

AUSTRALIA'S MAMMAL EXTINCTIONS: A 50,000 YEAR HISTORY

CHRIS JOHNSON

A REVIEW BY ROD WELLS

The mystery of vanishing species has occupied the minds of palaeontologists and neontologists for more than a century. In more recent times the exponential growth of the human population with accompanying habitat destruction and shrinking biodiversity is an inescapable reality. Could humans have also been responsible for the extinction of the ice-age megafauna? Martin & Wright (1967) attributed the extinction of North American megafauna to the spread of humans. It was a theme echoed in Australia by Merrilees (1968) in his keynote paper 'Man the destroyer' and revisited by Flannery (1994) in 'The Future Eaters'. A confounding variable in the Ice-age extinctions has been the role of climate. Contemporary research into past climates is providing temporal resolution approaching biological time scales and now sheds new light on a number of single cause hypotheses.

Chris Johnson's book, *'Australia's Mammal Extinctions: a 50,000 year history'*, is both timely and comprehensive. It aims to bring a scientific approach to a multidisciplinary problem. The author outlines the importance of multiple working hypotheses and refutation in arriving at a best fit explanation. An approach perhaps obvious to readers with a scientific background but all too often missed or misunderstood in an adversarial society. Whether you agree or disagree with Johnson you have a framework in which to test his interpretations. The structure of the book invites debate not blind acceptance, indeed the author's bias is clear and the conclusions in many sections are built on so many 'ifs', 'mays' and 'mights' that one can lose count. Paradoxically this is a strength not a weakness for it provides not only an endless array of research questions but should also sound a cautionary note to those who would blindly invoke the conclusions to frame management policy.

Johnson has surveyed an impressive body of literature in many disparate fields and this well written and referenced book should appeal to both the general reader as well as specialists seeking a broader context for their own research. What will not be so apparent to the general reader are the assumptions underpinning the interpretation of evidence from the sub-discipline areas. The book is well illustrated with some elegant paintings of extinct mammals.

The book is divided into three sections: Part I Ice-

age Australia 2.6 million to 10,000 years ago, Part II The Late Prehistoric period 10,000 to 200 years ago, and Part III the last 200 years.

Part I begins with a brief history of Australia's mammals and habitats to the end of the Tertiary and then moves into an extended debate on the Pleistocene megafauna, their environment and extinction. Various extinction scenarios are canvassed. The 'testing' of these hypotheses using three specified criteria leads to the conclusion that hunting by humans was the cause of the megafauna's demise. This outcome is based largely on the modelling the effect of low levels of predation on the young and juveniles of large slow reproducing animals at a time when the climate was ostensibly benign. The discussion or speculation on the size and distribution of the human population at this time is replete with many caveats that warrant closer scrutiny. The section on plant defences, plant isotopic signatures and the role of fire makes for interesting reading. Change in vegetation distribution is attributed to the extinction of the megafauna. Interestingly the alternative, contraction of suitable fire prone vegetation to widely separated refugia leading to extinction of megafauna (*sensu* Murray and Vickers-Rich 2004) is rejected as the climate of the time is perceived as equable. Interpreting the role of fire, as measured by charcoal frequency, is bedevilled, as the author points out, with same problems as the pollen record (p.92) "poor geographical coverage and uncertain dating". The use of a number of proxies to resolve climatic variability on ENSO time scales stepping back 150 thousand or more years points to a cold arid phase around 70 – 50 thousand years ago but this is also passed over in favour of the more equable period 50 – 35 thousand years ago that brackets the Roberts *et al* (2001) extinction 'event' around 46 thousand years ago. I quibble, but to quote Johnson "lack of evidence does not constitute evidence against overhunting" but then nor does it constitute evidence for overhunting. It is the elimination of the alternatives, albeit many built on rather weak foundations that lead to his conclusion. One is left with the impression that the author was more committed to his final analysis at the beginning rather than being 'led' there by the dispassionate weighing of evidence. It is quite apparent that many of the data sets he uses are weak and patchy. While on one hand it is risky to apply these on a continent wide basis on the other it could be argued that it is better to take a stab at an explanation and thereby provide a target for further research and discussion.

We enter Part II, rather disturbingly, free of all doubt, (p. 132) "the arrival of people caused two environmental changes first the extinction of the megafauna and then (very probably) rearrangement of the vegetation". Realistically all that can be said is that the megafauna were extinct and vegetation distribution had changed in ways we only partially understand. The discussion of prehistory that follows can be broadly divided into pre and post 6 thousand years ago, the latter period associated with a rapid increase in human population and the exertion of more control over their environment through the development of new technologies particularly the use of fire. Firestick farming is seen as a replacement for megafaunal browsing in maintaining a mosaic of vegetation types. Johnson's discussion of the role of other mammalian predators including the appearance of dingoes, and Aboriginal 'intensification' set against a background of increasing aridity leads to a second wave of extinction. The Thylacine is lost from the mainland followed much later by the Tasmania Devil leaving the top predator niches to dingoes and cats. This sets the scene for the third and ongoing wave of extinctions.

Part III focuses on mammal extinctions in European Australia. I found this section particularly interesting. It highlights the tremendous advances that have been made in the last 30 years in our understanding of contemporary Australian mammal ecology. The author draws upon both actualistic and experimental data sets in his search for a unifying theme to account for the loss of so many small mammal species in the last 200 years. Central to his thesis is the disruption of the co-evolutionary relationships that existed between species and their environment. Could there be a single factor that transcends the plethora of disasters that include disease, droughts, fires, famines, habitat destruction, introduced herbivores and predators that sent relict populations of these smaller mammals to extinction? Johnson sifts through all these variables and believes he has found the answer. He attributes their loss to hyperpredation by foxes and cats. Can anything be done to conserve the remaining vulnerable species? Johnson thinks so. His suggestion for mimicking the past evolutionary balance with reintroduction of Tasmanian Devils and dingoes into south eastern Australia as a control over the populations of feral cats and foxes is worthy of consideration. It will no doubt engender a vigorous debate. Such an approach has its parallels in the reintroduction of the wolf to parts of Europe and North America.

Overall this book is a very interesting and thought provoking interpretation of a complex multidisciplinary problem. Johnson's conclusion is that the introduction of new predators is the driving force behind all three major extinctions. This will no doubt stir debate among an older generation of ecologists schooled in the belief that predation *per se* could never account for the extinction of a species. Whether you agree or disagree with his analysis this well written book provides an excellent road map to a contentious and pressing conservation problem. It is highly recommended for both specialist and non-specialist.

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