Our civilization is founded on mathematics: why do so many of our citizens have no knowledge whatsoever of what that subject involves? *Journey Through Genius* is really aimed at liberal arts students, of a kind that can be found throughout the United States, but which are less common on the other side of the Atlantic. But the book can be recommended to all lively-minded people, whether their interests lie mainly in arts or in science, as a vital cultural experience. □

Ian Stewart is in the Mathematics Institute, University of Warwick, Coventry CV4 7AL, UK.

Avian analyses

Robert M. May

Population Trends in British Breeding Birds. By John Marchant, Robert Hudson, Steve Carter and Phil Whittington. *Nature Conservancy Council/British Trust for Ornithology*: 1990. Pp. 300. Pbk £12.

POPULATION biologists are often asked what it is that determines the abundance of a particular plant or animal population, and whether the population is increasing or decreasing in response to recent changes. One of the reasons why such apparently simple questions are so hard to answer is that we lack long runs of consistently gathered data on abundances. This is because it is hard to organize (and find money for) the large amount of field work needed to assess population abundance, and even harder to sustain the enterprise over the long sweeps of time — decades or more — that are required for species that take a year or more to attain sexual maturity.

In Britain in the early 1960s, two major and widespread environmental changes became increasingly evident, caused by chemical pesticides and by 'intensification' of agriculture (of which hedgerow removal is the most attention-getting element, but by no means the only one). What are the long-term effects on wildlife? Motivated by this question, and by the fact that birds are more conspicuous than most other animals, the British Trust for Ornithology initiated a year-by-year census of common birds in Britain. Commissioned by the Nature Conservancy Council, this project began with a pilot study in 1961, and started in earnest on farmland in 1962 and in woodland in 1964. This book records the results of the first 27 years of this study.

The Trust solved the massive labour problem of undertaking such a project by making imaginative and disciplined use of its large cadres of amateur members. In the opening chapters of the book, the authors detail how the data were gathered and compiled, allowing for the inevitable

Whitethroat dynamics — showing a marked decline in the late 1960s due to a drought in the Sahel. (Graph taken from *Population Trends in British Breeding Birds*; photo from Ardea.)

problems caused by workers and sampled plots changing somewhat from year to year, and by sampling efficiency varying from person to person. The Trust chose to focus on counting the territories of individual birds during the breeding season, because the constraints of egg-laying means birds are relatively sedentary then. In all, about 200 to 300 local regions or 'plots' were censused each year, with more than 40,000 bird territories mapped in a typical season.

The bulk of the book contains the resulting data, for each of 105 species. Each entry begins with a telegraphic summary of the present population trend (Lapwing: "marked downward trend in the south; probably downward overall", for example) and estimated total size of the breeding population, followed by a graph of year-by-year population change together with a narrative account of the main findings, and concluding with comments on regional variations and trends elsewhere in Europe. Seabirds are excluded, as are those rarities where the nesting population is fewer than 50 pairs. Briefer accounts are provided for an additional 59 species for which the Trust has no census data, so that the book discusses population trends for all terrestrial and freshwater British birds with current breeding populations of more than 50 pairs.

The book is a mine of information. At the British Association meeting in Swansea this year, Peter Lack (of the Trust) used the data it contains to shed light on population trends among the subset of 55 farmland species since the advent of 'intensification'. A typical lowland farm in southern England is likely to contain 30 to 40 of these species, with more than half the individuals in the most abundant five or six species. Broadly speaking, Lack

finds 12 of the 55 species to have increased, 19 to have been relatively unaffected, while 24 have declined. The main decreases, by a factor of around three, are seen in seed eaters (probably because increased herbicide use means fewer of their seeds) and in small hedge species (almost surely owing to destruction or thinning of hedges). Conversely, some larger hedge-and-woodlot species — crow, magpie, wood pigeon — are increasing, probably because they are less persecuted than of yore.

Other changes can be associated with natural events, not least the harsh winter of 1962–63 (which got many of these census-strings off to a low start). Perhaps the most striking example is found among those migratory species which over-winter in the Sahel: sand martin, redstart, sedge warbler, whitethroat and others. These have shown marked decline from the late 1960s onwards, caused by the Sahel drought.

Some changes remain mysterious. As Mike Pienkowski of the Nature Conservancy Council asks in the forward, "why are nuthatches and blackcaps increasing while dunnocks, marsh tits and tree sparrows decrease? Are the decreases in turtle doves, spotted flycatchers and song thrushes linked respectively to usages of herbicides, insecticides and molluscicides?"

This book is a landmark. In a time of growing concern about the biological consequences of climate change, it serves as a guide for long-term studies of other groups of animals and plants, studies we should be starting now. □

Robert M. May is Royal Society Research Professor at Imperial College London and in the Department of Zoology, University of Oxford, South Parks Road, Oxford OX1 3PS, UK.