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Support for Indigenous wildlife management in Australia to enable sustainable use

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Abstract

Wildlife managers could play a greater role in ensuring that Indigenous wildlife harvesting is sustainable and helping to address community health and employment challenges facing Indigenous Australians in remote and rural areas. Wildlife managers need to listen more to what Indigenous people say they want from their country and for their people, such as increased game to supplement their diet and security for totemic species, to maintain culture. In pre-colonial Australia, adherence to customary law maintained wildlife species Indigenous Australians wanted. Today the long-term sustainability of Indigenous wildlife harvesting is threatened. Where Indigenous communities lack leadership and other social problems exist, their capacity to apply customary land-and sea-management practices and to operate cultural constraints on wildlife use is reduced. The Indigenous right to hunt should coexist with responsible management.

Improved wildlife management that combines science and traditional knowledge has implications for Indigenous people worldwide. Western science can support Indigenous passion for caring for the land. It can draw on traditional Indigenous practice and, through reciprocal learning, help reinstate Indigenous law and culture in communities. In Australia, wildlife managers could be more engaged in supporting Indigenous Australians in activities such as surveying populations and estimating sustainable yields, identifying refuge areas, maximising habitat diversity, controlling weeds and feral animals, and exchanging information across regions.

Although support for Indigenous land and wildlife management has risen in recent years, it remains a minor component of current Australian Government resource allocation for addressing Indigenous need. Wildlife management could be a stronger focus in education, training and employment programs. Proactive wildlife management conforms to both the western concept of conserving biodiversity and Indigenous wildlife management; it can support sustainable harvesting, provide employment and income, create learning and training opportunities and improve Indigenous health. If greater expenditure were directed to Indigenous wildlife management, wildlife managers, especially Indigenous wildlife managers, could become more engaged in cultural initiatives across traditional and scientific practices and so contribute to programs that address the health and motivational challenges facing Indigenous communities.

Historical wildlife use

The arrival of humans on new continents and islands throughout the world in the late Pleistocene coincided with the extinction of mega fauna. Diamond (1992) reviewed the human expansion process and concluded that the extinctions were caused by hunting, although he was less certain about the impact on continental species than on island species. Johnson (2006) argued that the mega fauna extinctions in Australia were at the hand of human hunters while observing the earnest debate over the role of climate change and the human use of fire. Grün *et al.* (2010) has produced further evidence indicating that human, not climate, factors were responsible.

Once established in Australia, Indigenous Australians developed a new sustainable balance with the natural environment and they continued as hunter-gatherers for 40–60 000 years until British colonisation. Thus, Indigenous Australians have a long history of subsisting on wildlife. Indigenous use of wildlife existed under a framework of customary law where a moral responsibility to look after their country returned food, water and other necessities (Rose 1984). Indigenous traditional law (or 'lore') such as the '*Tjukurpa*' in the Pitjantjatjara language, was and still is based on totemism, taboos and prescribed responsibilities to the land (Collins *et al.* 1996). Importantly, Indigenous law applied constraints, such as where and when hunting and gathering could occur and by whom. In Australia and throughout the world, hunting and gathering remain important elements of Indigenous culture and connection with the land and sea, in remote, coastal and urban environments.

Our paper is an opinion piece that reviews factors that can lead to over-harvesting in Australia and proposes greater application of western science alongside Indigenous knowledge. We believe there is an opportunity, and indeed a responsibility, for wildlife scientists and governments to play a larger role in supporting Indigenous Australians to manage wildlife resources sustainably. Furthermore, improved management of wildlife has the potential to assist and sustain Indigenous communities (Wilson

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et al. 1992). We advocate higher priority for investment in Indigenous land and wildlife management.

The law, and Government support for Indigenous wildlife use

The cultural and spiritual relationships of Indigenous people with the land, sea and wildlife continue to exist. The international 'Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity' recognises the right of Indigenous people to utilise resources and harvest wildlife (Secretariat of the Convention on Biological Diversity 2004). The document also clearly stipulates that adequate policies and capabilities should be provided by governments to ensure that uses are sustainable, and to provide assistance where harvest levels need reducing (Principle 12). The concepts are also supported in the United Nations Declaration on the Rights of Indigenous Peoples, endorsed by Australia in April 2009.

The Australian legal system acknowledges land rights and the interests of Indigenous people, allowing them to conduct activities as they have in the past under their traditional laws and customs. In regard to wildlife, Indigenous hunting is substantially uncontrolled by statute law, although permission may be required from landowners to access private land. The situation varies in detail across Australian jurisdictions, and in summary, statutes exempt customary use from many constraints. For example, in the Northern Territory (NT), Indigenous people have the right to use their country in accordance with tradition for hunting and food gathering (*Territory Parks and Wildlife Conservation Act 2002* (s122)).

The size of the Indigenous estate (see Fig. 1) provides a good indication of the importance of Indigenous Australians' involvement in managing wildlife. It is over 20% of the Australian land mass or 1.5 million km^2 (Altman *et al*. 2007; Altman and Jackson 2008). The area contains vast tracts of relatively undisturbed and intact ecosystems. Furthermore,

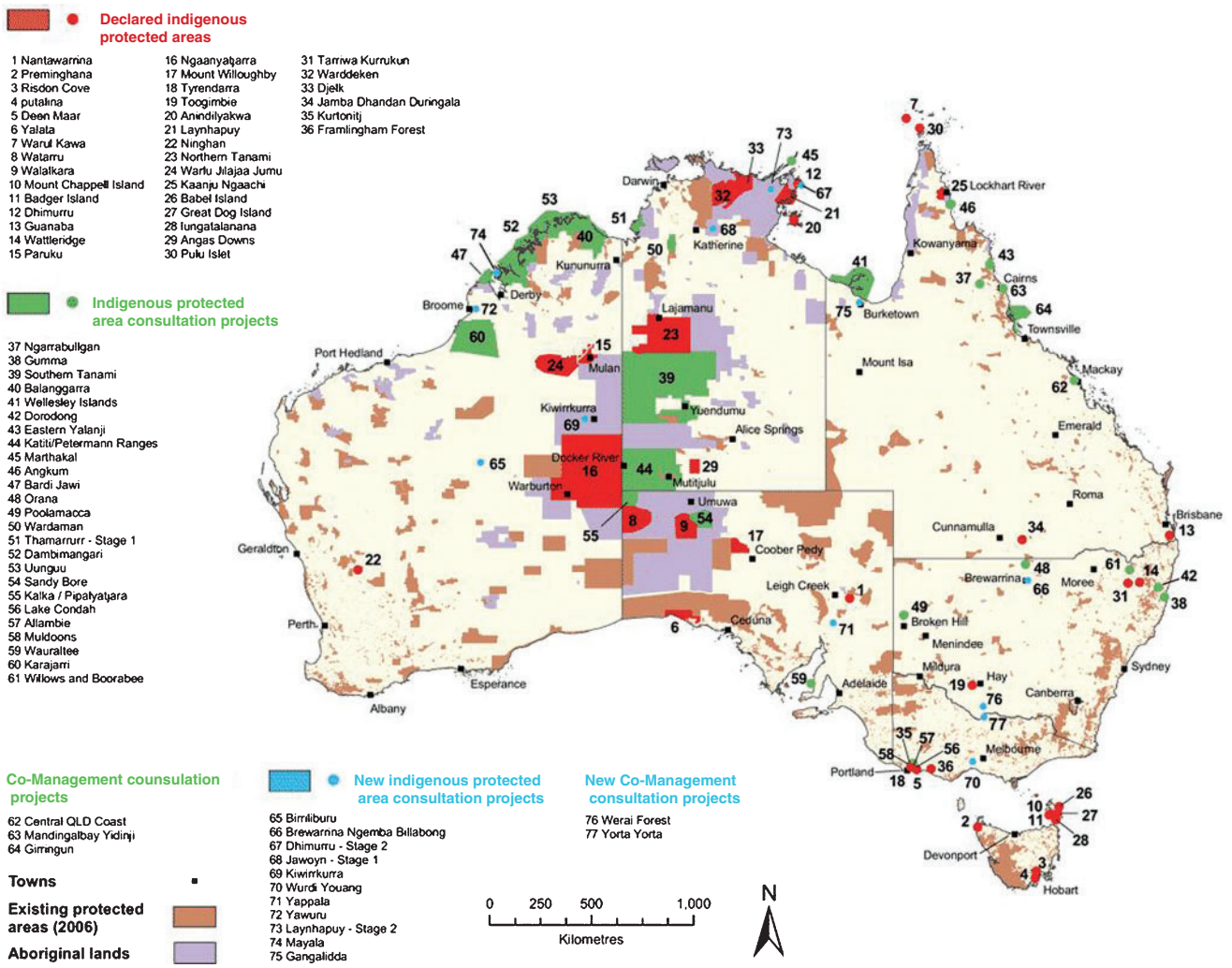

Fig. 1. The Australian Indigenous estate: Indigenous Protected Areas and Aboriginal lands (Source: Department of Environment Water Heritage and the Arts 2010).

Indigenous ownership and responsibility for coastal and marine wildlife resources is substantial and expanding. The Blue Mud Bay decision by the Australian High Court in 2008 found that Indigenous owners of land held under the *Aboriginal Land Rights Act* in the NT have an associated right to exclude commercial and recreational fishers from the intertidal zone (National Native Title Tribunal 2008; Northern Territory of Australia v Arnhem Land Aboriginal Land Trust 2008). Thus, the management of these areas should be both a conservation exercise and one of responsible sustainable use; however, so far management is sparse and under-supported for the latter purpose.

From a low base, support from government and philanthropy is growing through programs such as Indigenous Protected Areas (IPA) and Working on Country (WoC), although the focus of these programs is on threatened species and biodiversity conservation and rarely on consumptive use. Similarly in national parks and similar reserves under co-management agreements, State and Federal governments aspire to share decision-making with Indigenous communities and seek to integrate those communities into the park management as equal partners. But again support for wildlife harvesting practices and scientific backing for sustainable use is not a feature of management. More generally, Indigenous Australians are not included in management or decision-making processes about wildlife use outside reserves, notwithstanding their ready access to the resource for subsistence hunting purposes.

New technologies and circumstances are affecting wildlife harvest

The availability of new technologies and altered Indigenous circumstances are contributing to changes in Indigenous wildlife use throughout the world. Guns, motor vehicles, motor boats, chainsaws, shovels and metal digging sticks have made hunting and gathering more efficient and have increased geographic range, mobility and opportunity. Unsustainable subsistence hunting as a result of the application of new hunting technologies, greater resource access and increasing human populations is evident internationally (see Redford 1992; Levi *et al*. 2009). Today in Australia, instead of hunting kangaroo (*Macropodidae* spp.) on foot with spears and boomerangs, vehicles and guns are used; instead of hunting dugong (*Dugong dugon*) and sea turtle (*Cheloniidae* spp.) in canoes or from platforms, motor powered dinghies and metal harpoons are used (Kwan *et al*. 2006). We do note that in some circumstances, increased mobility can spread hunting pressures and reduce localised exploitation around settlements (Bomford and Caughley 1996).

The adverse impact of new technologies, unregulated harvests and unlimited access is not confined to Indigenous wildlife use. For example, 80% of world fish stocks are over-exploited because of applications of improved fishing technologies (increasing size and rates of catch) in conjunction with unregulated harvest rates and unlimited access (Food and Agriculture Organisation of the United Nations 2009).

Other Indigenous circumstances that have an impact on hunting pressure are also changing. Indigenous family groups are no longer nomadic and human populations have aggregated and increased, raising the pressure on local wildlife resources. Across Australia, Indigenous people have been and continue to be encouraged by programs such as the Territory Growth Towns program to move to towns and settlements that are not on their traditional lands and, as a consequence are less constrained by local Indigenous laws and customs (Department of Housing Local Government and Regional Services 2009). Cultural obligations to share meat amongst the family, community, and even distant diaspora, can also bring pressure on hunters to increase harvests in some communities (Kwan *et al*. 2006). Indigenous law, as a mechanism to regulate wildlife harvesting, is less likely in communities in which the authority of elders is diminished, leadership is lacking and there is a range of social, economic and health problems including substance abuse. Anangu elders in central Australia, the *Tjilpis* and *Myinkmaku*, have told us they believe many social and health problems are the result of a breakdown in the old ways, and that implementation of *Tjukurpa* (Indigenous law) and restoring the land would help solve these problems (Wilson *et al*. 2005).

Prior Indigenous ecological and cultural management practices have been disturbed, which in pre-colonial times constrained hunting pressure. Therefore, in a changing world, is it realistic to expect Indigenous people, particularly in remote areas, to manage the use of their wildlife resources with little or no scientific support? We advocate that western science and Indigenous knowledge can combine to generate sustainable wildlife use.

Is current Indigenous hunting sustainable?

In raising the question 'is current Indigenous hunting sustainable?' our aim is not to be critical of the rights of Indigenous people to carry out customary practices, but to emphasise that the Indigenous right to hunt should coexist with management that accounts for all factors affecting sustainability. We do not question that there are non-indigenous anthropogenic activities, such as habitat destruction, predation by feral animals and climate change that also threaten wildlife populations. Our contention is that these impacts are compounded by over-utilisation processes on Indigenous land, especially in more arid lands and for some marine species. We do note that recent changes in gun control laws that restrict access to rifles and rising fuel costs are likely to be limiting the mobility of hunters and lowering hunting pressures. We also recognise that some Indigenous communities have used, and appear to continue to use, their wildlife resources sustainably (Altman 2003). However, in such circumstances, the hunted populations usually have high population growth rates, and are supported by more productive habitats, and/or are under lower anthropogenic environmental pressures.

In the Indigenous land in central Australia where ecosystem productivity is low, many wildlife populations are threatened. Popular *kuka* (game) species, such as emus (*Dromaius novaehollandiae*) and Australian bustards (*Ardeotis australis*), are hunted as soon as they are sighted or nests with eggs are located (G. R. Wilson, pers. obs. 2009), regardless of the expressed desire by Indigenous groups to increase animal numbers (Wilson *et al*. 2004). Hunting is directly threatening bustard populations (Ziembicki 2006), and emus and bustards

are classified as vulnerable in the NT (Department of Natural Resources Environment the Arts and Sport 2007).

On Angas Downs, a 3000-km^2 Indigenous-owned property in central Australia, between 208 and 260 red kangaroos (*Macropus rufus*) were harvested per year for community consumption in the past (Rose 1965). In 2010, the resident kangaroo population does not support a harvest at these rates (P. Coombs, Anangu Elder, Imanpa Community 2010, pers. comm.). Nevertheless, the enthusiasm and demand for kangaroo remains strong and frozen kangaroo tails are favoured items in the local Imanpa store. The tails come from pastoral lands elsewhere in Australia where kangaroo populations are higher. More productive lands were appropriated from Indigenous people throughout Australia as part of the colonisation process. Today management practices for livestock, such as providing water and controlling predators, also favour kangaroos and they are hunted commercially in those areas under government-regulated management plans (Department of Environment Water Heritage and the Arts 2009).

Dugongs are culturally important to many Indigenous groups and the meat is highly prized. On a global scale, the International Union for Conservation of Nature lists dugong as vulnerable to extinction due to netting, subsistence hunting, human settlement, agricultural pollution (Marsh 2008) and episodes of sea-grass dieback (Marsh and Kwan 2008). Pre-colonial Indigenous harvesting of dugong was probably sustainable (McNiven and Bedingfield 2008); however, changing economic, environmental, social and cultural pressures, new technologies and erosion of sanctions and taboos have triggered unsustainable dugong harvest rates (Heinsohn *et al*. 2004; Marsh *et al*. 2004; Kwan *et al*. 2006; Australian Fisheries Management Authority on behalf of the Torres Strait Protected Zone Joint Authority 2007; McNiven and Bedingfield 2008). The Australian Fisheries Management Authority on behalf of the Torres Strait Protected Zone Joint Authority (2007) reported that community elders regard the practice of young men hunting dugong and turtle as culturally inappropriate.

Some traditional hunting practices could now also be contributing to unsustainability. Females are often targeted for their higher fat content, such as with harvesting of dugongs, green turtles (*Chelonia mydas*) (Roberts *et al*. 1996; Australian Fisheries Management Authority on behalf of the Torres Strait Protected Zone Joint Authority 2007), kangaroos and wallabies (Davies *et al*. 1999). This behaviour can have a significant impact on the age, sex and size of populations.

Integrated Indigenous practice and wildlife science – some examples

Indigenous resource use and western wildlife science can be integrated and so support Indigenous Australians' passion for caring for and living on their land. However, there remains a significant gap between the opportunities and the delivery of benefit to Indigenous people through involvement in land and wildlife management. Reciprocal learning that draws on traditional Indigenous practice and reinstates its place in communities, assists in maintaining Indigenous law and culture. Implementing Indigenous management practices and measuring their effectiveness is a form of adaptive management (see Wilson and Woodrow 2009) and a mechanism for building resilience (Berkes *et al*. 2000). The principles of building ecosystem resilience are strongly linked to resilient social systems and *vice versa* (Berkes and Folke 1998). Resilient ecological and sociological systems have by definition a greater capacity to withstand disturbances, shocks and tipping points (Walker and Salt 2006), which may be induced by climate change.

In more practical terms, wildlife managers can learn from Indigenous practice and use science to assist Indigenous Australians' capability to survey populations and estimate sustainable yields, identify refuge areas, maximise habitat diversity in the landscape, and exchange information across regions within a culturally specific context. Wildlife managers need to listen to what Indigenous people say they want from their country and for their people, such as increased game to supplement their diet and security for totemic species to maintain culture (see DVD *Kuka Kanyini*: *Looking after game animals*; Kuka Kanyini 2004).

An example of the integrated wildlife management we are advocating for expansion is a project by the Northern Australian Indigenous Land and Sea Management Alliance. It aims to achieve sustainable harvesting of dugong and sea turtles across northern Australia, through a process of community engagement. Traditional owner-endorsed management plans have been developed on six islands with seasonal closures, gear restrictions, restricted areas and limits on catches (North Australian Indigenous Land and Sea Management Alliance 2006*a*; Torres Strait Fisheries Management Advisory Committee 2008). However, implementation is imperfect and there is still no current catch data for dugong fisheries in the Torres Strait (Torres Strait Scientific Advisory Committee 2009). Strong leadership and authority are essential in these communities to reduce harvest effectively.

In central Australia, the traditional owners of Uluru–Kata Tjuta (Nguraritja) and Parks Australia share decision-making for the management of Uluru–Kata Tjuta (Ayers Rock) National Park and work with each other to manage and monitor the land and wildlife (Director of National Parks and Uluru–Kata Tjuta Board of Management 2010). Sustainable wildlife use is acknowledged in the plan; however, sustainable consumption is not a part of day-to-day management.

Indigenous Protected Areas plans of management are being implemented to meet environmental and cultural goals important to the traditional owners, and natural resources are being managed using traditional knowledge complemented by science. Additional support for the IPA program comes from the WoC by funding Indigenous Rangers to carry out works under their own leadership. In some instances, the IPA program is moving to integrate sustainable resource use and wildlife science.

On the Angas Downs IPA and Watarru IPA, plans of management have incorporated a framework for sustainable use of wildlife called *kuka kanyini* (looking after game animals), which was devised in discussion with traditional owners on the Anangu Pitjantjatjara Yankunytjatjara (APY) lands in South Australia (Wilson *et al*. 2004). *Kuka kanyini* captures the desire of elders such as Frank Young for increased wildlife numbers (see Frank Young in *Kuka Kanyini*: *Looking after game animals* 2004). *Kuka kanyini*

embodies proactive wildlife management by defining a sought-after outcome, and then implementing management towards that outcome. *Kuka kanyini* has in part been implemented on the Watarru IPA within the APY (Leanne Liddle, pers. comm.) and awaits wider implementation across the APY Lands. In 2010, it is early days for results on Angas Downs although there are signs that kangaroo numbers are increasing in response to feral animal control, habitat protection, provision of water and Indigenous-imposed restrictions on hunting.

The *kuka kanyini* framework draws on Indigenous land-management practices and sets out priorities for scientists to work with Indigenous wildlife managers. It describes an adaptive 'learning by doing' management process, integrating Indigenous knowledge with western science (Wilson and Woodrow 2009). Knowledge from both the Indigenous knowledge base and western science is used to improve habitats for species, increase water availability, protect refuge areas (including sacred sites), manage fire to enable habitat diversity, decrease feral animals and weeds, monitor populations and set harvest targets. In addition to increasing populations of desired species, the framework can generate wider employment for Indigenous people and, potentially, tourism opportunities.

Blending Indigenous ecological knowledge with wildlife science requires improved wildlife-monitoring programs on Indigenous lands. Indigenous participation in biological surveys is being facilitated by new technologies such as Cybertracker, an icon-based data capture system that enables non-literate trackers to gather data on wildlife populations and other environmental factors (North Australian Indigenous Land and Sea Management Alliance 2006*b*; CyberTracker Conservation 2009).

These Australian experiences of how science and technology can support Indigenous wildlife management are limited and can be informed by parallel activity elsewhere in the world. Monitoring techniques of fish by the Cree people of northern Canada combine western science and Indigenous knowledge, and offer a better outlook than either approach independently (Moller *et al*. 2004). Also in Canada, aerial surveys are used to track populations of species such as muskoxen (*Ovibos moschatus*) to determine subsistence and commercial quotas (Klein 2005). In New Zealand, a co-managed research project involving a Maori community guides customary harvest of sooty shearwater (*Puffinus griseus*) populations and identifies merits and weaknesses of both knowledge systems (Newman and Moller 2005).

In Africa, examples of integrating conservation and rural community development include the Integrated Rural Development and Nature Conservation (2010) program, Community Based Natural Resource Management in Namibia (Ministry of Environment and Tourism (Namibia) 2010) and the Communal Area Management Program for Indigenous Resources program – CAMPFIRE – in Zimbabwe (Martin 1986). These programs aim to build the capacity of communities and community leaders to manage and use their resources sustainably and productively.

Wildlife scientists should be making greater use of ecological science to help deliver what Indigenous people want from their land. Governments and philanthropic supporters could be allocating resources to improve the capacity of Indigenous people to ensure sustainable resource management and strengthen Indigenous ecological law and knowledge within individual communities. However, there are several impediments to the integration and support of Indigenous knowledge with western science.

Impediments and barriers to applying western science

Barriers can arise from cross-cultural differences in knowledge systems and institutional arrangements (Davies *et al*. 1999; Nadasdy 1999; Collins 2005; Ellis 2005). The use of language between Indigenous Australians and government management agencies can also significantly influence wildlife management through ineffective cross-cultural communication (Nursey-Bray 2009). In terms of conventional information systems and institutional arrangements, there are difficulties in comprehending and documenting the values, practices and the context underlying Indigenous knowledge and there is an unwillingness to acknowledge Indigenous-knowledge messages that conflict with the agendas of government or industry. Combining traditional knowledge and science should allow traditional wildlife users to evaluate scientific predictions on their own terms (Moller *et al*. 2004).

Indigenous knowledge is the intellectual property (IP) of the holders and represents time, effort and learning built up over many generations. Some of the data have commercial value, such as Indigenous medicines and plant compounds. Indigenous IP needs to be identified and recognised early in any project, be it management, science/research or commercial. Effective mechanisms need to be in place to ensure that the IP is protected (Githaiga 1998; Marinova and Raven 2006). In Australia, there are various resources and protocols for dealing with Indigenous IP, such as protocols developed by Biotechnology Australia (2001) and the Desert Knowledge Cooperative Research Centre (2008). The process of integration can serve to concentrate power in administrative centres rather than in the hands of the Indigenous people (Nadasdy 1999).

Indigenous people may be unable to disclose information about places and wildlife because holding that knowledge is restricted to initiated people, or persons of a prescribed sex, age or family relation. Procedures for collecting and recording information and managing access, while honouring constraints, have been developed; for example, the Ara Irititja project (Dallwitz 2009) – a community-based initiative designed for Anangu, which obtains and electronically stores Indigenous knowledge, photographs, film and sound, documents, books, magazines, diaries and artworks. It provides private, uncensored, family and community history to those that are allowed to view it. In 2010, land and wildlife management is being added.

The levels of health, education, life expectancy and living conditions are significantly lower in Indigenous communities than in non-Indigenous communities. The situation was reiterated in July 2009 when the Productivity Commission reported that there had been little change or improvement in the key indicators of Indigenous disadvantage despite targeted policy (Steering Committee for the Review of Government Service Provision 2009).

Low literacy levels also present difficulties for communities to set and operate self-imposed or quota-based restrictions. In the past, Indigenous wildlife managers hunted game sustainably without literacy or numeracy. In general, Aboriginal languages do not generally have numbers and counting systems (Blake 1991; Goddard 1996). Currently, wildlife science, counting and monitoring of harvests are prerequisites to ensure sustainability.

Programs to overcome impediments and barriers need to be cross-disciplinary. Conflicts with wider ideological and political agendas need to be addressed. Furthermore, some Indigenous people may be reluctant to share knowledge because they do not trust wildlife managers or scientists and barriers may arise where there is history of conflict as a result of dispossession. Taking these issues into account, we believe the barriers and impediments above are outweighed by the environmental, social, cultural and economic benefits of blending western science with Indigenous knowledge.

Sustainable wildlife use can address Indigenous disadvantage

Greater support for Indigenous involvement in wildlife management will not only increase wildlife populations and western concepts of biodiversity conservation but also enable greater sustainable use of wildlife by Indigenous Australians. Furthermore, there are many social benefits from involving Indigenous Australians in natural resource management (Hunt *et al*. 2009). 'Being-on-country' for reasons that are a priority to Indigenous people could play a greater role in reversing some of the causes of community dysfunction – contact with the criminal justice system, domestic violence, low educational achievement, high unemployment, poor health and substance abuse. Active involvement in wildlife management can reconnect people to the land and sea, and communities and individuals to the values of Indigenous law and customs.

Wildlife management also provides a framework for maintenance and passage of Indigenous culture and ecological knowledge to younger generations. It can provide economic development opportunities and job creation in a sector that is important to Indigenous people – as well as tourism and bush-tucker enterprises – thus tackling the poor employment statistics. Improved school engagement and educational outcomes, motivation and job-readiness have been examples of documented benefits (Hunt *et al*. 2009). Stories about the land, sea and wildlife also underpin many of the paintings in the highly successful Indigenous art industry.

There are flow-on benefits for Indigenous involvement in wildlife management and increasing the number of food species available to supplement the diet. Bush tucker replaces processed foods, increases physical activity and hence improves health and well-being. Research confirms the reciprocal benefits of this relationship. Burgess *et al*. (2009) reported that participation by Indigenous people in land management brings significant health benefits, including a reduction in obesity, blood pressure, diabetes and kidney and cardiovascular disease.

Being involved in land and wildlife management also engenders a sense of pride, ownership and responsibility among Indigenous people; it has a high priority in Indigenous eyes. Research to explore the options and involve Indigenous people in natural resource decision-making and management is needed. If science and Indigenous wildlife management work together and more resources are provided, Indigenous capability to manage land and wildlife resources will be improved and decision-making powers can remain with Indigenous groups.

Recent Australian Government expenditure

Closing the Gap between Indigenous and non-Indigenous Australians is a major government priority. The Australian Government, together with State and Territory Governments, are committed to delivering large investments to address health, and social and legal issues affecting Indigenous Australians and to 'working with Indigenous Australians to ensure they are able to fully participate – both socially and economically – in the life of the nation' (Prime Minister of Australia (Media Release) 2008). The emphasis is on the promotion of enterprises and encouraging Indigenous people to move from welfare into work. In 2008, the Council of Australian Governments (COAG) agreed to initiatives totalling $4.6 billion for Indigenous Australians to improve early childhood development, health, housing, economic development and remote service delivery through the National Indigenous Reform Agreement (Council of Australian Governments 2008).

Although expenditure in Indigenous land and wildlife management has risen in recent years, it remains a minor component of current resource allocation. Of the $4.6 billion committed by COAG for 2008–13, only 3% or $150 million (Department of Families Housing Community Services and Indigenous Affairs 2009), will be directly spent on Indigenous involvement in natural resource and wildlife management. This is despite the high priority placed on land and wildlife management by Indigenous Australians and the documented social, cultural and economic benefits. Altman (2009) described the Closing the Gap policy as 'failing to accommodate Indigenous goals and aspirations in all their diversity' and questioned how such a policy can lead to improvements. Other funding is available for Indigenous land management, including through the Indigenous Land Corporation budgets.

The broad Caring for our Country Program, within which IPA and WoC programs sit, does not fund wildlife enterprise development, and bush-tucker production even for local consumption is largely excluded. Such a policy position cuts off the benefits that can flow from successful income-producing wildlife-management initiatives. Ironically, through the Australian Council of International Agricultural Research (ACIAR) Australia does fund research and management to underpin economic development of indigenous peoples overseas, whereas there is no such dedicated research funding program for Indigenous Australia.

Conclusion

Wildlife managers should be empowered to support Indigenous ecological law and knowledge and use science to help deliver what Indigenous people want from their land and to address the challenges facing Indigenous communities. Although not the sole cause, there is growing evidence that current hunting pressures from Australian Indigenous people are threatening

the long-term sustainability of some of Australia's native species. Evidence of over-hunting by Indigenous people throughout the world is also available. In drawing attention to this situation and making these assertions, our aim is not to criticise the rights of Indigenous people to carry out customary practices, but to emphasise that the Indigenous right to hunt should coexist with responsible management. We want to encourage discussion on the topic of an unregulated harvest and its potential impact on wildlife populations. With responsible management, subsistence hunting to supplement the diet and for cultural purposes of even threatened species, such as the dugong and emu, has every chance of being sustainable and providing multiple benefits to Indigenous people.

Expenditure and support for Indigenous communities should have a greater emphasis on land and wildlife management, to greater reflect Indigenous goals. A program of scientific support integrated with Indigenous ecological knowledge for looking after game animals – such as *kuka kanyini* – will ensure Indigenous people continue to hunt wildlife, while increasing the wildlife population base from which they take their resources. It will also build resilience in Indigenous communities through economic development, culture maintenance and improvements to Indigenous health and living arrangements.

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