A Feral Population

Wild Horses of the Great Basin. Social Competition and Population Size. JOEL BERGER. University of Chicago Press, Chicago, 1986. xxii, 326 pp., illus. $24.95. Wildlife Behavior and Ecology Series.

The spread of feral livestock has been one of the least investigated consequences of the global dissemination of European agriculture in the last 400 years. Surprisingly few scientists have grasped the opportunities offered by these vast and repeated experiments in population and community ecology. Yet scientific information on feral species is now urgently needed for the management that is demanded by an often polarized public. Over no feral species does public opinion take more extreme positions than over the feral horse in North America. This is a timely book, providing an excellent, full, and very readable account of the ecology and behavior of a population of feral horses in part of the Great Basin Desert. The horses were studied in a remote area, free from the effects of cattle or humans but living with native wild herbivores. Over five years the author and his team recorded the resources and habitats seasonally used by the horses, their social organization, and, above all, their individual reproductive success and the social and ecological factors that influenced it. In this area in particular the book goes far beyond being a simple account of feral horse biology and becomes an advanced exploration of the behavioral ecology of the species. Yet it does so in pursuit of what I had considered a rather outdated theme.

The book's subtitle is "Social Competition and Population Size," and on the first page Berger declares: "My central theme is simple: *if individuals that are likely to reproduce do not do so because of the behavior of others, then social limitations are imposed on the size of the population*" (his italics). Nowadays that should produce a chorus of "not necessarily" responses from ecologists, since the statement is true only if the surrendered reproductive output of the affected individuals would have exceeded the extra output gained by their oppressors. In the end, Berger dismisses this "central theme" as unproven since almost all events that could be interpreted as limiting the population are explicable in terms of resources rather than social interactions. However, competition between stallions for control of female bands induced some abortions, increasing interbirth intervals for some mares and leading to a 4 percent reduction in the number of foals born. This and a few combat-related deaths of adults were the only demonstrable contributions of social behavior to limitation of population size, he believed.

This pursuit of an unprovable "central theme" detracts little from an otherwise straightforward account of reproductive strategies in a wild equid. The book is full of new and intriguing ecological and behavioral insights. For example, familiarity rather than genealogy seems to determine a stallion's behavior toward colts and fillies growing up in his harem; individuals of either sex are apparently not recognized by the stallion after 18 months' separation. Stallion weight is relatively unimportant in fighting in this homomorphic species, but "experience" of aggression is positively correlated with high breeding status. Berger explodes the myths that female horses band for life (at least half will change bands) and that young females are ousted by stallions or other females.

It is pleasing that the publisher has placed the plates, figures, and tables close to the relevant positions in the text rather than clustering them. I personally like having a summary of major points at the end of each chapter but should warn readers that here there are some discrepancies between the text and these summaries. The level of production is very high and the writing very clear. Tests of ideas are carefully introduced and conclusions are usually conservatively drawn.

Berger ends his book with an appraisal of the conservation needs of the Great Basin Desert and its wildlife. He puts forward a well-argued case for a national park kept free of all exotic animals, cattle-raising land from which most horses would be removed, and at least three small preserves (free of cattle) for feral horses. This plan, if implemented, would nicely balance the wishes of those who condemn horses as competitors with cattle or destroyers of native pasture and those who want there still to be wild horses running free. I read this book while taking part in a survey of environmental damage by feral horses in arid central Australia (where there are over 200,000 feral horses). Like Berger, I admired the sight of free-running bands of wild horses; but unlike him I had to watch as surviving horses picked their way past their starved, dead companions to reach water, and I looked out across valleys stripped of grass by the horses, the soil trampled to dust and blowing or washing away. Preservation of feral horses has little place here, yet this book will have as much value for those who must decide how to manage this overstocked region as for those who wish to keep wild horses in the Great Basin. This is an excellent and thought-provoking book for wildlife biologists and behavioral ecologists alike.

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Cenozoic Paleoceanography

The Miocene Ocean. Paleoceanography and Biogeography. JAMES P. KENNETT, Ed. Geological Society of America, Boulder, CO, 1985. vi, 337 pp., illus., + microfiches and insert. $42. GSA Memoir 163.

The Miocene Epoch, 24 to 5 million years ago, marked the beginnings of the modern world, oceanographically, climatically, and biologically. Our biota owes its character to evolutionary events initiated in that epoch. *The Miocene Ocean* provides, in 14 papers full of data and interpretations, a detailed look at the oceanography and biogeography, at least for the pelagic realm, of this important time period for understanding the present.

Thirteen of the papers result from studies of Deep Sea Drilling Project cores collected by the D.V. *Glomar Challenger* throughout the world's oceans, excluding the Arctic. These studies are not loosely collected works but result from a coordinated group effort known as the Cenozoic Paleoceanography Project (CENOP), led by the book's editor, J. P. Kennett. After the initial introductory paper on sea-floor depth changes through the Neogene, the remaining papers all deal with the microfossil record in one respect or another. Age correlation between cores is essential to a study of this nature, and two papers establish the biostratigraphic criteria in detail. Several papers document the oxygen and carbon isotopic record preserved in the Miocene microfossils with the aim of interpreting the thermal history of the oceans. Biogeographic patterns in benthic and planktonic Foraminifera and Radiolaria are documented in six papers.

Of course, not all of the Miocene could be examined in detail, so CENOP chose to focus on three time slices: 22, 16, and 8 million years ago. These provide a changing picture of the Miocene, dominated chiefly by the development of a global latitudinal thermal gradient in the oceans. Along with this gradient came intensification of the