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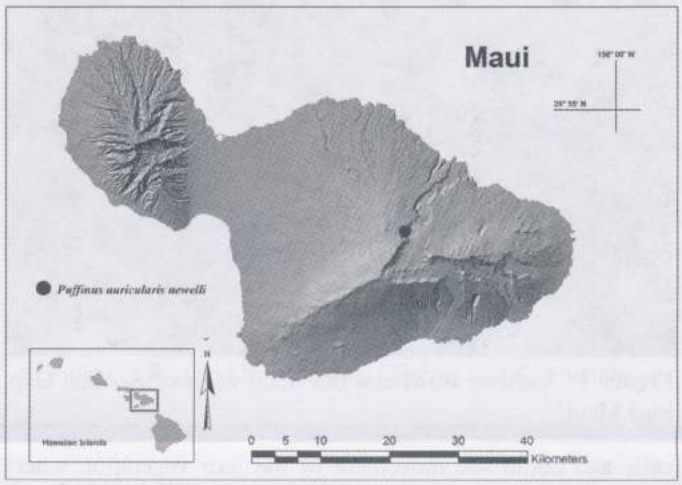
VEGETATION DESCRIPTION OF A NESTING SITE FOR NEWELL'S SHEARWATER (*PUFFINUS AURICULARIS NEWELLI*), PI'INA'AU STREAM, EAST MAUI, HAWAI'I

KENNETH R. WOOD[1] AND PAT BILY[2]

INTRODUCTION

After several centuries of research describing and observing species it is clear that islands are home to a great diversity of organisms, yet we still understand very little about their life cycles and habitat preferences. This is quite apparent in Hawai'i where we still have much to learn about many of our seabird breeding colonies. Newell's Shearwater or 'a'o (*Puffinus auricularis newelli*) is a subspecies endemic to the Hawaiian Islands and is listed as threatened under the U.S. Endangered Species Act. Nesting colonies have been observed on Kaua'i, Moloka'i, and Hawai'i (Ainley et al. 1997), and in small numbers on Lehua Islet (VanderWerf et al. 2007), yet there have been no published observations in recent years that confirm active nesting on O'ahu, Maui, and Lana'i. As a class, birds are second following terrestrial mollusks in the number of known extinctions over the past few centuries (Jenkins 1992), with these extinctions being mostly on islands (Bibby 1994). Bird populations were depleted mainly by over-hunting, predation by introduced vertebrates, and alteration of the original vegetation (Milberg & Tyrberg 1993).

Considering the importance of understanding the habitat preferences for Hawaii's seabirds we wish to contribute this short note on a previously undescribed nesting habitat for the Newell's Shearwater, the *Sadleria* ('ama'u) mixed shrubland community. On 17 March 2004 a Newell's Shearwater nesting site was observed while conducting research on East Maui within the upper Pi'ina'au headwater region situated within the Ko'olau Forest Reserve and just above the western wall of Ainahou Bowl of Ko'olau Gap (see Map 1). The breeding season of Newell's usually begins in March or April when birds return to land and establish nest sites. To date, nesting sites for Newell's have not been documented in *Sadleria* ('ama'u) dominated fern cover and are most often observed within steep mountainous terrain where they burrow under matting fern species in the Gleicheniaceae family such as *Dicranopteris linearis* (uluhe), *Diplopterygium pinnatum* (uluhe lau nui) and/or *Sticherus owhyhensis* (unuhe), and are frequently associated with sparse *Metrosideros* ('ōhi'a) and/or *Cheirodendron* ('ōlapa) tree cover with a varying presence of understory native shrubs. Substantial numbers of Newell's are also known to nest on sparsely vegetated cliffs in remote valleys on the dry leeward side of Kaua'i (Wood et al. 2001).



Map 1. Nesting site for Newell's Shearwater (*Puffinus auricularis newelli*), around the headwaters of Pi'ina'au Stream, and above the western walls of Ko'olau Gap, East Maui.

METHODS

Biological surveys were conducted along the northern slopes of Haleakalā, East Maui, during 1997–2008. Survey locations ranged in elevation from 820–1980 m and included sections of Ainahou Bowl, Hanawi, Honomanū, Kawaipapa, Kopili'ula, Pi'ina'au, Waikamoi, Wailua Iki, and Wailua Nui (Bily et al. 2003, 2004, and 2008; Wood 1997, 1999, 2001; Wood & Bily 2000, 2002, 2006; Wood et al. 2005). Although the main focus of this research was botanical, overnight vigils listening for seabird activity were also conducted. Several audile observations of Newell's were made around the western walls of Ainahou bowl (see Figure 1) and west Wailua Nui (Wood & Bily 2002; Bily et al. 2003, 2008), but only one precise nesting location for Newell's was visually observed during this research (Bily et al. 2004). This site was discovered on the evening of 17 March 2004 when the authors, along with M. Chimera, heard several Newell's arrive in the early evening (ca. 8:00 pm) and continue to make their distinctive 'braying donkey' calls for over one hour within 50 m of our Pi'ina'au headwater camp, ca. 1950 m elevation. The night was clear, the wind was light, and the moon was in a waning crescent phase. That evening the lead author (KRW) approached the general location of the

continued on page 64

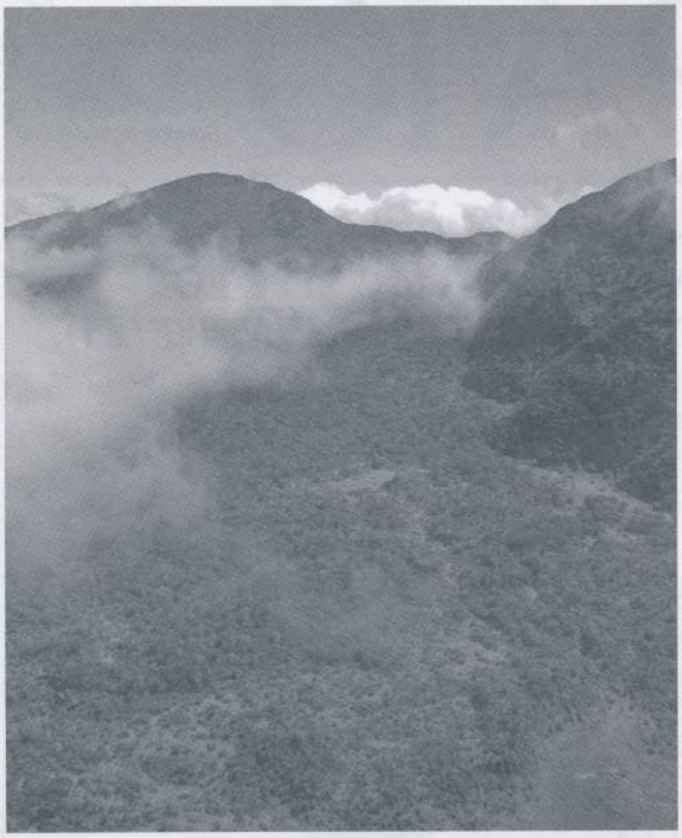


Figure 1. Ainahou Bowl and the steep walls of Ko'olau Gap, East Maui.

calls and could see movement in the fern vegetation where several Newell's were activity vocalizing. The site was flagged outside the dense fern cover and geographical coordinates were taken (i.e., UTM NAD83 0789912 – 2299220). In the morning KRW returned to the site and described the nesting location botanically by estimating a 250 m^2 circular plot (ca. 9 m radius) around the nest site and calculating the percentage of vegetation cover at several levels, including tree canopy, shrub cover, fern cover, herb cover, and sedge & grass cover. No attempt was made to walk through the dense fern-shrub layers, wishing not to disturb any hidden burrows within the plot, and therefore we do not include any descriptions of burrow shape, number of entrances, tunnels etc.

VEGETATION DESCRIPTION FOR NEWELL'S SHEARWATER NESTING SITE

Tree canopy layer (3–7 m). This Newell's nesting site is characterized by a 5% canopy cover of *Metrosideros polymorpha* ('ōhi'a) reaching heights of 3–7 m tall, along with a 1% cover of *Coprosma ochracea* (pilo) at 3 m. **Shrub layer (1.5–2.5 m).** Emergent through the ferns and ranging from 1.5–2.5 m in height, four species of native shrubs dominated 50% of the plot including 20% cover of *Leptecophylla tameiameiae* (pūkiawe), 10% cover of *Vaccinium dentatum* ('ōhelo), 10% *V. reticulatum* ('ōhelo), and 10% *Coprosma ernodeoides* ('aiakanēnē). There was also a 5% cover of the non-native shrub *Rubus argutus* (blackberry). **Fern layer (0.5–1.5 m).** Native ferns dominated 70% of the plot in this understory layer, including a 65% cover of *Sadleria cyatheoides* ('ama'u) at 1–1.5 m and a 5% cover of *Dryopteris fusco-atra* ('i'i) at 50–100 cm tall (see Figure 2). **Herb layer (<35 cm).** There was a 5% cover of non-native herbs, including *Prunella vulgaris* (selfheal) and *Lythrum mauritianum* (loosestrife). **Sedge & grass layer (<50 cm).** Sedges and grasses composed around 25% cover and included <1% native *Carex alligata* and 5% native *Deschampsia*

Figure 2. *Sadleria cyatheoides* ('ama'u) dominated nesting site for Newell's Shearwater (*Puffinus auricularis newelli*) on East Maui.

continued on page 65

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nubigena (hairgrass), with the remaining ca. 20% being non-native grasses, including 10% *Anthoxanthum odoratum* (sweet vernalgrass) and 10% *Holcus lanatus* (common velvet grass). Fresh pig disturbance was observed in 5% of the entire plot and only occurred in open grassy sections.

DISCUSSION

Understanding the distribution, abundance, and habitat requirements of rare species is fundamental in conservation initiatives. The fact that so many threatened species have very limited ranges leads to the obvious priority for identifying and protecting the uniquely important sites where they occur (Terborgh & Winter 1982). As previously stated, Newell's Shearwater are more commonly known to burrow under species of matting ferns in the Gleicheniaceae family, and there have been no previous reports of Newell's nesting in *Sadleria* ('ama'u) dominated fern cover. *Sadleria* represents a unique evolutionary lineage in the Blechnaceae family and is one of only three endemic fern genera in Hawai'i. Plants are characterized by decumbent to erect rhizomes that can be slender to trunk-like, have large fronds, and, considering the very dense *Sadleria* cover at this nesting site, would afford seabirds ample protection for burrowing into small openings and carrying out their nesting cycles. There are still large areas of *Sadleria* dominated habitat on the northern slopes of Haleakalā, E. Maui, especially along steep ridges and the windswept rims of upper valley walls where *Metrosideros* forests thin out and dense shrublands and fern dominated communities prevail. The substrate in this community type is mostly composed of a fine-grained brown-black soil, which can be easily burrowed into.

The 95% open canopy along with the absence of intermediate sized understory trees at this site is a significant attribute in that it may allow for an easy, open landing entrance for Newell's when returning to burrows. The 50% cover of native shrubs <2.5 m in height would give protection against weather and erosion and would also aid in preventing non-native animal disturbance. The relative remoteness of this site from human activity is noteworthy in that domesticated animals such as dogs (*Canis familiaris*) and cats (*Felis sylvestris*) would have limited access to these breeding grounds, although they are known to range into remote wet forest. The moderate 5° slope of this nesting location is relatively level when compared to other known Newell's sites, making seabird colonies in this region more vulnerable to invasive mammals. Predation by introduced mammals is considered a major cause of avian extinction in insular habitats (King 1985), and this site is potentially threatened by mongooses (*Herpestes auropunctatus*), rats (*Rattus* spp.), and pigs (*Sus scrofa*). Barn owls (*Tyto alba*) are also a serious threat to nesting seabirds, and are quite capable of predating on nests in the most vertical of habitats. Procellariidae, the family to which shearwaters belong, along with Columbidae, are most frequent among the extirpations of island populations (Milberg & Tyrberg 1993). Paleoenvironmental studies of subfossil birds indicate that around half the original avifauna in Hawai'i was lost in less than a millennium including several bizarre forms of large flightless ibises and anatids, at least a dozen species of flightless rails, a sea eagle, four species of owls, and a variety of passerines (Olson and James 1991; James and Olson 1991; Burney et al. 2001) and demonstrate the vulnerability of island biotas (Milberg & Tyrberg 1993).

The Pi'ina'au region of our study area (1650–1980 m elevation) is quite rich biologically. Adjacent to the windswept *Sadleria* ('ama'u) mixed shrubland community lies a vast expanse of *Metrosideros polymorpha* mixed wet forest dissected by dynamic riparian communities. The flora of this region includes 107 native taxa, 53 of which are dicots, 10 monocots, and 44 pteridophytes (fern taxa). Also of note, the Pi'ina'au region contains 14 Maui single island endemic plant taxa, which exceeds all other sites inventoried on Haleakalā's northern slope (Bily et al. 2004; Wood et al. 2005). Native forest birds, namely *Palmeria dolei* (Crested honeycreeper or 'ākohekohe), *Hemignathus virens wilsonii* (Maui 'amakihi), *Himatione sanguinea* ('apapane), *Paroreomyza montana* (Maui 'alauahio), and *Vestiaria coccinea* ('i'iwi) were also present and heard throughout our research, adding to the diversity of the region.

Safeguarding protected areas within centers of endemism such as the Pi'ina'au headwaters offers a pragmatic response for a high proportion of globally threatened animals and plants (Bibby 1994). By targeting disproportionately small, yet biologically rich areas we may greatly minimize the overall loss of species. There is a strong argument that the study and identification of critical habitat requirements for our threatened biota may more effectively direct conservation efforts in accomplishing the overall goal of conserving genes, species, populations, and ecosystems, and the value of such efforts can hardly be over-estimated. Since many island birds and plants are critically threatened and may only survive through the preservation of the remaining natural vegetation, combined efforts are actively in process. Most noteworthy are the conservation efforts being conducted by numerous members of the East Maui Watershed Partnership which include extensive fencing exclosures, weed eradication, and invasive animal removal to mention a few. It is recommended that further studies be conducted along the western rim of Ainahou Bowl to better understand the full extent of this Newell's Shearwater nesting population and determine if additional measures are needed to protect the colonies from excessive predation by introduced vertebrates during breeding season.

ACKNOWLEDGMENTS

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continued on page 66

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HAS Field Trips

Contact the HAS Office at: (808) 528-1432, hiaudsoc@pixi.com

There are no field trips for November

Saturday, December 6

Wetland Walking Tour, with Ron Walker

HAS Second Vice President and expert birder, Ron Walker, will lead you on a wetland birding tour. Contact the HAS office for more information and to reserve a space; be sure to leave your contact information.

Saturday, December 13, 1:00 p.m.

Energy Efficient Solar House, with John Harrison

HAS President John Harrison will give a tour of his energy efficient home which is run on solar power. Contact the HAS office for more information and to reserve a space; be sure to leave your contact information.

December 14 – January 5

Christmas Bird Count

Count dates and times for all islands will be announced in the next *'Elepaio* issue, and online at www.hawaiiaudubon.com. Join us in collecting important data for Hawaii's birds!

HAS Annual Awards Dinner 2008

Hawaii Audubon Society members, friends and distinguished guests gathered October 20th at Treetops Restaurant in Mānoa Valley for the Society's fifteteenth Annual Awards Dinner. This year's event featured a raffle and a silent auction which included over thirty books on birds and birding, and many beautiful handmade craft items. Awards were presented to five notable individuals and groups who were recognized for their contributions to environmental education and the protection of Hawaii's wildlife and habitats.

Dr. Frank Bonaccorso, wildlife biologist with the U.S. Geological Survey at the Pacific Island Ecosystems Research Center, gave a fascinating presentation entitled "A Night in the Life of 'Ōpe'ape'a: Radio Tracking the Hawaiian Hoary Bat." Working from his headquarters at the Hawai'i Volcanoes National Park, Dr. Bonaccorso has studied endangered 'ōpe'ape'a habits and habitats on the island of Hawai'i for many years. These elusive creatures are hard to spot in the wild, but Dr. Bonaccorso's resarch has provided valuable information on population trends, foraging and roosting behaviour, and seasonal movements in Big Island forests. The data indicates that existing Hawaiian hoary bat populations there are stable and should remain so if their habitat is carefully protected. The audience also enjoyed Dr. Bonaccorso's photos of bats he has studied around the world, from Africa to Europe and the South Pacific.

The following Annual Awards for 2008 were presented with great appreciation from the Hawaii Audubon Society Board of Directors:

President's Award

Hawai'i State Representative Cynthia Theilen was recognized for her years of dedicated pursuit of protections for Hawaii's environment. As an active member of both the House Energy and Environmnental Protection Committee and the Water, Land, and Ocean Resources and Hawaiian Affairs Committee, she has consistently promoted solid values of environmental advocacy through proposed legislation and incisive questioning of those who would undermine Hawaii's strong environmental laws. Ms. Theilen's specific interests range from global warming to renewable energy and native wildlife and habitat protection. She worked in support of the Ramsar designation of Kawainui Marsh and the Hawai'i Celebration of World Wetlands Day in February of 2008. Cynthia Theilen also initiated Project Kanu, which is a native tree planting program for Windward O'ahu schools.

Charles Dunn Lifetime Achievement Award

Dr. Fern Duvall, wildlife biologist with the Hawai'i Department of Land and Natural Resources, was recognized for his long-standing commitment to the protection of Hawaii's native wildlife. His dedication to habitat conservation and predator control has positively impacted seabird, forest bird, and wetland bird populations throughout the state. While he may be considered too young to be a recipient of an award for lifetime acheivement, the HAS Board of Directors is highly confident that Dr. Duvall's good works will continue for many years to come.

HAS Second Vice President Ron Walker presents the Charles Dunn Lifetime Achievement Award to Dr. Fern Duvall.

Volunteer Service Award

Pauline Kawamata, volunteer program manager for Hawai'i Nature Center, was recognized for her inspiring accomplishments in recruiting and organizing volunteers at the Pouhala Marsh on O'ahu. This site was recently a neglected tidal mudflat in need of extensive trash and alien species removal. Through the efforts of Ms. Kawamata and her teams of volunteers, Pouhala Marsh has been restored to its natural state and functions as a favored habitat for Ae'o, the endangered Hawaiian stilt. The marsh is now the site of Hawai'i Nature Center outdoor wetland programs for shool children

Conservation Award

Arleone Dibben-Young of Nēnē 'O Moloka'i has worked tirelessly to help conserve Hawaii's wetlands and the species they support. Ms. Dibben-Young works hands-on to restore native wetlands on the island of Moloka'i and she also volunteers her valuable time and energy to educate Molokai's school children about Hawaii's birds. She regularly authors news articles about native wildlife, leads wetland tours, conducts Avian Influenza surveillance, and organizes the annual Audubon Christmas Bird Counts on Moloka'i.

Environmental Education Award

Mālama Hawai'i, a hui of over 70 organizations and hundreds of individuals, was recognized as a vital network providing information and connections to promote the care of our island home. Mālama Hawai'i has used public awareness campaigns, educational programs, website development and community surveys to bring light to important environmental issues in Hawai'i. Recent accomplishments include: launch of the 2008 international Year of the Reef Campaign at the State Capitol, co-sponsorship of the first annual Keiki Ocean Fest at Waimanalo Beach park, creation of a website for Mālama Moanalua, and airing of the first two of three public service announcements regarding the plight of Hawaii's native duck, the Koloa maoli, on "Outside Hawaii."

Yellow-orange mantis shrimp, very pregnant swimming crab, ghost crabs running all over, and a baby barracuda! WHAT DO THESE ALL HAVE IN COMMON?

By Alice P. S. Roberts

Twelve of us went on the Hawaii Audubon Society Low Tide Reef Walk to Paikō Lagoon Wildlife Sanctuary, Saturday, August 30th, from 8 to 11:30 a.m. – scheduled to end at 10; however, some of us were having too much fun to leave! A couple of us have been there several times and we still never know what to expect.

We did see several Pacific Golden Plovers (Kōlea, *Pluvialis fulva*), a couple Ruddy Turnstones ('Akekeke/Keke, *Arenaria interpres*) doing their flipping thing, a White Tern (Manu-O-Kū, *Gygis alba*) flying high, 2 very close watchable Black-Crowned Night-Herons ('Auku'u, *Nycticorax nycticorax hoactli*) (one even caught and ate a fish!), and about 14 ducks of various color-patterns and therefore genetics - mallard X Koloa X whatever? We did not see the Wandering Tattler or the Black-Necked Stilt pair we have seen on several previous trips.

The red Northern Cardinal that has been there for years was absent; he used to sit on the wires at the end of Kuli'ou'ou Road and tell us about his territory. Of course we saw/heard Mynas, Pigeons/Rock Doves, Zebra/Barred Doves, Red-Vented Bulbuls, and House Sparrows.

In the water (tide was 0.1 foot), we tried corralling several Mullet schools, saw many teeny tiny Gobies and baby Mamo, a Lizardfish, and a baby Barracuda near the shoreline just hanging around looking like a floating twig, waiting. We caught a sickish Cardinal fish and watched a gorgeous but weird 2 foot long Snowflake Eel for about 10 minutes before it finally swam away – very slowly.

In a tiny tide pool, several 'ōpae (glass shrimp) were hovering; we caught 2, amazing to look through them and see their organs. At one spot, we saw a flash of yellow-orange, like a goldfish, but this was salt water... it was not a leaf ... it was swimming about 2 inches below the surface. Then it stopped on Daughn's shoe! Just sat there for all of us to see ... a Mantis Shrimp. Deena caught it in a peanut butter jar, amazing up close, what an incredible predator! It can bash shells and slice and spear fish. Last trip we caught only male crabs, well this day, we saw and caught both sexes, including one very pregnant swimming crab.

(L to R) Brandon, Karen, Alice, Deena, and Peter enjoyed the reef walk at Paikō Lagoon in August 2008

We threw many clumps of gorilla ogo (a "bad" invasive red algae) up above the high tide line to dry out and die, and some of the leathery invasive green as well.

For those of you that have been to Paikō with me before, we found "sand balls" very early-on, lots and lots of them! AND there were "tongues" everywhere! Shhhh, don't tell those who might go for their first time in mid to late April when the shorebirds leave for Alaska. FYI: if your Kōlea was late returning, Phil Bruner told us at the last Program Meeting that the Kōlea left Alaska about 2 weeks late this year.

As we returned to our starting point, we collected trash as usual, found one very strange boney plate about the size of my hand. Peter is taking it to Bishop Museum for ID when he volunteers next week.

See you in April 2009, Aloha, Alice

HAS Program Meeting

Program Meetings are sponsored by HAS and the UH Biology Department, and are held at UH Mānoa's St. John lab building (Botany Building) in room 011 (ground floor auditorium). The address is 3190 Maile Way. Attendance is free and open to the public.

November 10, Monday, 6:30 - 8:30 p.m.
Effect of Feral Cat Populations, with Namaka Bustos
Namaka Bustos, Hawaii Audubon Society board member and wildlife biologist, will speak on the effect of feral cat populations on native avian populations.

ATTENTION KŌLEA WATCHERS

A Special Request from Dr. Wally Johnson

This past summer we banded 30 Kōlea nesting near Nome, Alaska, and one of the birds was sighted near Hiroshima, Japan in September! From other studies, we know that many plovers migrate between Hawai'i and Alaska. Now it looks like there may also be a Kōlea connection between Alaska and the East Asian Flyway! It's almost certain that at least some of the plovers caught last summer are wintering in Hawai'i, but where? Please be sure to look closely at plover-legs during the '08-'09 winter season. We're keeping track of banded plovers in the Punchbowl and at the Veterans Cemetery in Kāne'ohe, but if you spot a banded Kōlea anywhere else we would be ecstatic to hear from you. Each plover wears a metal band plus a unique combination of color-bands. The Alaska bird combos from last summer are all very colorful. We used 4 colors (red, white, blue, green), in various individual combinations and both legs are carrying bands. It is important to record the exact sequence on each leg, and whether there is a color-band above or below the metal band.

Send observations with as much information as possible to:
Wally Johnson, Dept. of Ecology, Montana State University, Bozeman, MT 59717
Email: owjohnson2105@aol.com; Tel: 406-585-3502
MAHALO!

FIELD TRIP NOTES

By Ron Walker

On Saturday, October 25, a field trip sponsored by HAS and the U.S. Fish and Wildlife Service (FWS) was conducted at the Ki'i Unit of the James Campbell National Wildlife Refuge (NWR) in Kahuku on O'ahu. The day was overcast and rainy, but as the saying goes, "it was a good day for ducks!" Peter Donaldson, a volunteer with the FWS and one of Hawaii's premier birders, led the tour.

Everyone had excellent views of the resident native waterbirds including the Hawaiian Stilt, Coot, Moorhen and Koloa/Mallard hybrids. The indigenous Black-crowned Night Heron favored us with a profile pose on top of a water control structure. Mainland migrants were also present, including the Northern Pintail, Northern Shoveler, American Wigeon, and one Pectoral or Sharp-tailed Sandpiper. The photographers in the group were excited by a close-up view of a Hawaiian Coot nest with several chicks.

After the tour was over, Peter also found a Pectoral Sandpiper and a probable Green-winged Teal on the refuge, and two Dunlins at the Kahuku shrimp ponds. Ever the fanatic birder, he proceeded to the Honouliuli Unit of the Pearl Harbor NWR and recorded 18 Northern Pintails, 3 Northern Shovelers, 4 Wigeons, 1 Green-winged Teal, 1 Glossy or White-faced Ibis (a first-year bird), 1 Black-bellied Plover, 1 Curlew Sandpiper, 1 Dunlin, 2 Pectoral Sandpipers, 1 Snipe, and 4 Dowitchers.

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Calendar of Events

Monday, November 10
HAS Program Meeting
Effect of Feral Cat Populations, with Namaka Bustos
See page 68

Saturday, December 6
HAS Field Trip
Wetland Walking Tour, with Ron Walker
See page 66

Saturday, December 13
HAS Field Trip
Energy Efficient Solar House, with John Harrison
See page 66

December 14 – January 5
Annual Christmas Bird Count
Count details will appear in the next *'Elepaio* issue
Stay tuned!

Table of Contents