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## Book reviews

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*Avian Genetics: A Population and Ecological Approach.*

Edited by F. COOKE and P. A. BUCKLEY. London, Orlando, San Diego, New York, Austin, Boston, Sydney, Tokyo, Toronto: Academic Press, Harcourt Brace Jovanovich. 1987. 488 pages. £40, \$72. ISBN 0 12 187570 9.

This collection of fifteen papers may prove a landmark in ecological genetics. The intention of the authors, Cooke and Buckley, was to offer students of wild bird populations an authoritative summary of the practical and theoretical tools of genetic analysis, demonstrate how they are being deployed and identify a host of problems which are amenable to genetic analysis. They and the contributors have made a good job of this collective enterprise. The marshalling of up-to-date information, supported by excellent reference lists, makes this book compulsory reading for those who work with wild bird populations and should not be missed by anyone interested in animal populations, whatever the species. Because birds continue to fascinate so many naturalists, the secrets of their lives are better known than for any other group of animals. The point is made more than once that there is therefore better prospect of fleshing out the bare bones of population genetics theory with real data.

The articles are grouped into three sections dealing respectively with the methods of measuring genetic variation, the way in which gene frequencies are influenced and an account of several field studies of particular species. We can consider the contributions in that order.

The first section includes material most likely to be familiar to the general reader. Thus, the first chapter introduces the Mendelian genetics of birds and general principles while the second covers the established concepts of quantitative inheritance. The next chapter by Shields strikes a less familiar note. Avian cytogenetics has languished because birds are more often than not endowed with a large number of microchromosomes which are a cytogeneticist's nightmare. We learn that, of some 8000 species of birds only about 6% have been karyotyped, compared with 40% of approximately 4200 species of mammals,

many of which have been scored in large numbers and the chromosomes banded. Hence avian genetics is almost a virgin field awaiting exploration by sufficiently determined spirits, who will find Shields' article a reliable point of departure.

Evans follows with a concentrated yet lucid account of the evidence for allozyme variation in bird populations. Information is tabulated for 160 species with respect to numbers of populations, individuals and loci studied, together with the estimates of gene frequencies and levels of heterozygosity, as well as the attributes of 32 commonly studied proteins, the buffers used, etc., a valuable compilation which is supplemented by a critical discussion of what can be inferred from systematic comparison of allozyme variation. The only qualification is that all the evidence refers to starch gel electrophoresis. Judging from the experience of those who work with human allozymes, anyone embarking on a population survey would be well advised to consider isoelectric focusing or at least ordinary polyacrylamide electrophoresis.

A contemporary theme is taken up by Quinn and White in their summary of how to study variation in DNA sequences, both nuclear and mitochondrial. Although the technology has been described often enough it is right to emphasise this approach in the present context. There is little doubt that mtDNA analysis will make a notable contribution to the elucidation of phylogenetic relationships at all levels. It is also very necessary to compare such evidence with that derived from allozyme studies on the same populations.

The second section of the book moves into more theoretical dimensions since it deals with population structure, breeding behaviour, selection and gene flow, which together determine the way in which genetic variation is maintained and modified. Greenwood looks at philopatry and inbreeding and finds it remarkable that so little research has been devoted to their interrelations. So far, levels of inbreeding in natural populations have been established for only a single species of bird. For philopatric species there may be an optimum degree of outbreeding, a challenging idea worth pursuing.

Rockwell and Barrowclough are concerned with gene flow and population structure. They dissipate the confusion between the terms migration and dispersal, consider the theoretical treatment of gene flow and draw attention to current ignorance of just how much gene flow takes place between natural populations. Evidence from allozyme studies suggests a relatively low among-population component of genetic variance, probably related to mobility. There is a pressing need for dialogue between field worker and theoretician to facilitate the development of robust models, designed to meet the practical needs of those who work with real populations.

Price and Boag review the types of natural selection which can occur, a story which apparently began with Bumpus. Alternative kinds of selection for single gene differences and for quantitative characters are discussed with particular attention to Lande and Arnold's emphasis on the measurement of selection for correlated characters in the interests of an empirical fitness model. This is unlikely to be easy given the uncertainty attached to estimates of genetic correlation. Field workers are faced with the task of marking, measuring and following the fate of individual birds. There is also an interesting summary of directional selection for body size in Galapagos finches.

Findlay follows with a discussion of non-random mating and makes the point that mating preferences are not for individual traits but for complexes of characters, which may or may not be correlated. There are considerable practical difficulties in determining the basis and consistency of mating preference.

Corbin is concerned with geographical variation, a classic topic. Allozyme variation suggests that local variation due to drift and/or natural selection is dissipated by gene flow between populations. On the whole, degrees of similarity derived from allozyme evidence are consistent with corresponding morphological comparisons, although there are some significant exceptions which merit attention.

The message which comes across from this section of the book is that there is no shortage of theoretical treatments of hypothetical situations in natural populations but a prime need to marry them to hard evidence. As noted above, because we are dealing with birds the prospect of doing so is reasonably encouraging.

The last section moves to some practical examples of the genetical analysis of natural populations. van Noordwijk discusses the latest evidence from the long term studies on the Great Tit, pioneered by Kluyver. Because this species likes to nest in boxes individuals can be easily ringed and parents and progeny followed with fair success. Heritability estimates from wild birds are considered for several quantitative traits like clutch size, egg size, date of laying, body size, etc. Often the values are high, suggesting plenty of intra-population genetic vari-

ation, not too surprising but useful to know. Of particular interest are the estimates of inbreeding in the island of Vlieland, where a substantial proportion of the pairs studied have pedigrees of both male and female complete to the grandparents. Just to show that nothing is simple, although inbreeding is correlated with a reduction of the rate of egg hatching, related pairs produce twice as many grandchildren of breeding age as unrelated pairs, due to higher survival after fledging.

The genetics of the House Sparrow is dealt with by Parkin who presents a comprehensive review, particularly with respect to allozyme variation. Perhaps the most remarkable feature of this species is the dramatic differentiation into geographical races in North America, after introduction from Europe in the latter part of the nineteenth century. But it is rather shocking that the genetic basis for such differences, which exemplify ecological rules, has yet to be confirmed. This is not a frivolous caveat, witness the recent evidence of James, who interchanged clutches of eggs between the nests of morphologically distinct populations of the Red-winged Blackbird, to find that the offspring tended to resemble their foster parents. Such apparent importance of environmental variation needs confirmation and careful scrutiny in the context of both geographical variation and even estimates of heritability.

One of the editors, Cooke, summarizes the results of extended studies on the Lesser Snow Goose, a widespread, colonial, arctic species, polymorphic for two colour phases, determined primarily by two alleles, one of which is incompletely dominant. This simple genetic variation has opened the way to a study of selection, gene flow and non-random mating in an analytical study which is successfully integrating genetic, behavioural and ecological evidence.

Finally O'Donald presents an up-to-date report of his study of the Arctic Skua, another species polymorphic for two simply inherited colour phases. Here there is clear evidence of sexual selection, which turns out to be by female choice, a conclusion reached after systematic exclusion of alternative ways of maintaining the polymorphism.

The book is rounded off with a chapter which no browser should miss, since it is no less than a masterly summary by Buckley of the state of play, focusing attention on the strengths and deficiencies of the current approach and pointing the way forward with encouraging enthusiasm.

The reader puts this book down with somewhat mingled emotions. There is unqualified admiration for the collaborative effort in collating so much information and so many ideas and satisfaction at the successes already notched up. There is pleasurable anticipation at the opportunities which evidently exist for pushing genetic analysis of bird populations further than ever before. But there is also a lively concern at the

complexity of biotic interactions of all kinds. It is very difficult to win quantitative evidence about the dynamic structure of any natural population of animals. Having read this book we can only hope that devoted ornithologists will go forth with renewed vigour, and a long overdue awareness of genetics, to more analytical investigations of their favourite species.

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*Journal Publishing: Principles and Practice.* By GILLIAN PAGE, ROBERT CAMPBELL and JACK MEADOWS. London: Butterworths, 1987. 184 pages. Hardback £27.00. ISBN 0 408 10716 2.

Most scientists are much involved with journals, but only as readers, authors and (often unwillingly) as referees. So they pay little attention to the complex problems of producing, publishing and selling the papers which carry their articles. New journals are started at intervals, often with the aim of skimming the cream from the latest research area; and if they are very successful they can claim a rejection rate of 50, 70 or even 90% of submitted papers. The frequency at which new journals have been founded in recent years in the linked fields of molecular and developmental biology, genetics and biotechnology, not to mention journals with the word 'Evolution' in the title, gives one the strong impression of an ever-increasing rate of scientific progress consequent upon an ever-rising number of researchers, with the visible threat that we shall shortly be overwhelmed by the flow of new knowledge (this has long been an expressed fear).

An analysis in depth of these apparent trends would be of great interest, but that is not, of course, the aim of the book under review. The authors include a past and a present Director of Journal Publications in a major publishing house (Cambridge University Press and Blackwell Scientific), and an expert on Library and Information Studies. Their aim is to fill in the commercial and organizational background involving editing, production, marketing, sales and distribution; to advise those rash enough to want to start a new journal on how to be successful, and also on how to set about putting an ailing journal on its feet again. Legal, financial and bibliographical aspects get attention; and appendices discuss the use of micro-computers, list associations of editors and publishers of learned journals, give useful sources of mailing lists, and name some subscription agents and consolidators for bulk air distribution of journals.

A particularly interesting chapter discusses alternatives to the traditional journal, which may be paraphrased as 'In what form shall we be getting our scientific information in the year 2000?' The book is a little cautious on this question, since new methods of information propagation are developing rapidly. One

of the options tried is synopsis journals, like the *Journal of Chemical Research*: a two-page synopsis of each article is published, and readers can order any complete article in microfiche or miniprint. One problem here is that statements in the synopsis will be much more widely read than will the complete article, and may well become unjustifiably accepted in the literature. This method has not yet, apparently, made much headway.

An alternative is some form of electronic publishing, such as is used for gene and protein sequences. These are very well designed, because of their simple form, for on-line transmission from Gene Bank to customer, and could even be transmitted in morse code. Electronic publishing/transmission of scientific papers, however, raises a number of obvious problems. (1) Do they need to be refereed, revised and edited before going out on-line? If not, the reader will find literature searches extremely frustrating. (2) Transfer and printing of electronic messages is less than perfect, and cannot handle illustrations effectively, while text may become garbled by overcrowding of the transmission line. (3) Only a small proportion of journal readers will have ready (or any) access to electronic outlets. (4) The cost of such machinery and the transfer costs of large papers will be an important factor.

DTP is becoming almost as fashionable an acronym as DNA, and most of us know it stands for Desk Top Publishing – a phrase which is more impressive than the systems it represents. One of the DTP systems now getting so much advertising space would allow us to print small copy numbers of our own rejected papers and send them to friends, but they would have to be quoted as 'private communication from X' in proper journals, and would not get the author listed in the Citation Index.

I suspect that we are all very ignorant of the possibilities of these new methods of propagating knowledge, and I would hesitate to assert that they will not replace the traditional journal in the next 10 years. It is certainly much easier to study critically a well-printed journal paper than a VDU text, but perhaps we shall end up with synopses on VDU and the full papers we ask for arriving on disk. By that time we shall all be able to bombard authors with electronic messages asking 'Is that blob half way up lane 5 in Fig. 3 a DNA band or a figment of my printer's imagination?'

This is a very stimulating book, and I hope that the next edition will go much more deeply into all aspects of electronic and computer-assisted publishing, on which we really need to be instructed and brought up to date. We can then make up our minds what we shall have to save up for in the mid-1990s.

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