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Lousy Lists

The Chewing Lice: World Checklist and Biological Overview.—R. D. Price, R. A. Hellenenthal, R. L. Palma, K. P. Johnson, D. H. Clayton. 2003. Illinois Natural History Survey Special Publication 24. x + 501 pp. ISBN 1-882932-08-0. \$35.00 (hard cover).

“The student of the Mallophaga . . . can be compared to the palaeontologist. He delves into the past, not by quarrying into the rocks for fragments of bones, but by studying the morphology and distribution of these living fossils. As he pieces together the story of their evolution, he likewise unfolds the story of the evolution of the birds.”

(Rothschild and Clay, 1952: p. 146)

Arguably no insect has played a more prominent role in the study of cospeciation than that of the parasitic louse. From the formulation of the rules of parasitism by Fahrenholz (1913) and Eichler (1948), through to the seminal gopher louse studies of Mark Hafner and colleagues (Hafner et al., 1994), the study of parasitic lice is as intertwined with the study of cospeciation, as lice are with the evolution of their hosts. Passed like genetic heirlooms from one host generation to the next, lice track their hosts' evolutionary histories with varying degrees of fidelity. The study of this association has spawned a cottage industry of empirical research aimed at building and comparing host and louse phylogenies. Evidence of host-lice cospeciation provides an opportunity to test hypotheses of coadaptation, and calibrate rates of evolution in biologically disparate taxa. Lice have even been the subject of a recent conference (Smith, 2003) and formed the prevailing empirical examples in two recent symposia on cophylogeny (Johnson and Clayton, 2004; Page, 2002). Intense methodological debate surrounds the best method of reconciling host and parasite trees, and louse datasets form the basis for the development of many of these methods. Despite this interest, obtaining the evidence for cospeciation, particularly host-lice cospeciation is fraught with difficulties; perhaps the most fundamental of these is the necessity to understand the basic diversity and distribution of lice.

Until recently, these data have largely sat unpublished in patchy card catalogues of the world's major natural history museums, or in obscure publications written in many different languages. Price, Palma, and Hellenenthal unite this information in a new checklist of chewing lice, a landmark publication that provides an unparalleled opportunity to study the global diversification of this large parasite fauna across its avian and mammalian hosts. This book represents the fourth published checklist of world chewing lice, and almost doubles the number of chewing louse taxa recognised since the last checklist, printed some 50 years ago (Hopkins and Clay, 1952). It documents a staggering 9311 associations between 4464 chewing lice, parasitizing 3248 bird and 422 mammal species—not counting a further 1880 species and subspecies considered in synonymy. Given this breathtaking scope, it is not surprising that it has taken the three principal authors almost 20 years to compile. Taxonomic coverage is restricted to “Mallophaga,” a large paraphyletic group that, together with the Anoplura or ‘sucking lice,’ form the insect order Phthiraptera. This division reflects the specialisation of the authors and will appeal to entomologists that traditionally consider these insect groups separately (Durden and Musser, 1994). The checklist is accompanied by keys for every host order, illustrations of all 253 chewing louse genera, and through the collaboration of Kevin Johnson and Dale Clayton, includes an extensive review of chewing louse biology, ecology and evolution.

The book's introduction charts the rise and fall of louse taxonomy from the late 18th century to the present day, encompassing a so-called “Golden Era,” between 1953 and 1972 that saw the description of almost 30% of all chewing louse taxa. Although some aspects of louse research have undergone a minor renaissance of late, the same cannot be said of louse taxonomy, and this takes on a special significance when one considers issues of host specificity. Price et al. vividly portray this in their

introduction, taking the unusual approach of tabulating the number of louse taxa described by each of the worlds leading louse systematists, and what proportion of these taxa they consider valid in the new checklist. Respectfully, the authors only include deceased workers, but the results are nonetheless revealing, implying that either many early louse taxonomists were poor morphologists, or more likely, were somewhat seduced by host associations as an indicator of louse specificity. The latter assumption is born out by subsequent tables that chart louse specificity among each bird and mammal order. Any expectation of strict host specificity is quickly dismissed. Nevertheless, the tables reveal six bird and mammal orders where each known louse species is restricted to a single host species, and several other host orders where the level of louse specificity lies tantalizingly close to this mark. Although it is naïve to suggest that these data alone provide an indication of the extent of louse cospeciation or coevolution within a host clade, the temptation to make this link is strong and the tables do provide a starting place for those seeking groups of hosts where we might expect to see evidence of cophylogeny.

The last set of comprehensive generic keys and illustrations for chewing lice was published in 1908. Price et al. produce a much-needed update with a complete set of illustrated keys for all genera. The literature on louse morphology is replete with conflicting interpretations and synonyms, making the compilation and use of keys for chewing lice exceedingly difficult. Price et al. avoid much of this nomenclatural jargon by arranging the key by host order. This has the effect of dramatically simplifying each couplet, making it much more widely accessible than would otherwise have been possible. It does mean that at least some knowledge of the host taxon is required before the key can be useful. However, the number of instances when the host order of a louse is unknown are thankfully few. This key, coupled with the illustrations, make this a valuable resource that alone is worth the cover price of the book.

The *pièce de résistance* comprising the bulk of this book is the checklist, divided into two sections arranged by louse and by host. Host classification follows Howard and Moore (1991) for birds, and Wilson and Reeder (1993) for mammals. The authors have been ultraconservative in their classification of the lice, accepting fewer familial names than were considered valid in the last louse checklist published 50 years ago. Furthermore, the decision to arrange the louse portion of the checklist alphabetically by family is surprising given recent efforts to identify and resolve the phylogeny of the major chewing louse clades. This arrangement could either be seen as prescient given the transient nature of some recent phylogenetic hypotheses for lice, or at best rather "traditional." I reserve judgement, but failure to divide this section up by the principal louse suborders whose monophyly has been generally accepted for at least 50 years seems odd—at least it is an improvement on the 1952 checklist, which was entirely arranged alphabetically by genus. Within both portions of the checklist each entry

is arranged in the form of an indented list. Authorities, synonyms, hosts, and type hosts are indicated, and the checklist is completed by an extensive bibliography that includes references to every alpha taxonomic publication ever published on chewing lice.

Navigating the checklist is difficult, hindered by headers that provide little more than the briefest indication of context. Within the host section, anyone with a good working knowledge of bird or mammal classification is unlikely to be too impeded by this, but I can think of fewer than 10 individuals worldwide that would be equivalently familiar with louse taxonomy. I regularly found myself getting lost amongst the myriad of pages devoted to speciose louse genera, amongst whose pages there is no indication of the louse genus and only the family name is indicated by the header. The situation is worse in the host list, where the header is limited to distinguishing between mammals and birds. Separate indices to genus are provided for louse and host taxa, alongside another index for host common names. However, in such a large and unwieldy book I found myself spending more time trying to locate the right index and find the appropriate entry than I did when I actually arrived at the relevant page. These niggles are unlikely to deter a casual user, interested in the host distribution of a particular louse species, or the louse fauna present on a particular bird or mammal. As such, amateur entomologists, ornithologists, and veterinarians will doubtless find the checklist a valuable addition to their bookshelves. However, as a resource for wider scientific research, such niggles become an insurmountable barrier to unlocking the true potential of the data contained within these pages.

From the perspective of an evolutionary parasitologist, biogeographer, or comparative biologist, this checklist offers the raw material to study the forces driving the radiation and diversification of a major lineage of insects of worldwide distribution. Estimates of host specificity and species diversification are directly available from data within the checklist. If these were coupled with host geographic ranges, and a growing forest of known phylogenies for both the hosts and their parasites, the checklist would offer an unparalleled tool for addressing many fundamental questions concerning host-parasite evolution. Only an electronic release of the checklist would make this meta-analysis possible, and it is unfortunate that the checklist authors did not have the vision to present their data in a more accessible format to accompany the published book. Inclusion of a CD-ROM, or development of an accompanying website would enable the book to reach an audience far broader than the relatively narrow band of systematists it doubtless will otherwise attract. The inevitable additions and corrections necessary for a checklist of this scale would also be much easier to administer and release in electronic form. It is particularly frustrating that the authors are clearly aware of some of the issues surrounding electronic release of data, as a portion of the introduction is devoted to describing the relational data model in which

the checklist data was stored prior to publication. A lack of digitized taxonomic records frustrates efforts to compile lists of the world's living species, and development of the next generation of tools and data repositories that can be woven using web services into GenBank, PubMed, or the fledgling Global Biodiversity Information Facility (GBIF) (Agosti, 2003). GBIF recently announced a major funding initiative designed to digitize old taxonomic catalogues and checklists in an attempt to speed up the electronic capture of taxonomic names. It borderlines on madness that while some members of the systematic community are busy digitizing taxonomic works produced before the dawn of the personal computer, others are using electronic techniques to publishing new paper-based catalogues that will at some future point need to be redigitized!

Publication of this checklist was aided by the PEET initiative (Partnerships for Enhancing Expertise in Taxonomy) funded by the US National Science Foundation (Rodman and Cody, 2003). This funding was intended to bridge the gap between an aging population of taxonomic specialists and a new generation of phylogeneticists and ecologists, and enabled the hardbound checklist to be published by Illinois Natural History Survey at the reduced price of \$35. It also brought with it the collaboration of Kevin Johnson and Dale Clayton who contributed the final chapter on chewing louse biology, ecology, and evolution. The position of this chapter reflects this change in authorship but is perhaps unfortunate, as this section is arguably more accessible to the casual reader than much of the preceding text. Parasitic lice dominate methodological and empirical debates on cospeciation and form a useful 'model system' to address a range of questions associated with the evolution of host-parasite faunas. Johnson and Clayton seek to explain the unique characteristics of these parasites that have enabled them to acquire 'model' status, and in doing so provide a detailed account of chewing louse natural history. This authoritative account gathers data on all aspects of chewing louse biology, and succeeds where similar accounts in entomological textbooks have failed by placing these data in a broader research context. Anyone interested in the evolutionary ecology or cophylogeny of parasites is encouraged to read this chapter, which makes valuable addition to the book.

To some (probably not the readers of this review), checklists epitomize traditional taxonomy—dry lists of species diversity with few redeeming qualities. Indeed it is fair to say that most checklists don't make exciting reading, are hard to fund, almost impossible to publish, and require years of expertise to compile. With the exception of a handful of taxonomists working on high profile taxa, the majority of taxonomists compiling checklists are close to or over retirement age and un-

paid for their efforts. Yet these lists represent the foundation stone for understanding biological diversity. Making sense of this data requires releasing it to the widest possible audience and in the case of taxonomic data, this can only mean an electronic release to accompany traditional methods of publication. This checklist of chewing lice is far more than a list of names. It represents the collective efforts of three taxonomists that between them have more than 100 years of experience in insect systematics. Their description of that diversity is a magnificent achievement that will doubtless form the cornerstone of chewing louse biology for many years to come. Yet this description is just a first step towards understanding that diversity, and it is vital that taxonomists recognise this role for their data. Taxonomy is a tool—like any other it serves a wider purpose. Only by embracing this fact and releasing taxonomic data to the widest possible audience will this role be realized. In doing so perhaps the profile of taxonomists will be raised in the process.

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