with good illustrations. There is a brief description for each bird of the 20 native bird species that have managed to survive civilization's impact on a small Pacific island for three centuries. (South Pacific Bulletin, v. 17, No. 4)

Someone was talking about seeing a pair of black cardinals

Editor's note: If you know anything about the black cardinals, please write to Kojima, 725-A 8th Avenue, Honolulu, Hawaii 96816.

FOR JUNIOR MEMBERS:

Field note by Jonathan Hegele, 3 March 1968: Varied Tit

Quite recently the Hawaiian Trail and Mountain Club did Waimano Trail in the Koolau. There was a new approach to the hike which led across a small valley and up a short hill before joining the old trail. I hiked to where the trail zigzaged up a ridge and stopped where a strong wind blew down over a cleared section of the trail before retracing my steps down the hill.

I had only gone a few feet when I observed a varied tit, of all things, perched about 50 feet up in a tree. It was chattering constantly, while five or six whiteeyes flitted about closeby in neighboring trees. It was the first time I had seen the bird, but the white cheek patches, black throat, and crown with chestnut along the sides stood out so plainly that I could not think of any other bird the markings would fit.

I moved up quietly hoping to get a better view, but some fellow hikers appeared, driving the bird into some dense foliage. I would estimate the time to be from 10 to 12 in the morning, while the tree in which it was perched was located fairly high up on the ridge.

Going back I saw a number of white-eyes singing as well as two 'amakihi, and of course, there were the regular leiothrix in the valley by the stream.

Editor's note: Jonathan is a senior at Honolulu Junior Academy, and despite his busy schedule he has frequently shared his experiences with us. MAHALO NUI LOA.

Field trip to Sand Island, Waipio, and Kahuku, March 10, 1968:

The last shorebird field trip of the season on March 10 provided interesting birds at almost every stop. We first visited Sand Island, where, on the small offshore island among Plovers, Turnstones and Sanderlings, was the gull seen here in January. Its plumage is now considerably whiter - with some dark areas on head and breast, a dark mantle and black bill. A size comparison with the Golden Plovers indicates a smaller gull than the Western as it was tentatively identified in January. The consensus in March is Laughing Gull. A Brown Booby was seen beyond the surf line.

Our next stop was the mud flat just west of Hickam Harbor. This is one of the most accessible spots on the island at which to see shorebirds. They can be seen from the car 100 to 200 feet away. Although nothing unusual was seen, this writer saw a Willet there on December 21 and a Greater Yellowlegs on February 22-23.

Our stop on the Waipio Peninsula was along the bay a half mile beyond the old settling ponds which are still dry. Here there were six Stilt feeding at the water's edge along with a Night Heron, a Coot, and two Mallard. As widely distributed and common as the Mallard is on the Mainland it is decidely uncommon here in the islands. We next moved to the Waipahu dump where Night Herons and Cattle Egrets mixed with the shorebirds including two Black-bellied Plovers. The presence of these plovers is quite dependable in that area. During the field trips of the past two winters they have been seen regularly (as many as six at once) on the Waipio Peninsula, but never on the windward coast. Ricebirds, Mannikins and two Strawberry Finches were seen in the grass and weedy fields adjoining the dump and a large, white-headed, dark mantled gull was seen flying over the dump. This gull has been seen by several observers since February 23. On March 2 this writer obtained an extremely close look at the bird - 75 feet away through a 20X telescope. It is primarily white with some indistinct dusky marks on the neck, bill yellow with a red spot, eye yellow, foot pinkish (one leg missing), mantle dark grey contrasting with black outer primaries. Referencing Peterson's Western Guide and Alexander's "Birds of the Ocean" this would make it a Slaty-backed Gull from the eastern coast of Asia where it breeds on the Kamchatka Peninsula, the Kurile Islands and northern Japan.

Our final stop was at Kahuku. At the ponds near the airstrip were 60-70 duck mostly Pintail and Shoveler with five American Widgeon and three Green-winged Teal. Several hundred Plover, Turnstone and Sanderling were out on the airstrip and six Red-footed Boobies were seen offshore. At the ponds nearer the town were a few Pintail and Shoveler, about 20 Coot and 30 Cattle Egret. The Egret were flushed several times but were reluctant to leave the vicinity. The compact flock wheeling overhead in the late afternoon sun was a satisfying end to an enjoyable day.

J. Richard Gauthey

Has anyone seen the Black-throated Cardinal (<u>Paroaria gularis</u>)? During March I saw only one bird, but on 15 April I saw two of them at Fort Shafter. Mrs. Pyle saw one at Moanalua Gardens; so if you are around this neighborhood, look for the birds.

The following is from FINCHES AND SOFT-BILLED BIRDS by Henry Bates and Robert Busenbark, page 235: "The Black-throated Cardinal from South America is sometimes called the "Little Pope Cardinal" in the bird trade. It is not as well known as the Pope Cardinal, but it is much prettier. It is quite a bit smaller than the Pope Cardinal, rather less than six inches in overall length; but the basic pattern, diet, and habits are similar. The female shows less brilliance on the head and a paler shade on the throat.

"The beak is a horn color with the outer areas tipped in black. The orange eyes are elliptically surrounded by a blackish-red shade. The head and most of the neck is brightly glossed in brilliant red. As in the Pope Cardinal, the crest is absent. The back, wings, and tail are glossy black; and these upperparts are therefore a better and sharper contrast than the gray of the Pope Cardinal. The underparts, like the Pope Cardinal are white except for the basic red V-shaped throat area which darkens to a near black in this species. The feet and legs are grayish-black."

These birds are always flying around with the Brazilian Cardinals, so if you see a flock of cardinals look carefully for this new escapee, and if you do see one, please write to Kojima, 725-A 8th Avenue, Honolulu, Hawaii 96816.

Excerpts from minutes of general meeting, Hawaii Audubon Society, February 19, 1968: ...Vice President, Jack Throp, presiding officer, opened the 469th, or so he

said, meeting by having guests stand and introduce themselves.

He then asked Past-President Michael Ord to say a few words and introduce his wife Bennett Ann Ord. Mike Ord will be moving to Guam for at least two years....

Richard Gauthey gave a report for the field trip of February 11, 1968 to Palikea. Mockingbird were seen frequently on the road up and also small flocks of Black-headed Mannikin. A Skylark was heard by Michael Ord. On the trail there were about 20 'Amakihi and 'Apapane. Bushwarblers were often heard but rarely seen. There were also 'Elepaio, Housefinch, Leiothrix and White-eye. Waipio was still pretty dry, but there were a few Golden Plover and Strawberry Finches. On the way home the leader saw a Red-vented Bulbul on Kamehameha Highway in front of the Navy-Marine Golf Course on a wire. He referred the group to an article about them in the September 1967 issue of THE ELEPAIO....

Jack Throp called on Robert Pyle to tell about his trip into Alaka'i Swamp on Kauai on Saturday, February 17 with Michael Ord, Tom Telfer and Mrs. Pyle. Seven species of native birds were observed, 'Apapane, 'I'iwi, 'Anianiau, 'Amakihi, 'Elepaio, Akepa and a pair of the rare 'O'u. The rare Puaiohi Thrush was heard.

Jack Throp told us about new arrivals at the Honolulu Zoo. Among other new arrivals, a new Waterfowl Exhibit near the front gate was of great interest.

Robert Pyle was called upon to introduce the speaker for the evening Ralph Schrieber who gave the program of colored slides on Christmas Island birds, a fine collection of pictures of 19 breeding birds there....

ALOHA to our new members:

Mr. & Mrs. William J. Edger, 12350 Ridge Road, Plymouth, Michigan 48170 Roy T. Puchey, 329 S. Union Ave., Cranford, N.J. 07016

The annual index will be mailed to the members only upon request, so if you are interested in receiving a copy, please send in your reservation before June to Kojima, 725-A 8th Avenue, Honolulu, Hawaii 96816.

HAWAII'S BIRDS, new field guide now available for \$2.00. Send in your orders to: Book Order Committee, Hawaii Audubon Society, P.O. Box 5032, Honolulu, Hawaii 96814.

MAY ACTIVITIES:

May 12 - Field trip to Poamoho Trail to study the native forest birds. Bring lunch, water, and if possible, your car. Transportation cost (\$1.00) to be paid to the drivers. Meet at the Library of Hawaii at 8:00 a.m.

Leader: LCDR J. Richard Gauthey, telephone: 432-7218.

May 13 - Board meeting at the Waikiki Aquarium Auditorium at 7:30 p.m. Members are always welcome.

May 20 - General meeting at the Wakiki Aquarium Auditorium at 7:30 p.m. Program for the night: Speaker - Mrs. Carl F. Frings Topic - 'Elepaio (color slides)

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