

# Hunting, Magic, Maintenance Ceremonies and Increase Sites Exploring Traditional Management Systems for Marine Resources in Northern Cape York Peninsula.

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## Abstract

Emerging archaeological evidence from archaeological sites in northern Cape York has the potential to shed light on indigenous cultural practices relating to turtle hunting. This paper explores the nexus between cultural practice and indigenous ecological knowledge and 'lost' knowledge which has implications for how Traditional Owners may choose to manage resources today. Often when we hear of Indigenous environmental management techniques the focus is on management 'practices' e.g. mosaic burning, rather than 'systems'. While not denying that some practices may be useful or cost effective alternatives to other 'western science' based land management practices the question needs to be asked: how effective can these be in ecosystem management if adopted in isolation of the other components of Indigenous management systems?

Lines (2006) has challenged the efficacy of Indigenous management systems and questioned their sustainability but provides little evidence that he understands the complexity of such systems and the interrelationship of nature and culture, or indeed that he believes such systems exist. A more valid question is, what happens to these complex systems when key elements are discontinued, lost or destroyed? Perhaps if we, in partnership with Aboriginal communities, explore the changes to such systems over time we can begin to understand the consequences of these changes and the implications for long term species and ecosystem management. This paper provides preliminary outcomes of a current archaeological project which may further this discussion.

At the time when European's were first recording observations along the Cape York Peninsula coastline, Aboriginal people and their Torres Strait Islander neighbours were hunting and consuming turtle and dugong in numbers great enough to be remarked on. Sites comprising heaped turtle and dugong bones were noted and in some cases sketched. Populations of both animals were however extremely healthy, the size of herds of dugong (Thorne 1876; Jackson et al 2001) and the proliferation of turtle were also remarked on. Was this just some kind of coincidence or was there an Indigenous system in place that actively contributed to the sustainability of this resource?

## Introduction

This paper explores the current situation regarding indigenous use of marine turtles in northern Cape York and uses archaeological and historical/ethnographic information to identify changes in this 'indigenous system' in recent times. In doing this I stress that this is a 'work in progress' and it is expected that on-going research will continue to illuminate this issue. Ongoing research in Northern Cape York (Greer et al. 2005; Greer et al 2011 submitted) is looking more broadly at change and influence in this border between mainland Australia and the Torres Strait Islands. This paper focuses on evidence from some sites in Northern Cape York first described in 1848 and considers their potential to inform current indigenous practices within the context of current discussions on the value of Traditional Ecological Knowledge (TEK), the resilience of Indigenous knowledge systems generally and an apparent backlash against the incorporation of these into current conservation efforts, particularly as summarised by Lines (2006) in his book *Patriots: Defending Australia's Natural Heritage*.

In 1848 Oswald Brierly (later renowned as maritime artist to Queen Victoria) was travelling as the naturalist aboard HMS Rattlesnake as it undertook hydrographic surveys of the coastal reefs around Cape York Peninsula and the Torres Strait. Amongst his many sketches recording his observations was



Figure 1 Location of Study area

one of a stone cairn located on a small rocky islet. This site was relocated during archaeological field work in 2003 (McIntyre-Tamwoy and Harrison 2004). Excavations by McIntyre-Tamwoy at the site in 2007 revealed a shallow midden of shell and turtle bone associated with the Cairn. Both Macgillivray and Jukes who also participated in surveys aboard the Rattlesnake recorded similar stone cairns decorated with the skulls of turtles. Moore (1974) records 13 similar sites in this general area although he provides no detailed description. Through the ,albeit scanty, details recorded by these early observers and through archaeological observations it is clear that these sites were associated with the hunting of turtle and involved the use of ritual and magic. At the time of archaeological investigation these sites were no longer used or maintained by the local Indigenous community although the hunting and consumption of turtle is still carried out.

Lines (2006), challenges the contribution of Aboriginal traditional ecological knowledge with an attack on what he refers to as the 'myth of the ecological aborigine'. He claims that idea of Aboriginal people living in harmony was a '...racial fantasy' in which 'white men not black ... (were) barbarous and ignorant' he claims that 'Aborigines were a trope, a figure of speech used to illustrate and condemn the destructiveness of the modern world' (Lines 2006:49). Of course this is not a new analysis of early encounters and it is now well understood that one of the paradigms influencing some early observers (including for example Cook) were the ideas of the Enlightenment which romanticised the ideal of man in a state of nature (Tench 1793; Macgregor 1997; Williams 1985). While it is acknowledged that similar ideas persist in some popular understandings of Indigenous relationships with the environment, Lines summarily overlooks the evidence from over 200 years of anthropological and ethnographic research that details the complexity of Australian Indigenous people's relationships with and understanding of their environment.

Lines claims that rather than living in harmony with nature ...

...Australian Aborigines were flexible and opportunistic. They took advantage of the world as they encountered it. They did not recognise resources as finite or scarce. Rather, they considered scarcity merely as a temporal and spatial inconvenience remedied simply by moving to another area where that scarcity did not exist. Instead of practicing conscious conservation- which requires deliberate and self conscious sacrifice of immediate self interest to long term preservation of endangered species and habitats- Aborigines limited their impact by limiting their population, employing a limited technology and living within a limited understanding of need. (2006:50)

In this rendition of hunter –gatherer practice Lines clearly portrays Aboriginal people as unthinking consumers of environmental resources somewhat akin to a locust plague moving across the landscape consuming one area and moving on to the next. This scenario completely disregards the complex net of taboos and ceremony attached to the use of many key resources such as turtle and dugong in the current study area. Clearly ceremony and magic cannot be integrated into Line's conservation paradigm even though they often involve 'self conscious sacrifice of immediate self interests'.

In contrast to Line's view, protected area managers in Australia have introduced elements of Indigenous traditional management into their routine land management practices with

increasing regularity over the past decade and a half. It has been noted however (Cruikshank 2000; Rose 2005), that where Aboriginal traditional environmental knowledge is considered by researchers and land management agencies there is tendency to collect it as data (e.g species use) and isolated practices (e.g. seasonal burn patterns/times) and to then incorporate it into Western paradigms, ignoring as irrelevant any cosmological framework in which these practices had been embedded. Once collected, TEK is commonly appropriated (for further discussion see for example Ross & Pickering 2001; Toyne and Johnston 1991) and through the process of incorporating it into management documents it is transformed into something new which stands independent of the cultural system that developed it.

Rose outlines an Indigenous philosophical ecology for discussion where there are four general principles:

- *Subjectivity in the form of sentience and agency is not solely a human prerogative but is located throughout other species and perhaps throughout the country itself.*
- *Life processes although they rely on humans do not prioritise human needs and desires;*
- *Kinship with nature- where non-humans and human are part of the same moral domain;*
- *The ecological system is not activated solely by human agency but rather calls humans into relationship and into activity. i.e... rather than humans deciding autonomously to act in the world, humans are called into action by the world. (Rose 2005:302-302).*

Understanding Indigenous ecological knowledge requires an understanding of the 'system' in which the 'practice' is grounded. Archaeologists often describe individual sites or collections of sites in a broad landscape context. To this end and to imply the interrelatedness of these sites, the term Indigenous 'culturescape' (Greer, et al 2005) has been coined to describe the range and collection of these sites. Similarly one can describe elements of culture as 'practices' and an interrelated collection of these that work to effect certain outcomes or control and mitigate processes as a 'system' To describe a system we must first recognise and describe the various elements and understand how they work together.

The almost total disconnect between economic practice and politics; and ceremonial practice and cosmology in our society obscures the relevance of ceremony and cosmological beliefs to the management of marine resources and to their crucial role in indigenous 'systems'. While some cursory acknowledgement is made to Indigenous contributions to ecological management these 'contributions' are often treated superficially. In some instances they are attributed to political correctness rather than deemed to hold any innate value, in a backlash against the stereotype of the 'ecological aborigine'. In reporting the evidence for TEK, both archaeologists and anthropologist are probably guilty of over-stating the evidence for retention of TEK in some instances, to the extent that they have not identified missing elements or the inevitable consequences of cultural disruption on the transmission of such knowledge. In many cases they will have considered the gaps in this knowledge as self evident with the focus of their work being what has been retained. Lines (2006:16) implies some devious intent to misinform the general public by referring to this as 'myth making about Aboriginal Australia'. He says: 'The net result [of the influence of anthropology and cultural

relativism on the environment movement and public thinking about the environment] ...was that one stereotype- Aborigines as hyperactive managers and ecological geniuses possessed of a wisdom unattainable by other human beings- replaced another'. (Lines 2006: 169)

Although put in a particular scathing and objectionable manner- at a broad level his accusations have some validity. Part of the problem is the way that these ideas have been embraced- so that land managers, governments and even Aboriginal people themselves in some instances, selectively take 'practices' e.g mosaic burning etc....and patch them together and call them knowledge 'systems'. Practices may be an important way of reinforcing Aboriginal ownership and control and they may be useful ecological tools but in isolation they tell us very little about Aboriginal relationships with the environment. In some cases the extraction and isolation of these practises reflects the discomfort of western science with the religious and spiritual realm.

In looking at the turtle and 'magic' and ceremonial sites I am exploring the fundamental connection between the practices related to these places in order to see if they functioned in part, as an ecological management system. Whether or not the ecological impacts of this system were positive or negative is not assumed. Applied sciences assume the separation of all things magical from those technical. This is a fundamental difference between western science and TEK as in the latter there is no such separation. Alfred Gell provides a way of exploring the role of magic in technology that may be useful in this current study. Gell maintains that the 'opposition between the technical and the magical is without foundation. Technology is inadequately understood if it is simply identified with tool -use and tool -use is inadequately understood if it is identified with subsistence activity. (Gell1988:6).

In his exploration of what 'technical' means Gell points out that 'What distinguishes technique from non - technique is a certain degree of circuitousness in the achievement of any given objective. It is not so much that technique has to be learned, as that technique has to be ingenious. Techniques form a bridge, sometimes only a simple one sometimes a very complicated one between a set of given elements (the body, some raw materials, some environmental features) and a goal-state which is to be realized making use of these givens. The given elements are rearranged in an intelligent way so that their causal properties are exploited to bring about a result which is improbable except in the light of this particular intervention (1988:6)

Magic provides 'the orienting framework within which technical activity takes place. Technical innovations occur, not as a result of attempts to supply wants, but in the course of attempts to realize technical feats heretofore considered 'magical'.(1988:8)

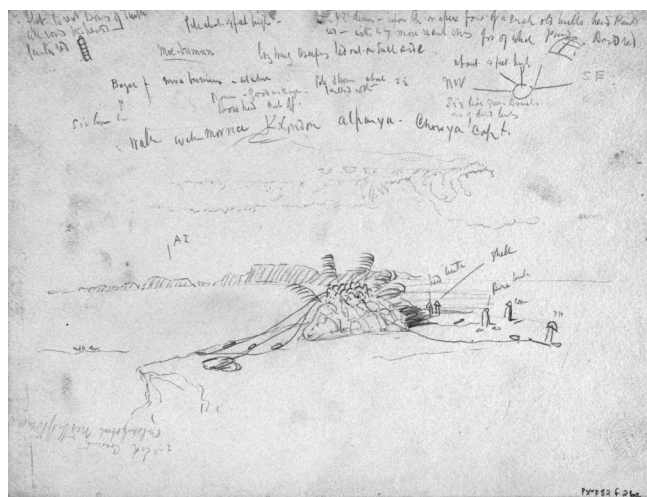
Magic is "an ideal" technology which orients practical technology and codifies technical procedures at the cognitive-symbolic level...Production 'by magic' is production minus the disadvantageous side-effects, such as struggle, effort etc." This resonates with how Aboriginal people describe hunting magic. 'When you do it - you don't have to sweat the dugong go meet you half way' (pers.comm T. Lifu 2004).

## Exploring Sites Related To Turtle Use

The mid 19th Century was a time of exploration in North Queensland and a lot of valuable information comes from the

journals and sketches of the naturalist/observers on the hydrographic survey ships such as *HMS Rattlesnake*. From them we get some of the earliest recording of turtle and dugong ceremonial and magic sites. Jukes (1847: 136ff) provides a description and two illustrations of a 'native grave' on Cape York Island. These 'graves' were later found to be stone cairns covered with turtle skulls, not human skulls as first assumed by Jukes (see McIntyre-Tamwoy & Harrison 2004 for more detail). Jukes also reports that Macgillivray later excavated the mound and found 'human bones belonging to more than one individual, but no individual, not even a complete skull' (1847: 138) inside. Brierly's diary and sketchbook (see Moore 1979; Brierly 1848-50a) from this same journey record in much greater detail a number of significant observations from key Gudang and Kaurareg informants about these turtle increase cairns and associated turtle hunting magic.

Brierly was shown an actively used turtle increase cairn on the top of a hill on *Moebunum* [Tree Islet] near Albany Island. Brierly measured the cairn and produced a field sketch (Figure 2). He described it's appearance in detail (Moore 1979: 87-88) and refers to the placements of offerings and decorated turtle heads. Brierly's sketch also accurately reproduces several small subsidiary stones around the main cairn on which were placed various items in different combinations including (fresh) turtle flesh, (old) turtle bone, shells, grass and a round stone, which he later describes using the generic word for magical objects, *uperi* (Moore 1979: 226).



**Figure 2** Brierly's sketch of the site. (Courtesy Mitchell Library PX\*D82.f26a)

Several other sites related to hunting are worth noting. The first of these is a large site at Evans Bay made up of multiple stone cairns, stone circles and a large midden. We know that ceremonies were carried out at this site involving not only the local Gudang but also Kaurareg and other visitors because large gatherings were noted by Brierly. We also know from Brierly's observations (Moore 1979: 72) that the ceremonies were 'secret' as much to his disappointment he was not allowed to watch or participate and that turtle masks were involved. The stone arrangement also was apparently not visible to him suggesting that the stone cairns were not decorated with bones as more visible isolated agu were (McIntyre-Tamwoy & Harrison 2004). There was until recently, another large site at the very tip of Cape York was comprised of stone circles similar to a few that can be found at the edge



of the Evans Bay site. However it was substantially different in form as it did not have the many stone cairns which are the dominant feature of Evans Bay. The Cape York site has now been almost totally destroyed by tourists and tour operators but as recently as the late 1980's the multiple stone circles were visible across the headland.

The large number of stone cairns and other stone arrangements at Evans Point, the observance of ceremonies involving large number of people including visiting tribes and the presence of turtle masks suggests that it may have functioned as an important turtle increase centre, involving large groups of Aborigines and Islanders in joint ritual activities. The apparent anxiousness of the Aboriginal men who met Brierly at Evans Point and led him around the stones so that he did not disturb them, coupled with the presence of stone circles, suggests the site had a secret/sacred purpose perhaps a dual initiation/bora and increase function. From Brierly's account we know that this was an important inter-group meeting place where secret ceremonies involving large groups were undertaken.

A number of single stone cairns (*agu*) occupy prominent headlands in the region. These appear to have functioned on a clan group or sub-clan group scale and did not require large inter-group gatherings. Brierly notes the use of *uperi* (magic objects) carefully placed around the stone cairn. Practices at these sites focused on balancing what is taken from the system by 'giving back', a practice that is a familiar part of traditional Aboriginal hunting practice in this part of northern Cape York as well as other parts of Australia. The placement of turtle heads on the cairn was 'thought to bring more turtle about' (Moore 1979: 168).

Some men had magic paperbark bundles (*marki mabarr*) containing the tongues of head-hunted enemies and other magical objects, which would be anointed with turtle fat and tied to the bow of the canoe to give good luck during the hunt (Moore 1979: 184). Injinoo people today use certain sites and natural stone formations for hunting magic. The use of these sites maximises hunting success. One of these relates primarily to dugong (at Yunyara) and the other to turtle and other things (Peak Point). These sites are still in use today and there are likely to be other such sites. The sites such as the one at Peak Point may be well known but access to the magic is restricted to traditional owners through controlling information on the practices carried out.

Reviewing the sites related to turtle magic and ceremony I have reconstructed a tiered relationship of at least 3 levels of sites and practices. These comprise

- Higher level ceremonies and securing the health and proliferation of the species (increase ceremonies).
- Species maintenance during the season and from one season to the next, characterised by offerings and other practices after a successful hunting trip.
- Hunting magic sites and practices which are about efficiently harvesting animals and increasing the days catch.

Although I recognise the over simplification of the practices involved in terms of species management these sites are characterised by different resource management purposes i.e species increase, maintenance and extraction/harvest.

## Similarities and Differences with the Torres Straits

McNiven (2003) has cited much of the ethnographic evidence of turtle magic from the Torres Strait and also in McNiven and Feldman (2003) with reference to their excavation of a dugong hunting magic site composed of dugong bone on Pulu Islet near Mabuiag Island. Similarly to the recorded use of magic charms as hunting magic in Cape York, the use of magic charms to attract and even facilitate a 'connection' to prey is discussed in relation to dugong (McNiven 2010).

Haddon (1904: 334-5) also records a large granite boulder on Mabuiag called a *wiwai* stone which was used in turtle increase and hunting magic rituals. This sounds similar to the site at Peak Point near Cape York. Haddon describes the way in which the skulls of successful hunters could be incorporated into the materials which were ritually deposited at turtle magic places to harness the skill of the spirit of the dead hunter (1935: 69). This is the practice described by MacGillivray at Albany Rock and consistent with the occurrence of human bone in the Cape York Island *agu*.

What is not found in the Torres Strait however are the large increase sites such as the one at Evans Bay. The stone cairns recorded at Evans Point appear to be similar in appearance to the *agu* described by Brierly, which prior to the turn of the nineteenth century were still being actively constructed and used by Aborigines at Cape York. However the *agu* generally appear as individual stone cairns. In addition it is clear that the stone Cairns at Evans Bay were not usually decorated with turtle skulls as were the individual *agu* or Brierly would have noted this when he visited the area

## Recent Excavations –Tree Island

In 2003 I relocated the site recorded by Brierly on a small islet near Albany Island with a colleague and several traditional owners (see McIntyre-Tamwoy & Harrison 2004). At that time an extensive but shallow midden was noted extending along the western side of the cairn and continuing down the slope (see Figure 3). In 2007 I returned with Traditional Owner Meun Lifu to excavate the site with the aim of identifying the midden content and obtaining a date range for the site if possible.

The site as it exists today of course lacks the organic decorative elements, the vines, branches and turtle shell, noted by Brierly. This makes his description all the more valuable as it provides information that could not be recovered from the archaeological remains. In fact it provides us with evidence of 'magic', the missing component in TEK. Like many intriguing archaeologically elements these stone cairns have the potential to remain closed books to archaeologists. They are usually built on rocky promontories and therefore provide little potential for deep stratified archaeological deposits. The organic items that once decorated them have long disintegrated and in fact without the description by Brierly the original appearance of the site would be unknowable from the remains.

The midden proved to be largely comprised of broken turtle bone with some shell. The deposit as expected was shallow but densely packed with bone. The predominance of turtle bone may seem obvious but recall that the description by Brierly and those by MacGillivray of similar sites mention only the turtle skulls decorating the cairns which does not necessarily suggest



**Figure 3** Preparing to Excavate Tree Islet (Mr Meun Lifu in photo)

that the entire animal was butchered at the site. In fact the location of these cairns appears almost always to be a steep climb from the water and turtles are heavy so I had not anticipated finding so much turtle bone in the deposit. Nevertheless the results provided the opportunity to date some bone samples. Two samples were chosen. One (sample Tree Islet F) towards the south-eastern extreme of the midden and the other (sample Tree Islet D1) towards the cairn itself.

Keeping in mind that the site was actively used at the time of Brierly's visit in 1848, the samples provided interesting results. Tree Islet D1 (Beta267384), the sample closest to the cairn provided a measured carbon age of  $100.9 \pm 0.5 \text{ pMC}$  (or 0 BP) indicating that 'the material was living within the last 50 years.'<sup>1</sup> The sample from Tree Islet F (Beta - 267385) yielded a date range of Cal BP 470-280 (i.e Cal AD 1480 to 1670 or Cal BP 470 to 280).

There is a growing literature relating to the use of radiocarbon dating to date the recent past (Hau 2009; Wild et al 1998 and Barbetti et al 2004). There are several issues relating to the use of turtle bone for dating that require consideration. Advice from Hau (2011 pers comm.) is that age calibration of this is not necessarily simple because it depends on the diet of the turtle, which determines the  $^{14}\text{C}$  level of this animal. He advises that it is important to consider whether all foods are from terrestrial material, all foods have marine origins, or foods are from terrestrial + marine + aquatic (freshwater) material. Unfortunately the turtle bone samples used for dating are so fragmented that it may not be possible to identify the turtle species and at this point I have not attempted to do so. The turtle most commonly used by Traditional Owners of this area today is the Flatback Turtle. However green turtle is also a possibility. The former is a carnivore, its diet including such things as fish, sea cucumbers, prawns, jellyfish and sometimes it will eat algae. Whereas the Green Turtle is a herbivore eating mainly seagrasses and algae. In both cases the turtles source their food from the marine environment. In this case the sample's calendar age should be around 1960-1965 AD (Hau per comm 2011. See also Hau 2009 Fig. 11 p 386).

Given the intriguing results some more samples have been earmarked for dating to try to determine the date range for the use of the site. From the information currently to hand we know that the site was in use possibly 400 hundred years before

Brierly's visit in 1848 and that possibly this use continued until sometime within the last 50 years.

The question of course arises as to what happened to cause use of the site to cease and local knowledge of the site to die out so rapidly? Consideration of the historical context of the area provides several possible catalyst for change. The Northern Peninsula Area Aboriginal Reserve was created in 1948 introducing a new era of government intervention in the lives of the Indigenous people of this area. A series of forced relocations of Indigenous people to this area from other parts of Cape York and the Torres Straits occurred over the next two decades. Undoubtedly this would have been a period of great change. If we accept that the site was in use at the calibrated date of 1960-65 AD it seems that some additional disruption may have been in play. It is tempting to speculate that this catalytic event may have been the introduction of beer canteens by the Queensland Government in 1971 under regulations gazetted under the *Aborigines Act, 1971 (Qld)*. This initiative has been credited with causing major disruption to the transmission of Indigenous culture throughout Cape York Peninsula. Further research is required at similar sites to test this theory of a connection between this event and changes to hunting practices.

## Conclusion

There is evidence in Cape York Peninsula for a network of ceremonial sites associated with turtle which was in use at the time of initial European contact. It is not known how long this system had been in place although we now know that it was in use for around 400 years before European settlement. We also know that at least one of these sites (of the second tier or maintenance level sites) was in use up until as recently as the mid 20th century sometime after which it was abandoned and apparently fell rapidly out of local memory.

In this paper I pose the possibility that the use of magic and a ceremonial system had developed around the use of turtle and prior to European occupation of the northern Cape York region. Further that this cultural system functioned in part as a species management system, ensuring the proliferation of the species through ceremony and monitoring catch volumes through control of access to the hunting resource. The practices that together comprised this 'system' fostered an awareness of the importance of the resource and its connection to the broader ecosystem and the welfare of the community. It did this through the adoption of rituals which 'invested' in the environment and encouraged contemplation of the role hunting 'practice' in the environment. In other words the ritual practices associated with hunting ensure that hunting is carried out 'mindfully', meaning people are aware of the act of taking an animal from the environment rather than as Lines would have us believe consuming resources opportunistically.

Of course the other side of this view suggests that when such practices are discontinued through a breakdown in traditional knowledge systems as happened in many instances under the pressures of European colonisation, then the efficacy of the system is threatened. Clearly the large inter group ceremonies are highly vulnerable to restrictions on the freedom of groups to travel and meet at appropriate times and places. It is possible that in this region the large inter group ceremonial sites faltered soon after the establishment of Somerset in 1864. These sites are located only a short distance along the coast from

Somerset and both John Jardine (original Police magistrate at Somerset) and later his son Frank were known to have restricted indigenous access to certain traditional lands such as for example Albany Island (McIntyre-Tamwoy 2002). The smaller sites used by individuals and clan groups were less vulnerable as they were able to be used and maintained without the need to involve other groups. Such sites are still dependent on access to specific types of locations by 'owner' groups and so in the region would have been somewhat vulnerable to restriction of access to specific sites, although it is likely that new sites could have been created in similar locations. It appears from the example of Tree Islet that the use of such sites may have continued until the severe restrictions imposed on Indigenous freedom by the formation of the Northern Peninsula Area and the actions and initiatives this imposed on Traditional Owners. In contrast to the larger site many hunting magic sites may be accessed by individual hunters and so the knowledge and use of such sites is not reliant on the ability to gather with other groups. The use of hunting magic sites has therefore continued and several such sites are known to be used in the area today.

Critics such as Lines (2006) may be uninformed and too easily discount the complexity of indigenous relationships with nature. However, it is clear that understanding how cultural systems have changed over time and what elements have been lost or replaced, is essential to understanding traditional resource management and traditional hunting systems and to assessing whether or not these constitute sustainable resource use. Aboriginal and Torres Strait Islander people have a painful obligation to explore and confront the changes that have occurred to their traditional practices through the many, at times cataclysmic and at others subtle, events and imposts since European invasion. Clearly, the loss or abandonment of ritual and ceremony can threaten the very relationship that Aboriginal people have with the environment and/or specific species. At the very least, individuals may lose the quality of 'mindfulness' that previously governed the use of the resource. Whether or not similar elements can be reintroduced into contemporary practice is of course a matter for Traditional Owners to determine and has been a controversial matter elsewhere (Ross & Pickering 2002; Mowaljarlai et al. 1988). For resource managers and scientists it is important to understand that ceremony and magic are important components of TEK. They cannot be excluded from a 'scientific' assessment for as Gell (1998:6) says ...*the opposition between technical and magical is without foundation.*

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#### Endnotes

- 1 *The source of this "extra" 14C in the atmosphere is thermo-nuclear bomb testing which on-set in the 1950s. Its presence generally indicates the material analyzed was part of a system that was respiring carbon after the on-set of the testing (AD 1950s)*