Preface

In this book, the authors present current research in the study of the evolution and behavior, breeding strategies, migration and spread of disease within the bird species. Topics discussed in this compilation include sex determination in birds; structure and function of the avian respiratory system, with discussion regarding its predisposition to injury by particulates and pathogenic microorganisms; distribution and dispersion of coccidia in wild passerines of the Americas; an animal geography of the dominant urban avian scavenger in contrasting case studies; recent infectious diseases or their responsible agents recorded from Japanese wild birds; ticks on Brazilian birds; an overview of recent parasitic diseases due to helminths and arthropods recorded from wild birds, with special reference to conservation medical cases from the Wild Animal Medical Center of Rakuno Gakuen University in Japan; environmental factors that affect urban avian communities; and the impact of landscape configuration and competitors on hooded vulture necrosyrtes monarchus temminck 1823 in Southern Ghana.

Chapter 1 - How gender is formed in birds? What caused dimorphism and formation of biologically important feature? What are the internal physiological mechanisms and the role of the genome in the process? To all these questions are answered offered to the reader head chapter. Paper is devoted to sex determination in birds. It will be reviewed data on the genome of birds, information on the sex chromosomes, heterogametic, sex of birds of the different karyotype. Specificity of Z and W chromosomes, sex chromosomes in Ratinae will be considered. The ideas will be presented about the role of hormones in sex determination and differentiation. The data on the possibility of "inversion" of sex in birds in the inhibition of aromatase, estrogen exposure and gonadectomy will be introduced. In addition, review key sex determining genes, chromosomal determinants, specific dosage compensation will be discussed. Sex determining genes will be examined in birds, including *Dmrt1, AMH, FOXL2* and W chromosomal determinants. The specificity of birds dose compensation will be described. The data will be submitted about MHM region of Z chromosome. Features of sex determination in males and females will be discussed. Bird cell-autonomous sexual identity (CASI) will be considered.

Chapter 2 - Among the air-breathing vertebrates, the avian respiratory system, the lung-air sac system, is structurally the most complex and functionally the most efficient gas exchanger. The lung which is small and compact is firmly held between the ribs and the vertebrae while the air sacs are capacious transparent membranous structures which are widely spread in the coelomic cavity. The lung is ventilated unidirectionally and continuously by a bellows-like synchronized activity of the air sacs. It takes two inspiratory cycles and two

exhalatory cycles for the air to enter and exit the lung. Morphometrically, the avian lung is highly specialized. Compared to a mammal of equivalent body mass, the bird lung has a respiratory surface area which is 15% greater and the blood-gas barrier is 62% thinner. Free (surface) macrophages are scarce on the the respiratory surface of the avian lung. Because of this it has been argued that birds have poor pulmonary cellular defences and are therefore highly vulnerable to injury by particulates and infection by pathogens. This conclusion has, however, been questioned. Diverse phagocytic cells which include subepithelial macrophages, pulmonary intravascular macrophages, bronchial epithelial cells, and free macrophages should provide adequate protection. The large tidal volume of birds and the extension of the air sacs to lie superficially, are some of the features which make birds susceptible to pulmonary afflictions and infections.

Chapter 3 - Reports of coccidia of the genera *Eimeria* Schneider, 1875 and *Isospora* Schneider, 1881 from passerine birds have been reported for more than two centuries. In the Americas, the order Passeriformes comprises 47 families containing 2,453 species. *Isospora* species have been observed in 23 (49%) of the 47 families (Dendrocolaptidae, Furnariidae, Thamnophilidae, Cotingidae, Tyrannidae, Corvidae, Meliphagidae, Mimidae, Cardinalidae, Coerebidae, Emberizidae, Estrildidae, Fringillidae, Hirundinidae, Icteridae, Parulidae, Passeridae, Sturnidae, Thraupidae, Timaliidae, Turdidae, Troglodytidae, Zosteropidae) and in 66 (3%) of the 2,453 species. A total of six *Isospora* species have been described from *Ramphocelus bresilius dorsalis* (Sclater); four from *Camarhynchus parvulus* (Gould); and *Saltator similis* (Lafresnaye d'Orbigny); three from each of the following: *Sporophila caerulescens* (Vieillot); *Sporophila frontalis* (Verreaux); *Oryzoborus angolensis* L.; *Thraupis sayaca* L.; and *Zosterops japonicus* (Temminck, Schlegel); two from each of the following: *Dendrocolaptes certhia* (Sclater & Salvin); *Xiphorhynchus ocellatus* (Spix); *Saltator grossus* L.; *Coereba flaveola* L.; *Geospiza fortis* (Gould); *Lonchura punctulata* L.; *Serinus canaria* L.; *Thraupis palmarum* (Wied); *Turdus albicollis* (Vieillot); and *Sicalis flaveola* L.; and a single species from each of the following: *Glyphorynchus spirurus* (Vieillot); *Dendrocincla merula merula* (Lichtenstein); *Dendrocincla merula barletti* (Chubb); *Hyloctistes subulatus* (Spix); *Sclerurus caudacutus* (Vieillot); *Automolus infuscatus* (Sclater); *Hylophylax naevioides* (Lafresnaye); *Procnias nudicollis* (Vieillot); *Myiarchus ferox* (Gmelin); *Mionectes rufiventris* (Cabanis); *Corvus brachyrhynchos* (Brehm); *Calocitta formosa* (Swainson); *Cyanocorax chrysops* (Vieillot); *Foulehaio carunculatus* (Gmelin); *Cardinalis cardinalis* L.; *Paroaria coronata* (Miller); *Tiaris fuliginosus* (Wied); *Zonotrichia capensis* (Müller); *Gubernatrix cristata* (Vieillot); *Carduelis carduelis* L.; *Carduelis atrata* (Lafresnaye d'Orbigny); *Carduelis tristis* L.; *Carduelis chloris* L.; *Fringilla coelebs* L.; *Hemignathus virens* (Cabanis); *Petrochelidon pyrrhonota* (Vieillot); *Dives atroviolaceus* (Lafresnaye d'Orbigny); *Cacicus cela* L.; *Sturnella bellicosa* (Filippi); *Icterus icterus* L.; *Icterus graceannae* (Cassin); *Geothlypis aequinoctialis* (Gmelin); *Passer domesticus* L.; *Gracula religiosa* L.; *Leucopsar rothschildi* (Stresemann); *Chlorospingus ophthalmicus* (Du Bus Gisignies); *Iridosornis analis* (Tschudi); *Dacnis cayana* L.; *Leiothrix lutea* (Scopoli); *Myadestes obscurus* (Gmelin); *Catharus aurantiirostris* (Hartlaub); *Turdus migratorius* L.; *Turdus grayi* (Bonapart); *Turdus assimilis* (Cabanis); *Turdus plebejus* (Cabanis); *Thryophilus rufalbus* (Lafresnaye); *Cantorchilus modestus* (Cabanis); and *Mimus gilvus* (Vieillot). Observations in relation to *Eimeria* species have been significantly less frequent. Specifically, the species *Eimeria divinolimai* Berto, Flausino, Ferreira, Lopes, 2008 and *Eimeria sicki* Berto, Luz, Flausino, Ferreira, Lopes, 2009 were described from two hosts only [*Casiornis*

rufus (Vieillot) and *Myiarchus ferox* (Gmelin)] both of which belong to the family Tyrannidae. This chapter contributes to the author's understanding of the distribution of coccidian parasites of passerine birds from Northern, Central and Southern America. To this end, the coccidia were organized and grouped according to the family of the host, emphasizing the geographic location of the reports and associated aspects.

Chapter 4 - Animal geography and avian ecology represent two ways of looking at avian relations with the environment and human behavior. Animal geography is the geography of animals, including the examination of animals as actants; active agents creating relations with people as individuals and groups. Avian ecology is more concerned with statistical generalization, at inter- and intra- species levels. Urban areas provide instructive case studies for the application of such perspectives, due to the intense relation between animals and people in highly variable landscapes. In this chapter, case studies of the application of these paradigms and sub-disciplines are taken from published articles on urban birds in North America, Europe and Africa. In all the studies there were similar issues; dominant scavengers in relationship with smaller birds, and with people acting as non-feeders, and accidental and deliberate feeders. From the perspective of urban avian ecology, dominant avian scavengers obtained a statistically significant dominant relationship with smaller scavengers. From the perspective of animal geography, both dominant and dominated scavengers constructed individual strategies to enable food access. This individualism, in reaction to other birds, and towards variable, individualist human behaviors, could be defined as actancy, with evidence of innovation, experimentation and possibly strategic thinking. These studies illustrate the importance of flexibility in avian ecological studies.

Chapter 5 - Most infectious micro agents, e. g., parasitic and/or commensal viruses, bacteria, fungus and protozoans, are component parts of the ecosystems in which their wild avian hosts occur, they have co-evolved, and the infectious agents do not necessarily cause disease. Sometimes, however, ten of thousands of birds become sick and in extreme cases die, in various parts of the world because of an outbreak of an epidemic disease. By the way, considerable environmental change has occurred in Japan over the last 150 years as well. Furthermore, Japan is an important transit country for a wide range of migratory species. Japan is situated on the East Asian Flyway a migratory route, connecting northeast Asia with Southeast Asia, with important branches passing through the Nansei Shoto, Kyushu, Honshu and Hokkaido into northeast Russia and also via Kyushu and the Korean Peninsula into eastern China. The outbreaks of infectious disease have not so far significantly impacted populations of birds in Japan. Because an understanding of the infectious avian disease organisms that are present in Japan, their ecology, transmission, and symptoms is an essential conservation tool, the authors have overviewed this field by the end of the 20 century. However, according to the decade passed by, several issues have to be added to the review. Hence, this chapter provides a recent overview of the infectious diseases and/or their responsible micro agents recorded in Japan, and briefly potential strategies for epidemic risk reduction are given. For example, in viral diseases or agents, avian pox, rotaviral enteritis or arthritis, Newcastle disease, avian paramyxovirus infection, highly pathogenic avian influenza and West Nile fever were mentioned, respectively. Especially, since the WNV has been reported from the Far East, the virus will invade to Japan in nearly future. According to the computer simulation of the risk assessment of extinction due to an outbreak of West Nile disease among free ranging Red-crowned Crane (*Grus japonensis*) in Hokkaido Island, Japan, with usage of the software "Vortex", the population will die out within 40 years. Hence, the

VecTest has been performed on oral and tissue swabs from all wild birds carried to the Wild Animal Medical Center in the Teaching Animal Hospital of the School of Veterinary Medicine, Rakuno Gakuen University. In bacterial diseases epidemiology, systematic surveillance and/or individual case reports on *Esherichia coli, Actinomyces* spp., *Plesiomonas shigelloides*, *Staphylococcus epidermidis Salmonella enterica* serotype Typhimurium DT40, *Vibrio cholera*, *V. parahaemolyticus, Campylobacter jejuni, Chlamydophila psittaci, Mycobacterium genavense* etc were given. Above all, mass mortality of sparrows (*Passer montanus*) due to an epidemic caused by *S. enterica* has been just started from 2005 to now. And, the mortality has seemed to be often associated with a chemical deicer poisoning and/or staphylococcal infection, respectively. Although diseases due to biotoxins are defined as a non-infectious disease, some of the diseases have an intimate relationship with presence of certain responsible bacteria, e. g., cyanobacteria, such as the genera *Microcystis*, *Anabaena, Aphanizomenon, Nodularia*, and *Oscillatoria*. And, some suspicious cases of such problems were recorded even in Japan. Several fungal genera, in particular *Candida, Cryptococcus, Aspergillus, Microsporum, Trichophyton, Fusarium, Ochroconis* and *Absidia* have been reported as causing diseases as well, and some suspicious cases in free-ranging birds without a positive identification of each responsible fungal species have been given. Furthermore, there are several genera of avian flagellates and amoeba (Phylum Sarcomastigophora), such as the genera *Trypanosoma, Hexamita, Histomonas, Parahistomonas, Monocercomonas, Trichomonas, Tetratrichomonas, Chilomastix, Entamoeba*, *Endolimax* etc. In particular, several cases due to *Trichomonas*, *Tetratrichomonas* and/or *Hexamita* infection have been found in wild birds, but there have been no reported mass mortality due to the protozoan agents in Japan. And, *Trypanosoma* spp. have, however, been found in wild and/or captive passerines and owls, but they seem to have been non-pathogenic, at least now. On the other hand, some of avian coccidian and haematozoan genera (Phylum Apicomplexa), such as *Eimeria, Isospora, Tyzzeria, Wenyonella, Caryospora, Cryptosporidium, Sarcocystis, Toxoplasma, Atoxoplasma, Hepatozoon, Haemoproteus, Leucocytozoon, Plasmodium* and *Babesia*, may be responsible for severe disease. First of all, several cases including observatrion of *Isospora* shaped oocysts of *Atoxoplasma* sp. from fecal examinations and/or histopathological observation from postmortem examinations from not only captive Bali Myna (*Leucopsar rothschildi*), but also free-ranging passerines, e.g., *Passer montanus, Chloris sinica* and *Spodiopsar cineraceus*. There have been many case reports on intestinal coccidiosis including *Cryptosporidium meleagridis* infection from common avian species, it is prominent that *Eimeria ueki* was found from endangered subspecies, *Lagopus muta japonica*, on high mountain area. In 2002, fatal cases of the Red-crowned cranes due to disseminated visceral coccidiosis, caused by *Eimeria reichenowi* and *E. gruis*, were found. Control of the visceral coccidian species is more difficult than the control of intestinal coccidian species. Adding to this, the authors could observe renal coccidiosis concomitant infection with *Corynebacterium* sp. and *Renicola* sp. from mass mortality of *Puffinus tenuirostris*. *Sarcocystis*, most commonly found among waterfowl in the United States, is nonfatal, but severe infections can cause loss of muscle tissue and result in lameness, weakness etc. Recently, there have been several records of the protozoans among wild birds in Japan as well. Within the areas of both public health and captive animal health, toxoplasmosis among poultry is also very important. Serological evidence of the protozoan infection has been found so far among almost one third individuals of free-ranging anatids in Obihiro, Hokkaido Island. Although the agents for avian malaria including the genera

Leucocytozoon, *Haemoproteus* and *Plasmodium* have been commonly found among various avian species including endangered ones, e.g., *Ketupa blakistoni, Haliaeetus pelagicus, Lagopus muta japonica* etc and exotic one, e.g., *Leiothrix lutea*, in Japan. Adding to the protozoans, at least in Japan, hosts of the genus *Babesia* have been restricted to mammals, but the piroplasma was obtained from *Spilornis cheela* in Yaeyama Archipelago, southern part of Japan. Certain free living protozoans such as diatoms (Phylum Bacillariophyta: genera *Nitzschia* and *Pseudonitzschia*) and dinoflagellates (Phylum Dinoflagellata: genera *Alexandrium* and *Gymnodinium*) produce neurotoxins such as domoic acid, saxitoxin, and brevetoxin, that can affect sea birds. Most reports of mortality in birds have been die-offs occurring in conjunction with protozoan blooms in the United States, but no such mortalities have been reported yet in Japan. Nevertheless, many protozoan blooms occur around Japan making it essential that the authors pay attention to such events because of their potential for causing mortality. Including the diseases, the disease outbreak or mass mortality prevention will need to be based not only on an understanding of avian ecology but also of agents (pathogens) epidemiology. And, in order for medical researchers to be able to prepare for future epidemic outbreaks amongst birds, they must perform epidemiological surveys of the probable agents mentioned above in wild bird populations both in Japan and its surrounding areas; international and inter-agency cooperation is, therefore, essential in disease prevention. Needless to say, very careful attention should be paid to the possibility of infection by zoonotic agents during monitoring surveys.

Chapter 6 - Brazil has one of the richest avifauna in the world. There are 1,832 species distributed in 31 orders and 98 families. The Amazon, Atlantic Forest and Cerrado biomes have the richest diversity of birds in the country, but the most endemic bird species are found in the Atlantic Forest. Several species of migratory birds are also found in this country, originating from North and Central America and some countries in South America. Therefore, data from studies focusing parasitism by ticks and the pathogens they transmit are of great importance to animal and human welfare. To date, 6,201 ticks (4,270 larvae, 1,784 nymphs and 147 adults) have been collected. Passeriformes was the most parasitized order (5,964 ticks). The Thamnophilidae shows the highest numbers of parasitized species 25 (14%) out of 174 occurring in Brazil, followed by Tyrannidae (22/13.16%), Furnariidae (18/137. 17%) and Thraupidae (17/99. 17%). A total of 21 species of ticks belonging to four genera: *Amblyomma*, *Rhipicephalus*, *Ixodes* and *Haemaphysalis* have been identified. The most abundant tick species are *Amblyomma longirostre* and *Amblyomma nodosum*. To date only bacteria from the genus *Rickettsia* are isolated from ticks associated with wild birds: from *Amblyomma longirostre, Rickettsia amblyommi* and *Rickettsia parkeri;* from *Amblyomma nodosum, R. parkeri;* from *Amblyomma geayi, R. amblyommi;* from *Amblyomma parkeri, R. parkeri,* from *Amblyomma calcaratum, R. parkeri* and from *Amblyomma sp., R. parkeri.*

Chapter 7 - Most parasitic animals including helminths, e. g., trematodes, cestodes, nematodes, acanthocephalans, leeches etc., and arthropods, e. g., ticks, mites and tongue worms, are component parts of the ecosystems in which their wild avian hosts occur, they have co-evolved, and the infectious agents do not necessarily cause disease. Sometimes, however, some individuals become sick and in extreme cases die, in various parts of the world because of an outbreak of an epidemic disease. And, considerable environmental change has occurred in Japan, especially, most northern part of Hokkaido Island, over the last 150 years as well. Furthermore, the island is one of important transit sites of the country for a wide range of migratory avian species, because that is situated on the East Asian Flyway a

migratory route. Hence, the mortality or subclinical diseases due to the parasitic animals mentioned above have not so far significantly impacted populations of birds only in Japan. Because an understanding of the parasitic avian disease organisms that are present in Japan, their ecology, transmission, and symptoms is an essential conservation tool, the authors have overviewed this field by the end of the 20 century. However, according to the decade passed by, several issues have to be added to the review paper. So, Yoshino and Asakawa (2013) presented the nematode diseases and/or agents recorded from anatid species on the island. Hence, this chapter provides a recent overview of the parasitic diseases and/or their responsible agents recorded on non-anatid avian species as the succession, and briefly potential strategies for epidemic risk reduction are given based on the data from Wild Animal Medical Center, Rakuno Gakuen University. By the present, parasitic helminths including total 175 trematode, 148 cestode, 70 nematode, and 20 acanthocephalan species have been recorded. Among trematodes, *Leucochloridium* sp., *Renicola* sp., *Balfouria monogama* etc were found. Several cases of nematodiasis including fatal cases were reported, for example, eustrongylidosis was confirmed as one of factors contributing to the mortality of such piscivorous birds in Japan, too. The spirurid belonging to the genera *Thelazia, Acuaria, Cosmocephalus, Dispharynx, Synhimantus, Tetrameres* etc. have been found among various avian species including endangered ones by the author's recent studies. As other nematodes, e. g., genera *Heterakis, Porrocaecum, Strongyloides, Hamatospiculum, Desmidocercella* etc were reported from not only intestines, but also air sac. Several acanthocephalan, bloodsucking leeches, e. g., *Theromyzon*, external/internal parasitic arthropods could affect many free-ranging birds. The parasitic diseases prevention will need to be based not only on an understanding of avian ecology but also of parasites. And, in order for medical, conservation ecological and/or veterinary medical researchers to be able to prepare for future epidemic issues amongst birds, they must perform epidemiological surveys on some highly pathogenic parasites mentioned above in wild bird populations in Japan including Hokkaido Island. In short, an international cooperation is essential in parasitic disease prevention. And, furthermore, proper educational activities for a citizen of the area are needed for the trial as well. For example, the authors know that parasites from a wild bird may be a popular exhibition to general citizen, because of showing indirectly an ecological aspect of the bird species. That is very important for the potential strategies against the parasitic disease control because of a holder of the casting vote for the avian future is eventually such people.

Chapter 8 - In the present study the authors determine in to x35 areas of Iberian Peninsula along a gradient of urbanization the following factors: After the age of the park (AG), altitude (AL), number of buildings in a circle of 500 m (BL), cover of grass (CG), shrubs (CS) and trees (CT), average noise (DB), distance to nearest city (DC), use of herbicides (HB), inhabitants of nearest city (NC), number of persons in the park (NP), density of old trees (OT), park area (PA), species richness of shrubs (RS), trees (RT) and woody plants (RW) and number of water areas (WA). The authors check the relationships of these environmental factors with the total bird abundance (N), the alpha-fisher diversity (α), the bird species richness (S), the Berger-Parker dominance (d), the Margalef diversity (Mg), the Shannon diversity (H), the Shannon entropy (e^h), the Simpson diversity (D) and the Simpson dominance (1-D) using stepwise multiple linear regression. To validate these statistical models, the authors determine the coefficients of determination (R^2), the residual normality by Shapiro-Wilk test (W) and the residual homoscedasticity by Breusch-Pagan test (BP). In all the regressions the authors obtained exhigh coefficients of determination, residual

normality (except in Simpson dominance) and residual homoscedasticity. The main causal variables that effected ecological parameters of community were altitude, distance to nearest city, noise level and shrub cover. The age of the park was irrelevant because in urban areas the environment is continuously modified by gardening and, consequently, the succession processes are not produced. The author's study shows that consequently, urban parks could be considered potential reserves for bird conservation if the authors manage these four factors in an optimal way.

Chapter 9 - The Hooded Vulture, the smallest and commonest vulture in West Africa, is also possibly the most adaptive African vulture, evidenced by its tolerance of human proximity and high urban presence. However, very few studies assess its role as a dominant urban and rural scavenger in West African contexts outside the range of the larger vultures, rather focusing on its relationship with the larger vultures in the Eastern and Southern African plains. This chapter examines the relationships between Hooded Vultures, competing avian scavengers (black kites and pied crows) and rural/urban landscape configuration in the little researched southern half of Ghana, West Africa. Similar to crows and kites, hooded vulture numbers were positively correlated with settlement populations, and these birds had a stronger presence in urban than rural contexts. Hooded vultures had higher correlations with organic waste than crows or kites, and were the commonest avian scavengers in urban areas with high organic waste (abattoirs, markets), but less common than pied crows in residential and business districts with low organic waste. Vultures, kites and crows were commoner in urban areas near dense forest (including dense, urban green spaces), than in urban areas near lighter vegetation. Vultures nesting was correlated with dense rural forests, and to a lesser extent with dense, urban green spaces. Vultures were active in the late evening, early dawn and night in urban areas. In rural areas, vulture numbers were less correlated with vegetation density than in urban areas, and town proximity was positively correlated with vulture numbers. Conflicts between vultures, kites, crows and feral dogs were common, and no species was significantly dominant. The hooded vulture therefore has some specialist tendencies, despite its common portrayal as a successful generalist.