

BOOK REVIEWS

Hold this Land: A History of soil conservation in New Zealand. L. W. McCaskill. A. H. and A. W. Reed, Wellington. \$8.50.

In 1971 Lance McCaskill resigned from the North Canterbury Catchment Board and thereby formally ended his active association with soil conservation in New Zealand. He was one of the prime instigators of the movement in the 1930s and 1940s, the first University teacher of soil conservation, and the first director of Tussock Grasslands and Mountain Lands Institute. It is therefore fitting that the Association of Soil Conservators has persuaded him to write the story of soil conservation in this country.

There are 16 chapters in the book. The first five unfold a sequence from the early unease expressed by a few people at the exploitive pattern of land use in New Zealand, through the east coast floods of 1938 which finally brought home the fact that something had gone disastrously wrong, to the Soil Conservation and Rivers Control Act of 1941 and the eventual gazettement of Catchment Boards and appointment of soil conservators. Apart from three chapters dealing with control of burning and wild animals and the use of aeroplanes for topdressing, the remainder of the book is largely devoted to administrative aspects of soil conservation; a preoccupation that becomes understandable when it is realized that, at present, responsibility at the national level is shared among the National Water and Soil Conservation Authority, the Soil Conservation and Rivers Control Council, the Water Pollution Council and the Water Allocation Council. At the local level the Waikato Valley Authority operates under a different Act from the catchment boards and commissions. Historically, a picture emerges of damaging rivalry between the Ministry of Works and Department of Agriculture. Research has been fragmented with these two departments, Forest Service, DSIR, universities, Tussock Grasslands and Mountain Lands Institute and some of the catchment boards all having participated. The author is restrained in stating that "in spite of the variety of effort, out of the vast amount of uncoordinated and often uncompleted testing of plants had come little published material. . . . In too many trials, inadequate provision was made for supervision and recording. Support seemed to be forthcoming for initiating but rarely for completing projects; and it was nobody's job to see that the standards and netting used to fence the numerous plots were removed. They still litter the tussock grasslands from one end to the other." (p. 129).

To those who have heard McCaskill the orator—pungent, provocative and never dull—the style of the book is disappointing. Even his tilts at the Department of Agriculture as chief villain are quite subdued. While the success of soil conservation over the last 30 years is

undoubted, one might have expected a clearer account of the failures and major remaining problems. The reviewer finds the country's heavy dependence on phosphate fertilisers disturbing, since these are a non-renewable resource and, moreover, sooner or later may have adverse effects on quality of water.

The only serious misprint noted gives the area of the Bay of Plenty Catchment Commission as 369 square miles—presumably a zero is missing—but there are misspellings of personal names and incorrect initials. The scientific reader will find little critical information on scientific aspects of soil conservation. Nevertheless, to those advocating that ecological principles be applied to the use of our environment, the book is a salutary reminder that to put forward the scientific facts is only the beginning; he who pursues the battle must be able to persevere through the years of politicking, misunderstanding, opposition and administrative inertia and obtuseness.

P. Wardle

Energy flow through small mammal populations. Proceedings of I.B.P. meeting on secondary productivity in small mammal populations, Oxford, England, July 29-August 2, 1968. Editors: K. Petruszewicz, L. Ryszkowski. Warszawa 1969.

This book is a record of a meeting of specialists in the population dynamics and productivity of small mammals, held under the auspices of International Biological Programme at Oxford in 1968. It comprises a collection of thirty-one short papers grouped under four headings: (1) Standing crop evaluations and dynamics of numbers; (2) Food resources and bioenergetic parameters; (3) Reproduction and survival; (4) Energy flow and productivity estimations. As indicated by these headings, the title of the work is misleading in-so-far-as it gives no indication that about half the papers it contains deal almost entirely with demographic problems.

Being the work of so many authors, the book is not easily summarised. A few general points can be made. Overall, it is difficult to read. This is due in part to its highly specialised nature and the inevitable jargon, and in part to quaint—and sometimes bad—English, exacerbated by numerous mistakes. In some cases, where these involve numerical data in abstracts and summaries they are very misleading (e.g. pages 277 and 281). Despite this criticism, it certainly contains a wealth of information about small rodent populations, particularly those of principle aims of the I.B.P. programme is to improve communication between scientists of different nations through standardisation of techniques. This collection of

papers is an important and successful step in that direction. The review nature of some of the Russian contributions will be much appreciated by many western workers. The intensity of research work on small mammals in Poland is impressive, as is the number of these animals caught. For example, Wojciechowka boasts 31,001 captures of 10,921 individuals, and Pucek *et al.* captured over 10,000 individuals of *Clethrionomys glareolus* in their three year study. With the exception of a paper by Mezhzherin (U.S.S.R.) on the evolution of the shrews, I had no worries about the data back-up for the statistical models presented. However, a remark by Pucek that "the introduction of more complicated calculations without demonstrating the correctness of the assumptions [on which they are based] does not solve the problem" seemed relevant in places.

The list of species covered is formidable, including *Clethrionomys glareolus**, *C. rufocanus*, *C. rutilus*; *Microtus agrestis**, *M. arvalis**, *M. oeconomus**, *M. gregalis*, *M. middendorffii*, *M. julzaski*; *Apodemus agrarius**, *A. flavicollis**, *A. sylvaticus**; *Sorex* longirostris*, *S. araneus*, *S. minutus*; *Avicola terrestris**, *Peromyscus gossypinus*, *Ochrotomys brevicauda*, *Mus musculus (spicilegus)*, *Pitymys subterraneus*, *Sigmodon hispidus*, *Myocastor coypus*, *Lemmus sibiricus*, *Alticola lemminus*, *Alticola roylei*, and *Cricetulus migratorius*. Those marked * are dealt with in more than one paper, or at some length. As there is no index a review of the data presented by different authors for any one species would be laborious.

Part 1. Standing crop evaluations and dynamics of numbers:

Most of the papers in this section—the longest—deal critically with methods of estimating density. The "standard minimum method" is evaluated by various workers in different ecosystems, and tested against other techniques. This method was proposed as a standard technique by the I.B.P. working group on small mammals and employs a grid of 16 rows and lines of kill traps, each point on the grid being 15 m apart. The 256 points (covering 5.8 ha) are prebaited for five days with grain, then two kill traps are placed at each point and operated for five days. The population density is estimated from the decline in catch during the trapping period. Migration onto the grid, and "edge effect", are dealt with critically and an interesting marking technique, using coloured wool in the food supply, is described.

Annual fluctuations in rodent population numbers in agricultural systems are dealt with by Wojciechowska, who suggests that population explosions are preceded by excessive immigration into the area. In this study increase in numbers was most marked in agricultural fields, despite the fact that this was not the most favoured habitat in "normal" years. Hamar and Sutova-Hamar also deal with agro-systems, demonstrating that home ranges vary with density and type of crop, but animals generally occur in overlapping aggregations. The significance of this for

density estimation is considered. Emphasis throughout Part 1 is on the agronomic importance of accurate methods of estimating mice and vole densities. This is important for plant protection, the prediction of population outbursts and the evaluation of rodenticides.

Part 2. Food resources and bioenergetic parameters:

Trojan describes a model of the costs of maintenance of *Microtus arvalis*, including a consideration of the effects of reproduction on the energy budget. The strategy of energy storage is alluded to by Golley, who points out that energy in excess of that needed for population maintenance may be stored either as body fat (i.e. "quality" individuals), or may be channelled into more reproduction ("quantity"). Presumably, in populations subjected to high mortality risk, natural selection would tend to favour the latter strategem. Golley demonstrates that in *Sigmodon hispidus* energy storage is not correlated with size, age or sex but follows a seasonal pattern. In field populations of *Microtus agrestis*, according to Evans, fat storage is almost absent, so that any increase in energy use by the population must be associated with increased food intake.

Choice, digestibility and assimilation of herbage are covered for several species. *Microtus arvalis* will eat at least 15 of the 27 species in the meadow communities it inhabits, but despite its catholic tastes, only about 0.07 percent of the food available is eaten (Gebezynska). This figure may be unusually low, as several investigations reported in Part 4 give higher values.

Tahon deals with the agronomic significance of grazing by small mammals, stressing that the waste caused by them is not in direct proportion to the calories consumed. Even small depredations of certain plant parts may have a great effect on plant growth and economic yield, if not on ecological productivity. For example, the death of a pear tree results after only three percent of its biomass (10% of its root system) has been destroyed by *Avicola terrestris* scherman. This could result in a loss of 10 to 20 years of pear production, amounting to, say, 500 kg loss of economic yield for only two kilogram of consumed tissue. When account is taken of the additional problems of managing an orchard which, as a result of such attacks, is composed of uneven aged trees, the total economic effect of the damage is apparent. The ecological aspects of the destruction of tree seedlings in forest are also covered, and it is pointed out that the location of the destroyed seedlings, whether in the open or in shade, may be more important in forest regeneration than the absolute quantity eaten. The interactions between seed dispersal patterns, rodent niches and home ranges in forest ecosystems present many fascinating problems.

Part 3. Reproduction and Survival:

In this section, as in Part 1, there is considerable emphasis on methods, but some fascinating data are presented for *Clethrionomys glareolus* by Pucek *et al.*, and for *Apodemus agrarius* and several other species by

Svarc *et al.* The low life expectancy of the first species, generally 1.3-3.9 months depending on generation and habitat, suggests a reproductive strategy favouring quantity rather than quality. In *Apodemus*, different generations can almost be regarded as distinct "physiological races", with quite different life expectancies (Bashenina). Svarc *et al.* compare the population dynamics of this and thirteen other species inhabiting the Russian tundra, taiga and alpine geographical zones. A brief summary of work on the life history of the coypu in eastern England (Newson) demonstrates how the sexes can differ in life expectancy, females of this species living longer than males.

Part 4. Energy flow and productivity estimations:

This part provides data on ecosystem productivity and estimates of the proportion transmitted to the herbivorous rodents. Nothing approaching a complete ecosystem analysis is attempted however, and emphasis remains on the population level of organisation. Petruszewicz *et al.* give estimates of the roles of different generations in the productivity of *Clethrionomys glareolus*. Annual biomass production, as suggested by Svarc *et al.*, must be an important aspect of over-winter survival, particularly in severe climates. Response to predation is also important; Walkowa shows that in mice the main result of heavy exploitation is to increase the survival of very young individuals.

Drawing on many years of experience in rodent population ecology, Myllymaki points out some of the difficulties, frequently glossed over, in estimating population energy flows. The altered trappability of rodents as density changes, and estimation of primary production in a grazed system, are two such problems. During periods of peak numbers (2,115 voles/ha) in the *Microtus agrestis* populations studied by Myllymaki, 13.7 percent of the food supply available in July was consumed. This author suggests that summer food supply is a critical factor limiting winter survival in years of high density.

Figures given by other workers, despite misprints, generally indicate that small rodents consume less than two percent of the primary production in the ecosystems they inhabit, although it is stressed that not all this production is equally available to them. Grodzinski *et al.* conclude that even if small rodents in beech forest destroy twice as much as they consume, they still do not utilise more than 10 percent of their forest food supply.

The final three papers, dealing with the productivity and energy flow in rodent populations inhabiting agricultural areas, pine and beech forests respectively, make a valuable and fitting conclusion to the whole volume.

In summary, it is an interesting technical work which should by now have found its place on the shelves of all institutions and individuals interested in the ecology of small herbivorous mammals. Its wider appeal will be

limited by its specialised nature and poor presentation, although, with perseverance, it is found to contain much of interest to the more general reader, even a botanist!

J. Ogden

Water (with reference to Australia and New Zealand).
Jane M. Soons. Pp. 56 + index. Reed Education
1972. \$1.75.

This book is intended for secondary school students and geography teachers, it would also be suitable for teachers of social studies. It explains the climatic controls affecting water supply and the increasing problem of water availability. Subsequent chapters deal with provision of water for agricultural, urban, power and recreation uses and the importance of water quality. The last chapter on multiple use of water stresses the need for co-operation and legislation if water resources are "to bring maximum benefit to the greatest number of citizens" and an awareness of continuing problems as the population grows.

The text is clear and concise and well illustrated by photographs, maps and diagrams. In addition, there are useful exercises compiled by M. P. O'Malley and a comprehensive list of books for more detailed reading.

The figure quoted on p. 11 for depth of rainfall on the earth's surface as 25 mm per year appears incorrect, H. L. Penman (*Scientific American*, September 1970) quotes a figure nearer to 100 cm.

The book's emphasis on both physical and cultural aspects of water supply is very relevant to the Senior Geography syllabus with its sociological bias.

J. A. Foggo

Biology and the future of man. Philip Handler (Ed.).
Oxford University Press, New York. NZ\$6.45.

The vast majority of readers are normally drawn to a book through its title and this one, **Biology and the future of man**, should, in this modern day and age, be an adequate attractant for scientists and laymen alike.

Interest having been aroused in the book, the first feature examined will probably be the "Contents" and in this case, unusually detailed circumscriptions for each of the twenty chapters are given. One is not surprised to discover that approximately the first half of the book is devoted to what appears to be a standard modern exposition of biology—from molecular biology through cell and organismic biology to ecology and thence heredity and evolution. Then comes a minor but perhaps refreshing surprise, "Digital computers and the life sciences". Following that, 300 pages (five chapters) are apparently devoted to various modern applications of

biology while the last chapter proves to comprise 38 pages headed, a little surprisingly, "Biology and the future of man"—the title of the book.

Striving to evaluate further the browser may next turn to the index, and here there may be a major surprise; because of the two copies available to the reviewer one has not got an index—an extraordinary and irksome shortcoming.

Moving to the "Preface" it almost immediately becomes clear that many erudite committees, working at the instigation of the National Academy of Sciences, have been involved in the compilation of the book. The indication is clearly that the various panels were encouraged to provide "a pithy summary of the status of the specific subfield", to pose the questions of the present day and to provide an indication of "how these problems are being attacked." It is stated that this is *not* a textbook—"Much—indeed most—of the detailed knowledge ('facts') will be missing."

The early chapters are nevertheless reasonably formal, factual and certainly up to the minute (1969) although, as is almost invariably the case, it is not difficult to find points with which to take minor issue. Botanists for example might object to the drawing of "A typical cell" which as acknowledged is from Keeton's "Biological Science" where it is more correctly captioned "A typical animal cell." A critical New Zealander might similarly object to the bald unqualified statement that "the kea changed from an insect eater to a predator of sheep when sheep were introduced."

It may well be that the allocation of space to each of the various segments of Biology will not meet with universal satisfaction. Particularly one may question the 110 pages which are expended on "Nervous system" and "Behaviour", especially when in addition to the subsection "The structure of the neuron" in the nervous system chapter, there is a subsection headed "Neurogenesis" in a different chapter. "Comparative studies of the sense organs" appears in a different chapter again and there is a further account plus an illustration of ear anatomy in yet another chapter, the one on "Digital computers" no less.

There may too be objections to the mental gymnastics required to cope with, for example, "Fertilization and implantation", "Neurogenesis" and "Photoperiodic control of flowering" in consecutive subsections of a chapter, but quibbling aside the overall impression of this first half of the book must be that of a genuinely new, modern, vital subject that is very much on the move. Ultra moderns may even welcome the total absence of xylem and phloem, of tibiae and fibulae, of *Hormosira* and *Amoeba* and of a thousand and one "facts" of classical biology. The genuinely utilitarian approach, the repeated quest for causes, the many explanations at molecular level and the provocative questions left in the mind of the reader convey a sense of vitality, even urgency.

This same approach continues through the second half of the book which could perhaps be aptly described as applied human biology. The committee effects are still present, biological snippets twice or thrice stated or not mentioned at all; but, if not exactly encyclopedic, it is solidly informative. It is perhaps noteworthy that to the end of Chapter 19 "The future of man" appears only to a minor extent and even Chapter 20, which is devoted to the more or less immediate future on two fronts (population control and medical technology), is not as broad as its title suggests.

Because it has the greater chance of being unclouded and is therefore one likely to remain in the readers mind, the last statement in each paragraph, in each chapter, in each book, is the one about which writers are often advised to be particularly careful. Here at the end of the book the reader is finally presented with ". . . *Homo sapiens* has finally risen to responsibility." As the mind of the present reviewer flicks across Vietnam, Apartheid, Organophosphates, Bangladesh, Mururoa, Watergate, Amphetamines . . . , the belief comes that the author is either naive, a sublime optimist or being deliberately provocative, yet somehow the latter would be very much out of character with the rest of the book.

The title of the book is, then, something of a misnomer, because there is not very much of the informed crystal ball gazing that might be expected. Yet all pure and applied biologists, most of whom have had their head in some or other small corner since their graduation—teaching, research, professional practice, etc.—should find this a readable, authoritative potted version of 1970 biology, its implications and applications. And perhaps the book would go further than any other towards finally persuading physical scientists and laymen alike, that Biology is a great deal more than just slightly academic nature study.

J. P. Skipworth

Population, Resources, Environment: Issues in human ecology. Paul R. Ehrlich and Anne H. Ehrlich. W. H. Freeman, San Francisco. Second Edition, 1972. Price US\$9.50.

There are many popular books on this subject, but **Population, Resources, Environment** stands out for the following reasons: it is comprehensive, drawing on a wide variety of sources and providing cogent arguments countering contrary view-points, and it is a good text book, being clearly written, well researched and documented, factual, useful for the study of questions related to its title, and suitable for both the serious student and the general reader.

The Ehrlichs' major conclusions are that: the world is grossly overpopulated; the rate of growth and number of people hinder the solving of human problems; the world cannot produce much more food, and attempts at a

technological solution accelerate environmental deterioration; and if man doesn't rapidly achieve a "birthrate solution", a "deathrate solution" will be imposed upon him, through war, famine and disease.

The Ehrlichs vividly describe *The Crisis* in the first few lines of their excellent and provocative book: "The explosive growth of the human population is the most significant terrestrial event of the past million millenia. Three and one-half billion people now inhabit the earth, and every year this number increases by 70 million". Furthermore, we felt that the Ehrlichs' analogy regarding the behaviour of the world fishing industry: ". . . one might conclude that if they were to go into the chicken-farming business they would plan to eat up all the feed, all the eggs, all the chicks, and all the chickens simultaneously, while burning down the henhouses to keep themselves warm" . . . applies equally well to man's present attitude to *all* resources. The depressing prognosis is that we cannot avoid a crisis from which little or none of our society will survive.

Clearly no technological panacea exists for the complex problems of the population-resources-environment crisis, but technology, properly applied to such problems as pollution abatement, communications, and fertility control can provide massive assistance. The Ehrlichs insist that the real solutions involve dramatic and rapid changes in human *attitudes*, especially those relating to reproductive behaviour, economic growth, technology, the environment and resolutions of human conflict.

Although the Ehrlichs show that attitudes (in the U.S.A.) to family size and to the importance of limiting population have changed remarkably they regret that growth-rate has changed little in the last few years. However, after this edition was published, the official U.S. estimate of birth-rate for 1972 showed an all-time low of 15.2 per thousand—a glimmer of hope?

People familiar with the first edition of this book (reviewed by J. R. Bray for *Proceedings of The New Zealand Ecological Society* in 1971) will be interested to compare this edition. Although a third bigger and with twice as

many references, the book is basically the same. It has been completely revised, nearly every page has some alteration, addition or updating in text, tables or figures. Several sections have been added.

These additions include such diverse subjects as: a description of age-specific population analysis and of Z.P.G.; a piece on forest resources; a new perspective on the way that technological agriculture converts fossil fuel to food; heavy metal pollution; the psychology of violence in modern cities; laterization of tropical soils; ecocide in Indochina; prostaglandins; Malthus; substantial additions to the chapter on social, political and economic change; development, exploitation and aid; manpower explosion in the underdeveloped countries; de-development of developed countries; and conventional arms.

The first edition was criticised for some minor bias toward U.S. rather than communist bloc attitudes and some changes have been made in this edition. However, the Ehrlichs do point out that a "major cause of humanity's current plight lies not in the economic differences between the two superpowers but in the economic attitudes that they have in common".

The last part of the book, dealing with social, political and economic change and with the international scene focuses largely on the U.S.A. Here, there is a danger that readers in small countries, like New Zealand, will identify the problem with large overdeveloped countries and conclude that nothing can be done at home. In fact, the problems and suggested solutions in the Ehrlichs' book apply to all people, whether they be in large, small, affluent or poor countries.

The Ehrlichs recommend "a positive program", and state that: "Although our conclusions must seem rather pessimistic, we wish to emphasise our belief that the problems can be solved. Whether they *will* be solved is another question." This book compels one to conclude that positive action is essential.

D. G. Dawson and P. R. Wilson