

THE SMITHSONIAN BOOK OF BIRDS

# LORDS OF THE AIR

JAKE PAGE AND EUGENE S. MORTON

*Introduction by S. Dillon Ripley  
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scopic view of peacock feather; pages 4-5:  
overlapping breast feathers of a ring-necked  
pheasant; pages 6-7: exquisite "eye" in a  
peacock's tail feather; page 11: young  
American coot, Whitford Lake, Alberta.



H. Douglas Frazer  
1976

The scientific description of living species of Hawaiian birds began in 1778 when Captain James Cook and his men first explored this remote archipelago. Then, as later, the wonderful diversity of the Hawaiian finches, or honeycreepers, diverted attention from the fact that the rest of the birdlife was actually quite impoverished. Indeed, by the beginning of the 20th century, when most of the Hawaiian birds had been discovered, many species had begun to disappear at a startling rate. No one considered, however, that even more extinction might have occurred prior to the arrival of Europeans. In fact, such a possibility was dismissed out of hand by scientists, who claimed, for example, that "no serious inroads were made on the native birds by the Hawaiians."

This skein of misconceptions began to unravel in 1970 with the discovery of bones of extinct birds in sand dunes on the island of Molokai and later in dunes on Kauai. Soon archaeologists discovered other bone deposits in sinkholes in a raised limestone reef on Oahu, deposits that provided a surprisingly bountiful record of past birdlife on that island as well. Even greater riches were uncovered on the island of Maui, this time in lava tubes—caves that form during lava eruptions. Weak places in the roofs of these tubes may collapse and open up treacherous pitfalls that act as natural traps. Judging from the accumulated bones that have been found in lava tubes, such was the fate of a number of flightless birds that once lived in Hawaii.

Further excavations on four of the main islands have brought to light fossils of heavy-bodied, flightless descendants of ducks. Called moanalos, which in Hawaiian means "vanished fowl," these birds were about the size of barnyard geese, but with much more massive legs and feet and strangely shaped beaks with which they must have browsed on native vegetation. Quite probably the moanalos, like

their larger counterparts, the moas of New Zealand, occupied much the same ecological role as the tortoises of the Galápagos Islands, which feed exclusively on vegetation. All of these large, island-dwelling, avian herbivores are now extinct.

Another discovery among the Hawaiian bones was flightless ibises—the first ever to be found. Unlike the long-legged ibises that are associated today with marshes, the Hawaiian ibises had rather short legs and ran around on the forest floor, probably preying on insects and snails. Their habits would have been much more like those of the kiwis of New Zealand than those of typical ibises.

Rails are the birds that are best known for reaching remote islands and becoming flightless. Only one such rail, extinct since at least the middle of the last century, was known from the main Hawaiian Islands until our fossil discoveries showed that flightless rails were once probably everywhere in the archipelago. We have found as many as 10 new species, all of which were flightless. One of these, from Molokai, is the smallest known rail and was surely among the smallest of all flightless birds.

The most widespread predatory bird in the Hawaiian Islands today is the pueo, or short-eared owl, which is the same species

*An extinct flightless Hawaiian ibis, seen in the painting opposite, shares the forest understory with two extinct flightless rails. The first flightless species of this bird family to be discovered, the flightless Hawaiian ibis, came to light in 1976. Like those of other flightless Hawaiian birds, the remains of the Hawaiian ibis, such as those below on Maui, have been found in lava tubes. Recent fossil discoveries have doubled the number of endemic Hawaiian bird species known to have existed before the arrival of the Polynesians some 1,600 years ago.*





*Fossil collectors sift sand at Kauai's Makawehi dunes, which perch over sea cliffs on the island's southeast coast. This site yielded hundreds of honeycreeper bones as well as those of other bird families.*

found on the mainland. It probably colonized the Islands after the Hawaiians cleared land and thus created habitat suitable for the owl, and also introduced food in the form of the Pacific rat. Before the arrival of people, however, a different owl lived in the Islands, of which four species have been discovered so far. These were descendants of such owls as the barred owl of North America, but they had longer, more slender legs and shorter wings, thus resembling in their proportions such bird-catchers as Cooper's and sharp-shinned hawks. And we know that the owls *were* bird-catchers: the

fossilized remains of their pellets contain the bones of small birds.

Rare among our fossils are bones of a small hawk quite unlike the living Hawaiian hawk. This extinct hawk was descended from harriers, such as that of North America, but, unlike those long-winged hawks, this species had short wings and must also have been specialized for feeding on birds. Chief among the raptors was an eagle, very similar to the bald eagle, that was probably the only significant predator on the moanalos and adult ibises.

Among the Hawaiian honeycreepers,

we have found bones of at least 15 new species, including at least three new genera. One of the most interesting of these is a gigantic finch-billed species, rivaling the largest known finches in massiveness of beak.

Everywhere we have worked in Hawaii we have found bones of living or recently extinct birds on islands where they had not been known before. The palila, for example, an endangered finch that today is found only above 5,000-foot elevation on Hawaii's Mauna Kea volcano, once occurred at sea level on Oahu. What today is called the Maui parrotbill was once also on Molokai. The Hawaiian crow, known only from the Big Island, where it is now all but extinct, may have lived also on Maui and had at least two much larger cousins on Molokai and Oahu. Bones of the Hawaiian goose, or nene, also thought to have been confined originally to the island of Hawaii, are found throughout the archipelago. Even the Laysan finch and Nihoa finch, which survive only on tiny, remote islands in the northwestern Hawaiian chain, left bones behind on Oahu and Molokai to show that today's populations are but remnants of once more widespread species.

Of the archipelago's 92 unique species of birds now known, with the fossil record taken into account, only 48, or 52 percent, were discovered before the fossil excavations began. And we know that the fossil record is incomplete.

What happened to cause such massive extinctions, and when? With few exceptions, all dated deposits are only a few thousand years old or less, much younger than the last ice age that might have triggered climatically caused extinctions. From radiocarbon dates and from the association of bones of extinct birds with those of rats and lizards and with shells of snails that were introduced by Polynesians, we know that these now-vanished birds were still present and thriving in the Islands when the first people arrived some



*A complete skull of the extinct Hawaiian long-legged owl, top, was uncovered in the highly fossiliferous Moomomi dunes on the island of Molokai. Scientists have even found fossilized pellets regurgitated by these owls. The particularly well-preserved fossil owl pellet above, found in Kauai's Makawehi dunes, contained the bones of three species of honeycreepers.*



Many of Hawaii's endemic birds have become extinct or endangered since the Islands were colonized first by Polynesians and later by Europeans. The akialoas, such as the Oahu akialoa, above, are now extinct, as are the five Hawaiian honeyeaters, including the Hawaii ʻoo, above right. Hawaii's state bird, the nene, opposite, is endemic to the island of Hawaii; specialized features, such as reduced webbing between the toes, enable it to live on thinly vegetated lava flows. Captive-breeding programs have attempted to restore the nene population, which suffered great reductions after 1850 due primarily to hunting, ranching, and other development.

1,600 years ago. The influence of these human settlers is strongly implicated in the severe depletion of the avifauna.

Direct hunting for food would have presented an immediate threat to birds, especially to the large, flightless birds, and was certainly a factor in the reduction or extinction of seabird populations nesting in the Islands. Pigs, dogs, and especially the Pacific rat introduced by the Hawaiians may have played a role in extinction, as might diseases brought in by introduced chickens. But probably the greatest damage was wrought through habitat destruction as lowland forests were cleared for the extensive crops that were later to sustain large Polynesian populations on most of the main islands. Almost all dry-forest vegetation was lost through cutting and burning, so that the only native vegetation remaining was the cold, wet rain forests on mountainsides unsuited for agriculture. With the lowland vegetation gone, the majority of Hawaii's animal species also disappeared forever.

Are the Hawaiian Islands an exception in the amount of prehistoric extinction they suffered? The answer is an emphatic no. On every island where bones have

been preserved and collected the story is the same.

Between roughly a quarter and a third of all historically known species of birds are endemic to islands. If we consider that these may represent half or fewer of the species that were present on islands before the arrival of people, then human-caused extinctions on islands, most of which have taken place within the past 2,000 years, may have effected one of the swiftest and most pervasive catastrophes in the entire history of avian evolution. Unfortunately, this process continues, and island species are still being lost at an alarming rate.

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Curator Storrs L. Olson and his wife, Helen F. James, both of whom work in the Division of Birds in the Smithsonian's National Museum of Natural History, began their investigation of Hawaiian fossil birds in 1976.



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