# BOOK REVIEWS

## AUSTRALIAN WATERBIRDS: A FIELD GUIDE by Richard Kingsford. 1991. Kangaroo Press: Kenthurst. Pp. 128, col. photos 88, numerous small maps and drawings, endpaper maps, card cover, 130 × 210 mm. $14.95.

Intended for field use by newcomers to waterbird watching, this book is designed and priced accordingly. Its value to experienced birdwatchers is limited, however, because it offers little that cannot be learnt from the more comprehensive popular guides.

Notes on use of the book are included in the introductory pages, where the author also defines the species covered, discusses the need for waterbird conservation, and gives useful hints on field study. Accounts for 88 species follow, two per page, each with short text, a distribution map and graphic data on size and breeding. A facing colour photograph of the bird is bordered by an illustrated index to habitat and food. Places to see waterbirds in Australia are listed in a 19-page appendix; wetlands judged to be best value for seeing waterbirds are plotted on the endpaper maps. The book also lists birdwatching books, organisations and journals, and has a frontispiece with silhouettes of waterbird groups and an index by species.

The sequence of species accounts is by habitat, but scanning photos of similar-looking birds may be easier for the novice. Wetland tree and shrub habitats are important throughout Australia, and should have been included. The colour photographs, inclusion of which distinguishes this from other field guides, are generally well selected and apart from those on page 33, well reproduced. The book's format does not allow for extra photos illustrating the common, confusing plumages of about 25 species (e.g. female Blue-billed Duck). Some northern wetland species should not have been left out, notably Little Curlew and Oriental Pratincole.

Inconsistency of subject in the species texts may frustrate the user trying to compare data for similar species. Although texts generally are interesting, more emphasis could have been given to critical points of identification – e.g. neck lengths of egrets, and the distinctive calls of the Spotless Crake. Poor expression creates confusion in more than a dozen places – e.g. "green legs and plumage" for Marsh Sandpiper. Critical errors include the statement that all egrets other than Little Egret have yellow bills (p.68): Great Egret has a black bill when breeding.

Breeding seasons for species occurring both in the north and south of Australia, though often different in each region, are not distinguished thus limiting the usefulness of the breeding charts. Also, there are some errors in the distribution maps – e.g. Intermediate Egret has been omitted from north-eastern South Australia.

The main appendix (Appendix IV) is one of the most useful features of the book, although inclusion of rarely-flooded lakes such as Lake Frome, as well as certain reservoirs, is of dubious value.

In conclusion, the strengths of the book are its simplicity, tailored to the target readership, and the inclusion of photographs and places to visit. There are significant weaknesses in the quality of the text, particularly for identification purposes, and in the novel features, while the book's durability is questionable. Nonetheless, it is a commendable work and deserves reprinting after revision. Richard Kingsford or other authors may be encouraged to produce similar books on less well known groups (e.g. seabirds, rangeland birds) in the hope of improving awareness and conservation of those species.

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## PHYLOGENY AND CLASSIFICATION OF BIRDS: A STUDY IN MOLECULAR EVOLUTION by Charles G. Sibley and Jon E. Ahlquist. 1990. Yale University Press: New Haven & London. Pp. 976, many graphs. $100.00

Many people who study birds may at first see little need to consult this book. However, some familiarity with the ideas advanced in it will make one's bird study more interesting, be it professional or amateur, systematic, ecological, physiological, evolutionary or even conservation-orientated. Whatever the book's shortcomings, it is one of the more important ornithological texts to appear for some time.

The book is the result of work that originated, so we are told in the Preface, on 11 September 1955. That date saw the completion of Charles Sibley's **A Synopsis of Birds of The World: A Manual of Systematic Ornithology,** a text used by Sibley in a course that he taught in systematic ornithology at Cornell University. Following that date, Sibley's interests in bird phylogeny and systematics grew and led to his now famous collaboration with Jon Ahlquist. Together they did extensive research into bird evolution using egg-white proteins. Superseding the egg-white protein work, their DNA-DNA hybridisation studies began on 30 January 1975. For eleven and a half years the DNA work continued. It saw 1209 sets of experiments, the vast majority of which were of birds. Publication of results began in the early 1980s with papers on the more phylogenetically problematic

groups of birds. (Along the way there have been not infrequent rebuttals to substantial criticisms, too!) This book brings together all of the avian work, along with more responses to criticisms and updated views on the evolutionary ideas published earlier.

Though the book's Table of Contents lists only two main Parts, the book is actually organised into four sections. The first consists of Chapters 1–13 and to my way of thinking, though obviously out of sequence, Chapter 17. This section is designed for the reader who wishes to comprehend the nature of DNA (deoxyribonucleic acid – the genetic material), the technique of DNA hybridisation itself, data analysis, and the advantages and shortcomings of the technique relative to others. Overall, these chapters achieve their aims very well. Much has already been said, and I am sure much more will be said by other reviewers in more appropriate places, about many of the facets of molecular evolution discussed here by Sibley & Ahlquist (S/A). These include: the rate of DNA evolution – its calibration and relationship to generation time; the application of cladistic principles to DNA hybridisation data; the statistical and biological significance of branching points in S/A's evolutionary trees; neutrality vs selection in molecular evolution; choice of statistics in analysing DNA hybridisation data. I am reluctant to deal with them here. Indeed, I am thankful for having learnt a lot from reading these chapters. I should, however, stress that an understanding of how S/A have dealt with these sorts of issues is ultimately the only basis on which the merit of their work can be judged. This applies especially to the statistics used and the relationship of generation time to DNA evolution as so much of their data interpretation hinges on these matters. The interested reader might consult Gill & Sheldon (1991), Werman *et al.* (1990) and Sarich *et al.* (1989).

The book's second part deals with the classification of birds. It begins with the chapters sandwiched between Chapters 13 and 17 and continues with the main Accounts themselves. The initial chapters are a fascinating, readable account of the history of classification of the birds of the world. The authors bring to life what could easily be a dull recounting of the various criteria used by previous workers and the classifications that resulted. The explanations given of the many character states used in earlier classifications will help any interested reader's access to earlier work. The accounts are coloured by descriptions of the intellectual climates in which earlier students of bird evolution worked and even of some of their personalities. All of this I found enthralling and it is a subject on which Charles Sibley always has been almost unassailable. This part alone probably makes the book worth its cost even for those vaguely interested in bird evolution. The only body of research that I am aware of having been missed here is that by Renzoni concerning the pineal body in many birds (including pigeons, doves, parrots and owls – see Renzoni & Watters 1972 and papers cited therein).

Continuing the second part of the book are the 428 pages of Accounts of the Groups of Birds (which are listed formally in the contents as Part II). Here the results of the DNA hybridisation experiments are discussed in detail. The accounts are organised according to the major higher categories of birds that S/A recognise. Each account has three components: a detailed taxonomic diagnosis and history of the evolutionary study of the group in question, a review of the DNA hybridisation evidence and a conclusion that always begins with the words "We conclude that . . . ". This helps the reader come quickly to a clear understanding of how S/A have synthesised their data, who they consider is related to whom, and what problems they feel remain. In being a detailed extension of Chapters 14–16, the Accounts continue the fascinating reading offered in those chapters. So interesting were the issues raised along the way concerning relationships between groups that I found it difficult to keep my mind on one group of birds at a time, and freely skipped from one account to another. This section concludes with a chapter on Historical Geography that I thought could have done with more integration of the content and conclusions of the preceding accounts (e.g. avifaunal connections between Australia and South America).

The book's third part is the 164 pages of melting curves, which are the closest we are given to the actual data, cladograms and "The Tapestry" – a single evolutionary tree for the birds of the world spread over 29 pages.

Finally comes the fourth section, the Literature Cited, and this will be an invaluable collection for anyone interested in bird evolution.

The classification proposed by S/A will surprise many. The phylogeny depicted in The Tapestry has many branching points at many levels, and S/A argue for the statistical significance and biological reality of many of them. Consequently, they adopt awkward-sounding but nonetheless clear principles of subordination of groups that are described on page 253. The groups recognised in their classification reflect these principles. The result is some seemingly outlandish groupings: the diurnal birds of prey, for example, are classified in the Ciconiiformes, the Order that has traditionally comprised the herons and their allies. Here S/A are *not* saying that kestrels are egrets. What they *are* saying is that they may be more closely related than previously thought, but that to transfer the essentially three dimensional branching pattern shown in an evolutionary tree to a linear sequence (i.e. orders, families within orders, genera within families) on a two dimensional page this is the classification that had to be adopted.

Some of the more interesting and at times controversial conclusions reached by S/A that are also relevant to the Australian region are summarised below. Their conclusions often support work done earlier by other authors using traditional criteria and often are new. In presenting this summary, I am deliberately going beyond the normal scope of a book review in the hope that readers might become more familiar with the interesting ideas that S/A have offered us for future research. Such a familiarity is how I think the book can complement the way that we in Australia look at birds: Australia is home to so many species and genera of critical importance in understanding bird evolution.

**Ratites**

S/A conclude that the closest relatives of the ratites (emus, cassowaries, rheas, ostriches, kiwis and the extinct moas) are the Neotropical tinamous. The emus and cassowaries are each other's closest relatives and the kiwis their nearest relatives. The positions of the rheas and ostriches relative to each other and to the emu-cassowary-kiwi group are uncertain and ought to be the subject of much further research. Interestingly, S/A admit that some of their explanations of problematic data here "may be correct, or they may be viewed as special pleading to explain away discrepancies. Perhaps they include some of each."

**Waterfowl**

The Magpie Goose *Anseranas semipalmata* is concluded to be closest to the South American screamers though not a close relative, this concept having been suggested earlier on osteological grounds.

**Buttonquail, Cuckoos, Pigeons and Doves, Parrots**

Each of these groups, S/A conclude, are ancient lineages whose closest living relatives are uncertain. Surely, we have here many challenges to future avian sytematists.

**Passerine Birds**

From about the early 1970s onwards, the idea began to take shape that many endemic Australo-Papuan passerines are not so closely related to their Northern Hemisphere namesakes as had been thought since their discovery. That is, for example, that the many Australo-Papuan flycatchers are not closely related to the muscicapid and sylvoid flycatchers, or that treecreepers are not closely related to creepers. The possibility of these birds having evolved in Australo-Papua instead of having been derived from the north began to emerge. It gathered momentum from some of S/A's earlier work (notably Sibley 1976) and from papers such as Boles (1979) on the Australo-Papuan flycatchers generally, Parker's (1982) analysis of relationships of the treecreepers and sittellas, and Schodde & Weatherly's (1982) monograph on the malurids. The hypothesis of an Australo-Papuan origin for so many of this region's passerines has now reached its most complete elaboration with the DNA hybridisation studies. Thus the oscine passerines are split into the primarily Australo-Papuan Corvida (the Vireonidae of the Americas are included here as being an early offshoot) and the Passerida, of which Australo-Papua has relatively few species and genera and most of these are thought to have arrived very recently. Even S/A's stiffest critics have supported their (S/A's) interpretations a) that many Australo-Papuan passerines have evolved in this region and b) that their adaptive radiation to so many ecological niches parallels that of the marsupials and the eucalypts. Indeed, this hypothesis has met with almost total accord, the only criticism I am aware of being that of Wilson (1988). Wilson's main difference concerns S/A's calibration of the rate of DNA evolution. Based on a different calibration, he has not disputed an Australo-Papuan radiation of these birds but instead has suggested that the radiation took place much later than S/A allow. A quick radiation, he argued, would have followed the entry of an ancestor of these birds into the Australo-Papuan region from the north. Wilson's paper is not cited but his criticism is responded to implicitly on page 603. Again, the interested reader might pursue these points in more detail. Here I think it is sufficient to say that the whole question of passerine origins and subsequent diversification can now be approached from fresh standpoints and with renewed vigour as a result of S/A's work.

The Corvida comprises three superfamilies, the Menuroidea, Meliphagoidea and Corvoidea. The Menuroidea comprises bowerbirds, lyrebirds and scrub-birds and, tentatively, the treecreepers. S/A have aligned treecreepers with lyrebirds and scrub-birds since 1984 (Sibley *et al.* 1984) and this must be one of the single most interesting conclusions of all their work. Their claims that treecreepers and scrub-birds are alike in size and colouration, which they have now made twice (Sibley *et al.* 1984, present work) have, however, always struck me as an example of clutching at straws. Nonetheless, S/A have given us two seemingly outlandish but essentially exciting hypotheses that a) treecreepers are not at all closely related to groups with which they have been aligned such as honeyeaters (e.g. Harrison 1969; Parker 1982) and that b) they diverged very early from the rest of the Menuroidea. I eagerly await the testing of these hypotheses by biochemical, morphological and histological methods. Using protein electrophoresis, Christidis & Schodde (1991) have already found much support for the DNA-based phylogeny though some inconsistencies, such as in the positioning of the treecreepers, were also detected.

The Meliphagoidea comprises fairywrens, emuwrens, honeyeaters and chats, pardalotes, bristlebirds and acanthizids such as the thornbills, gerygones and scrubwrens. Here we see clear demonstrations of the adaptive radiation proposed by S/A – e.g. pardalotes being more closely related to thornbills than they are to honeyeaters and chats, which together constitute the Meliphagidae.

Thirdly, the Corvoidea brings together many of the other Australo-Papuan and near Australo-Papuan passerines (except for example the suboscine pittas). Notably, the birds-of-paradise are placed here and not with the bowerbirds with which they have often been grouped. The position of the magpie-larks *Grallina* spp again exemplifies the adaptive radiation that S/A have discovered in the Australo-Papuan passerines. S/A propose that the magpie-larks are most closely related to monarch flycatchers, an idea that Beecher (1953) hinted at in his studies of jaw musculature of oscines.

The book abounds with other examples of interesting problems and relationships. The closer relationship of the New World Vultures to the storks than to all other diurnal birds of prey, which had been suggested and dismissed long ago, is now corroborated with DNA hybridisation data. S/A consider that some of the most complex and controversial questions in avian phylogeny concern the relationships among the totipalmate swimmers. This group has traditionally been the Pelecaniformes but considered here in it are the grebes, tropicbirds, gannets and boobies, anhingas and darters, cormorants and shags, herons, hammerhead, flamingoes, ibises, pelicans, shoebill, New World Vultures and storks, frigatebirds, penguins, loons, petrels, albatrosses and other procellariid seabirds. Clearly, a diverse assemblage of birds are placed in a division of what is here recognised as the order Ciconiiformes. S/A ask "Is it possible that the totipalmate foot, lack of an incubation patch, intraorbital salt gland and other shared characters have evolved more than once or are primitive characters that have been lost in the other lineages of the Ciconiides?" This question recalls the hypothesis that flight may have evolved twice in mammals: once in insectivorous bats and once in fruit-eating bats which, it is suggested, may be more closely related to primates than to insectivorous bats.

So, where does the study of the evolution of the world's birds now stand? At the October 1976 meeting of the South Australian Ornithological Association, the speaker for the evening, Dr Richard Schodde, commented in jest that Sibley and Ahlquist's DNA hybridisation research would solve all problems of avian systematics and so put avian systematists out of a job. This book, in presenting the results of their work, does quite the opposite, as I know Dr Schodde only too readily acknowledges. It probably marks the end of a period of relative stability that has surrounded higher systematics of birds for much of the present century, and throws open the field by giving us many hypotheses to test and problems to pursue that will keep systematists occupied for years to come. We in Australia and nearby regions are fortunate to be at the geographical focus of many of these problems. Thanks to the work of Charles Sibley and Jon Ahlquist, the ornithological community as a whole is now at the beginning, not the end, of what deserves to be an exciting period in the history of avian phylogeny.

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