



‘ELEPAIO

VOLUME 85, NUMBER 1

Journal of the Hawai‘i Audubon Society

JANUARY / FEBRUARY 2025

Examination of the Status of the Lavender Waxbill in Hawai‘i using eBird Data

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INTRODUCTION

Many of the bird species present in the Hawaiian Islands today are not native and were introduced by humans deliberately or accidentally. At least 211 species of non-native birds are known to have been released or have been identified in the wild in Hawai‘i, and approximately 54 of these are regarded as naturalized, meaning they have established wild, self-sustaining breeding populations (Foster 2009; Pyle and Pyle 2017; VanderWerf et al. 2017). In some areas of the Hawaiian Islands, most or all of the bird species present are not native, particularly in urban and low-elevation parts of each island. There are some notable exceptions, such as the White Tern or Manu o Kū (*Gygis alba*) and Pacific Golden Plover or Kōlea (*Pluvialis fulva*), which are familiar and iconic native birds that are common in some urban areas.

Despite their ubiquity, we know relatively little about the distribution and abundance of many of the non-native bird species present in our islands. Part of the reason for this lack of information is the absence of a systematic method of surveying for them. Much greater effort has rightly been dedicated to surveying for native bird species in Hawai‘i. The primary method used for monitoring native forest birds is the annual Hawaiian Forest Bird Survey, which began in the 1970s (Scott et al. 1986) and has since rotated among islands on a roughly five-year basis, with the exception of O‘ahu, which was included only once, in 1991 (Camp et al. 2009a,b). These forest bird surveys cover only the higher elevation portions of each island because that is where the majority of native

forest birds remain (Camp et al. 2009a,b). All bird species are counted during these surveys, and this method has been reasonably effective for monitoring some non-native bird species, but only in the montane areas covered by the surveys. The primary tool for monitoring wetland birds in Hawai‘i is the Biannual Waterbird Survey, which has been conducted in January and August of each year since 1986 (Paxton et al. 2022, Gorresen et al. 2024). As the name suggests, only waterbirds are counted during the waterbird survey, and most non-native birds in Hawai‘i are not waterbirds.

The status of some non-native bird species in Hawai‘i has been studied because they represent a threat to agriculture, native species, or pose an environmental threat in some other way, such as the Rose-ringed Parakeet (*Psittacula krameri*) and Mitred Parakeet (*Aratinga mitrata*; Loope et al. 2001, Runde and Pitt 2008, Shiels et al. 2018). However, the distribution and abundance of many non-native birds in Hawai‘i has not been monitored at all. Substantial time and effort would be required to monitor many of these non-native species.

Citizen science programs powered by volunteer observers are being used increasingly as a viable method of monitoring the status of many bird species. The Christmas Bird Count, organized by the National Audubon Society and many local Audubon societies, including the Hawai‘i Audubon Society, is the longest-running citizen science bird monitoring program in the United States and has been a popular and useful method of monitoring many birds (see <https://www.audubon.org/conservation/science/>

christmas-bird-count). More recently, eBird has rapidly become the largest citizen-science bird monitoring platform in the world. eBird is a searchable, interactive, online database of bird observations with geographic and time data (see <https://ebird.org/about>). Moreover, eBird data are accessible and freely available to scientists and amateur naturalists. Data from eBird have been used to examine the status of many bird species over large geographic areas (see <https://science.ebird.org/en> for many examples). Range maps have been produced by eBird for several Hawaiian forest birds (e.g., <https://science.ebird.org/en/status-and-trends/species/iiwi/abundance-map>), but these maps do not include any population trend information. VanderWerf and Kalodimos (2020) used eBird data to examine changes over time in the distribution of some non-native parrot species in Hawai'i. The potential to use eBird data to examine the changing status of native and non-native birds in our islands is largely untapped.



Lavender Waxbill near Kona, Hawai'i. September 24, 2016. ©Eric VanderWerf

This is the first of what we intend to be a series of papers examining the current status of non-native bird species in the Hawaiian Islands using eBird data. We chose the Lavender Waxbill (*Glaucostreptus caerulescens*) as the subject for the first of these efforts because there is interest in this species among birders for a somewhat esoteric reason. In 2016, the Hawaiian Islands were added to the American Birding Association (ABA) area, which is one of a number of geographic areas in which birders can tally and report the number of species they have seen (for the rationale and discussion about this decision see <https://blog.aba.org/2016/11/the-aba-adds-hawaii-now-what.html>). Prior to this, the ABA area consisted essentially of the continental United States and Canada. The ABA has a checklist committee (ABA-CLC) that maintains a list of species

that have been observed in the ABA area, and the ABA-CLC evaluates whether reports of vagrant birds are valid and whether populations of introduced species have become established and thus should be added to the official list (Pyle et al. 2018, 2024).

In Hawai'i, the list of birds that have been observed in the islands and surrounding waters has been maintained by Pyle and Pyle (2017) and, starting in 2014, by the Hawai'i Bird Records Committee (HBRC; see VanderWerf et al. 2018). When Hawai'i was added to the ABA area, the ABA-CLC reviewed all the species on the Hawai'i bird list to determine whether they met

standards for inclusion set by the ABA (Pyle 2017). All native Hawaiian bird species were accepted, of course, but determining whether a non-native species is established can be complicated, and there is no universal standard or set of criteria used in making such a determination. There were a few non-native bird species that had been accepted by the HBRC but were not accepted by the ABA-CLC, and Lavender Waxbill was one of those species (Pyle et al. 2018). The main reason Lavender Waxbill was not accepted by the ABA-CLC was that there was insufficient information available at that time about its abundance and distribution, and there were questions about whether it will persist in the wild and whether its persistence so far might have been supported by releases of captive birds.

The ABA-CLC agreed to reconsider the status of Lavender Waxbill in April 2024. They were provided with the analysis reported in this paper, after which they voted to accept the species as established (Pyle et al. 2024). Although this may seem trivial, it is important to some birders who keep lists, and birders comprise an important and increasing component of the ecotourism industry. Moreover, this exercise demonstrates the utility of eBird data in

helping to monitor the status of non-native species in Hawai'i. The Lavender Waxbill is not considered to be an environmental threat in Hawai'i, but other non-native species might be, and it is worth examining their status. We intend to examine the status of several other species using eBird data.

Lavender Waxbills were first reported on O'ahu in 1965 and on Hawai'i Island in 1966 (Kalodimos 2007, Pyle and Pyle 2017). The first nest of this species, documenting it as a breeding species in the wild, was observed near Pu'u Wa'a, Hawai'i Island in 1979 (Ashman and Pyle 1979). eBird was launched in 2002, but the oldest reports of Lavender Waxbill in Hawai'i in eBird were in 1972 on O'ahu and 1978 on Hawai'i Island, because some birders have entered their older observations. Data from eBird thus cannot be expected to adequately represent the status of the species in the years before eBird began or in its few first few years when use of eBird

was low. Data from eBird during the most recent several years, when use of eBird has become more common, probably does provide a reasonable picture of the species' status. This paper presents an examination of the recent status using of the Lavender Waxbill on O'ahu and Hawai'i Island using eBird data. For a more comprehensive description of the history of the species on each island, see Kalodimos (2007) and Pyle and Pyle (2017).

METHODS

We requested data on Lavender Waxbills from eBird and were given a link to download a text file that contained all reports of the species in the Hawaiian Islands through March 2024. We used these data in several ways. First, we used ChatGPT to create a parser in Python (a computer coding language) to read the text file and create a summary spreadsheet that contained the following information: a list of all

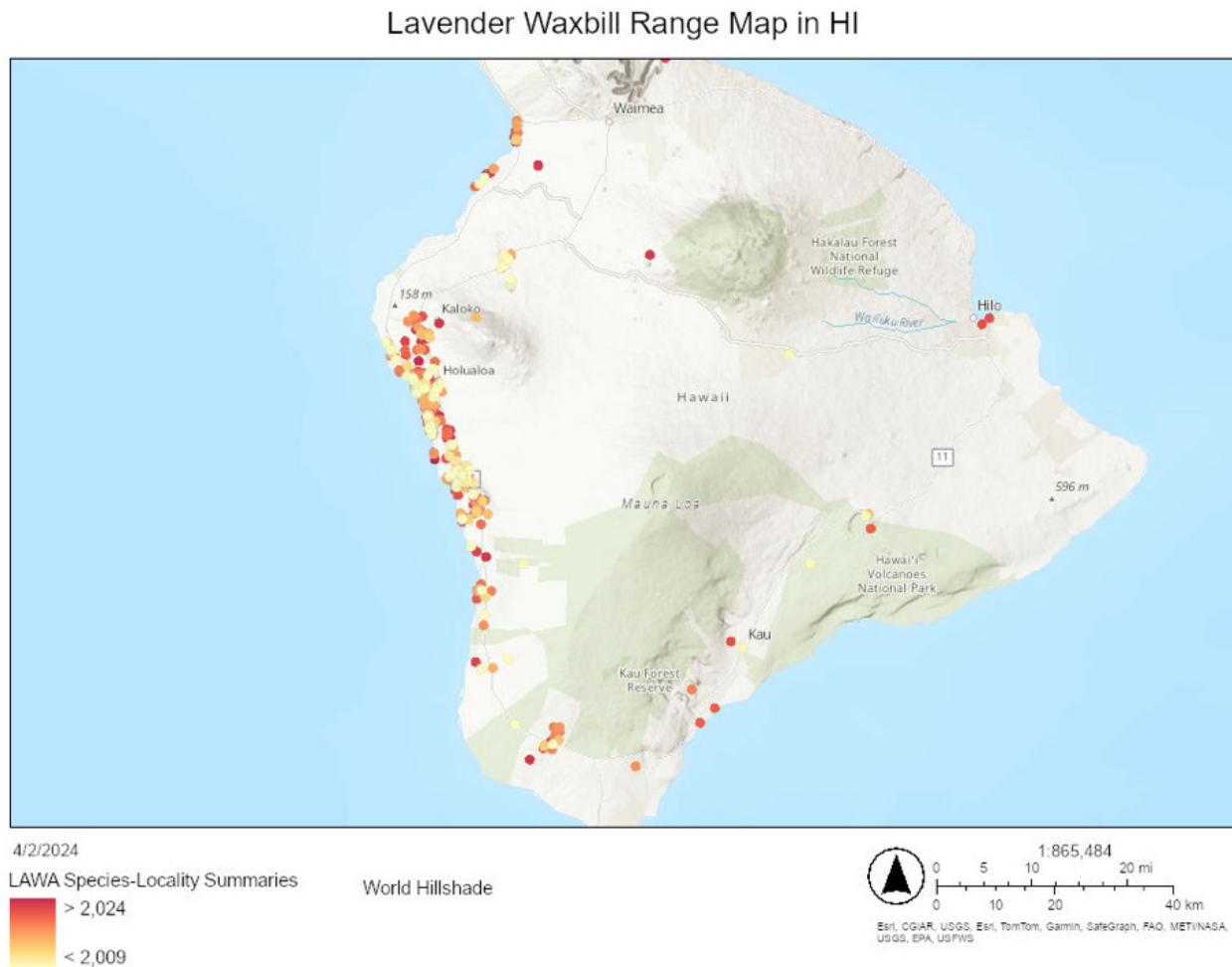


Figure 1. Locations of Lavender Waxbill reports in eBird on Hawai'i Island. Year of the report is shown by the color of the dot, ranging from pale yellow for older reports to dark red for the most recent reports in 2024.

the locations where the species had been reported; the latitude and longitude coordinates for each location; the number of reports at each location; the maximum number reported at each location; and the years in which Lavendar Waxbills were first and last reported at each location. We simultaneously instructed ChatGPT to format the summary output for addition to ArcGIS as a feature layer. With the assistance of ChatGPT, we were thus able to create a tool which, in a single step, is capable of rapidly processing large volumes of eBird data to produce summaries of target species that can then be readily loaded into ArcGIS for visualization. Once in ArcGIS, a vast array of geoprocessing and data analysis tools can be leveraged to reveal new insights into the locations and movements of understudied bird species in Hawai'i and elsewhere. We intend to use this workflow for subsequent papers in this series.

Second, we compiled the raw data by year and calculated several simple measures that provide an indication of the species abundance and distribution over time, including: the number of reports each year; the number of locations from which it was reported each year; and the average number of individuals observed per report each year. Each of these measures is influenced by

a number of factors and the results should be interpreted cautiously, but together they provide a reasonable indication of population status and trends of the species, especially on Hawai'i Island.

RESULTS

There have been 1,688 reports of Lavender Waxbills in the Hawaiian Islands in eBird through March 2024, including 10 on O'ahu and 1,678 on Hawai'i Island. Lavender Waxbills have been reported at 563 locations during that time, including 10 locations on O'ahu and 553 on Hawai'i, though some of those locations are geographically close to each other and are not necessarily independent (Figure 1).

Our geospatial-temporal analysis of eBird data using all reports of the species in Hawai'i showed that the species has expanded in range on Hawai'i Island over time (Figure 1). The distribution of the species already encompassed much of the Kona side of the island when it began appearing in eBird checklists from the 1990s and early 2000s. They continue to be reported in that area, and the range of the species has since increased to the north, south, and east. It is spreading around the south coast of the island into the Ka'u district,

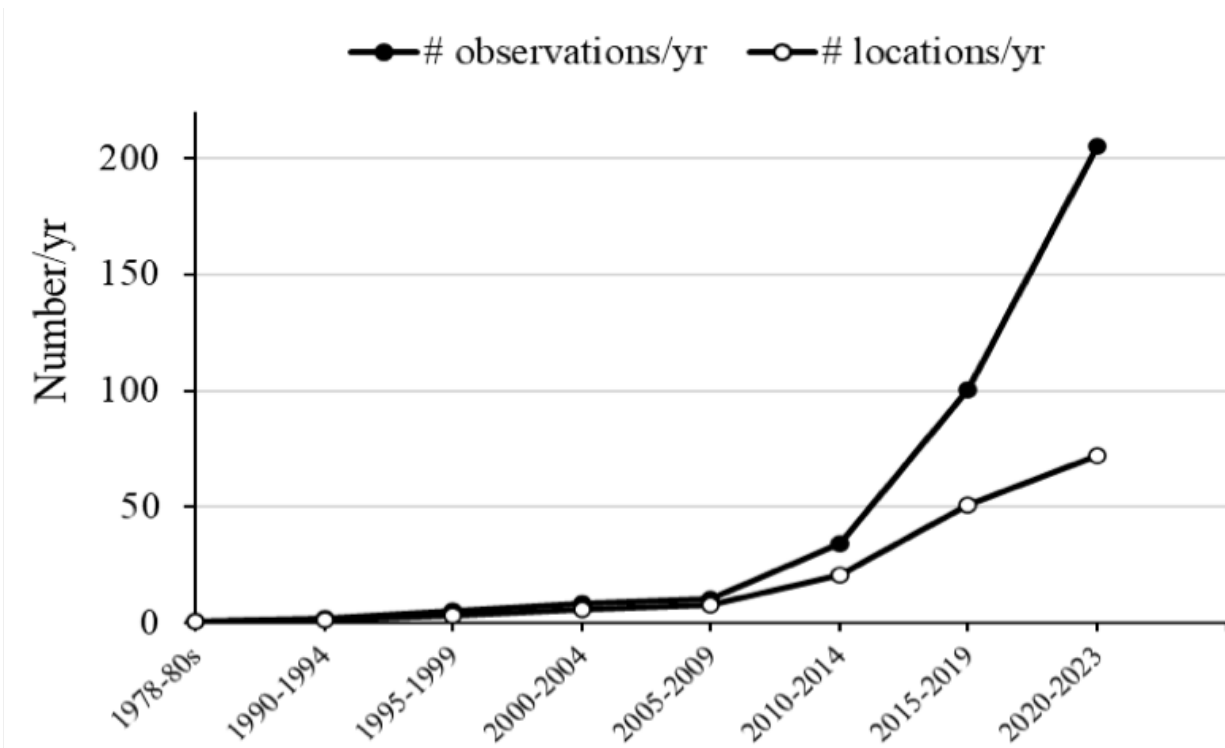


Figure 2. Number of eBird reports on Hawai'i Island with Lavender Waxbills over time and number of locations where they were reported.

where it has recently been documented with photographs at several sites. Some of the reports in the interior of the island along Saddle Road and in Volcano and in Hilo are not supported by any photographic documentation and may not be valid, but even if those reports are discounted the range of the species has expanded in recent years. Analysis of eBird data also demonstrated that there have been increases over time in the number of reports of Lavender Waxbills per year and the number of locations where the species was reported each year (Figure 2). Some of this increase is undoubtedly an artifact of increased use of eBird over time, and also an increase in the number of birders visiting Hawai'i in the last several years since it was added to the ABA area. It is hard to gauge how much of the apparent increase might be caused by increased observer effort in eBird, but the sharp increase in number and distribution of reports demonstrate that the species is at least stable, and probably increasing. Large areas of Kona are difficult for birders to access because they are private land. Lavender Waxbills probably occur in much of the area between the locations where they have been reported. The average number of Lavender Waxbills per checklist also increased over

time (Figure 3), and regression analysis showed that this increase was statistically significant ($F_{1,33} = 9.89$, $p = 0.004$). Most reports were of just a few individuals, which is typical for this species that usually does not form large flocks like other waxbills, but there were some reports of up to 30 birds.

The situation is very different on O'ahu, where eBird data indicated that Lavender Waxbills have completely disappeared from the slopes of Diamond Head where they were first observed in the 1960s. Kalodimos (2007) reported regular observations of the species in some suburban areas of east Honolulu for several years. More recently there have been a few reports of 1-4 birds in the same suburban areas (Pyle and Pyle 2017), including one in 2022.

DISCUSSION

The O'ahu and Hawai'i populations of Lavender Waxbill both originally resulted from the deliberate release of captive birds, but the importance of such releases and of bird feeders in maintaining the wild populations likely has differed between the islands, and this has played an important role in whether each population persisted. On O'ahu, Lavender

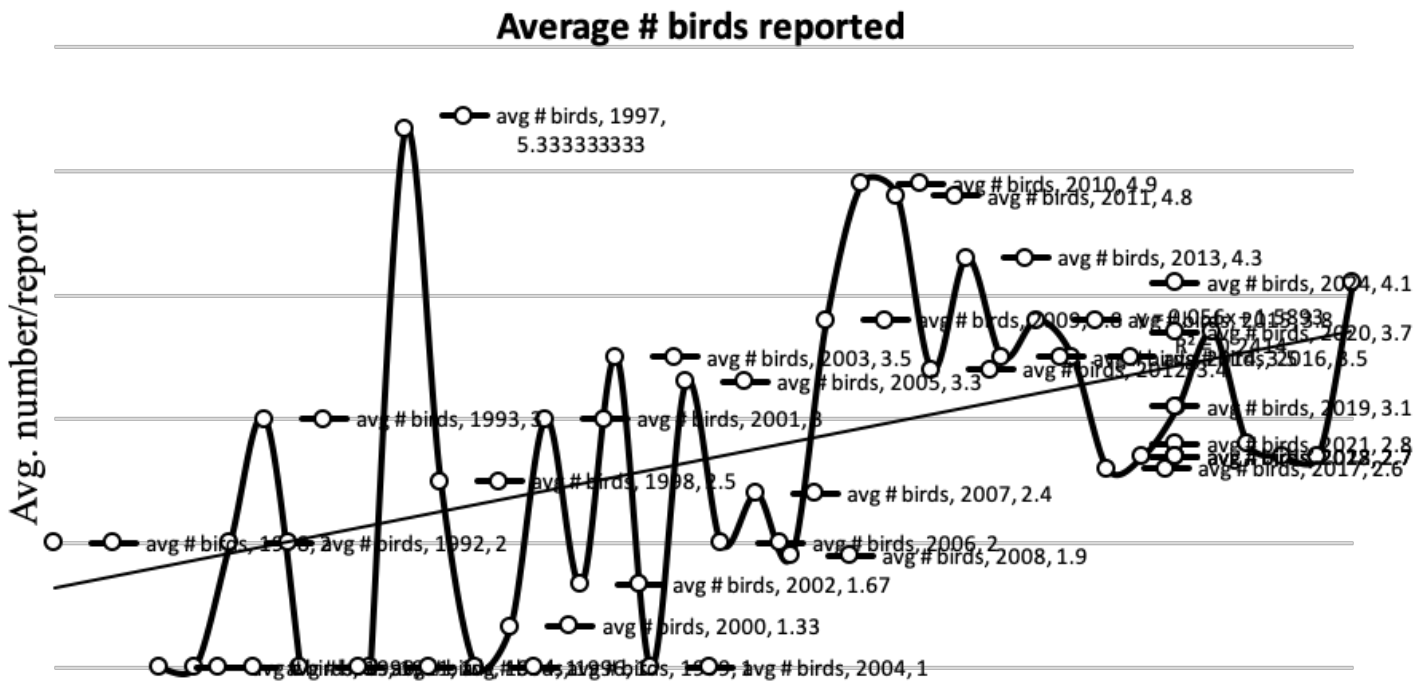


Figure 3. Average number of Lavender Waxbills per report by year, with best fit regression line.

Waxbills had a limited range and were common only in and near one location at Diamond Head (the Na Lā'au Trail and Arboretum, which is now defunct). Pyle and Pyle (2017) reported that the number of birds in the Diamond Head area declined after bird feeding in the adjacent neighborhood ceased in 1978. Lavender Waxbills subsequently were observed sporadically in several suburban areas of eastern Honolulu, mostly after they had disappeared from Diamond Head (see Kalodimos 2007 and Pyle and Pyle 2017 for a summary). The occasional more recent reports in eastern Honolulu may be recently escaped or released captive birds or the last remnants of a disappearing wild population.

In contrast, the range of Lavender Waxbills on Hawai'i is much larger, encompassing approximately 10% of the island, or about 1,000 square kilometers (Figure 1). Much of the range consists of dry forest and shrubland with sparse or no human population, and is similar to their native habitat in Africa. Lavender Waxbills are known to visit feeders in some subdivisions in Kona, but their persistence and expansion over such a large area away from human habitations cannot be explained by feeders. Even if releases are still occurring, this persistence and expansion could not be caused by occasional releases of a few captive birds. Waxbills are not long-lived birds; a long-term study of 27 Estrildid species in southern Africa found that the average lifespan of an individual was just 3.7 years, with a maximum known lifespan of 10.9 years (Rose and Oschadleus 2018). The persistence over several decades and observed expansion in range on Hawai'i must have been caused by extensive reproduction in the wild. Given its relatively broad range that appears to be increasing and its persistence in wild areas away from human habitation, it seems likely that the Lavender Waxbill will persist on Hawai'i and is established as a naturalized part of the current Hawaiian avifauna.

ACKNOWLEDGMENTS

We thank the eBird staff of the Cornell Laboratory of Ornithology for providing the raw data on Lavender Waxbills in Hawai'i. We also thank Peter Pyle and Thane Pratt for comments that helped to improve the paper.

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END

STATE OF THE SOCIETY: Annual Report for 2024 By Susan Scott, President

EMPLOYEES

We’re growing. For the first time ever, the Hawai’i Audubon Society has two fulltime employees and will soon have a third. In February, Laura Doucette, a UH Manoa Natural Resources and Environmental Management



Laura Doucette (left) and Elena Arinaga (right) surveying Wedge-tailed Shearwater chicks at Freeman Seabird Preserve. ©Susan Scott

graduate (and board member Wendy Kuntz’s former student), began as **Operations Manager**.

It's a far-ranging subject that includes managing and publishing the 'Elepaio (in color this year), creating and maintaining a complex bookkeeping system, and carrying out countless tasks that keep us legal, organized, and able to move forward.

In September, Elena Arinaga joined us as **Outreach, Events, and Education Manager**. Elena is an enthusiastic carrier of our joy-of-birds message. She routinely posts bird doings on several social media platforms, creates our lovely newsletters, and engages HAS in as many community events and school visits as she can squeeze in.

On January 1, 2025, biologist Keith Swindle, recently retired from the U.S. Fish and Wildlife Service, will start as the Society's **Executive Director**. We all look forward to Keith joining the team as he shares decades of experience working with Hawai'i's birds and the people who care about them. I speak for the entire Board of Directors in saying that we feel grateful and lucky to have these knowledgeable and friendly workers join our team.

BIRD PROGRAMS

Through board member, Rich Downs, we continued this year sharing with our multiple **Hui Manu-o-Kū** partners the Honolulu White Tern monitoring program. Through that, citizen scientists in 2024 helped reunite nearly 100 chicks with parents, transferred 60 chicks to

rescue centers, surveyed approximately 3,000 trees, and recorded over 10,000 observations.

One of the Society's contributions to Honolulu's official city seabird was the charming manu o Kū costume, created in intricate detail by Kailua costume artist Kathe James. The tern-with-chick costume made its debut at the April 27th Manu o Kū Festival at 'Iolani Palace Coronation Grounds.



Aloha Kea, HAS' manu o Ku costume, surrounded (left to right) by dedicated student volunteer Andres Jojoa, HAS President Susan Scott, and Board member Rich Downs at our Annual Members Dinner and Meeting. ©Elena Arinaga

Our **Kōlea Count** 2023-2024 season ended June 30th with board member Rich Downs compiling the last three years of our count numbers with eBird numbers. We now have one comprehensive database in which we will extract location, date, and participation information. Reports will come in 2025.

Elena planned, and launched, our first annual "Welcome Home Kōlea Festival" at Magic Island on October 12th. Kathe James also created a male kōlea costume for this and other public events. HAS owns the two bird costumes, and because they are so well-made, and have such attention-grabbing educational value, we're considering a third, a Wedge-tailed Shearwater.

Honolulu's one-acre **Freeman Seabird Preserve**



HAS Vice President Liz Kumabe Maynard with Kōlea Nui, one of HAS' new mascot ambassadors, at Ho'omaluhia Botanical Garden for a kōlea talk event. ©Elena Arinaga



David Hyrenbach examines a Wedge-tailed Shearwater burrow during the height of breeding season at Freeman Seabird Preserve. ©Laura Doucette

in the residential neighborhood of Kahala’s Black Point continues to be a unique urban laboratory to teach, and learn about, native plants and ‘u‘au kani (Wedge-tailed Shearwaters). The birds are nesting there in record numbers. The egg count his year was the highest ever at 432 with the chick count of 322. Keeping free-roaming cats from killing chicks is an ongoing challenge, as is being a good neighbor in this residential neighborhood.

Seabird researcher Dr. David Hyrenbach of Hawaii

Pacific University is preparing a 2024 report about our FSP shearwaters for the next ‘Elepaio issue.

TOURS AND EVENTS

Kona board member Mike Carion continues organizing tours and events on the Big Island. The BOD voted to pay, annually, \$190 for each of eight students and young professionals with a desire to study native birds, to attend the Hawai‘i Wildlife Society’s **Beginning Bird School** in Hilo and Hakalau Forest National Wildlife Refuge.

In June, a total of 20 HAS members, including plover expert Dr. Wally Johnson, traveled to Nome for our second annual **Kōlea Quest**. We are in the early stages of planning the third Nome trip from June 23-27.

Our annual meeting on November 17 was again at Bishop Museum’s Atherton Hālau with Dr. Eric VanderWerf our featured speaker and Da Spot our caterer. We sold a record number of 118 tickets to the event, which made us break even on expenses.

A FUTURE GOAL: HAS AS LIASON

Hawai‘i hosts at least 31 private and public organizations (list available upon request) working with Hawai‘i’s birds in one way or another. The



Hawai‘i Audubon Society’s vision and goal umbrella of advocacy. Graphic by Susan Scott.

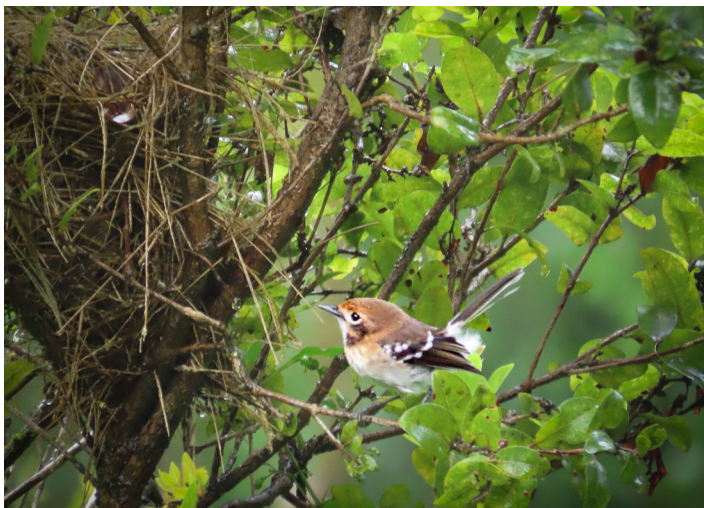
subjects these groups address is wide, including protection, education, monitoring, predator control, rescue, rehabilitation, translocation, habitat restoration, free-roaming pets, and more. Some are island specific; others are statewide.

One of Hawai'i Audubon Society's goals this coming year is to learn more about the missions and people of each of our state's bird-related groups, and help share their information. The more we all know about Hawai'i's birds, the more we can help and enjoy them.

*** END ***

Hawai'i Audubon Bird Tour, 'Aiea Loop Trail By Colleen Soares

Our Audubon bird tour to 'Aiea Loop Trail, Monday, Oct 28, 2024, was wet but sweet. It was a rainy day and five people cancelled. Yet seven of us reluctantly started out in the mud and light rain. We heard more birds than we could see: 'amakihi, finches, maybe an 'apapane. I saw three Red-billed Leiothrix close to the trail, and we saw five green parrots fly overhead. About 10:00 AM, the rain stopped and the sun came out. At that point we were at the H3 freeway viewpoint, about halfway down the trail.



An O'ahu 'Elepaio perches on a branch next to a bird nest on the 'Aiea Loop Trail during an HAS bird tour. ©Peggy Horton

Some of our group decided to finish the loop trail and continued on. The rest of us decided to return to the upper trailhead. And on the way we had a

special treat. In several small trees right next to the trail were two saucy little O'ahu 'Elepaio (*Chasiempis ibidis*), our Hawai'i Audubon Society namesake.

Monarchids such as the O'ahu 'Elepaio are small insectivorous songbirds with long tails. The population on O'ahu is decreasing and the O'ahu 'Elepaio is listed as endangered under the U.S. Endangered Species Act and by the State of Hawai'i. In 2012, the estimated population was 1,261 birds, with 477 breeding pairs and 307 single males. The greatest threats are Black Rat predation while nesting and mosquito-borne diseases.



A close up image of an 'elepaio. ©Peggy Horton

Eric VanderWerf has done considerable research and reporting on 'elepaio. He notes that the height of nests relates to Black Rat predation, which is a serious threat to 'elepaio and that the height of the nests 'elepaio build has increased over the past 20 years, which may be an evolutionary trend. Pacific Rim Conservation devotes a website, www.elepaio.org, to this bird to increase awareness, appreciation, understanding, and conservation.

The two 'elepaio we observed were flitting about in two small trees. In one photo (left) you can also see an empty nest, not necessarily an 'elepaio nest. We got a good look and so did the birds. And the sun was out. It was a wonderful bird tour.

*** END ***

Interested in joining a bird tour? Keep an eye on our events calendar for regular updates on new birding adventures across the Hawaiian Islands.

Hawai'i Audubon Society Donations and Membership

Mahalo for helping us inspire people to love and protect birds.

Founded in 1939, Hawai'i Audubon Society is an independent nonprofit 501(c)(3) organization.

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Ae'o, or Hawaiian stilt, in flight. ©Tom Fake

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Announcements

Calling all volunteers: seeking a chance to get involved in your community, do good for birds, and meet like-minded people? If so, we have several opportunities available.

- Freeman Seabird Preserve habitat restoration January - March
 - Kōlea Count:
count kōlea & contribute to community science
 - Hui Manu-o-Kū:
community science, bird rescue, tree monitoring

Scan this code to find out more, visit the websites listed below, or contact: office@hiaudubon.org



Events

November 9, 2024 - January 4, 2025: Annual Christmas Bird Count. Find more information about event dates on each island listed on our website:

<https://hiaudubon.org/christmas-bird-count/>

January 17: E Ola Kākou - Health Education Symposium. Details here: <https://sites.google.com/k12.hi.us/eolakakou>

February 2: World Wetlands Day

February 14-17: Great Backyard Bird Count, sponsored by National Audubon Society. Find more information here: <https://www.birdcount.org>

For more details and updates visit:

hiaudubon.org/events or email events@hiaudubon.org

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'Elepaio ISSN 0013-6069

Managing Editor: Laura Doucette

Scientific Editor: Eric VanderWerf, PhD

The 'Elepaio is printed on recycled paper and published six times per year.

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'ELEPAIO • 85:1 • JANUARY / FEBRUARY 2025

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Laura Zoller, Elena Arinaga, Susan Scott, Liz Kumabe Maynard, and Wendy Johnson at the STEAMFEST science fair. ©Susan Scott