



Ecology

ECOLOGY—INTRODUCTION

SHEILA CONANT

Subsequent to the publication of several major, descriptive works (e.g., Wilson and Evans 1890–1899, Rothschild 1893–1900, Henshaw 1902a, Perkins 1903) at the turn of the last century, research on Hawai'i's birds nearly came to a standstill. George Munro, who assisted in some of the fieldwork leading to the above-mentioned publications, continued doing fieldwork, eventually publishing his own book, *Birds of Hawaii*, in 1944. Charles and Elizabeth Schwartz came to Hawai'i specifically to work on the ecology, life history, and distribution of its introduced game birds (Schwartz and Schwartz 1949), and Harvey Fisher and Paul Baldwin (birds of Midway, breeding cycles of seabirds; Fisher and Baldwin 1946a,b) carried out general life history and ecology studies of seabirds (Fisher 1948a,b, 1949, 1951, 1965, 1967, 1968, 1969). From 1944–1969, Paul Baldwin reported on the natural history of the endemic birds of Hawai'i (Baldwin 1945, 1969a,b). His monograph on the annual cycle, environment, and evolution in Hawaiian honeycreepers (Baldwin 1953) was the first systematic use of banded birds in the study of Hawaiian honeycreepers, and his paper on the life history of the Laysan Rail (*Porzana palmeri*) was the first and last detailed description of that extinct species (Fisher and Baldwin 1945, 1946a; Baldwin 1947b). Richardson and Bowles' (1964) survey of the birds of Kaua'i made the last collections of the Greater 'Akiakoa (*Hemignathus ellisianus*) and 'Ō'ō'ā'ā or Kaua'i 'Ō'ō (*Moho braccatus*) while simultaneously decrying their declines. The 1960s saw a revival of interest in the ecology of Hawaiian birds, beginning with the work of Andrew Berger, who initiated studies on the ecology and natural history of native and introduced species (Berger 1966, 1967, 1969a,b,c, 1970a,b, 1974, 1975a,b,c,d,e,f, 1977a,b,c,d,e) and published a widely read book (Berger 1972, 1981). His students studied life history and ecology of both native (Eddinger 1970, Conant 1977; van Riper 1978, 1980a,b, 1984) and introduced birds (Guest 1973, Hirai 1975). Richards and Bock (1973) published an extensive study of the feeding apparatus of Hawai'i 'Amakihi (*Hemignathus virens*), 'Ākepa (*Loxops coccineus*), 'Anianiau (*Hemignathus parvus*), O'ahu 'Alauahio (*Paroreomyza maculata*), and 'Akikiki (*Oreomystis bairdi*), all of which were then in the genus *Loxops*. Studies by U.S. Fish and Wildlife Service biologists

John Sincock, Eugene Kridler, and Winston Banko included surveys and general ecological observations of both forest birds and seabirds. They were often joined in their fieldwork by Department of Land and Natural Resources biologists David Woodside, Ernie Kosaka, Gerry Swedberg, and Ron Walker. Rediscovery of several endangered species (Newell's Shearwater [*Puffinus auricularis newelli*], Sincock and Swedberg 1969; Maui Parrotbill [*Pseudonestor xanthophrys*] and Maui Nukupu'u [*Hemignathus lucidus affinus*], Warner 1967, Banko 1968) inspired ornithologists to get out into remote field areas. The results of additional fieldwork included the discovery of the Po'ouli (*Melamprosops phaeosoma*; Casey and Jacobi 1974, see also Baker *this volume*), a species that has gone from discovery to near extinction in 25 years (Reynolds and Snetsinger *this volume*). Richard Warner's landmark paper on avian diseases (1968) brought the first critical attention to the problem of disease as a limiting factor for the distribution of Hawai'i's forest birds. Carpenter's and MacMillen's studies on foraging ecology and territory in the 'I'iwi (*Vestiaria coccinea*) and 'Apapane (*Himatione sanguinea*; Carpenter 1976a,b; Carpenter and MacMillen 1976, 1980; MacMillen and Carpenter 1980) were part of a larger set of ecological studies conducted under the auspices of the International Biological Program (Mueller-Dombois et al. 1981a,b). Moulton and Pimm's (1983) and Mountainspring and Scott's (1985) studies on competition were the first efforts to quantify the role of competition among native and nonnative species of birds. The U.S. Forest Service initiated an intensive study of the ecology and life history characteristics of endemic species (Ralph and Fancy 1994a,b,c, 1995, 1996) to complement the extensive surveys of distribution, abundance, and habitat associations conducted by the U.S. Fish and Wildlife Service and Hawaii Department of Land and Natural Resources (Scott et al. 1977, 1984, 1986; van Riper et al. 1978, Mountainspring and Scott 1985, Mountainspring et al. 1990, and references cited therein). Building on those large area surveys researchers have framed hypotheses regarding distributional anomalies (e.g., Hart *this volume*). Others conducted detailed ecological studies of the Palila (*Loxioides bailleui*) and other endemic species.

In this group of papers, Steve Hess and coauthors document the temporal response of 'I'iwi,

'Apapane, and Palila to different habitat types and the occurrence of seed pods and nectar-producing flowers. Bethany Woodworth and coauthors report on the demography of the endangered Hawai'i Creeper (*Oreomystis mana*), implicating nest failure as a major limiting factor for this species. Lenny Freed's study of the significance of old growth forests to the Hawai'i 'Ākepa (*Loxops coccineus coccineus*) is the first of its kind in Hawai'i and has major implications for the conservation of this species. Patrick Hart's comparisons of demographic traits of high and low density of 'Ākepa populations is pioneering and has major implications for con-

servation of Hawai'i's endangered bird species. Three papers shed light on the ecology of one of Hawai'i's rarest birds, the 'Ākohekohe (*Palmeri dolei*). Ellen VanGelder and Thomas Smith characterize the breeding ecology of this species, while Kim Berlin and colleagues demonstrate a positive correlation with the timing of breeding in the 'Ākohekohe and abundance of the 'ōhi'a-lehua (*Metrosideros polymorpha*) bloom. John Carothers' study documents that age-related differences in diet for 'Apapane and 'Ākohekohe are affected by differential growth demands of immatures and adults and complements the work of Hess et al., VanGelder and Smith, and Kim Berlin et al., all in this volume.

