

## Evolution, Ecology, Conservation and Management of Hawaiian Birds: a Vanishing Avifauna

J. Michael Scott, Sheila Conant and Charles van Riper III (eds) (2002)

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THIS volume from the Cooper Ornithological Society is the 22nd instalment in the *Studies in Avian Biology* series, which is dedicated to ornithological papers of too great a length for publication in *The Condor* journal. Evolution, Ecology and Conservation Biology are themselves very separate streams, each encompassing a diverse spectrum of application. However, they are brought together here, in a synthesis addressing an appalling record of extinction in the endemic birds of the Hawaiian Islands, which as a group, are among the world leaders in their tally of historically extinct and currently endangered bird species (King 1985).

Polynesians reached the Hawaiian Islands around 500AD, but Europeans did not settle there until after Captain James Cook's third voyage of discovery in 1778. Some eight years earlier, when the *Endeavour* was anchored off New Zealand, the botanist Joseph Banks made the following observation (O'Brien 1987).

*"This morn I was awaked by the singing of the birds ashore from whence we were distant not a quarter of a mile, the numbers of them were certainly very great who seemed to strain their throats with emulation, perhaps; their voices were certainly the [most] melodious wild musick (sic) I had ever heard, almost imitating small bells but with the most tuneable silver sound imaginable".*

In pre-settlement Hawaii, one would have awoken to a similar cacophony. Millions of seabirds nested not only on the offshore islets, cliff faces and subalpine areas where they are found today, but also on the beaches and in the adjacent forests. Further inland, open grasslands were grazed by numerous species of geese, including ten that were flightless. The forests themselves were alive with a plethora of birds, including honeyeaters, honeycreepers, owls and hawks, flightless ibis and rails, as well as a variety of large-billed finches (Scott *et al.*, this volume). The glorious riot of sound from this noisy, active and quarrelsome assembly of birds, many of them brilliant colours (*ibid.*), must have been deafening; for this was confirmation of the health of a wondrous and unique ecosystem. Such a symphony will never again be heard. As so poignantly described by Flannery (1994), "walking through the ancient forest, I heard nothing but the whisper of leaves blowing in the wind. It was like the rustles of the last curtain fall on an orchestra that will be no more".

Like New Zealand, the native terrestrial vertebrates of Hawaii consisted entirely of birds and two or three species of bat. Before exotic mammals were introduced to these refuges, the dawn chorus must have been second to none in the world. Sadly, many extraordinary species are now extinct and are known only through their fossil remains (Olson and James 1991; James and Olson 1991). Following a survey during 1936 and 1937, Munro (1944) estimated that since civilization came to the Hawaiian Islands, 30 species of birds had disappeared or were likely to become extinct, while 25 species had a fair chance of survival.

The idea of the book originated during informal discussions at the 67th annual meeting of the Cooper Ornithological Society in Hilo, Hawaii in April 1997. During that meeting selected authors of presentations on natural history, ecology and taxonomy of Hawaiian birds were invited to submit manuscripts for consideration in a peer-reviewed publication addressing Hawaii's disappearing avifauna. Eight additional manuscripts were solicited to broaden the context and make the book as comprehensive as possible. The result is a monograph which includes 35 papers, most of which were presented at the 67th annual meeting of the Cooper Ornithological Society. Each paper has been peer-reviewed by the editors and at least one independent reviewer. The 35 chapters are presented in six interlocking sections each introduced with an historical review. Together, they report on the status of the avifauna of the Hawaiian Islands at the end of the 20th century.

A general introduction provides the reader with a background to the Hawaiian Islands from a biogeographical perspective, before they were colonized by the early Polynesians and then Europeans. This sets the scene for a saddening account of habitat destruction, the killing of creatures with no instinctive fear of man, and the introduction of exotic birds, mammals and diseases. A detailed checklist follows, of endemic Hawaiian birds both past and present, and an outline of the desperate remedial measures that have since been introduced to preserve the remnants of what is largely a ghost avifauna. This preamble includes an invaluable introduction to the pronunciation of Hawaiian names, which are used throughout the book.

The first section *Historical Perspectives* examines how many bird species occurred in Hawaii before first contact with humans. Typical of the Pacific, the history of ornithological exploration was a legacy of missed opportunities; the first extensive surveys coming 100 years after the arrival of the Europeans, by which time the avifauna was greatly diminished (Olson and James 1994). It is estimated that the Pacific avifauna was composed of nearly 1 500 species, of which approximately only 230 survive. Included is an impressive checklist of over 140

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species of birds introduced to the Hawaiian Islands. The question is posed, "why are some introduced species able to displace endemics more readily than others do and why do others fail?" In its conclusion, the section implicates the success of certain introduced species, not only to their ability to adapt to a new environment, but also to introduction effort.

Coinciding with a renaissance in phylogenetic research, driven by advances in methods of analysis and molecular genetics, a considerable effort directed towards the systematics of Hawaiian birds is evident. The second section *Systematics* shows the importance of new technology in that even extinct lineages can be studied through amplification and sequencing of DNA fragments from fossil bones. The power of molecular genetics is exemplified here, in giving estimates of the length of time each lineage has been present in the islands, with further glimpses of the questions that may be answered by using these methods.

The value of genetics and systematics in conservation is also demonstrated with reference to extant taxa. One objective of conservation management is to preserve evolutionary diversity. Consequently, it is useful to know to what degree a particular species differs from its surviving relatives when making decisions about which species to focus on. Particular endangered endemic species have been selected as "ambassadors" to show how phylogenetic analysis can contribute to conservation planning by providing a way to assess the distinctiveness of threatened species. However, for the non-taxonomist, this is heavy going and, a debate over species concepts only adds to the confusion. Nonetheless, this section illustrates the ways in which genetics, phylogenetics, palaeontology and modern molecular techniques can contribute to conservation management.

Authors in the third section *Status and Trends* report on more recent efforts in assessing Hawaii's avifauna. By using field observations, modelling techniques, and the analysis of long-term data sets, it could be shown that some species showed population declines to the nature of 30–60% in a ten-year period. Others are on the brink of extinction. The known population of Hawaii's rarest terrestrial bird stands at three individuals. This section presents the challenge to scientists and conservation managers, of what action and resource allocation is dictated by such rare and endangered species.

In the fourth section *Ecology*, emphasis is placed on a family of endangered, endemic nectarivores, the honeycreepers, to exemplify changing demographic traits and breeding productivity. Factors such as habitat alteration and old-growth forest regeneration were found to influence nest-site availability, while poor reproductive potential and nesting failure were implicated in low rates of breeding success. Authors also discuss the foraging responses by honeycreepers to changes in population density, as well as tree density and flower abundance and the role of feral animals. These studies lead naturally into the fifth section of the book *Limiting Factors*, and how they have influenced the loss of more than half of Hawaii's endemic bird species and their

habitats. Habitat changes, human and non-human predation, avian competition, parasites and diseases, as well as abiotic factors are examined and the effect of each of these is discussed in relation to pre human, post-Polynesian and post-European contact.

Examples are both numerous and interesting. Although concerns that an aggressive, introduced ant, responsible for annihilating populations of endemic arthropods, may affect the breeding of an endangered seabird were largely unfounded, a population viability analysis suggests that, at current rates of cat predation, this defenceless, burrow-nesting species may not persist. Failure to eliminate introduced ungulates and feral predators are predicted to result in all but two or three of the commonest species becoming extinct. There are no endemic mosquitos in Hawaii, but a bird-biting species was accidentally introduced in 1826. Consequently, its spread allowed avian malaria and avian pox to escape into native bird populations. The decline and change in demographics of these, as a result of blood parasites, are reviewed in this section, and a subsequent evolution of genetic resistance and/or tolerance factors is suggested. Finally, this section examines some population dynamics and life histories of the Hawaiian avifauna, as well as emerging and future threats to the endemic fauna and flora, which may have worldwide implications.

This sets the scene for the final section *Recovery and Management* where the importance of controlling mammalian terrestrial predators is highlighted. While habitat restoration is naturally on the agenda, some interesting methods of enhancement are covered here. These include mowing and fertilization of grasslands to encourage breeding in endangered geese, and the use of military vehicles to open up mudflats to improve nesting and foraging opportunities for a rare species of wading bird. A computerized simulation of the extinction process used to assess the long-term population viability of one endangered bird, suggested that conservation measures for the species be implemented, and that translocations should commence without delay. This precedes a discussion of restoration techniques including egg-collection, artificial incubation and hand rearing of chicks, and a comparison of methods in translocation and reintroduction.

The section, and book, conclude with a summary of the conservation status and recovery strategies for endemic Hawaiian birds, and an eye-opening account of the costs involved in saving endangered birds. To date, only one firm success story exists in Hawaii, despite approximately \$94 million dollars having been spent (Steiner, this volume).

The book is available in both softcover and hardcover. Although now permanently buckled after standing in my bookshelf for two months, my (softcover) copy initially stood up well to repeated trips in my backpack and to much thumbing back and forth between chapters and the bibliography. Because of a high degree of redundancy in references cited among authors, the editors chose to combine all cited literature in a single bibliography

at the end of the book rather than at the end of the individual chapters. Although this undoubtedly minimizes repetition, some readers may find delving through the substantial bibliography inconvenient, especially if intending to photocopy a particular chapter of interest.

Overall, this monograph is a masterly summary and review of the status of the birds of Hawaii. It covers the gamut of conservation and management issues regarding these, but do not attempt to read it cover to cover. Because the book comes in the form of a series of scientific papers, it is not (and is not intended to be) a textbook for the Conservation Biology student. It will be more at home on the ornithologist's bookshelf. However, as a companion volume to such a textbook it would serve as an invaluable reference that provides real case histories of the real issues and logistics involved in the conservation of not one, but many species on a rapid decline. It is of interest not only to the ornithological researcher or post-graduate, but to any such worker involved with endangered species because the problems are universal, not specific.

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## Conservation in the Internet Age: Threats and Opportunities

Levitt, J. N. (ed) (2002)  
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WHEN I opened the package from *Pacific Conservation Biology* and looked at the book that I was to do my first review on, my first thought was "What have I got myself into". I was looking at a collection of papers that were written by experts in various fields, of which I knew nothing about. As I prepared to slog through all the technical information about networks and social interactions, I realized that this was not just a collection of technical papers, but a well-constructed look at how the Internet has and will affect the way conservation occurs across the globe over the next few decades.

This textbook, as it is more suited to the classroom instead of the bedside table, is divided into four parts with papers that Levitt has selected to take the reader through the environmental history of the United States and how development of networks, including the Internet, affected land use and abuse in the USA.

Part one looks at the effect that the new rail and telegraph network in the 19th Century had on the demographics of continental USA and how these led to massive environment degradation. I enjoyed Levitt's paper "Networks and Nature in the

American Experience" as it gave the reader a good look at the impact of the rail and telegraph network development in the United States and hinted at the possible replication of these mistakes in the near future.

The second part then discusses the effects that the Internet had on America during the 1990s and how this is a repeat of mistakes already made by earlier networks. This is made painfully obvious in the Hansen and Rotella paper "Rural Development and Biodiversity: A case study of greater Yellowstone" where the effect that the urbanization of rural areas close to National Parks and Nature Reserves, with the aid of a decentralized workforce, has on fauna is discussed and the reader can see how easily the mistakes of past generations can be repeated.

The third selection of papers looks at how conservation groups use the power of this new communications network to aid their own quests to conserve and protect by spreading their message and gathering information. An exceptionally good example of this is the Fitzpatrick and Gill paper "BirdSource: using birds, citizen science, and the internet as tools for global monitoring" which looks at how the global spread of computer technology and the Internet has allowed members of the global community to contribute to scientific research and how scientists can use this technology to increase sample sizes almost a hundred fold. As a budding scientist, this really got the blood pumping as it

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