

Book reviews

Species: The Units of Biodiversity (Systematics Association Special Volume Series 54). M.F. Claridge, H.A. Dawah and M.R. Wilson (eds). Chapman and Hall, London. 1997. Pp. 439. Price £49.00, hardback. ISBN 0 412 63120 2.

‘...the Swiss sometimes find it difficult to say exactly where the Junfrau and neighbouring Monch mountains start and stop, but this does not lead them to doubt the reality of these two mountains because their limits are unclear.’

(Van Regenmortel, Chapter 2)

If species are the ‘units of biodiversity’, or even if they are just used as such in our measurement of the diversity of life, it is clearly important that the concept of species is used consistently in practice. One might also hope that the species was a meaningful unit. Given the long and often acrimonious debates that have surrounded both of these aspects of species definitions, the Systematics Association, and particularly the meeting organisers who became the editors of this proceedings volume, took on a major task when they sought to bring together a wide interdisciplinary group to consider ‘The Units of Biodiversity: Species in Practice’.

The approach was to consider the species problem in each of a wide range of taxonomic, or in some cases ecological, groups. The result is a sequence of sixteen chapters covering the ground from viruses to mammals. The surprise, to me at least, was the similarity between these different points of view. The same problems exercise the minds of virologists, nematologists and arachnologists: how can asexual organisms be incorporated in a common system with sexuals, can species be paraphyletic, and how can one deal with the continuum of divergence among allopatric populations? These are familiar questions indeed and one needs to be a dedicated connoisseur of species to work through all their variants from start to finish.

Not only are the problems consistent across taxa but so are the solutions. Most authors offer a choice between ‘biological’ or ‘phylogenetic’ species concepts. Some stay on the fence while others jump one way or another with varying degrees of conviction. Knowlton and Weigt’s excellent contribution on marine invertebrates, for example, comes out in favour of biological species after a thoughtful discussion of these two alternatives. Cracraft’s chapter, ostensibly the one about birds, stands out because it lacks the doubts expressed by most other authors! It is actually one of the most enjoyable reads in the book: proselytising for his phylogenetic species concept but also directing his remarks to a ‘user community’, conservation biologists, where most authors seem more interested in speaking to other systematists.

It is a pity that the authors of the first 17 chapters did not read the last two as part of their preparation for the meeting. Hull argues that a species concept should be judged, like any scientific theory, on the basis of its theoretical significance, generality and applicability. He then discusses several classes of species concept, in the process making an important distinction between ‘diagnosable’ and ‘monophyletic’ concepts that are both called ‘phylogenetic’ elsewhere in the book, and argues that they inevitably make trade-offs between these desirable attributes. A species concept cannot be simultaneously general, applicable and theoretically significant and so the ‘ideal species concept’ cannot be found. This conclusion, reached after 376 pages, may cause those of jaundiced mien to give up on species altogether. Mayden fortunately comes to the rescue in the final chapter where he ‘reveals a hierarchy of species concepts that should finally put the species problem to rest!’ This feat is achieved by formalizing a way of thinking that is, I suspect, quite widespread: a ‘primary concept’, roughly the real thing that actually underlies biodiversity, has to be theoretically significant and general while subsidiary concepts can sacrifice these qualities for applicability or operationality. These subsidiary concepts govern the way systematics is carried out in practice. Mayden identifies 22 species concepts and forms them into a hierarchy beneath the evolutionary species concept of Simpson, his candidate for the prime concept.

Even if few readers can face the full survey of ‘species in practice’ taxon by taxon, hopefully many people will read and ponder on these last two contributions. They will not stop the debates among proponents of different species concepts, of course, but they may help to keep the arguments in perspective.

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An Electronic Companion to Genetics Workbook + CD-ROM. Philip Anderson and Barry Ganetzky. Cognito Learning Media, Inc., New York (Oxford University Press, Oxford). 1997. Pp. 304. Price £19.53, paperback. ISBN 1 888902 39 6.

As the title suggests, *An Electronic Companion to Genetics Workbook + CD-ROM* comprises two parts which, together, promise ‘customised learning with easy access to review and self testing’. The approach is built around thirteen topics which cover Mendel, Chromosomes, Pedigrees, Linkage, Prokaryotes, Genes and Proteins, Replication, Repair and Mutation, Gene Expression,

Recombinant DNA Technology and Population Genetics. The intended target readership for this package is not made clear but, in my opinion, it is pitched somewhere between A-level and first year undergraduate. For the purposes of this review, it seems appropriate to consider the book and the CD-ROM separately and then to see how well they interact to deliver the stated aim.

The workbook is not attractively presented. It is flimsy, has an awkward fastening and, after the CD-ROM has been removed from the front cover, looks and feels a bit of a mess. There is no colour, no introduction and no instructions for use. What you get are short summaries with little detailed information (2 pages) followed by a series of questions and answers (around 26) for each topic. Apart from the number of questions, there is nothing here that you can not get in a typical textbook, although the questions were different to those compiled on the CD-ROM.

What, then, of the CD-ROM? In these days of 'all-singing, all-dancing' multimedia software this had a very limited feel. The image size was not adjustable and on my 17" monitor the available window was small enough to make diagrams and text difficult to read. Secondly, there was no 'undo' function and this rapidly became infuriating; clicking a wrong button meant having to go back through a series of pages. Finally, I had problems with the search facility. This failed to find hits for 'PCR' or 'sex-determination' despite the fact that I had read the appropriate entries! When these deficiencies are coupled with the lag-time at each click, I think students will find their patience tested.

As for content, the CD-ROM covers the same topics as the workbook but the format does not offer sufficient advantages to compensate for the lack of detail. There are a limited number of animations and simple videos that do help to explain certain topics (for example chromosome segregation) but they were not particularly gripping and were backed by a very uninspiring voice over. The topic reviews contain only marginally more information than the topic summaries in the workbook and students in all but the most basic of genetics courses will have to consult a textbook to fill in the many gaps. There are also deficiencies in the content. I was, for example, very disappointed with the coverage of population genetics. It is over simplified and makes no attempt to integrate the subject with the modern era. The review has just seven paragraphs (allele frequencies, H-W equilibrium, selection, heterozygous advantage and mutation-selection equilibrium) forming a random selection with little coherence or structure and not even any whizzy multimedia by way of justification. The CD-ROM presents sex determination in *Drosophila* as a simple XY system and makes no attempt to explain the importance of X:autosome balance. Curiously, this topic is correctly presented in the workbook! Finally, there are some aspects of the software that are simply quirky. The description of non-disjunction in *Drosophila* has diagrams of insects which vibrate their wings noisily and fly away just as you are trying to take in

the information. This was amusing the first time, but irritating and unhelpful subsequently.

Are there any advantages? Once again, some students might appreciate the 'self-tests' which can be taken in any or all of the topics. The CD-ROM format presents little interaction here although there are some on-screen hints. One or two of the questions are awkwardly phrased, as if they were designed to trick the student. Anyway, that is my excuse for scoring only 60% on the test that I did! All in all, I found the package disappointing and, although I might use some of the questions, I can see little scope for its inclusion in my courses as a teaching aid. I suspect that students would rather spend their £20 on a comprehensive and colourful textbook.

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DNA and Protein Sequence Analysis — A Practical Approach M. J. Bishop and C. J. Rawlings (eds). IRL Press (Oxford University Press), Oxford. 1997. Pp 374. Price £29.95, paperback. ISBN 0 19 963463 7.

The quantity of DNA and protein sequence data generated by the research community continues to expand at an ever increasing rate. The availability of automated DNA sequencing technology has led to the determination of the complete genome sequences of several unicellular organisms, and the *C. elegans* and human genomes are likely to be characterized within a few years. This has resulted in the accumulation of a large number of sequence databases and the increasing use of computers both to store and analyse sequence data. However, the establishment of many independent databases has led to a lack of standardisation that complicates the retrieval of information, whilst the vast choice of software for a given application can often be confusing.

This volume, from the Practical Approach Series, provides clear and critical guidance on the analysis of DNA and protein sequence data from experts in all areas of the field. The book begins with an excellent overview of the sequence databases currently available, including methods for depositing, identifying and retrieving data and the potential problems associated with disparity between databases. Later chapters include appraisals of software for sequence analysis, covering the uses, advantages and disadvantages of individual programs. There are excellent reviews of DNA sequencing methodology, including many clear and helpful protocols, and of methods for gene identification. Other topics covered include: the analysis of simple and repetitive sequences; methods for sequence alignment — with an overview of the advantages and disadvantages of the many algorithms available; and the use of programs for sequence alignment and structure prediction as a means of forecasting protein