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Article *in* Anthrozoos A Multidisciplinary Journal of The Interactions of People & Animals · June 2009

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A Review of the Relationship between Indigenous Australians, Dingoes (*Canis dingo*) and Domestic Dogs (*Canis familiaris*)

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ABSTRACT Canids form a large part of Indigenous Australian life and mythology, an association first developed with the dingo, and later with the domestic dog. The relationship between canids and Indigenous Australians is intricate, but unique in that these peoples never domesticated the wild dingo. Neither were dingoes and dogs seen as a source of food nor in many cases considered practical hunting assistants, yet they were highly prized. Apart from featuring heavily in Indigenous Australian spirituality (The Dreaming), advantages of camp dingoes and dogs include them being protectors or guardians, "bed warmers," and companions. However, these benefits were weighed against the many associated social and economic costs incurred such as disruption to camp life and religious ceremony, burden on camp food supply and storage, and potential source of disease. This review explores the relationship between Indigenous Australians, dingoes and dogs, and attempts to explain why dingoes, and later dogs, were kept, yet not domesticated. By bringing together the many disparate observations made by early anthropologists, insight into traditional human–canid relationships may be gleaned.

Keywords: Aboriginal Australians, Indigenous Australians, dingo, dog, domestication, human–animal interaction

Studying the relationship between primitive dogs and traditional societies is important as it offers many opportunities to understand the early human–canine bond and the potential factors that may have influenced the domestication of early canids. Such insight is challenged by the decreasing number of traditional Indigenous communities around the world (Brisbin and Risch 1997), which typically rely on oral records of traditions and knowledge. The relationship between

Indigenous Australians and their "dogs," represents "part of the living heritage of hunter-gatherer culture" (Clutton-Brock 1995, p. 15), offering a unique perspective on the human–canine relationship, which may not be "dissimilar to that of hunter-gathers and wolves all over Eurasia some 12,000 years ago, in the pre-agricultural period" (Clutton-Brock 1995, p. 15).

This review summarizes the existing literature examining the role of both dingoes (*Canis dingo*) and domestic dogs (*Canis familiaris*) within traditional Indigenous Australian society. The task of undertaking such a review was challenging considering few accounts specifically focus on relationships between Indigenous Australians and canids, the sheer quantity of anecdotal accounts not readily located or accessed, and the diverse nature of Indigenous communities across Australia. Throughout this review an attempt is made to clearly differentiate between dingoes and domestic dogs, and where information pertains to both, the general term "canids" is used. Early accounts, however, may not have clearly made this distinction, appearing at times not to distinguish between "dogs" and "dingoes," or making inferences about dingoes based on observations of domestic dogs. Today, the interest in human–animal interactions is increasing, but such an interest is not evident in the accounts reviewed here, with many anthropologists making only fleeting references to these inter-species interactions.

As non-Indigenous Australians, the authors face the added burden of responsibility of providing the most accurate and culturally-sensitive account possible of the relationship between Indigenous Australians and canids. The non-Indigenous accounts reviewed here may be colored by other cultural perspectives and prejudices, and not reflect current or all Indigenous Australian points of view.

The Arrival of Dingoes in Australia

Australia has been home to Indigenous Australians for at least 50,000 years (Flood 1999; Mulvaney and Kamminga 1999), with most of this time spent without canine companions until the arrival of the dingo about 3,500–5,000 years ago (Gollan 1982, 1984). This date is supported by a number of fossil remains dated in the region of 3,000 years BP (the oldest radiocarbon dated at 3,450 ±95 years BP; Milham and Thompson 1976), the similarity of Australian dingoes to Asian counterparts in terms of mitochondrial DNA (Savolainen et al. 2004) and skull morphology (Corbett 1985, 1995), Dreaming narratives describing the arrival of dingoes (Harney 1951; McIntosh 1999), and the absence of dingoes on certain islands including Tasmania (Jones 1970). The arrival of dingoes may be attributed to the lengthy association between Indigenous Australians and other more "seafaring" nations such as Torres Strait, Papua New Guinea, Indonesia (Thompson 1949; Berndt and Berndt 1981; Corbett 1985) and India (Gollan 1982, 1985), whose peoples may have traveled with dingoes for protection, companionship, hunting aids, and as a potential source of food (Breckwoldt 1988; Corbett 1995). The likeness of the dingo to the dogs of neighboring islands, such as the New Guinea Singing dog (*Canis hallstromi*; Koler-Matznick et al. 2007), implies that transportation of these domesticated Asian dogs spread throughout the Pacific.

Evidence for a network of trade includes the incorporation of new tools into Indigenous Australian society (acquired from Asian communities) at about the same time as the arrival of the dingo (Flood 1999; Mulvaney and Kamminga 1999). This period has been referred to as "intensification," based on a more intensive utilization of natural resources by humans, along with innovations in hunting technology, increased population density, expansion of habitat range, and more sedentary behavior (Johnson and Wroe 2003). Flannery (2004) describes this period as a "dingo-driven revolution" (a position criticized by Johnson 2006). Multiple visitations by non-Indigenous

Australians are also supported by the presence of biting lice (*Heterodoxus spiniger*; Enderlein) on canid species worldwide (apart from northern latitudes), as dingoes that returned to Asia after spending time in Australia are likely to have picked up these lice from Australian marsupials (Hopkins 1949; Murray and Calaby 1971; Clutton-Brock, Corbet and Mills 1976; Corbett 1995).

Based on skull measurements, potential ancestral species of the Australian dingo include the Indian Wolf (*Canis lupus pallipes*) and the Arabian wolf (*Canis lupus arabs*), with divergence taking place between 6,000 and 10,000 years ago (Corbett 1985, 1995). This period corresponds to changes in human lifestyle in southern Asia (to settled agricultural subsistence), which in turn would have allowed for a symbiotic, or perhaps commensal, relationship to establish between human and dog (Clutton-Brock 1977; Corbett 1995). Recent analysis of mitochondrial DNA provides evidence that the Australian dingo population was founded by a small number of individuals (perhaps even a single pregnant female), most likely evolving from a population of "domesticated" east Asian dogs (Savolainen et al. 2004). This DNA evidence, genetic isolation, and the species' essentially unaltered state for at least 3,500 years (Macintosh 1964; Gollan 1982), suggest that the dingo is one of the most primitive forms of the domestic dog (Macintosh 1975) signifying "living, purebred relics of the first domesticated dogs to inhabit southern and eastern Asia in the early prehistoric period" (Clutton-Brock 1995, p. 14).

Once in Australia, the dingo quickly colonized the mainland and nearby islands, establishing itself as a functional and integral member of the Australian ecosystem (Johnson, Isaac and Fisher 2007). Dispersal time is estimated by Tindale (1974) as 100 years (based on the introduced fox's rapid spread across Australia), but no longer than 500 years according to Gollan (1984). These estimates are likely to be underestimated given the many factors which limit dingo population growth, including social (a complex pack structure which includes breeding suppression and breeding limited to the alpha-pair), environmental (minimal access to water sources, and periods of drought), and high rates of natural mortality (Corbett 1995). Since the dingo founder individuals already had an association with humans, they are likely to have forged a relationship with local Indigenous Australians. This relationship may have hastened the dispersal of dingoes over the mainland as they accompanied or followed Indigenous Australians as they traded with other neighboring communities (Kohen 1995).

The origin of the name "dingo" derives from an Indigenous Australian term believed to describe tame camp dingoes by people living in the Port Jackson area (New South Wales) at the time of European settlement (Ryan 1964). It is likely that "tingo," meaning tame, was misunderstood by the European settlers, becoming "dingo" instead (Breckwoldt 1988). The Indigenous term "dingo" is not used universally, differing within states (e.g., in New South Wales *mirri* and *warrigal* are used; Ryan 1964) and between states (e.g., *ngupanu, papa, parrutju, tjantu, wanaparri, yinura* and *maliki* are used in Western Australia, the Northern Territory and South Australia; Burbidge et al. 1988). Definitions of dingo or wild dog in the Anbarra community include "fearful one" (*gugurkuja*), referring to the dingo being afraid and running away from people on contact in the bush, or "wild animal or beast" (*an-mugat*; Meehan, Jones and Vincent 1999). Camp dingoes, or those associated with people are also distinguished from wild dingoes (see Ryan 1964 and Breckwoldt 1988). The many different Indigenous names for the dingo can be traced along clear routes of distribution (Ryan 1964), which may have been influenced by regional differences in dialect where cultural and language barriers prevented the sharing of knowledge, or a reflection of the pattern of its rapid dispersal (Tindale 1974), where individual communities encountered dingoes before their human neighbors could inform them of its given name.

The arrival of the domestic dog with early European settlers in the late 1700s resulted in a drastic change in the relationship between Indigenous Australians and dingoes. Many Indigenous communities at this time appeared to choose the more "subservient" domestic dog over the dingo, since domestic dogs were more readily obtained and were considered to be "less troublesome and generally fit in better with living in close quarters with man" (Kolig 1978, p. 95). However, prior to European settlement, dingoes, which largely foraged for themselves, are likely to have been easier to maintain and less of a drain on resources than domestic dogs (Hayden 1975).

Was the Dingo Domesticated in Australia?

Prior to European settlement, less nomadic communities of Indigenous Australians were known to tame young native animals, such as kangaroos, wallaroos, emu and cassowary chicks, and lizards (Tindale 1974; Kolig 1978), but the highest numbers of animals within the community were dingoes. As early Europeans only observed the dingo within Indigenous communities and were unaware of dingoes living in natural environments, this led to erroneous claims that the dingo only went "feral" after European settlement, as dingoes fled to the bush after Indigenous communities were disrupted (Trezise 1978; Walters 1995). This in conjunction with the intricate relationship between Indigenous Australians and dingoes has often led to the latter being labeled as "domesticated" (e.g., Hamilton 1972; Tindale 1974; Trezise 1978; Walters 1995). However, it is now widely accepted that the dingo was not domesticated (Meggitt 1965; Macintosh 1975; Manwell and Baker 1984).

To date, the domestication status of the dingo has not been discussed in great detail (with the possible exception of Meggitt, 1965) according to the recognized criteria of domestication, nor has any author discussed possible reasons why the dingo was not domesticated in Australia. The apparent lack of attempt by Indigenous Australians to domesticate the dingo may appear unusual given Darwin's (1936) certainty that in ancient times attention would have "been paid to breeding, for the inheritance of good and bad qualities is so obvious" (p. 31). Others, such as Meggitt (1965) find it remarkable that a "people could associate for several millennia with an economically and ritually significant species without domesticating it completely" (p. 10).

Domestication implies that the animals have been placed in a "captive" environment and exposed to certain management practices (Price 1984), eventually losing all contact with their wild ancestral species (Clutton-Brock 1999). Domestication generally fulfils a distinct purpose, need, or desire in humans (Darwin 1936; Downs 1960), offers an advantage of some description to the human "domesticator," and requires strict control or "selective breeding" of particular individuals within a population of animals.

In the case of the dingo, some control was evident in terms of puppy acquisition or removal from dens, and the killing of weak or deformed puppies or older dingoes that became dangerous or refused to leave once sexually mature. Thus, some dingo traits were clearly preferred by Indigenous Australians, but with respect to natural selection, it is impossible to know whether the killing of some dingoes and not others (selecting for preferred traits) made any difference to traits passed on to future generations. Female dingoes that denned and whelped around campsites, potentially increasing their access to resources, may have increased their likelihood of reproductive success (Coppinger and Schneider 1995). That dingoes were encouraged to leave upon reaching sexual maturity (explained later) goes somewhat against the principle of domestication, which encourages animals to remain closely bonded with humans.

The later interactions between Indigenous Australians and the domestic dog may provide valuable insight into the lack of intervention or domestication practices imposed on dingoes. Indigenous Australians did not appear to selectively breed domestic dogs, apart from some isolated cases in Tasmania (Jones 1970), with most accounts suggesting that there was "absolutely no evidence of any attempt to restrain free breeding of either category [hunting or pet] of the camp dogs" (White 1972, p. 202). Any male could breed with any bitch, and any "mongrel" with any "hunting dog" (Meehan, Jones and Vincent 1999). Kolig (1978) agrees, adding that the process of natural selection or domestication was undoubtedly not employed given the low ratio of effective hunting dogs to "useless" companion dogs. Although puppies showing potential hunting ability were treated more favorably, they were not selected as preferred breeding animals (White 1972). However, despite selective breeding not "deliberately" taking place, the fact that dogs with preferred traits were treated more favorably and thereby more likely to survive and pass on genes, suggests the possibility that "unconscious" selection may have been taking place (Darwin 1936).

Successful domestication is marked by both a cultural change in humans and a biological change in the species being domesticated (Clutton-Brock 1992, 1999). Culturally, the animals must become "incorporated into the social structure of a human community and become objects of ownership, inheritance, purchase, and exchange" (Clutton-Brock 1999, p. 31). Such integration into human society results in the domesticated animals becoming reproductively, genetically and behaviorally isolated from their wild counterparts.

The dingo certainly meets the "cultural change" criterion of domestication, permeating every aspect of Indigenous Australian society. Dingoes became objects of ownership, items for bartering with other Indigenous communities and European settlers, and held deep cultural and spiritual significance for Indigenous Australians. In practical terms, as will be discussed later, the dingo served a role as protector, living "blanket," food item, and companion, with a questionable role as a hunting assistant. Nevertheless, the dingo fails to meet the "biological change" criterion of domestication which is caused by natural selection in response to the human community and environment, and artificial selection for economic, cultural, and aesthetic reasons (Clutton-Brock 1992, 1999). Domestication of a species inevitably leads to changes in morphology (the structure of an organism) and reproductive "traits" over time (Trut 1999), as well as potential physiological changes to the endocrine system (Dobney and Larson 2006) and the hypothalamus (Fox 1978). Other changes expected as part of the domestication process include changes in cranial capacity (changes in neocortex), neoteny (the retention of juvenile characteristics such as barking and floppy ears in adulthood), and coat color (aberrant colors or markings, Clutton-Brock 1992). None of these traits that accompany domestication are apparent in the dingo (aside from the more recent isolated cases below), with the modern dingo essentially unchanged when compared to its prehistoric ancestor of over 3000 years ago (Macintosh 1975; Gollan 1982).

Most dingoes that had an association with an Indigenous community bred in natural environments, since they typically left when they reached sexual maturity. However, there are two reports of Indigenous communities that maintained a breeding colony of dingoes within the last 1,000 years, most likely because their particular lifestyle could support it (Gollan 1984). At Kiola and Murramarang Point (New South Wales), dingo remains at some Indigenous burial sites exhibit skeletal markers (particularly cranial) suggestive of selective breeding of specific populations. These apparently isolated instances are unlikely to have had a significant effect on the entire species. In addition, even if dingo breeding did take place within the community,

it would have been difficult to "counterbalance the constant loss of tame dingoes through death or running away" (Meggitt 1965, p. 23).

In sum, according to the five stages of domestication outlined by Zeuner (1963), the Indigenous Australian–dingo relationship only met the first stage, where the animal maintains a "loose contact" with humans but breeds freely without human intervention. Such an association fits well with Dobney and Larson's (2006) description of relationships between humans and animals that are neither "wild" nor "domesticated," and fall outside the more rigid definitions of domestication. Possible reasons for this apparent lack of attempt by Indigenous Australians to domesticate the dingo will be explored in the following section.

Factors Influencing the Domestication of the Dingo

There are many behavioral barriers or constraints limiting domestication of wild canids. Wolves for instance, can be tamed, but not trained to follow commands reliably, resisting "human direction of their activities and inhibition training" (Koler-Matznick 2002, p. 99). Furthermore, wolves raised by humans typically retain their instinctive behavior and are therefore very difficult to socialize to humans, are easily frightened and difficult to calm, and show avoidance of humans (Fentress 1967; Frank and Frank 1982; Zimen 1987). As will be discussed in this paper, dingoes are no different, and exhibit similar behavior when under human "control." Macintosh (1975) and Oakman (2001) also provide discussion relating to the difficulties of keeping dingoes as pets, suggesting that dingoes are "escape artists," very independent and retain a powerful "prey drive."

In addition to the behavioral limitations, the Indigenous Australian lifestyle did not easily facilitate the domestication process. Indigenous Australians did not engage in farming or domestication, instead as "pseudo nomadic pastoralists" they moved location constantly, depending on the seasons and availability of food (Kimber 1976). Such constant moving provided little opportunity for large numbers of personal possessions to accumulate, and the infrastructure required to successfully domesticate animals was not present. "Taming" alone may have provided the perceived necessary benefits the dingo could offer the Indigenous community, and further investment in domestication was not required.

Importantly, the key role that the dingo plays in Indigenous Australian Dreaming (spirituality) may also explain why this species was not an ideal choice for domestication. Indigenous Australians have a close kinship with the land and respect for nature, with The Dreaming providing codes of conduct for moral relationships between people and animals. It may have been unacceptable or inappropriate to domesticate a species or to permanently remove an animal from its natural habitat (Rose 1992). Thus, despite the close association with the dingo, respect for the species is shown by a lack of interference. "The dingo hunts its own food, makes his own camp, finds his own shelter, and follows his own law" (Rose 1992, p. 176). With the dingo being viewed as an important being in both the natural and spiritual world, there was perhaps even more of an incentive not to disrupt this balance. Lastly, as the dingo engaged in many behaviors considered unfavorable in humans, it is possible that Indigenous Australians wanted to be closely, but not *too* closely associated with the animal. There may have also been some residual fear and mistrust in some societies as a result of The Dreaming image of the dingo, which is discussed subsequently.

Having covered the arrival of the dingo into Australia and the possible explanations why Indigenous Australians did not employ strategies to domesticate it, the nature of the relationship between Indigenous Australians and canids can now be explored in greater depth.

Acquisition of Dingoes and Dogs and Their Retention within Indigenous Communities

Indigenous Australians obtained dingoes by raiding and "extracting" pups from native dens during the whelping season (usually starting around July), with pups taken to Indigenous communities to be hand reared (Meggitt 1965; Hamilton 1972; Lumholtz 1980). This acquisition may have taken place opportunistically when humans undertook hunting activities (e.g., Hamilton 1972; Tindale 1974), or may have been a targeted or deliberate process (Meggitt 1965; Hayden 1975). For example, in a number of Eastern Australian and Western Desert Indigenous communities, during the month of May (heralded by celestial changes), the number of ceremonies or "*mirera*" taking place increased, reflecting a desire to raise dingo numbers (Radcliffe-Brown 1929; Tindale 1959, 1974). In this region, healthy dingo pups were kept, whereas weak or deformed pups were killed and perhaps eaten. Breeding-age female dingoes were left alone, which apparently resulted in stable dingo population numbers.

Indigenous Australians did not need to control the population of dingoes living within their communities and their number was never excessive. Despite their close association with Indigenous Australians from puppyhood, dingoes tended to return to their natural habitats once they reached sexual maturity and did not return (Lumholtz 1980). It is possible that dingoes were tied up or somehow restrained as pups, and later released once habituated to human environments; however, this does not appear to be a well supported claim. Macintosh (1975) suggests that "the dingo would simply take off once released, and return only to steal food" (p. 97). It is possible that those dingoes failing to adjust to life around humans, or becoming dangerous and refusing to leave once sexually mature, were killed (e.g., Rose 1992).

Indigenous Australians may have acquired domestic dogs (at least in Tasmania) through a number of means including targeted theft, as payment for prostitution, gifts from early settlers, or trade between neighboring tribes (Jones 1970). The number of dogs living in Indigenous communities, however, often far outnumbered the human inhabitants. For example, at Yatala the ratio was slightly above 1:1 (White 1972) and in South East Arnhem Land there were three dogs per household (Senior et al. 2006). These high numbers of domestic dogs may be attributed to their desire to remain near humans rather than leave for natural environments, the greater "usefulness" of the dog over the dingo, the lack of any attempt to control or suppress breeding, and the capacity for domestic dogs to breed more than once per year, compared with the seasonal breeding cycle of the dingo (Catling, Corbett and Newsome 1992).

The Position and Treatment of Dogs and Dingoes in Indigenous Australian Society

In many human societies, including some Indigenous Australian societies, dogs appear to fall somewhere between human and non-human animal in status. For example, both dogs and dingoes were afforded certain human privileges (Maddock 1982), which included being given traditional or mythological names (e.g., Jankuntjara community, Hamilton 1972; Ngukurr community, Senior et al. 2006), and like children also given "skin identities" or personal "kinship" names, food, and shelter (Yarralin communities, Rose 1992). However, dogs were "restricted from accompanying men to ceremony, but expected to follow the women, in the same way that children accompany women" (Senior et al. 2006, p. 44).

To some Indigenous Australians, dogs served as a "reference point" for human behavior. Dogs were regarded as individuals and as members of the community, but ones that did not "heed" the social laws or rules of kinship (Maddock 1982). Socially disapproved behavior such as greed, anti-social or unpredictable behavior, and sexual promiscuity, for example, were considered dog-like traits (Hamilton 1972; Berndt and Berndt 1981). Anyone disregarding marriage "restrictions" was considered to be acting "like dogs" (Maddock 1982). With respect to dingoes, Rose (1992) draws parallels between the developmental stages that dingoes and some Indigenous Australian males pass through, with both being nurtured within the community during their youth, but having to leave the community upon reaching sexual maturity (at least for a short period, for the humans to fulfill initiation practices).

In many cases, dogs were regarded more as members of the family than as personal property, and any offence against them, including accidental or deliberate killing (Kolig 1978) "might have violent repercussions" (Berndt and Berndt 1999, p. 345). Some authors describe the great affection that Indigenous Australians directed towards dogs, particularly puppies, as remarkable (Hamilton 1972). In some Indigenous communities, such as the Jankuntjara, people groomed their dog puppies' fur searching for scales, sores, or parasites (Hamilton 1972). As with many young animals, dog puppies were particularly appealing to their human caregivers, but once they grew older, they were largely ignored and left to take their chances with the rest of the canid population (Meehan, Jones and Vincent 1999).

Sometimes a dog remained a favorite with a particular human, who continued to lavish exclusive attention and affection upon it, particularly if it had been hand reared. For example, Hamilton (1972) witnessed favorite puppies being rubbed with a mixture of fat and ochre (used on humans) in order to make their bodies strong and resistant to evil spirits. Gould (1969a) found both men and women in Western Desert Indigenous communities had particular favorites, and in some cases only provided food for these animals. Children in Indigenous communities were not always as careful with dogs, with a major cause of death attributed to children's "constant" play (Hamilton 1972; Kolig 1978).

There was also a clear distinction in Indigenous Australian attitudes towards camp dogs, with "hunting" dogs highly-regarded and "non-hunting" dogs less respected (White 1972). For example, White (1972) found that the superior health and well-mannered behavior of "hunting" dogs was in stark contrast to the "mongrels" resorting to scrounging and stealing food to survive. In more recent times, domestic dogs living in Indigenous communities have been reported to suffer from chronic eye and skin infections and a number of other diseases (Meehan, Jones and Vincent 1999). This is likely to reflect the lack of veterinary resources accessible to Indigenous Australians, as well as unnaturally high dog densities, poor diets, and inbreeding in dogs as a result of a lack of a natural social pack structure.

Less information is available about relationships between Indigenous Australians and dingoes living within their communities; however, dingoes were also known to have been treated as lovingly as the people would have treated their own children (Lumholtz 1980). In some cases, dingo genitals were seen to be "fondled" and "petted" as a way of soothing tired animals (Gould 1969b; Kolig 1978). It appears more attention was given to dingo puppies, although they soon lost their appeal as they "quickly progressed from babies to beasts which everybody loathes" (Kolig, 1978, p. 93).

Although well loved, dingoes living in Indigenous communities often appeared to be in poor physical condition. Gould (1969a) describes the dingoes he encountered as the skinniest "dogs" he had ever seen. Indeed, the poor physical condition of dingoes living amongst humans was

considered a means of telling them apart from their healthy free-ranging ("wild") counterparts (Meggitt 1965). The dingoes' poor condition reflected the scarcity of food available (especially around camps) and the intense scavenging that occurred (Hamilton 1972), resulting in a "never ending battle" for food (Gould 1970, p. 65). Similarly, dogs faced the same problem regarding the limited food available. For example, adult dogs living in the Jankuntjara community mostly survived on raw flour left over from damper (a type of bread) making, or the bones of large game. Only when meat was in large supply did the dogs receive "even a token amount of food" (Hamilton 1972, p. 290). Dogs here supplemented their meager scraps by "stealing" food as they roamed around the campsite, rarely attempting to forage themselves away from camp. As puppies matured, they received glancing blows on the nose to keep them away from food, with hands, sticks, or metal bars used to punish those that crowded around humans at mealtimes (Hamilton 1972).

The Role of Dingoes and Dogs in Hunting

Opinions concerning the effectiveness of the dingo in aiding Aboriginal hunting are somewhat contradictory (Macintosh 1975). Hayden (1975) is convinced that "the original and continuing primary reason for the regular adoption of dingoes into Indigenous Australian groups was related to hunting subsistence…" and that other uses were "acquired and accrued advantages, which have sometimes become dominant under settlement conditions" (p. 14). He cites early accounts that suggest dingoes were trained as pups for hunting, that they hunted on behalf of humans throughout the day and for themselves at night, that they were successful hunters of kangaroos, and that their ability to follow scents assisted in the capture of kangaroos, snakes, rats, possums, and lizards. Hayden (1975) also stresses that regardless of the evidence, we should not doubt the assertions made by the Indigenous Australian people themselves that confirm the dingo's role in hunting.

It is important to note that in attempting to determine the exact nature of the role that dingoes played during hunting, reporting does not often specify whether the canid referred to is a dingo or a domestic dog. Hayden (1975) may have made this error when he provides examples of domestic dogs to support his assertion that dingoes were used for hunting. This presents a problem, since the traditional use of dingoes may have been different or obscured by later reports focusing on use of domestic dogs that had potentially been trained or selectively bred for hunting skills. For example, some Indigenous Australian communities in Tasmania immediately recognized the useful hunting skills of domestic dogs by quickly "adopting" these dogs, despite the fact that these Indigenous communities had never encountered canids before (Jones 1970; Boyce 2004).

With respect to the Indigenous Australian–dingo relationship, it appears dingoes were rarely utilized or necessary for the successful hunting of large game (Meggitt 1965; Gould 1969a 1970; Hamilton 1972; White 1972). This may reflect that dingoes were ineffective hunting aids in certain open environments (Meggitt 1965), or that the economic benefit attained from their assistance was only minimal (e.g., Hamilton 1972). What is undisputed, however, is that male Indigenous Australian hunting parties were far more successful when unaccompanied by dingoes. Even Hayden (1975) admits that "dogs vary in their success in game capture and very possibly succeeded less often than hunters using stalking and spearing methods" (p. 13). Indeed, dingoes were considered a liability for hunting parties employing strategies based on concealment or stalking (Gould 1970). Typically, the hunters hid behind blinds of brush or rock, or stalked animals if encountered in the open, but the success of these hunts was compromised if dingoes

frightened or chased prey away (Gould 1969b, 1970). The Indigenous Australian hunters were skilled trackers, and able to use fresh tracks to follow animals closely without alarming them. If dingoes were present, they usually disturbed the prey (e.g., by howling or barking), resulting in a long and unsuccessful chase (Gould 1969b; Hamilton 1972; Kolig 1978).

On some occasions, if dingoes did not accompany hunters but were nearby, the dingoes were "called up" to pursue injured prey animals, tiring and harassing them until the hunter caught up (Pickering 1992). Kolig (1978), however, suggests that this technique was both tiring for the human hunter and largely ineffective, since the dingo was "notorious for devouring most of the prey before the hunter has a chance to claim it for himself" (p. 91). Meggitt (1965) confirms this, adding that dingoes that were poorly treated by humans were even more likely to consume game before the hunters got to it, and in addition may have returned to natural environments in search of more reliable sources of food. It is more likely that dingoes were used for more social hunting outings, which also included women and children (Gould 1969b; Kolig 1978). Thus, any meat contributed by the dingo occurred on an opportunistic basis, or during hunts for smaller prey. Furthermore, the use of fire for hunting (flushing out prey) and land management began around the time of the dingo's arrival (Kohen 1995), so the use of fire rather than dingoes would have been a far more effective hunting tool.

Similarly, domestic dogs in many cases were considered such a hindrance to successful hunts, that before any hunt the men would continually drive them back to camp (Gould 1970; Hamilton 1972), sometimes with a "hail of stones" (Hamilton 1972, p. 291). In one reported case, the presence of a favorite dog was tolerated, as long as it remained a quarter of a mile behind and caused no interference (Gould 1970). At no point in the area visited by Hamilton (1972) were dogs used by any "serious" hunting group specifically attempting to kill large game. These cases, however, may appear the exception rather than the rule, with many authors expressing the positive influence of dogs (even if only a selected few) to hunting, especially for capturing smaller prey items or larger prey in areas with dense coverage of bush or forest. Hunting strategies incorporating dogs were used if game was chased rather than stalked (Hayden 1975), and sometimes dogs were used to assist in driving prey out of hiding (Thompson 1949). When densities of large game were low, dogs helped capture small items of prey and occasionally brought back kills whilst accompanying women on gathering outings (Hayden 1975; Meehan, Jones and Vincent 1999). Dogs that were left behind by male hunting parties tended to accompany women on their tasks (Gould 1969a), with small domestic dogs used to help dig out rabbit and wombat warrens (Hamilton 1972). It is not known whether dingoes were also used for these purposes.

White (1972) describes the use of domestic dogs by Indigenous Australians in Yalata Aboriginal Reserve (South Australia) as a significant innovation in hunting technique, greatly enhancing success rates compared with "the old tribal times" (p. 203). The range of hunting abilities amongst domestic dogs varied greatly, but "hunting" dogs at this site made a substantial contribution of meat to the community, being considered more effective "weapons" than spears and clubs. Jones (1970), after summarizing the use of dogs in hunting in Tasmania, concluded that dogs were incorporated into the traditional hunting repertoire replacing men in the role of harriers, "thus allowing the armed hunters to expend less energy for the same results," a skill "probably facilitated by observations of Europeans hunting, and by the initial use of European-trained hunting dogs" (p. 267). It must be noted here that not all Indigenous communities embraced the use of dogs as hunting aids (Senior et al. 2006), and for those that did, not all camp dogs were used in this way.

Based on the evidence reviewed, it appears that dogs in many areas were used successfully as hunting aids whereas dingoes were not, perhaps reflecting the dingoes' strong "prey drive," independent nature, and inability to be trained (Macintosh 1975; Oakman 2001). The literature may not accurately reflect the nature of the early relationship between Indigenous Australian hunters and dingoes prior to European settlement, as accounts were written after domestic dogs had become a major part of Indigenous Australian community life.

Dogs and Dingoes as Food

Dogs have been eaten by humans in a number of cultures (see Manwell and Baker 1984); however, consumption of dogs by Indigenous Australian communities appears rare. Meggitt (1965), Kolig (1978), and Tindale (1974) point out that dingoes were only eaten during times of famine "as a kind of last hope meal for people facing abject starvation" (p. 109). In those instances where Indigenous Australians were observed to eat dingo, even when other meat was available, the meat was not highly prized (Hamilton 1972). Another report describes the killing of a dog during a food shortage in central Australia, which ended in the humans being unable to eat the dead dog, instead spending the whole night mourning its passing (Mountford 1948). Some Indigenous Australians considered dog to be taboo as a source of meat, and if desperate enough to eat it, the human would "vomit" (Meehan, Jones and Vincent 1999). Other Indigenous Australians considered the camp dogs that they knew as sacred and thus inedible, whereas strange or unknown dingoes or domestic dogs were considered fair game. Corbett (1995) finds it interesting that Indigenous Australians did not pick up the custom of eating canids, since they were used as a source of food by Asians who brought the dingo to Australia.

Dingoes and Dogs as a Direct Competitor for Food and General Nuisance?

Indigenous Australians and canids competed for prey, particularly prey items that were young or weak (Kohen 1995), as well as for food around the camp. The competition is neatly summarized by Hamilton (1972): "dogs are significant competitors with man for food, both wild dogs when he goes hunting and camp dogs when he comes home" (p. 290). It is estimated that both "wild" and "camp" canids may have been responsible for stealing as much as 10% of food available (Hamilton 1972), whilst "camp" canids only contributed a small portion of the overall edible food that was taken back to the community (Meggitt 1965; Gould 1970; Hamilton 1972; Hayden 1975). For example, over two six-month periods, dogs living in the Jankunjara Indigenous community contributed 64kg of meat, largely wallaroo and kangaroo, but consumed 148kg (Hamilton 1972).

Some reports describe the dingo or dog as a "camp hanger-on" or scavenger that was not only costly in economic terms, but also a disruptive nuisance to the Indigenous community in general, since they wreaked havoc by: "brawling, thieving, barking all night, interfering in ceremonies and tripping up dancers" (Hamilton 1972, p. 293; Kolig 1978). Indigenous communities found it difficult to cache and store food with dingoes or dogs around, sometimes having to resort to constructing a "table" or shelf across branches at a height of six-feet off the ground, and children were often forced to eat standing upright to avoid hungry dogs (Hamilton 1972; Clutton-Brock 1999, Figure 2.1). Similarly, to protect the dead from the "unwelcome attention of dingoes" (Claoué-Long 2006, p. 20) rocks or cairns were used on terrestrial graves (Claoué-Long 2006) and "aerial tombs" were located in trees (Yarrow 2004; Claoué-Long 2006).

The affection bestowed on canids by many Indigenous Australians seems unwarranted at times (Hamilton 1972), given the extent of the disruption that they reportedly caused to everyday life, the effort needed to acquire puppies (in the case of dingoes), and the economic costs incurred by allowing them to live as part of the community (e.g., Kolig 1978). Yet, as the following sections will show, canids provided a number of other benefits that cannot readily be measured in economic terms.

Dogs and Dingoes as Guards and Protectors

Dogs living in Indigenous communities performed roles as watch dogs with "great enthusiasm" (Hamilton 1972; White 1972; Senior et al. 2006). Dogs in the Jankuntjara community, for instance, individually protected a territory of about 4.5m around each human shelter, but collectively defended the entire perimeter of the Indigenous community (Hamilton 1972). These dogs greeted returning hunting parties, outsiders or unwelcome strangers, and members of "secret revenge expeditions" with "raised tails," "snapping jaws," and "violent barking." Dogs were also considered to serve another important protective role, since it was believed that they could see all "*mamu*" or evil spirits, which are invisible to humans (Hamilton 1972; Kolig 1973, 1978; Meehan, Jones and Vincent 1999). The presence of "evil forces," only capable of being detected by dogs, explains, for example, why women rarely went hunting alone and why they always had dogs with them (Meehan, Jones and Vincent 1999). So important was this role, that even those individual dogs considered largely "useless" served as protectors from human and spirit intruders, since they added to the combined "power" of all the dogs living in the community (Senior et al. 2006). The larger the number of dogs, the safer the community felt, with visitors forced to remain at a distance and call out loudly to make their presence known. Propensity for barking in dogs may have been a specifically selected trait in the early domestication process (Manwell and Baker 1984).

While the role of the dog as protector is a focus in the literature reviewed, it is less clear whether dingoes served the same role, although like domestic dogs, dingoes are very territorial and thus likely to have protected the Indigenous community they lived in. It has long been claimed that dingoes do not bark (e.g., Meggitt 1965; Barker and Macintosh 1979), but this is not the case, as they emit a number of vocalizations including "snuff-barks" and "bark-howls" (Corbett 1995), which would have alerted their owners to the approach of "strangers," just as they alert other dingoes in their natural environments (personal observation, Fraser Island, 2007).

Campsite Cleaner and Sanitary Role of the Dingo and Dog

Both dingoes and dogs scavenged around camps for food scraps and also human feces (containing pathogens potentially harmful to humans). This role is considered by some authors to be essential in helping to maintain a sanitary and clean site (Hamilton 1972; Tindale 1974; Trezise 1978; Manwell and Baker 1984), thereby extending the period they could stay in one location. Other authors disagree, suggesting that campsites could be moved if necessary (Abbie 1969) and that dogs and dingoes potentially added to the sanitation and potential health problems (Manwell and Baker 1984), as they attracted flies, urinated and defecated around living areas, and were often infested with sores and parasites (Hamilton 1972; Meehan, Jones and Vincent 1999). The potential spread of pathogens and disease from dogs to humans or wildlife has been widely documented (see Jenkins and Andrew 1992; Jenkins et al. 1996; Meek 1999), although the threat posed by dingoes as such a vector prior to European settlement is not well understood.

Dingoes and Dogs as Bed Warmers and Walking Blankets

Mutual warming by endothermic animals (warm blooded) for the maintenance of body temperature is essential for survival in some environments (Manwell and Baker 1984). Given the cold temperatures in the desert areas at night, Indigenous Australians probably considered an animal capable of providing warmth as a valuable asset. Early explorers often mentioned the use of canids for this purpose (Meggitt 1965; Abbie 1969; Tindale 1974), entering into Australian folklore in the description of a cold night as a "three dog night" (Breckwoldt 1988, p. 64). Interspecific "huddling," however, can only occur in the absence of fear and aggression, with dingoes potentially only capable of serving this role if raised correctly from "puppyhood," and prior to sexual maturity when they typically left camp. Dingoes not suited to the role are likely to have been killed or discarded (Manwell and Baker 1984).

Gould (1970) found that "on chilly nights the desert Aborigines always sleep next to a fire with their dogs huddled around them to keep warm" (p. 65), and this was particularly so for the eldest women of the camp. But the use of dogs to keep warm was not always necessary, with Hamilton (1972) suggesting that in most "environmentally stable situations" sleeping around small fires, with the addition of wind blocks (for an example, see Flood 2006) was sufficient for warmth. Dogs were also reported to lie between the fire and their human companions, frequently having to be driven away, thus potentially acting as a competitor for heat from fires. However, dogs were clearly useful for warmth during rainy periods or "damp heavy morning dews" (Hamilton 1972).

Canids also acted as clothing. Tindale (1974) noted that "…where skin clothing was not worn, the dog was of value enough to be kept, a walking blanket for a nomad [sic] unable to carry his wanderings more than a limited number of possessions" (p. 109). A number of authors cited by Meggitt (1965) observed the use of dingoes as "living shawls" or lap dogs, particularly by older members of the community, suggesting that Indigenous Australians "depend greatly on their dogs for warmth" (p. 15). Hamilton (1972) observed women carry dogs on their backs for warmth. In colder parts of South Australia, however, it appears that dogs were used as blankets as Indigenous Australians in this area were unable to use any form of animal skin as clothing, since scavenging dingoes tended to "eat" these garments (Tindale 1974).

Dogs and Dingoes as Canine Companions

Puppies were particularly popular in some Indigenous communities and appeared to serve a role as "substitute" children, providing an outlet for "nurturing" in areas which did not support a large human population (Hamilton 1972). In some communities, childless women were observed to carry dogs around their waist with "all women who were barren or had ceased bearing children…required to nurse a dog in this way" (White 1915, p. 726, as cited by Hamilton 1972). Early explorers also reported witnessing Indigenous Australian women breast-feeding young dingo pups (Hamilton 1972). Hamilton (1972) recorded the number of dogs kept by individual households and found that "older persons and those with no resident children have more dogs; younger persons with young families have only one or none at all" (p. 294). In Anbarra society, each woman on average owned about three dogs, with elderly women "owning" up to 12 dogs (Meehan, Jones and Vincent 1999). Both Gould (1970) and Meehan, Jones and Vincent (1999) describe separate instances of an elderly Indigenous Australian woman fussing over her many dogs in order to compensate for unsatisfactory personal relationships.

The importance of dogs in human culture is well illustrated by the existence of dog burials all around the world, dating to at least 12,000–14,000 years ago (see Morey 2006 for a review). Similar to their human companions, dogs were given the opportunity to take part in the "after life," being viewed as beings capable of true "unconditional" friendship (Morey 2006). In Australia, dingo remains have been found near areas of intense habitation by Indigenous communities, such as mounds and open coastal middens (e.g., Gollan 1982, 1984), suggesting that some dingoes were held in high regard. Pardoe (1996) located a human and dog (possibly dingo) burial site at the Coorong, South Australia. Humans were buried at the centre surrounded by a large number of hearths (fireplaces), and five dogs (possibly dingoes) were buried at the edge of the site. The intentional positioning of these canids outside the living areas suggests that the canids were protecting their dead human companions in the spirit world.

The Role of the Dingo in Indigenous Australian Spirituality

Traditional Indigenous Australian spirituality is often described as The Dreaming, which refers to a period when the world was created, and when the "responsible creational beings" and framework of laws governing Aboriginal action were formed (McIntosh 1999). Compared with other animals (except perhaps the snake) the dingo is over-represented in Indigenous Australian mythology (Kolig 1978), and associated with the supernatural more than any other animal (Kolig 1973). The dingo appears in numerous Dreaming narratives across the continent (see Harney 1951; Kolig 1978; Rose 1992; Cowan 1992; McIntosh 1999), with Dreaming stories popularized in children's literature, such as *The Giant Devil Dingo* (Roughsey 1976) and *Lasca and Her Pups* (Trezise 1990). For a comprehensive summary of the dingo's role in Indigenous Australian Dreaming (including its role in human and environmental creation, hunting and resurrection), see Parker (2006).

According to the Yarralin Community, humans have dingo origins; the dingo quite literally making us human. Dingoes gave humans their characteristic shape with respect to head and genitals (different to Australian marsupials) and upright stance. The dingo is the only animal that walks now as he did in The Dreaming, and there was a time when the dingo and human were one and the same (Rose 1992). Each person also has an animal or plant "relative" and a subsequent spiritual bond with it. "Old Tim Yilngayari," the "dog man" of the Yarralin Community, is known for his "intimate concern for, and understanding of, dingoes and dogs. His life is connected to dingo life and he has assumed a special responsibility for canines" (Rose 1992, p. 29). Dingo and human death are also intricately connected, since: "Human death, too, originates with the dingo. The moon has the Law of eternal life, and he offered it to the dingo" (Rose 1992, p. 48). The dingo is also often associated with the rites of fertility, circumcision, and subincision (Tindale 1974; Macintosh, 1965; Kolig 1978), and recognized as an intermediary between the living and spiritual worlds, potentially warning humans of approaching evil spirits (Kolig 1973).

This section has focused on the dingo in The Dreaming, but some Dreaming narratives also refer to the dog, but it is unclear whether these are domestic dogs, dingoes or both. In general, whenever the dingo/dog appears in The Dreaming, it is considered to have detrimental (negative) or uncanny attributes, appearing as a "vicious," "murderous," "blood thirsty," "deceitful," and "wicked creature" (Kolig 1978). These mythical dingo/dogs wreak havoc through "acts of destruction; they never obey their masters, are vicious and disloyal; they rape and thieve; and they never act as culture heroes as many other mythical beings do" (Kolig 1973, p. 123).

Although as a "fully fledged lawman" the dingo institutes Dreaming laws, it also breaks them, appearing as a "trickster" capable of transcending "humankind's conceptual boundaries, moving freely between the worlds of gods and humans and playing tricks on both" (McIntosh 1999, p. 184). The dingo, as a sacred totem, provides a reference point for Indigenous Australian customs and social structure, serving as "a powerful symbol for moderation in behavior at both individual and group levels" (McIntosh 1999, p. 185). The "trickster dingo" threatens the status quo, and Indigenous Australians recognize that this potential trait exists within every member of the community (McIntosh 1999).

Conclusion

Soon after the arrival of the dingo, and later the dog into Australia, it was adopted by the Indigenous people, infiltrating many facets of their lifestyle, culture, and spirituality. Although some benefits of Indigenous Australians having camp "dogs" appear obvious (as guardians or protectors, companions, bed warmers, and as mythological creatures), the close association with these animals has its disadvantages, including interruption to hunting, camp life, and religious ceremonies, as well as a burden on scarce resources. Behavioral barriers in conjunction with the lifestyle and religious beliefs of Indigenous Australians may have restricted opportunities for domestication as a viable option. It is also possible that "tame" dingoes provided the necessary perceived benefits, and further investment in domestication was not required. Consequently, it is important that we remain open to other cultural approaches or points of view concerning the nature of human–animal interactions, and whether the need or desire to domesticate any non-human species is always appropriate.

The Indigenous Australian–canid relationship provides a unique example of how a traditional society interacted and viewed an early form of "domestic dog" over a 3,000+ year period, facing some of the difficulties or barriers encountered by earlier prehistoric peoples attempting to domesticate and maintain a population of wild canids. These barriers to domestication that Indigenous Australians faced are in line with the behavioral, genetic, and archaeological evidence discussed by Koler-Matznick (2002) and Raisor (2004). These researchers suggest that the earliest domestic dogs did not diverge from wolves as a result of human intervention. Instead, this evolutionary divergence occurred as a result of other factors, leading to a medium-sized generalist canid, which only then began its commensal or symbiotic relationship with humans as the earliest "wild domestic dog." The dingo may represent an extant species, most closely resembling this ancestral canid. Future studies of human–"wild dog" relationships in the Asia-Pacific region (e.g., Thai pariah dogs and New Guinea Singing Dogs) may lead to more valuable insights about the use, treatment, and position of "wild dogs" in human societies.

Acknowledgements

The authors wish to thank the Interlibrary Loan department of the Library at the University of South Australia for persistence in tracking down difficult to obtain references. Thanks also to Rob Appleby, Nick Baker, Dr. Rob Ranzijn, Lyn and Peter Watson, Prof. Tony Winefield, Assoc. Prof. Keith McConnochie, Joanne Davis and three anonymous reviewers for their helpful comments on earlier versions of the manuscript.

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