

## Australia and Oceania (Australasian)

### 9.1 Dingo

***Canis lupus dingo*** (Meyer, 1793)

Vulnerable – VU: A2e (2004)

L.K. Corbett

#### Other names

**French:** dingo; **German:** dingo; **Indonesian:** tengger dog; **Japanese:** akita, hokkaido, shikoku, kai, shiba, kishu; **Korean:** jindo, jingo; **Thai:** maa; **Indigenous names:** Australian Aborigine: warrigal, tingo, joogoong, mirigung, noggum, boolomo, papa-inura, wantibirri, maliki, kal, dwer-da, kurpany; Melanesia: koli, kuli; Micronesia: kiti, kiri, komoa; New Guinea: New Guinea singing dog, singer, waia, sfa, katatope, kurr ona, agl koghma, yan-kararop; New Zealand: kirri, kuri, pero, ghooree; Philippines: aso; Polynesian: kuri, ilio, kurio, maile, uli, ooree.

#### Taxonomy

*Canis antarticus* Kerr, 1792. Animal Kingdom, vol.i, p.136. Type locality: Port Jackson, New South Wales [Australia].

The nomenclature is based on Honacki *et al.* (1982) as well as usage in recent dingo publications and major Australian institutions, including the Australian Museum and CSIRO. Furthermore, recent research clearly indicates the long antiquity of the dingo and the evolutionary line of the wolf-dingo-domestic dog (Corbett 2004).

Europeans did not discover the dingo in Australia until the 17th century and taxonomists originally thought the dingo was a feral domestic dog (hence one of the earlier names *Canis familiaris dingo*). Many early zoologists and anatomists assumed that Aborigines introduced the dingo into Australia in Pleistocene times, and this led to much confusion about the dingo's nomenclature and relationships for about 200 years. It is only since recent investigations have shown that the dingo is a primitive dog transported to Australia by Asian seafarers about 4,000 years ago (Corbett 1985) that the taxonomy is better understood.

Today, the wild population comprises dingoes, feral dogs and hybrids of the two. The names *C. f. dingo* for the dingo proportion of the wild dog population and *C. f. familiaris* for both wild-living and commensal domestic dogs have had the greatest use in scientific literature over the past 50 years. Corbett (1995) concludes that wild-living dogs in Australia are subspecies of the grey wolf (*C. lupus*), that is *C. l. dingo* and *C. l. familiaris*, and these designations are currently being investigated (W.D.C. Ride pers. comm.).

Chromosome number: 2n=78 (Hsu and Benirschke 1967–1976).

The relatively extended isolation of a dingo-like dog population in Papua New Guinea – initially described as the New Guinea singing dog (*Canis hallstromi*) (Troughton 1957; Schultz 1969) – and subsequent adaptations to the mountainous habitat it occupies (Ortolani 1990; Brisbin *et al.* 1994; Bino 1996; Koler-Matznick *et al.* 2000), strongly suggests that it could be designated an “evolutionarily significant unit” (Crandall *et al.* 2000) within dingoes (Bininda-Emonds 2002).

Further research based on valid morphological and molecular comparisons is required to elucidate the taxonomic status of dingo-like dog populations in Papua New Guinea, Asia, Africa and North America. There is, however, mounting evidence that recent and extant populations are now hybrid. For example, the morphology of all New Guinea singing dog skulls examined to date, including the holotype and paratype, matches that of hybrid dingoes (L. Corbett unpubl.). Further research is also required to confirm whether or not the ‘Carolina dog’ (Brisbin and Risch 1997) and ‘basenji’ (Coe 1997), in North America and Africa, respectively, have descended from pure dingoes.

The following definitions of dingoes and other wild, dingo-like dogs are based on Fleming *et al.* (2001):

- *Dingoes*: Native dogs originating in Asia. Dingoes were present in Australasia and Oceania before European settlement. Pure dingoes are populations or individuals that have not hybridised with domestic dogs or hybrids.
- *Domestic dogs*: Dog breeds (other than dingoes) selectively bred by humans, initially from wolves and/or dingoes that usually live in association with humans. Introduced to Australia and other range countries by Europeans.
- *Hybrids*: Dogs resulting from crossbreeding of a dingo and a domestic dog and the descendants of crossbred progeny. Some hybrids are phenotypically indistinguishable from pure dingoes (e.g., hybrid populations in south-eastern Australia – see Daniels and Corbett 2003).
- *Wild dogs*: All wild-living dogs (including dingoes and hybrids).
- *Feral dogs*: Wild-living domestic dogs.
- *Free-roaming dogs*: Dogs that are ‘owned’ by humans but not restrained so they are free to travel away from their owner’s residence and breed.
- *Commensal dogs*: Wild dogs (including dingoes and free-roaming domestic dogs) living in close association with, but independent of humans.

## Description

Dingoes are dog-like with a fairly broad head and tapered muzzle, erect ears about half the head length, legs about half the head-body length and without dewclaws, hind feet about a third of the leg length, short body hair and a fairly bushy tail that does not extend beyond the hocks. In order of frequency of occurrence, the adult pelage colours are ginger (red to sandy), black with tan areas (cheeks, muzzle, ears, legs), all white, and all black. Most individuals have small white markings on the chest, feet/legs and tail tip, and some have white belly markings and/or a black muzzle. In ginger animals, there is a faint but distinctive shoulder

stripe. All other colorations indicate hybridisation with domestic dogs (Daniels and Corbett 2003). Males are universally larger and heavier than females of the same age (Table 9.1.1). Dingoes from northern and north-western Australia are larger than dingoes in central and southern regions; all Australian dingoes are larger and heavier than those in Asia (Corbett 1985, 1995; see body measurements). Relative to similar-sized domestic dogs, dingoes have longer muzzles, larger bullae, larger carnassial teeth, longer canine teeth, and flatter crania with larger nuchal crests (Newsome *et al.* 1980). Dental formula is  $3-1/1-4/4-2/3=42$ .

**Table 9.1.1. Body measurements for the wild and commensal dingo and the New Guinea singing dog.** All Australian and Thailand measurements were of adults with ginger pelts and females that were not obviously pregnant (Corbett 1985, 1995). Australian measurements are means of samples from northern (Kakadu National Park) and central (Alice Springs) regions, and Thai measurements are from north-eastern (Tharee) and North Thailand (Chieng Mai) (Corbett 1985, 1988a). All New Guinea measurements were of captive specimens one year of age or older (J. Koler-Matznick unpubl.). Wild specimens may weigh less.

	Australia (wild dingoes)	Thailand (wild and commensal dingoes)	New Guinea (New Guinea singing dogs)
HB male	914mm (835–1,110) n=50	824mm (750–917) n=20	849mm (780–910) n=10
HB female	883mm (813–1,010) n=38	755mm (703–810) n=16	802mm (710–889) n=9
T male	324mm (280–370) n=50	264mm (210–301) n=20	252mm (220–280) n=10
T female	311mm (247–350) n=38	239mm (200–270) n=16	235mm (230–250) n=9
HF male	190mm (176–220) n=51	166mm (149–190) n=21	156mm (140–168) n=10
HF female	180mm (165–195) n=38	152mm (143–165) n=16	148mm (140–168) n=9
E male	103mm (95–110) n=50	85mm (76–99) n=21	95mm (70–110) n=10
E female	98mm (87–107) n=38	79mm (71–87) n=16	90mm (65–105) n=9
WT male	15kg (12–22) n=51	12kg (7–17) n=21	12.2kg (9.3–14.4) n=9
WT female	13kg (11–17) n=38	10kg (8–14) n=16	11.2kg (8.6–13.2) n=7



Yearling male dingo.  
Strathmore Station, Gulf of  
Carpentaria, Australia, 1997.

Lee Allen

**Subspecies** Based on skull morphology, size, coat colour and reproduction, regionally distinct populations of dingoes appear to exist between Australia and Thailand (Corbett 1985, 1995) but not within Australia (Corbett 2001). There may, therefore, be a case for subspecific names for dingo populations in Thailand and Australia.

**Similar species** Grey wolves (*Canis lupus*), are generally larger, more slender and with relatively longer legs than dingoes. Dingo-like dogs and hybrids are usually distinguished from pure dingoes by coat colours other than ginger, black-and-tan, all black and all white.

### Distribution

**Historical distribution** Based on fossil (Olsen and Olsen 1977), molecular (Vilà *et al.* 1997; Corbett 2004) and anthropological evidence (Corbett 1995), the early primitive dingoes formerly had a cosmopolitan distribution (Corbett 1995). The primitive dingoes were associated with nomadic, human hunter-gatherer societies and later with sedentary agricultural population centres where the primitive dingoes were tamed and subsequently transported around the world. Austronesian-speaking people transported the dingo from mainland Asia to

Australia and other islands in Southeast Asia and the Pacific between 1,000 and 5,000 years ago (Corbett 1985).

**Current distribution** Pure dingoes have been demonstrated to occur only as remnant populations in central and northern Australia and throughout Thailand. However, based on external phenotypic characters, they may also occur in Burma, Cambodia, China, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines and Vietnam.

**Range countries** Australia, Burma, Cambodia, China, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam (De Vis 1911; Troughton 1957; Menzel and Menzel 1960; Schultz 1969; Fernando 1977; Medway 1977; Corbett 1985, 1988a, 1995; Koler-Matznick *et al.* 2000).

### Relative abundance

Estimating dingo abundance is difficult because the external phenotypic characters of many hybrids are indistinguishable from pure dingoes. For example, populations of 'wild dogs' in the south-eastern highlands of Australia have been fairly abundant over the past 50 years. However, the proportion of pure dingoes, as based on skull morphometrics, has declined from about 49% in



**Figure 9.1.1. Current distribution of the dingo.**

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the 1960s (Newsome and Corbett 1985) to about 17% in the 1980s (Jones 1990) and the pure form may now be locally extinct (Corbett 2001). Such quantitative data is not available for countries other than Australia, Thailand and Papua New Guinea so that the following qualitative estimates of abundance refer to pure dingo and/or hybrid populations as based on general body form, pelage colour and breeding pattern.

In Australia, pure dingoes are common in northern, north-western and central regions, rare in southern and north-eastern regions, and probably extinct in the south-eastern and south-western regions. The density of wild dogs (dingoes and hybrids) varies between 0.03 and 0.3 per km<sup>2</sup> according to habitat and prey availability (Fleming *et al.* 2001). Dingoes are rare in New Guinea and possibly extinct as there have been no confirmed sightings for about 30 years (Newsome 1971; Brisbin *et al.* 1994; Bino 1996; Koler-Matznick *et al.* 2000). Dingoes are common in Sulawesi but their abundance elsewhere in Indonesia is unknown. They are common throughout the northern and central regions of Thailand, but less so in the southern regions; considered rare in the Philippines and probably extinct on many islands. Present in Malaysia, Vietnam, Cambodia, Laos, China, Burma and India, but abundance unknown. Dingoes are probably extinct in the wild in Korea, Japan and Oceania, although several local dog breeds share dingo-like characteristics.

**Estimated populations/relative abundance and population trends** Dingoes were formerly widespread throughout the world (Corbett 1995) and although populations of wild dogs remain abundant in Australia and other countries, the proportion of pure dingoes is

declining through hybridisation with domestic dogs (Table 9.1.2). The data in the following table refers to estimated populations of pure dingoes and/or hybrid populations as based on general body form, pelage colour and breeding pattern.

The ecological and behavioural information in the following sections is largely based on wild-living dingoes in Australia and Thailand.

### Habitat

Dingoes occupy all habitats, including tropical alpine moorlands above 3,800m a.s.l. in Papua New Guinea (Troughton 1957; Newsome 1971), forested snow-clad peaks in temperate eastern Australia, arid hot deserts in central Australia, and tropical wetlands and forests of northern Australia (Corbett 1995). The absence of dingoes in many grassland habitats of Australia is due to persecution by humans (Fleming *et al.* 2001).

### Food and foraging behaviour

**Food** Most of the dietary information comes from studies conducted in Australia, where dingoes eat a diverse range of prey types and over 170 species have been identified ranging from insects to buffalo (Corbett 1995). However, in a particular region they usually specialise on the most available (common) vertebrate prey. The main prey in Australia are magpie geese (*Anseranas semipalmata*), rodents (*Rattus colletti*) and agile wallabies (*Macropus agilis*) in the northern tropical wetlands (Corbett 1989); rabbits (*Oryctolagus cuniculus*), rodents (*Rattus villosissimus*, *Mus musculus*), lizards (*Ctenophorus nuchalis*) and red kangaroos (*Macropus rufus*) in arid central Australia (Corbett and Newsome 1987; Corbett 1995); euros (*Macropus robustus*) and red kangaroos in arid north-western habitats (Thomson 1992); rabbits in the south-western deserts (Marsack and Campbell 1990); and wallabies (*Wallabia bicolor*, *Macropus rufogriseus*), possums (*Trichosurus vulpecula*, *Pseudocheirus peregrinus*) and wombats (*Vombatus ursinus*) in the east and south-eastern highlands (Newsome *et al.* 1983; Robertshaw and Harden 1985; Corbett 1995). In recent years, rabbit populations throughout Australia have greatly declined due to rabbit calicivirus disease, and dingo diet in former rabbit-infested regions is likely to change (Fleming *et al.* 2001).

In Asia, dingoes live commensally with humans in most regions and their main food items are rice, fruit and other table scraps provided by people or scavenged (Corbett 1995). In rural areas of Thailand and Sulawesi, dingoes have been observed hunting insects, rats and lizards along roadsides, rice paddies and in forests (Corbett 1985, 1988a). In the Papua New Guinea highlands, Newsome (1971) reported rodents in canid scats. Bino (1996) noted that wild dogs commonly eat cuscus (*Phalanger* spp.) and scavenge harpy eagle kills and human-trapped animals.

**Table 9.1.2. The status of dingoes in various range countries** (Population: A=abundant, C=common, U=unknown, Ex=extinct, ?=current presence not confirmed; Trend: D=decreasing).

Country	Population/abundance	Trend
Australia	C	D
north/north-west	A	D
central	A	D
south-west	U	D
north-east	C	D
south-east	Ex?	D
Burma	U	D
Cambodia	U	D
China	U	D
India	?	D
Indonesia	U	D
Laos	U	D
Malaysia	U	D
New Guinea	Ex?	D
Philippines	Ex?	D
Thailand	C	D
Vietnam	U	D



**Foraging behaviour** Dingoes change their group size and hunting strategy in order to maximise hunting success. For example, packs have greater success than solitary dingoes in hunting kangaroos (Thomson 1992) and vice versa when hunting rabbits. Dingoes also scavenge and steal prey from other predators (Corbett 1995).

**Damage to livestock or game** In Australia, dingoes (and hybrids) kill livestock, particularly sheep, cattle and goats, and can threaten the economic viability of properties in some areas (Fleming *et al.* 2001). Many attacks occur when native prey is scarce (e.g., during droughts or as a result of human disturbance to habitats). However, there is evidence of seasonal peaks in predation on livestock, possibly related to the seasonal breeding activity of dingoes, as well as the timing of lambing, calving and control activity (Fleming *et al.* 2001).

### **Adaptations**

During droughts in Australia, dingo packs fragment and the likelihood of death is high for all pack members, irrespective of social status. During good seasons, population recruitment is also low due to infanticide where the alpha female kills the pups of subordinate females (Corbett 1988b). This behaviour is believed to be an adaptation to the capricious Australian environment that has demanded a common reproductive selection strategy: the more pups born, the greater the chance that some will survive adverse periods. Since most breeding dingoes are closely related, at least some of the alpha's genes will survive to the next generation if all pregnancies go to term and if some of the smaller pack units survive the drought (Corbett 1995).

Other adaptations to drought are the dingoes' ability to survive on free and metabolic water from prey in waterless regions in winter (Green 1973), and female's regurgitating water to weaned pups confined to den sites in summer (Corbett 1995).

### **Social behaviour**

Throughout most of their range in Australia and Asia, dingoes are usually seen alone but most individuals belong to socially integrated groups whose members meet every few days or coalesce during the breeding season to mate and rear pups. At such times, scent marking and howling is most pronounced and there are frequent skirmishes with adjacent groups (Corbett 1995).

In remote areas of Australia, where dingoes and their prey are least disturbed by humans, discrete and stable packs of 3–12 dingoes occupy territories throughout the year. The home ranges of individual pack members overlap considerably but neighbouring pack territories do not (Thomson 1992; Corbett 1995). Packs have distinct male and female hierarchies where rank order is largely determined and maintained by aggression, especially in

male ranks. The dominant pair may be the only successful breeders but other pack members assist in rearing the pups including coaching the pups in hunting (Corbett 1988b, 1995).

Territory size varies with prey resources and terrain but is not correlated with pack size. For individuals, home range size also varies with age (Thomson 1992). The largest recorded home ranges (90–300km<sup>2</sup>) occur in the deserts of south-western Australia (Thomson and Marsack 1992). Home ranges recorded elsewhere are 45–113km<sup>2</sup> in north-western Australia (Thomson and Marsack 1992), 25–67km<sup>2</sup> for arid central Australia (Corbett 1995; L. Best pers. comm.), mean 39km<sup>2</sup> for tropical northern Australia (Corbett 1995) and 10–27km<sup>2</sup> for forested mountains in eastern Australia (Harden 1985; McIlroy *et al.* 1986). Most dingoes remain in their natal area and mean distances travelled per day average less than 20km. Some dingoes disperse, especially young males, and the longest recorded distance for a tagged dingo is about 250km (Thomson and Marsack 1992; Corbett 1995).

Dingoes frequently howl but rarely bark as domestic dogs do. There are three basic howls (moans, bark-howls and snuffs) with at least 10 variations (Corbett 1995). Dingoes howl over large distances to locate other dingoes for the purposes of attracting pack members and repelling intruders. Dingoes howl with distinct pitches in a chorus howl and as the number of animals howling in a group increases, so do the variation in pitches (Ortolani 1990); this suggests that dingoes can estimate the size of an unseen pack. The frequency of howling varies and is influenced by breeding, dispersal and social stability of packs (Thomson 1992; Corbett 1995). The New Guinea singing dog has a distinctive shriek-like howl that is characterised by a very sharp rise in pitch at the start and ends at a very high frequency (Ortolani 1990).

Dingoes also communicate with pack members and rival packs by defecating and urinating on grass tussocks and other conspicuous objects at shared sites such as waters, trails and hunting grounds. Males scent-mark more than females and both sexes perform more in the breeding season (Corbett 1995). Dingoes also scent-rub whereby an animal rolls on its neck, shoulders or back on a 'smell' that is usually associated with food or the scent markings of conspecifics (Thomson 1992; Corbett 1995).

### **Reproduction and denning behaviour**

Dingoes breed once each year. Litters are usually whelped in winter (May to July) although in tropical habitats breeding can occur in any month. This breeding pattern is determined by the female's annual oestrous cycle, as males are fertile most of the year in most regions (Catling *et al.* 1992). Most wild females commence breeding at two years (Catling *et al.* 1992) and, in packs, the alpha female (usually the oldest) tends to come into oestrus before the subordinate females. Pro-oestrus and oestrous periods

for captive dingoes last about 10–12 days (Corbett 1995). However, in the wild, behavioural data suggest that pro-oestrus may last up to 60 days (Thomson 1992). Males reach full sexual maturity at 1–3 years. Gestation lasts 61–69 days in captive dingoes and is similar for wild dingoes. The average litter size for dingoes is five (range=1–10) throughout Australia and Thailand, and usually more males are born than females. Pups usually become independent at 3–6 months or if in a pack, at 12 months when the next breeding season begins (Corbett 1995).

In contrast to dingoes, female feral dogs and hybrids of similar size to dingoes may have two oestrous cycles each year, although it is unlikely that they successfully breed twice every year in the wild. Gestation is 58–65 days for hybrids and the average litter size is similar to dingoes.

In contrast to wolves in the northern hemisphere, where alpha wolves prevent subordinates from breeding, the Australian dingo's main method of suppressing reproduction is infanticide: all the pups of subordinate females are killed by the alpha female (Corbett 1988b).

In Australia most dens are 'underground' and have been recorded in enlarged rabbit holes, caves in rocky hills, under debris in dry creek beds, under large tussocks of spinifex, among protruding tree roots, hollow logs, fallen trees, enlarged goanna (*Varanus* spp.) holes and old wombat burrows (Thomson 1992; Corbett 1995).

### Competition

The demise of two endemic marsupial carnivores, the thylacine (*Thylacinus cynocephalus*) and the Tasmanian devil (*Sarcophilus harrisi*), on the Australian mainland soon after the dingo's arrival about 4,000 years ago is attributed to competition. It is assumed that the dingoes' superior social organisation enabled them to better exploit scarce resources during droughts or after extensive wildfire (Corbett 1995).

Dingoes may now present red foxes (*Vulpes vulpes*) and feral cats, both exotic species to Australia, with a similar kind of competition. There is some evidence that dingoes limit fox and feral cat access to resources and there is evidence of an inverse density relationship between dingoes and foxes (Fleming *et al.* 2001). One implication of these findings is that reducing dingo density (via human control) might result in an increase in other predators with overlapping diets ('mesopredator release'). It is therefore possible that removing dingoes from a system where foxes and cats also occur will result in an increase in their numbers with consequent increased predation on small native mammals.

### Mortality and pathogens

**Natural sources of mortality** Starvation and/or dehydration during drought or after extensive wildfire; infanticide; drowning by kangaroos (Corbett 1995);

snakebite; predation on pups by wedge-tailed eagles (Fleming *et al.* 2001); buffalo and cattle goring and kicking (Fleming *et al.* 2001).

**Persecution** A major cause of dingo mortality in Australia is a cycle involving dingo population density, food supply and human control. When food becomes scarce for a large population of dingoes in a 'safe' area (source), they disperse to pastoral and agricultural areas where there are fewer dingoes. At those sites, intense human control measures (poisoning, trapping or shooting) create vacant areas (sinks) and perpetuate the dispersal-mortality cycle (Thomson 1992). Dingoes have been eliminated in most of south-eastern Australia through such human control and loss of habitat, and this situation is maintained with a 5,614-km-long barrier fence (Breckwoldt 1988). In Australia dingoes are also chased and killed by people on horseback.

In Asia and Oceania, dogs (dingoes, hybrids and domestic dogs) are considered a delicacy (Titcomb 1969) and are regularly killed for human consumption. For example, in north-east Thailand, at least 200 dingoes are butchered each week and sold in markets for human consumption (Corbett 1985). Prior to the mid-20th century, dingoes were regularly eaten by Australian Aborigines (Breckwoldt 1988).

Persecution due to predation on stock has decreased over the past 30 years following the results of scientific research and better understanding of dingo movements, sociality and predation. It is recognised that in particular seasons, dingo predation may limit increases in competing feral and native herbivores.

A bounty system operated throughout mainland Australia from 1836 until recently, but despite the billions of dollars paid out, there is little evidence that bounty systems are (or were) an effective management tool for dingoes (Fleming *et al.* 2001).

**Hunting and trapping for fur** Not practiced.

**Road kills** Animals are occasionally run over by vehicles.

**Pathogens and parasites** Thirty-eight species of parasites and pathogens have so far been recorded in dingoes in Australia (Corbett 1995; Fleming *et al.* 2001), but in most cases diseases have little effect on the survival of adult wild dogs. Exceptions include: canine distemper, hookworms (*Uncinaria stenocephala* and *Ancylostoma caninum*) and heartworm (*Dirofilaria immitis*) in northern Australia and south-eastern Queensland. Pups are also killed by lungworm (*Oslerus osleri*), whipworm (*Trichurus vulpis*), hepatitis (Adenovirus), coccidiosis (*Isospora rivolta*, *Eimeria canis*), lice (*Trichodectes canis* and unidentified species) and ticks (*Ixodes holocyclus*, *Rhipicephalus sanguineus* and *Amblyomma triguttatum*). Sarcoptic mange

(causal agent *Sarcoptes scabiei*) is a widespread parasitic disease in dingo populations throughout Australia but it is seldom debilitating. Hydatidosis (caused by the cestode *Echinococcus granulosus* and part of a dingo-wallaby sylvatic cycle) results in serious illness in infected humans and in the devaluation of infected livestock carcasses at slaughter. However, this parasite does not cause mortality in dingoes (Fleming *et al.* 2001).

**Longevity** Dingoes live up to 7–8 years in the wild and up to 13 years in captivity (Corbett 1995).

### Historical perspective

Dingoes often accompanied Asian seafarers when they migrated to Australia and other regions of the world several millennia ago (Corbett 1985). Those journeys and other associations continue to be an integral part of oral and written culture of native people in those areas including the traditional use of dingoes as food, of canine teeth in necklaces and hair for ceremonial costumes (Titcomb 1969; Medway 1977; Breckwoldt 1988; Corbett 1995). The dingo is also an important animal in Australian Aboriginal mythology; dingoes are associated with sacred sites, totems and Dreamtime characters (Breckwoldt 1988). Aborigines also used dingoes as hunting aids (for macropods and small game), camp dogs and their scalps as a form of currency (Corbett 1995).

### Conservation status

**Threats** Cross-breeding with domestic dogs represents a significant threat to the long-term persistence of dingoes. Hybrids exist in all populations worldwide (including Fraser Island, Australia; Woodall *et al.* 1996) and the proportion of hybrids is increasing (see Relative abundance). A related threat to dingoes in Australia concerns the actions and consequences of ‘so-called’ dingo preservation societies, dingo ‘farms’ and legislation allowing legal ownership of dingoes by members of the public because most are based on known hybrids or untested dingo stock and thus effectively increase the hybridisation process (Corbett 2001). The increasing interest of private individuals and groups in keeping ‘dingoes’ as pets in Australia and other countries including Switzerland and USA, also poses a threat via human selection of form and behaviour.

**Commercial use** Bounties for dingo skin and scalps exist in some regions of Australia. Dingoes are also sold in human food markets in several Asian countries. They are also bred by private individuals and companies in Australia and USA and sold as pets.

**Occurrence in protected areas** Protected areas for dingoes only occur in Australia. Within Australia, dingoes are ‘legally protected’ in national parks, nature reserves

and the Arnhemland Aboriginal Reserve in the Northern Territory (NT), National Parks and Nature Reserves in New South Wales (NSW), National Parks in Victoria, and throughout the Australian Capital Territory (ACT). Dingoes occur in all of the NT’s 17 national parks including Kakadu, Litchfield, Gregory, Davenport Range, Nitmiluk and Uluru-Kata Tjuta. Dingo occurrence and abundance is unknown for most of the 117 national parks in NSW and the 20 national parks in Victoria. Known sites include Kosciusko, Barrington Tops and Kinchega National Parks and Nadgee Nature Reserve in NSW; Alpine, Mt Buffalo, Baw baw and Croajingolong National Parks in Victoria; and forested highland areas of the ACT.

**Protection status** CITES – not listed.

**Current legal protection** Although protected in Federal National Parks, World Heritage areas, Aboriginal reserves, and the Australian Capital Territory, the dingo is a ‘declared’ pest throughout much of its remaining range, and landholders are obliged to manage populations; the dingo is ‘undeclared’, but not protected, in the Northern Territory (Fleming *et al.* 2001). The dingo is not protected in any other countries of its range.

**Conservation measures taken** No conservation measures have been taken other than that the dingo has been nominated as a threatened species in the State of NSW and the Australian Federal Government has recently published ‘best practice’ guidelines to manage and conserve dingoes (Fleming *et al.* 2001). The efforts of dingo ‘preservation’ societies in Australia are currently ineffective because most of their stock is untested or known to be hybrid (Corbett 2001). There are no conservation measures for wild dingoes in Asia. However, in New Guinea, the Department of Environment and Conservation has indicated that measures will be initiated to protect New Guinea singing dogs (I.L. Brisbin pers. comm.).

### Occurrence in captivity

Dingoes and/or dingo-like hybrids occur in many zoos and private facilities worldwide. Tests using skull measurements of deceased animals or valid DNA tests (see below) are required to assess the purity of captive populations.

### Current or planned research projects

A. Wilton (University of New South Wales, Australia) is investigating methods to identify genetically pure dingoes (and hybrids, domestic dogs and New Guinea singing dogs). This research aims to provide a method to test the purity of live dingoes; however, it is essential that control samples in Australia should be taken from pre-European material, so that samples are unequivocally dingo. Unfortunately, this is not the case to date (Wilton 2001).

L. Corbett (EWL Sciences, Darwin, Australia) is involved in a comparative morphometric study of skulls of dingoes and hybrids from Australia, Thailand, New Guinea and Japan.

L. Allen (Queensland Department of Natural Resources, Australia) is examining relationships between dingo abundance, dingo predation on cattle and control methods in Queensland, Australia.

A dingo and wild dog management programme is underway in south-east New South Wales and ACT (Australia Capital Territory), which aims to integrate control of dingoes and other wild dogs to prevent predation of livestock with conservation of dingoes in national parks (D. Jenkins, Australian Hydatids Control and Epidemiology Program; P. Fleming, New South Wales Agriculture; H. Cathles, Yass Rural Lands Protection Board). The Program includes DNA studies (A. Wilton), movement and behaviour studies, and assessment of control strategies for dingoes and other wild dogs.

M. Feinstein (Hampshire College, Amherst, MA, USA) and A. Ortolani (Disney's Animal Kingdom, Orlando, FL, USA) are undertaking a comparative study of the larynx and throat anatomy of captive New Guinea singing dogs and domestic dogs.

J. Koler-Matznick is involved in ongoing behavioural studies of captive New Guinea singing dogs (New Guinea Singing Dog Conservation Society, Central Point, OR, USA).

### **Gaps in knowledge**

1. Morphological and genetic assessment of the taxonomic status of dingo-like dogs in Papua New Guinea, Indonesia, Malaysia, Vietnam, Cambodia, Laos, China, Burma, India, Philippines, and where present, their distribution, abundance, ecology and behaviour.
2. The ecological role of hybrids in Australia. If pure dingoes become extinct, will hybrids alter predation rates on native fauna and livestock?
3. Rabbits are a major prey in Australia but their populations have recently been decimated by rabbit calicivirus disease. What will be the effect on dingo ecology including predation on livestock?
4. What are the ecological effects of dingo control on feral cat and fox populations in Australia (meso-predator release)?

### **Core literature**

Corbett 1985, 1995, 2001, 2004; Fleming *et al.* 2001; Newsome and Corbett 1985; Thomson 1992.

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