

Is a grumpy ecologist an oxymoron?

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ABSTRACT

This paper examines the widespread phenomenon of grumpiness among Australia's ecologists and members of related disciplines. It argues that their disillusionment is a result of consistent first-hand experience of irretrievable, but preventable, losses of species and ecosystems. It also contends that the lessons of their professional experience continue to go unheeded by the broader community, and that this increases their feeling of disillusionment. The paper examines the Australian Bureau of Statistics' report *Measures of Australia's Progress* in the context of the threats facing Australian fauna and the existing state of public knowledge concerning these threats. It then analyses the results of the *Who Cares About the Environment?* report, conducted by the Office of Environment and Heritage, New South Wales (2012). It concludes that these reports illustrate a disturbing lack of knowledge and awareness of our fauna among the Australian public, as well as the threats facing biodiversity.

Key words: Australian Bureau of Statistics; Australian Academy of Science; Australia's population; ecosystem loss; IUCN; *Sydney Morning Herald*; threatened species; wellbeing index; *Who Cares About the Environment?*

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Nature under a cloud

In the lead-up to the 2012 Royal Zoological Society of New South Wales (NSW) forum on 'Grumpy scientists: the ecological conscience of a nation', a headline in the *Sydney Morning Herald* of 13-14 October 2012 read: "Better lives for people but nature under a cloud." Such a headline is guaranteed to make an ecologist grumpy, or – for those who are already grumpy – just that little bit grumpier. Each year, journalist Mark Moncrieff explained, the Australian Bureau of Statistics (ABS) releases the *Measures of Australia's Progress*. It is the Bureau's attempt, Moncrieff wrote, to address the question: "Is life in Australia getting better?" The opening line of the article captures the picture: "Fitter, smarter, but less productive and living in a less pristine environment." The article concluded with a grim statement: "On another measure of diversity - biodiversity - the nation is diminished. The number of threatened animal species has grown from 353 in 2001 to 439. For plants, the number has increased nearly 20% to 1344" (Moncrieff 2012).

The idea that a nation can knowingly let itself be diminished and accept living in an environment that is becoming less pristine is appalling. It is a tragic statement given that we know the nation's environmental problems, know how to monitor them and measure their impact, and can identify ways to resolve them (e.g., Ehrlich and Ehrlich 1970; Recher *et al.* 1986; Bradstock *et al.* 1995; Millennium Ecosystem Assessment 2005). We are consuming our future to live above our means. This ought to make far more people grumpy than just a few bad-tempered ecologists. As Dick Smith commented in response to an earlier ABS report, "What I find fascinating is that if I tried to sell the Treasurer a perpetual motion machine, he wouldn't buy it." Yet, he continued, everyone is addicted to "perpetual growth" (Smith 2011).

While many aspects of life in Australia have improved, what brings us to this forum is the knowledge that Australia's biodiversity continues to diminish. Australia shares this problem with the rest of the world, but we live in Australia and have a special responsibility to protect its flora and fauna for the future. As ecologists, naturalists, zoologists, conservation biologists, and concerned citizens, we cannot help but reflect with grief on the indices of 'progress'. For us, the ABS report attests not only to 'the good life' of productive, well-paid work in the company of better educated and healthier individuals, but to our own failure to conserve Australia's biodiversity. In short: if you feel grumpy about how the 'good life' is measured, you are in good company.

Is a grumpy ecologist an oxymoron?!

From an ecological perspective, it is nonsensical to file the Bureau's findings under the title 'progress', irrespective of positive social and economic change, while our ecosystems degrade and much of our fauna slides ever closer to extinction. The societal model which prioritises economic growth and material wellbeing at the expense of all other concerns necessarily relegates the natural environment to the background, despite significant long-term costs which are becoming more obvious each day. In view of these problems, it is little wonder that ecologists are grumpy. Although an ill-tempered and disillusioned ecologist *should* be an oxymoron, in that an ecologist deeply appreciates how the living world works, they are an all-too-familiar figure on the frontlines of conservation.

From an ecological point of view, it is economic madness to look only at the credit column at the expense of the

1. As defined by the Macquarie Dictionary (3rd edition), an oxymoron denotes "a figure of speech by which a locution produces an effect by a seeming self-contradiction". (Locution is defined as "a ... style of speech or verbal expression, phraseology.")

debit column. Gross national product, rising household income, and improvements in education and healthcare all too easily obscure environmental degradation. It is impossible to see an extinct species; it is even harder to estimate its loss. In economic terms, the loss of fauna and the degradation of ecosystems, from the Great Barrier Reef to vast tracts of the arid and semi-arid lands, do not appear on the national balance sheet. An increase in the number of nationally threatened species, and thereby in the loss of fauna nationwide, is not included in the national accounts – from which the State of the Environment reports (Commonwealth 2011) sit alone. Nor does the Reserve Bank alter interest rates in response to a deteriorating environment. Here, we could learn from the British Government's recent establishment of a Natural Capital Committee designed to “ensure that Government has a better informed understanding of the value of Natural Capital”, and to “influence the economic policy of the UK for the good of the natural environment” (Natural Capital Committee 2013a). The Committee has recently published its first report, which aims to develop a framework for the valuation of national natural assets (2013b).

In view of the bleak picture in Australia, one would be forgiven for assuming that the environment and the economy exist in separate spheres; indeed, this is often how they are treated in practice. This is familiar to all those who view the broad sweep of economic decision-making from the outside. Biodiversity is only one of the factors which go unexamined in this process. The costs of many changes in people's lives are hard to estimate, particularly the cost of an unrelenting expulsion of fauna from areas of population expansion. If no provision has been made to retain diversity and natural habitat, the landscape looks quite monotonous to the human eye. Although such issues as these are registered by the media, they are not mainstream concerns. Ecology is one of the tools at our disposal for interpreting and assessing impacts, proposing remedies, and examining the consequences of human behaviour as it affects an ecosystem. However, what we have seen with the climate change debate is that scientists are not simply ignored, but opposed, as was evident in previous RZS forums (Banks *et al.* 2012; Lunney & Hutchings 2012). We have the analytical tools and the individuals with the relevant skills, such as ecologists, to place a value on the natural environment and its losses in the same manner as valuations are placed on the costs and benefits of industry, but there is little will to pit their research and expertise against the immense material gains we derive from economic growth. The idea that the two are antagonistic should be well past, but decision-makers have different values. Thus, when the ABS issues its next report we are unlikely to read about an enhanced environment, and a stronger level of biodiversity.

The reason for the grumpy ecologist syndrome is clear: ecologists' vision of an Australia where ‘the good life’ extends to its fauna, where Australians give priority to the conservation of their nation's diverse ecosystems, seems ever further from being realised. We must sustain our efforts and ensure that Australia's diminished biodiversity receives the public visibility it requires to garner support

to reverse the decline. As part of my work as a research scientist in a government agency with responsibility for conserving and managing the fauna of NSW, I meet many people who make small, but positive, contributions to wildlife conservation. They may be fellow staff members, wildlife rehabilitators, members of conservation groups and professional societies, those who work in local, state or the Commonwealth government organisations, farmers, contract ecologists, or university staff. Their collective voice is powerful; in fact, it is all we have going to conserve our wildlife. However, we also need high profile ecologists to speak out (Lindenmayer 2007; Kingsford 2013; Recher 2013). Their messages are a rallying call to encourage others to support the cessation of the ever-increasing loss of native habitat and its dependent wildlife. The voices supporting economic progress are the loudest, but when economic progress is at the expense of our natural areas, without real effort at rehabilitation or genuine offsets, then we all lose in the long run.

The question of what constitutes the ‘long run’ is a topic for debate. The size of the gap between short-term development costs and long-term impacts can be immense. When we examine the issues from an evolutionary perspective, the time frame shifts from years to millennia, with millennia being a short period for evolution, but an unimaginable period over which to assess impact (Lunney *et al.* 1997). The ‘weasel word’ here is “discount rate”, which means that the further away the impact, the more we can discount it. When one places a number on that rate, issues of 1000 years do not figure at all. In fact, most decision-makers with a responsibility to the environment do not seem to conceive of the end of this century, despite the fact that a baby born in Australia today has at least a one-in-three chance of living to 100 (Richards 2013). As a society, we need to revise our system of values, incorporate the long-term ecological future into economic calculations, and stop prioritising population expansion and economic development at the cost of fewer patches of native vegetation, fresh air and clean water, and diminished biodiversity.

A century from now appears distant; yet, for wildlife, it is a short time. Some sectors of our community have committed to preventing damage to our faunal habitats by supporting the dedication of National Parks, joining conservation groups, and planting native plants in their gardens. However, the impact of these actions is dwarfed by the increase in the human population and the premium placed on material prosperity at the expense of ecological values (Ehrlich 2013). We need to raise the profile of our fauna so it constitutes an integral part of the debate concerning our choices in developing a more ecologically-sound future.

With this project in mind, the reservation of more protected natural areas should be one of our top priorities. Since the passage of the *Fauna Protection Act* (1948), Australia has been a world leader in dedicating faunal reserves for habitat protection and research, and national parks for nature conservation of large tracts of relatively undisturbed land. The heritage significance of protected areas and their capacity to retain biodiversity and promote the

protection of native fauna are internationally recognised. As the International Union for Conservation of Nature (IUCN) states: “Protected areas are widely regarded as one of the most successful measures implemented for the conservation of biodiversity, drawing upon traditional and community-based approaches, governance regimes, scientific and traditional knowledge and contemporary practices of governments and conservation agencies” (IUCN 2012). As a member of the IUCN’s World Commission on Protected Areas (WCPA), I concur with this view.² While the headlines in 2013 focus on the issue of recreational hunting in national parks, we need to keep our primary focus on the long-term value, measured in millennia, for protected areas. Selecting, dedicating and managing these areas comprise a suite of related disciplines, and their management is largely a function of government, especially as regards the question of longevity. However, private enterprise also has a role, be it individuals protecting or restoring native areas, or groups, such as Australian Wildlife Conservancy sanctuaries.

Although there are some who challenge the value of National Parks and Nature Reserves, in my view they miss a crucial dimension of their significance – the temporal dimension. Without placing Australia’s national parks in historical perspective, we cannot appreciate their value. Australia’s first park – the Royal National Park – was dedicated in 1879, and it has stood the test of time as an area of natural bush that people appreciate. It now serves as a standard for the conservation of natural areas, although getting the balance right between recreation, and other uses, and natural area management has been a recurrent issue for the managers of Royal National Park almost since its dedication 134 years ago. Now that Sydney has undergone extensive population expansion, it stands as an urban park of great faunal significance (Schulz and Ransom 2010). While it is essential to recognise that Australia’s parks and reserves, particularly those located near urban areas, have been degraded with resulting losses of natural values, this is no reason to challenge their value altogether. Indeed, this not only reflects their history of use, but the increasing number of visitors they receive. In turn, this illustrates the value that these protected areas hold for local citizens and tourists alike. We will return to this issue, but for now let us examine the ABS statistics in the context of wellbeing.

The Wellbeing index

In a recent edition of the *Sydney Morning Herald*, the editorial headline read: “We’re doing so well yet we keep whinging” (SMH 2013). The opening line was intriguing: “The father of measuring wellbeing, Nobel Laureate Amartya Sen, saw beyond mere economics into what freedoms empowered people to make choices in the pursuit of a happy life.” The editorial expressed the view that, “as the wellbeing index for 2012 shows, our nation is doing very well, thank you very much.” “Yet”, the editorial noted, “many of us keep whinging about the

cost of living, taxes and the latest scandal.” It questioned the origins of these “elements of darkness in our national psyche”, arguing that “Sen’s philosophy” provided many clues. His philosophy distinguishes between ‘wellbeing’, considered a personal achievement, and ‘advantage’, or the real opportunities a person has, especially compared with others. The editorial reported that Sen made clear in his book *Commodities and capabilities* (Sen 1999) that “It is possible for a person to have genuine advantage(s) and still to muffle them, or to sacrifice one’s own wellbeing for other goals, and not to make full use of one’s freedom to achieve a high level of wellbeing.” The editorial noted the economic advantages that Australians enjoy, but concluded that we have hampered our freedom to choose by focusing on “other policy goals at the expense of one that is crucial to collective happiness” (SMH 2013). The editorial contended that this overlooked goal was health, specifically obesity and mental health. There is no argument that these are pressing issues, but the editorial omitted to mention our failure to prioritise another policy goal that is crucial to our collective happiness – the environment. Let’s turn to some details of the lost chances to conserve our environment as provided by the ABS.

Progress and trade-offs

As the ABS explains, there are trade-offs for progress. For zoologists, this is most acutely realised as we witness the loss of fauna. It might be pointed out that although threatened species lists are a valuable means of registering losses, they are reactive and not pro-active. A species appears on the list only after it is in a parlous state. In addition, there is a high threshold for entry onto the list, meaning that the loss and degradation of habitats, the shrinkage and fragmentation of wildlife populations, and the increased risk for species not yet on the list is high and, for an ecologist, alarming.

One can juxtapose many related factors when measuring progress. I have selected just one – population growth – because of the inescapable impact that population expansion exerts on our environment, the natural landscape, and the space for wildlife in a growth economy. The media discussions on the issue of population are narrowly focused on immediate political issues, such as refugees, illegal immigrants, and detention centres, but there is no discussion of the environmental dimensions of population growth.

Consider the following figures, taken from the ABS report, in relation to their environmental impact. At June 2011, Australia’s resident population was estimated at 22.3 million people, an increase of approximately 2.9 million since 2001. Between 2001 and 2006, natural increase and net overseas migration contributed similar numbers to the population. However, since 2007, net overseas migration has been the main driver of Australia’s population increase, reaching its highest level of the decade in 2009 (299,800 persons) before falling to 170,300 in 2011. While the

2. For a different perspective, see Recher (2013).

population's natural increase has grown over the past decade, partly due to a decreased death rate and increased birth rate, its contribution to Australia's population was comparatively lower (rising from 141,700 in 2007 to 150,500 in 2011).

The opening paragraph of the preface to the publication of the Australian Academy of Science's report *Negotiating our future: 2050 Living scenarios for Australia* (Raupach *et al.* 2012) provides us with a context within which to interpret these statistics. Crucially, the authors address the relationship between the affluent and ever-increasing human population and the natural world in which it lives. They emphasise that the "increasingly extensive and intensive use of our planet's continents, islands and oceans" has been "gathering momentum for centuries". In their view, however, the twenty-first century is particularly important: it is "a pivotal period in the ongoing human story", as it is in this period that the strain humans have placed upon "the Earth System at large" is becoming increasingly visible. They continue:

"As the size and affluence of the human population have grown we have placed increasing demands on natural resources, leading in turn to cascading stresses and impacts upon the natural world that serves as the planetary life support system for all human societies. Those impacts are evident through climate change, loss of biodiversity and ecosystem resilience, changes to the great natural cycles of carbon, nitrogen, phosphorus and other essential elements, overuse of surface water and groundwater resources and in threats to food security. These developments collectively define the challenge of environmental sustainability." (Raupach *et al.* 2012: i)

The authors write with confidence – no ambiguities, not a 'maybe' in sight – and with hope. Their arguments are now so well accepted by ecologists that they are commonplace. The ecologists in this RZS forum would agree with the problems that the authors have identified, but point out that this line of reasoning has been understood for some decades. The critical elements are a) the time available to find and implement solutions; and b) population size. The other side of the coin is how much damage can be sustained before the increasing stresses mentioned in the text have robbed Australia of its fauna, and how much loss we tolerate while still calling for sustainability as though it is a future challenge, rather than a wake for lost opportunities. If we return to the ABS figures on biodiversity loss, it becomes apparent that we have passed the point of sustainability for a considerable range of Australia's biodiversity.

The monumental policy failure

As the ABS points out, no single indicator can encapsulate all Australian biodiversity – that is, the abundance and diversity of all micro-organisms, plants, and animals, the genes they contain, and the ecosystems they form. As a result of this limitation, the focus lies on the number of threatened fauna species, as this provides one index of the threat to biodiversity and how it has been changing over time. The ABS added that ongoing research means that

our knowledge of and ability to assess species populations has improved. It also means that the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) listing of threatened species is becoming more comprehensive as time goes on. Some caution is required when interpreting the lists: increases in the number of species listed as threatened may be due to improved information and field investigations, rather than actual changes in overall biodiversity. Nevertheless, species listings are among the best information currently available to measure progress or regress in our biodiversity.

It is important to keep in mind that 'official' measures of biodiversity and its status consider only a small fraction of Australia's biota, with almost all of the most important elements unaccounted for (Beattie 2013). Yet, as the ABS report pointed out, an increase in the endangered status of listed species threatens ecological processes and can point to a wider decline in biodiversity. This provides an indication of the magnitude of decline in overall biodiversity and how biodiversity is changing over time. The EPBC Act notes that species listed as either 'Extinct in the wild', 'Critically endangered', 'Endangered' or 'Vulnerable' are matters of national environmental significance. Since 2000, when the EPBC Act effectively began, the total number of listed threatened fauna species has increased by 37%, rising from 312 in 2000 to 427 in 2009. Of the list of threatened fauna species in 2009, just under half (46%) were listed as vulnerable, around two-fifths (41%) were listed as endangered or critically endangered, and just over one in ten (13%) were listed as extinct. Birds and mammals accounted for over half (54%) of the vulnerable, endangered or critically endangered species in 2009, while close to half of the extinct species were mammals (48%) and a further 41% were birds. Furthermore, as invertebrates are largely ignored in the compilation of these lists, one is justified in assuming that the scale of the threats is larger than these figures convey.

In view of these figures, one can argue that the monumental policy failure is the failure to acknowledge that conservation efforts will inevitably be overwhelmed by the increasing demands of a burgeoning human population. It is imperative that scientists assume a public role to ensure that the correct information, particularly concerning our threatened species, reaches non-specialists. We cannot afford to invest our energies in specialist publications alone when the plight of our fauna is, disturbingly, largely unknown to the Australian public. Of course, specialist publications have a place; they are crucial in discerning the scope of a problem, and in devising strategies to address it. However, it is my contention that if our research is to be transformative, it must be matched by efforts to engage, educate, and involve the public, for it is these measures that will sustain long-term change.

The *Future Dilemmas* report (Foran and Poldy 2002), commissioned by the CSIRO, provides us with an instructive example of the way in which scientific knowledge is generally communicated and disseminated. The report sought to address the crucial question: "What impact will the size of Australia's future population have on the environment, the physical economy, the national

infrastructure and our quality of life?” (CSE Resource Futures 2006). The document which resulted from this inquiry has all the characteristics of an excellent scholarly work; it is insightful, penetrative, well-researched, and wide-ranging in its observations. However, it is also stylistically impenetrable (Lunney 2003). The contributions it makes to the existing knowledge on the connections between population expansion and environmental change are obscured by the authors’ writing style. Their academic register – and, at times, esoteric language – dooms the report to gather dust on the shelves of the CSIRO archives. When non-specialists display so little understanding of the ecological dimensions of Australia’s environmental problems, one can argue that the choice of such a writing style is ill-conceived, even irresponsible. It is this style that ensures that the report’s critical message – the ruinous impact of a high growth economy on the Australian environment – is lost on the non-specialist reader.

Science and the sustainable population debate

In 2010, the President of the Australian Academy of Science, Professor Suzanne Cory, welcomed Prime Minister Julia Gillard’s statements concerning a sustainable population for Australia (Australian Academy of Science 2010). This was consistent with the Academy’s longstanding argument that a large increase in Australia’s population should not take place without a full analysis of the consequences for the environment – including impacts on land, water, sustainable agriculture, and native flora and fauna. The Academy has supported the development of evidence-based public policy in this area for decades. In so doing, it has sought to embrace the perspectives and expertise not only of scientists, but also of specialists in other disciplines.

In a report for the Academy, Butler (2003) found that considerable scientific expertise exists within Australia in the areas of demography and the environment, but identified comparatively little research that integrates the two fields in a sophisticated manner. While environmental scientists and geographers often consider population issues in their work, Butler noted, demographers rarely consider environmental constraints. As economic opinion often draws on the findings of demographers, it follows that paradigms of economic growth, such as the concept of ‘optimum population size’, are conceived in isolation from the views and research of environmental scientists. After investigating the substance of economists’ views, Butler’s findings were unsettling: “Economic opinion that is currently influential concerning a desirable population size for Australia was found to use particularly naïve assumptions. These warrant explicit articulation and broader public and scientific discussion” (Butler 2003: 5). What is even more disturbing is Butler’s conclusion that “Policy-makers attribute greater weight to the opinion and findings of leading demographers and economists than to correspondingly qualified geographers and environmental scientists” (2003: 5). Butler added that more involvement by social scientists in research related to carrying capacity is needed.

One can only agree with Butler’s argument. Ecologists alone cannot constitute the only source of criticism – not even the grumpy, high profile ones. That they be joined by others with expertise in a diverse range of fields is especially vital given the increasing challenges which face advocates of a sustainable population. In his concluding statements, Butler identified one of these challenges: “Powerful forces, largely external, are likely to force substantial increases in the Australian population in the coming decades, even against the wishes of the broad population.” Alongside the promotion of debate and scientific research, he recommended that “the adoption of new technologies, economic theories, and social and farming practices are essential to improve the economic, social and environmental resilience which Australia will need to cope with this challenge” (Butler 2003: 6).

Butler’s findings certainly complicate the scale of the problem. Worse, we appear to be no closer to developing a coherent means of managing this matter at the national level in the decade since Butler published his report. In the meantime, we watch the population increase, the environment deteriorate, and the number of threatened species rise, but see no corresponding increase in support for research and management actions to cope with the threats to our fauna. This points to a bureaucratic and managerial blindness to the magnitude of the problem, and to the fact that more staff, more resources, and more funding for ecological research are needed to at least stem the losses.

Ecologists out of work

Charley Krebs’ (2012) graphic description of the collapse of the CSIRO Division of Wildlife Research is chilling. It was the premier wildlife research centre in Australia. It is now gone. Ecologists, wildlife biologists, and members of related disciplines are still being trained, but their jobs are less secure. New graduates in these disciplines are also facing increasing challenges in finding employment in their areas of expertise. Logically, if environmental losses are increasing, we cannot also afford increasing job losses in the disciplines which provide specialist scientific knowledge. The converse should apply: more jobs, more resources, and more support among decision-makers for ecological thinking.

Among my recommendations for change is the employment of more zoologists (as would be expected from a member of the Royal Zoological Society of NSW), along with botanists and members of a suite of related disciplines. At present, there are widespread national job losses in the specialised studies that underpin our knowledge of what we are losing and how we might stem the losses. Research is often portrayed as an indulgence, with the political headlines favouring front-line staff. If front-line staff are always privileged over backroom staff, including research scientists studying fauna, then we will never properly grasp a problem. As a result, we will not arrive at an optimal solution, nor will we have the ability to evaluate the answers and adjust to new ways of engaging with a problem. When budget cuts fall

more heavily on researchers than other staff, our ability to discern a problem and develop solutions with an ecologically sound foundation will diminish. Hutchings (2012a; 2013) makes this point vividly with reference to research at the Australian Museum, as do Recher and Pyke (2012). Hutchings states that her essay expresses her personal views, but she speaks for many across the nation.

Australian heritage in historical perspective

Those seeking some hope in the present environment of funding cuts and increasing threats to our fauna may point to our system of national parks and reserves. There have been considerable gains in the national parks estate in the last half-century. Appreciation of our parks and reserves is strong among the non-scientific community, as reflected by the consistently high visitation rate to parks such as Royal National Park (DECC 2009). It is important to recognise that the majority of the areas which were dedicated in the last half-century have occurred in less fertile areas, leading to the under-representation of fertile lands in our system of parks and reserves. As a result, the system does not currently satisfy the criteria of being comprehensive, adequate, and representative of the uncleared lands which existed prior to the European settlement of Australia (Pressey 1994; Pressey *et al.* 2002). However, under-representation does not constitute an argument for disparaging the system of parks and reserves. There is a strong case to be made that it is the best tool we have available to conserve native wildlife and natural areas. Instead of criticising its potential, we need to prioritise the acquisition of parks and reserves in fertile, well-watered areas along river frontages and, most importantly, the conservation of the remnant vegetation on these fertile lands.

The case for more protected areas grows ever stronger as Australia's landscape continues to change and deteriorate, particularly in connection to climate change. We need to acknowledge that there will never be enough protected areas. This leads to the conclusion that other aspects of land management and species protection need to be greatly strengthened if we are to conserve our fauna. These aspects include recovery plans, restoration strategies, detailed scientific studies on a species-by-species basis, and the management of productive landscapes for fauna (such as farms, forests and urban environments). In order to support these initiatives most effectively, we need to develop a conservation ethic that acknowledges that fauna consists of more than a few charismatic species, and incorporates population-based perspectives. There is great potential to maximise the role of education in this area.

We also need other voices to articulate what is at stake in ongoing conservation debates. Consider Kate Grenville's (2013) article in the *Sydney Morning Herald*, concerning the proposed road development in the western Sydney town of Windsor. If the controversial project is accepted, a new bridge will be constructed which will cut through Thompson Square – by Roads and Maritime Services'

own admission, “the most intact surviving square of those designed by Governor Macquarie” (RMS 2013). As a novelist whose interest lies in colonial Australia, Grenville values Thompson Square as “a rare window into lives about which we know little” (Grenville 2013). The lives to which she refers are those of “ordinary working Australians” – the small-scale farmers, convicts, and business owners who inhabited Windsor in the colonial period, and who left few written records. In Grenville's view, it is this deficiency in existing archives that makes preserving “the built environment” so crucial: “it makes their lives real to us.” She concludes: “Losing so much of our past is a national tragedy” (Grenville 2013).

Arguments against losing our national built heritage bear close parallels with arguments supporting the preservation of our natural environment. With one or two words changed in Grenville's writing, we could be discussing a patch of suburban remnant vegetation or a vanishing population of a native animal or plant. Grenville's historical perspective is valuable, compelling us to reflect on the significance of our current decisions concerning which elements of our heritage we shall erase or leave for posterity.

Who Cares about the Environment?

We are fortunate that the Office of Environment and Heritage NSW has recently published its tri-ennial sociological perspective entitled *Who Cares about the Environment in 2012?* (OEH 2013). The authors' principal method was a state-wide telephone survey of 2,006 people aged 15 years and over. For a zoologist, the results are startling, if not alarming. With regard to threatened species, the report states: “The majority [of respondents] had difficulty naming any threatened species. Where species were nominated, it was without any conviction and they were mentioned more as questions than statements of fact” (OEH 2013: 84). The report gave two examples from the survey: “There's those fairy penguins over at Manly threatened”, and “I have heard koalas are threatened, but I couldn't tell you where within the country that would be” (OEH 2013: 84). Hutchings (2012a) has called this state of knowledge “the death of life sciences”.

These statements are consistent with the overall findings of the survey. Under the heading ‘Immediate priorities’, the authors write:

“Environmental issues have declined as an immediate community priority for attention by the State Government compared to other issues such as health, education and transport, mainly due to the reduced prominence of water issues. In 2012, the environment/environmental issues are mentioned by 6%, down from 11% in 2009.” (2013: v)

The authors found that the top seven current environmental issues for people in 2012 were: “water issues, nominated by 18%, which includes water supply, conservation and management/drought; mining, 17%; air pollution/air quality, 17%; waste, 14%; forest/bushland/biodiversity, 12%; climate change, 12%; and energy/fuel,

12%” (2013: v). From an ecological perspective, all of these issues are relevant to conservation and sustainability. However, from the more narrow perspective of a zoologist, or an ecologist keen on the conservation of populations of native fauna, it is distressing that biodiversity ranks here as a middle order issue.

I have some methodological concerns about the survey that carry direct implications for the way in which these findings are interpreted. As stated in the report, *Who Cares about the Environment?* is a social research series that has been conducted every three years since 1994 to measure the environmental knowledge, attitudes, and behaviour of people in NSW (OEH 2013: 1). The series was initiated in 1994 by the NSW Environment Protection Authority (EPA), a separate organisation to the NSW National Parks and Wildlife Service (NPWS). The EPA has a distinctively human-centric focus on environmental issues such as pollution, while wildlife has traditionally been the remit of the NPWS. As a consequence of the EPA's dominant focus, the survey's treatment of the environment has often emphasised human health issues. If that bias leads to less emphasis on what the report sees as a lower ranking matter, namely biodiversity, then an error of priorities can creep into analysis. Consider the statement in the opening pages of the report:

“On the one hand, a combination of doubt about the severity of problems, perceptions that the environment is being well-managed and that things are improving, and lack of a perceived immediate environmental ‘threat’ have contributed to a decline in concern about environmental problems, and community engagement. On the other hand, over the longer term, there is a growing belief in the importance of looking after the environment. Moreover, what were once seen as fringe issues have become embedded in behaviours and daily lives. Recycling, using ‘green’ shopping bags and being energy- and water-wise have become routine.” (OEH 2013: viii)

Given the examples of recycling and ‘green’ shopping bags, there is reason to argue that fauna is not in this picture. This is corroborated by survey questions such as Question 12a, which opens with the statement: “Doing the right thing for the environment may not always be easy for people in today’s busy world. Different people find they can do different things and, perhaps for people in some situations, there may not be a lot they can really do” (OEH 2013: 110). The interviewer then provides a list of environmentally friendly behaviours and asks respondents to state whether they have “often”, “sometimes”, “just occasionally”, or “never” acted in these ways. The full list is provided in Appendix C of the report:

- a. Chosen household products that you think are better for the environment
- b. Decided for environmental reasons to re-use something instead of throwing it away
- c. Made an effort for environmental reasons to reduce water consumption
- d. Taken active steps to reduce energy consumption, for example, turning off lights or using appliances or home heating and cooling more efficiently

- e. Taken active steps to reduce fuel consumption and vehicle air pollution, for example, by driving a smaller or more fuel efficient car, car-pooling, using public transport, bicycling or walking
- f. Composted food or garden refuse, or used a worm farm
- g. Avoided plastic bags to carry shopping home
- h. Reduced the amount of food that your household throws out
- i. For environmental reasons, bought fewer items that you don’t really need
- j. Avoided putting things like oil, fat, turps, paints or chemicals down the sink or toilet. (OEH 2013: 110)

Given this list of options, it is unsurprising that the report found that, “when asked to nominate specific behaviours undertaken, nearly all commented on actions they had taken close to home”, including “conserving water; using environmentally friendly shopping bags; switching off lights and appliances; planting natives/vegetable gardens; composting; using the car less; [and] recycling.” Indeed, the authors continue, “almost no one had taken any other actions and indeed few could think of other actions they might take” (OEH 2013: 93).

It is reasonable to assume that the human-centric bias of many of the questions could lead respondents to believe that the ‘environment’ under discussion denotes issues such as clean air and water, rather than other issues such as the state of Australian fauna and biodiversity. The authors do not provide a definition of the term ‘environment’; instead, they let the definition emerge from the balance of the questions. While the authors are interested in the public’s conceptualisation of ‘the environment’ (OEH 2013: 78-81), and thus do not wish to proscribe responses by providing a definition, they are arguably in danger of generating results which reflect the biases of their approach. Additionally, the balance of the questions could potentially lead respondents to contend that the environment is improving. As the report notes, the participants in the discussion groups “believed they now held a much broader understanding of the environment and that it had permeated many areas of day-to-day life. Issues of recycling, environmental building regulations, improved controls on industry and tougher emission standards on cars were all cited as examples of positive change from the past” (OEH 2013: 80). It is possible that this human-centric and localised understanding of the environment may have affected perceptions of biodiversity issues. In this area, the report finds that, “compared with 2009”, “many more people believe things have improved rather than become worse on conserving the marine environment and protecting and conserving endangered plants and animals” (OEH 2013: 37). This is frightening given the finding that, “compared with six years ago in 2006, there has been a decline in awareness that more mammals have become extinct in recorded history in Australia than in any other country” (OEH 2013: 29).

Contrary to respondents’ perceptions, the situation of Australia’s fauna is not improving. Consider the findings of the EPA’s 2012 *State of the Environment* report with regard to native fauna and threatened species:

“The overall diversity and richness of native species in New South Wales remain under threat of further decline. Thirty-five additional species have been listed as threatened under NSW legislation since 2009, including 11 terrestrial vertebrate species. The conservation status of 66% of terrestrial vertebrate species still remains non-threatened. A general pattern of decline in biodiversity over the longer term is evident in changes to the extent and abundance of many native vertebrate species. At the same time, many species less susceptible to existing pressures have maintained their distributions, while a small number of adaptable species have flourished.” (2012: 5.1)

This statement is consistent with the ABS' picture of biodiversity decline for 2012. Thus, we have two problems: one concerning the public perception of pressing threats to our fauna, and a methodological problem that relates to the first. Here, improvements in such areas as pollution and recycling have been misinterpreted as evidence of broader public commitment to protecting the environment, and as a result have overshadowed the deteriorating condition of our native fauna.

Let's return to some of the alarming details of the OEH report. The following statement is disturbing: “Doubt about the severity of environmental problems is the most common reason for *lack* of concern, consistent with 2009, and mentioned by 21% of those who say they are not concerned. However, the second most common reason for lack of concern is that people see the condition of the environment as being good or well managed (18%, up from a low of 9% in 2009)” (OEH 2013: vi). This not only means that many messages of concern are being lost, but that those working in the area of fauna conservation have not spoken up often enough, or that the ecological bases of their messages are absent from their public statements. The latter view is evident in the next paragraph of the report: “The qualitative research indicates that this doubt is underpinned by: belief that climate/weather issues are part of natural cycles, or that the Earth can adapt and recover from environmental damage; a perception that issues have been ‘over-hyped’, and that predictions of environmental disasters have failed to materialise; and conflicting information or science about environmental matters” (OEH 2013: vi). The report added that: “These perceptions, particularly conflicting information and unfulfilled predictions, lead some people to disengage, because they find it difficult to make sense of the issues, and to find the ‘truth’” (OEH 2013: vi). This finding is worthy of much more examination, but we do have some idea as to what is at issue. The climate change debate is one example of this problem (Lunney and Hutchings 2012b; Banks *et al.* 2012; Recher 2012). We should be in no doubt concerning the reality of climate change, but since the cost of changing human behaviour is high for some sectors of society, they oppose the idea, and propagate confusion and conflicting information. The OEH report shows that they have been successful. This calls for those with a genuine concern for the environment, and for long-term fauna conservation in particular, to assume a more active public role (eg. Ehrlich 2013; Kingsford 2013; Recher 2013).

A particularly interesting feature of the survey was Question 21: “What would you say is the single most important thing that the NSW Government could do to protect and look after the environment over the next few years?” The report found that no single issue was nominated by a particularly large number of people. The following seven topics each attracted a mention by approximately one person in ten: vegetation/biodiversity (12%), education/community engagement (9%), mining (9%), energy and greenhouse (8%), government strategies (8%), regulation (8%), and waste (7%). The report also added that among this top group, significant gains compared with 2009 are apparent for three areas, including vegetation/biodiversity. In the authors' estimation, “a combination of small increases” in a number of issues has contributed to this growth. These include “protecting wildlife/habitats; the creation of new reserves or marine reserves; better management of weeds and feral animals, and new to the agenda, concerns about shooting in national parks” (OEH 2013: 18). For conservation biologists and ecologists, this is encouraging, and it serves as a basis for building education and public engagement.

For those who work on the education front, the report's snapshot of existing environmental knowledge and views among the Australian public is depressing. The report found that, compared with 2006, fewer people are aware that more mammals have become extinct in recorded history in Australia than in any other country – down from 51% to 44% (OEH 2013: 29). The report also found that for most of the 18 issues surveyed, the number of people who feel that the situation in NSW has become *better* over the past three years greatly exceeds the number of those who feel it has become *worse* (OEH 2013: 28). Thus, we have a low level of knowledge, alongside the inconsistent view that the environment has improved.

The level of public ignorance becomes more apparent as we examine the findings that resulted from the question: “Please write down ideas, words or concepts that come to mind when you think about...” (OEH 2013: 78). For the word ‘Biodiversity’, the authors of the report comment that “there was a significant proportion of the sample that had little understanding of the term biodiversity. Consequently, this word generated the fewest responses. It also generated responses that were far from the meaning of the word.” For the word ‘Ecosystems’, the authors found that, “like biodiversity, many were unsure as to how to interpret ecosystems. This led to some variation in responses” (OEH 2013: 84).

The report concluded that “the volume of information and inability to sift through it coherently caused participants to wonder who they could trust. All parties were perceived to have agendas and could not be trusted: politicians: spin, for political benefit; business: financial interests; experts: don't appear impartial and disagree; and, media: interested in extreme issues and views to sell their product” (OEH 2013: 91). This is a grim view of the world, and it represents a significant barrier to our ability to improve public knowledge and gain further support for conservation initiatives, especially as they concern such esoteric groups as many of our cryptic fauna.

The report also compared the views of those who reside in Sydney versus those who live in rural New South Wales. It found that Sydneysiders “are more likely to nominate air pollution or pollution in general as important top-of-mind environmental issues, while those outside Sydney are more likely to mention water supply/conservation/management/drought, and mining.” It also found that “people outside Sydney are more inclined to think regulations are *too strict* for farming and agriculture, forestry, property development and construction, and recreational and commercial fishing. They are also a little more likely to think there is too much emphasis on protecting natural habitats. Sydney people are more likely to think regulations are *too lax* for property development and construction, and recreational and commercial fishing” (OEH 2013: 107). This indicates that one’s view of environmental matters is partly a function of where one lives and works, and that decisions for the allocation of resources for environmental problems will be influenced by the perspective of the person speaking or writing, which in large part derives from their location. This is not so surprising, but it does mean that for the conservation of fauna across the state and the nation, ecological and research issues such as population management and ecosystem management will find it hard to gain widespread traction. The reduction in the resources available to biodiversity conservation arguably reflects this confusion. As resources are reduced, so too is our ability to discern, interpret, and analyse problems. Consequently, the ever-present issue of “data deficiency” will persist, or worsen. The logic of the matter is that we need more, not less, resources to study our fauna, to report on it, and to make sure that the work of research scientists is more widely publicised.

“Extinct frog hops back into our gene pool”

A recent edition of *The Sydney Morning Herald* bore a spectacular front-page headline: “Extinct frog hops back into our gene pool” (Phillips 2013). The accompanying article publicised the recent success of the so-called ‘Lazarus project’, led by a team of Australian scientists. Over five years, the team, led by palaeontologist Mike Archer, inserted DNA extracted from a frozen specimen of the extinct gastric-brooding frog (*Rheobatrachus silus*) into hundreds of eggs from a living relative, the great barred frog (*Mixophyes fasciolatus*). The eggs later grew into three-day-old embryos – the first time that this cloning technique has been successful in resurrecting an extinct species.

The article connects many absorbing themes in the contemporary debate about conservation. Inevitably, the team’s work will be criticised by those who contend that the possibility of bringing a species back from extinction overturns the shrill claim that extinction lasts forever. Novel thinkers, such as Archer, have to wear such ill-informed criticism. As Archer pointed out, resurrecting the genetic material of the extinct frog depended on frog researcher Mike Tyler freezing a specimen before it disappeared from the wild. Even then, as Archer comments, “It’s a minor miracle that a university freezer had not been turned off in a power failure” (Phillips 2013: 1). In sum, it little

short of incredible that we are in a position – both technologically and scientifically – to reverse the extinction of this frog.

Consider the message that the article has managed to convey. Even if we can reverse some extinctions, it will be extremely difficult, and it won’t be available as an option for many species. The real message, therefore, is to keep what we have and avoid extinctions. Archer and Phillips have also thrown a spotlight on the plight of frogs by pointing out that frog populations have plummeted around the world. What is also attractive is the journalist’s mention of two other researchers – Mike Mahony and Andrew French. With Archer as a palaeontologist, Mahony and Tyler as frog biologists, and French as a reproductive biologist, the article shows that teams of specialists are needed to make progress in such complicated areas. What is so attractive about the article is that it makes science, and biology in particular, interesting, and that the problem being tackled is the most frightening one: that of extinction. There need to be more articles like this, and with education and training, there could be many more.

While such promising examples of intelligent public discourse about science deserve to be applauded, it remains important to recognise that, overall, the overwhelming trend is towards the devaluation of scientific expertise – particularly with regard to the biological sciences. The frog story shows us that arresting the decline requires serious effort by zoologists. It is no use undertaking major reforms in ecosystem management, passing new legislation, or focusing on environmental matters of direct human concern, such as air and water quality, while neglecting to sustain the employment of zoologists who work on naming, understanding, and conserving our fauna (Hutchings 2013). Their work is an essential component of any effort to conserve Australia’s native fauna and to give some assurance that its legacy will be handed on to future generations.

From a conservation perspective, there is one thing about which to feel pleased: a high quality environment matters enough to be seen as a trade-off on the ABS score sheet. Although some criticise the efficacy of reporting, the situation would be far worse if environmental decline did not rate a mention in attempts to ascertain the ‘state of the nation’. An ABS report specifying our conservation failures and responsibilities is a welcome cautionary perspective in view of the increasingly large community of those who view ‘green tape’ as an impediment to progress (see e.g. Seeney 2013; Crowe 2013). We need to be vigilant and ensure honest and thorough reporting on the environmental front, and encourage an expanded version of the ABS report which transcends a list-based interpretation of environmental degradation as represented by threatened species.

Grumpy ecologists, grumpy zoologists

Unfortunately, the figure of the ‘grumpy ecologist’ is not an oxymoron. Rather, it is thoroughly explicable in view of the position of ecology today. In part, the frustration of my colleagues derives from the increasing emphasis given to computer-based approaches to conservation

at the expense of understanding the natural history and ecology of our native species, and integrating that information into ecosystem management. To exclusively use computer-based approaches limits zoological work to the images that can be gained digitally, such as satellite imagery. This is one valuable means of understanding and processing knowledge, but there are other approaches and skills that need to be recognised, funded, and supported. Crucial among these are field programs: indeed, it is difficult to imagine a competent zoological study for the conservation of a species which could be undertaken without a hands-on element in its program. Prioritising computer-based approaches places many zoologists at a disadvantage, for the animals they study are not visible using computer imagery and can only be observed via fieldwork. If we overlay the value of digital technology for researching these species in the current climate of cuts to field programs, we run the risk

of inferring their population size from computer images without field verification. Optimally, the two approaches would be used in conjunction. However, the temptation to use existing (and limited) data sets rather than sustain field programs is strong.

Fundamentally, the disillusionment of many ecologists arises from consistent first-hand experience of irretrievable, but preventable, losses of species and ecosystems taking place before their eyes. On another level, it arises from the fact that the lessons of their professional experience – specifically, the warnings that they issue as a result of expert knowledge – are unheeded by the broader community. This feeling of disenchantment stems from watching the relentless deterioration of the status of the Australian fauna to which they have devoted their working lives to conserving. Their grumpiness is on behalf of the future of the native fauna of Australia.

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