HAWAIIAN DUCK *Anas wyvilliana*

Other: *Koloa, Koloa maoli, Auku* monotypic

native resident, endemic, endangered

The Koloa is endemic to the *Southeastern Hawaiian Islands*, where it was historically widespread and abundant (Dole 1879, Henshaw 1902a, Perkins 1903, Munro 1944) on all islands except Lana'i (where Munro 2007 failed to see one in 1911-1929) and Kaho'olawe, but has suffered population declines resulting from several factors related to European contact. As with other native Hawaiian birds its systematic history is checkered (Stejneger 1888, Wilson and Evans 1899, Rhymer 2001; see Synonymies). Although Ellis (1782), Cook and King (1784), Dixon (1789), Peale (1848), and others (Olson 1996a) had noted or collected many "wild ducks" on Kaua'i and elsewhere, and the resident species had been known since the early 1800s (e.g., de Freycinet 1819, Bloxham 1827b), it was considered a Pacific Black Duck (*A. superciliosa*; see Synonymies) or sometimes a Mallard ("*A. boschas*"; *cf.* a specimen apparently collected by Peale in 1840 and named this by Cassin 1862) until Sclater (1878; see also 1881) named it *wyvilliana* based on a specimen collected during the 1875 Challenger Expedition (led by Charles Wyville Thompson). Sclater's description just preceded another by Ridgway (1878), who described it as *Anas alberti* based on a specimen of Koloa from Mazatlan, Mexico, that had undoubtedly been transported there. Although the Koloa has variously been treated as a subspecies or a species of the Mallard (or a congener of Laysan Duck) since originally named, it is now widely considered a separate monotypic species (Rhymer 2001). See Greenway (1967), Swedberg (1967b), Banko (1987a), Engilis and Pratt (1993), USFWS (1999), and Engilis et al. (2002) for summaries of the biology and historic population status of the Koloa. Banko (1979) summarized 69 specimens of Koloa known at the time.

As with the Hawaiian Goose (Nene), populations of Koloa have declined dramatically during the past 200 years but have been reinvigorated by propagation efforts and predator-control programs (Berger 1972, 1981; Graph); DOFAW Waterbird Surveys indicate a general statewide increase in numbers between 1986 and 2006, with high counts of 550 in Aug 1996 and 520 in Jan 2004. Conversion of fields for taro and rice production may have assisted Koloa populations in the 1800s. But declines beginning in the late 1800s (Henshaw 1902a, Bryan 1915; *PoP* 14[7]:18) were caused by the same factors afflicting Nene populations: pressures related to introduced predators, habitat alteration, and hunting (Schwartz and Schwartz 1949, 1953; Swedberg 1968; Berger 1972, 1981; USFWS 1978; Paton 1981a, Scott and Kepler 1985; *E* 31:43; *PoP* 14[7]:18). Although hunting prohibitions were enacted in 1925-1939 (Berger 1972, 1981), many were mistaken for migratory species and they continued to be shot through at least the early 1940s. Koloa formerly inhabited wetlands throughout the islands but native populations for the most part have retreated to mountainous streams.

The most serious present threat is genetic introgression from introduced Mallards (predicted as early as the turn of the 19th century by Perkins 1903; see also Lewin 1971, Shallenberger 1977a, *AB* 43:1370, Browne *et al.* 1993, Kishinami 2001, Rhymer 2001, Uyehara et al. 2008). It may have already been occurring during the late 1800s: a

specimen collected by Perkins in the winter of 1892-1893 greatly puzzled Newton (*in* Evenhuis 2007:172, 253, 375), who concluded in the end that it was likely a hybrid with Mallard. This threat could lead to the extinction of pure Koloa if measures are not taken (USFWS 1999, 2005; Engilis *et al.* 2002); see Mallard for more information.

The most intact populations of Koloa have survived on ***Kaua'i*** (e.g., HRBP 5749-5753) and ***Ni'ihau***, where streams and other wetland habitats preferred by Koloa are prevalent. These are the only islands on which natural populations were not extirpated; however, they were reportedly reduced to a single individual on Ni'ihau (down from around 100 observed by Palmer in 1893; Rothschild 1900) and 500-1500 individuals on Kaua'i in the 1940-1950s (Fisher 1951, Schwartz and Schwartz 1953, Swedberg 1967b). The draining of Mana Swamp, Kaua'i, in 1923 removed habitat where 2-4,000 Koloa formerly resided but a healthy population was able to persist among streams of the Alaka'i Swamp (Scott and Kepler 1985). It has generally been reported that populations on Kaua'i have recovered and remain relatively free of Mallard genes; population estimates based on island-wide censuses indicated 2-3000 individuals from the 1960s to the 1990s (Swedberg 1967b, Telfer 1975, Shallenberger 1977a), including nominal increases between 1977 and 1986, at least in the lowlands, where some down-slope dispersal in the winter is suspected (Engilis and Pratt 1993). However, Banko (1987a) examined the data more thoroughly and concluded that populations were probably lower and had declined significantly between 1956 and 1982. DOFAW Waterbird Surveys in 1986-2007 indicate a general increase, with a peak in 1993-1996 of up to 400, a low of 175 in 1998, and a high of 455 in Jan 2004; populations were also increasing on Kaua'i during the 1990-2000s according to Christmas Count data (Graph). During the 2000s an estimated 2000 individuals resided on Kaua'i and Ni'ihau (Engilis et al. 2002, USFWS 2005a, BLI 2009; *HE* 18[3]:4-5). Birds from Kaua'i are suspected of flying to Ni'ihau to take advantage of seasonal wetlands there. Aerial surveys by DOFAW on Ni'ihau have recorded up to 56 in Jan 1975, 45 in Jan 1978, and close to 100 in Aug 2006 and 2007, but most counts have been of 20 individuals or less.

On ***O'ahu***, ducks, presumably native Koloa, were noted in Waikiki 10 May 1825 (Bloxam 1827a, 1827b), Waimanalo Marsh Jun-Jul 1879 (Finsch 1880), and fairly commonly at Wailua and elsewhere around the island in 1899-1900 (Seale 1900, Perkins *in* Evenhuis 2007:109). Munro (1944) summarizes breeding by Koloa on the Mokulua Is off Kailua, probably in the 1930-1940s ("1891" as quoted by Munro, seems an error), and speculates that they went there to escape mammalian predation. Target practice on these islands during war efforts in the 1940s apparently extinguished this incipient population. Draining of marshes, hunting, and urbanization further led to the restriction of Koloa on O'ahu, primarily to mountain streams by the mid 1940s (Schwartz and Schwartz 1953) and to a state-wide count of just one bird Near Bellows AFB in Jan 1966 (Banko 1987a). Reintroduction programs have been underway throughout Hawaii since the mid-1950s and releases occurred on O'ahu in 1968-1982 (*E* 29:87-88; Berger 1981, Banko 1987a, Engilis *et al.* 2002; USFWS 2005). However, after some apparent success in the 1970s-1990s as observed on both the Waipi'o (Graph) and Honolulu (Graph) Christmas Counts, released birds have interbred extensively with feral Mallards, such that few or no pure Koloa remain (Browne *et al.* 1993, Rhymer 2001, Engilis *et al.* 2002; but see Engilis and Pratt 1993, BLI 2009). Recent DOWFAW surveys also indicate a sharp decline in numbers of pure Koloa on O'ahu, from 100-200 in 1986-1992 to < 40 in 2000-2006, and

a concomitant increase in hybrids from <100 in 1986-1998 to 510 in 2007. In the 1990-2000s individuals of various genetic hybrid ancestries were observed regularly on stock ponds and in marshes throughout O'ahu, with counts of up to 80+ recorded at the Ki'i Unit of JCNWR, where efforts occurred to eliminate the influence of Mallards from the population.

Populations of native Koloa on ***Moloka'i*** and ***Maui*** were historically small to begin with (Bryan 1908, Banko 1987a) and had become extirpated by 1947 (Schwartz and Schwartz 1949, 1953; Engilis and Pratt 1993). Reintroductions (see above) occurred on Maui in 1989-1990 but, as on O'ahu, released birds have interbred extensively with feral Mallards, and by the 2000s individuals of various genetic constitution were being observed on both islands. Recent DOWFAW surveys indicate gradual increases of pure Koloa on Maui, with a peak of 67 birds in Jan 2006, but these counts likely included hybrids. Avian botulism killed at least 29 birds at Kealia NWR, Maui, in October 2000 (*E* 60:81). A female duck showing characters of Koloa, observed with 1-2 Mallards or hybrids in Dec 2007 through 2009, is the only documented record for Moloka'i since 1893.

Henshaw (1902a) reported that Koloa were common on ***Hawai'i I*** at the turn of the century, particularly on mountain streams north of Hilo, and Perkins (1903) noted them to 2400 m elevation on Mauna Kea. Subfossil remains of 13 Koloa were found in a cave above Puu Waa Waa, indicating that they must have occurred frequently in this (now) dry area, unless transported there by pre-contact Polynesians. In Waipi'o Valley they were noted commonly when rice was grown there in 1919 but they disappeared after rice-growing ceased in 1927 (Banko 1987a). Thereafter they decreased and may have become extirpated on Hawai'i I by the 1950s (Schwartz and Schwartz 1949, 1953), although a small population may have persisted in the remote Kohala Mountains through 1958 when reintroduction efforts on Hawai'i began and resulted in a stable population of about 200 individuals by the 2000s, relatively free of Mallard genes (Engilis et al. 2002, USFWS 2005a, BLI 2009; *HE* 18[3]:4-5). DOFAW Surveys tallied about 20 birds in 1986-1999, followed by higher numbers in 2000-2006, with a high count of 97 in Aug 2004. Breeding is centered in the Kohala Mts (Uyehara et al. 2008) and extends along the Hamakua coast to Hilo (Paton 1981a, Giffin 1983a); they are observed infrequently throughout the rest of the island, especially in fall and winter. Koloa appear to favor wetland habitats on Hawai'i, which are managed for them by the USDA Wetlands Reserve Program (Uyehara et al. 2008).

A group of large, flightless, grazing waterfowl found in the subfossil record of Laysan, Kaua'i, O'ahu, and Maui Nui, the moa-nalos (Olson and James 1991, Sorenson et al. 1999, Burney et al. 2001, Ziegler 2002), appear to be highly modified descendents of Anas ducks unrelated to Koloa (Sorenson et al. 1999, Fleisher and McIntosh 2001).

Acronyms and Abbreviations

Literature cited

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