Disasters for wildlife: an analysis of media attention

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ABSTRACT

Abstract: When disasters occur, media reporting tends to focus on the impacts on humans and their property, with only occasional references made to impacts on natural assets such as wildlife. We looked at a range of print and internet media sources to examine the way the media treat wildlife in their reporting of disasters. We found a growing media interest in wildlife problems from earlier analyses, at least partly generated by growing awareness of the risks to wildlife posed by global warming, a hot media topic. Scientists were rarely directly reported, but when they were the message came through loud and clear, calling for better bases for government actions to conserve wildlife. The media industry is separate to academic science and the policy and management world of governments, but has a responsibility to carry important information from these bodies to the wider community. For their part, wildlife scientists should make more effort to set priorities and to inform reporting, recognising that the media influence the political agenda. If global warming is making Australia more disaster-prone (*New York Times* 30 September 2009), the consequences for wildlife need to be understood and widely communicated, as a precondition for protective actions.

Key words: climate change; bushfire; media; journalistic ethics; Garrett; Possingham; Kingsford, Flannery; Lindenmayer; science communication; alien invasive species; extinction.

Australia is now "far more disaster-prone"

Disasters – events with catastrophic consequences – typically include fires, floods, droughts, tsunamis, storms and oil spills, but for wildlife they also include processes such as gross habitat loss or change, and alien invasive species, such as the introduction of foxes *Vulpes vulpes* to Tasmania. Such processes usually have underlying causes, such as land clearing or overuse of water. In this sense we can apply different time scales to the definition of disasters, and see, for example, that the colonisation of Australia, with its consequent modification of landscapes and extinctions, has been a disaster for wildlife. Further, to the extent that we can foresee the consequences of current processes such as climate change, land clearing or high rates of wildlife roadkill, we can predict future disasters. Getting the mass media to accept and respond to this broader definition is an immediate and urgent challenge for environmental scientists, in order to take our message to the general public, and through them, to all the decision-makers.

Australia's climate and environmental problems are attracting world-wide media attention. US newspaper the *New York Times* (30 September 2009) ran the headline, *Australia's Dust Bowl and Global Warming* (http://roomfordebate.blogs.nytimes.com/2009/09/30/australias-dust-bowl-and-global-warming/, accessed 10 October 2009). The article cited a number of prominent scientists around the world saying that Australia's recent travails – prolonged drought, devastating fires and floods, and the dust storm which blanketed Sydney recently – are linked to climate change, which is making an arid continent's environment far more disaster-prone. Andy Pitman, the co-director of the Climate Change Research Centre at the University of New South Wales (NSW), was reported as stating that: "On Sept. 23, a dust storm hit Sydney, Australia. It actually hit much of the east coast of Australia." Pitman said that every climate scientist was asked, "Is this global warming?" Pitman put the answer succinctly: "The problem is that eastern Australia is in drought and a large amount of inland eastern Australia has been subject to some farming practices that have tended to degrade the native vegetation. Eastern Australia has undergone major deforestation for pasture and crops which, combined with the ongoing drought, has left vegetation cover badly reduced. The exposed soil is vulnerable to the 100 km per hour winds we saw here last week. This has direct parallels with the [US] Dust Bowl catastrophe."

The same *New York Times* article reported similar views from Penny Whetton, leader of the climate change research group at the CSIRO, and Kevin Hennessy, who leads the climate change risk adaptation and policy team at CSIRO. They, too, start with the obvious question: "Was there a link between climate change and last week's massive red dust cloud that emerged from central Australia to engulf two of Australia's largest cities, Sydney and Brisbane, and the capital Canberra? Or the Victorian bush fires in February 2009 that claimed more than 170 lives?" Their answer was as follows: "First the fires. There has been no formal detection and attribution study that our group is aware of to assess whether anthropogenic climate change contributed to increasing the risk of the extreme weather event on Feb. 7, 2009. When considering the factors that contributed

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to this event, we need to include the sequence of events leading up to that day. Since fire weather is influenced by temperature, rainfall, humidity and wind speed, CSIRO has assessed recent studies of trends in these variables, and the likely contribution of anthropogenic climate change. Based on literature CSIRO is aware of, increases in mean and maximum temperature in Australia since 1950 have been mostly attributed to anthropogenic climate change. The observed rise in maximum temperature (mostly due to anthropogenic climate change) is likely to have contributed to an increase in the risk of heat waves and extremely hot days in Victoria. The decline in rainfall over southeastern Australia during the past 50 years is mostly due to a trend in the intensity of the subtropical ridge, which in turn appears partly attributable to anthropogenic climate change. Hence anthropogenic climate change is likely to have increased the risk of extremely dry conditions over Victoria." "In Australia, there is a season for dust storms – from September to March, with its genesis often in the Lake Eyre Basin of Central Australia, a region of desert, grasslands and wetlands that accounts for one sixth of the Australian continent." "Based on our projections, in which Australia will get drier and warmer, the risk of continuing dry conditions in the Lake Eyre Basin would be increasing."

The striking feature of these accounts is that they were reported in the US media – in a prominent newspaper. Australia's environmental disasters are of world significance. Global warming is a major issue worldwide, and it has brought on a major policy debate in the USA, as it has in Australia. In fact, the policy debate, and the politics surrounding it, has taken up most of the coverage in Australia. The science gains only a small proportion of the media attention, but the points are well made by the scientists, as shown by some of Australia's leading climate scientists cited by the *New York Times*. The comparison of the orange, or red, dust in Australia on 23 September 2009, to the US Dust Bowl disaster is telling. What is also important here is the linking of over-clearing of vegetation with climate change. Climate change is exacerbating the existing problems of dust storms and bush fires. The reporting here has allowed the scientists to make the links in their terms. What also stands out is that natural disasters, such as dust storms and bushfires, are being amplified by human actions, in this case anthropogenic climate change. What is not apparent from this reporting is the impact of climate change, through dust storms and bushfires, on the wildlife. Those links have to be made elsewhere, and a conscientious reading of the media begins to establish them, but it does take dedicated reading and tracking of the media to do so. The aim of this study was to examine how those links are established, how the media report wildlife responses to disasters, and what role the media play through their selection of material to publish.

Sources

A major daily newspaper in Sydney (the *Sydney Morning Herald* [SMH] and its Sunday edition the *Sun-Herald* [SH]) was examined over two years – late 2007 to October 2009 – for any articles, letters, editorial and photos relating to disasters and wildlife. The free media reporting service *Making Environmental News* (http://www.banksiafdn.com/) was examined in 2009, and the internal media coverage by the Department of Environment, Climate Change and Water NSW (DECCW)[1] was examined, with its special emphasis on regional newspapers, as well as media alerts from colleagues as a service within DECCW. The internet, via Google (both world and Australian websites), was also searched, with key words being: wildlife, disasters, ecology and media. The academic search through *Scopus* was examined, with the same key words. The result was a flood of information, ideas and points of view. The next step was to sort the material into categories that made ecological and zoological sense. There was a high overlap of material, not surprising given that many press sources report on the one event, so only a small selection was chosen for any event, so that the topic was covered.

The investigative steps were to examine how the media report wildlife responses to disasters, how links are established among issues, what role the media play through their selection of material to publish, to look for novel interpretations and ideas, and to seek ways of being both critical and constructive. There is a number of striking features of the media that can easily be overlooked in any analytical approach, and that includes the photos (were they present, what was their story?), the wording of the headline, and the language of the copy that presented the story. These served as a primary means of collating and interpreting the reports. The comparisons between the media presentations and how a zoologist or ecologist might consider the matters of conservation and the media emphasis drew on existing practice in the scientific literature and the working plans and reports of governments and government departments, particularly DECCW, and the body of ideas that forms part of the effort by the Royal Zoological Society of NSW to promote the science of zoology and the conservation of our fauna.

Reporting wildlife disasters

Literally thousands of articles were included in the initial examination, but the repetition rate was high. Wildlife gains a regular spot in the media, with most articles being about loss, often serious loss. As we were finalising this text, pictures of oil-covered wildlife and dead fish were being beamed daily into living rooms around the world during the disastrous 2010 Gulf of Mexico oil spill. Such reporting on individual species, or groups of similarly affected species, at specific locations, is the commonest form of reporting. For example, the demise of the Tasmanian devil has been covered, and its deadly disease, under the predictable heading, *Devil of a challenge to save species* (Ben Cubby SMH

1 This paper was written for the 2009 Royal Zoological Society of NSW forum. Since then, in March 2011, the department has undergone a name change to the Office of Environment and Heritage NSW. However, DECCW remains in the text because that is when this paper was written, and it refers to media material preceding the RZS forum.

14 February 2008). Under the somewhat cryptic heading, *Ocean ghosts wait for the unwary* (SMH 15 October 2008), Emma Blacklock reported that discarded nets are causing untold damage to sea life. She writes that, "For an Olive Ridley turtle living and breeding in the Gulf of Carpentaria, dodging the deadly environmental menace known as ghost nets means life can resemble a Hollywood thriller. Ghost nets are the serial killers of the oceans, floating aimlessly in the coastal waters of the gulf." "Ghost nets are fishing nets that have been lost accidentally, deliberately discarded or simply abandoned."

The Victorian bushfires of February 2009 were headline material, consuming the media for weeks, and the subject continues to be reported. The word disaster readily applies to this event. Under the heading, *Wildlife the silent victims of deadly fires*, the ABC news reported (18 February 2009): "The devastating loss of human life in the Victorian bushfires is evident, but it is less clear what the toll will be for the state's wildlife." (http://www.abc.net.au/reslib/200902/r340347_1548275.jpg, accessed 5 October 2009). Given the terrible loss of human lives, more than passing media attention to wildlife losses might have seemed insensitive. The story remains open, and there is a considerable body of valuable science yet to be drawn on by the media, rather than the more obvious statement that the wildfire killed and injured native animals, as in this ABC report.

What is not so clear is when climate change fits into the disaster category from a media viewpoint. The consequences of climate change for wildlife will be disastrous for many species, and entire ecosystems, and the media have picked up on this point. Under the heading, *Antarctic food chain threatened*, Andrew Darby reported that: "The predicted rise of atmospheric carbon dioxide will wreak havoc on krill, the tiny crustacean at the heart of the Antarctic food web, a study has shown." (SMH 14 October 2008). The article also mentioned the researcher, Lilli Hale, as well as the Antarctic Division's program leader, Steve Nicol. This is a clear example of a wildlife problem resulting from climate change, and one that put researchers squarely and favourably in the picture. However, most articles on climate change did not mention wildlife, or even wildlife habitats. The politics of climate change holds the top spot on the reporting and, as 2009 advanced, so did the politics of how Australia should be poised for the meeting at year's end in Copenhagen. The outcome of that wrangling will have major implications for our wildlife, but the reporting rarely covers this aspect. It is more frequent for an iconic location to be included by way of example of the impact of climate change. The Great Barrier Reef, Kakadu National Park and the Murray-Darling Basin can claim top billing. When the Garnaut (2008) report was released, it made front page headlines: *Adapt or perish* (SMH 5-6 July 2008). Phillip Coorey and Stephanie Peatling reported in the opening paragraph that "Australians must pay more for petrol, food and energy or ultimately face a rising death toll, economic loss and the eventual destruction of the Great Barrier Reef, the snowfields, Kakadu and the nation's food bowl, the Murray-Darling Basin." Under a smaller, yet still front page, headline, *The apocalypse 2100, a climatic odyssey*, Stephanie Peatling reported: "Thousands of deaths each year from heat stress. Hundreds of plant and animal species extinguished. An inland migration to escape rising sea levels and severe storms. And the end of agriculture in most of the Murray-Darling Basin." Given these headlines, there is little doubt of an impending disaster, and species and ecosystems illustrate the point. However, the opening words were, "Australians must pay more..." and that sets in train a long series of articles on the politics of the matter, and wildlife then fades, mostly to re-appear by way of illustration of this looming disaster.

Marian Wilkinson (SMH 22-23 November 2008), under the headline, *Climate threatens the koala*, reported that: "Koalas, already listed as vulnerable, are likely to die in greater numbers as they adapt to climate change, which will bring more intense bushfires, rising temperatures, increased drought and a drop in the nutrition levels of their food, a senior NSW Government scientist warned. Dan Lunney told a conference of the NSW Nature Conservation Council [in November 2008] that rising greenhouse gas concentrations would push up toxins and lower nutrients in eucalyptus leaves. As leaf quality dropped and bush fires intensified, koalas would be forced to roam further afield as they foraged for food in shrinking bushland surrounded by farms, housing developments and logging operations. "The further they have to travel, the more frequently they are on the ground, the more likely they are to be attacked by dogs. And if there is a road in between the patches of trees, they'll die on the roads," said Dr Lunney, a leading koala expert with the NSW Department of Environment and Climate Change." Further explanation was provided in the article by Marian Wilkinson: "Professor Ian Hume of Sydney University began 'waving a yellow flag' earlier this year over research warning of the effects of rising carbon dioxide levels on eucalyptus leaves and the likely effects on koalas." "We won't see dead koalas everywhere but over a period we'll see fewer and fewer koalas."[2]

From these three examples, it is reasonable to conclude that wildlife disasters, both widespread and local, both horrific and modest, gain regular reporting. In fact, most reporting was of loss, decline and looming extinction, and it was disasters, or looming disasters, that drew media attention to wildlife. Nevertheless, the association of problems is evident in the best reporting, such as that climate change will compound the threats that wildlife already face, and those threats, such as loss of habitat, fragmentation of what remains, and introduced problems such as cars and dogs, are heightened by the new problem of climate change. What climate change has done, from a media viewpoint, is provide a link among threats to biodiversity that were present before climate change but are now highlighted by it. This is an essential ecological lesson, but it makes an ecologist weep to have to wait so long to see these links spelt out so clearly by the mass media. However, now that the point has been seen, even small reports point to the sequence of loss.

2 This subject of Koala deaths and climate change became the subject of a paper in the 2010 Royal Zoological Society of NSW forum on *Wildlife and climate change: towards robust conservation strategies for Australian fauna*, Lunney *et al.* (2012).

Under the headline, *Time running out for Riverina forests: report*, Marian Wilkinson (SMH 1 October 2009) reported that "The state's iconic river red gum forests in the Riverina are under serious threat with many of the trees dead, dying or highly stressed, a new report by the Premier's senior advisory body has found. If the drought conditions continue in line with climate change predictions, much of the existing forests that are home to numerous threatened species will not survive even in their current condition. The report by the NSW Natural Resources Commission found that prolonged drought has devastated the forests and without a return to a wet period, "the future of the forests in their current form looks bleak"." "The new report found the magnitude of change in some areas such as the Werai forest raises questions about the capacity of local species such as forest owls and raptors to survive there. Waterbirds that use the wetlands in the forest are also vulnerable. But the report found that the forest could rejuvenate if long-term flooding returned. Agricultural development, irrigation, dam and weir construction along with logging have had a serious impact. The report found there were about 1000 jobs associated with the forestry industry in the region but this represented just over 1 per cent of employment." Even though the article was short, just 337 words, the reporter had linked the impending disaster to climate change, logging, and the need for long-term flooding. Threatened species, forest owls, raptors and waterbirds, were mentioned. So was the issue of conflict over logging. This point on conflict followed from an earlier article by Marian Wilkinson and Brian Robbins, under the headline, *Carr tells Rees to save Riverina red gums* (SMH 24 July 2009): "The former premier Bob Carr has challenged his successor Nathan Rees to support the campaign to stop logging river red gums in the Riverina, arguing that saving the forests was, "the most urgent nature conservation challenge we face in this state"." In fact, conflict is a primary cause of an issue being reported, and then the investigative reporting follows.

The voices of science

The language of the reports was usually clear, unambiguous, and readily quotable. It was often formulaic, with issue, consequences, who is making the decisions, what happened, and is it being followed up reported as standard sentences. Quotes from some individual scientists were given, but that was uncommon. When the scientist's voice came through, the impact was considerable, memorable and made the points starkly. Richard Kingsford is among the most notable media performers. Under the demanding headline, *Water theft threatens $10b Murray rescue*, Daniel Lewis and Marian Wilkinson stated that Professor Kingsford said: "Most of the levees and constructed channels are legal, although often guidelines to maintain free passage for floods have been breached. While the earthworks on the Macquarie flood plain may not be illegal, taking part of the environmental share of the water is a very different matter." (SMH 25 February 2008). Under the headline, *The River Crusader*, with the subheading, *Scientist Richard Kingsford fears for the future of our wetlands*, reporter Steve Dow states that Kingsford's report card on the state of Australian wetlands gave an 'F' for fail (SMH 11 October 2009). The full page article included a large photo of Kingsford beside a wetland. Dow reported that Kingsford applauds the Rudd Government's $3.1 billion plan to buy water for wetlands, and quotes Kingsford: "we're still not seeing the sort of leadership we need for climate change, rivers and land clearing", and he urges Australia to follow Canada and legislate to create a 'heritage rivers' system to protect more rivers to prevent ecosystems collapsing. Kingsford here is leading by example. As the article explains, via a biography of Kingsford, he started as a keen bird watcher, undertook a PhD on ducks on the family's farm dam in Goulburn, and has now extended his vision to all the wetlands of Australia, and their waterbirds, with comparisons with the rest of the world. This is a personal crusade, as the headline makes clear, and the zoological basis for his concerns is well articulated.

ABC Radio National reporter Linda Mottram interviewed David Lindenmayer in a segment entitled, *Australia's species meltdown* (10 June 2009, http://www.radioaustralia.net.au/connectasia/stories/200906/s2594111.htm, accessed 12 October 2009). The introduction stated: "An alarm has been sounded about the rate at which Australian species are dying out and a top Australian ecologist says Canberra has delayed releasing a report on just how poorly the government is responding." "Mottram: By current estimates, Professor David Lindenmayer says 30 per cent of all Australian bird species are threatened with extinction. The Australian National University ecologist says most Australian species types across the continent are in similar trouble. Take the case of Christmas Island, off Australia's north west coast. Lindenmayer: There's a huge crash in species there, there are species extinctions about to take place if they haven't already taken place. The Christmas Island Pipistrelle, a little bat, these are actually mammals that are basically ready to go off the map[3]. Mottram: Professor Lindenmayer says that's a microcosm of the picture all over Australia, with some regions – like the country's south-west – finding that species which had been endangered but had shown signs of recovery are now declining again. It signals the potential loss of hundreds of unique species, that've survived for millennia in the isolation of an ancient island continent. David Lindenmayer says the Australian government's investment in biodiversity conservation is way too low and its commitment to well-grounded science less than sophisticated. And he says the government has delayed releasing the 2008 Terrestrial Biodiversity Assessment because the news is bad and the criticisms of government policy strong. Professor Lindenmayer points to the government's recent decision to shut down research body, Land and Water Australia – which saved 15 million dollars for the government – as an example of the government's failings."

3 An account of this matter is reported in Lunney *et al.* 2011.

Another successful presenter to the media is Tim Flannery, and he gained a substantial item in the SMH of 9 October 2009, under the headline, *Australia in 'biodiversity crisis'*. Paola Totaro reported that the former Australian of the Year, Professor Tim Flannery, said he is 'appalled' that the Federal Government has backed away from saving single endangered species. "In an impassioned speech delivered in London, the scientist and chairman of the Copenhagen Climate Council warned that the continent is in the grip of a 'biodiversity crisis'." "In a broadside at the Environment Minister, Peter Garrett, Professor Flannery said it was imperative that both the Government and the environment movement in Australia understood that entire eco-systems could collapse if the protection of single species was abandoned. "You see the great eucalypt forest, its trees are 300 feet high and they are still there. But they can only exist with the partnership of a humble fungus. It plays a vital role for the eucalypt because it unlocks nutrients underground that allow the tree to grow to a huge size in poor soil. And what spreads it? A tiny rat kangaroo that is now highly endangered all round Australia. Why should we worry? Because everything is interrelated"." The reference here was to a speech last month, where "Mr Garrett warned that limited funding meant some species may have to be abandoned. He told an international conference of ecologists in Brisbane that the Government planned to shift its focus to protecting 'ecosystems', rather than putting money into individual projects for endangered animals." "Professor Flannery accused Mr Garrett of abandoning policy for political expediency, avoiding controversy over funding or, worse, failing to save a species of animal." "He described the imminent loss of a native bat on Christmas Island as an indictment of the current system: "The Christmas Island pipistrelle is the next species to fall off. There are just 20 individuals remaining and we still don't have a plan. Then it will be the mountain pygmy possum and after that something else. I guess I shouldn't be so frank but even the environmental organisations don't care so much about individual species for some reason. They just want to preserve ecosystems but don't see the inevitability that if you keep losing species you don't have ecosystems so it is incredibly important to draw the line at 'no more species will go extinct in our country'.""

At issue was the statement made by Peter Garrett at Intecol, an international meeting of ecologists in Brisbane in August 2009. *Garrett concedes: extinction inevitable,* was the main headline on page 1 of SMH on 18 August 2009. Environment reporter Tom Arup made the point starkly: "The Environment Minister, Peter Garrett, has warned that money to save endangered wildlife is limited and some species may have to be abandoned when funding decisions are made. In one of the strongest speeches of his ministerial career he told an international conference of ecologists in Brisbane that the Government will shift its focus to protecting 'ecosystems', rather than putting money into individual projects for endangered animals. Mr Garrett's speech follows a report by the Department of Climate Change that found global warming would severely threaten many native species. Mr Garrett said the current system of funding on an animal-by-animal basis was the equivalent of paramedics waiting at the bottom of a hill performing 'triage' on those who fall down. "Australia has 1750 species now on the threatened list," he said. "And while … we will have to act in an urgent way from time to time to prevent their extinction, it won't always be effective to keep tackling them one by one." Mr Garrett discussed his recent decision to fund a recovery program for an endangered bat on Christmas Island and whether he could afford to spend the money given the animal's low chance of recovery." Dissent was evident, even within that lead article: "Phil Gibbons, a senior fellow at the ANU's Fenner School of Environment and Society, said focusing on ecosystems was the most cost-effective approach to saving animals. But he said Mr Garrett had recently spent large amounts on programs for politically popular animals, including $10 million to help save the Tasmanian devil. Mr Gibbons added that Mr Garrett and the Rudd Government had not yet been prepared to have a debate about "the links between economic growth and the damage we are doing to our natural ecosystems"."

What is so striking about Garrett's statement is that is concedes defeat on a major front. To those who study and assist in conserving threatened species, it would be dispiriting. Phil Gibbons sees inconsistency, Tim Flannery pointed to an ecological matter of interconnectedness, and the need to address the question of how to allocate the funding priorities for *Caring for our Country* in a business-like fashion has been the subject of calls by Hugh Possingham and Brendan Wintle (2009). The papers at the Intecol conference showed what intellectual resources are available to tackle these issues, and a categorical statement of abandoning species programs would not be a good summary of the thrust of the papers at the meeting. Sutherland *et al.* (2009) identified the 100 top questions to ask to conserve biodiversity. Of the 100, 8 were directed to species management, with the preamble to the section stating: "as the benefits of ecosystem function to humans become more apparent, and as we come to appreciate the complex, often indirect ecological effects of our activities, the conservation spotlight has shifted away from individual species. Nevertheless, many remaining questions can only be addressed at the species level." The authors point out that a considerable number of species can be affected by an individual stressor, such as climate change, wildlife trade and land conversion, as well as those species that have disproportionate positive or negative effects on communities. The authors identified the question: "What are the ecosystem impacts of efforts to conserve charismatic, flagship or umbrella species?" What becomes apparent is that there is much sense in looking at this question ecologically as well as determining where there is the greatest benefit for the dollars invested. In that debate, species conservation remains on the table.

There is another matter that is not so apparent, especially to non-Australians. Peter Garrett represented the Commonwealth, and the *Environment Protection and Biodiversity Conservation Act 1999*. It is not the most important piece of wildlife legislation in Australia. Of greater importance is the various States' legislation. In NSW, the two critical Acts for fauna are the *National Parks and Wildlife Act 1974* and the *Threatened Species Conservation Act 1995*. The Commonwealth only has responsibility for species listed under its Act, and even then, those species are also state responsibilities. Some species, even famous and iconic

species such as the platypus *Ornithorhynchus anatinus*, are covered by State legislation, and in NSW the platypus is not a threatened species. It is covered by the *National Parks and Wildlife Act 1974*, along with 74% of the fauna of NSW. The case has been made that they are the neglected 74% because of the conservation emphasis given to threatened species (Lunney *et al.* 2004). The recent position adopted by Peter Garrett may push them even further out of sight. Since they are not a federal responsibility, they are not within the meaning of Garrett's speech. This division of power between the States and the Commonwealth can be confusing, but it does need to be identified in the debate over priorities and any discussion about the abandonment of conserving species.

Besides the scientists speaking at conferences, or being interviewed, scientists can also write opinion pieces, such as that by Roger Short, a professor at the University of Melbourne. He wrote a strong piece in the *National Times* on 5 October 2009. The title of his article put his main point succinctly: *The problem with our environment is too many of us*. The opening paragraph presents a challenge, as well as an explanation of the current stalemate on managing carbon emissions: "Natural selection has ensured that we are well-endowed with selfish genes. We will always put self before family, family before community, community before country. Hence efforts to get international agreement on controlling global carbon emissions will always be bedevilled by the 'after you' syndrome." The article then presents some tough facts: "The latest report of the UN population division of March 11, 2009 shows that the world's population is 6.8 billion, and is expected to exceed 9 billion by 2050. When I was born in 1930, there were only 2 billion people on Earth. What has happened to cause this staggering increase, and for how long can it continue?" "Perhaps there is some hope. A young PhD student at the London School of Economics, Thomas Wire, has just carried out a detailed cost-benefit analysis of all the ways in which we might be able to reduce future carbon emissions. His startling conclusion is that it is family planning that is one of the cheapest ways of combating climate change. Each $US7 spent on basic family planning would reduce carbon dioxide emissions by more than one tonne, so family planning must be seriously considered at Copenhagen. This fits in rather well with our own thinking. In January 2009, the University of California at Berkeley hosted a two-day discussion of 'The World in 2050', with 42 participants from all around the world. The conclusion was that it was rapid population growth in some regions, combined with increasing affluence and explosive growth in fossil fuel and natural resources consumption, that was seriously endangering a broad range of natural systems that support life." "The manuscripts from our Bixby conference in California have just been published by the Royal Society of London as a theme issue of its Philosophical Transactions – Biological Sciences, entitled 'The impact of population growth on tomorrow's world'. The Royal Society has agreed to give a copy to each delegate attending the Copenhagen Climate Change Conference." This piece demonstrates the value of scientists entering the field of journalism. This is a well-written piece that is both sound science and engaging writing. We need more of it.

Local reporting

The local press, the regional newspapers, report disasters in their local area, although the heading is not about the concept, but often the reporting of an incident, a point of view, a conflict, or even a good news story where an impending disaster was averted for an individual animal. Under the heading, *Wombat brings highway to a complete standstill*, the short article in the *Eden Magnet* (6 August 2009, no reporter mentioned) stated that "National Parks and Wildlife Service staff travelling the Princes Highway between Narooma and Bega were forced to leap into action when a fully grown wombat brought highway traffic to a halt by standing in the middle of the road." Under the heading, *Free at last*, Matt Deans (*Coffs Harbour Advocate* 14 September 2009) reported that "A four hour rescue mission has successfully saved a humpback whale that became snared in ropes attached to a fish trap off Mullaway Headland. "Increasing whale numbers and human use of the oceans mean that there is a greater chance whales can be entangled in fishing gear, nets and ropes," NPWS Area Manager Glenn Storrie said."

The local press was enlisted under the heading, *Illegal yabby traps are killing our platypus* (*Macarthur Chronicle* 8 September 2009, no reporter mentioned). The article stated that: "One of Australia's leading platypus biologists has joined the Wollondilly Council and the National Parks Association Macarthur Branch in raising awareness about the dangers of yabby traps. The illegal use of the Opera House-style traps in the Wollondilly's waterways is killing many platypuses each year. The traps are a problem for platypuses because the rare creatures enter the trap to eat the yabbies and then, unable to get out, they drown. Platypus biologist Tom Grant, of the University of NSW, says several measures could be taken to reduce mortalities. "First, there needed to be greater public awareness of the laws relating to yabby traps", he said." This is a neat example of a disaster for wildlife, in this case platypus, that has been highlighted by the local press to help prevent the problem. The *Illawarra Mercury* (29 August 2009) took the same supportive approach. Under the headline, *The fight against the ferals*, Michelle Hoctor reported in Churchillian language: "We're fighting them on the beaches, the sporting fields, the streets and in the hills, but surrender is unlikely from the feral animals of the Illawarra." "Top of the list are deer, which remain a concern even after an intensive, 12-month culling program undertaken by the National Parks and Wildlife Service in the Royal National Park in 2008-09. Others are the European rabbit, feral cats, dogs, pigs and goats, foxes, carp and myna birds." This is a positive story in what can be a contested area socially, namely killing animals because they are a pest. However, the issue becomes more complicated when the animal is native and threatened. Consequently, the issue of wildlife management also features conflict.

Under the heading, *Fox killers are 'unlawful'*, Katrina Vella (*Hawkesbury Gazette* 2 September 2009) reported that: "An expert panel has found that the shooting of grey-headed flying foxes as a method of mitigating crop damage caused by the vulnerable species is unacceptable both ethically and legally. The conclusion is one of many

which were found after the long awaited report on flying-fox licensing. This allows licensed farmers to shoot a quota of [flying] foxes to protect their orchards."[4] Under the heading, *Wildlife laws not working: campaigner*, the *Bay Post* (no writer was named) reported that, "Logging of Bermagui forest is providing a perfect example of how Australia's laws to protect wildlife are not working, according to forest campaigner Harriet Swift." "She said that in Bermagui forest, where logging resumed this month, about 1000 of the highly endangered swift parrots were sighted feeding during their winter migration. "In spite of this, no meaningful measures are being applied to protect them from logging of their feed trees. Forests NSW says in its Harvest Plan that it will keep five trees per hectare for the parrots, but, in practice, this means nothing extra for them. The five trees to be saved are likely the same five trees that have been saved for every other purpose, such as 'recruitment' habitat and so on. They are just adding another label onto the same trees." "It is time the RFAs [Regional Forest Agreements] were scrapped and wildlife given meaningful protection from logging", she said." In both these accounts the wildlife has had a central role in the story. The difficult task of deciding priorities – orchards and logging, versus wildlife conservation, both of threatened species where continued killing and loss of habitat would matter – was noted, but not resolved. However, these local accounts were plain about the views of at least one participant in the debate.

The more vexed issue of hunting in national parks gained widespread coverage through rural NSW. The *Blue Mountains Gazette* (23 September 2009) reported, under the heading, *Society says no to hunting in national parks*: "The Blue Mountains Conservation Society (BMCS) claims the NSW Government is sending mixed signals about legislation that could lead to hunting in national parks. "The political reality is the Rees Government does not have a majority in the Upper House", BMCS president Tara Cameron said. "The Government needs the Shooters Party votes to get their legislation passed and the Shooters' price seems to be to allow hunting in national parks and the establishment of private game reserves"." Ben Pike of the *Macarthur Chronicle* (15 September 2009), under the headline, *Parks the target*, reported that, "Residents, conservation groups and animal rights activists fear Thirlmere Lakes National Park and more of Bargo State Conservation Area will be opened up for commercial exploitation if hunting at the sites is permitted. The Shooter's Party is proposing a Game and Feral Animal Control Amendment Bill which would open up the state's 788 parks and reserves to hunters to shoot feral and native wildlife, including birds." A different point of view was reported by Bevan Shields in the *Central Western Daily* (31 August 2009), with the major heading, *Returning Fire*, and the minor heading, *Hunters stick to their guns on national parks bill*. The report stated that: "District recreational hunters have defended a bill that will give shooters entry into the state's national parks should the legislation be passed by lawmakers this week." The debate about hunting has exposed deep divisions in the community, including the role of national parks and nature reserves, the right to shoot, and the difference between hunting feral animals and native species. The disaster implied in this argument is that national parks have been set up, *inter alia*, as sanctuaries, therefore hunting in the sanctuary puts our already threatened wildlife at further risk. However, the issue is not that straightforward, with related issues, such as danger to people and the encouragement of shooting animals for pleasure and gun culture being among them. The word 'disaster' does fit the case for one side of this issue, and that makes it good media, but in this case its social and political dimensions gave it added prominence in the media.

Discussion

The media as an industry

The media thrive as a separate industry to academic science and the careful policy and management world of government departments. If scientific information is readily available, the media draw upon it, and express it in plain English. This interpretation opens up the opportunity for a lot more science to be included in media statements on wildlife and disasters, and for more wildlife scientists to present their material to the media. However, as anyone working in this field knows, science is not value free, nor free of misinterpretation. Some topics are fraught with chances to exploit divisions within the community, and therefore in the political arena. Such topics include climate change, control of alien invasive species, fire management, logging of native forests, managing kangaroos, Japanese whaling and species extinction. Nevertheless, disasters do occur, the media do report, the issues of wildlife get touched upon lightly, occasionally substantially, or, most often, are not mentioned. From the point of view of managing our biodiversity, these latter are chances lost. Equally damaging is that disaster reporting, and general news reporting, often uses 'feel-good' wildlife stories to counterbalance the bleakness of so much of the news, especially when it is very bad (e.g. end story of TV news bulletins). The rescue and rehabilitation of a lone Koala from the February 2009 Victorian bushfires, or the birth in a zoo of an international 'endangered species', is always reported, as though we can relax, that species will be OK now, when as scientists we know that is not the case.

The media are pervasive and powerful, and ecologists should be uneasy about the emphases in the media's presentation of wildlife responses to disasters. Lunney and Matthews (2003) and Lunney and Moon (2008) critically examined the print media in relation to wildlife and concluded that, while basically fair to science, it is selective in its reporting, with an emphasis on the sensational, and a narrow range of what makes up our native fauna. There is an ethical issue in this. The Journalists' Code of Ethics (www.alliance.org.au/resources/media/) forbids giving 'distorting emphasis', pointing out that 'journalists describe society to itself'. Ecologists concerned with wildlife conservation are interested in long-term studies, sound experimental design and rigorous standards in publication. For the

4 This subject is covered in Divljan et al. 2011.

media, a bushfire, a tsunami or an oil spill are instant events that are spectacular and make sensational and immediate news. For example, under the charged headline, *Wildlife die as oil slick leaves explosive pollution*, environment reporter Ben Cubby opened his account dramatically: "Sea birds, turtles and fish are being choked to death by an oil slick lapping Queensland's Moreton Island and Sunshine Coast caused by a cargo ship carrying hundreds of tonnes of explosives which was damaged when caught in the aftermath of a tropical cyclone." (*Sydney Morning Herald* 13 March 2009). This article presented a direct link between pollution from a disaster and a tragedy for wildlife. However, reports of disasters are usually of human tragedies, and this captures everyone's imagination, sympathy and desire to help. The political and public response is usually quick and generous. Wildlife does often gain a minor mention, and some engaging photos and stories are presented. The questions that arise for ecologists and wildlife managers are both immediate and more searching. The immediate questions include: what species are reported in the media; what is regarded as a response; who is consulted, and is rescue possible or reasonable? The more reflective questions include: what is a disaster for wildlife; do the media presentations cause problems or create difficulties for wildlife conservation, or conversely, provide benefits; do scientists play their part in commenting on, or studying, disasters; and is there any chance that a more constructive relationship can exist between the frames of reference of those in the media and the wildlife ecologists and managers?

Role of the media following disasters

Vasterman *et al.* (2005) examined the role of the media in the aftermath of disasters in relation to health. Their conclusions reached beyond their own discipline, and are most relevant to conserving our zoological heritage. They concluded that people tend to adopt the explanations offered by the media and integrate them into their own story about their own health complaints. On the other hand, they also concluded that there is a positive role of the media by informing, educating or communicating with people. They add that there are few studies that have explicitly examined the role of the media in the aftermath of disasters.

In a reflective piece, with an economic bent, Miles and Morse (2007) drew on the observations of Vasterman *et al.* and examined the role of the news media in natural disaster risk and recovery. They considered four types of capital – natural, human, social and built – and concluded that natural capital received relatively less attention in the media coverage of recent disasters. They commented that the media's role in building social cohesion and constructing narratives has made it an important element in social change, such as by contributing to problem definitions. A wildlife scientist might frame this as: what questions should we ask, and how do we state our objectives clearly in any study of a problem? In fact, basic as such a statement seems to be, it is one that bedevils much of the wildlife management debate, such as how to allocate scarce resources with alternative uses to address the seemingly endless questions of conserving biodiversity, including disasters.

Who determines priorities for wildlife conservation: media or scientists?

An argument can be mounted that if scientists cannot be clear about their own objectives and priorities, they will not obtain public support or funding, and in a vacuum, the media will define the issues in their own terms. Disasters can bring such matters to a head, with the media calling for action, or more simply, the issues that are reported are the ones most likely to receive attention. This matter has been the subject of intelligent analysis. For example, there have been repeated calls for a better definition of our objectives on how to allocate funds to the recovery of threatened species. Consider the questions posed by Possingham and Wintle (2009) in *Decision Point*: "Research in decision science is energising because it's about real problems and requires diverse skills. And AEDA [Applied Environmental Decision Analysis] researchers have made important contributions to the big issues in Australasian environmental management. These include: How should a threatened species recovery budget be most effectively allocated? How should *Caring for our Country* funding be spent? How should the return on investment in *Caring for our Country* be monitored and reported? How should we prioritise spending on climate change adaptation to avoid species' extinctions? What are the complex patterns of woodland biodiversity recovery in restored landscapes? How should we manage fire regimes for biodiversity? How effective are marine reserves in increasing fish stocks?"

The juxtaposition of their plea with a media analysis may help explain why they have been having such an uphill battle to state the scientifically obvious. Their topics are of central media interest, so the media have been defining the problem in their terms, yet they are not ones that readily allow a decision point to be achieved (http://www.aeda.edu.au/news, accessed 5 October 2009). By making this link, we hope to extend the readership of their concerns and questions, and agree that it is energising. However, we add that there is much advantage in gaining more regular media coverage of these issues. In fact, Hugh Possingham is an accomplished media performer, he has seen the link, but we do need more scientists with his clarity and courage. We also need more scientists to be journalists, such as Paul Willis (2005, 2007).

Out of sight and out of funds

Wildlife, as seen in academic journals, can count for little in the media. The major paper by Parnaby (2009) on the taxonomic treatment of a bat species formerly known as *Nyctophilus timoriensis* will never be headline news, but such knowledge is part of the infrastructure of biological science, i.e. the natural capital. At best, Parnaby can hope to be cited by fellow taxonomists and authors of field guides, but along with a tiny tribe of fellow specialists, his work is out of sight and out of funds. Yet, in NSW, 20 of the 36 species of bats are threatened with extinction (Lunney *et al.* 2000, 2011; Eby and Lunney 2002). Parnaby's study of two decades has now helped clarify where fellow bat biologists might focus their efforts. After his new species are considered by threatened species

committees across Australia, it is likely to be concluded that *N. timoriensis*, currently listed as a threatened species, should be reclassified as a number of threatened species, causing our list of threatened species to grow. Parnaby has contributed to a better definition of our fauna – our natural capital – and its status as threatened species. He is not a media hero, and one can trawl through the media reports and not find the word taxonomist. Museums, the repository of the specimens upon which such taxonomic research is conducted, are rarely mentioned either. This point is drawn to the attention of those allocating funds and other support to ensure that such fundamental work is sustained, and that the experts in this field stay in it (also see Hutchings 2010, 2011).

In a similar vein, it is apparent that some of the most fundamental concerns of conservation biologists, wildlife managers and working ecologists are rarely reported, even though they arguably meet the criteria of disaster. Land clearing has been the most important matter that has led to the loss of biodiversity and created such a massive list of threatened species and ecosystems. It is not reported as a disaster, it did not occur as a cyclone, but it has cleared much of the best land in Australia. The issue arises as to how to manage such a major problem given that it is not in the public eye. Even more difficult is a syndrome, suite or succession of impacts that are not reported as a disaster. Land clearing, compounded by alien invasive species, such as rabbits or foxes, exacerbated by loss of water through over-allocation, and highlighted by drought, erosion, then climate change, is a problem that covers vast areas of Australia. The ever-increasing human population along the coast, with poor initial planning and local plans that do not contain major provisions for wildlife, are compounding the losses already incurred. This is a disaster for the coastal strip as far as wildlife is concerned, but when we are talking in terms of centuries, from 1788, it is not a disaster in media terms, it lacks immediacy. The consequence is that conservation biologists need to reframe part of their communication strategies to reflect media imperatives.

Natural disasters: an ever-richer field for study

Natural hazards can form a long list, ranging from cyclones, to dust storms, to wildfire and fauna that directly affect humans, including plagues of rabbits, rodents or locusts. Zoologically, overabundance is a major issue (Lunney *et al.* 2007).The subject of hazards, disasters and their zoological causes and consequences is providing an ever-richer field of study because of its significance for both wildlife conservation and human well-being. The scale of the subject is growing in commercial terms, as was apparent from an article on insurance (SMH *Business Day* 12 October 2009) under the headline *Executives defend rise in premiums*. Eric Johnston reported that "Natural disaster payouts since 2007 of nearly $3.4 billion were more than twice the 20-year average for payouts linked to disasters." Johnston reported that Bernadette Inglis, group executive for personal insurance for Suncorp, said that Australia had suffered significant weather-related events in recent years, from fires in Victoria and severe floods and storms across NSW and into Queensland. The personal loss here would be referring to property. Not costed is the loss of wildlife. One might infer that, if the fires and storms are causing so much more property damage in recent years, then the loss of wildlife would also be significant. A question arises as to which wildlife, and how do we cost it, or how do we cost the support for wildlife. Economists Wilson and Tisdell (2005) examined knowledge of wildlife, using a sample of tropical bird species as a case study, and willingness to support their conservation. They found that respondents to their experimental survey allocated more funds to the better-known and more common species, unless they were provided with balanced information about all the selected species. What leaps to mind in the context of the media is the impact on conservation priorities given that the media tend to favour some species over others. The answer to that question reaches the underlying theme of this paper.

A sociological perspective

In their paper on *One hundred questions of importance to the conservation of global biological diversity*, Sutherland *et al.* (2009) framed questions 67-100 to consider organisations, social context and conservation interventions. This stated clearly that conserving biodiversity is embedded within the society in which we live, both locally and in the world. The word media does not appear, and it is not clear that the authors saw the media as playing a key role. By implication from their writing, the media would reflect, rather than lead, public opinion. The authors consider that, "For decision makers eager to strengthen conservation organisations and foster more effective conservation policy and practice, social scientific research examining conservation organisations themselves may yield valuable insights." To us, the inclusion of 'and the media' after 'conservation organisations' would be warranted. Then one of the topics would be specific to the media and, we would argue, it is not only a topic for social research, it is a proper topic for scientists and wildlife managers, especially those who are keen to conserve our biological heritage.

Croteau and Hoynes (2000) examined the media and society as sociologists. We await a complementary text by conservation biologists, but the sociological perspective does provide vital insights into the subject of conservation biology and the media. Croteau and Hoynes make the observation that we do not usually explore the definition of 'news'. What makes an event important, what information is relevant? It is usually left to professional journalists, so to understand the news, we need to understand how journalists work. This is a call to understand how to make a slowly unfolding environmental disaster newsworthy. Conversely, it helps us read a news item from a new perspective. It is not a paper to a scientific journal, it is what can be assembled quickly, and an experienced journalist will call on considerable background material, existing views and key players (while an inexperienced journalist may produce a poor report). Croteau and Hoynes pointed out that media products are created by professionals who follow a relatively stable set of practices, and that one of the principal resources is fame, or stardom. This is where Garrett, Kingsford, Flannery, Lindenmayer

and Possingham, and now the climate change scientists, have been so successful, and so influential. To the extent that their views reflect those of the broader scientific community, we are well served. When there are differences, there can be an issue and some disquiet. The real case is to speak up, not try to repress those with a different viewpoint.

Croteau and Hoynes (2005), under the heading "*Dominant ideology versus cultural contradictions*", pointed out that the mass media can be understood in ideological terms as forms of communication that privilege certain sets of ideas and neglect or undermine others. Research has reflected the debate from those who argue that the media promote the world view of the powerful – the dominant ideology – and those who argue that the mass media texts include more contradictory messages, at least partially challenging world views. Croteau and Hoynes stated that examination of media content has traditionally been the most common type of media analysis, perhaps because of the easy accessibility of media products. An additional point could be added for science, and zoology in particular, that content analysis can be easy. A Koala, a red gum forest or orange dust can be photographed, and reported upon in a straightforward way, or a modest exploration of ideas could link such issues to climate change, threatening processes or the conflict over the policy implications of taking, or not taking, conservation action. Lunney and Matthews (2003) noted that some species, such as the Koala, are mentioned often, that marine mammals dominated as a group, and animal welfare was a dominant theme. A bias towards some animal groups and issues was evident, while other animals and issues, particularly invertebrates, did not feature at all, other than as pests. Croteau and Hoynes concluded that the news media do not reflect the diversity of the real world. They are biting when they added that "by its lack of diversity, media content does reflect the inequality that exists in the social world – and in the media industry." They then ask whether the media content is cause or effect. Croteau and Hoynes answer their own question, and say it is both. They add that the potential role of the media in promoting a more vibrant political process remains unrealised.

Conclusions

The aim of this study was to examine how the media report wildlife responses to disasters, how links are established among issues, and what role the media play through their selection of material to publish. Arguably the greatest current debate on the environment in the media is that of climate change. It is the one where the politics is most intense, and divisions evident on how to respond. Do we respond to our selfish genes, as Roger Short alerted us? Are we being misled by the media as to what are the important issues, as suggested by Croteau and Hoynes (2005)? Or are we just waking up to the immense problems of managing the issues of environmental degradation that have been clear to scientists for decades, but not seen as cohesively by the public (or the media audience to use a sociological term), before the advent of the climate change problem? The answer is that all three observations are true.

Croteau and Hoynes (2005) have shown how the mass media set the agenda for political action on issues of public importance. The media report 'newsworthy' events, including disasters, in a manner palatable to the general public. Decision-makers respond to this media interest. As biological scientists, our work shows us disasters unfolding before our eyes, but too slowly to be newsworthy at any given time, that is, until irrevocable harm is done. The climate change debate has alerted the public and the media to a suite of interrelated problems for wildlife conservation, and facilitated public understanding of how problems such as extinctions, invasive species, habitat loss, degradation of the Great Barrier Reef, loss of wetlands, and threats to the coastal zone and montane species, are occurring. The mass media – tabloids, commercial TV and radio, the internet – are the primary avenue for getting the message of impending disasters into the public domain, and hence onto the radar of decision-makers. Scientists have a responsibility to carry that message, in a reportable way, to the population and hence to the decision-makers. Similarly, the media have a responsibility to listen to scientists when they warn of impending disasters, to understand what they are saying, and communicate this in an interesting form to the wider community, not limit their output to popular animals and sensational events.

The argument promulgated in this paper is that weak communication of science undermines the conservation objectives of that science. Put bluntly, conservation outcomes are frequently foregone, not because the science is weak, but because the case in the media is not well argued. It follows that scientists must either become skilled communicators, or utilise those who are. Media presentation is a skill, and those with that skill attract the media, the journalists seek them out for comment. We need to value their contribution: it can be exhausting if you make a statement and you are attacked in the press, it does take courage, and it can be lonely defending yourself, even if your science is right. Media studies, journalism and similar courses, can be one way to become skilled from the reporting side, and one can see the same names of reporters covering environmental matters. That too takes skill, and it is apparent that the translation of an ecological idea to a crisp media story is more than just the importance of the issue, it is the ability to ask a sharp question and look for a brief, colourful answer. There is an ever-growing case for being trained in both science and the media, not just one or the other, and the ABC has advertised short-term traineeships in this area. There is a case for encouraging students in schools of biological sciences to undertake media studies, such as the 1-semester Science in the Media courses, or 2-year Graduate Certificate in Science Communication, currently offered by the Australian National University in Canberra, so that matters of great zoological import can be made interesting to a wide audience. We notice that some of the climate change scientists who have suddenly found themselves in the spotlight, and under attack by those with opposing views, look like scientists who have never before met the media at a personal level. It is hard to be so skilled in one discipline, in this case science, but be thrown by simple questions from sheer lack of practice at being in the media spotlight. Our suggestion is to not

join in a national debate without some media experience. If you are in a university, give your story live to someone in the media section, who will lead you more far gently than a shock jock on popular radio. Try giving a story to a rural newspaper, or local newspaper where you live, and then work up to the national media. It does take some time to become adept at seeing the question, then answering in plain English so that you can be quoted. However, this is the arena in which public and political opinion about conservation issues is forged, and without a strong contribution from science, the conservation case can be lost for good.

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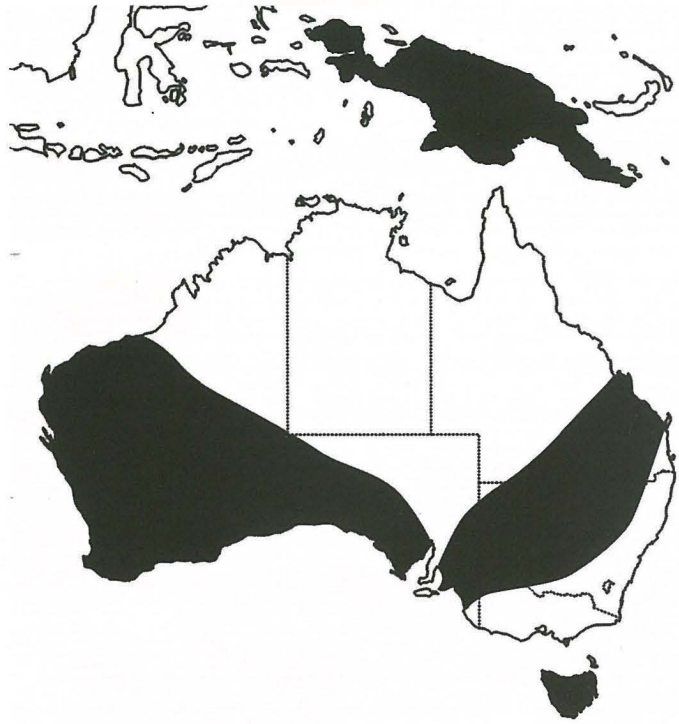
APPENDIX 1

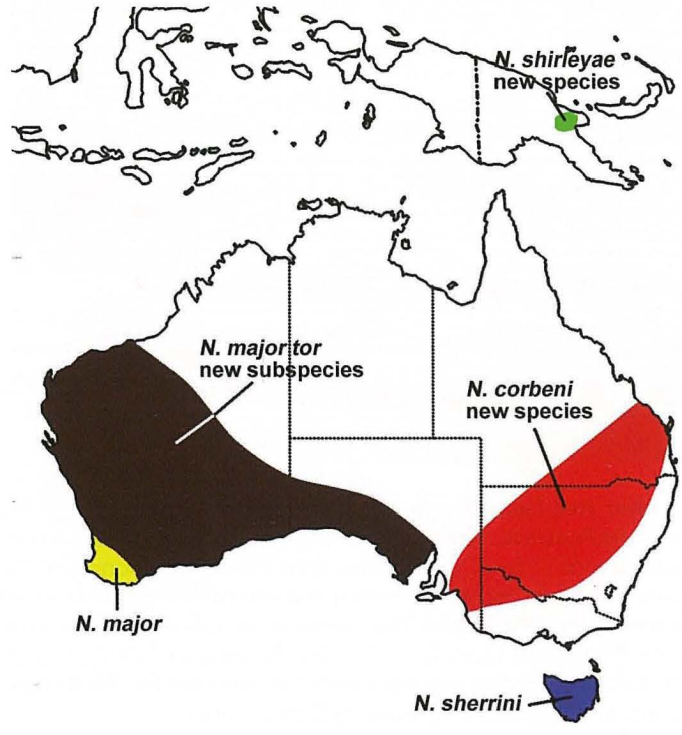
Orange dust storm. Like so many of Sydney's residents, we were astonished by the colour and intensity of the orange dust storm on 23 September 2009. This photo was taken in the inner west of Sydney. Andy Pitman (University of NSW) posed, then answered, the question: "So what role does global warming play, if any? The current drought has not been that dry. Droughts around 1900 and 1940 were probably similar. But it has been hotter than we have seen before – precisely as predicted due to global warming. It reached over 46° C (116° F) in Melbourne last summer and Adelaide recorded six sequential days exceeding 40° C (104° F). This, combined with many temperature records being broken across eastern Australia, cannot be explained without using global warming as a partial cause. And that has made the landscape very vulnerable to the strong winds. With an unusually warm and dry spring, and a developing El Niño that tends to bring drought, further dust storms should not surprise any of us." http://roomfordebate.blogs.nytimes.com/2009/09/30/australias-dust-bowl-and-global-warming (Photo by Dan Lunney).

Koala resting in a tree in suburban Campbelltown, on the south-western fringe of Sydney. The koala is an iconic species and its conservation touches much of the rich agricultural and forest landscapes of eastern and southern Australia. It is a species dependent on leaves of the trees that grow on the richer soils, which are the areas traditionally selected as farms, then linked by roads and now being encroached upon by housing estates. The koala is a threatened species in NSW, but not under Commonwealth legislation. Loss of koala populations is a disaster which the public and the media readily comprehend. This koala was part of a larger study of the natural history of the koalas of Campbelltown (Lunney *et al.* 2010). (Photo by Dan Lunney)

APPENDIX 1



a.



b.

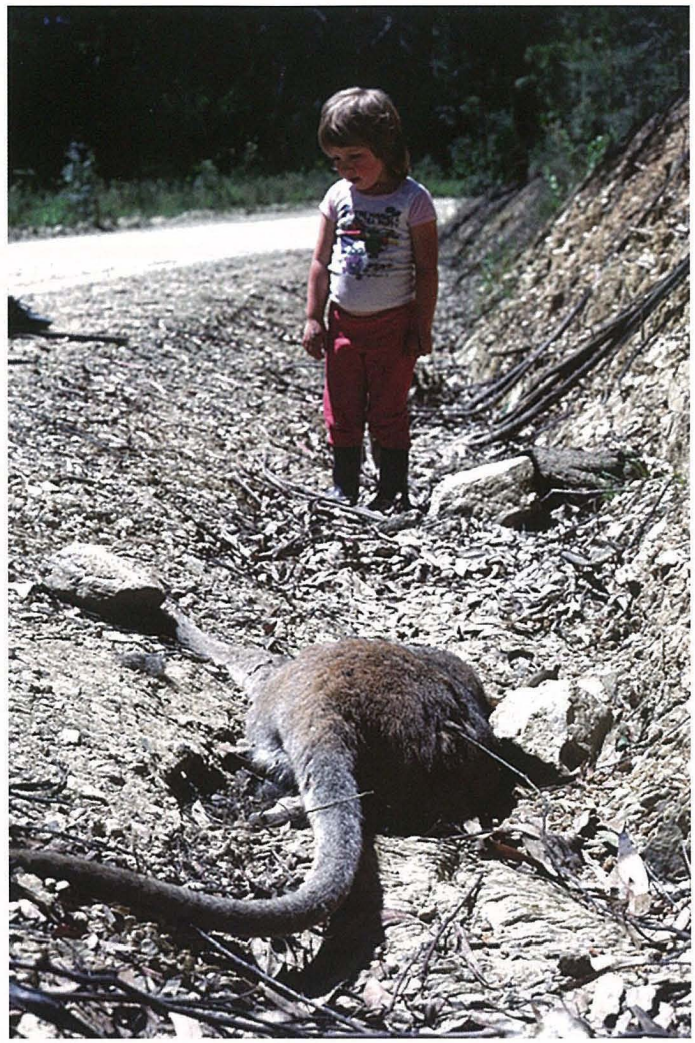
Distribution of the Greater Long-eared Bat, before and after taxonomic research. Changing concepts of the number of species of the Greater Long-eared Bat *Nyctophilus timoriensis:* **(a)** before 2009, thought to be one widely distributed species in Timor, New Guinea and Australia; **(b)** taxonomic study of Parnaby (2009) found it consisted of four species and one subspecies, each with restricted distributions: *N. major* new species (yellow); *N. major tor* new subspecies (black); *N. corbeni* new species (red); *N. sherrini* new species (blue) and *N. shirleyae* new species (green). There are no media reports of bat taxonomy, but if the skills were to fade away, distinctly possible because the subject does not attract funding, there would be a major loss to the infrastructure of the knowledge of our faunal species in Australia. This would compound the disaster of losing species, especially if they become extinct before formal recognition that they even existed, and have major implications for conservation strategies. (These maps were drawn specifically for this paper by Harry Parnaby based on Parnaby 2009).

APPENDIX 1

A camp of Grey-headed Flying-foxes in an urban setting. Land clearing has been disastrous for Grey-headed Flying-foxes *Pteropus poliocephalus*, causing some to camp in urban habitat refuges and feed in orchards. The question of how to manage flying-foxes is proving to be one of the most vexed wildlife issues, and conflict is now reported publicly, and usually unsympathetically to these large bats. The subject continued to be a media issue over 2007-2009, and many of the matters raised in Eby and Lunney (2002) remain unresolved. (Taken in Burdekin Park, Singleton, NSW. Photo by Dan Lunney.)

Old, hollow-bearing River Red Gums Eucalyptus camaldulensis are one of the most important trees in arid and semi-arid Australia. River Red Gums grow along waterways and in wetlands, and provide vital habitat for a wide suite of species. This photo was taken along the Warrego River in south-western Queensland, near Charleville. Here it is being studied as koala habitat in a project run through the University of Queensland. The media attention (e.g. Marian Wilkinson SMH 1 October 2009) on the River Red Gum forests in the Riverina in NSW includes conflict over logging. Conflict leads to an issue being reported, with the potential for disaster giving the matter the urgency that focuses media attention. (Photo by Dan Lunney).

APPENDIX 1



Wildlife killed on the road is a national disaster. The photo here of a small child looking at a recently-killed Red-necked Wallaby *Macropus rufogriseus* is not newsworthy. The media is selective in how it presents wildlife disasters in the news. (Photo by Dan Lunney)