

- Paradise Lost? The Ecological Economics of Biodiversity.* By BARBIER (EDWARD B.), BURGESS (JOANNE C.) and FOLKE (CARL). (London: Earthscan Publications, 1994. Pp. xvi + 267 £14.95 paperback. ISBN 1 85383 181 6.)
- The Economic Value of Biodiversity.* By PEARCE (DAVID) and MORAN (DOMINIC). (London: Earthscan Publications, 1994. Pp. viii + 172 £32.50 hardback, £12.95 paperback. ISBN 1 85383 225 1, 1 85383 195 6.)
- The International Regulation of Extinction.* By SWANSON (TIMOTHY M.). (London and Basingstoke: Macmillan, 1994. Pp. xiv + 289. £40.00 hardback. ISBN 0 333 57848 1.)

As all the principal authors have collaborated to publish similar work in recent years, the appearance of three books concerning economic aspects of declining biodiversity is far from indicative of new ideas burgeoning. However, the Rio Conference on the Environment and the resulting Convention on Biological Diversity stimulated new research initiatives, and Barbier *et al.* preview the results from one of these. Also, the current offerings span the range of approaches economists have developed to explain environmental problems: Pearce and Moran environmental economics, Swanson renewable resource models, and Barbier *et al.* ecological economics.

The least interesting of the three is Pearce's collaboration with Moran, which follows the familiar line of his books with other associates. Half the work is a fairly general review of methods for achieving, and estimates of, non-market values, much of which has been covered better elsewhere. A few interesting tables summarise more specific information but the text ignores them. The concentration on individual species diverts attention from problems in valuing ecosystem and genetic diversity. Meanwhile, space is used for the obliquely related issue of carbon sequestration by trees.

Uncritically accepting a global cost-benefit approach, where 'the objective decision criteria becomes the extra cost of an increment to the probability of survival' (page 12), leads Pearce and Moran to neglect or negate several important issues. First, biodiversity 'embraces the whole of "Life on Earth"' (page 1) while the number of species is unknown 'even to the nearest order of magnitude' (page 4); thus the rate of biodiversity loss is unknown but required to calculate successful intervention (pages 10-12). Second, the philosophy of 'maximise diversity per dollar' (page 12) is recognised to neglect intrinsic value (page 22). Intrinsic value is relevant to conservation decisions but unhelpful when funds are scarce (page 1); this spurious argument is presumably the justification for bypassing the subject. Third, willingness to accept compensation is the appropriate welfare measure of biodiversity losses, but is rejected as a format unfamiliar to the general public (page 54). Divergences

between willingness to accept and to pay go unmentioned despite coverage of other bias problems in contingent valuation (pages 50–64). Fourth, the basis for thresholds remains unclear. For example, 'population should be limited' (page 36), but is this on cost-benefit or some other grounds?

Barbier *et al.* provide a much better introduction to the subject and summarise research from the Beijer Institute's Biodiversity Programme. Numerous authors contributed to the Programme, including Pearce and Swanson. The irrelevant quasi-religious title might be ignored, along with the suggested fall from grace of Christians, but for the conclusion (page 228) that in ten years time, by following the policies prescribed, paradise could be regained! Despite this and some textual repetition, the coverage of economic and ecological perspectives, case studies (forestry, wetlands, marine ecosystems, and rangelands), and policy issues makes this an ideal teaching aid.

Thresholds are at the forefront here, with advocacy of the safe minimum standard approach, based upon the importance of ecological functioning and resilience. Bishop (1993) is mentioned in this context, although the full reference is missing. Biodiversity loss is seen as an issue of uncertainty where humans remove parts of the life support system without knowledge as to their necessity. Thus, economists must recognise that life-insurance-species preserve ecosystem functions as much as keystone-species (page 29).

This message and other points are clearest in the overview but elsewhere the presentation can be ambiguous. For example, on the required sequencing of policy steps to prevent biodiversity losses (pages 187–90) the excessive use of 'may be' is followed by the word 'may' occurring seven times in two paragraphs (page 204). Several explanations are possible including genuine indecision, the opinions of numerous contributors being irreconcilable, or finding ecological and economic values incompatible. The divergence of economic and ecological values is a serious problem arising elsewhere in the book. For example, the forestry case study recognises resilience as outside economic valuation (page 100) but calls for sustainable forest management on the basis of financial rates of return (page 102). Maintenance of ecological thresholds are also likely to conflict with the prescribed direction of national and regional biodiversity strategies using cost-benefit analysis.

The lack of attention to, and ambivalence over, non-market valuation is surprising. Option, existence, and bequest values are relegated to footnotes as are problems in contingent valuation where the sole reference is to a discussion paper (pages 103–4). Yet, non-market valuation is recommended as a central policy tool in the case studies on forestry (pages 114–15), wetlands (page 131), and marine ecosystems (page 148). How this approach fits with the earlier call (page 18) for 'fundamental changes in our economic, environmental, and social relationships' is unclear. An apparent discord can also be heard in the marine study's mentioning of a pluralistic approach and the rangelands study's failure to recommend non-market valuation.

Environmental values are also relevant to Swanson's work where the 'trade-off' between the benefits and opportunity costs of conversion, constitutes a fundamental problem of biodiversity management' (page 7). A key implicit

assumption is the existence of a 'marginal value of biologically diverse resources' (pages 34, 161). However, the diagrammatic explanation (strikingly similar to an optimal pollution model) misleadingly simplifies dynamic global evolution, happening over millennia, to a static supply and demand model. There is no definition or explanation of 'value'. The attribution by global humanity of a present value to biodiversity losses is, we are told, a functional notion. Hence, a change in the evolutionary path of the planet is equated to a marginal change in the supply of a market good. That the choice affects who and how many people exist, raising inherently moral issues, is of no concern.

Swanson's analysis is driven by the right of all human societies to pursue 'development'. However, 'development' is never defined. Despite this, proponents of a 'steady state', such as Daly, are regaled as environmental imperialists (pages 8-9). Meanwhile, Swanson advocates both optimal control models which lead to steady-states and intervention in less developed countries, e.g. restricting exports to unworked natural resources (page 213). Unfortunately, Swanson's development paths cannot leave areas 'unmanaged' or allow for development without materialism, e.g. culturally and spiritually. 'Use it or lose it' is the motto.

Swanson describes the dominant approach to economic development as 'conversion' of diversity, e.g. monoculture farming. Less developed economies are characterised as having the 'asset' biodiversity which they want to convert, while the developed North wants it preserved. This simplifies the issue to two parties and an externality which allows the application of neoclassical theory and optimal control models. Biodiversity is then an input to a biological production function giving outputs of information and insurance (resilience). The mathematics is difficult to separate from the text, despite a contrary claim (page xiii), and textual repetition is excessive rather than helpful, including the duplication of a figure.

The critical development of Clark's fisheries model is especially interesting and innovative, but does restrict the concept of biodiversity. This single species model neglects ecosystem and genetic diversity, and Swanson's main example is the African elephant (reminiscent of a book coauthored with Barbier, Burgess, and Pearce). Focusing on key species preservation assumes other species will be preserved by default, or vague surplus amounts paid on consumptive uses of key species will protect others (page 204).

An underlying difficulty with Swanson's approach is the necessity to exclude aspects which fail to conform to the methodology and models. For example, an identity is drawn between intellectual property rights for biodiversity conversion and rights over any informational investment (e.g. computer software). The reader is warned that drawing a distinction would be illogical (page 231). No difference here between revealing non-anthropocentric, pre-existing information (discovery), and humans creating information (invention). Thus, all logical people believe, rights over the genetic code of humanity are no different from ownership of Space Invaders or Game Boy. More generally, extinction as a process of optimal human choice rejects the type of human ignorance which surrounded the introduction of foreign species, the main cause

of species extinction in the last 200 years. Swanson also neglects his own words that 'The biological process is random and evolutionary, not deterministic, and to the extent that it can be understood, it is too complex to predict' (page 171).

Perhaps surprisingly, given the different perspectives, all three books point towards valuation as a central issue in biodiversity economics. Yet limits to non-market valuation in the context of biodiversity are given inadequate analysis. Pearce and Moran along with Swanson avoid many valuation issues, while Barbier *et al.* never address the value conflicts they raise. The potential of ecological economics is freedom from the obsession with squeezing complex global environmental problems into simplistic pre-existing models and methodologies.

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