

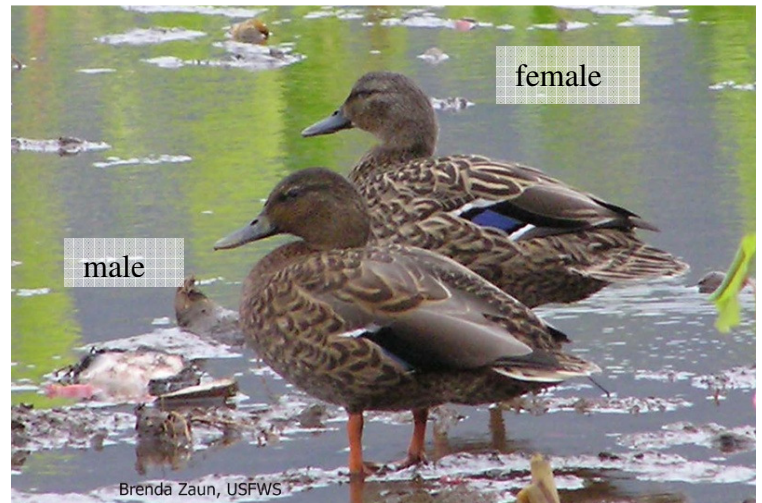
Koloa Maoli General Background Information for Teachers



The Koloa maoli is one of two native duck species found in Hawai'i (the other is the Laysan Duck that is currently found only in the Northwestern Hawaiian Islands). Koloa maoli is our only native duck in the main Hawaiian Islands. It is an endangered species with an estimated population of only about 2,200 of these waterbirds left on Earth. Most Koloa are now found on the islands of Kaua'i, Ni'i'hau, and Hawai'i. On O'ahu and Maui, most resident ducks are feral Mallards or Mallard-Koloa hybrids.

Appearance

Koloa maoli adult males (drakes) and females (hens) are overall colored mottled brown. Males have darker heads and necks, more olive-tones (yellow-green) in their bills and brighter orange feet than females. Females have dark bills with orange or fleshy tones and they are smaller than males. Both sexes have iridescent green-to-blue wing feathers (speculum) edged with white that are sometimes visible as a patch on their sides.



Koloa maoli photos by Brenda Zaun, USFWS

Food

Koloa maoli are dabbling ducks. They are known to be good divers but usually feed by “tipping” rather than submerging. You might see them “bottom up” in the water, with their necks stretched down to gather food (see photo to right). Dabblers also “dabble.” They have bills that are specially designed to strain small invertebrates and plant material from the surface of the water. Koloa maoli eat primarily small invertebrates such as aquatic insects, snails and crustaceans. They also eat freshwater *limu* (algae) and seeds of grasses, sedges and other plants. They sometimes graze on grasses and legumes (bean-type plants) similar to geese. Note that fish are not part of the normal diet. Invasive fish (mosquito fish and tilapia) compete with Koloa maoli for food and degrade water quality.



Habitat

A habitat is a place a plant or animal can get the food, water, shelter and space it needs to survive. What makes the Koloa maoli unique among other waterbirds is that they are able to live in a wide variety of wetland habitats ranging from lowland areas to higher areas of elevation such as rain forests. A wetland is an area of land that has standing or moving water, such as a swamp, marsh, bog, or riparian zone (river and floodplain).

Like most ducks, Koloa maoli like to live in areas where there is freshwater. But this duck is special. It lives in *makai* (toward the ocean) as well as *mauka* (toward the mountain) areas. A proper habitat should provide food, water, shelter and space for a plant or animal. Most Koloa can be found in freshwater wetlands, both natural and human-made such as mountain bogs, streams, plunge pools at the bases of waterfalls, watering ponds for stock animals, flooded pastures, golf courses, taro *lo'i* (patches) and coastal wetlands. Taro *lo'i* fall into the category of agricultural wetlands and are not natural but they provide habitat for birds and food for people. In addition to aquatic habitats, Koloa use grasslands and riverbanks near wetlands for nesting, feeding and resting. They also frequent upper forest bogs and streams.

Wetland areas have been impacted significantly over time primarily for development. Not only are wetlands important as habitat for native birds and plants, they also break down nutrients, pesticides and bacteria, recharge our water table, store carbon, and serve as buffer zones that protect areas from flooding and sedimentation. Coastal wetlands are especially valuable because they are usually located between areas where people live and work and the ocean, which can bring high waves that could damage human structures.

Threats

Koloa maoli were once plentiful on nearly all of the main Hawaiian Islands but their populations crashed from the combined effects of habitat loss, introduced predators and over-hunting. At one point they were down to roughly 500 birds. Their numbers increased after protection efforts increased. However, the threats to the Koloa maoli continue, including:

- Habitat loss: In the last century, more than 30 percent of coastal plain wetlands have been lost to draining and filling. Most of the wetlands that remain are degraded by altered hydrology, invasive plants and contaminants and not good habitat for Hawaiian waterbirds. A shift from wetland agriculture to other crops also has reduced the amount of wetland habitats.
 - Altered hydrology: Changes to wetland habitats for flood control or to provide municipal water sources can disturb the Koloa maoli habitats.

- Non-native invasive plants: Several species of invasive plants, including pickleweed, water hyacinth, and mangrove reduce or completely cover open water, mudflats, or shallows which are important Hawaiian waterbird microhabitats.
- Environmental contaminants: Fuel and oil spills are harmful contaminants
- Introduced predators: Koloa maoli eggs and ducklings are especially vulnerable to predation by dogs, rats, feral cats, mongooses, cattle egrets, barn owls, and non-native predatory fish (e.g., bass).
- Avian Diseases: the most important disease affecting Hawaiian waterbirds is avian botulism (not contagious to people).
- Hybridization: Koloa maoli are interbreeding with a closely related but non-native invasive bird, the feral Mallard.

*feral = domesticated species that has gone wild

Hybridization with Mallards

Currently, the most serious threat to the Koloa maoli is hybridization with feral Mallards. Hybridization is when two closely related species reproduce to create a crossbreed. This is a problem for the Koloa maoli, because their gene pool is diminishing. The species could become extinct because of hybridization alone in a matter of a relatively short period of time. This unique Hawaiian species that has taken hundreds of thousands of years to evolve, could vanish because of our activities (e.g. releasing and feeding Mallards) in a little over 100 years.

• Mallards

The Mallard is native to North America, Europe, and Asia. It has been introduced by humans to New Zealand, Australia, Africa, and Hawai'i. Scientists believe that Mallards were brought to Hawai'i starting in the late 1800s for stocking ornamental ponds and farming. In the 1950s and 1960s they were brought in by the hundreds for sport hunting. Few Mallards are migratory and come to Hawai'i on their own but they are here during their non-breeding season (November through March) and are not believed to pose a threat to Koloa.

Domesticated Mallards that have been released or escaped into the wild and are reproducing are called "feral." Feral Mallards are dominant ducks, adapted to survive and reproduce in habitats with human influences, giving them the competitive edge over Koloa maoli. Large concentrations of feral ducks in parks near dining establishments are a potential human health hazard.

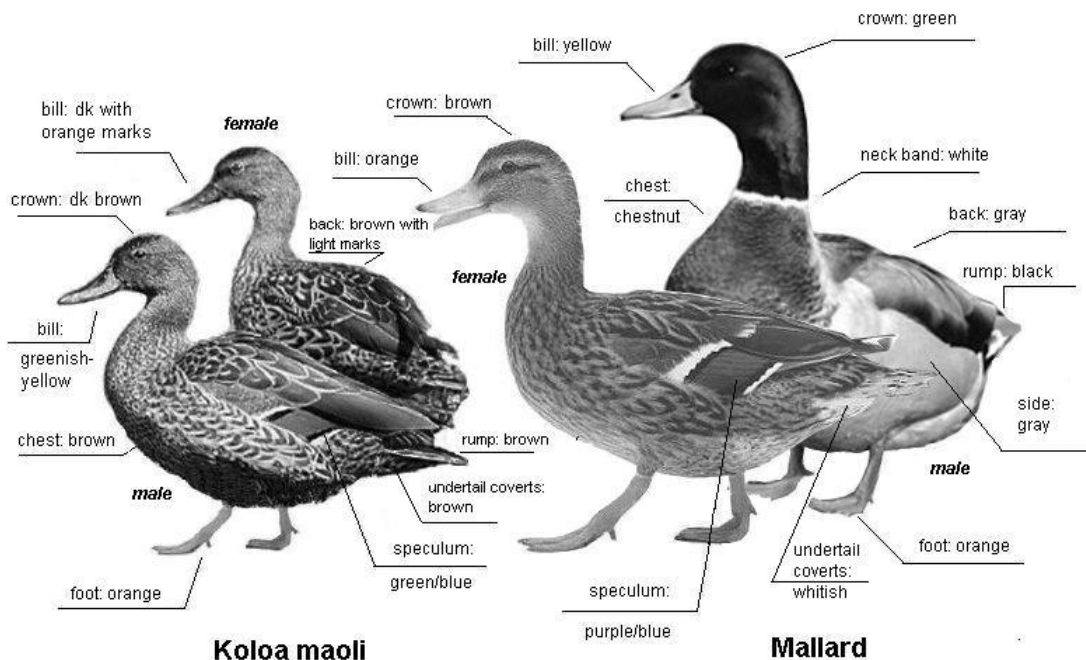
• Comparing Koloa and Mallards

The Mallard is closely related to the Koloa maoli. The male Mallard has the distinctive green head, white neckband, and yellow-green bill. Its chest is

chestnut-colored and body is gray with a black rump. Females are mottled drab brown with orange bills. Both sexes have iridescent purple-blue wing feathers (speculum) edged with white. During the late summer and fall, some male Mallards molt and look like female Mallards.

Major physiological differences between Koloa maoli and Mallards

	Male Koloa	Female Koloa	Male Mallard	Female Mallard
Head color	Brown	Dark brown	Green	brown
Breast	Chevron pattern	Chevron pattern	Solid chestnut	Chevron pattern
Back	Brown with bars and markings	Brown with bars and markings	Solid gray	Brown with bars and markings
Speculum	Green to blue-green	Green to blue-green	Blue to purple	Blue to purple
Bill	Olive to dark	Olive-brown with orange base and tinge	Yellow to green	Orange with dark saddle
Undertail	Brown	Brown	Mostly white	Brown
Belly	Spotty brown	Spotty brown	Gray	Spotty brown
Size	Small	Very small	Large	Larger than male Koloa



photos by Jack Jeffrey

When comparing a Koloa maoli and Mallard side by side, one would see that the Koloa is a deeper, richer brown, and about 20 to 30% smaller than the Mallard. The behaviors are also different. The Koloa maoli is usually “shy” and “secretive” whereas the Mallard is more “bold” and “aggressive.”

Mallard/Koloa hybrids are often difficult to distinguish from Koloa because the size and plumage (feathers) of hybrids can vary greatly. Even biologists have trouble! To help with this problem, scientists are developing techniques to more accurately differentiate duck types.



While it may seem appropriate to use the analogy of mixed races of people to hybrid ducks, that is incorrect. All human races are of the same species (*Homo sapiens*). The Koloa maoli (*Anas wyvilliana*) and Mallards (*Anas platyrhynchos*) are completely separate species. They are in the same genus

(*Anas*) and are related closely enough to breed and create offspring that are fertile. Some hybrids, like the mule (cross of a female horse and male donkey) are infertile. Outside of rare cases, mules cannot make more mules. Koloa and Mallards were reproductively isolated until people brought Mallards to Hawai‘i.

Resident wild ducks on O‘ahu and Maui are predominantly Mallard/Koloa hybrids, but true Koloa populations are believed to still occur on Kaua‘i, Ni‘ihau and Hawai‘i in wetlands *mauka* to *makai*. However, recent genetic studies show that hybrids now occur on Kauai and Hawai‘i, worsening the problem. Twenty year trends on O‘ahu show a rapid increase in Mallard-hybrid observations and an equally rapid decrease in Koloa observations.

- **Global problem**

Feral Mallards are not only problematic in Hawai‘i. They threaten native duck populations around the world. Feral duck control programs in other regions have made significant strides. In Florida, for example, feral Mallards threaten the native Mottled Duck and wildlife officials are able to enforce strict laws prohibiting possession and sale of Mallards.

Native ducks threatened (or potentially threatened) by feral mallards

Species	Location
African Black Duck	Southeast Africa
American Black Duck	Eastern North America
Mottled Duck (aka Florida Duck)	Southeastern U.S.
Laysan Duck	Laysan and Midway, Northwestern Hawaiian Islands
Mexican Duck (almost extinct)	Southwestern North America
New Zealand Grey Duck (almost extinct)	New Zealand
Australian Black Duck	Australia
Eastern Spot-billed Duck	Russian Far East
Yellow-billed Duck	Southeast Africa
Meller's Duck	Madagascar, Mauritius

Source: Hawai'i Conservation Alliance Koloa-Mallard Hybridization Position Paper

Solutions

Solutions to save the Koloa maoli include:

- protect and enhance their habitat
- breed and release additional populations that are safe from threats
- conduct education and awareness programs to address issues of predation by introduced predators as well as hybridization and control of feral Mallards. (messages: reduce their population; don't buy, sell, or feed them – and don't release them into the wild)

If feral Mallards are removed from Hawai'i, our islands' isolation may provide natural barriers for reinvasion. Therefore, scientists believe that the Koloa maoli has a high potential for recovering from being endangered but only if we act now.

Interesting Koloa Stories

- ❖ In the "Story of Umi," it is told that Imaikalani, the fierce fighting blind king of Ka'ū, was aided by two "wild ducks" (Koloa). Imaikalani could throw 10 spears in a single throw, five from the right hand and five from the left; the spears would fly in a group like lightning from which no man could dodge. It was believed that the ducks were the source of his skill and daring bravery. 'He had two wild duck watchers which reported to him the appearance of any one either from the front or from the rear, or from the sides, whichever way the voices of the birds indicated.' The birds would hover above and make a noise from the direction of the opponent to warn and prepare Imaikalani to make a crushing blow.

From Selections from Fornander's Hawaiian Antiquities and Folk-lore
Samuel H. Elbert, Editor, University of Hawai'i Press, 1971, p. 169

- ❖ There is an account of Koloa maoli seen “nesting on the twin islands of Mokulua off Lanikai, and returning to O‘ahu carrying or swimming chicks to the Kawainui swamp at Kailua or in the outlet of the Kaelepulu Pond by Lanikai. Mr. John Fleming saw a duck fly to the swamp carrying a young one between its feet.” (G.C. Munro, *Birds of Hawaii*, 1944).

In “The Koloa: A preliminary report on the life history and status of the Hawaiian duck (*Anas wvilliana*) by Gerald E. Swedberg, 1967.

- ❖ Koloa maoli are most frequently seen in lowland wetland areas like those found at Hanalei Refuge on Kaua‘i. They have also been seen swimming in the river and flying through the forest in Waipā, Kaua‘i (personal communication with S. Sproat-Beck, 2008). They are truly mauka to makai birds!