ALAN NEWSOME: Thank you very much for the invitation to be here.

Firstly, in part answer to a previous question to Laurie Corbett on hybrids, it is not only dingoes coming into the towns that leads to hybridisation but station dogs going walk-about. In one case, a friend who ran a station south of Alice Springs had a white male labrador dog which used to disappear in the breeding season. One time he followed the dog to find it was taking food out to a den of dingo pups that were almost certainly his. They were red in colour, which is genetically dominant to the white. In Gippsland we knew of a blue heeler which used to go several kilometres into the forest surrounding the farm. In fact we caught him in a trap there, having been warned by the farmer.

On the issue of domestication, domestic dogs have foreshortened snouts compared with dingoes. In some smaller dogs, like terriers, the jaws have shrunk so far that the pre-molar teeth are actually swivelled laterally across the jaw. That is the domestication process.

Now for my talk.

The biology and ecology of the Dingo

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ABSTRACT

Dingoes have been largely eradicated in sheep lands, but are widespread and common in cattle country on the other side of the Dingo Barrier Fence. Pockets of dingoes, and/or their hybrids, survive in the Great Dividing Range and down to the coast in New South Wales and Victoria. Studies in central Australia demonstrate how rabbits are the dingo's main prey. That is so even in drought; but as rabbits become scarce, dingoes turn on red kangaroos as alternate prey. Populations of both species are suppressed at low levels by such predation for some time, even after good rains return. In other words, the dingo is on our side as a pest controller.

A Dingo Barrier Fence separates sheeplands in eastern and southern Australia from cattle country further west in inland and northern Australia. It was once *c*. 9,000 km long but was truncated in Queensland, and now is 5,531 km long. It also separates abundance of red kangaroos in the sheeplands from scarcity which begins immediately on the other side of the Fence. The highest density is in north-western New South Wales, measured in the 1970s at 12/km^2, c*f.* 0.07 km^2 across the Fence in South Australia. There are other disjuncts across the Dingo Fence. There are four species of kangaroo in New South Wales with only the red kangaroo in South Australia. Neither are there feral goats or pigs on the South Australian side.

A recent paper argues that other factors than dingo control lead to increased populations of red kangaroos in north-western New South Wales (Newsome *et al.* 2001). Analyses indicate insufficient rainfall to produce and support current red kangaroo densities. The causes are likely to be: increased run-off of rainfall from catchments due to over-grazing by sheep, rabbits and feral goats; the presence of a large geomorphic basin west of the Barrier Range in New South Wales which impounds most water shed from the Range.

Pages 20 - 33 in *A Symposium on the Dingo* edited by C. R. Dickman and Daniel Lunney, 2001. Royal Zoological Society of New South Wales, Mosman NSW.

ABSTRACT

That predation can suppress rabbit populations was tested at Yathong Nature Reserve, central New South Wales. Following good rains post-drought, very low populations of rabbits increased by up to *c.* 8-fold in one breeding season where foxes and feral cats were persistently shot. Rabbit numbers remained suppressed, however, where foxes and cats were not shot. Indeed, after two years of shooting, rabbits on the shot site were well on their way to another eruption, except that another drought intervened. Similar results emerged from persistent control of foxes around isolated rock wallaby colonies in Western Australia. Such colonies increased in numbers, while in one case with no such protection, the colony went extinct. Such studies have been followed by similar fox control experiments around remnant colonies of mala, bandicoots and bettongs.

Introduction

I wish to begin with some succinct statements:

Dingoes and sheep do not mix;

The presence or absence of dingoes basically determines whether cattle or sheep are run throughout Australia;

Dingoes, however, help control vertebrate pest species (kangaroos, emus, rabbits, foxes and feral pigs) for which evidence will be presented below; and

There are no simple answers, and sometimes no easy compromises between the two imperatives to eradicate and to conserve.

Studies of the dingo

Results presented here have come from a number of studies of the dingo (*Canis lupus dingo*) throughout the continent. The Appendix lists scientists, their topics and study areas. They include other speakers and colleagues here, especially Laurie Corbett, and Peter Catling, two of the stalwarts who were deeply involved in CSIRO's 10 year study of dingoes with me in central and south-eastern Australia. Simultaneously, Bob Harden, another speaker here, was working in the New England region. To mention a few others, Neil Shepherd in Sturt National Park worked on dingoes which invaded during a flood which wrecked part of the Dingo Barrier Fence between New South Wales, South Australia and Queensland. The dingoes preyed upon red kangaroos (*Macropus rufus*) in the Park, mostly the younger ones. Also, Peter Jarman and his students studied the social systems of grey kangaroos (*M. giganteus*) in New England. The study of Robertshaw and Harden (1986) was fascinating. They found that dingoes had worked out how to get pouch-young from swamp wallaby mothers (*Wallabia bicolor)* by chasing them and forcing them to jettison their young. In essence, the dingoes were 'farming' the young, because mothers then produced another young, more than the usual one per year. A recent study of red foxes (*Vulpes vulpes*) in Namadgi National Park, Australian Capital Territory, has shown that they too have worked that process out for grey kangaroo mothers, significantly reducing fecundity (Banks 1997). A current experimental study by Lee Allen in central and northern Queensland (Allen 1997) on predation on possums (*Trichosurus vulpecula*), bettongs (*Aepyprimnus rufescens*), grey kangaroos (*M. giganteus*) and calves (*Bos* spp.), with and without dingo control, is likely to provide some surprises also. Results are not clear-cut, but involve the dingo's social systems.

A similar study is being planned for central Australia (G. Edwards, pers. comm.). Other studies listed are by Laurie Corbett in Arnhemland, Northern Territory, with prey ranging from rodents (*Rattus* spp.), magpie geese (*Anas semipalmata*), wallabies (*M. agilis*), feral pigs (*Sus scrofa*) to buffalo (*Bubulus bubulis*) (See Corbett 1995). Peter Pavlov (1987) in far north Queensland showed that there were large numbers of young feral pigs on Prince of Wales Island where there are no dingoes, but that there were very few young pigs on Cape York where dingoes thrive. Dingoes are plainly involved in creating that difference. The study of Woodall (1983) in south-east Queensland examined the issue of bounties paid for feral pigs relative to dingo control.

Fig. 1 presents two of four maps of bounty payments in NSW between 1896 and 1930 Glen and Short (2000). Scalp returns on areas of 100 km^2 show how rapidly the distribution of dingoes contracted towards the north-east and

south-east of New South Wales. Few remained in the far west compared with the east of the State, and there are very, very few indeed in the farmlands as you might expect. By the 1930s it was all up for the dingo. They no longer existed west of the Great Dividing Range right out to the Dingo Barrier Fence. They remain in southeast New South Wales, with a scattering of dingo-like canids northwards up the coast, with remnant populations in the north-east remaining the closest to pure dingo, as Laurie Corbett pointed out in his paper at this Forum.

Slides were presented earlier which showed a pair of dingoes around a dam in central Australia, in the Simpson Desert in drought. The dam was badly trampled by cattle. Dingoes drink there often, but may hang around feeding off dead cows in drought. Sometimes calves are killed, as another slide showed from down the Tilcha Track into South Australia. Dingoes also kill kangaroos, as one slide from north-west of Alice Springs showed. A freshly killed red kangaroo had been ambushed at a turkey-nest dam by one dingo, which had attacked while

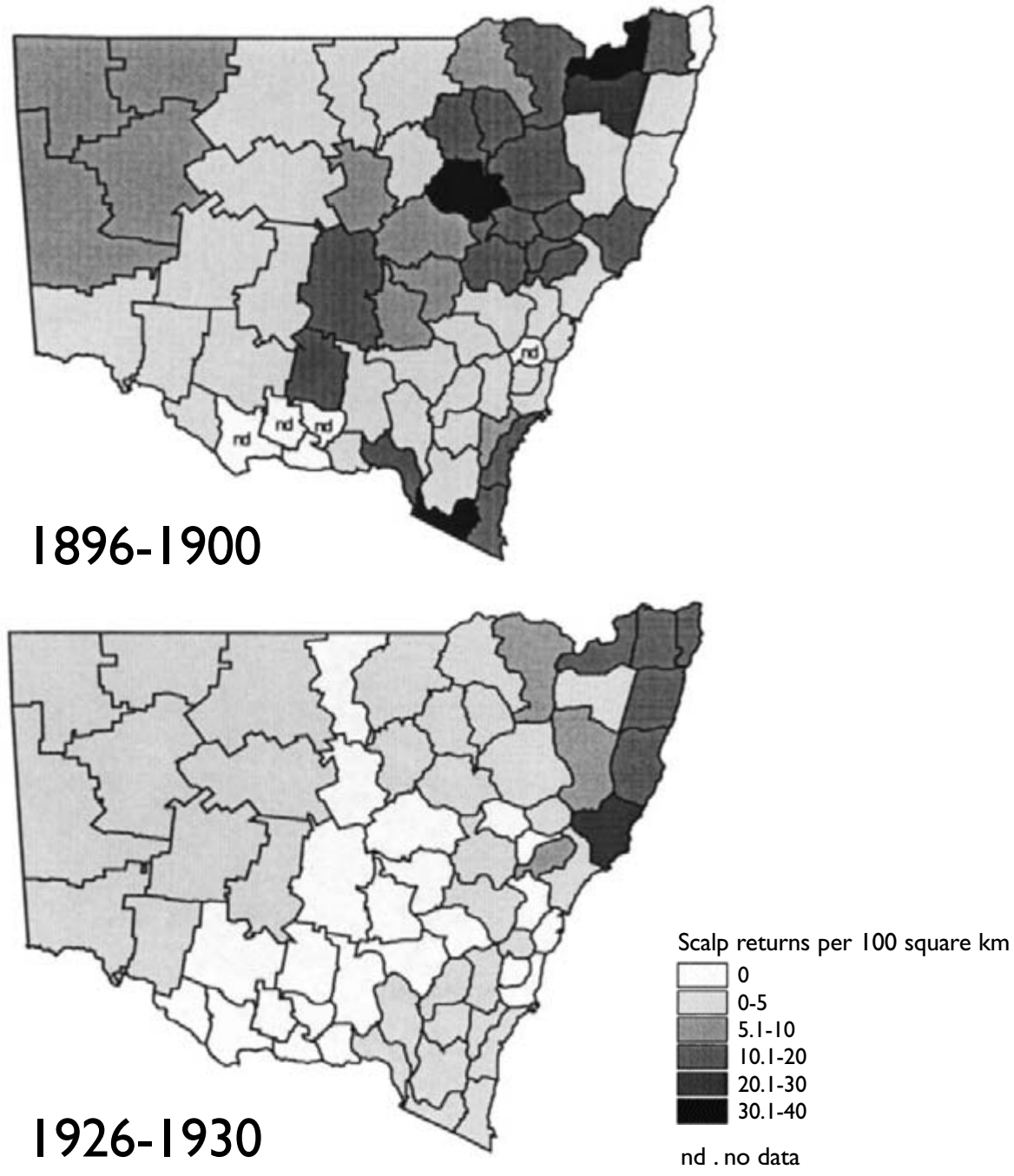

Figure 1. Diminishing scalp returns of dingoes in New South Wales - an historical perspective (from Glen, A.S. and Short, J. 2000).

the kangaroo was inside the surrounding fence. The remains of several red kangaroo skeletons were within 20-30 m of the fence around the dam. The dingo(es) had worked out how to get them.

The next slide was of the Dingo Barrier Fence mentioned by Roland Breckwoldt in his talk (see also Breckwoldt 1988). Originally, the Fence included a northerly loop around the Mitchell Grass (*Astrebla pectinata*) in sheep country in Queensland, but it has been truncated. The response of dingoes to that extra freedom will be interesting to watch. Where truncated, the Fence goes southerly towards the Queensland border, follows it to Cameron's Corner, and then goes down the South Australian border with NSW. About 250 km south, it heads westerly, south of Lake Frome, over the top of the Flinders Ranges, beneath Lake Eyre, and then across to the Nullarbor Plain. The total length is given above. The sheep lands in southern Queensland, New South Wales and South Australia are enclosed by the Fence, hence the cattlemens' scornful term for the sheepmen as living in the 'Inside Country', i.e. 'penned up', with no freedom as in the 'Outside Country'. As stated above, the presence or absence of dingoes determines whether cattle or sheep are run.

Aerial surveys conducted continentally to count kangaroos in the 1970's by Graeme Caughley *et al.* (1980, 1987) found the highest densities of red kangaroos in the 'Inside Country' of north-west of New South Wales (see Fig. 2). There were more than 20/km^2 at the time, and yet that region is one of the most arid parts of the State. Why that is so will be discussed below.

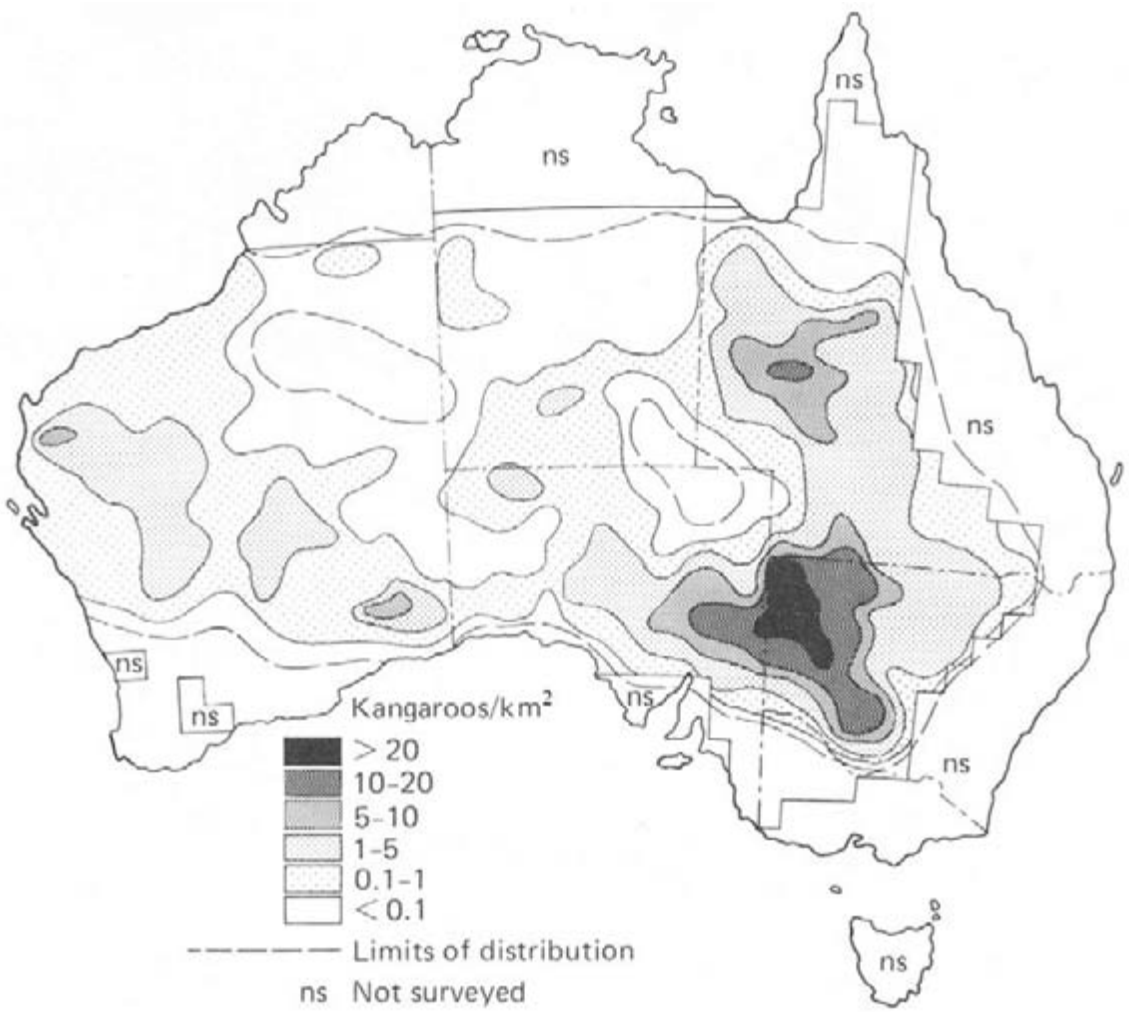

Figure 2. The distribution and abundance of red kangaroos relative to the Dingo Barrier Fence in the 1970's: aerial surveys (from Caughley *et al.* 1987)

Interactions of dingoes with eruptive rabbit populations, red kangaroos and cattle in central Australia

The sequential predatory interactions of dingoes first with rodents (*Pseudomys* spp.; *Mus domesticus*) as they erupted, then with rabbits (*Oryctolagus cuniculus*) similarly, then red kangaroos and cattle (*Bos taurus*) as drought intervened once more, are shown in (Fig. 3) (Corbett and Newsome 1987). The study was conducted on 'Erldunda Station' south-west of Alice Springs over seven years. The proportions of trapped dingoes with rabbit remains in their guts were compared with rabbit abundance (spotlight counts) through time. Most dingoes ate rabbits when abundant (Fig. 3a); but rabbits remained of high importance in drought as well (Fig. 3b). Between 30 to 65% of dingoes were still preying upon rabbits, indicating high levels of concentration upon them as prey, despite their scarcity.

The graphs show well separated curves for good seasons, and for times of scarcity during drought (Fig. 3a, b). Note in particular not only the similarity of the patterns of the two curves, but their separation along the X-axis according to the different seasons, and densities of rabbits and red kangaroos. The dingoes were concentrating on the surviving few rabbits almost to the end. That high reliance on scarce rabbits indicates that predation may have been limiting the increase in rabbit populations. Indeed, when they did breed after one set of rains, no young were seen, nor was there any increase in rabbits. Now look at the proportions of dingoes eating red kangaroos relative to their spotlight counts in the two periods (Fig. 3c). Kangaroos were most evident during the rainy period, with *c*. 60 seen at most per 100 km of the spotlight transect, but that was not when dingoes concentrated on them as food. Instead predation was greatest during the drought, at a time when rabbits were scarce. Those data were the first to indicate that predation mattered in wildlife conservation and pest control in Australia, and that the two issues could be related.

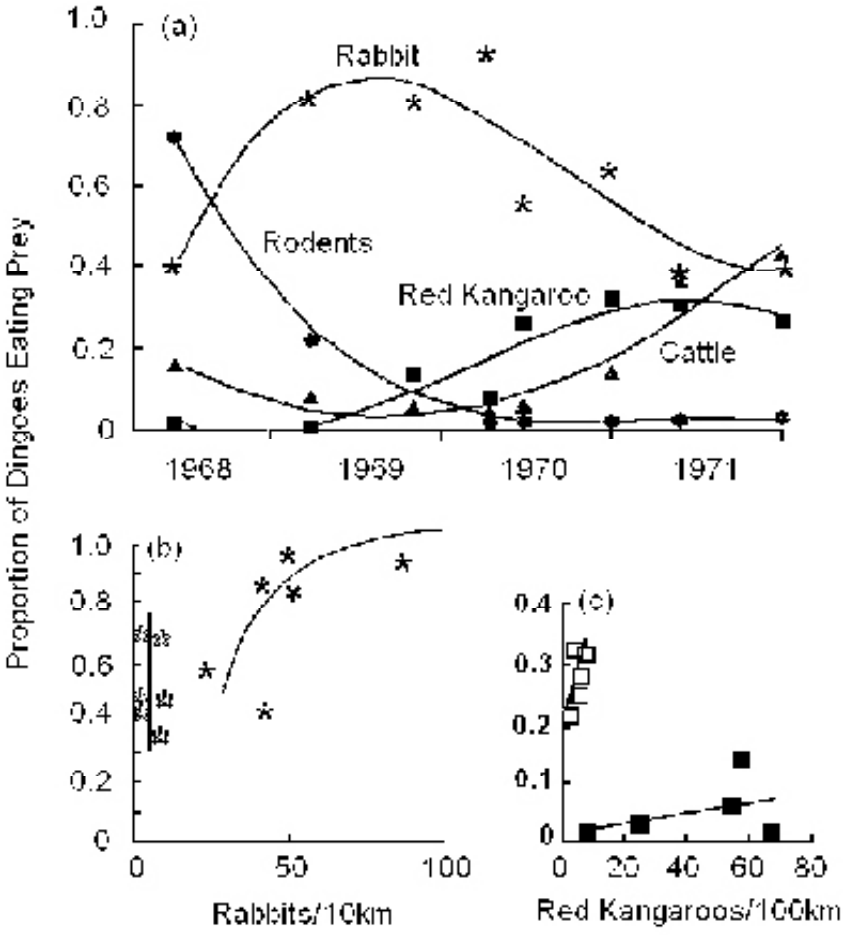

Figure 3. a) Dietary responses of dingoes to sequential abundances of prey of increasing size as drought prevailed in central Australia after good rains; b) continued severe predation upon rabbits as drought progressed; c) and the high predation rates upon red kangaroos as alternate prey during severe drought (open symbols). Note the low predation rate on red kangaroos were common after rain, but when rabbits had erupted.

Dingoes belong to social groups. Packs are not needed to hunt rabbits but sociality succeeds with the far less common kangaroos. Grouping helps in killing calves as well; but cattle dying around waters provide easy food supplies for dingoes in drought. Supporting evidence comes from Laurie Corbett's (1995) analysis of population growth of rabbit populations during the good rains which broke the drought. He compared 'Erldunda' (the site discussed above) where trapping reduced dingo numbers continually, with "The Gardens Station' on the Hale River north-east of Alice Springs where we also worked, but where there was no dingo control. Both sites were notorious for rabbits and dingoes (hence their choice as study sites). The rains broke the droughts in both places. Rabbit populations rebounded swiftly at 'Erldunda Station', but remained low for at least 3 years on 'The Gardens Station' (Corbett 1995). That evidence strongly supported the predation hypothesis.

No sheep are run now in central Australia; but in sheeplands in the Carnarvon region of Western Australia, dingo predation was so severe after dingo controls were relaxed, that controls were re-imposed (Thomson 1992).

The dingo fence, Cameron's Corner, and kangaroos

Two slides were shown of the Dingo Fence. One was aerial looking south from Cameron's Corner from the junction of the Queensland and South Australia Dingo Fences, and the other was similar but on the ground looking south along the sand dune from the 'Gate'. That part of the dune in NSW was swarming with red kangaroos, their footprints covering the sand, whereas in S.A. the dune was smooth and bare. Habitats are similar on either side of the Fence and yet, to take one step through the Fence was to enter a totally different ecosystem faunistically. That distinction continues for *c*. 250 km down the Fence. That second ecosystem, with dingoes and few kangaroos, stretches all the way to the Indian Ocean and northwards into the Northern Territory. As mentioned above, Caughley *et al.* (1980) concluded that such high numbers of red kangaroos were due to removal of dingoes in New South Wales. A subsequent study has challenged that conclusion as the sole cause (Newsome *et al.* 2001). The problem is that rainfall in that region is insufficient to produce high densities of red kangaroos, let alone to sustain them (Newsome *et al.* 2001). Greater discharge from catchments onto the outwash plains is also involved, caused by over-grazing by sheep, rabbits and feral goats (*Capra hircus)* following European settlement of the region. There is little favourable habitat beyond the Fence into South Australia, and run-off rarely reaches there anyhow, due to water being impounded in New South Wales.

There are other faunal differences across the Dingo Fence in the region (Table 1). Whereas there is only the red kangaroo in South Australia, there are three other species in New South Wales, *M. giganteus*, *M fuliginosus* and *M. robustus*. Emus (*Dromais novaehollandiae*) are less common in South Australia also (see also Caughley *et al.* 1980). There are similar discrepancies for some feral pests (Newsome *et al.* 2001). There are feral goats and pigs (*Sus scrofa*) in New South Wales, but none in South Australia. The red fox (*Vulpes vulpes*) is more abundant in New South Wales (see below also) but feral cats (*Felis catus*) are equally abundant on both sides of that Fence. As well, rabbit populations fluctuate independently on either side. Huge irruptions of rabbits arise in South Australia, but are unknown east of the Dingo Fence in New South Wales. These last issues are not understood. The last slide shown at the Forum was of a large scatter of skeletons of red foxes in New South Wales near the Border Fence. There were at least 40 foxes, all shot in the same night. There is no way that such numbers could be repeated in South Australia (see Crooks and Soulé 1999). The much lower densities there accord with theory and practice of meso-predator interactions, the larger dingo being common there. Thus, the contrasts between the ecological systems on either of the Dingo Fence are stark.

The explorer, Charles Sturt, came through that country in the 1840's searching for his 'Inland Sea'. He had recorded kangaroos as abundant on the Murray River, but recorded only one kangaroo in the semi-arid regions west of the Barrier Range. Sturt and his party had trouble finding water. It was scarce then where now stock waters are common. The scarce pools found would have been precious for dingoes and kangaroos as well, the latter almost certainly being ambushed by dingoes as they came into those few waters. Sturt went westwards into South Australia, looking for his fabled inland sea. In the vicinity of Strezlecki Creek, there must have been a rodent plague at the time because a few Aborigines encountered had scores of hopping mice, possibly *Notomys*

Table 1. Status of medium sized and large vertebrates on either side of the Dingo Barrier Fence (from Newsome 1990; see Newsome *et al.* 2001 also).

	Dingoes present (South Australia)	Dingoes absent (New South Wales)
Introduced species		
Cattle (*Bos spp.*)	+++	+
Sheep (*Ovis ovis*)	--	+++
Goat (*Capra hircus*)	--	+
Pig (*Sus scrofa*)	--	+
Fox (*Vulpes vulpes*)	+	+++
Cat (*Felis catus*)	+	+
Rabbit (*Oryctolagus cuniculus*)	+++	+++
Native species	+	+++
Red kangaroo (*Macropus rufus*)	--	+
Eastern grey kangaroo (*M. giganteus*)	--	+
Western grey kangaroo (*M. fuliginosus*)	--	+
Hill kangaroo (*M. robustus*)	+	++
Emu (*Dromaius novaehollandiae*)	6	12

+++ abundant ++ intermediate + rare -- absent

fuscus (Watts and Aslin 1981), dangling from their belts. They were eaten whole after brief roasting on the coals.

Martin Denny's (1980) extensive report from his several years in the region widely documents faunal distributions and contrasts over the adjacent corners of New South Wales and into Queensland. His data supported those of Caughley *et al.* (1980, 1987), and the subsequent data as presented here. Denny's overview is provided below as part of the typescript of the open discussions, which followed this presentation.

Experimental demonstrations of predation regulating prey populations

An opportunity to experimentally test the effectiveness of predation in controlling rabbit populations arose at Yathong Nature Reserve, central New South Wales (Newsome *et al.* 1989; Pech *et al.* 1992), with foxes and feral cats as the predators. In 1979, rabbit numbers there had exploded from initially *c.* 2,000 counted around a 32 km spotlight transect to reach *c.* 10,230 (320/km) only to collapse to *c.*70 rabbits (2.1/km) in 1980 during a 6 month drought (Newsome *et al.* 1989). For the experiment, an area of 220 km^2 was subdivided into three large sites. Foxes and cats were shot persistently on one of them for 3 years, and similarly on half of another area in the 2nd and 3rd years. There was no shooting at all on the other two areas. The response of rabbit populations was dramatic. In the first breeding season, rabbit numbers increased *c.* 8-fold where foxes and cats were taken out, but remained low for the 3 years where their numbers were not controlled (Fig. 4). Such an impact on rabbit populations has since been confirmed in a recent fox-removal experiment in sub-alpine habitat (Banks *et al.* 1998).

Another fox-removal experiment tested the

impact of fox predation upon dwindling numbers of black-footed rock-wallaby (*Petrogale lateralis*) in the wheatlands of Western Australia (Kinnear *et al.* 1988, 1998). That study raised the alert that the fox was indeed an endangering threat to medium-sized marsupials and birds at least. Kinnear and colleagues showed that populations increased where foxes are controlled, but continued to decline elsewhere, to extinction in one case. Those studies have led to fox control to safeguard dwindling and remnant populations, such as those of the Mala (*Lagorchestes hirsutus*), Western Barred Bandicoot (*Perameles bougainville*), Brush-tailed Bettong (*Bettongia penicillata*), Long-footed Potoroo (*Potorous longipes*), Rock-wallabies (*Petrogale* spp.) and other critical weight range species. Also, in response, there has been much other research on the impact of the fox, and continual aerial baiting thoughout the forests of eastern and western Australia.

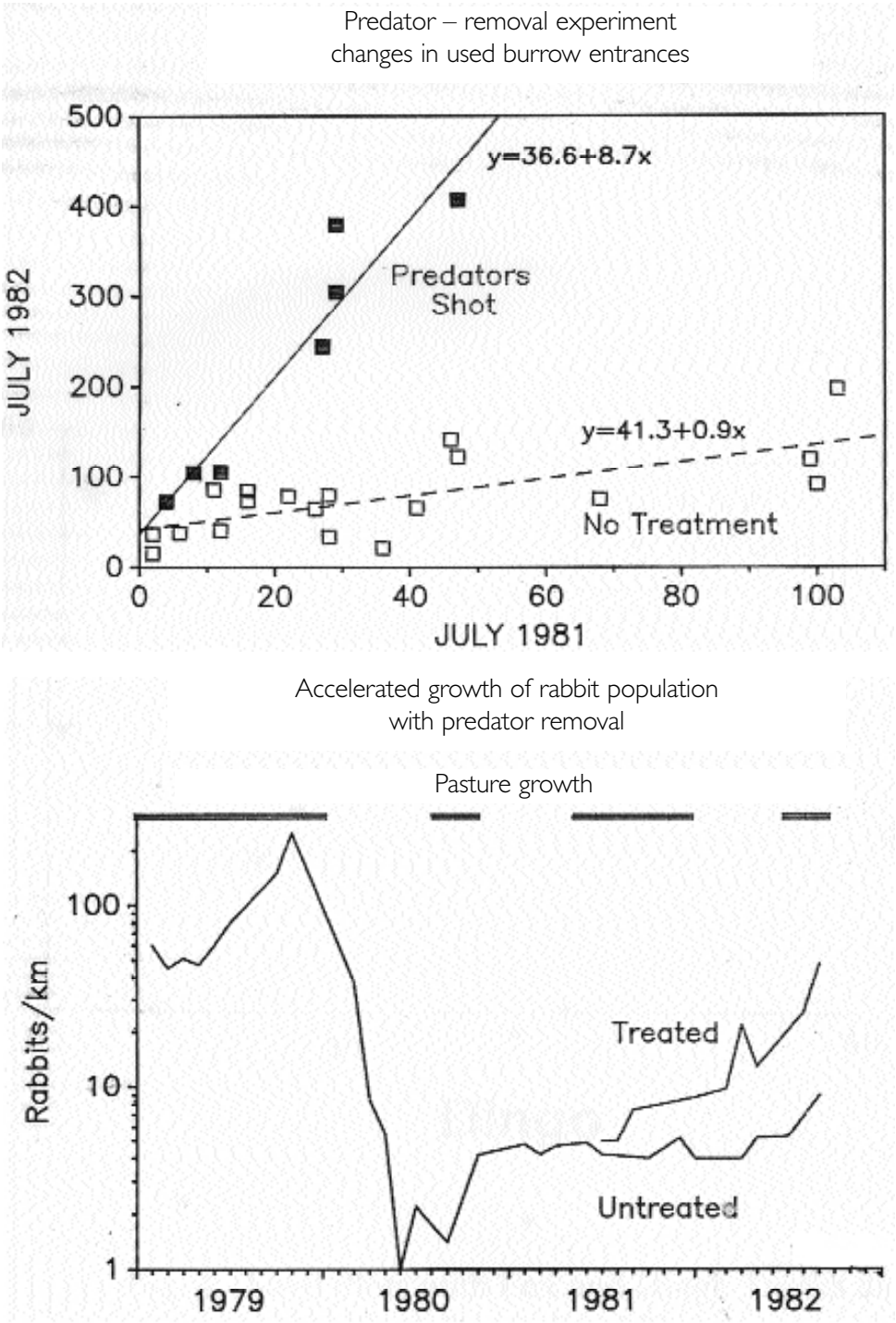

Figure 4. Large increases in rabbit numbers where foxes and cats were persistently shot cf. where no shooting occurred at Yathong Nature Reserve from: a) counts of active burrow in rabbit warrens, and b) from spotlight counts of rabbits (Newsome *et al.* 1989).

The Pest Animal Control CRC is developing infertility as a control method for foxes, and for the house mouse (*Mus domesticus*) and rabbit also. The ecological arm of the Centre examined (among other things) the levels to which fox populations must be lowered for wildlife populations to benefit, and the brief answer is quite a lot. The study site is the Burrendong Dam catchment between Wellington and Mudgee, New South Wales. The subtleties of predator-prey reactions extend beyond predator and prey, to predator and predator, as mentioned above for dingo and fox. A fine study of the interactions between feral cat and fox there (Molsher 1999) showed that where foxes were removed continually, feral cats extended their habitat use to include open grassland, normally ignored by them but used by the fox. Two other studies have shown that, where foxes were controlled, habitat use and feeding responses of brushtailed possums (*Trichosurus vulpecula*) expanded. They stay on the ground for longer, range further, use normally marginal habitat more, and also visit experimental feeders more than where foxes were not controlled (Gresser 1996; Pickett *et al.* 1999). The mere presence of fresh fox urine restrained the possums' behaviour (Gresser 1996).

Inverse relationship between abundances of foxes and dingoes

The last Figure (Fig. 5) contrasts the numbers of sand plots (specially raked across roads every kilometre or so) which had dingo and fox prints on them. Data come from field trips in the Tin Mines region of Kosciusko National Park and Nadgee Nature Reserve, both in New South Wales (Newsome *et al.* 1997). Note the inverse relationship between tracks for fox and dingo. Wherever we had worked, that was the pattern. If there were dingoes, there were proportionately fewer foxes (see Table 1 on page 26). It is now known that such a relationship does not always obtain (Catling and Burt 1995). I had hoped to present also a few slides from Nadgee Nature Reserve concerning faunal responses to severe wildfire, especially that for the long-nosed potoroo (*Potorous tridactylus*). The incidence of that species in the diet of the dingo rose *c.* 20 fold in the 2-3 years post-fire after habitats were opened up, but predation declined to negligible amounts again once the under-storey regenerated, especially down drainage lines. The importance of complex ground cover was mentioned above for brushtailed possums.

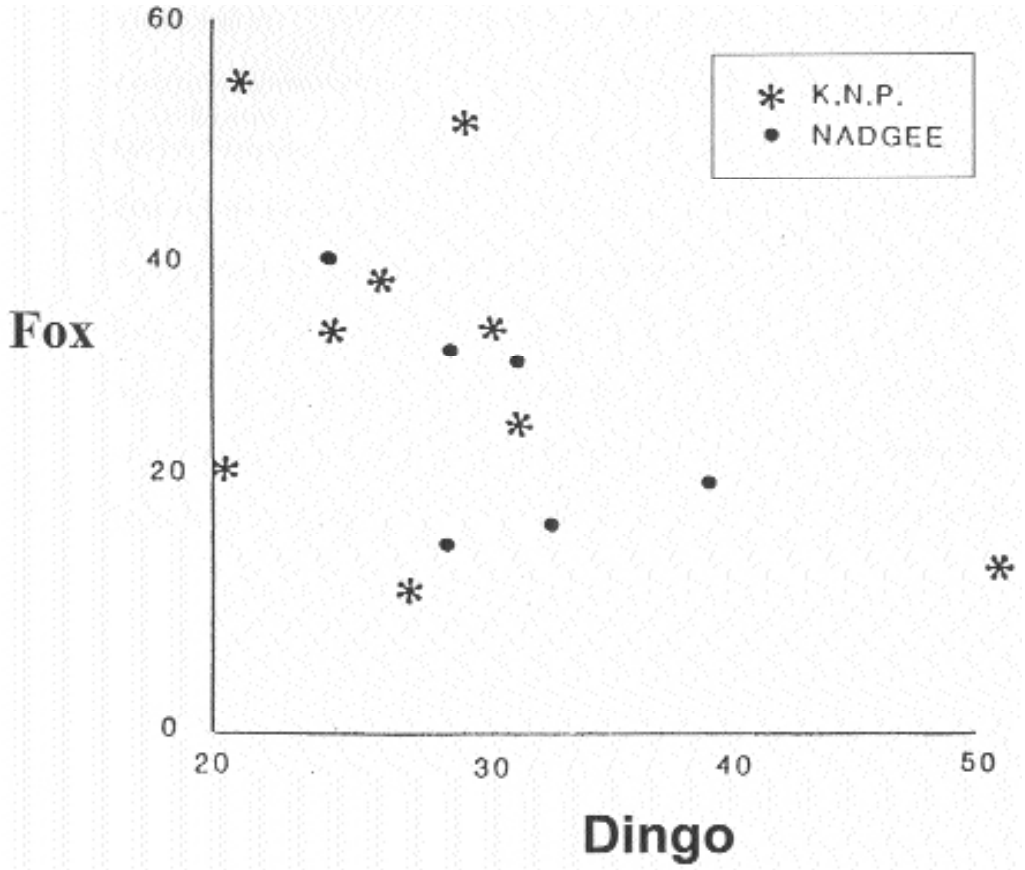

Figure 5. Inverse relationship between numbers of tracks of foxes and dingoes per 100 sand plots, placed every 1 km along bush roads (from Newsome *et al.* 1997)

Conclusions

I said at the outset, when four of the conclusions for this talk were presented, that dingoes and sheep do not mix. Thus, dingoes can determine whether cattle or sheep are run, as argued above also for northwestern New South Wales and adjacent South Australia with the Dingo Fence in between. Results of studies in central Australia presented here also show that, when rabbit populations collapse in drought, dingoes then prey on red kangaroos. That species, and other kangaroo species as well as feral goats and pigs, are scarce and mostly absent throughout lands beyond the Dingo Barrier Fence. That is not the case east or south of it, the sharp contrast commencing not one metre inside the Fence.

So, as custodians of the environment, we must make a choice. What do we want? On the one hand, the evidence is clear. The dingo does a lot of the pest control work for us - while we sleep – doing work that we want done. On the other hand, with the control of dingoes, other pests arise, both carnivore and herbivore, feral and native, and all of which we then busily endeavour to control. It does not seem to make very much sense.

There are no simple compromises to the issues of eradicating or retaining the dingo. Part of our dilemma is historical and due to issues like land tenure. From my reading, it appears that sheepmen found western New South Wales first. If cattlemen had done so, the dingo would not be a problem. Indeed, the Dingo Barrier Fence would have been built further east, and cattle would now dominate grazing west of the Barrier range – not a bad option in fact. That the properties are small by comparison today is a function of the First World War, 'living areas' having been made available to Returned Soldiers. From our perspective, governments have made some shocking mistakes. A recent Committee chaired by John Kerin has examined problems of the Western Lands, searching for solutions to cure the mistakes of 75 years ago (Kerin 2001). Solutions to such land tenure problems have to be found. Usually they are found by trading land. Kosciusko is no longer grazed; it is a National Park. Yathong Nature Reserve originally comprised three sheep stations, and so on. In north-western New South Wales, in the corner of two Dingo Barrier Fences, Sturt National Park was created by trading land also. However, the problems associated with the presence or absence of dingoes are still with us. Must we continue to trade land for solutions?

I do not have any simple answer, but I have been exposed to the issue of water trading recently. I find it almost impossible to conceive that someone on the Warrego/Barcoo in south-western Queensland can trade water rights with somebody near Burrendong Dam on the central western slopes of New South Wales. I find that almost incredible, that they can play such a game between such widely separated regions - even though the waters belong ultimately to the same huge catchment, the Murray-Darling. I do not know how that is done; but let me put this to you. Perhaps it is possible to bring about some kind of traded rights between both sides of the dingo argument. Of course it can be done with money changing hands, but is there another way? Are we able to rationalise land-use amenably?

It's easy to say, 'Right, if you want to look after dingoes, then you've got to pay me to keep them'. That's one way of thinking about trading; but I suspect that that still remains an economic solution at a fairly unsophisticated level. What I challenge you with is this: are we able to somehow convert tradability from water to landscapes without loss of tenure?

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DAN LUNNEY: Thank you, Alan. That leaves a few minutes for questions.

MARTIN DENNY: Just two points, Alan. The first one is a very minor point. It is that during most of the work we did going through western Queensland, talking to other landowners - there was an attitude that dingoes on cattle properties were not an advantage, particularly during drought, because the dingoes would kill off the calves and allow the mothers to survive to the next generation.

The second point I'd like to make is that the work that I was doing through Sturt National Park and south of there and into western Queensland, particularly on the role of dingoes, red kangaroos and kangaroos in general, and the reports I have produced on that, we sampled various properties, particularly through western New South Wales, where there were various combinations. There was cattle, sheep, cattle and dingoes, sheep and dingoes, no dingoes, and so on, running through the whole place outside Sturt National Park. We found that the properties in western New South Wales where there were dingoes, and cattle with dingoes, that the actual kangaroo numbers were as high as they were anywhere else where there were no dingoes.

Then we did the same sort of surveying in western Queensland, and again came up with the idea that you have to look particularly at that region where most of those aerial surveys were done by Graeme Caughley. There is a triangle, there's the actual border dog fence, there's the barrier dog fence, and there's the very old dog fence that still comes down that border; and this is going back into the 70s, of course. So there's actually a triangle, but there was no movement of kangaroos in or out of that triangle. So, consequently, even though there were high numbers of predators, and it's those dingoes within the Queensland area which could keep the kangaroos down, there was no way for any kangaroos to come in to build up the population numbers again; whereas in New South Wales, of course, those kangaroos have free movement.

That was illustrated even more where the floods came through, knocked down the dog fence, and the dingoes came into New South Wales. At the same time, there was a large population of kangaroos left in Queensland. They stayed there and were maintained, particularly along the Warwick Creek, which is in that western Queensland area, for several years and bred there for several years. They've slowly declined; they'll probably so decline again because of degradation but also because there is no way for kangaroos to migrate into that area, because of those fences.

So I think it's a lot more complicated than you, Graeme Caughley, Neil Shepherd and others have actually set up. It's more than just a dingo thing; it's dingo, plus lack of being able to migrate into those areas.

ALAN NEWSOME: Thank you very much for that, Martin. Part of the answer lies in the complexity of predator-prey systems. We love linear systems, but these are non-linear. There are inflections in them. Densities of prey matter. Once prey populations are brought low by drought, imposed control measures, or disease (rabbit calicivirus), then predation can get on top and suppress prey populations for a long time; but once prey populations increase, then it becomes much harder to reverse that situation. Part of this is due to the biology of predators. Dingoes cannot increase three to four-fold just because of rabbits or kangaroos. The numbers of dingoes are regulated also, by density-dependent issues, territories, social systems, dispersal and so on.

One of the things I would love to put before the current Committee of Review of the Western Districts of New South Wales by John Kerin (2001) is this: 'If you want to do one single thing in western New South Wales, it is move the Dingo Fence east of the Barrier Range'. I have certainly mentioned it to our Chief, Dr Brian Walker, who sits on the Committee. Such a change would not mean automatically that kangaroos and the feral pests are going to collapse because dingoes move in. We would have to intervene with management controls to lend a hand, to bring numbers down sufficiently to allow control of kangaroos by dingo predation to succeed. But, there would be also a diminution in the number of goats, and similarly feral pigs,

which are not so common to begin with. The dingoes will ultimately be working for you, but they will need a hand first.

It's just dreaming of course. It cannot happen, but offers an ideal. We might try to reverse Sturt National Park and place it outside the Fence. Is Jack Giles with us today? It was one of his dreams, to divert the Fence this side.

KEITH ALLISON: We have costed that. You can do it, Alan, for $10 million. We've done the feasibility study and all.

ALAN NEWSOME: We need that remark on record - anything for as cheap as $10 million. If you would be so kind as to come down and put your remark on tape. It will then be in the proceedings. We want those valuable comments from the far corner of the room.

KEITH ALLISON: Keith Allison of the Wild Dog Destruction Board. I'm a pastoralist from the western division, located near Broken Hill, born there, spent my life there, and have been on the Wild Dog Destruction Board for some number of years, and have gone through the Fischer inquiry, the parliamentary inquiry, and several other inquiries in the western division. I'm currently on the advisory committee for the kangaroo management program. I've also had plenty of discussions in relation to grid electricity throughout the remainder of the State; in the Fischer inquiry etc., in relation to Sturt National Park. I know about the degradation of that Park, as Alan has pointed out, in relation to curent capacity and very low rainfall, and the non-control and the absence of dingoes in comparison to what we're seeing on the South Australian border and Queensland border, as Alan was telling you.

The Fischer inquiry came along. We did a full study under Dick Condon in those days. It would cost an estimated $9 million-odd to take down the fence and square it up in a more accessible area than what we're trying to maintain now, and bring the north-western corner into a national park where dogs could be introduced. However, the community and the government have not been convinced of the benifits, I gather or there hasn't been enough push for it.

However, we know that 700 kilometers of fence is safeguarding the wool and sheep production as far as Dubbo, from an effect early in the century – at Hillston on the Lachlan in one year, they paid for 38 scalps. Few people realise what's gone on in the past in relation to dingo predation, the development of the west and the preservation of your land resource – things have had to happen. Unfortunately, this generation today hasn't had the personal experience of those people in earlier days.

Alan showed you the fox situation. There's more 1080 and everything used out there on foxes, but not on dogs. We have spent more money on rabbits out there in the last 10 years than ever was spent in the 100 years prior to that. This symposium today is on one species. The community has got to decide what type of ecosystem it wants for our future generations. You've got woody weeds to control, you've got a lot of other things.

There are amazing differences now in our land resource as a result of RCD in rabbits – that picture that Alan showed you of the barrier fence there is embarrassing. I've taken Judy Messer and a heap of other people out there in a rabbit plague, and it's opened their eyes. Rabbits used to plague every nine years. After RCD, we haven't seen them until recently, but we've got a big, big problem at present on the Bullygree. We didn't think the rabbits would breed or the dingoes would breed in any numbers, but the last 18 months of high rainfall and good seasonal conditions and the flooding of the Bullygree have seen an outbreak of rabbits up there that we did not ever think would happen again.

We have introduced RCD. We have had to have the grader on the fence everyday to fill in the rabbit holes, trying to stop the rabbits digging their way through. We haven't seen that for a long, long time. That is one inch. There's nothing on the South Australian fence, it's not in Cameron's Corner; it is in a range of 75 to 100

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kilometres. That's the type of thing that we've got to put up with, and that's the type of thing that we manage that most of you people don't know about, we've got to make judgements fro the community as a whole and for the people that are supporting or trying to make a living and maintain an ecosystem and a land resource out there to the community's wants. They are the investors out there and not the community. Thank you.

ALAN NEWSOME: Thank you very much, Keith. It's lovely to catch up with you again.

DAN LUNNEY: Thank you indeed, Keith. That will be recorded. Before we break for morning tea and have the chance to look at the dingo and the thylacine specimens the Museum has kindly provided, I will hand over briefly to Chris Dickman.

CHRIS DICKMAN: Good morning. Later on today we'll be hearing about the function of dingoes. One function that we probably haven't discussed and may not discuss very much specifically is the function of this dingo, Donna, who belongs to Mr John Hogan.

John is hearing impaired and the dingo that he has at the moment is Australia's only certified hearing dingo. She assists John in telling him when people are around, when they're speaking , when they're on the streets, when there are cars around, and assists him in everyday life. She is apparently an animal that is scared of her own shadow, doesn't bark or bite, and very happily shakes hands and puts her arms around you!

In the tea break John will be here, and anybody who would like to interact and take a closer look can do so throughout the tea break. So just an introduction, I guess, to a live animal during the day's proceedings. Thanks very much to John for bringing Donna in to these proceedings for us.

Dingo studies: Predation on wildlife and livestock

APPENDIX

Red kangaroos	Sturt National Park	N. Shepherd
	Nullarbor	P. Marsack & G. Campbell
	Central Australia	L. Corbett, A. Newsome & L. Best, B. Green,
	Nadgee Nature Reserve & Gippsland	A. Newsome, P. Catling & L. Corbett
	N.W. NSW	M. Denny
		Newsome, A., Catling, P. &Cooke, B., R. Smyth
Grey kangaroos	New England Tablelands	P. Jarman & S. Wright
Swamp wallaby	New England Tablelands	J. Robertshaw & R. Harden
Possums/kangaroos/calves (± dingoes)	Central Queensland	L. Allen
Rabbits ± dingoes	Central Australia.	L. Corbett
Feral pigs/buffalo/dingoes	Arnhemland	L.Corbett
Feral pigs/age structure/dingo	Cape York	P. Pavlov
Feral pigs & dingo bounties	SE Queensland	P. Woodall
Habitat use by fox & dingo	NSW forests	P.Catling & R. Burt
Cost of baiting for wild dogs	NE New South Wales	J. Thompson & P. Fleming
Dingo control & bounties	New South Wales	A. Glen & J. Short