

A CHRONOLOGY OF ORNITHOLOGICAL EXPLORATION IN THE HAWAIIAN ISLANDS, FROM COOK TO PERKINS

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Abstract. Although ornithological exploration of the Hawaiian archipelago began in 1778, more than a century elapsed before reasonably comprehensive avifaunal surveys were conducted in the 1880s and 1890s. We review the history of early bird collecting for each of the major islands, based on examination of specimen data, archives, and the published literature. An island-by-island approach shows that some islands were more favored for visits by early collectors, while others, especially Maui, were long neglected. Given the uneven collecting histories of individual islands, we speculate that additional species and populations may have become extinct after first European contact, but before specimens were preserved for science.

Key Words: Hawaiian Islands; history of ornithological collecting; historical extinctions; museum collections.

Compared to many parts of the world, ornithological exploration got an early start in the Hawaiian Islands, beginning with the third and final voyage of Captain James Cook in 1778, which expedition marked the first European contact with the islands. By way of contrast, the first bird to be collected for science in Panama, crossroads of world trade from the late 15th century onward, was not described until 65 years after Cook first landed in Hawaii (Gould 1843a). Despite this promising beginning, over a century elapsed before serious efforts were made to survey the Hawaiian avifauna.

We now know that human-caused degradation of Hawaiian ecosystems began with the arrival of Polynesians (Olson and James 1982, 1991; James and Olson 1991), and was only accelerated by the increased habitat destruction and introductions of animals, plants, and pathogens that followed with new waves of human settlers from abroad. The dominant theme in Hawaiian ornithology has therefore been a chronicle of extinction.

The present survey, based on an extensive literature search and on specimen data from most of the museums housing significant collections of Hawaiian birds, emphasizes the degree to which our perception of the number and kinds of birds known historically (as opposed to those known only from bones) in the islands may be biased by the

manner and timing of ornithological collecting in the 19th century. Some species and island populations of birds probably survived undetected into the historic period but were overtaken by extinction before specimens could be collected. To identify possible biases of this nature, it is instructive to examine the history of ornithological collecting on an island-by-island basis.

In the century following Cook's arrival, ornithological exploration in the Hawaiian Islands was sporadic at best, so that an account of these years reads like a litany of missed opportunities, as noted a century ago by Newton (1892). Numerous exploring expeditions with naturalists aboard touched in the islands without adding much to ornithology. We have tried to list all those that brought back at least a few specimens (Table 1). Others that apparently did not may be found in Judd (1974). Explanations of museum acronyms are in the Acknowledgments.

In the late 1880s, Scott B. Wilson, motivated by the interest of his mentor Alfred Newton, of Cambridge University, undertook ornithological explorations of the major islands in 1887 and 1888. Wilson usually based himself in the mountain houses of island residents (Manning 1986:13), not necessarily in the best places for collecting. In several instances his activities on a given island were decidedly perfunctory, so that

he overlooked numerous species. The results of Wilson's efforts were published over several years and summarized in his magnum opus (Wilson and Evans 1890–1899). His itinerary has been pieced together partly from that source but mainly from specimen data. Wilson visited the islands in the 1890s as well. Although Newton remarked on Wilson's apparent lack of interest in further collecting at that time (Manning 1986:18), a few of his specimens from this period are found scattered in various museums.

Wilson's original discoveries spurred Walter Rothschild to send his own collector, Henry Palmer, to the islands. The industrious Palmer, with assistants including George C. Munro and one Wolstenholme (? = Harry Wolstenholme—cf. Whittell 1954:780), scoured the archipelago with such avidity that he was often accused by Rothschild's rival, Newton, of pillaging the avifauna during his sojourn from December 1890 to August 1893. An outline of Palmer's itinerary is given in Rothschild (1893) and Mearns and Mearns (1992).

Meanwhile, Newton and colleagues coordinated a Joint Committee for the Zoology of the Sandwich Islands that secured funding from the Royal Society, the British Association for the Advancement of Science, and eventually the Bishop Museum, to send another collector to the islands—R. C. L. Perkins, whose extensive labors in both ornithology and entomology spanned the period 1892 to 1897, after which his energies were devoted almost exclusively to the latter. The history of this cooperative effort and Perkins' itinerary are detailed by Manning (1986). Although Perkins' collections added only a single new species, the Black Mamo (*Drepanis funerea* Newton), to the then known avifauna, he was, fortunately, a very keen and intelligent observer who worked under field conditions of extreme deprivation and who left us with virtually all we will ever know about the habits of many now extinct species (Perkins 1893, 1895, 1901, 1903, 1913).

Although many of Wilson's specimens

went initially to UMZC, he also sold specimens rather widely (e.g., to Rothschild and RMNH). Palmer's specimens went directly to Rothschild and the bulk was subsequently conveyed to AMNH with the purchase of the Rothschild collection, although a sizable portion went to BMNH with the Rothschild bequest. Perkins' specimens were divided mainly between UMZC, BMNH, and BPBM. Material of all three collectors has been extensively dispersed through exchange and may now be found in many museums around the world.

The itineraries of Wilson, Palmer, and Perkins are summarized in Table 1. What follows is a short account of collecting in the islands prior to their more organized efforts, with notice of a few significant subsequent collections.

HAWAII

Cook's third voyage brought back a number of birds from Hawaii upon which 11 new species were later based. The principal natural history forays of this expedition took place in January and February of 1779, when the vessels were anchored at Kealahou Bay on the Kona (western) coast of the island of Hawaii. All Hawaiian specimens from the third voyage upon which new species were later founded came from this general area (Medway 1981, Olson 1989c). Most of what is known of the subsequent history of Cook voyage Hawaiian birds is dealt with in detail by Medway (1981). Of the 11 species named from this expedition, only the rail *Porzana sandwichensis* was never taken in the Kona district again.

Andrew Bloxam, naturalist of H.M.S. *Blonde* (see Oahu account), collected a single Elepaio (*Chasiempis sandwichensis*) on Hawaii in 1825 and reported the presence of what we now know to have been Dark-rumped Petrels (*Pterodroma phaeopygia*), but contributed little else to the island's ornithology (Bloxam 1827, 1925, MS notes).

Between 1825 and 1840, only a few specimens of birds, mostly geese (*Branta sandwichensis*) that presumably originated on the

TABLE 1. ISLAND-BY-ISLAND HISTORY OF COLLECTING IN THE HAWAIIAN ISLANDS MORE OR LESS CHRONOLOGICALLY ORDERED BY DATE OF FIRST SIGNIFICANT ORNITHOLOGICAL ACTIVITY. THESE HISTORIES COVER THE PERIOD THROUGH THE EXPLORATIONS OF R. C. L. PERKINS, BUT ALSO INCLUDE A FEW SUBSEQUENT COLLECTIONS OF NOTE. EACH ENTRY GIVES THE KNOWN TIME SPAN, COLLECTOR OR EXPEDITION, ANY PERTINENT LITERATURE, AND PRINCIPAL REPOSITORIES OF SPECIMENS (THE LAST TWO OMITTED FOR WILSON, PALMER, AND PERKINS). THIS SUPPLEMENTS THE TABULATION IN OLSON AND JAMES (1991:TABLE 1) IN WHICH THE ENDEMIC LAND BIRDS OF THE ISLANDS ARE LISTED CHRONOLOGICALLY BY DATE OF ORIGINAL DESCRIPTION (WHICH WAS SOMETIMES LONG AFTER THE SPECIMENS WERE COLLECTED)

HAWAII	
1779 Jan.	Cook's Third Voyage (Medway 1981, Olson 1989c; LIV, RMNH, NMW)
1825 June.	H.M.S. <i>Blonde</i> (Bloxam 1827, Olson 1986; BMNH)
1832 Sept.	David Douglas sends <i>Branta</i> (Olson 1989a; LIV, ANSP)
1834.	Lord Derby's <i>Branta</i> received (Olson 1989a)
1836 Sept–Oct.	<i>Bonite</i> (Eydoux and Souleyet 1841; MNHN)
Between 1837 and 1848.	Rev. Forbes for J. K. Townsend (Peale 1848:107)
1840 Nov–1841 Mar.	U.S. Exploring Expedition (Wilkes 1845, Peale 1848, Cassin 1858; USNM, ANSP, MCZ)
1846 Nov 2–12.	<i>Galathea</i> (Steen Bille 1852; ZMUC, ZMB)
1851–1855.	Jules Rémy (Wagner et al. 1990:table 8; MNHN, MCZ)
1856 Mar.	U.S. North Pacific Surveying & Exploring Expedition (Cassin 1862; ANSP)
[1852–1863].	Andrew Garrett (present on Hawaii through years indicated—Thomas 1979; undated material at ANSP, 1857 and 1859 at MCZ)
1850s–1860s.	J. D. Mills [arrived Hilo 1851, d. 1887, thought to have been most active collecting ca. 1859–1860] (Dole 1878, Manning 1978, 1979; BPBM, RMNH)
ca. 1863 or before.	Specimens obtained for Ferdinand Gruber (Olson 1990; USNM, NMW)
1864 or 1865.	William T. Brigham (Olson 1992; MCZ)
1872.	Théodore Ballieu (Wagner et al. 1990:table 8; MNHN; Mearns and Mearns 1992)
1875 Aug 14–19.	<i>Challenger</i> Expedition (Sclater 1878, 1881; BMNH)
1876–1878.	Théodore Ballieu (Wagner et al. 1990:table 8; MNHN, also MCZ, BMNH, RMNH)
1887 May–1888 June.	Wilson
1891 Apr., Aug.	Wilson
1891 Sept.	Palmer
1892 Jan–June.	Palmer
1892 June–Oct.	Perkins
1892 Apr., Nov.	Wilson
1894 July–Aug.	Perkins
1895 June–Sept.	Perkins

TABLE 1. CONTINUED

1895 Apr 3, 8, May 29.	Thos. C. White for Flood brothers (MCZ)
1895 Dec–1896 Jan.	Perkins
1896 Mar., Aug–Sept, Nov–Dec.	Perkins
1896 May, June.	Wilson
1896.	Schauinsland (UMB)
1897 Feb–Mar.	Perkins
1898 Apr 9–1903 Aug 24.	Henshaw (resident on Hawaii from Dec 1894 to Feb 1904—Henshaw 1919–1920, Nelson 1932; BPBM, USNM)

OAHU

1786 May–June.	H.M.S. <i>Queen Charlotte</i> (Dixon 1789; BMNH)
1825 May.	H.M.S. <i>Blonde</i> (Bloxam 1827, 1925, Olson 1986; BMNH)
1834 Sept.	M. Botta (MNHN)
1835 Jan.	Townsend and Nuttall (Townsend 1839; specimens not separable from those of 1837)
1837 Jan.	Townsend (Townsend 1839; ANSP, LIV, USNM, FMNH)
1837 Jan.	Deppe (ZMB, ZIL, NMW)
1837 July.	<i>Venus</i> (Prévost and Des Murs 1849; MNHN, MCZ)
1837 July, 1839 June.	HMS <i>Sulphur</i> (Gould 1843b; BMNH)
1840 Sept, Nov; 1841 Mar–Apr.	U.S. Exploring Expedition (Midshipman Henry Eld; ROM)
1842.	Specimens sent via Chile (Olson 1989b; SMF, BMNH)
1843.	May <i>Danaïde</i> (M. Jaurès [or Jaurèr]; MNHN)
1843.	Specimens obtained for I. G. Voznesensky (ZIL)
1845.	Specimens obtained for I. G. Voznesensky (ZIL)
1846 Oct 7–31.	<i>Galathea</i> (Steen Bille 1852; ZMUC, ZMB)
1849 May, 1850 Oct.	H.M.S. <i>Herald</i> (Capt. Kellett; BMNH, ZIL)
1870 Feb 21–Mar 2.	Austrian East Asian and American Expedition (Pelzeln 1873; NMW)
1873–1874.	U.S. North Pacific Surveying Expedition (Streets 1877a, b; USNM)
1888 Apr., Oct–Nov.	Wilson
1891 Oct.	Wilson
1892 Aug, Sept.	Wilson
1893 Jan.	Wilson
1893 Mar–June.	Palmer
1892 Mar–June, Oct–1893 May.	Perkins
1895 Apr., June, Nov.	Perkins
1895 Feb., May, June, July–Aug, Oct, Dec; 1896 Jan.	M. J. Flood (especially Jul–Aug); some by John Seaburg, and James and Fred McGuire for Flood (MCZ)
1896 Feb., July, Aug, Sept, Nov.	Perkins
1897 Jan., Feb, Mar.	Perkins
1901 Nov, Dec.	Perkins
1902 Oct, Nov.	Perkins

KAUAI

1778 Jan.	Cook's Third Voyage [no significant specimens]
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TABLE 1. CONTINUED

1835 Feb. Townsend and Nuttall (Townsend 1839; ANSP, LIV, USNM)
 1840 Oct. U.S. Exploring Expedition [no specimens] (Wilkes 1845, Peale 1848, Cassin 1858)
 1866. Knudsen (Ridgway 1882, USNM)
 1886–1893. Knudsen (Stejneger 1887a, b, 1888, 1890; USNM, ZMUO, BMNH)
 1888 Apr, Sept. Wilson
 1890 Dec–1891 Jan–Apr. Palmer
 1891 Apr 29. Wilson
 1892 Feb, Nov. Wilson
 1893 Jan, Nov. Hans Isenberg (UMB)
 1893 Feb. Wilson
 1893 June–Aug. Palmer
 1894 May–June. Perkins
 1895 Apr–May, Oct–Nov. Perkins
 1895/1896. Hans Isenberg (UMB)
 1896 Apr. Wilson
 1896 July–Aug. Perkins
 1897 Jan–Feb. Perkins

MOLOKAI

1864 or 1865. Brigham (Olson 1992; MCZ)
 1888 June. Wilson
 1892 Dec–1893 Feb. Palmer
 1893 May–June, July–Sept, Oct–Nov. Perkins
 1894. R. Meyer
 1894 Dec–1895 Feb. M. J. Flood (MCZ)
 1896 June. Perkins
 1896. Meyer (UMB)
 1898. Meyer (UMB)
 1902 Feb. Perkins
 1907 Apr–June. W. A. Bryan (Bryan 1908; BPBM)

MAUI

ca. 1850–1880. A single *Vestiaria* collected by a Mr. Chapin (CAS)
 1879 June 30–July. Finsch (Finsch 1880; ZMB, BMNH)
 1888 July. Wilson
 1892 July–Oct. Palmer
 1890s. Mathias Newell (Bryan 1901; BPBM, MCZ)
 1894 spring. Mathias Newell (Henshaw 1900; BPBM)
 1894 Mar, May. Perkins
 1896 Feb–Mar, Apr–May, Sept–Oct, Dec. Perkins
 1897 Jan. Perkins
 1900 June, July. Henshaw (BPBM)
 1901 June, Aug. Henshaw (BPBM)
 1973 Sept. *Melamprosops* collected (Casey & Jacobi 1974; BPBM, AMNH)

LANAI

1888 June. Wilson
 ca. 1888. Hayselden (BPBM)
 1892 Nov. Palmer
 1893 Dec–1894 Feb. Perkins
 1894 June–July. Perkins
 [1911–1934] 1913 Feb 22. Munro [dates of residency and date *Dysmorodrepanis* collected] (Perkins 1919; BPBM)

TABLE 1. CONTINUED

NIIHAU
 1887 or 1888. Knudsen (Stejneger 1888; USNM)
 1893 July 15–28. Palmer

KAHOOLAWE

1892 Oct. Palmer (Rothschild 1893)

NORTHWESTERN CHAIN

1889 Jan. Wilson's purchase of *Telespiza* (Wilson 1890, Olson and James 1986; RMNH)
 1891 May–June. Palmer
 1916 Feb. 12. *Thetis* (Bryan 1917; CAS)
 1923 June. *Tanager* Expedition (Wetmore 1924, 1925; USNM, BPBM)

island of Hawaii, found their way to Europe (e.g., Olson 1989a). J. K. Townsend was on Hawaii briefly in 1837, where he remarked on the paucity of birds and apparently did not collect any himself (Townsend 1839). Specimens were later sent to him from there by a missionary, Rev. Forbes, including those used later by Peale (1848) in the original description of the Hawaiian Crow (*Corvus hawaiiensis*).

Vessels of the United States Exploring Expedition arrived in the islands in September 1840, some staying until April 1841. The expedition ornithologist, Titian Peale, was in the archipelago for a only a short period before being dispatched to the south (Wilkes 1845) and it is not clear to what extent the few Hawaiian bird specimens that have survived from this expedition were the result of his efforts or those of others. One of the expedition's two principal vessels, the *Peacock*, was wrecked at the mouth of the Columbia River, occasioning the loss of many specimens, including all those of the crow, as Peale (1848:107) later lamented. Although members of the expedition were on Kauai and Oahu, all of the birds that survive from the expedition (Peale 1848, Cassin 1858), save for a few from Oahu preserved by Midshipman Henry Eld and now in the ROM, are certainly or probably from the island of Hawaii.

Subsequent to the Exploring Expedition, collecting yielded little of interest for an-

other 35 years. Although amateur taxidermist J. D. Mills was active in this period (Manning 1978, 1979), material from his important collections was not described until considerably later (Dole 1878).

In 1875, the brief visit of the British *Challenger* Expedition resulted in little other than securing the type of the Hawaiian Duck, *Anas wyvilliana*, though the species had been collected previously several times (at least on Oahu in 1837 and 1846). Théodore Bailleu, whose name has been almost invariably misspelled “Bailleu,” including in the specific name of the Palila, which commemorates him (*Loxioides “bailleui”*), was French Consul at Honolulu from 1869 to 1878 (Mearns and Mearns 1992). By collecting at higher elevations in the Kona district of Hawaii, he was able to secure the first specimens of Palila in 1876 as well as what are the earliest extant examples of Akiapolaau (*Hemignathus wilsoni*), although the species was not recognized as new at the time.

The final few species to be added to the avifauna of Hawaii were collected by Wilson and by Palmer; no others were added by Perkins, or through the long residence of H. W. Henshaw, who collected extensively on the island at the turn of the century.

OAHU

The first vessels to visit the Hawaiian Islands after Cook, H.M.S.S. *King George* and *Queen Charlotte*, captains Nathaniel Portlock and George Dixon, called at various islands in 1786 and again in 1787. They returned with a few specimens of birds of which Dixon (1789) published a plate of what is clearly the Oahu Oo (*Moho apicalis*). The species was not recognized as distinct and named for another 70 years (Gould 1860), and it was even later that its island of origin was determined. Nevertheless, Dixon’s plate is the earliest documentation of a bird specimen from Oahu.

The year 1825 saw the arrival of H.M.S. *Blonde* on a political mission, Lord Byron, successor to the poet, in command. Serving

as expedition naturalist was Andrew Bloxam, who at age 23 had recently graduated from Oxford, but with scant training in natural history. To judge from his diary (Bloxam 1925) and the journal of the expedition’s horticulturalist (Macrae 1922), Bloxam did not exert himself unduly and collected birds on only a few days of his fairly lengthy stay on the island.

An account of the expedition was compiled by Maria Graham from various diaries and was published under Byron’s name (see Bloxam 1827). The appendix on natural history was taken from Bloxam’s manuscript notes and so heavily edited and misinterpreted that Newton (1892:466) dismissed it as “a disgrace . . . utterly unworthy of its reputed author.” Nevertheless, several scientific names date from this publication with Bloxam as author. Bloxam’s unpublished natural history notes (see Olson 1986) document that among the material that he turned over to the Lords of the Admiralty were 24 bird specimens from Oahu, all but two of which are present in the collections of the British Museum.

Bloxam was the only collector ever to find the Oahu thrush (*Myadestes*). His two specimens, an adult and an immature, were long thought to have been lost, but we have studied an immature in BMNH and an adult in ANSP that we believe most likely came from Oahu and that may well be Bloxam’s specimens.

In 1835, John Kirk Townsend, accompanied by Thomas Nuttall, collected birds on Oahu (Townsend 1839). Townsend returned in December 1836 and linked up with Ferdinand Deppe, a renowned collector of Mexican birds. On 15 January 1837 he and Deppe hired a house in “Nuano” (= Nuuanu) Valley where they were “very successful” at procuring “birds, plants &c.” (Townsend 1839:207).

The fate of Townsend’s Hawaiian material was tangled and unfortunate (see Kauai account). Although none of his specimens from Oahu were ever described, new taxa based on Deppe’s material were named over

a span of years by Lichtenstein and Cabanis. Neither Townsend nor Deppe obtained any thrushes, despite their having collected in the same general area where Bloxam obtained them 12 years before. No collectors subsequent to Townsend and Deppe obtained either the Oahu Akialoa (*Hemignathus lichtensteini*) or the Oahu Oo (*Moho apicalis*), nor were any species discovered subsequently on Oahu that had not been taken by either Bloxam or Townsend and Deppe.

KAUAI

Specimens of *Vestiaria coccinea* were received in barter when Cook's ships stopped at Kauai in 1778, but there is no evidence of any other birds having come from Kauai prior to 1835. J. K. Townsend, accompanied by Thomas Nuttall, arrived on Kauai on 11 February of that year and made "several long excursions over the hills and through the deep valleys, without much success. The birds are the same as those we found and collected at Oahu, but are not so numerous. They are principally creepers (*Certhia*) and honey-suckers (*Nectarinia*) . . . and some species are very abundant" (Townsend 1839:207–208). Although Nuttall may have aided Townsend in collecting birds, he was mainly botanizing and his only published contribution to Hawaiian ornithology is his passing mention of the Short-eared Owl (*Asio flammeus*) (Nuttall 1840).

Townsend's specimens were later scattered and their significance never appreciated. Some went to ANSP but a large portion went to J. J. Audubon to try to sell in Europe. In June 1838, Audubon offered for sale to the 13th Earl of Derby a large selection of birds collected by Townsend, including 121 specimens of at least 13 species from the Sandwich Islands. The Earl made a manuscript list of the offering that was transcribed and discussed extensively by Medway (1981). The Earl selected only a handful, most of which are now in the Liverpool museum, and the others were dispersed. Such as still exist and can be iden-

tified as of Townsend origin may be found in diverse collections in Europe and North America.

Townsend's birds from Kauai were the first other than the Cook *Vestiaria* to be taken on that island and he brought back species that remained undescribed for decades afterwards. For example, there is a Townsend specimen of *Loxops parvus* in the collections of the Smithsonian Institution that had been received prior to 1841 by its predecessor, the National Institute. Yet the species was not named until 1887, from material supplied by Valdemar Knudsen (Stejneger 1887a).

The U.S. Exploring Expedition was on Kauai in 1840, where Peale (1848:149) mentions a bird that is certainly the endemic meliphagid *Moho braccatus*, although he confused it with *Certhia* (= *Drepanis*) *pacifica*. Although Peale says that some of these birds were killed at Hanalei, if they were preserved they must have been lost in the wreck of the *Peacock*.

Moho braccatus was clearly illustrated by Reichenbach (1853), although he erroneously regarded it as the female of *Moho nobilis*. In all likelihood this figure was based on one of the birds collected by Townsend. The species was finally recognized and named by Cassin in 1855, based on a Townsend specimen in ANSP.

Apart from the Exploring Expedition, which contributed nothing to knowledge of birds of the island, ornithology was essentially dormant on Kauai for the half century after Townsend, to be revived by Valdemar Knudsen, a Norwegian adventurer who settled on Kauai in 1857 (Peppin 1956). Knudsen forwarded birds to the Smithsonian Institution as early as 1866, though it was not until considerably later that any received attention (Ridgway 1886, 1888). These and additional specimens cataloged in 1886, 1887, 1888, and 1889, were described by Stejneger (1887a, b, 1888, 1890).

There is an interesting card in the biographical file of C. W. Richmond at USNM that was sent to Richmond, probably about

1912, by Augustus F. Knudsen, in which the latter states that he, too, “collected birds in 1885 & 86—specimens sent in with Mr. V. Knudsen’s collection. Also in 1892–93–94. But again my father insisted on only his name going in as he had hoped to find new birds. I gave in. 4 new birds were found by me.” A number of Knudsen specimens dated 1890 and 1893 were sent to Robert Collett in Norway (ZMUO), from which some were in turn sent to BMNH. Eleven specimens purchased 2 June 1887 by the Berlin Museum (ZMB) from a dealer, J. Wentscher, are of obvious Knudsen make and some bear label annotations in English that can only have come from Knudsen’s original labels or notes. The most notable among this series is the holotype of Cabanis’ name *Hemignathus procerus*.

In terms of ornithological knowledge, the Knudsen’s efforts put Kauai ahead of the other Hawaiian islands for a time. Wilson collected on the island in 1888, securing and naming *Loxops caeruleirostris*, which had eluded previous collectors. Because of the better comparative material available to him, he was also able to distinguish as new both the akialoa and the amakihi of Kauai, naming them both for Stejneger, who had reported Knudsen specimens of each but, in the absence of comparative material, had no way to separate them from the previously described species from Hawaii. Palmer made his first visit to Kauai from December 1890 through April 1891, by which time there was but one new bird left for him to find, the small Kauai thrush, *Myadestes palmeri*, leaving no new ornithological discoveries for Perkins to make.

MOLOKAI

Strangely, the avifauna of the much smaller and less populous island of Molokai was better documented by collections than its larger neighbor of Maui. We know from Dole (1869) that William T. Brigham recorded and presumably collected a strange bird on Molokai in 1864 or 1865. What is believed to be Brigham’s small, dataless col-

lection is in the MCZ and included two specimens of the extinct drepanidine *Ciriodops anna*, which may have been Brigham’s puzzling bird (Olson 1992).

Wilson visited Molokai in June 1888, but as on Maui, his activity must have been very limited and the number of specimens he procured were few, apparently including only *Phaeornis lanaiensis*, *Loxops virens*, and the types of *Paroreomyza flammea*.

Palmer made a much more thorough job of his visit from December 1892 through February 1893, adding *Palmeria dolei* to the Molokai list and obtaining the first specimens of *Moho bishopi*. Perkins followed hard on Palmer’s heels in May and June of 1893 (he visited the island twice more during the same year), when he obtained the first specimen of *Drepanis funerea*, the only new species of Hawaiian bird that he personally was able to discover once Rothschild’s collectors had been through the islands.

Milton J. Flood, who with his brother Oliver operated a commercial collecting business, was on Molokai from December 1894 to February 1895 and preserved very large series of specimens of the commoner birds, most of which are at MCZ. The more desirable rarities seem to have eluded him, however, probably because he was denied permission to collect on Bishop Estate lands because he did not represent a “reputable scientific society” (Manning 1986:16).

Perkins revisited Molokai in 1896. During this period, R. M. Meyer (Charles Bishop’s ranch manager on Molokai—Manning 1986:15) and his family were host to most bird collectors visiting the island. Members of the Meyer family preserved birds about this time that are still in the possession of the family, including such rarities as *Drepanis funerea* and *Moho bishopi*. Six specimens of the former were taken by Theodore Meyer in 1894 according to Bryan (1908). Specimens in UMB are attributed to R. Meyer in 1896 and 1898, acquired through then director Hugo Schauinsland.

A substantial series of specimens was secured by William A. Bryan (1908) for the

Bishop Museum from 15 April to 15 June 1907. After great exertion, he was able to collect three specimens of *Drepanis funerea*, but did not encounter *Moho bishopi*, which by that time may already have been extinct. Based on specimens he took, he named the Molokai thrush as a distinct species, *Phaeornis rutha*, after his wife. This has usually been considered identical with *Phaeornis* (= *Myadestes*) *lanaiensis* of Lanai, although our comparisons indicate that it is probably subspecifically distinct.

MAUI

Maui is the second largest of the Hawaiian Islands and home to the once busy whaling port of Lahaina. As extraordinary as it may seem, with one unimportant exception, we have found no record of any specimen of bird having been preserved from Maui prior to 1879, exactly a century after the departure of Cook's expedition from the islands. Why this should be is unclear, but lack of convenient access to forest habitats in the steep mountains of West Maui that back Lahaina may have been a contributing factor. Regardless, the lack of early collecting has doubtless had an effect on our current perspective of the "historically" known avifauna of Maui.

In June and July 1879, Otto Finsch visited Maui and made desultory observations and collections in the lowlands and in forest near Olinda. Although he mentions several species that he did not collect (Finsch 1880), he brought back specimens of only 3 species of forest birds. He was thus the first collector to obtain specimens of *Paroreomyza montana*, which he misidentified as *Hemignathus obscurus* (!), and *Loxops coccinea ochracea*, which he accurately described but unfortunately under a previously used name that proved to be a synonym of *L. c. coccinea*.

Almost another decade then passed before Scott Wilson arrived on Maui in July 1888. His collecting effort seems to have been no more intense than that of Finsch and appears to have resulted in only a scant handful of specimens in the collections at

UMZC, the only one of note being the single juvenile that became the type of what is now called *Palmeria dolei* (Wilson).

Thus, the avifauna of Maui was never adequately sampled until Palmer's sojourn from July through October 1892. Palmer obtained all the forest birds known historically from Maui (except *Melamprosops*) and because of his efforts the privilege of naming the most new forms from Maui fell to Lord Rothschild. The taxa include four valid subspecies of drepanidines, the genus *Palmeria*, and the singular Maui Parrotbill, *Pseudonestor xanthophrys*.

Brother Mathias Newell, who resided on Maui, preserved a number of birds in the 1890s, though these had minimal data (Bryan 1901). The most notable was the holotype of *Puffinus newelli* (Henshaw 1900). Perkins, followed by Henshaw, collected extensively on Maui, but neither discovered any new taxa there. No significant subsequent collections of birds were made on Maui until the surprising discovery of *Melamprosops phaeosoma* in 1973 (Casey and Jacobi 1974).

LANAI

The much smaller and less populated island of Lanai was neglected by ornithologists for even longer than Maui. Scott Wilson made the first bird collections we know of from the ornithologically depauperate island in June 1888. He stayed with F. H. Hayselden, who at about the same time supplied bird specimens from Lanai to the Bishop Museum. Henry Palmer visited Lanai in November 1892, when he obtained the only three specimens known of *Hemignathus lanaiensis*. Perkins collected birds on Lanai in 1893 and 1894.

The experienced naturalist and collector George C. Munro occasionally collected birds on Lanai during his residence from 1911 until 1934 (R. C. Munro 1957). Although the *Hemignathus* eluded him, he obtained the unique holotype of *Dysmorodrepanis munroi* (Perkins 1919) on 22 February 1913, the validity of which has recently been

affirmed through anatomical studies (James et al. 1989).

NIHAU

No native land birds have ever been recorded from Nihoa. The first specimens of birds from the island are a few waterbirds taken by Knudsen in 1887 or 1888. Palmer collected there in 1893 and likewise found only shorebirds and introduced mynas (*Acridotheres tristis*). Only the fossil record of this paleontologically unexplored island can now tell us what species of native land birds once occurred here.

KAHOOLAWE

This smallest of the main Hawaiian Islands was ecologically degraded even in Cook's time. Subsequent ranching did nothing to improve the environment, after which the island was used as a bombing range, beginning in 1941. Palmer visited Kahoolawe briefly in October 1892, reporting that he found no land birds except introduced House Finches (*Carpodacus mexicanus*) and a few shorebirds (Rothschild 1893). Brief paleontological surveys of the island suggest that there is unfortunately little potential for obtaining much of a fossil record there.

NORTHWESTERN CHAIN

Extensive documentation of the history of ornithological collecting in the Northwestern Hawaiian Islands is available elsewhere (Amerson 1971, Amerson et al. 1974, Clapp 1972, Clapp and Kridler 1977, Clapp and Wirtz 1975, Clapp et al. 1977, Ely and Clapp 1973, Woodward 1972) and need not be repeated here. Only those expeditions or collectors obtaining new species are listed in Table 1. The first endemic bird reported from these islands was the Laysan Finch (*Telespiza cantans*), which was described from a specimen that Wilson purchased alive in Honolulu (Olson and James 1986). Palmer collected widely in the chain in 1891, obtaining all five endemic species of Laysan. He did not land at Nihoa, however, which held out its two endemic species until the

next century. The types of the Nihoa Finch (*Telespiza ultima*) were brought off by the *Thetis* in 1916, and the Nihoa Warbler (*Acrocephalus kingi*) was the prize of the *Tanager* expedition of 1923.

CONCLUSIONS

Vagaries in the history of ornithological collecting between different islands of the Hawaiian archipelago could have permitted a number of extinctions of species or island populations to have gone undetected during the historic period. Nowhere is this more likely to have been the case than on Maui, which was not adequately surveyed until 1892. By this time *Myadestes*, *Moho*, and the akialoa (*Hemignathus*) had long since vanished on Oahu, and flightless rails (*Porzana*) and the passerines *Chaetoptila angustipluma*, *Drepanis pacifica*, and *Ciridops anna* had disappeared on Hawaii. Representatives of all of these genera save *Ciridops* are known from late Holocene bones on Maui (Olson and James 1991, James and Olson 1991). Indeed, Perkins (1903:378) alludes to a report that thrushes existed on Maui some 30 years prior to the mid-1890s. Sabo (1982) refers to sight records of *Moho* on Maui from the early 1800s up to recent times. Perkins (1903:453) also reported native observations of flightless rails on Molo-kai in the 19th century.

In conclusion, although many species of birds, particularly the larger flightless species and raptors, were probably exterminated long before the arrival of Cook, we would emphasize that any assessment of the the distribution and extinction of the historically known avifauna of the Hawaiian Islands should also take into account the potentially great bias that has been introduced by the differences in timing and intensity of collecting efforts on the individual islands.

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nymys generally follow those given by Leviton et al. (1985), with some departures, especially for institutions they did not include. AMNH, American Museum of Natural History, New York. ANSP, Academy of Natural Sciences of Philadelphia, Pennsylvania. BMNH, British Museum (Natural History), Sub-department of Ornithology, Tring, England. BPBM, Bernice P. Bishop Museum, Honolulu, Hawaii. CAS, California Academy of Sciences, San Francisco. FMNH, Field Museum of Natural History, Chicago, Illinois. LIV, Liverpool Museum, Liverpool, England. MCZ, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts. MNHN, Muséum National d'Histoire Naturelle, Paris, France. NMW, Naturhistorisches Museum, Wien (Vienna), Austria. RMNH, Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands. ROM, Royal Ontario Museum, Toronto, Canada. SMF, Forschungsinstitut Senckenberg, Frankfurt/M, Germany. UMB, Übersee-Museum, Bremen, Germany. UMZC, University Museum of Zoology, Cambridge, England. USNM, National Museum of Natural History, Smithsonian Institution, Washington, D.C. ZIL, Academy of Sciences, Zoological Institute, St. Petersburg (Leningrad), Russia. ZMB, Universität Humboldt, Museum für Naturkunde, Berlin, Germany. ZMUC, Zoologisk Museum, University of Copenhagen, Denmark. ZMUO, Zoological Museum, University of Oslo, Norway.

LITERATURE CITED

- AMERSON, B. 1971. The natural history of French Frigate Shoals, Northwestern Hawaiian Islands. Atoll Research Bulletin 150.
- AMERSON, B., R. C. CLAPP, AND W. O. WIRTZ. 1974. The natural history of Pearl and Hermes Reef, Northwestern Hawaiian Islands. Atoll Research Bulletin 174.
- BLOXAM, A. J. 1827. Of the natural history of the Sandwich Islands; selected from the papers of A. Bloxham [sic], esq. Of birds. Appendix 3, pp. 248–253 in Lord Byron, Voyage of H. M. S. *Blonde* to the Sandwich Islands, in the years 1824–1825. John Murray, London. [Dated 1826 but published in 1827.]
- BLOXAM, A. J. 1925. Diary of Andrew Bloxam naturalist of the "Blonde." S. M. Jones (ed.), B. P. Bishop Museum Special Publication 10.
- BRYAN, W. A. 1901. A list of the Hawaiian birds in the St. Louis College collection, Honolulu, H. I., including records of several North American species. Auk 18:382–387.
- BRYAN, W. A. 1908. Some birds of Molokai. Occasional Papers of the B. P. Bishop Museum of Polynesian Ethnology and Natural History 4:133–176.
- BRYAN, W. A. 1917. Description of *Telespiza ultima* from Nihoa Island. Auk 34:70–72.
- CASEY, T. L. C., AND J. D. JACOBI. 1974. A new genus and species of bird from the island of Maui, Hawaii (Passeriformes: Drepanididae). Occasional Papers of the B. P. Bishop Museum 24:215–226.
- CASSIN, J. 1855. Notices of some new and little known birds in the collection of the U.S. Exploring Expedition in the *Vincennes* and *Peacock*, and in the collection of the Academy of Natural Sciences of Philadelphia. Proceedings of the Academy of Natural Sciences of Philadelphia 7:438–441.
- CASSIN, J. 1858. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes, U.S.N. Mammalogy and ornithology. J. B. Lippincott & Co., Philadelphia, PA.
- CASSIN, J. 1862. Catalogue of birds collected by the United States North Pacific Surveying and Exploring Expedition, in command of Capt. John Rodgers, United States Navy, with notes and descriptions of new species. Proceedings of the Academy of Natural Sciences of Philadelphia 1862:312–328.
- CLAPP, R. B. 1972. The natural history of Gardner Pinnacles, Northwestern Hawaiian Islands. Atoll Research Bulletin 163.
- CLAPP, R. B., AND E. KRIDLER. 1977. The natural history of Necker Island, Northwestern Hawaiian Islands. Atoll Research Bulletin 206.
- CLAPP, R. B., E. KRIDLER, AND R. R. FLEET. 1977. The natural history of Nihoa Island, Northwestern Hawaiian Islands. Atoll Research Bulletin 207.
- CLAPP, R. B., AND W. O. WIRTZ. 1975. The natural history of Lisianski Island, Northwestern Hawaiian Islands. Atoll Research Bulletin 186.
- DIXON, G. 1789. A voyage round the world: but more particularly to the north-west coast of America: performed in 1785, 1786, 1787, and 1788, in the *King George* and *Queen Charlotte*, Captains Portlock and Dixon. Geo. Goulding, London.
- DOLE, S. B. 1869. A synopsis of the birds hitherto described from the Hawaiian Islands. Proceedings of the Boston Society of Natural History 12:294–309.
- DOLE, S. B. 1878. List of birds of the Hawaiian Islands. Corrected for the Hawaiian Annual, with valuable additions. Pp. 41–58 in Hawaiian Almanac and Annual for 1879. Thomas G. Thrum, Honolulu.
- ELY, C. A., AND R. B. CLAPP. 1973. The natural history of Laysan Island, Northwestern Hawaiian Islands. Atoll Research Bulletin 171.
- EYDOUX, F., AND F. L. A. SOULEYET. 1841. Voyage autour du monde exécuté pendant les années 1836 et 1837 sur la corvette "*La Bonite*" Zoologie. Vol. 1. Arthus Bertrand, Paris.
- FINSCH, O. 1880. Ornithological letters from the Pacific. No. 1. Ibis series 4 4:75–81.
- GOULD, J. 1843a. [Nine new birds collected during the voyage of H.M.S. *Sulphur*]. Proceedings of the Zoological Society of London 1843:103–106.
- GOULD, J. 1843b. Birds. Pp. 39–50 in R. B. Hinds (ed.), The zoology of the voyages of H.M.S. *Sulphur*, under the command of Captain Sir Edward Belcher, R. N., C. B., F. R. G. S., etc. during the years 1836–42. Vol. 1. Smith, Elder and Co., London.
- GOULD, J. 1860. Description of a new species of the genus *Moho* of Lesson. Proceedings of the Zoological Society of London 1860:381.
- HENSHAW, H. W. 1900. Description of a new shearwater from the Hawaiian Islands. Auk 17:246–247.
- HENSHAW, H. W. 1919–1920. Autobiographical notes. Condor 21:102–107, 165–171, 177–181, 217–222; 22:3–10, 55–60, 95–101.
- JAMES, H. F., AND S. L. OLSON. 1991. Descriptions of thirty-two new species of birds from the Hawaiian

- Islands. Part II. Passeriformes. Ornithological Monographs 46:1–88.
- JAMES, H. F., R. L. ZUSI, AND S. L. OLSON. 1989. *Dysmorodrepanis munroi* (Fringillidae: Drepanidini), a valid genus and species of Hawaiian finch. *Wilson Bulletin* 101:159–179.
- JUDD, B. 1974. *Voyages to Hawaii before 1860*. [enlarged and edited by H. Y. Lind]. University Press of Hawaii, Honolulu, HI.
- LEVITON, A. E., R. H. GIBBS, JR., E. HEAL, AND C. E. DAWSON. 1985. Standards in herpetology and ichthyology: part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia* 1985:802–832.
- MACRAE, J. 1922. With Lord Byron at the Sandwich Islands in 1825, being extracts from the MS diary of James Macrae, Scottish botanist. W. F. Wilson (ed.). Privately published, Honolulu, HI.
- MANNING, A. 1978. James D. Mills: Hilo bird collector. *Hawaiian Journal of History* 12:84–98.
- MANNING, A. 1979. Bishop Museum's first Hawaiian birds: the Mills collection. *Elepaio* 40:35–43.
- MANNING, A. 1986. The Sandwich Islands Committee, Bishop Museum, and R. C. L. Perkins: cooperative zoological exploration and publication. *Bishop Museum Occasional Papers* 26:1–46.
- MEARNS, B., AND R. MEARNS. 1992. Audubon to Xántus, the lives of those commemorated in North American bird names. Academic Press, London.
- MEDWAY, D. G. 1981. The contribution of Cook's third voyage to the ornithology of the Hawaiian Islands. *Pacific Science* 35:105–175.
- MUNRO, R. C. 1957. George C. Munro. *Elepaio* 17: 82–86.
- NELSON, E. W. 1932. Henry Wetherbee Henshaw—naturalist. *Auk* 49:399–427.
- NEWTON, A. 1892. Ornithology of the Sandwich Islands. *Nature* 45:465–469.
- NUTTALL, T. 1840. *A manual of the ornithology of the United States and Canada*. 2nd ed. Hilliard, Gray, and Co., Boston, MA.
- OLSON, S. L. 1986. An early account of some birds from Mauke, Cook Islands, and the origin of the "Mysterious Starling" *Aplonis mavornata* Buller. *Notornis* 33:197–208.
- OLSON, S. L. 1989a. David Douglas and the original description of the Hawaiian Goose. *Elepaio* 49:49–51.
- OLSON, S. L. 1989b. Two overlooked holotypes of the Hawaiian flycatcher *Chasiempis* described by Leonhard Stejneger (Aves: Myiagrinae). *Proceedings of the Biological Society of Washington* 102:555–558.
- OLSON, S. L. 1989c. Notes on some Hawaiian birds from Cook's third voyage. *Bulletin of the British Ornithologists' Club* 109:201–205.
- OLSON, S. L. 1990. The supposed California record of Hawaiian Hawk *Buteo solitarius*. *Elepaio* 50:1–2.
- OLSON, S. L. 1992. William T. Brigham's Hawaiian birds and a possible historical record of *Ciridops anna* (Aves: Drepanidini) from Molokai. *Pacific Science* 46:495–500.
- OLSON, S. L., AND H. F. JAMES. 1982. Prodomus of the fossil avifauna of the Hawaiian Islands. *Smithsonian Contributions to Zoology* 365:1–59.
- OLSON, S. L., AND H. F. JAMES. 1986. The holotype of the Laysan Finch *Telespiza cantans* Wilson (Drepanidini). *Bulletin of the British Ornithologists' Club* 106:84–86.
- OLSON, S. L., AND H. F. JAMES. 1991. Descriptions of thirty-two new species of birds from the Hawaiian Islands. Part I. Non-passeriformes. *Ornithological Monographs* 45:1–88.
- PEALE, T. R. 1848. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes, U.S.N. Vol. 8. Mammalia and ornithology. C. Sherman, Philadelphia, PA.
- PELZELN, A. VON 1873. Ueber die von der österreichischen Mission nach Ost-asien und America (1869–1870) eingesendeten Säugethiere und Vögel. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 23:153–164.
- PEPPIN, H. 1956. Valdemar Knudsen. *Elepaio* 16:45.
- PERKINS, R. C. L. 1893. Notes on collecting in Kona, Hawaii. *Ibis* series 6 5:101–112.
- PERKINS, R. C. L. 1895. Notes on some Hawaiian birds. *Ibis* series 7 1:117–129.
- PERKINS, R. C. L. 1901. An introduction to the study of the Drepanididae, a family of birds peculiar to the Hawaiian Islands. *Ibis* series 8 1:562–585.
- PERKINS, R. C. L. 1903. *Vertebrata*. Pp. 365–466 in D. Sharp (ed.), *Fauna Hawaiiensis or the zoology of the Sandwich (Hawaiian) Islands*. Vol. 1, pt. 4. University Press, Cambridge, England.
- PERKINS, R. C. L. 1913. Introduction. Pp. xv–ccxxviii in D. Sharp (ed.), *Fauna Hawaiiensis or the zoology of the Sandwich (Hawaiian) Islands*. Vol. 1, pt. 6. University Press, Cambridge, England.
- PERKINS, R. C. L. 1919. On a new genus and species of bird of the family Drepanididae from the Hawaiian Islands. *Annals and Magazine of Natural History* series 9 3:250–252.
- PRÉVOST, F., AND O. DES MURS. 1849. Notice sur le genre hemignathe (*Hemignathus*, Lichtenstein), (1837). *Heterorhynchus* (La Fresnaye), 1839. Pp. 183–193 in *Oiseaux*; pp. 177–284, in *Abel du Petit-Thouars. Voyage autour du monde sur la frégate La Venus commandée par Abel du Petit-Thouars. Zoologie. Mammifères, oiseaux, reptiles et poissons*. Gide et J. Baudry, Paris.
- REICHENBACH, H. G. L. 1853. *Handbuch der speciellen Ornithologie*. Scansoriae. Tenuirostres. *Icones ad Synopsis Avium*. Number 11. Dresden and Leipzig: Expedition der Vollständigsten Naturgeschichte. Pp. 219–336. [The plate referred to was published as part of *Die Vollständigste Naturgeschichte*, issued in parts under various titles, to which the above reference was intended as a partial text.]
- RIDGWAY, R. 1882. Description of a new fly-catcher and a supposed new petrel from the Sandwich Islands. *Proceedings of the United States National Museum* 4:337–338.
- RIDGWAY, R. 1886. On *Aestrelata sandwichensis* Ridgw. *Proceedings of the United States National Museum* 9:95–96.
- RIDGWAY, R. 1888. Note on *Aestrelata sandwichensis* Ridgw. *Proceedings of the United States National Museum* 11(693):104.
- ROTHSCHILD, W. 1893 + 1900. The avifauna of Lay-

- san and the neighbouring islands: with a complete history to date of the birds of the Hawaiian possessions. Part 1. Pp. i-xiv, 1-58, pl. 1-41. Part 2. Pp. 59-126, pl. 42-46, 48-52, 54-58. Part 3 [1900]. Pp. 126-317, pp. Di. 1-21, i-xx, pl. 47, 53, 59-83. R. H. Porter, London.
- SABO, S. R. 1982. The rediscovery of Bishop's O'o' [sic] on Maui. *Elepaio* 42:69-71.
- SCLATER, P. L. 1878. Reports on the collections of birds made during the voyage of H. M. S. '*Challenger*.'—no. VIII. On the birds of the Sandwich Islands. Proceedings of the Zoological Society of London 1878:346-351.
- SCLATER, P. L. 1881. On the birds collected in the Sandwich Islands. Pp. 93-99 in Report on the birds collected during the voyage of H.M.S. *Challenger* in the years 1873-1876. The voyage of H.M.S. *Challenger*. Zoology. Vol. 8. Her Majesty's Gov't., London.
- STEEN BILLE, A. 1852. Bericht über die Reise der Corvette *Galathea* um die Welt in den Jahren 1845, 46 und 47. 2 vols. C. U. Reitzel, Copenhagen; C. B. Lord, Leipzig.
- STEJNEGER, L. H. 1887a. Birds of Kauai Island, Hawaiian Archipelago, collected by Mr. Valdemar Knudsen, with descriptions of new species. Proceedings of the United States National Museum 10:75-102.
- STEJNEGER, L. H. 1887b. Notes on *Psittirostra psittacea* from Kauai, Hawaiian Islands. Proceedings of the United States National Museum 10:389-390.
- STEJNEGER, L. H. 1888. Further contributions to the Hawaiian avifauna. Proceedings of the United States National Museum 11:93-103.
- STEJNEGER, L. H. 1890. Notes on a third collection of birds made on Kauai, Hawaiian Islands, by Valdemar Knudsen. Proceedings of the United States National Museum 12 [for 1889]:377-386.
- STREETS, T. H. 1877a. Description of a new moorhen from the Hawaiian Islands. *Ibis* series 4 1:25-27.
- STREETS, T. H. 1877b. Contributions to the natural history of the Hawaiian and Fanning Islands and Lower California. Bulletin of the United States National Museum 7:1-172.
- THOMAS, W. S. 1979. A biography of Andrew Garrett, early naturalist of Polynesia: part 1. *Nautilus* 93:15-28.
- TOWNSEND, J. K. 1839. Narrative of a journey across the Rocky Mountains to the Columbia River and a visit to the Sandwich Islands, Chili, &c. with a scientific appendix. Henry Perkins, Philadelphia, PA.
- WAGNER, W. L., JR., D. R. HERBST, AND S. H. SOHMER. 1990. Manual of the flowering plants of Hawai'i. Vol. 1. University of Hawaii Press, Honolulu, HI.
- WETMORE, A. 1924. A warbler from Nihoa. *Condor* 26:177-178.
- WETMORE, A. 1925. Bird life among lava rock and coral sand. *National Geographic Magazine* 48:76-108.
- WHITTELL, H. M. 1954. The literature of Australian birds. Paterson Brokensha Pty. Ltd., Perth.
- WILKES, C. 1845. Narrative of the United States' Exploring Expedition, during the years 1838, 1839, 1840, 1841, 1842. Condensed and abridged. Whittaker & Co., London.
- WILSON, S. B. 1890. On a new finch from Midway Island, North Pacific. *Ibis* series 6, 2:339-341.
- WILSON, S. B., AND A. H. EVANS. 1890-1899. *Aves Hawaiienses: the birds of the Sandwich Islands*. R. H. Porter, London.
- WOODWARD, P. 1972. The natural history of Kure Atoll, Northwestern Hawaiian Islands. *Atoll Research Bulletin* 164.