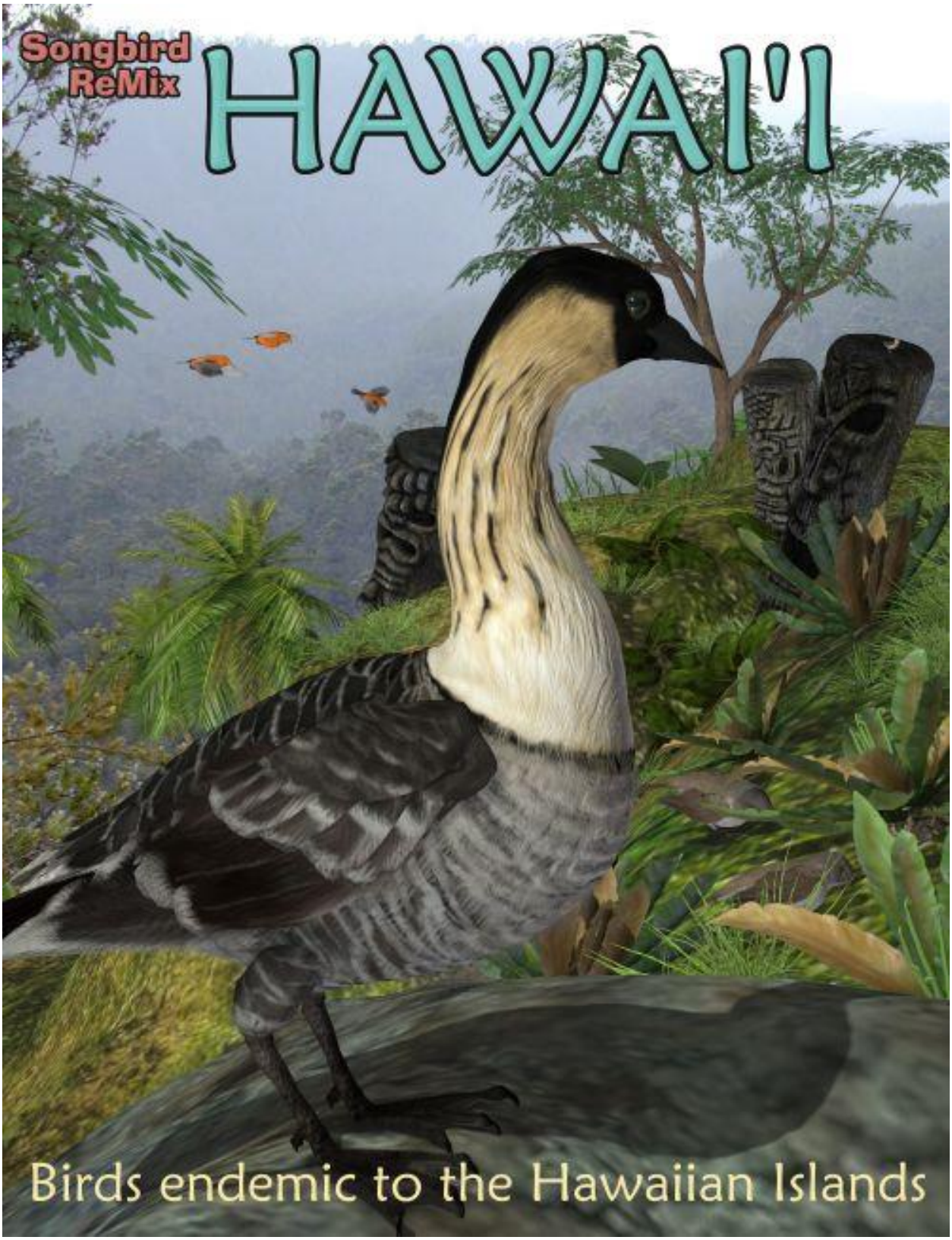


Avian Models for 3D Applications by Ken Gilliland

Songbird ReMix

Endemic Birds of Hawai'i

Contents

Introduction

Hawai'i has many of the most unique and usual bird species on the planet. Over half of the known bird species on Hawai'i evolved from the finch. Of the 71 known species of endemic Hawaiian bird, one-third are extinct and two-thirds of the remaining living species are endangered or threatened. This collection has almost half of the known species to inhabit Hawai'i (35 species, 41 birds in all).

The following birds and more are included in this set: The incredible extinct honeycreepers such as the Hawai'i mamo who's feathers adorn the cape of the great Hawaiian King, Kamehameha and the richly colored kakawahie. The Hawaiian Goose, the nēnē and the iwa (Great Frigatebird) that are perfect for coastal images. And the elusive woodpecker-like 'akiapola'au and vibrant scarlet 'i'iwi are awaiting a limb to perch on in your images set deep in the interior rain forest.

Whether you choose to create art with a message or you are simply looking for realistic and attractive birds for your imagery, this package will easily fulfill those needs.

Overview and Use

Select **Figures** in the Runtime folder then go to the folder that contains the **Songbird ReMix**. Here you'll find an assortment of files that are easily broken into 2 groups: **Conforming Parts** and **Bird Base models**. Let's look at what they are and how you use them

- **Bird Base Models included in this volume:**
  - **Songbird ReMix3 Base Model** – Used for the majority of birds in this package—if it doesn't have a number on the icon—it uses this model. **Note:** Both the Hawai'i Mamo and o'o nuku'umu (Black Mamo) **DO NOT USE** the "Bk-Close"morph. This morph should remain set to "0"; instead use the "Bk-Close4HoneyCrpr" found in the "Possible Action morphs" section
  - **Songbird ReMix3 WF1A and WF1B Palmate Base** - All bird species that are long or medium-necked Palmates (3 toed web feet) use this model (Albatrosses and Geese).
  - **Songbird ReMix3 WF2 and WF2B Totipalmate Base** - All bird species that are long or medium-necked Totipalmates (4 toed web feet) use this model (Boobies and Frigatebirds).
  - **Songbird ReMix3 WF3 Gull Base** - All bird species that are short-necked Palmates (3 toed web feet) use this model (Shearwaters and Terns).
  - **Songbird ReMix3 WF7 Small Wader Base** - All bird species that are small wading Shorebirds use this model (Stilts).
  - **Songbird ReMix3 Owl Base** - All bird species that are in the Owl family use this model.
- **Conforming Parts** (All Conforming Crests have alphabetical Icons that are identified in the lower right corners, for example: "C1", "C2" or "R". In the Pose folder you will find corresponding alphabetical Icons. All MAT/MOR files with the same icon use that

particular Conforming Part. Most conforming parts are Crests which cover the head part. When posing the Base Model, the Conforming Part will follow any Bend, Twist or Rotate Commands. It will not obey any **SCALE** or **MORPH** commands you give the Base Model. You must manually scale the Conforming Part and with morphs such as "OpenBeak" you must also set its counterpart in the head part of the Conforming Crest. So Now let's look at what's included in Conforming Parts:

- **<C07> Conforming Crest07.** For use with the 'alala and 'akohekohe . There is a Stretch morph in the head section that mirrors the base model's Stretch morph.
- **<C32> Conforming Crest32**. For use with the Magnificent Frigatebird. There are morphs such as "Deflate" in the BODY Section. **Be sure to read this:** Because of the shape of the Frigatebird's airsac, **neck motions are severely reduced**. There is no way, apart from creating a separate model specifically for the frigatebird's male breeding plumage, to limit the neck and Body EZ-Pose controls so these controls should be used sparingly or with a trial and error process. The parts that will cause the most adverse effects are: RetractNeck(BODY), most Neck EZ-Pose Controls (BODY), and all Bend, Side and Twist controls in Neck Section 3, 4 and 5. Try using the "WF1-2 Roost" pose for the breeding male Frigatebird and tweak the pose from there.

Quick Reference Guide

When using Poser or when going the route of using DAZ Studio's "Create Your Own" Base Models, here's a chart to help you figure out what model goes with what character. Load the appropriate base model and apply the character settings.

Load Model(s)	To Create… (apply MAT/MOR files)
 Songbird Model	• ʻākepa (ʻākepa) • 'akiapola'au ('Akiapola'au) • ʻakikiki (Kaua'i Creeper) • ʻamakihi (ʻAmakihi) • 'apapane ('Apapane) • ʻelepai'o (Hawaiian Wren) • ʻi'iwi (ʻI'iwi) • kakawahie (Moloka'i Creeper) • kāmaʻo (Large Kauaʻi Thrush) • kiwikiu (Maui Parrotbill) • Hawai'i mamo (Hawai'i Mamo) • Nihoa Millerbird • nukupu'u (Nukupu'u) • oloma'o (Lana'i Thrush) • oma'o (Hawaiian Thrush) • Oʻahu ʻalauahio (O'ahu Creeper • Oʻahu ʻŌʻō (O'ahu Honeyeater) • o'o nuku'umu (Black Mamo) • palila (Palia) • po'o-uli (Black masked Creeper)

 Songbird Model	• ‘alala (Hawaiian Crow) • 'akohekohe (Crested Honeycreeper)
 Long-necked Palmate	• nēnē (Hawaiian Goose)
 Medium-necked Palmate	• ka'upu (Black-footed Albatross)
 Medium-necked Totipalmate	• 'a (Masked Booby)
 Medium-necked Totipalmate	• iwa (Great Frigatebird)
 Short-necked Palmate	• ‘a‘o (Hawaiian Shearwater) • 'ewa 'ewa (Sooty Tern) • noi’o (Hawaiian Black Noddy)
 Small Wader Base	• ‘ae’o (Hawaiian Stilt)
 Owl Base	• pueo (Hawaiian Owl)

Note: Both the Hawai’i Mamo and o'o nuku'umu (Black Mamo) **DO NOT USE** the “Bk-Close”morph. This morph should remain set to “0”; instead use the “Bk-Close4HoneyCrpr” found in the “Possible Action morphs” section

Creating a Songbird ReMix Bird

1. Choose what you want to load. For this example, we'll create a finch species.
2. Load Poser or DAZ Studio and select **FIGURES** and the Songbird ReMix folder. DAZ Studio users will select the "Poser Formats" → "My Library" → "FIGURES" → "Songbird ReMix".
3. Because all of the finch use the "Songbird" base model we'll load that.
4. Go to the **POSES** folder and **Songbird ReMix** Master folder, then select the appropriate Songbird Remix library. This again, for DAZ Studio users will be found in the "Poser Formats" file section.
5. Select one of the finch Species and load/apply it by clicking the mouse on to our loaded Songbird ReMix base model. This species pose contains morph and texture settings to turn the generic model into the selected finch. It will automatically apply the correct DAZ Studio material settings if you are using DAZ Studio. As explained earlier in the Character Base Section, the Alphabet letter appearing on the base of a bird's Icon refers to what model it expects to adhere to. Thus the "Goose" character is going to want the <WF1> Waterfowl Palmate Base Songbird ReMix Model. Birds with no icon usually want the Songbird Base.

Displacement in Poser 5+

In Poser, several settings will help to bring out the best in this bird set.

Under "Render Settings" (CTRL+Y) make sure you check "**Use Displacement Maps**" and (in some rare cases) the "**Remove Backfacing Polys**" boxes. In some poses, the wing morphs will expose backfacing polygons which tend to render black. Clicking the "Remove Backfacing Polys" fixes this.

Scaling and Square Shadows in Poser

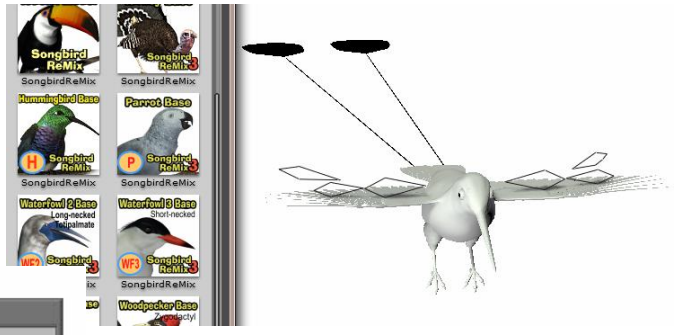
All the birds in this package have been scaled proportionally to DAZ 3D's Victoria and Michael models. The smallest of the included birds (such as Hummingbirds) **MAY** render with a Square shadow or improper lighting. This is a bug in Poser. Poser can't figure out how to render a shadow for something really small, so it creates a square shadow. There are two solutions: **1)** Put a larger item that casts a normal Poser shadow in the scene (even if it is off camera) and the square shadows will be fixed or **2)** scale the BODY of the bird to a larger size.

without prop off screen

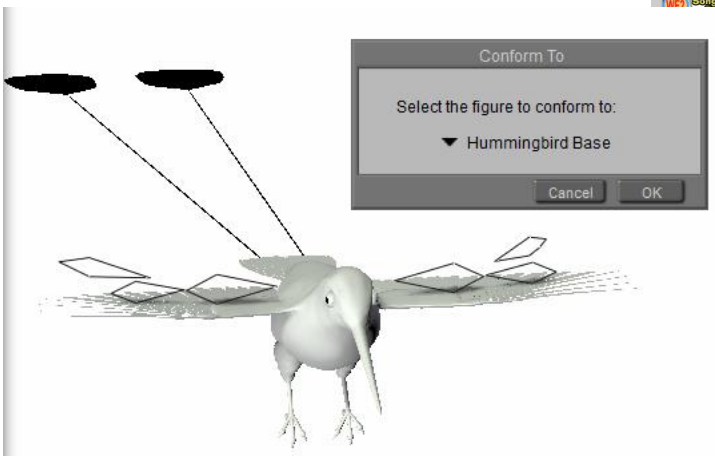
with prop off screen, lights/shadows will properly render

How to build a Songbird ReMix Character with a Conforming Part in Poser

1. In the Figures folder load a Bird base Model. Then load the appropriate conforming part for the bird you're trying to create.

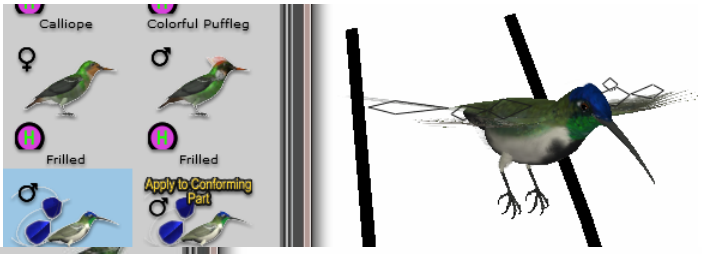


2. **Conform it** to the bird base model.

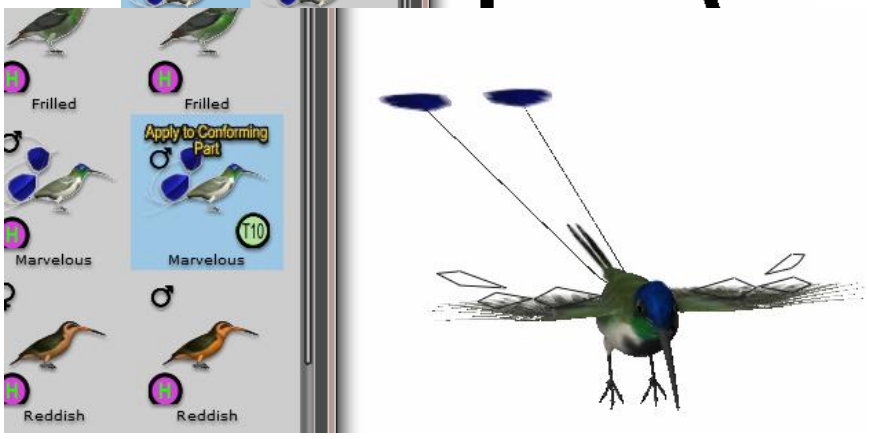


3. **Select the Base Model** and go to the **POSES folder.** Select and apply the appropriate Character/Material pose setting for the bird you're creating.

4. The Conforming part will look wrong. That's okay—we're going to fix that now. **Select the Conforming Part** and apply appropriate Character/Material pose for the part.



5. Voila! Your bird is done. Just remember to select the bird base when posing and often there are additional morphs in the conforming part you can use.



Alternative Beak Controls

Both the Hawai'i Mamo and o'o nuku'umu (Black Mamo) **DO NOT USE** the normal "Bk-Close" morph like the rest of the Songbird ReMix birds use. **This morph should remain set to "0";** instead use the "Bk-Close4HoneyCrpr" found in the "Possible Action morphs" section.

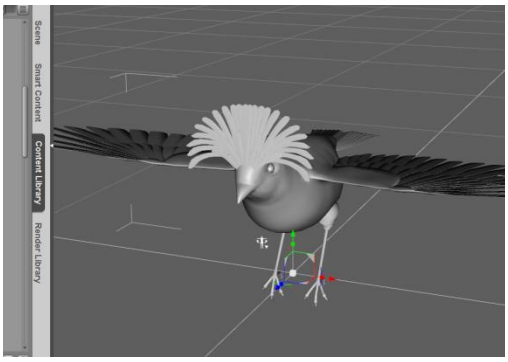
Updates and Freebies

The Songbird ReMix series is constantly growing and improving. New morphs and additions to upcoming and future products often end up benefiting existing sets with new geometry, morphs and textures.

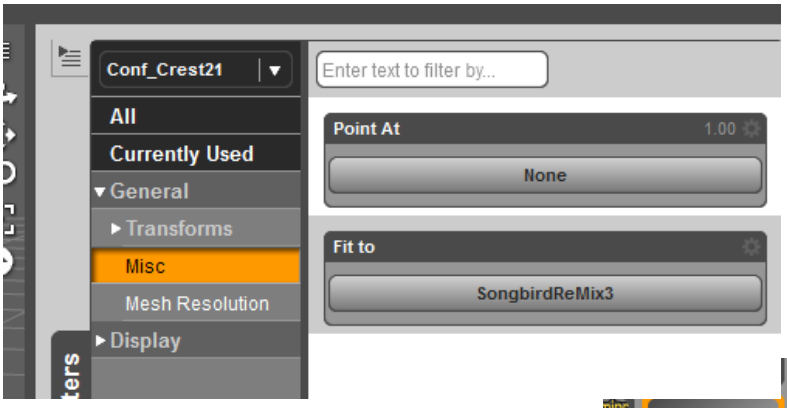
Songbirdremix.com always has the latest updates and additions to existing Songbird ReMix products (often months before they are updated at DAZ), plus the latest digital and real bird news, tutorials, videos, all the Field Guides, free bird characters, props and much more…

Songbird ReMix.com

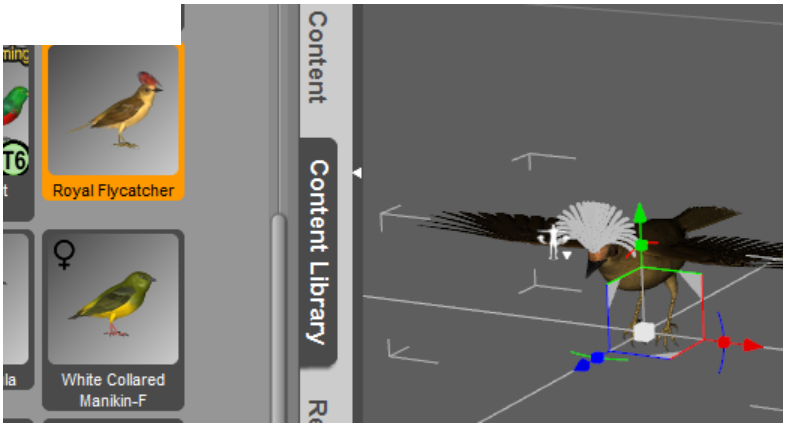
How to build a Songbird ReMix Character with a Conforming Part in DAZ Studio



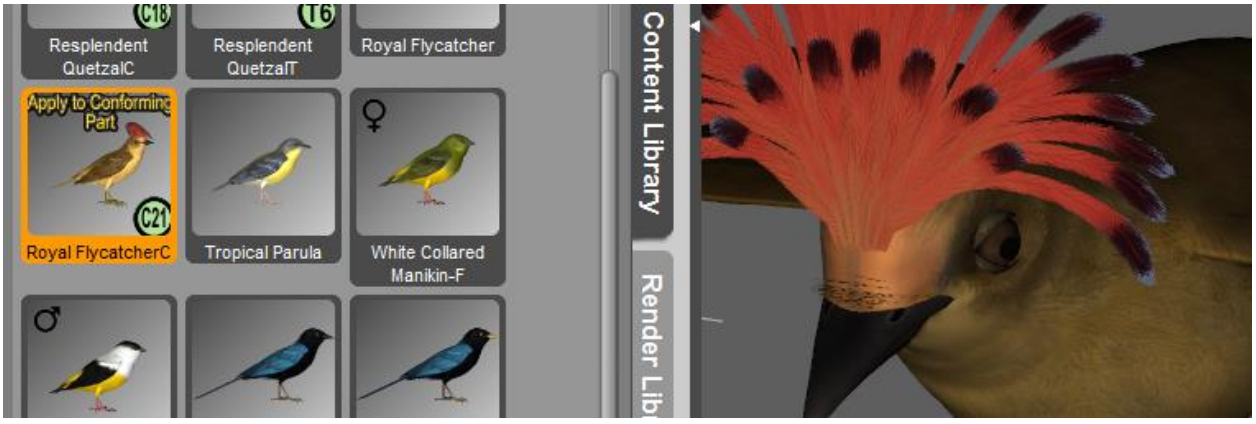
In the **Runtime** folder, select **Figures** and load the Songbird ReMix Model and the appropriate Conforming Crest in Studio. Select the Conforming Crest by selecting on the screen or in the **Scene** Tab.
Now, using the “FIT TO” command in the Parameters Tab, Select the Songbird ReMix Model. Go back to the **Scene** Tab and select the Songbird ReMix Model.



Select the Studio **Content** Folder and go to the **Animals : SBRM : !CreateYour Own : Characters** folder and select the appropriate Songbird Remix library. Apply the Character setting to the bird base. It will probably reduce the size significantly and change the shape of the bird.



Now that the bird is sized, select the conforming part and apply the conforming part character settings. Voila! Your bird is done. Just remember to select the bird base when posing and often there are additional morphs in the conforming part you can use.



Endemic Birds of Hawai'i
Field Guide

Albatrosses
ka'upu (Black-footed Albatross)

Petrels and Shearwaters
ʻaʻo (Hawaiian Shearwater)

Pelecaniformes
'a (Masked Booby)
iwa (Great Frigatebird)

Ducks and Geese
nēnē (Hawaiian Goose)

Gulls, Terns & Skimmers
'ewa 'ewa (Sooty Tern)

Shorebirds
ao'e (Hawaiian Silt)
noi'o (Hawaiian Black Noddy)

Owls
pueo (Hawaiian Owl)

Honeyeaters
Oʻahu ʻŌʻō (Oʻahu Honeyeater)

Warblers & Elepaio
ʻelepai'o (Hawaiian Wren)

Millerbirds
Nihoa Millerbird

Thrushes
oma'o (Hawaiian Thrush)
kāmaʻo (Large Kauaʻi Thrush)
oloma'o (Lana'i Thrush)

Crows
ʻalala (Hawaiian Crow)

Drepanidine Finches
palila (Palia)

Honeycreepers
ʻākepa (ʻākepa)
ʻamakihi (Amakihi)
'akiapola'au ('Akiapola'au)
nukupu'u (Nukupu'u)
ʻakikiki (Kaua'i Creeper)
kiwikiu (Maui Parrotbill)
'apapane ('Apapane)
ʻI'iwi (ʻI'iwi)
'akohekohe (Crested Honeycreeper)
po'o-uli (Black masked Creeper)
Oʻahu ʻalauahio (O'ahu Creeper)
kakawahie (Moloka'i Creeper)
Hawai'i mamo (Hawai'i Mamo)
o'o nuku'umu (Black Mamo)

Birds and Hawai'i

One-third of the birds found on the United States Endangered Species are found in Hawaii. Over thirty Hawaiian bird species are listed as endangered, more than anywhere else in the country. "That is the epicenter of extinctions and near-extinctions," said John Fitzpatrick, director of the Cornell Lab of Ornithology, which helped produce the study. "Hawaii is a borderline ecological disaster."

Hawaii's native birds are threatened by the destruction of their habitats by invasive plant species and feral animals like pigs, goats and sheep. Diseases, especially those borne by mosquitoes, are another killer. Because mosquitoes were introduced to the Hawaiian Islands by man, the endemic birds have no natural resistance to avian malaria. Most of the endemic birds are only found now in high elevation areas where mosquitoes can't survive.

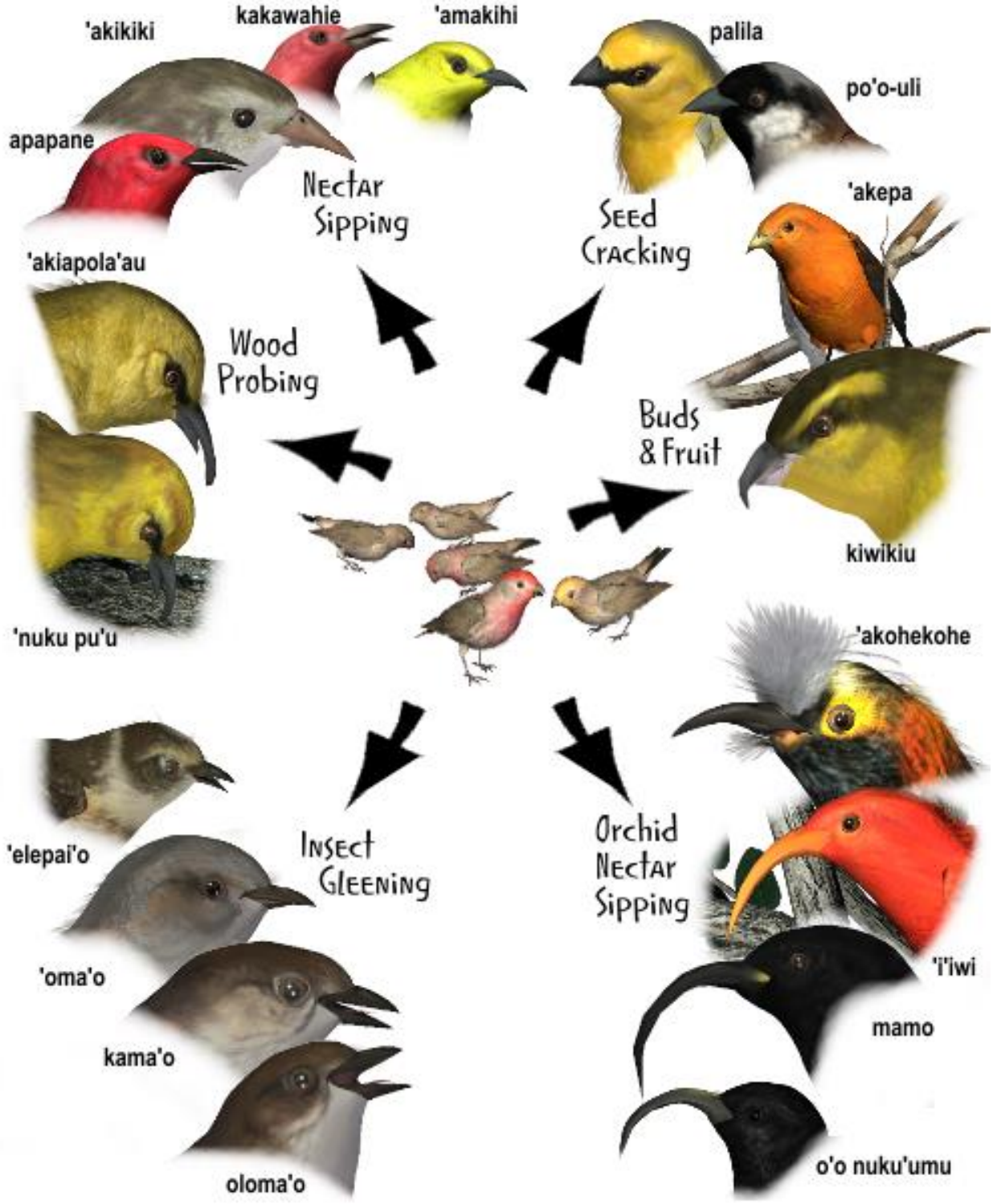
Mist rolls in at Hakalau Forest National Wildlife Refuge (Photo: Ken Gilliland)

While many species are moving to the extinction column, there is one Hawaiian success story. A habitat restoration project on the big island appears to be working. At the Hakalau Forest National Wildlife Refuge, workers installed fences, controlled invasive plant species, removed pigs, and planted koa and ohia trees (trees crucial to many endemic birds nesting and foraging). In 2009, Hakalau's populations of the Hawaii creeper and akiapolaau had increased dramatically.

Scott Fretz, wildlife program manager at the state's Division of Forestry and Wildlife, said he was confident such efforts could help restore all of Hawaii's endangered bird species, excluding those that have already become extinct.

"The basic, fundamental problem that we have is a lack of funding to do what we need to do," Fretz said. "If we had a lot more funding than we do, we would be able to recover most, if not all, of the species that we have that are endangered."

Fretz said the key is to get the US Congress to approve funding, which they been reluctant to do so far. Funding is the key to continue restoration efforts in Hawaii and to help it cope with climate change. Climate change is a serious issue in Hawaii because warmer temperatures allow mosquitoes to enter habitats at higher elevations currently inhabited by the endemic Hawaiian birds....



EVOLUTION of the FINCH

A number of Hawaiian Birds evolved from a single species of finch; each becoming a specialist at a specific food source.

Hawaiian Name: ka'upu

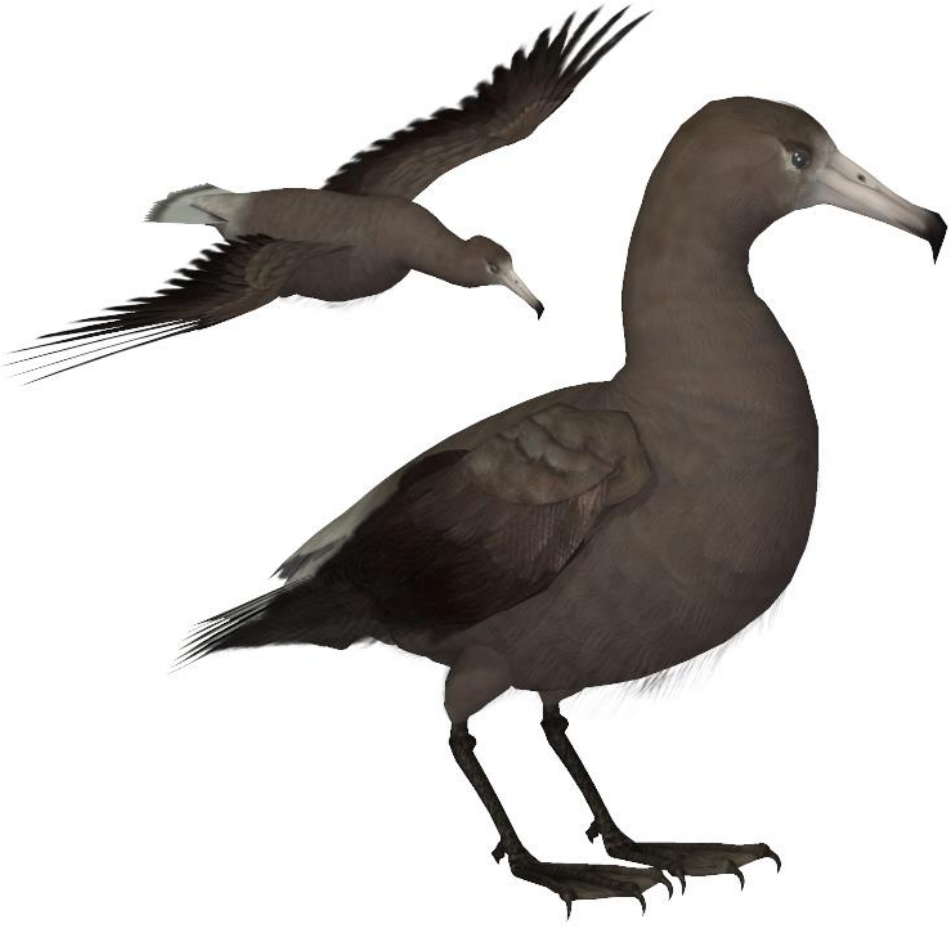
Common Name: Black-footed Albatross

Scientific Name: *Phoebastria nigripes*

Size: 32 inches (81 cm)

Habitat: Northern Pacific Hemisphere. They nest in colonies on isolated islands of the Northwestern Hawaiian Islands (Laysan and Midway), and the Japanese islands of Tori Shima, Bonin, and Senkaku. Found from Alaska to California and Japan

Status: Endangered. Global Population: 120,000 mature individuals. It is taken incidentally by long-line fishing. An estimated 4,000 to 8,000 are taken every year. It is also vulnerable to oil and ingestion of floating plastics, which reduces the space in the stomach available for food to be brought to the chick. All of its nesting sites in the U.S. are protected.



Diet: Fish, flying fish eggs, squid and to a lesser extent crustaceans.

Nesting: Albatrosses form long term pair-bonds that last for life. After fledging the birds return to the colony after three years, and spend two years building nests, dancing and being with prospective mates, a behavior that probably evolved to ensure maximum trust between the birds (raising an albatross chick is a massive energetic investment, and a long courting period establishes for both birds that the other is committed).

Nests are simple depressions scraped in the sand, into which one egg is laid. The egg is incubated for just over two months (65 days). Both birds incubate the egg, the male incubating more as the female leaves soon after hatching to recoup reserves used for egg-laying. The

average time spent on incubating shifts is 18 days. However, mates can wait up to 38 days to be relieved, and if something happens to the mate the other has been recorded incubating for 49 days without food or water.

The chick is brooded for 20 days by its parents, after which both parents leave the nest and return to feed the chick. The chick is fed regurgitated food by sticking its bill inside that of its parent. Fledging occurs after 140 days.

Cool Facts: The Black-footed Albatross is one of three Albatrosses found in the northern Hemisphere and is the only dark colored one. It has a keen sense of smell, which it uses to locate food across vast expanses of ocean. It will scare other predators away from its food by spreading its wings and screaming at it. It drinks seawater and excretes excess salt through glands above the eyes.

The Black-footed Albatross has a number of apparent adaptations to stay cool at hot, exposed nest sites. These include an extensive network of blood vessels in the head, as well as a habit of raising the feet off the ground.

Hawaiian name Ka'upu describes the bird's call.

Kona Coast, Hawai'i (Photo: Ken Gilliland)

Hawaiian Name: ʻaʻo

Common Name: Hawaiian or Newell's Shearwater
Scientific Name: *Puffinus newelli*

Size: 13 inches (33 cm); 76 cm wingspan

Habitat: Oceania; It breeds in at least 20 colonies on mountain slopes in the Hawaiian Islands. The main colonies are on Kauaʻi, on slopes around the Alakaʻi Plateau and probably in the Mokolea Mountains. Its distribution on the other islands is uncertain but it is known to breed on Molokaʻi and the island of Hawaiʻi and may breed on Oʻahu, Maui and Lānaʻi. From April to November it can be seen in the waters around the Hawaiian Islands, particularly around Kauaʻi. Outside the breeding season it disperses into the tropical Pacific Ocean. Its distribution at sea is little known but many move south and east into the waters of the Equatorial Counter Current. It has been recorded as far west as the Mariana Islands. In the south there are recorded sightings from Samoa in September 1977 and American Samoa in January 1993.

Status: Endangered. **Global Population:** 33,000 - 38,600 mature individuals and rapidly decreasing. On Kaua`i, hurricanes Iwa and Iniki devastated the forests in 1982 and 1992, and, since the latter, the species's population has been declining. Given that a large proportion of the population breeds on Kaua`i, catastrophic events, like hurricanes, are a serious threat.

Subsequent and ongoing habitat modification by alien invasive plant species, such as strawberry guava *Psidium cattleianum*, and feral pigs and goats, pose a significant threat. This is likely to be a contributing factor at one known colony abandonment. The recent establishment of the two-spotted leafhopper *Sophonia rufifascia*, which feeds on *D. linearis*, could be a further problem. Predation (e.g. by cats, rats, dogs, Barn Owls *Tyto alba* and pigs) is an additional threat. Predation of adults and juveniles by cats has been documented on Kaua`i, and rats are assumed to take eggs and chicks. Another potential predator, the small Asian mongoose *Herpestes javanicus*, has recently been discovered on Kaua`i. An estimated 70 adults and 280 subadults each summer, and at least 340 fledglings each autumn, die as a result of collisions with power-lines and communications towers, or indirectly because of light attraction. Birds attracted by artificial lighting become exhausted and fall to the ground. Once on the ground, fledglings are unable to

fly and many are killed by cars or cats and dogs, and some die from starvation or dehydration. Between 1978 and 1981, more than 5,000 individuals were grounded on Kaua`i, and over 30,000 have been recovered since 1979. On Kaua`i, approximately 1,500 fledglings are recovered annually after becoming grounded. Nine communications towers have recently been constructed on the Hawaiian islands without proper consultation, and these are now the subject of an ongoing lawsuit. A field of wind generators is planned for Lana`i, where the species potentially breeds, although this is thought to be unlikely. On Hawai`i, cinder mining has resulted in habitat loss at several colonies. The species may suffer indirect impacts from the over-fishing of tuna *Thunnus* species, which drive prey species to the ocean surface. This could have implications for the energetic costs of foraging, with potential impacts on chick growth and fledging success. Fledglings have been found with pox lesions, suggesting that disease may be affecting breeding populations.

Diet: Squid and small fish. It feeds far from land, in areas of deep water (at least 2000 meters). It dives into the water to catch its prey, swimming down to a depth of up to 10 meters using its wings to move forward. It is attracted to schools of tuna and gathers in flocks with other seabird species to catch prey driven to the surface by the tuna.

Breeding: The upper parts are black with a brown tinge while the under parts are white. The dark coloration on the face extends below the eye and is sharply separated from the white throat. There is a white patch on the flanks, extending onto the sides of the rump. The under wings are mainly white with a dark border. The under tail-coverts have a black and white pattern and appear white in the field. The bill is dark grey or brown and the legs and feet are mainly pale pink.

The nest site is a burrow dug into a steep slope, usually sheltered by uluhe (*Dicranopteris linearis* ferns). A single white egg is laid during the first two weeks of June. Both parents incubate the egg and an incubation period of 62 days has been recorded. The young birds leave the nest in October, 88-100 days after hatching. They fly out to sea and are no longer dependent on their parents.

Cool Facts: It is named after Brother Matthias Newell, a missionary who worked in Hawaii from 1886 to 1924. By 1908, it was thought to be extinct but was rediscovered in 1947 and found breeding on Kaua‘i in 1967. It is known in Hawaiian as the ‘a‘o which describes its’ call.

The bird flies low over the water on stiff wings with a mixture of short glides and periods of rapid flapping.

Hawaiian Name: ʻa
Common Name: Masked Booby
Scientific Name: Sula dactylatra

Size: 29-34 inches (74-86 cm)

Habitat: Tropical Oceans; from the Caribbean, across the Pacific Ocean, to Hawaii, Australia, and Indonesia-- a rare visitor to the United States.

Status: Least Concern. **Global Population:** Unknown. At least some mortality from tangling in fishing gear, but this problem is not known to be significant. Probably have frequent interactions with purse-seining tuna fisheries, as the fisheries often use Masked Boobies and other seabirds to locate tuna schools, but no data exist.

Diet: Fish and squid. Plunge-dives from various heights up to 30 meters (100 feet) into schools of fish.

Nesting: Sexes are similar. Female slightly larger. Nests are a slight depression on ground, surrounded by circle of pebbles or other debris, often near a breezy cliff edge or other take-off feature. One to two light blue eggs are laid. Although the Masked Booby regularly lays two eggs, it never raises two young. The first egg is laid four to nine days before the second, and the older chick always ejects the second from the nest. The parents do not protect or feed the ejected chick, and it is quickly scavenged by a host of associated crabs, landbirds, and frigatebirds

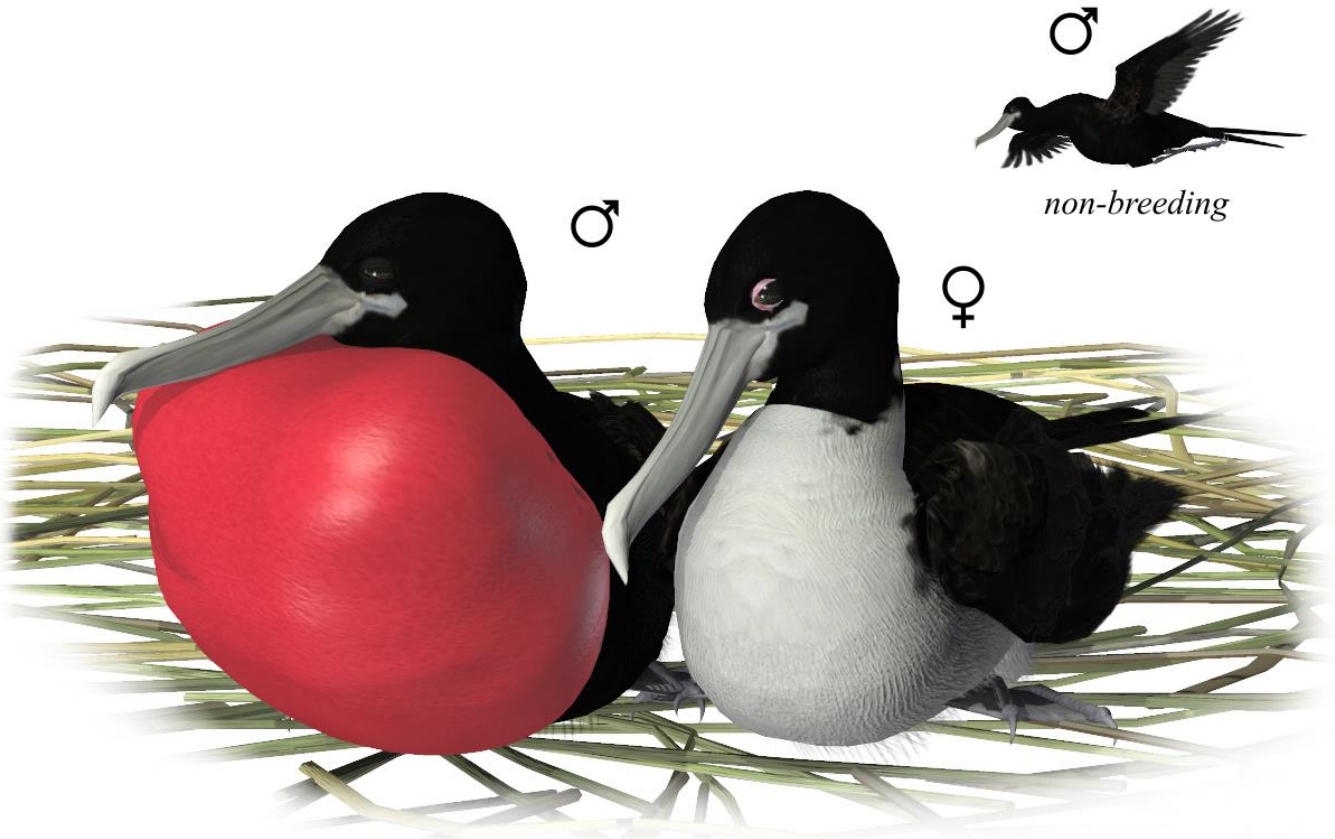
Cool Facts: The population of Masked Boobies breeding along the Pacific Coast of northern South America, including the Galapagos, was recently recognized as a separate species, the Nazca Booby. The Nazca Booby is smaller and has an orange, not yellow bill, which is significantly shorter and shallower, and whereas, the Masked Booby usually nests on low, flat areas, the Nazca Booby uses cliffs and steep slopes. It is known in Hawaiian as the ʻa which describes its' call.

Hawaiian Name: iwa
Common Name: Great Frigatebird
Scientific Name: Fregata minor

Size: 33-41 inches (85-105 cm); 205–230 cm Wingspan

Habitat: Tropical Oceans; Hawaii is the northernmost extent of their range in the Pacific Ocean, with around 10,000 pairs nesting mostly in the Northwestern Hawaiian Islands. In the Central and South Pacific, colonies are found on most islands Groups from Wake Island to the Galapagos Islands to New Caledonia with a few pairs nesting on Australian possessions in the Coral Sea. Colonies are also found on numerous Indian Ocean islands including Aldabra, Christmas Island, Maldives and Mauritius. The small populations in the Western Atlantic Ocean may still persist but are very small if they do. Great Frigatebirds undertake regular migrations across their range, both regular trips and more infrequent widespread dispersals. Birds marked with wing tags on Tern Island in French Frigate Shoals were found to regularly travel to Johnston Atoll (873 km), one was reported in Quezon City in the Philippines. Despite their far ranging birds also exhibit philopatry, breeding in their natal colony even if they travel to other colonies.

The Great Frigatebird forages in pelagic waters within 80 km (50 mi) of the breeding colony or roosting areas.



Status: Least Concern. **Global Population:** 340,000 - 1,000,000 mature individuals. The population is suspected to be in decline owing to ongoing habitat destruction and unsustainable levels of exploitation.

Diet: Flying fish, other fish species and squid. Prey is snatched while in flight, either from just below the surface or from the air in the case of flying fish flushed from the water.

Nesting: Male Great Frigatebirds are smaller than females, but the extent of the variation varies geographically. The plumage of males is black with scapular feathers that have a purple-green iridescence when they refract sunlight. Females are black with a white throat and breast and have a red eye ring. Juveniles are black with a rust-tinged white face, head and throat.

Great Frigatebirds are seasonally monogamous, with a breeding season that can take two years from mating to the end of parental care. The species is colonial, nesting in bushes and trees (and on the ground in the absence of vegetation) in colonies of up to several thousand pairs. Nesting bushes are often shared with other species, especially Red-footed Boobies and other species of frigatebirds.

Both sexes have a patch of red skin at the throat that is the gular sac; in male Great Frigatebirds this is inflated in order to attract a mate. Groups of males sit in bushes and trees and force air into their sac, causing it to inflate over a period of 20 minutes into a startling red balloon. As females fly overhead the males waggle their heads from side to side, shake their wings and call. Females will observe many groups of males before forming a pair bond. After forming a bond the pair will choose a nesting site, which may be at the display site or another location; once a nesting site has been established both sexes will defend their territory (the area surrounding the nest that they are able to reach) from other frigatebirds.

Pair bond formation and nest-building can be completed in a couple of days by some pairs and can take a couple of weeks (up to four) for other pairs. Males collect loose nesting material (twigs, vines, flotsam) from around the colony and off the ocean surface and return to the nesting site where the female builds the nest. Nesting material may be stolen from other seabird species (in the case of Black Noddies the entire nest may be stolen) either snatched off the nesting site or stolen from other birds themselves foraging for nesting material. Great Frigatebird nests are large platforms of loosely woven twigs that quickly become encrusted with guano. There is little attempt to maintain the nests during the breeding season and nests may disintegrate before the end of the season.

A single dull chalky-white egg measuring 68 x 48 mm is laid during each breeding season. If the egg is lost the pair bond breaks; females may acquire a new mate and lay again in that year. Both parents incubate the egg in shifts that last between 3–6 days; the length of shift varies by location, although female shifts are longer than those of males. Incubation can be energetically demanding, birds have been recorded losing between 20–33% of their body mass during a shift.

Incubation lasts for around 55 days. Great Frigatebird chicks begin calling a few days before hatching and rub their egg tooth against the shell. The altricial chicks are naked and helpless, and lie prone for several days after hatching. Chicks are brooded for two weeks after hatching, during this time they become covered in white down. Then they are guarded by a parent for another fortnight. Chicks are given numerous meals a day after hatching, once older they are fed every one to two days. Feeding is by regurgitation, the chick sticks its head inside the adult's mouth.

Fledging occurs after 4–6 months, the timing dependent on oceanic conditions and food availability. In bad years (particularly El Niño years) the period of care is longer. After fledging chicks continue to receive parental care for between 150–428 days; frigatebirds have the longest period of post-fledging parental care of any bird. The diet of these juvenile birds is provided in part by food they obtained for themselves and in part from their parents. Young fledglings will also engage in play; with one bird picking up a stick and being chased by one or more other fledglings. After the chick drops the stick the chaser attempts to catch the stick before it hits the water, after which the game starts again. This play is thought to be important in developing the aerial skills needed to fish.

Cool Facts: The Great Frigatebird is a large seabird and, despite its name, it is the second largest frigatebird, after the Magnificent Frigatebird. The frigatebirds have the highest ratio of wing area to body mass, and the lowest wing loading of any bird. It has been hypothesized that this enables the birds to utilize marine thermals created by small differences between tropical air and water temperatures.

The Hawaiian name, iwa, means “thief”.

Sea turtle on black sand beach, Hawai’i (Photo: Ken Gilliland)

Hawaiian Name: nēnē
Common Name: Hawaiian Goose
Scientific Name: *Branta sandvicensis*

Size: 25 inches (64 cm)

Habitat: Oceania; restricted to Hawai‘i, Maui, Moloka‘i, and Kaua‘i. Historically, it was also found on Kaho‘olawe and Lāna‘i.

The Nēnē is an inhabitant of shrubland, grassland, coastal dunes, lava plains, and related anthropogenic habitats such as pasture and golf courses from sea level to as much as 2,400 m. Some populations migrated between lowland breeding grounds and montane foraging areas.

Status: Vulnerable. Global Population: 1,241. It is believed that it once was common, with approximately 25,000 Hawaiian Geese living in Hawai‘i when Captain James Cook arrived in 1778. However, hunting and introduced predators, such as Small Asian Mongooses, pigs, and cats, reduced the population to 30 birds by 1952.

Other threats include disease and parasites, inbreeding depression, loss of adaptive skills in captive-bred birds and dietary deficiencies. Feral cats carry a protozoan organism (*Toxoplasma gondii*) which causes toxoplasmosis, a disease that can be fatal in the species. Road-kills are an important threat on Hawai`i and probably on Maui. Indeed road-kills were found to be the most common cause of known adult mortality on Hawai`i from 1989 to 1999.

While breeding in captivity has been successful, recruitment in the wild is low in this species. Yearly average hatching success was only 55% (range 44-77%), probably because of introduced predators rather than inbreeding. A yearly average of only 30% (range 0-50%) of nestlings fledged, with most lost to starvation, dehydration and predation. Recruitment into the breeding population is low, with only 42% of tracked fledglings

eventually attempting to breed. An average of 35% of the population breed each year, probably limited by food availability, which affects the females condition.

Diet: Leaves, seeds, fruit, flowers of grasses and shrubs.

Breeding: The male and female of the species look similar with the exception that males are 10% larger.

The breeding season of the Nēnē, from August to April, is longer than that of any other goose; most eggs are laid between November and January. Unlike most other waterfowl, the Nēnē mates on land. Nests are built by females on a site of their choosing, in which one to five eggs are laid (average is three on Maui and Hawai‘i, four on Kaua‘i). Females incubate the eggs for 29 to 32 days, while the male acts as a sentry. Goslings are precocial, able to feed on their own; they remain with their parents until the following breeding season.

Cool Facts: The Nēnē evolved from the Canada Goose (*Branta canadensis*), which most likely migrated to the Hawaiian islands 500,000 years ago, shortly after the island of Hawai‘i was formed. This ancestor is the progenitor of the Nēnē as is the prehistoric Giant Hawai‘i Goose and Nēnē-nui (Branta hylobadistes). The Nēnē-nui was larger than the Nēnē, varied from flightless to flighted depending on the individual, and inhabited the island of Maui. Similar fossil geese found on O‘ahu and Kaua‘i may be of the same species. The Giant Hawai‘i Goose was restricted to the island of Hawai‘i and measured 1.2 m in length with a mass of 8.6 kg, making it more than four times larger than the Nēnē. It is believed that the herbivorous Giant Hawai‘i Goose occupied the same ecological niche as the goose-like ducks known as moa-nalo, which were not present on the Big Island. Based on mitochondrial DNA found in fossils, all Hawaiian geese, living and dead, are closely related to the Giant Canada Goose (*B. c. maxima*) and Dusky Canada Goose (*B. c. occidentalis*).

Nēnē’s strong toes are padded and have reduced webbing, an adaptation that allows it to swiftly traverse rough terrain such as lava plains.

The Hawaiian name, Nēnē refers to the birds’ call.

Nene at Volcano National Park, Hawai’i (Photo: Ken Gilliland)

Hawaiian Name: ‘ewa ‘ewa

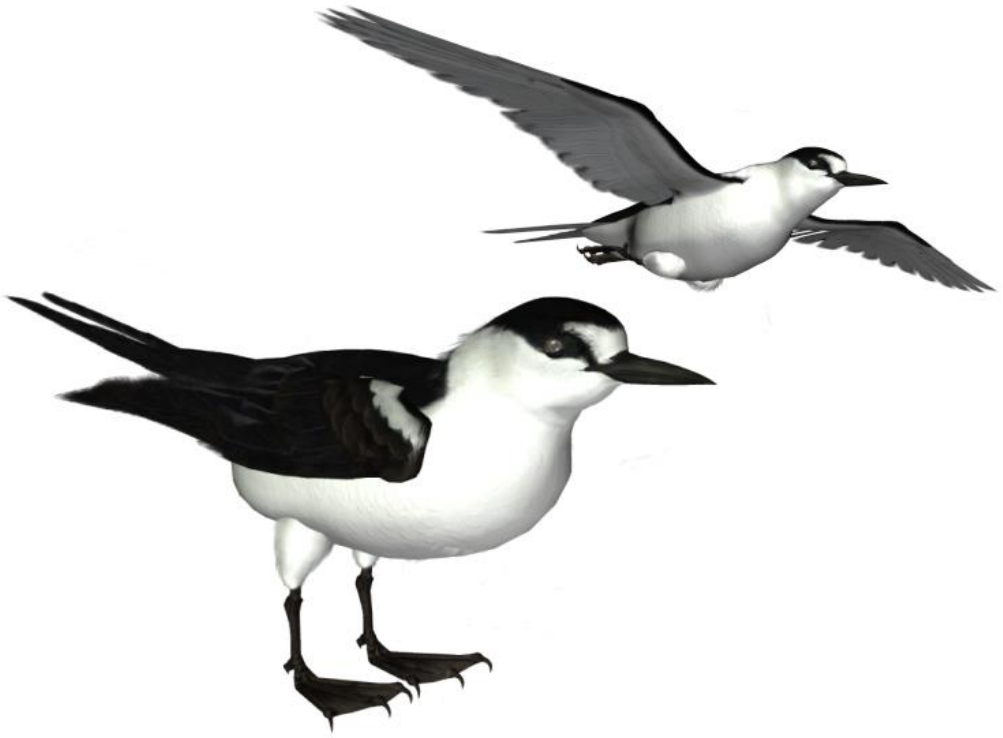
Common Name: Sooty Tern

Scientific Name: *Onychoprion fuscatus (formerly Sterna fuscata)*

Size: 13-14 inches (33-36 cm)

Habitat: Pacific & Indian Oceans. This bird is migratory and dispersive, wintering more widely through the tropical oceans. It has very marine habits compared to most terns. This species is a rare vagrant to Western Europe and is also not normally found on the Pacific coasts of the Americas due to its pelagic habits, however in Baja California several nesting locations have been found. It breeds normally on islands throughout the equatorial zone.

Status: Least Concern. **Global Population:** 21,000,000 - 22,000,000 mature individuals. The overall population trend is uncertain, as some populations are decreasing, while others are increasing or are unknown.



Diet: These birds often fly in large flocks, catching small fish on the surface in marine environments

Nesting: It breeds in colonies on rocky or coral islands creating a nest in a ground scrape or hole. It lays one to three eggs.

Cool Facts: It is known as the "Wideawake Tern" or just "Wideawake". These names refers to the non-stop calls produced by a colony of these birds, as does the Hawaiian name ‘ewa ‘ewa which roughly means "unpleasant noise". There are two subspecies of Sooty Terns; Onychoprion fuscatus fuscatus (Atlantic Sooty Tern, Underparts white. Breeds Atlantic and Caribbean) and Onychoprion fuscatus nubilosus (Indopacific Sooty Tern; Underparts light grey in fresh plumage, dull white in worn plumage. Breeds from Red Sea across Indian Ocean to at least central Pacific)

Sooty Terns rarely come to land except to breed, and can stay out to sea either by soaring or floating on the water for between 3 to 10 years.

Hawaiian Name: noiʻo

Common Name: Hawaiian Black Noddy

Scientific Name: *Anous minutus melanogenys*

Size: 15 inches (38 cm)

Habitat: Oceania; throughout the Hawaiian Archipelago, including all islands of NWHI and the coastal cliffs and offshore islets of MHI. Outside of Hawaiʻi, noio (black noddy) breed on islands throughout the world's tropical oceans. Noio (black noddy) typically remain near (within 80 kilometers [50 miles]) their breeding colonies year-round.

Status: Least concern. **Global Population:** 2,000,000-3,000,000 mature individuals. In Hawaiʻi, population estimated at 12,000 breeding pairs with the largest populations occurring on Midway Atoll (6,000 pairs) and Nihoa (5,000 pairs). All sites in NWHI are free of rats and cats, however the MHI support large populations of non-native mammalian predators and like all seabirds, adults and nests are susceptible to predation by rats *(Rattus spp.*), and feral cats (*Felis silvestris*). Also ʻIwa or great frigatebirds (*Fregata minor*), Laysan Finches (*Telespiza cantans*), and shorebirds will depredate eggs and chicks. Kayak and zodiac tours of sea caves used for nest sites can result in adults flushing from nests, resulting in predation by native birds. And because noiʻo (black noddy) rely on predatory fish to drive prey to the surface, overfishing may eventually affect Hawaiian populations.

Diet: Primarily takes juvenile goatfish, lizardfish, herring, flying fish, and gobies. Often forages in large, mixed species flocks associated with schools of large predatory fishes which drive prey species to the surface. Noiʻo generally forage in near shore waters and feeds mainly by dipping the surface from the wing or by making shallow dives.

Nesting: Individuals have slender wings, a wedge-shaped tail, and black bill which is slightly decurved. Adult males and females are sooty black with a white cap and have reddish brown legs and feet; bill droops slightly.

These birds make nests in caves, or rocky ledges of sea cliffs in late spring. Usually, Noi'o nest together as a colony. The females lay only one egg each year. They can often be seen hunting fish near their nesting sites. Established pairs return to the same nest site year after year. Breeding is highly variable and egg laying occurs year-round. Both parents incubate the single egg, as well as brooding and feeding the chick. Birds first breed at two to three years of age, and the oldest known individual was 25 years old.

Cool Facts: Noi'o are unusual because they are endemic coastal birds that reside in Hawai'i year round, while most of Hawaiian sea birds spend winters in Hawai'i, and leave in summer to breed in the arctic. Their cousins, Noi'o Koha, or Brown Noddys, nest on the ground, and because of this have not survived on the main islands, where they have been wiped out by predators.

Seven noi'o (black noddy) subspecies are generally recognized, and two are resident in Hawai'i: *A. s. melanogenys* (MHI) and *A. s. marcusi* (NWHI).

Flight is swift with rapid wing beats and usually direct and low over the ocean; this species almost never soars high.

Kihikihi (Moorish Idol). Hawaii has over 600 fish species. **(Photo: Ken Gilliland)**

Hawaiian Name: āeʻo

Common Name: Hawaiian Stilt

Scientific Name: *Himantopus himantopus knudseni*

Size: 16 inches (40.6 cm)

Habitat: Oceania; endemic to the Hawaiian Islands, USA. The āeʻo can still be found on all the major islands except Kahoʻolawe. Stilt numbers have varied from 1,100 to 1,783 between 1997 and 2007, according to state biannual waterbird survey data, with Mau'i and Oʻahu accounting for 60-80% of them. On Oahu, the largest numbers are found at Pearl Harbor and Kaneohe.

Studies have proven that the stilts fly from one island to another. The āeʻo requires shallow brackish water ponds, mud flats and shorelines where it finds its diet of small invertebrates.

Status: Endangered.
Global Population: 1500 mature individuals. The aeʻo was once a popular game bird, but waterbird hunting was banned in 1939. State and Federal effort in protecting wetlands, enforcing strict hunting laws, educating, and working with private organizations and landowners, play an important role in ensuring the livelihood of the aeʻo and many other waterbirds.

The primary causes of the decline of this Hawaiian native waterbird has been the loss and degradation of wetland habitat and introduced predators (e.g., rats, dogs, cats, mongoose). Other factors include alien plants, introduced fish, bull frogs, disease, and sometimes environmental contaminants.

Four stilt eggs were received in 1980 from the U.S. Fish and Wildlife Service, and were among the first to be raised and studied in a successful in-zoo propagation program at the Honolulu

Zoo. Since then more stilts have been raised at the zoo, including the ones seen in the Hawaiian water bird exhibit. Because it is often hard to observe all aspects of stilt behavior in the wild, the zoo program allows us to observe this endangered species more closely, and the information gathered can help not only in propagation but in protection of this unique Hawaiian bird.

Diet: Wide variety of invertebrates and other aquatic organisms (worms, crabs, fish). They like to loaf around in open mudflats, sparsely vegetated pickleweed mats, and open pasture lands perhaps because visibility is good. Specific water depths of 13 cm (5 inches) are required for optimal foraging.

Nesting: They have long pink legs, a long thin black bill and are blackish above and white below, with a white head and neck with a varying amount of black. Males have a black back, often with greenish gloss. Females' backs have a brown hue, contrasting with the black remiges. In the populations in which the males usually get all-white heads in winter, females tend to have less black on head and neck all year round, while males often have much black, particularly in the summer. However this difference is not clear-cut.

Nest sites are frequently separated from feeding sites and stilts move between these areas daily. Nesting sites are adjacent to or on low islands within bodies of fresh, brackish, or salt water. The nest site is a bare spot on the ground near water. The stilt lays 3-4 eggs.

Cool Facts: The āeʻo is the only breeding shorebird in Hawaii. It has a flapping flight, its long legs stretched out straight behind it. It forms small flocks of varying numbers.

The mature birds use tricks such as a "broken wing act" to lure intruders away from the nest area. It has a short sharp cry, "keek," that is given in flight and on the ground when disturbed. A soft muted call is given when resting.

Hawaiian Name: pueo
Common Name: Hawaiian Owl
Scientific Name: *Asio flammeus sandwichensis*

Size: Males 13 – 17 inches (33-43 cm) Wingspan 41 inches (105 cm)

Habitat: Polynesia. Endemic to the Hawaiian Islands. Pueo occupy a variety of habitats, including wet and dry forests, but are most common in open habitats such as grasslands, shrublands, and montane parklands, including urban areas and those actively managed for conservation.

Status: Endangered. Global population: unknown. They are strongly affected by light pollution. They are often killed in vehicular accidents in which they dive toward the headlights of cars, possibly in an attempt to hunt. Populations have dropped dramatically around newly-built roadways.

While the Pueo appears to be somewhat resistant to the avian malaria they have recently become victim to a mysterious "Sick Owl Syndrome", or SOS, in which large numbers of Pueo have been found walking dazedly on roads, leading to death by collision. The cause of Sick Owl Syndrome is unknown; it is suspected that pesticide toxicity may be responsible, particularly through secondary rodenticide poisoning. However, it has also been hypothesized that the cause may be an infectious agent, seizure-like confusion due to light pollution, or a variety of other causes.

Pueo nest on the ground, which makes their eggs and young susceptible to predation by the introduced Small Asian Mongoose and other predators, as well as by bulldozers.

State listed as Endangered on Oʻahu.

Diet: Small mammals

Nesting: Females are slightly larger. Males perform aerial displays known as a sky dancing display to prospective females. Nests are constructed by females and are comprised of simple scrapes in the ground lined with grasses and feather down. Females also perform all incubating and brooding. Males feed females and defend nests. Chicks hatch synchronously and are fed by female with food delivered by male. Young may fledge from nest on foot before they are able to fly and depend on their parents for approximately two months.

Cool Facts: This taxon was first named by Andrew Bloxam (as the species *Strix sandwichensi*s). He saw it in 1825 as the naturalist on board HMS Blonde. Later the owl was reclassified as a subspecies of the Short-eared Owl (*Asio flammeus).*

Unlike most owls, Pueo are active during the day, and are commonly seen hovering or soaring over open areas. Their relatively recent establishment on Hawaiʻi may have been tied to the rats (*Rattus exulans*) that Polynesians brought to the islands.

Pueo mean “huddled” or “crouched” in Hawaiian.

Hawaiian Name: Oʻahu ʻŌʻō
Common Name: O'ahu Honeyeater
Scientific Name: *Moho apicalis*

Size: 6 inches (30.5 cm)

Habitat: Oceania; Endemic to O'ahu. Hawaiian Islands (USA). Its habitat was the mountain forests on Oʻahu.

Status: **Extinct (1837).** **Global Population:** 0 mature individuals left. The reasons for its extinction were probably avian diseases caused by introduced mosquitos, habitat destruction by cattle and goats, deforestation, predation by introduced rats, and hunting (their plumage was used in robes for the Hawaiian nobility).

Diet: Flower nectar and fruit. ʻŌʻōs forage in the lofty branches of the forest canopy.

Breeding: The females were smaller than males. The plumage was predominantly sooty black. The tail feathers were brown and had, with the exception of the two central tail feathers, white tips. Further characteristics were the white feather tufts under the axillaries and the two narrow central tail feathers which changed into fine hair-like or fibrous tips. The flanks and the under tail coverts were colored deeply yellow. The bill and the tarsus were black.

Its biology and nesting behaviors were not well-studied.

Cool Facts: While in the Hawaiian Islands in 1825 as the naturalist on board HMS Blonde, Andrew Bloxam, first saw live Oʻahu ʻŌʻō s which were brought to him by locals. He preserved one specimen obtained in this way. He wrote in his diary (not published until much later): "They are now very scarce in all the islands. I did not see even one in the different excursions I made, & the natives asked a high price for the very few they brought to me." Bloxam misidentified his birds as the species now called *Moho nobilis.*

John Gould scientifically named and described the Oʻahu ʻŌʻō in 1860, when it was already regarded as vanished for 23 years. The last reliable evidence was a collection of about three birds by German naturalist Ferdinand Deppe in 1837. He found these specimens in the hills behind the capital Honolulu.

After surveys, led for example by ornithologist Robert C. L. Perkins, failed to find the bird between 1880 and 1890, it was described as almost extinct. Today there are seven specimens in the museum collections in Berlin, London, New York City and Cambridge (Massachusetts).

Named after an imitation of the loud, harsh 'oh-oh' call it made. The brilliant yellow feathers were extensively used by the native Hawaiians to make royal feather work. The royal bird-catcher guild used a sticky substance spread on the branches of an ohia tree to trap this bird, plucked a few of the yellow feathers and released the bird.

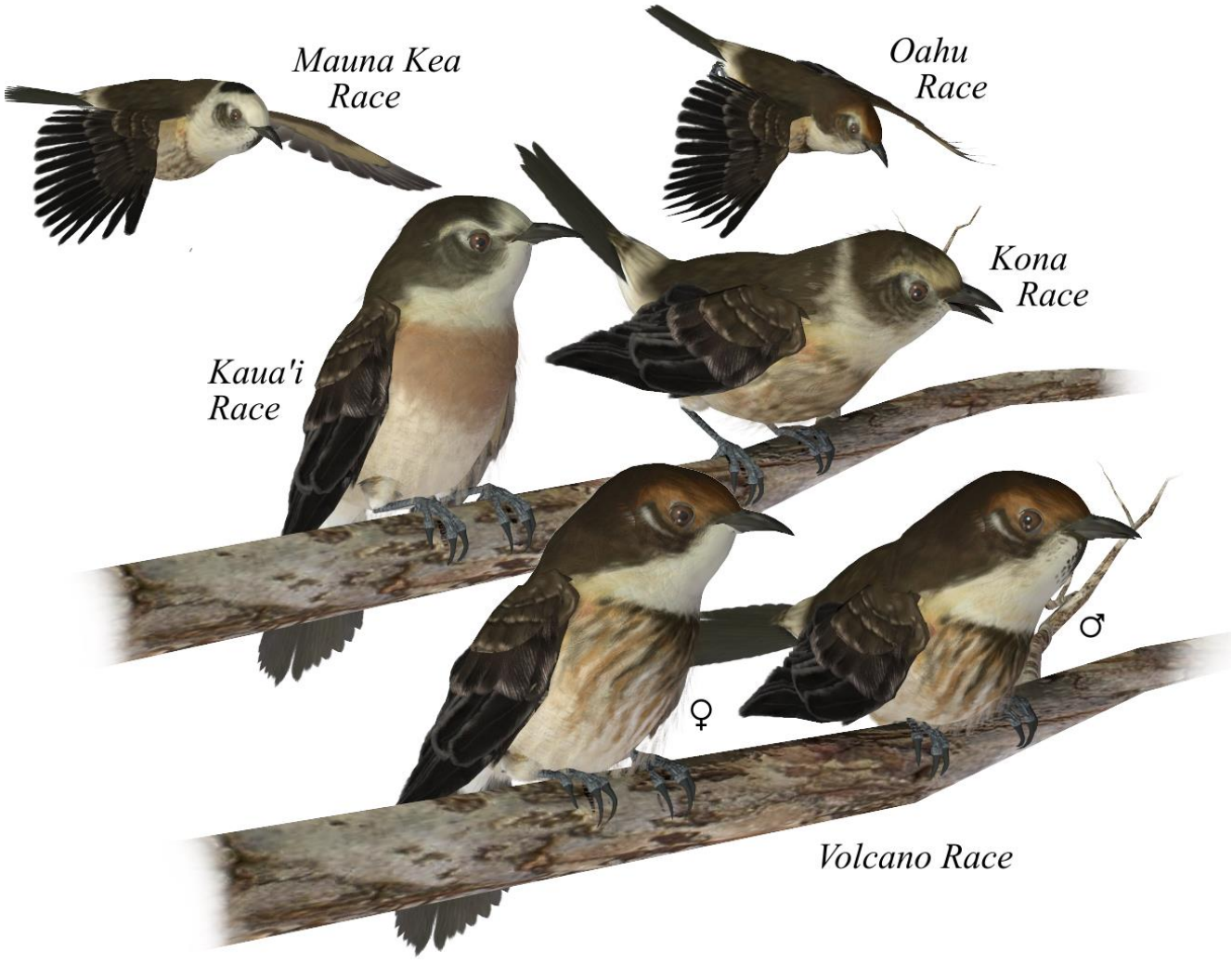
A mix of lava and forest is a common sight in Hawai'i (Photo: Ken Gilliland)

Hawaiian Name: ‘elepai’o
Common Name: Hawaiian Wren
Scientific Name: *Chasiempis sandwichensis*

Size: 6 inches (15 cm)

Habitat: Oceania; Hawaiian Islands. On Hawai`i, the Mauna Kea race (*C.s. bryani*) occupies arid, mostly high-altitude mamane and mamane-naio woodland, while the Kona race (*C.s. sandwichensis)* occurs in mesic habitats on western and south-western slopes, and the Volcano race (*C.s. ridgwayi)* is restricted to wet, eastern slopes. On O`ahu, the O’ahu race (*C.s. ibidis)* is most abundant in mesic forest in valleys. On Kaua`i*, the Kaua’1 race (C.s. sclateri)* is most abundant in wet to mesic montane forest, also occurring in woodland, scrub, savanna and drier habitats at lower densities.

Status: Vulnerable. Global Population: 240,000 Mature individuals. The habitat of the 'elepaio has been heavily browsed by feral ungulates and introduced grasses suppress regeneration and potentially increase the risk of fire. On O`ahu habitat loss to development has been extensive, with 56% of the former range of ibidis zoned for agricultural or urban development.



Diseases, such as avain pox and malaria, spread by mosquitos, are a problem at low and middle elevations on all islands, increasing mortality of adults by c.25% on O`ahu, and possibly preventing birds from nesting. Malaria prevalence in the species on O`ahu has been recorded at 87%, with 36% of birds showing signs of avian pox. High prevalences in mosquito-borne diseases and local declines in the species's population are associated with high rainfall. Nest-predation by black rats Rattus rattus is the most serious current problem on O`ahu. Fires are known to destroy key habitat and promote the spread of alien plants on O`ahu. Hurricane Iniki, in 1992, drastically reduced all populations of sclateri.

Diet: Insects and other invertebrates; occasionally some seed and fruit

Breeding: It nests between January and June. Unlike Hawaiian honeycreepers, both males and females participate almost equally in all aspects of rearing. Finely woven cup nests are built in a variety of native and nonnative trees. Clutch size is usually two and second and third nests are attempted after failures, but rarely is a second nest attempted if the first is successful.

Cool Facts: Hawaiians consider a visit by an ‘elepai’o good luck. In fact, in order to select the proper Koa tree for a canoe it first has to be landed on by an ‘elepaio. They considered it their guardian spirit, an incarnation of their patron goddess Lea, because if the bird pecked at a fallen tree, it was a sign that the tree was riddled with burrowing insects and thus not good anymore, but when the bird showed no interest in a tree, it indicated that the wood was suitable. This is the origin of the ancient Hawaiian proverb, ‘Uā ‘elepai’o ‘ia ka wa‘a ("The canoe is marked out by the ‘elepai’o").

Being a flycatcher, farmers believed the ‘elepai’o to be the incarnation of Lea's sister goddess, Hina-puku-‘ai, who protected food plants and was a patron of agriculture.

The ‘elepai’o is the first native bird to sing in the morning and the last to stop singing at night; apart from whistled and chattering contact and alarm calls, it is probably best known for its song, from which derives the common name: a pleasant and rather loud warble which sounds like e-le-PAI-o, hence the Hawaiian name.

Typical ‘elepai’o foraging area (Photo: Ken Gilliland)

Hawaiian Name: (unknown)
Common Name: Nihoa Millerbird
Scientific Name: *Acrocephalus familiaris kingi*

Size: 5.1 inches (13 cm)

Habitat: Oceania; Polynesia. It is endemic to the steep, rocky island of Nihoa in the North-western Hawaiian Islands (USA). It previously occurred on Laysan also, where the nominate race was estimated to number 1,500 birds in 1915, but became extinct between 1916 and 1923.

It prefers dense cover near the ground, particularly around the shrubs such as *Chenopodium oahuense, Sida fallax* and *Solanum nelsoni*.

Status: Critically Endangered. **Global Population:** 250-999 Mature individuals with fluctuating trends. Its extinction on Laysan was ultimately caused by the introduction of rabbits, which denuded the island of vegetation (causing severe insect food shortage). On Nihoa, the population size is probably regulated primarily by precipitation levels, which affect the abundance of invertebrate prey (extended droughts for example, are likely to have a negative impact). Severe weather events such as hurricanes may cause direct mortality of millerbirds; a single severe storm could extinguish the population. Fire is a past and potential threat and introduction of detrimental non-native species is a permanent possibility.

Diet: Small beetles, spiders, roaches and larvae. The extinct Laysan population was thought to have fed primarily on moths.

Breeding: Pairs show year-to-year fidelity in specific territories, with nesting apparently correlated with precipitation and most breeding taking place in the winter months (peaking January-March), although the breeding period may be extended in years of high summer rainfall. Nests are located in dense shrubs (*mainly C. oahuense*) and two eggs are generally laid.

Cool Facts: Nihoa is part of the Hawaiian Islands National Wildlife Refuge and Papahanaumokuakea Marine National Monument. Legal access is controlled by a permit system that is restricted largely to biologists, other researchers, and native Hawaiian cultural practitioners. Strict protocols are followed to ensure that legal permittees do not accidentally introduce new species via seeds, eggs or insects travelling on clothes and equipment. Visiting scientists make efforts to control alien plants by hand weeding.

The Nihoa Millerbird and Laysan Millerbird are the only known Old World warblers (subfamily Sylviinae) that colonized the Hawaiian Archipelago, the most remote group of islands in the world. The Laysan form, discovered first, was named “millerbird” (Henshaw 1902) because of its fondness for feeding on large miller moths (Family Noctuidae: probably Agrotis spp.). The Laysan and the Nihoa millerbirds are generally regarded as (at least) separate subspecies.

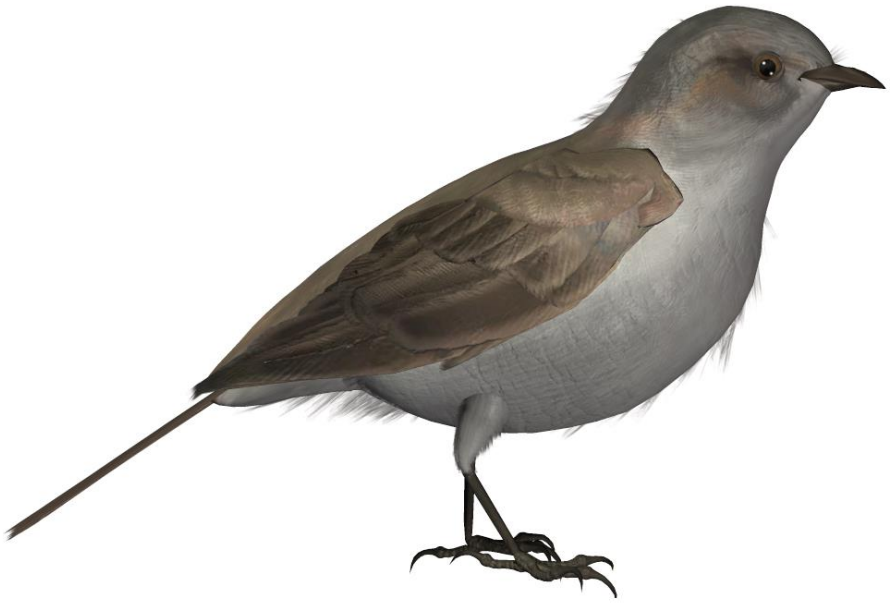
Fog rolls through a Hawaiian grassland habitat **(Photo: Ken Gilliland)**

Hawaiian Name: ‘oma’o
Common Name: Hawaiian Thrush
Scientific Name: *Myadestes obscurus*

Size: 7-8 inches (18-21cm)

Habitat: Oceania; found on Hawai’i in high elevation forests. The ‘oma‘o occur in mesic and wet montane forests above 1000 meters (3300’) in Hamakua, Ka‘u, and Kilauea districts of Hawai‘i island.

Status: Near Threatened. Global Population: 170,000. Population declines due to introduced avian malaria and habitat loss. Despite healthy population numbers, only 30% of this species' former range remains intact.



Diet: Fruits, berries, and insects

Breeding: The male and female of the species look similar.

Oma'os are usually solitary, but individuals can be found in pairs throughout the year, with pair bonds lasting at least one breeding season. Courtship behavior is most often seen between January and March, with most breeding taking place between April and August. Females are responsible for both nest construction and incubation of one or two eggs. The nest is a woven mix of twigs and fiber. Incubation lasts for about 16 days, and the young remain in the nest for about 19 days before fledging. Both sexes feed nestlings, and both adults provide parental care for more than three weeks after young birds leave the nest.

Cool Facts: The `Oma’o is also known as the Hawaiian thrush and is an accomplished songster. It is found throughout the native windward rainforests of the Island of Hawaii above 3,000 feet. It has the curious habit of quivering its drooped wings much like a young bird.

The Hawaiian name, oma’o probably is a corruption from 'Amaui (the name originally given to all the Hawaiian Thrushes) and is formed from the name Manu a Maui or "Island Thrush".

Hawaiian Name: kāmaʻo
Common Name: Large Kauaʻi Thrush
Scientific Name: *Myadestes myadestinus*

Size: 8 inches (20 cm)

Habitat: Oceania; endemic to Kaua`i in the Hawaiian Islands (USA). Originally inhabited forest at all elevations, but after the 1920s it was restricted to dense montane forest.

Status: Extinct (2004) Global Population: 0. It was the most common of the forest birds in 1891 but, by 1928, had disappeared from the lower altitudes and became restricted to dense montane forest in the Alaka`i Wilderness Preserve. During 1968-1973, its population was estimated at 337 while, in 1981, an estimated 24 individuals were present. The last probable sighting was in 1989, and since then there have been several unconfirmed reports but no confirmed detections despite numerous intensive surveys in areas formerly occupied, particularly in 1995 and 1997. It now seems appropriate to reclassify this species as Extinct as there seems little reasonable doubt that the last individual has died. However, it is worth noting that *M. palmeri* went many years without being seen, but then began to reappear in small numbers.

Disease carried by introduced mosquitoes and the destruction and degradation of forests are likely to have been the chief causes of extinction. The advance of feral pigs into pristine upland forests degraded habitat and facilitated the spread of mosquitoes. Competition with introduced birds may have exacerbated the problems faced by this species. Deprived of lowland forest the species was also exposed to the effects of hurricane damage of upland forest, which severely disrupted portions of native forest and allowed the germination and expansion of noxious weeds. Also potentially detrimental to the remaining suitable habitat was the introduction of new alien invertebrates, such as the two-spotted leafhopper (Sophonia rufofascia), which may have threatened many food plants of M. myadestinus.

Diet: Fruit and insects.

Breeding: The male and female of the species looked similar. They were usually solitary, but individuals could be found in pairs throughout the year, with pair bonds lasting at least one breeding season.

Courtship behavior was most often seen between January and March, with most breeding taking place between April and August. Females were responsible for both nest construction and incubation of one or two eggs. The nest was a woven mix of twigs and fiber. Incubation lasted for about 16 days, and the young remained in the nest for about 19 days before fledging. Both sexes fed nestlings, and both adults provided parental care for more than three weeks after young birds left the nest.

Cool Facts: Its song was a complex melody composed of flute-like notes, liquid warbles, buzzy trills, and gurgling whistles. The call was a raspy "braak," with an alternate high pitched note similar to a police whistle. The bird occurred in the understory of densely vegetated gulches, where it often perched motionlessly in a hunched posture. Like other native Hawaiian thrushes, it often quivered its wings.

Typical Hawaiian thrush habitat, Hakalua Forest NWR (Photo: Ken Gilliland)

Hawaiian Name: olomaʻo
Common Name: Lānaʻi Thrush
Scientific Name: *Myadestes lanaiensis*

Size: 7 inches (18 cm)

Habitat: Oceania; endemic to Maui, Lānaʻi and Molokaʻi in the Hawaiian Islands (USA). Originally inhabited forest at all elevations, but since 1920s restricted to dense montane forest.

Status: **Possibly Extinct (1980).** **Global Population:** Unknown. The olomaʻo is still classified as Critically Endangered due to the possibility that an extremely small population or individuals may still exist. The last definitive sighting occurred on Molokaʻi in 1980 in the Kamakou Preserve, and in 1933 on Lānaʻi. In the late 19th century, it was considered common to abundant on the three islands, but land clearing, including the establishment and subsequent development of Lānaʻi City, and avian malaria brought on by introduced mosquitoes decimated the birds. Introduced animals such as feral pigs (which create pools from their wallows for breeding mosquitoes) also aided in its demise.

The Kamakou Preserve and neighboring land have been partially fenced and control programs exist for feral ungulates. The Oloku`i Natural Area, established in 1986, protects pristine native forest where *M. lanaiensis* may persist. Should it be rediscovered, consideration should be given to establishing a captive population at high elevation on East Maui, where the habitat is relatively intact and free of threat from mosquitoes and avian disease.

Diet: Fruit and insects.

Breeding: The male and female of the species look similar. They are solitary birds, but individuals can be found in pairs throughout the year, with pair bonds lasting at least one breeding season.

Courtship behavior is most often seen between January and March, with most breeding taking place between April and August. Females are responsible for both nest construction and incubation of one or two eggs. The nest is a woven mix of twigs and fiber. Incubation lasts for about 16 days, and the young remain in the nest for about 19 days before fledging. Both sexes feed nestlings, and both adults provide parental care for more than three weeks after young birds leave the nest.

Cool Facts: Its song consists of a complex melody of flute-like notes, liquid warbles, and gurgling whistles. The call is a catlike rasp," with an alternate high pitched note similar to a police whistle. This bird occurs in densely vegetated gulches, frequenting the understory where it often perches motionless in a hunched posture. Like other native Hawaiian thrushes, it quivers its wings and feeds primarily on fruit and insects.

Mau'i birds may have constituted a separate subspecies or race, but became extinct before any studies could be performed. Two subspecies are recognized:

- *M. l. lanaiensis* - Lānaʻi Thrush
- *M. l. rutha* - Molokaʻi Thrush

Hawaiian Name: ‘alala
Common Name: Hawaiian Crow
Scientific Name: *Corvus tropicus*

Size: 19-20 inches (48-50 cm)

Habitat: Oceania; Hawaiian Islands. Last found on the island of Hawai’i in open montane forests. Fossil evidence shows that the crow was once found in abundance throughout the islands.

Status: Extinct in the wild (2002). Global Population: 77 mature individuals. The reason for its decline and extinction in the wild is unknown, although avian malaria passed by the non-endemic mosquito is believed to be a contributing factor.

Diet: A varied diet, including carrion, eggs and nestlings, other small creatures, fruits, and even human food and scraps.

Nesting: Nests are always found in trees with both males and females participating in nest construction. Females generally lay five eggs; the eggs may be incubated by either parent, with the other bird usually sitting quietly near its brooding mate.

Cool Facts: The ‘Alala is similar to the mainland crows except it has more rounded wings and a much thicker bill. Its plumage is a soft, brownish-black with long, bristly throat feathers. Its legs and bill are jet black.

The last two known wild individuals of this species disappeared in 2002. There are some individuals in captive breeding facilities, but attempts to reintroduce captive-bred birds into the wild have been hampered by predation by the Hawaiian hawk or ‘Io (which is also endangered). While some scientists believe that the small number of remaining individuals may be too small to offer a diverse gene pool, the San Diego Zoological Society’s breeding program produced 11 new fledglings in 2010 giving this species hope to survive.

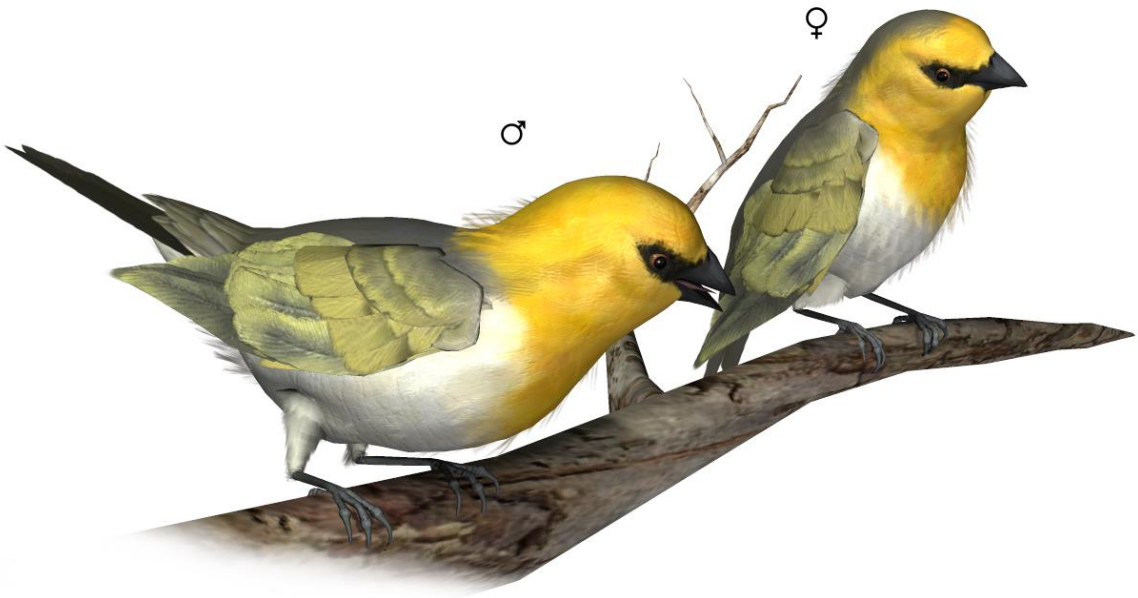
‘Alala means to cry, crow or caw. Also 'Ala means to rise and la means the sun and refers to the flocks of birds which would start calling noisily at dawn.

Hawaiian Name: palila
Common Name: Palila
Scientific Name: *Loxioides bailleu*

Size: 7.5 inches (19cm)

Habitat: Oceania; Slopes of Mauna Kea on Hawaii. Found in Mamane forests.

Status: Endangered. **Global Population:** 2,512 Mature individuals. It is endangered because its main source of food, the Mamane tree is also threatened. Cattle from nearby ranches trample the root systems of the trees, thereby killing them. Encroaching development also plays a role. In the mid-90's the remaining palila population was moved to the base of Mauna Kea where a 100 acre grove of Mamane trees still remained and was fenced off from cattle grazing. Unfortunately, invasive weeds and extremely flammable fountain grass surround the entire area. One wildfire could bring this bird to extinction and this author noted in a recent trip, numerous cigarettes butts were found scattered in the brush of its habitat.



Diet: Mamane Seeds; some insects and naio berries

Breeding: Nest in Mamane trees. The species exhibits low rates of reproduction, laying fewer eggs and taking longer to raise its young compared with mainland songbirds

Cool Facts: The palila lives the big Island of Hawaii. It nests and eats the seeds of the Mamane tree which is found on the dormant volcano, Mauna Kea, above the 6,000 foot line. The palila is the largest of the Hawaiian honeycreepers and is probably the most studied. Although the palila has been known to eat some insects and naio berries, its primary diet comes from the Mamane tree. It eats seeds from its green pods, the flower petals and even the young leaves. The population numbers for the palila are in direct proportion with the success of the Mamane's blooming season. The Hawaiian word "palia" refers to the species gray upperparts.

Hawaiian Name: ‘ākepa
Common Name: ‘ākepa
Scientific Name: *Loxops coccineus coccineus*

Size: 4 inches (10 cm)

Habitat: Oceania; Hawaiian Islands. Found on the island of Hawai’i, Mau’i and Kaua`i. Fossil evidence shows it was once found in O’ahu as well. Found most commonly in ‘Ohi'a-lehua and Koa-`Ohi`a forests above 3,000 feet.

Status: Endangered. Global Population: 14,000 mature individuals. The ‘ākepa was common in the 1800s on Mau’i and Kaua`i, but the largest population today remains on the Big Island (estimated at 14,000). The smallest population today is on Maui with an estimated number of 230. It is estimated that 5,100 individuals of this species live on Kaua`i today. O`ahu ‘ākepa were documented to be rare even in the 1800s and are believed to be extinct today, with the last possible sighting in 1976. Aggressive non-native plants and animals and loss of habitat are threats to the survival of the `Akepa.

Diet: Primarily of insects and spiders; some nectar from ’ohi’a blossoms.

Nesting: ‘ākepas on Hawai’i nest only in cavities in large, old-growth 'Ohi'a and Koa trees. Since no Hawaiian birds are known to excavate tree cavities, ‘ākepas are dependent on naturally occurring cavities for nesting sites. Females are solely responsible for nest

construction, which is unusual among the insectivorous and nectarivorous members of the Hawaiian honeycreepers group. Typical clutches have only one or two eggs, which results in an unusually low annual reproductive output for a small songbird. Another interesting aspect of ‘ākepas' breeding behavior is that males perform large, lek-like group displays, despite the fact that ‘ākepas are monogamous birds that form long-term pair bonds. Since this species is an obligate tree cavity nester, the logging of old, mature trees has eliminated potential nesting sites and decreased available foraging habitat.

Cool Facts: Akepa in Hawaiian means nimble or quick. ‘ākepa is also known as `Akakane, and the Maui ‘ākepa as `Akepeu`ie. They use their bills to pry open `ohi`a buds, small seed pods, and galls in search of food. They have been known to drink nectar from `ohi`a and other flowers. Their "kee-wit" calls are quiet and their songs are a short, warbling trill.

The Mau’i and Hawai`i ‘ākepa were listed as an endangered species on October 13, 1970. A large population of ‘ākepas on Hawaii is protected at the Hakalau Forest NWR, which was created in 1985 to protect native Hawaiian forest birds and their habitats. A threatened population of these birds is protected by the Pu'u Wa'awa'a State Wildlife Preserve on northern Hualalai. ‘ākepas also receive lesser protection at the Ka'u Forest Reserve, Kulani Prison, and Kilauea-Keauhou forests. Current conservation efforts on Hawaii include the introduction of artificial nest cavities at Hakalau Forest NWR. While only one artificial cavity (out of 69) has been used by ‘ākepas, that one cavity was used successfully by a pair two years in a row.

While the reasons for the decline of ‘ākepas on Mau’i are not understood, conservation efforts on that island have included the virtual elimination of feral pigs from important natural areas, as well as attempts to control rat populations. Despite these efforts, Mau’i ‘ākepas have continued to decline, and may well be extinct.

The Hawaiian word ‘ākepa means “Active”, “Nimble” or “Quick”.

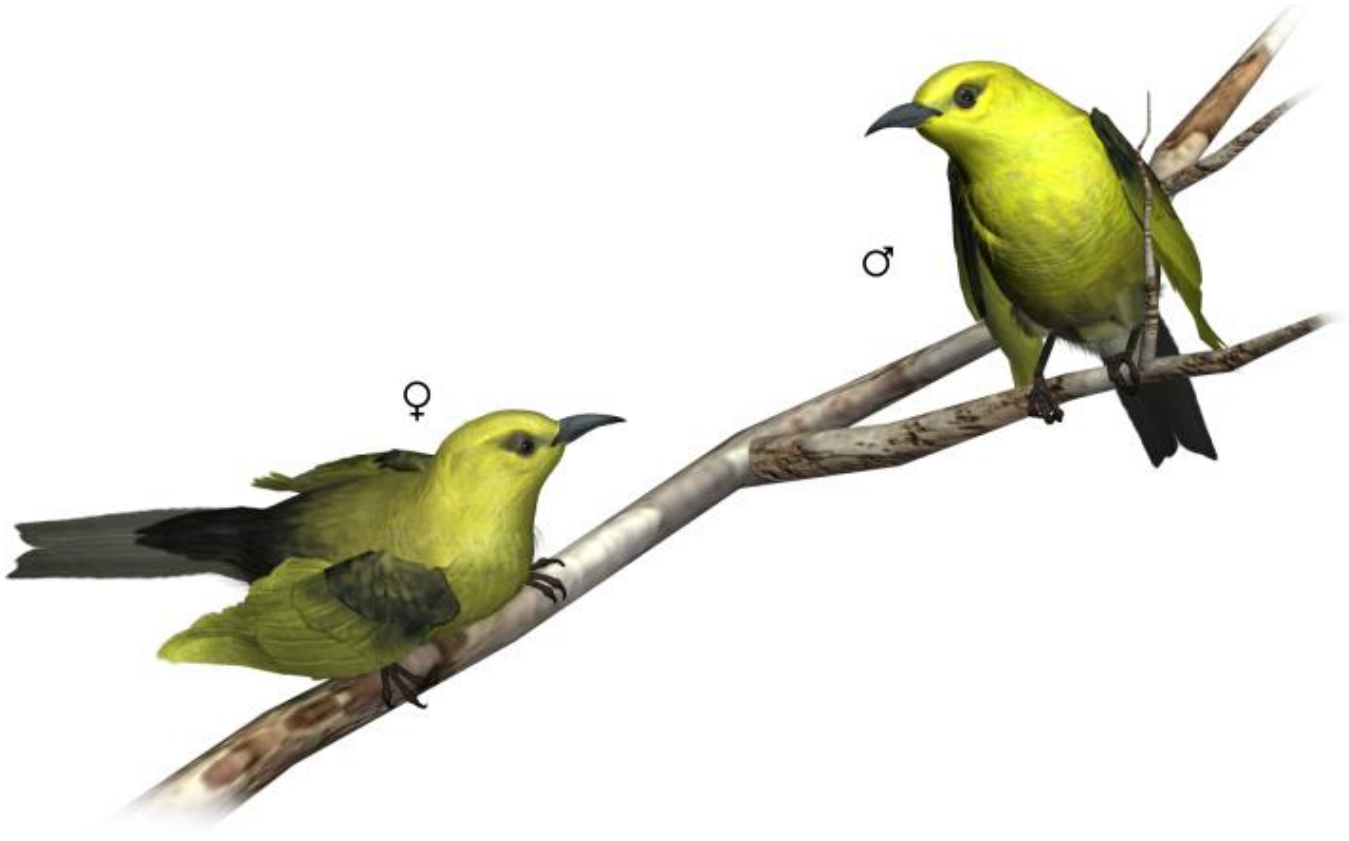
Ohia and Koa trees at Hakalua Forest National Wildlife Refuge (Photo: Ken Gilliland)

Hawaiian Name: ‘amakihi
Common Name: Common Amakihi
Scientific Name: Hemignathus virens

Size: 4.5 inches (11cm)

Habitat: Oceania; Hawaiian Islands. One of the most common native birds, found on all main islands, except Lana`i where it is now likely extinct. Inhabits a variety of native habitats from sea level to the shrub lands of the islands' highest volcanoes (around 8000 feet), and is occasionally seen among introduced vegetation.

Status: Not threatened. **Global Population:** unknown. Of all the native forest birds, `Amakihi may be least affected by changes in habitat that have resulted from human activities. Amakihi are one of the very few native birds that may be evolving resistance to introduced diseases such as avian malaria and avian poxvirus. `Amakihi are seen with increasing frequency in suburban areas of O`ahu, including Aina Haina, Manoa, and Nuuanu.



Diet: `Amakihi have a very wide diet. They possess a tubular tongue that is characteristic of nectar-feeding species, and use it to obtain nectar from a variety of native flowers such as `ohi`a-lehua, akala (Hawaiian raspberry), and mamane, as well as many introduced species. Amakihi also hunt a variety of insect and spider species which they glean from the foliage and bark of trees and shrubs, and are known to occasionally suck the juices from a variety of fruits.

Breeding: Males are green above, with tail and wings a darker green, and fairly bright yellow below. The female is duller, without the yellow breast. The bills are dark and slightly curved, lores are usually distinctive and black. The juvenile birds have the same coloring as females. There are four subspecies, with slight color variations. The breeding seasons vary depending on the island. Both male and female take part in building the nest, which is made of fine grasses and lichens. The clutch varies from two to four eggs. Incubation period is 14 days, nestling period is 17-20 days.

Cool Facts: `Amakihi are members of the endemic subfamily of Hawaiian honeycreepers (Drepanidinae), which are among the world's most famous and spectacular examples of adaptive radiation evolution of a variety of species from a single common ancestor. `Amakihi are often confused with Japanese white-eyes (or mejiro), but can be distinguished by their black lores and distinctive song and calls.

'Amakihi means "curved" from the words *kihi* or *kihikihi*.

Typical Amakihi habitat at Volcano National Park in Hawai'i (Photo: Ken Gilliland)

Hawaiian Name: ‘akiapola’au
Common Name: ‘Akiapola’au
Scientific Name: *Hemignathus munroi*

Size: 6 inches (14cm)

Habitat: Oceania; The Big Island of Hawaii in old growth Koa forests.

Status: Endangered. Global Population: 1,200 mature individuals. Its declines started in 1900 with the development of Hawaii. It also suffers from the fate of many native Hawaiian birds; no resistance to avian malaria. Mosquitoes are an introduced insect to the Hawaiian Islands and now virtually none of the native Hawaiian birds live below the 1500' level (the mosquito line).

Preservation efforts have helped slow the rapid decline of this bird. In 1992, the population was estimated at 1500 and has since then dropped below 1200. The Hakalau National Forest Preserve was established to help protect this and other endangered Hawaiian birds.

Diet: Insects and beetle larvae are the main food source for these birds as they creep down tree limbs in the forest canopy.

Breeding: The ‘akiapola’au is found around the base of Mauna Kea, Hawaii. It lives in ancient Koa tree forests where older Koa trees are excavated for nesting cavity.

Cool Facts: It has an unusual bill. The lower bill is shorter than the top— it’s a specialized beak than allows the bird to hammer and drill into the wood with the lower “woodpecker-like” bill and then spear insects with the top portion of the beak.

The ‘akiapola’au was also known as nuku pu’u in early Hawaiian literature.

Hawaiian Name: ‘nuku pu’u
Common Name: nuku pu’u
Scientific Name: *Hemignathus lucidus affinis*

Size: 6 inches (14cm)

Habitat: Oceania; endemic to eastern Maui, where it is dependent on high-elevation mesic and wet forests of ‘ōhi‘a lehua (*Metrosideros polymorpha*) and koa (*Acacia koa*).

Status: Probably Extinct (1998). Global Population: 0 mature individuals. The last sightings - both on Kaua‘i and Maui - were in 1998, though it is possible some of the sighting in the 1990s actually involve the Kaua‘i ‘Amakihi. Later sightings remain unconfirmed. Recent surveys have failed to locate the species and the United States Fish and Wildlife Service concluded that it in all probability is extinct or functionally extinct. BirdLife International (and thereby IUCN) have chosen to retain its status as critically endangered until additional surveys have confirmed its extinction beyond reasonable doubts. As with several other Hawaiian honeycreepers, the decline of the nuku pu‘u is connected to habitat loss (both due to man and hurricanes), introduced predators and disease-carrying mosquitoes.

The nuku pu‘u is one of the species a project of the East Maui Watershed has been aimed at. Other birds from this area included the ‘Ō‘ū and the Po‘ouli. The project involved fencing in the area and eradicating introduced predators. The entire project took out 22 feral cats, 209 pigs, 1,596 Polynesian rats, 1,205 black rats, and 1,948 common mice. On Kaua‘i, comparable projects exist around the Koai‘e Stream.

Diet: Insects and beetle larvae. Often joins mixed species foraging flocks. Apparently would creep along large ‘ōhi‘a (*Metrosideros polymorpha*) limbs searching epiphytes, moss, bark, and dead wood for arthropod prey; may also have taken nectar. Hammered bark with lower mandible, similar to its congener the ‘akiapōlā‘au (*H. munroi*), and used its upper mandible to fish out prey from excavations.

Breeding: Adult males are olive green with a yellow head, throat, and breast and have a small black mask; females are olive green above and variable yellow-gray below.

Older Koa trees are excavated for nesting cavity.

Cool Facts: Nuku pu‘u also are known from O‘ahu (*H. l. lucidus*) and Kaua‘i (*H. l. hanapepe*); the O‘ahu subspecies is certainly extinct. Currently, all nuku pu‘u are considered one species, however, ongoing research suggests that populations occurring on the three islands are distinct species. Historic and fossil evidence indicates that its range was much broader and remnant populations may have been surviving in marginal habitat. Habitat conditions of the species’ former range vary. Areas where nuku pu‘u were most recently sighted are managed as a Forest Reserve by the State of Hawai‘i or by the National Park Service.

Hakalua Forest National Wildlife Refuge **(Photo: Ken Gilliland)**

Hawaiian Name: ‘akikiki
Common Name: Kaua’i Creeper
Scientific Name: *Oreomystis bairdi*

Size: 5.75 inches (13cm)

Habitat: Oceania; endemic to Kaua’i. Found only in wet montane forests in central Kauai where it now occupies less than 10% of its former range.

Status: Critically Endangered. Global Population: 780 - 1,840 mature individuals. The population has declined dramatically since the 1960s and this trend appears to be continuing owing to a number of threatening processes. Consequently, the population is estimated to be declining very rapidly.

Lowland forests have been cleared for timber and agriculture, with feral livestock causing further degradation and destruction. Feral pigs continue to be particularly detrimental, additionally dispersing alien plants and facilitating the spread of introduced mosquitoes which transmit avian malaria and avian pox. Domestic and introduced birds provide reservoirs for these diseases, to which there is little resistance in Hawaiian honeycreeper populations. Predation by introduced animals and competition for arthropod resources by introduced taxa (especially Japanese White-eye *Zosterops japonicus*, wasps and ants) are additional threats. Introduced plants such as Kahili ginger (*Hedychium gardnerianum*), blackberry (*Rubus argutus*), strawberry guava (*Psidium cattleianum*), Australian tree fern (*Cyathea cooperi*) and firetree (*Myrica faya*) have degraded much native forest in Koke'e, and threaten the remaining habitat. Hurricanes have had major impacts on population size in the past; in 1992 Hurricane Iniki devastated forests throughout Kaua`i, and all bird populations on the island appeared to have been drastically reduced, although some have since recovered. Hurricanes are now thought to displace birds from the small area of suitable habitat at altitude and push them into the lowlands where avian malaria is prevalent. A growing concern is that rising temperatures could allow mosquitoes to survive at higher altitudes and further transmit avian malaria and avian pox, and having a montane distribution that is close to the maximum altitude within its range, this species is potentially susceptible to climate change.

Diet: Insects, larvae, and spiders. Forages among the twigs and branches of ohi'a *(Metrosideros polymorpha)* and koa *(Acacia koa)* trees. Possesses a tongue that is specially designed for extracting insects from crevices in bark, unlike the tubular nectar-drinking tongue of other members of the Hawaiian honeycreeper family.

Breeding: Akikiki juveniles have “spectacles” and will retain the dull pink bill into maturity. The Akikiki builds a simple open-cup nest between March and May, perhaps only in ohi'a trees. Both parents have been observed bringing food to the nest, with the male providing some food for the female, though the female also forages independently. A nesting pair in 2007 had a juvenile from a previous nest, indicating the species will attempt to raise two broods.

Cool Facts: While this species' core population resides in the protected Alaka'i Swamp region, it has been suggested that this site may not be ideal habitat but is utilized because optimum lowland habitat has been either lost or altered. To this end one of the key conservation strategies may be reestablishment of low elevation native forests. Meanwhile, the most important effort would be to fence portions of the Alaka'i Swamp and begin removal of feral ungulates and other introduced mammals. Lack of information on this species' life history and population dynamics is a serious impediment to recovery efforts, and studies are greatly needed. Like many other Hawaiian bird species that are in need of critical conservation, funds are lacking as is the will on behalf of the US Congress to carry out the recommended actions that may save the species from extinction.

The Zoological Society of San Diego is developing techniques for rearing *Oreomystis* creepers from eggs and breeding them in captivity, using the related Hawai`i Creeper, at the Keauhou Bird Conservation Center. The Hawai`i Creeper has been successfully propagated in captivity, and release of the captive population is planned. Captive breeding of ‘akikiki was due to begin in 2008.

The Hawaiian word, ‘akikiki probably refers to the birds’ call

Hawaiian Name: kiwikiu
Common Name: Mau'i Parrotbill
Scientific Name: *Pseudonestor xanthophrys*

Size: 6 inches (14cm)

Habitat: : Oceania; endemic to Mau'i in the Hawaiian Islands (USA), where it is found on the north-eastern slopes of Haleakala, although fossil evidence indicates that it occurred in the lowlands and on Moloka`i.

It is now restricted to montane mesic and wet forest at 1,200-2,150 m (mainly 1,500-2,000 m), and is absent from adjacent areas dominated by exotic trees.

Status: Critically Endangered. Global Population: 500 mature individuals. From 1945 to 1995, the invasion of feral pigs on Haleakala caused chronic habitat degradation and facilitated the spread of disease-carrying mosquitoes into remote rainforests. Most of the species' range is now fenced however, and the species may respond positively as a result. However, the interaction between malaria and climate change is a potential future threat; modeling has

suggested a possible population decline of c.75% by 2090. Furthermore, having a montane distribution that is close to the maximum altitude within its range, this species is potentially susceptible to climate change. Weather influences the survival of young and thus potential recruitment rates. Other limiting factors include predation and competition from exotic bird and insect species. Rats have been observed high in native 'olapa trees and are both a potential predator of eggs and young and a potential source of competition for berries. Nest predation by the Hawaiian Short-eared Owl *(Asia flammeus sandwichensis)* has been observed, though its extent and effect is unknown. Removal of small mammal nest predators may result in owl populations switching to a greater proportion of birds in their diet.

Conservation measures underway: The East Maui watershed is cooperatively managed with fencing at c.1,070 m and removal of feral ungulates. In the Waikamoi Preserve, Hanawi Natural Area Reserve and Haleakala National Park, conservation practices additionally combat the establishment of alien plants and, from the late 1980s, feral pigs have been controlled. As a result, the forest understory has recovered well and non-native plant invasions have slowed. Rats are being poisoned, although only in a tiny area. A small population of the kiwikiu exists in captivity, having bred for the first time in 2000, and numbered ten individuals (three males and seven females) in 2003. Progeny from this flock will be used for a pilot release program in the mesic forests of leeward East Maui where weather conditions may result in higher productivity. The Leeward Haleakala Watershed Restoration Partnership has been established to restore the south side of Maui's forests, and the State of Hawaii is working on fencing the leeward side which still contains some old growth koa - it is possible this may become a further suitable site for the establishment of a population

Diet: Larvae and pupae of wood- and fruit-boring beetles, moths and other invertebrates. It uses its large beak and powerful jaw muscles to remove bark and wood from small trees and shrubs such as ʻākala (*Rubus hawaiensis*), kanawao (*Broussaisia arguta*), and ʻōhiʻa lehua (*Metrosideros polymorpha*), eating the insects underneath. The Maui parrotbill also bites open fruits in search of insects. Pairs of birds forage in a territory of 2.3 hectares (5.7 acres), which they must defend from competing parrotbills.

Breeding: Chunky, short-tailed, big-headed passerine with huge parrot-like bill. Male olive-green above, yellow below with dark streak through eye and bold, sharply defined yellow superciliary. Two-toned bill, upper third of maxilla dark, remainder pale yellowish-pink. Female duller with much smaller bill.

The nest is cup-shaped and placed in the outer canopy forks of mature ohia (*Metrosideros polymorpha*) - a situation that may afford some protection from introduced predators. During the breeding season (November to June), one chick is usually raised per year and young are dependent on parents for 5-8 months.

Cool Facts: Its call is a short “chip”, which is similar to the Maui Nui ʻAlauahio, chirped every three to five seconds. It song consists of “cheer” notes that are slower and richer than the ʻākepa. It also has a short song that sounds like “cheer-wee”.

As far as anyone can determine, *Pseudonestor xanthophrys* had not historically had a common name in the Hawaiian language. The name Hawaiian kiwikiu was developed by the Hawaiian Lexicon Committee, who was contacted by the Maui Forest Bird Recovery Project to select an appropriate name. A naming ceremony was held in the bird's habitat in September 2010. The "kiwi" part of the name means bent or curved (e.g., sickle-shaped), which refers to the shape of the bill of this bird. "Kiu" has a double meaning, referring both to the bird's secretive ways and to a cold, chilly wind, such as the breezes in the bird's habitat.

Hawaiian Name: apapane
Common Name: Apapane
Scientific Name: *Himatione sanguinea*

Size: 5 inches (13cm)

Habitat: Oceania; the Hawaiian Islands. The Apapane can be found on six out of the eight Hawaiian Islands. Commonly found in the wet, mesic forests of ‘O’hia lehua blossoms, located on the island of Kauai at Kokee Park, Koolau range on Oahu, and a large population of Apapane at the Volcano National Park on the island of Hawaii. They are mostly found in high altitudes above 1250 meters for protection from predators like the mongoose, rat, and deadly a*vian malaria* carrying mosquitoes These predators are the cause for the great decline in the Apapane population.

Status: Least Concern. **Global population:** 3000. While the estimated 3000 Apapane number appear to be low, the Apapane is not considered to be an endangered species.

Diet: Primarily ‘O’hia lehua nectar with some fruit and insects.

Breeding: Nests are mostly found in the crown of the ‘O’hia lehua trees. The breeding season is during the months of January thru July. The female have approximately 2-4 white eggs with red markings. Incubation lasts13-14 days and during this time the female does not sing at all and only she incubates the eggs. After hatching, both parents feed the young juveniles and care for them until they are ready to fledge.

Cool Facts: While Apapane nests are mostly found in ‘O’hia lehua trees there is evidence that nests have also been found in lava tubes on the Island of Hawaii.

Apapane are frequently found in small groups, foraging through 'O'hia lehua trees, hopping from flower to flower consuming the nectar; they rarely feed from the ground. The Apapane have two distinct flight patterns: straight flight and a circling flight.

Hawaiian Name: ‘i’iwi
Common Name: ’I’iwi
Scientific Name: *Vestiaria coccinea*

Size: 6.5 inches (15cm)

Habitat: Polynesia; found on Hawaii, Maui, and Kaua'i in dense wet forests.

Status: Near threatened. Global Population: 350,000. 'I'iwis face many of the same threats facing other native Hawaiian forest birds: habitat loss, avian disease, and introduction of alien plant and animal species. Of these threats, avian diseases, combined with the possible introduction of temperate mosquitoes, may pose the greatest risk to 'I'iwi populations. 'I'iwis are extremely susceptible to avian malaria and avian pox, which are both transmitted by mosquitoes. When bitten just once by a malaria-carrying mosquito, nine of ten 'I'iwis tested died within 37 days; when bitten multiple times by infected mosquitoes, all ten ‘I’iwis died of malaria. The incidence of malaria in wild 'I'iwis is greatest during the times of year when birds move to lower-elevation forests where nectar is available, but mosquitoes are also present. Mosquito-transmitted avian diseases seem to have a greater impact on 'I'iwis than on other Hawaiian honeycreepers. Currently, mosquitoes are confined primarily to the lowlands of the Hawaiian Islands, allowing 'I'iwis relief from avian diseases at higher elevations, but if a temperate, cold-tolerant mosquito species is introduced, it could prove disastrous for ‘I’iwis and other native Hawaiian forest birds.

Diet: Flower Nectar and some insects.

Breeding: Two eggs are laid in a cup nest of twigs, mosses, and lichens high in the crown of an 'ohia-lehua tree.

Cool Facts: The long curved bill of the 'I'iwi has evolutionally adapted to sip nectar from the long tubular flowers of the native Hawaiian lobelioids. They will pierce a hole in the base of the flower and extract the nectar with their brushy tipped tongues. They are important pollinators for

many species of native plants. They forage high up in the mid to upper canopy of forests and will often defend a territory with a heavily flowering tree in it.

As the lobelioids have declined through habitat loss and extinction, 'I'iwis have shifted to feeding more on other native flowers such as the 'ohia-lehua, koa, naio, and mamane. This dietary shift has been reflected in the slight reduction in average bill length seen over the past century.

'I'iwis can produce a wide variety of calls from rusty door hinge sound to clear flute-like sounds.

'I'iwis breed and winter mainly in wet or moderately wet forests with 'ohi'a and koa as the dominant trees. They can also be found in dry forest dominated by mamane, but do not often breed in such forest. Although the species does occur in drier areas on Hawai'i as low as 300 meters, it is most commonly found above 1,250 meters of elevation, where disease-carrying mosquitoes are not present. 'I'iwis spend most of their time foraging on 'ohi'a trees, feeding primarily on 'ohi'a nectar, but also catching butterflies, moths, and other insects. Mamane nectar is another major part of 'I'iwis' diets, and in some areas, the nectar of the introduced banana poka is also an important food source.

The Hawaiian word I’iwi probably refers to the birds’ call but also means “eye twitching”.

'ohia-lehua (Photo: Ken Gilliland)

Hawaiian Name: 'akohekohe
Common Name: Crested Honeycreeper
Scientific Name: *Palmeria dolei*

Size: 7 inches (18cm)

Habitat: Oceania; the Hawaiian Islands. Northeastern slope of Haleakala Volcano on the island of Maui. The species formerly occurred on the neighboring island of Moloka'i, but that population is now extinct. Almost the entire population is found between 1,500 and 2,300 meters of elevation, in forest permanently enshrouded in clouds and mist. Average rainfall is 235 to 275 inches per year.

Status: Endangered. Global Population: 3,800 Mature individuals after a big decline, the ‘Ahohekohe populations appear to have stabilized. At this point in time, the major threats appear to be the negative effects of introduced animals (especially feral pigs) and plants. Feral pigs wreak havoc on the soil and vegetation in native forests, destroying native understory and subcanopy plants and creating wallows that can act as breeding sites for disease-carrying mosquitoes. Rainforest areas that have been affected by pigs can recover if the pigs are removed, but these areas have higher concentrations of non-native plants. Although 'Akohekohes feed primarily in the canopy on 'ohi'a trees, they also feed on flowering understory shrubs. The destructive activities of pigs, together with the encroachment of non-native plants into formerly pristine forest, may cause 'Akohekohes to search for food at lower elevations, where infectious mosquitoes and avian diseases are common.

Diet: Nectar from the 'Ohi'a tree makes up 40-75% of these birds' diets. They also feed on the nectar of other plants, caterpillars, flies, spiders, and other invertebrates.

Breeding: Breeding appears to begin in February-March. No nests have been described, although immature birds have been observed with adults in May-August.

Cool Facts: The Hawaiian name for this species, pronounced "ah ko-hay ko-hay," comes from a commonly heard call that it makes.

The ‘Akohekohe is very aggressive and will chase off Apapane and I’lwi for possession of 'ohi'a blossoms.

The Hawaiian name of the bird refers to the short crest feathers which were deemed reminiscent of pubic hair.

Hawaiian Name: po'o-uli
Common Name: Black-faced Honeycreeper
Scientific Name: *Melamprosops phaeosoma*

Size: 5 ½ inches (14 cm)

Habitat: Oceania; Hawaiian Islands North-eastern slopes of Haleakala on the island of Mau'i. Found in the 'Ohi'a-lehua forests.

Status: Presumed Extinct (2006). **Global Population:** 2? At the printing of this manual, it is believed that there may be 1 or 2 males left. The last remaining female died in late 2004. In 1973, the estimated population was felt to be less than 200 birds. The dramatic population decline has been attributed to a number of factors, including habitat loss; mosquito-borne diseases; predation by pigs, rats, domestic cats, and mongooses; and a decline in the native tree snails that the Po'o-uli relies on for food.

Diet: Snails, insects, and spiders.

Nesting: Nests are built of twigs and mosses and were located in leafy branches of Ohi'a-lehua trees. 1-2 eggs are laid.

Cool Facts: Po'o-uli loosely translated means "Dark Head" or "Bandit Mask".

A desperate attempt to save a species: **"**In 2002, a female was captured and taken to a male's home range in an attempt to get them to breed. The female, however, had flown back to her

own nest, which was a mile and a half away, by the next day. There was also a ten-day expedition which was scheduled to begin on April 27, 2004. The goal of this was to capture all three birds, and bring them to a bird conservation center on the island in the hope they would produce offspring.

On September 9, 2004, a male Po'o-uli was captured and taken to the Maui Bird Conservation Center in Olinda, in an attempt to captively breed the bird. However, biologists could not find a mate for the male before it died of avian malaria on November 28, 2004. Biologists are now searching for the two remaining birds, which have not been seen for over a year and are probably dead too. Tissue samples have been taken from the male for possible future cloning, but as neither birds of the opposite sex are now available nor natural behavior can be imprinted on possible cloned individuals (assuming that cloning of birds will actually be established as a working technique, which currently is not the case), this does not seem probable. As such efforts would likely compete with conservation funding of extant bird species, it may not even be desirable as a cloning attempt would both be highly likely to fail and at the same time jeopardize the survival of other highly threatened species. (VanderWerf et al. (2006)).

Hakalua Forest National Wildlife Refuge (Photo: Ken Gilliland)

Hawaiian Name: O‘ahu ‘alauahio
Common Name: O’ahu Creeper
Scientific Name: Paroreomyza maculata

Size: 4 inches (11 cm)

Habitat: Oceania; Endemic to O`ahu in the Hawaiian Islands (USA), where fossil evidence indicates that it once occurred in the lowlands. In the past few decades, there have only been a few confirmed sightings, with several of these from the area around North Halawa Valley, Ko`olau range. The last well-documented observation was of two birds on December 12, 1985 on Poamoho Trail during the Waipi`o Christmas Bird Count.

Recent sightings have been between 300 and 650 m in remnant native, lowland mesic to wet forest.

Status: Presumed Extinct (1992). Global Population: 0. The species was common there in the late 19th century, but rare by 1930. The last probable sighting was in 1990. The final sightings of this species were in the mid to upper regions of the Ko’olau Mountains between 980 and 2,132 feet, where there is remnant native lowland forest that has been degraded by introduced plants. Extensive surveys by state biologists in 1992 failed to detect the species, which is now considered extinct, although it is still listed as federally endangered.

Deforestation and mosquito-borne avian diseases are likely among the chief reasons for this

bird's disappearance. Predation may also have played a role, though there is no evidence to support this theory, since the bird had become so rare even 70 years ago. Presumably Short-eared Owls and introduced cats, rats and mongoose preyed on the birds, and pigs and other domestic ungulates degraded its habitat.

Diet: Invertebrates. It foraged on trunks and limbs of trees and shrubs, probing the bark for insects. In the 1890s, it was reported to eat quantities of carabid beetles, most likely wood-borers, as it was seen feeding on the dead branches of koa trees.

Nesting: Small, straight-billed, warbler-like passerine. Male yellow below, olive-green above, with dark lores fading into olive eye-stripe, and distinct yellow forehead and superciliary. Female greenish-grey above, pale yellowish-white below, with two prominent, pale wing-bars, pale lores and forehead, and dark eye-stripe.

Little is known of nesting habits. One nest with two eggs was collected in late January 1901.

Cool Facts: Surveys have been carried out during the 1990s to search for this species, but have failed to find any birds. A "Rare Bird Discovery Protocol" has been developed which could be applied to this species in the event of its rediscovery

Hawaiian Name: kakawahie
Common Name: Moloka'i Creeper
Scientific Name: Paroreomyza flammea

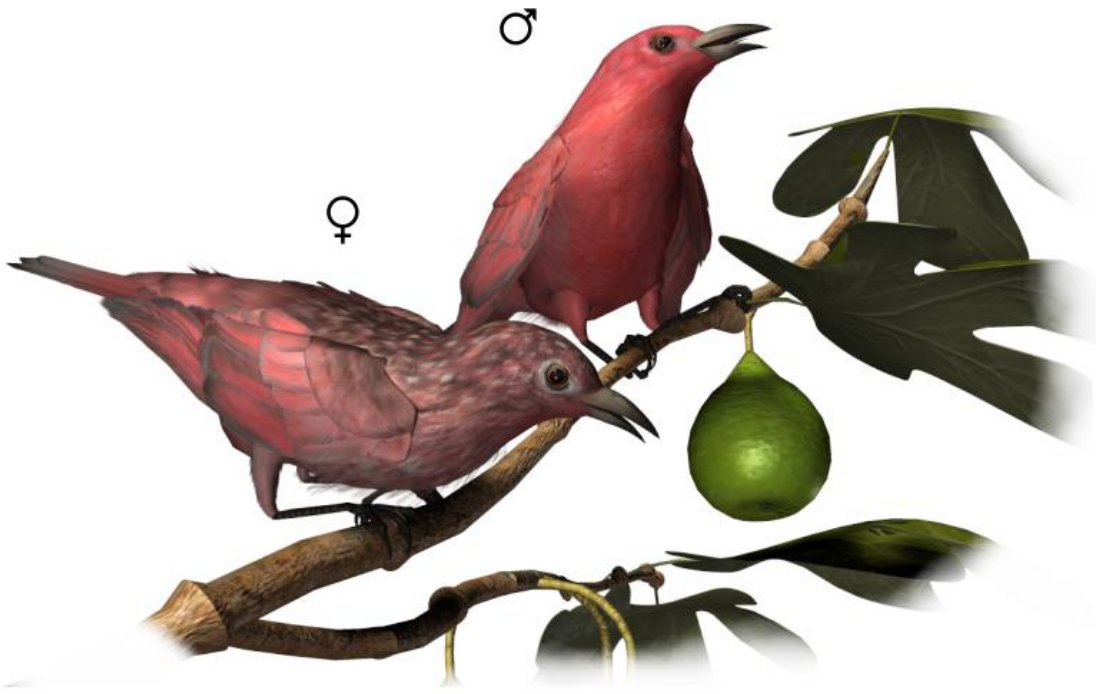
Size: 5 inches (13 cm)

Habitat: Oceania; Hawaiian Islands. Endemic to Moloka`i. Found in wet `ohi`a forests above 500 m.

Status: **Extinct (1962).** **Global Population:** 0. It was common in the 1890s, but became extinct over the first half of the 20th century. The last record was in the Kamakou Preserve in 1962. Its extinction was presumably due to habitat destruction and disease.

Diet: Insects, and spiders. Often foraged on tree trunks, branches and leaves.

Nesting: Males were bright scarlet; females rusty brown above, buffy white bellies with variable amount of orange on throat and breast.



Cool Facts: British ornithologist Scott Barchard Wilson discovered the Moloka'i creeper in the late 19th century while lost on a trail in the Moloka'i forest. He was hiking with a Hawaiian guide in the highlands of Kalae near what is now the R.W. Meyer Sugar Mill and Museum, when a penetrating mist brought the visibility in the forest down to zero. He later wrote: "While we were wandering about and searching for the trail, I heard a curious sound-a continued chip, chip, chip, not unlike the sound of chopping wood. At first I did not think it could belong to a bird; soon, however, I was undeceived, as a flash of brilliant orange color passed us in the fog."

His journal describes a method of study foreign to 20th century ornithologists. "The continuous metallic note enabled me to get within range and I fired, bringing down two birds, which proved to be male and female. Soon afterwards I shot another of the bright-colored males. We had by

this time hopelessly lost our way, and the consequences might have been serious; so we were extremely glad to hear revolver shots at no great distance, which proved to be fired by Mr. Meyer's sons, who had come in search of us."

Wilson collected the Moloka'i creeper and other birds and sailed back to England with their pelts and his journals. F.W. Frohawk made artistic renderings to depict the birds in nature.
Little did Wilson know that the Moloka'i creeper was on the verge of extinction. Hunting the bird for its colorful feathers to stitch into Hawaiian capes and for use in musical instruments and ceremonial implements had reduced the population before western explorers reached Moloka'i's mountains. Grazing, farming and logging by newcomers cleared many forests. The introduction of other birds into the Hawaiian islands also reduced the habitat for the kakawahie before Wilson arrived.

The last living specimen was seen in 1962 at Ohialele Plateau, one of the most isolated ecological niches in Hawai'i, located above Pelekuna Valley. This plateau is part of Kamakoa Preserve, which is managed by the Nature Conservancy and spreads across 2,744 acres of Moloka'i. It is home to more than 250 kinds of Hawaiian plants and remains a sanctuary for other endangered forest birds amakahi and apapane.

The Hawaiian name for this species, Kaka-wahie, means "to break up firewood," which describes the chipping call of this beautiful bird.

Koa Trees at Hakalua Forest National Wildlife Refuge **(Photo: Ken Gilliland)**

Hawaiian Name: Hawai'i mamo
Common Name: Hawai‘i Mamo
Scientific Name: *Drepanis pacifica*

Size: 8 inches (20 cm)

Habitat: Oceania; endemic to the big island of Hawai`i (USA). It inhabited forest canopies; especially Ohi'a-lehua forests.

Status: Extinct (1899). Global Population: 0. It was heavily trapped by Hawaiians for their feathers, but it is more likely that habitat destruction and disease were the ultimate causes of the species' extinction. European settlers changed the Mamo's habitat to support agriculture and cattle ranching, which damaged the bird's food source. The cattle roamed loose in the forests, destroying the understory ecosystem. Even though this was discovered early and was well known to the Hawaiians, the Mamo quickly disappeared.

Avian pox may have killed any birds that survived habitat destruction. There are many specimens of this bird in American and European museums. The bird seemed to disappear in 1899, but reports of this bird continued for a few more years. The last confirmed sighting was in July 1898 near Kaumana on the island of Hawai‘i by a collector, Henry W. Henshaw, who, as mentioned by Tim Flannery in his book, A Gap In Nature, shot and wounded a bird he was stalking, before it escaped with another bird.

Diet: Flower nectar.

Breeding: The male and female of the species looked similar.

Cool Facts: The Mamo was one of the most honored birds in Hawaiian society. Its orange feathers were used to create capes and hats (featherwork) that were used by royalty. Feather collecting contributed to the bird's decline. The famous yellow cloak of Kamehameha I is estimated to have taken the reigns of eight monarchs and the golden feathers of 80,000 birds to complete.

Hawaiians collected the birds by removing sap from sandalwood trees and breadfruit to create a sticky paste that they placed near the blossoms of lobelias. A hungry Mamo would drink the nectar, and its feet would get stuck in the sap.

Some scientists claim that after plucking, Mamo were kept as pets, or cooked. Others claimed that the birds were released, and that there was a Kapu or restriction that required live release. Even if the birds were released, they would still be in a state of shock and risk injury. However, Hawaiian birds are relatively tame and unafraid when captured, and so might have survived handling better than most birds.

The Hawaiian name probably is a corruption of Hoohoo ('O'o) and relates to the birds' calls.

Kalâkaua a he inoa	Kalâkaua is his name
Ka pua mae`ole i ka la	A flower that wilts not in the sun
Ea ea ea ea	Tra la la la
Ke pua maila ika mauna	Blooming on the summit
Ke kuahiwi o Maunakea	Of the mountain, Mauna Kea
Ea ea ea ea	Tra la la la
Ke `a maila i Kilauea	Burning there at Kilauea
Malamalama o wahine kapu	The light of the sacred woman
Ea ea ea ea	Tra la la la
A luna o Uwe Kahuna	Above Uwe Kahuna
Ka pali kapu o Ka`au	The sacred cliff of Ka`au
Ea ea ea ea	Tra la la la
Ea mai ke ali`i kia manu	The bird catching chief rises
Ua wehi i ka hulu o ka mamo	Adorned with feathers of the mamo bird
Ea ea ea ea	Tra la la la
Kalâkaua a he inoa	Kalâkaua is his name
Ka pua mae`ole i ka la	A flower that wilts not in the sun
Ea ea ea ea	Tra la la la

Hawaiian Name: o'o nuku'umu
Common Name: Black Mamo
Scientific Name: *Drepanis funerea*

Size: 8 inches (20 cm)

Habitat: Oceania; Hawaiian Islands (Moloka'i, Hawai'i and fossils found Mau'i). Found in forest understory.

Status: Extinct (1907). Global Population: 0. Its' extinction was probably largely caused by the destruction of its understory habitat by introduced cattle and deer, and predation of its nests by introduced rats and mongooses.

Diet: Flower Nectar (primarily arboreal lobelia and Ohi'a-lehua) and some insects. They spent only a few seconds over each flower, darting their tongues very rapidly in and out.

Nesting: Both sexes were alike although the beak of the male is perhaps longer and the female may be generally smaller.

Cool Facts: R.C.L. Perkins first discovered this beautiful jet-black bird in 1893 in Pelekunu Valley on Moloka'i. The last sightings of the bird were in 1907, but they were seen further to the east on the island. A survey on Moloka'i in 1936 failed to find any specimens. Perkins believed that in most respects, including the voice, this species closely resembled the Hawaii mamo, *Drepanis pacifica*. Black mamos were so tame that their discoverer was able to watch them at very close quarters as they worked their way from one large flower to another.

The last Black Mamos were observed in 1907 by a collector, Alanson Bryan, who had shot three birds. Tim Flannery quoted him as having written, "To my joy I found the mangled remains hanging in the tree in a thick bunch of leaves, six feet or more beyond where it had been sitting."

The Hawaiian name refers to " 'O'o with the sucking beak"

The following is a complete list of bird species endemic only to the Hawaiian Islands:

Procellariidae
- Hawaiian Petrel ʻUaʻu, Pterodroma sandwichensis (VU)
- Newell's Shearwater or ʻAʻo, Puffinus newelli (EN)

Anatidae
- Hawaiian Goose or Nēnē, Branta sandvicensis (VU)
- Hawaiian Duck or Koloa maoli, Anas wyvilliana (EN)
- Laysan Duck, Anas laysanensis (CR)

Accipitridae
- Hawaiian Hawk or ʻIo, Buteo solitarius (NT)

Rallidae
- Laysan Rail, Porzana palmeri †
- Hawaiian Rail, Porzana sandwichensis †
- Hawaiian Moorhen or ʻAlae ʻula, Gallinula chloropus sandwichensis
- Hawaiian Coot ʻAlae keʻokeʻo, Fulica alai (VU)

Recurvirostridae
- Hawaiian Stilt or Aeʻo, Himantopus mexicanus knudseni

Laridae
- Hawaiian (Black) Noddy or Noio, Anous minutus melanogenys

Strigidae
- Pueo, Asio flammeus sandwichensis

Meliphagidae
- Kauaʻi ʻŌʻō, Moho braccatus †
- Oʻahu ʻŌʻō, Moho apicalis †
- Molokaʻi ʻŌʻō, Moho bishopi †
- Hawaiʻi ʻŌʻō, Moho nobilis †
- Kioea, Chaetoptila angustipluma †

Corvidae
- Hawaiian Crow or ʻAlala, Corvus hawaiiensis (EW)

Monarchidae
- Kauaʻi ʻElepaio, Chasiempis sandwichensis sclateri
- Oʻahu ʻElepaio, Chasiempis sandwichensis ibidis
- Hawaiʻi ʻElepaio, Chasiempis sandwichensis sandwichensis (3 races)

Sylviidae
- Laysan Millerbird, Acrocephalus familaris familaris †
- Nihoa Millerbird, Acrocephalus familaris kingi

Turdidae
- Kamaʻo, Myadestes myadestinus †
- ʻĀmaui, Myadestes oahensis †
- Olomaʻo, Myadestes lanaiensis lanaiensis
- ʻOmaʻo, Myadestes obscurus (VU)
- Puaiohi, Myadestes palmeri (CR)

Drepanididae
- Laysan Finch, Telespiza cantans (VU)
- Nihoa Finch, Telespiza ultima (CR)
- ʻŌʻū, Psittirostra psittacea (CR)
- Lanaʻi Hookbill, Dysmorodrepanis munroi †
- Palila, Loxioides bailleui (EN)
- Lesser Koa-finch, Rhodacanthis flaviceps †
- Greater Koa-finch, Rhodacanthis palmeri †
- Kona Grosbeak, Chloridops kona †
- Maui Parrotbill, Pseudonestor xanthophrys (CR)
- Kauaʻi ʻAkialoa, Hemignathus ellisianus procerus
- Oʻahu ʻAkialoa, Hemignathus ellisianus ellisianus
- Maui Nui ʻAkialoa, Hemignathus ellisianus lanaiensis
- Lesser ʻAkialoa, Hemignathus obscurus †
- Common ʻAmakihi, Hemignathus virens (LC)
- Oʻahu ʻAmakihi, Hemignathus flavus (VU)
- Kauʻi ʻAmakihi, Hemignathus kauaiensis (VU)
- Greater ʻAmakihi, Hemignathus sagittirostris †
- Nukupuʻu, Hemignathus lucidus (CR)
- ʻAkiapolaʻau, Hemignathus munroi (EN)
- ʻAnianiau, Magumma parva (VU)
- ʻAkikiki, Oreomystis bairdi (CR)
- Hawaiʻi Creeper, Oreomystis mana (EN)
- Oʻahu ʻAlauahio, Paroreomyza maculata (CR)
- Maui ʻAlauahio, Paroreomyza montana (EN)
- Kakawahie, Paroreomyza flammea †
- ʻAkekeʻe, Loxops caeruleirostris (CR)
- ʻAkepa, Loxops coccineus (EN)
- ʻUla-ʻai-Hawane, Ciridops anna †
- ʻIʻiwi, Vestiaria coccinea (VU)
- Hawaiʻi Mamo, Drepanis pacifica †
- Black Mamo, Drepanis funerea †
- ʻAkohekohe, Palmeria dolei (CR)
- ʻApapane, Himatione sanguinea (LC)
- Poʻouli, Melamprosops phaeosoma (CR)

Special Thanks to…

….my beta team (FlintHawk, Linda, Jan, Rhonda and Sandra)

Species Accuracy and Reference Materials

Many birds of the same species do vary considerably in color. This package tries to emulate the colors and markings in the most commonly found variants.

The author-artist has tried to make these species as accurate to their real life counterparts as possible. With the use of one generic model to create dozens of unique bird species, some give and take is bound to occur. The texture maps were created in Painter with as much accuracy as possible. Photographic references from photographs from various Internet searches and several field guides were used.

Sources for this Volume and Field Guide

Books, Magazines and Papers

- "**The Sibley Guide to Birds**" by David Allen Sibley. Allred A. Knopf, New York 2001
- **"Birds of Hawaii and the Tropical Pacific"** by H. Douglas Pratt, Phillip L. Bruner and Delwyn G. Berrett, Princeton Press, 1989.

Websites

- Wikipedia (http://www.wikipedia.com)
- Honolulu Zoo (http://www.honoluluzoo.org/)
- Birdlife International (http://wwwbirdlife.org)
- US Fish and Wildlife Pacific Islands (http://www.fws.gov/pacificislands)

Road closed due to lava, Volcano National Park (Photo: Ken Gilliland)

Rendering Tips

Working with Songbird Remix morphs

Because birds in the Songbird ReMix series use generic bird bases and morphs, adding morphs upon morphs more often than not will create undesirable results. Case in point is the Parrot base which defaults with the “Parrot” morph loaded (which is found in the HEAD section (*Creations morphs : Specific Bird morphs*)). Adding the other creation morphs on top of that will be a hit and miss experience. Press **CTRL + E** to clear all the morphs in that section.

The reason why I have chosen to leave non-parrot morphs on for instance the parrot base is for experimentation and creating unique and imaginary species. In some cases, such as with a parakeet, it’s better to shape the parakeet head from the standard Songbird ReMix head than the default parrot morphs.

Another example is the BK-Close morph use. When BK-Height or BK-Length morphs are used often the BK-Close will require only a 0.7 or 0.8 setting to close the beak which normally takes a 1.0 setting. When applying a pose to a bird with a thicker or thinner than normal beak, you may need to adjust the BK-Close setting. The same is true with legs with shorten shins or thighs. One size does not fit all with a generic bird model.

Note: Both the Hawai’i Mamo and o'o nuku'umu (Black Mamo) **DO NOT USE** the “Bk-Close”morph. This morph should remain set to “0”; instead use the “Bk-Close4HoneyCrpr” found in the “Possible Action morphs” section

In VUE…

Vue often creates dark squares on Songbird ReMix wings. I'm not really sure why this happens and there's no easy solution. One thing that will minimize the issue is to use "Poly Mesh Options" and split the model shoulders (wings) by materials. Select the "wingfeathers" material in each shoulder to change the smoothing to 60% or less. The easiest way to do this is in combination with the sub-divide method. I also often find it better to also cut down the “Highlight Global Intensity” to 40% and “Highlight Global Size” to 50% on Plumage, Wings and Beak materials in the “Highlights” section.

The best solution is to save your bird as an .obj, then go into a 3D modeller and sub-divide the "wingfeathers" material once and save the .obj. If you do this you may have to re-enter the transparent material maps. Another way, or in combination with the sub-divide method, is to try turning the "wingfeathers" material smoothing down to 60% or less (either on the Poser CR2 or in the VUE mesh editor. This corrects 95% of the issues.

Sub-dividing the "Fluff" materials helps to cut down on the rings and graying that occur in Vue on Fluff areas.

In Carrara…

Carrara can have multiple issues with Songbird Remix models. The most common are scaling issues; Carrara does not accept internal Propagating Scale (a scale variable tied to the parent that tells all attached children to do the same) so will not import Poser files correctly. Songbird ReMix uses Propagating Scale in the wings, feet and head regions. Most issues seem to be tied to the Foot Scaling. Determine the amount of scaling in the foot and scale the 8 talon parts to match each foot.

The second most common problem is weird shapes or depressions in the rump area. This is because Carrara does not understand how to interrupt the scaling of the thighs. The best and easiest solution is to set each Thigh parts YScale to 100%.

I have seen some issues (primarily with the wings exploding) when importing a Poser scene file (.pz3) into Carrara. This doesn't appear to happen all of the time. I've corrected it by going into the BODY and each WING part and turning off/on the Wing Fold morph and making sure the BODY section's Wing Shapes are all in the default setting.

There is a Carrara Fix package available in the SongbirdReMix.com downloads that provides foot scaling poses.

In DAZ|Studio…

DAZ Studio can have multiple issues with Songbird Remix models when using the Poser Version**. Download and Use the DAZ|Studio version.** I used to provide each bird as a saved scene (.daz) in Studio but unfortunately with each newer version of Studio, the .daz format from previous versions is less stable; something not loading, sometimes mismapping textures. The current approach (described in the "Creating a Bird in DAZ Studio), while less convenient, does load and display the birds correctly with all versions of DAZ Studio.

The primary issue with using the Poser version with DAZ|Studio is Scaling; DAZ|Studio does not accept internal Propagating Scale (a scale variable tied to the parent that tells all attached children to do the same) so it will not import Poser files correctly. Songbird ReMix uses Propagating Scale in the wings, feet and head regions. Most issues seem to be tied to the Foot Scaling. Determine the amount of scaling in the foot and scale the 8 talon parts to match each foot.

The second issue is that material setting will be off. The DAZ|Studio version has Material files tuned to DAZ|Studio included. This version also has Character files so it is possible to load the Poser .cr2, then apply the DAZ|Studio character setting which will fix the scaling and material issues. This method can be helped if updated Songbird Remix CR2s are available.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