REPORT ON PROCEEDINGS BEFORE

PORTFOLIO COMMITTEE NO. 7 - PLANNING AND ENVIRONMENT

HEALTH AND WELLBEING OF KANGAROOS AND OTHER MACROPODS IN NEW SOUTH WALES

UNCORRECTED

At Macquarie Room, Parliament House, Sydney on Tuesday, 15 June 2021

The Committee met at 9:00 am

PRESENT

Ms Cate Faehrmann (Chair)

The Hon. Mark Buttigieg
The Hon. Catherine Cusack
The Hon. Ben Franklin
The Hon. Mark Pearson (Deputy Chair)
The Hon. Penny Sharpe

RICHARD KINGSWOOD, Director, Conservation Branch, National Parks and Wildlife Service, Environment, Energy and Science, Department of Planning, Industry and Environment, affirmed and examined

ROBERT QUIRK, Executive Director, Park Programs, National Parks and Wildlife Service, Environment, Energy and Science, Department of Planning, Industry and Environment, affirmed and examined

SHARON MOLLOY, Executive Director, Biodiversity and Conservation Division, Environment, Energy and Science, Department of Planning, Industry and Environment, affirmed and examined

SONYA ERRINGTON, Acting Director, Environmental Solutions, Environment Protection Authority, Department of Planning, Industry and Environment, affirmed and examined

TERRY BRILL, Senior Team Leader, Kangaroo Management, Environment, Energy and Science, Department of Planning, Industry and Environment, affirmed and examined

The CHAIR: I welcome our government witnesses. Do you have an opening statement to make to the Committee?

Ms MOLLOY: Yes, I do, and I will do that on behalf of the Environment, Energy and Science group. I will ask my colleagues from the National Parks and Wildlife Service to add anything that I may miss. Is that okay?

The CHAIR: Of course.

Ms MOLLOY: Thank you very much to the Committee for inviting us to give evidence this afternoon. As the New South Wales Government, we have a statutory obligation under the Biodiversity Conservation Act, the BC Act, to ensure ecologically viable populations of kangaroos in New South Wales and works to maintain ecologically viable populations through the commercial kangaroo management program and management of non-commercial culling licences. We do that in a number of different ways and I will outline some of that and a lot of it may get sort of discussed this afternoon. We work under a very tight legislative framework, not only under the BC Act but under the Environment Protection and Biodiversity Conservation [EPBC] Act which is the Federal legislation in terms of development of a wildlife trade plan, also the Prevention of Cruelty to Animals Act and the Firearms Act. There is a lot of interaction with different pieces of legislation that goes towards helping us to manage commercial and non-commercial.

We also have a number of codes, plans and guidelines and there is a national code of practice for humane shooting. There are annual surveys. There is a harvest plan that sits from 2017 to 2021 and that is under the process of being redone at the moment. We have annual quota reports and we have annual reports on what we have done, and most of that should be on our website, once it gets approved by the relevant internal approval processes. We also consider that we have good governance around the program. We have the Kangaroo Management Advisory Panel. There is also a task force. We have internal governance as well within Environment, Energy and Science [EES] and the wider DPIE in terms of approving various documents and guidelines with a stringent assessment of what we do as a program.

We also work very closely and collaboratively with the other relevant agencies: the police, the Local Land Services, the Food Authority, the RSPCA and the Department of Primary Industries. In terms of licensing and conditions, we have lots of those—tags, rules, things have to be returned. There is a considerable amount of data that we have collected over the last 45 years. We have a really robust system for collecting all that data and issuing tags in a wildlife management system and, as I have said, we have regular reporting. We try to get as much of that up on the website as possible.

We also have a risk-based compliance approach to how we do both our administrative compliance but also our operational compliance out in the field—compliance policy, prosecution guidelines and then a range of compliance and actions and things that we have at our disposal for people who breach legislation, such as advisory warning letters and penalty infringement notices. Obviously a big part of what we do in the compliance space is around education. In the Saving our Species space, where we do have macropods that are listed as threatened—obviously that is a separate program. A good example of that would be brush-tailed rock-wallabies. In conclusion, we operate a program that has been around for decades. It is continuous improvement. We base our decisions on the best available science and data. We are lucky that we have got as much data as we have. I might leave it there and invite Mr Quirk if I have missed anything there or if he would like to add anything.

Mr QUIRK: I have nothing to add. I think that was thorough. I am happy to take questions.

The Hon. MARK PEARSON: Thank you all for coming in and for the one summary speech at the beginning. From reading your submission, I conclude that you do not foresee that there is any threat at all to

macropods, even though you mention drought, climate change, urban development, commercial industry and non-commercial industry. You conclude that not only are there no threats posed by these, but in fact that kangaroos benefit from the aforementioned issues. Is that correct? That is in your submission.

Ms MOLLOY: I think—

The Hon. MARK PEARSON: It is quite remarkable, so that is why I needed it confirmed.

Ms MOLLOY: As I described in my opening statement, there is a lot that goes into how we manage the commercial and the non-commercial kangaroo management programs. One of the things that I think is pivotal to how we manage the program is the surveying that we do to make sure that the population remains ecologically viable. There are annual surveys in the western zones and triannual surveys on the tablelands.

The Hon. MARK PEARSON: Before you get to that detail, are you willing to confirm that statement that there is nothing to worry about?

Ms ERRINGTON: May I take that, Mr Pearson? There certainly are identified threats to species—climate change, fire, flood, drought being many of them. What we do is we manage the populations for ecological sustainability. We rely on surveys to determine to make sure that the welfare of the kangaroos is sustainable across the State. We use the best available information to help us do the quota settings, which can be adjusted and has been adjusted to recognise and acknowledge the impacts of drought, for example.

The Hon. MARK PEARSON: When you say "best available" in terms of the methodology used to calculate the populations for broadscale wildlife, how could you call it the best available when the methodology used and recommended by the University of Adelaide—it is used in South Africa, the United States and other countries—is actually the use of drones? That is now considered to be—and we have had evidence given to point to that as well. It makes sense: Drones can fly as low as 10 metres above the ground and can have highly sophisticated vision and calculating capacity. Why haven't we deployed drones in these calculations?

Mr QUIRK: If I can just pass one comment, I have been watching the conversation with drones closely. We do not use them for kangaroos that I am aware of but my only reflection I could offer is that we are using them for deer and for horses in Kosciuszko at the moment—experimenting with them. The biggest gap I would see in terms of a population scale survey for the size of New South Wales is scale. Most of the drones that are flown commercially are limited by line of sight. They are very good at small-scale, intense surveys, but in terms of the scale of the surveys that are done in western New South Wales there would be no drone that could do it in any sort of time frame that was achievable. They are much slower and you are limited by visibility about how far you can fly them, particularly over private property and farmland, and particularly at the heights you are talking about. I do not think—

The Hon. MARK PEARSON: South Africa and the United States are not small countries and do not have small national parks or grazing lands. Why would they be choosing drone technology over planes or helicopters?

Mr QUIRK: I cannot comment on what they are doing in other States. I just know in the work that we are currently doing, not around kangaroos but with other species, I have not been offered a technology that would work at that scale.

Ms MOLLOY: The best available expert, scientifically based advice that we have is the use of fixed-wing aircraft in the western zones and helicopters in the tablelands. That is not to say as part of—I made acomment around continuous improvement in terms of what we might do in the future. We are constantly lookingat new technology and what might be available to us in the future but at the moment the best available advice tous, and the robustness of what we do over that large an area, is what we currently do to collect that information.

The Hon. MARK PEARSON: With the methodology that is being used—I am just looking at the report that we were given to us recently. The *2021 Quota Report*. In table 17 in relation to Tibooburra, at 2020 the population is estimated at 6,859. That is last year. The density is 0.1 per cent. Then there is a percentage change—I imagine that is the correctional factor—of minus 86 per cent, therefore giving a quota of 6,782, leaving77 kangaroos. Is that acceptable as a quota? To lose—

Ms MOLLOY: My colleague Mr Brill may be able to comment on that.

Mr BRILL: Thanks for your question, Mr Pearson. You are actually misinterpreting the table. The quota of 6,782 is based on the 2019 population of 48,502.

The Hon. MARK PEARSON: So who counted the 2020 number of—

Mr BRILL: The year 2020 was counted in June-July 2020 and will be the basis for the 2021 quota, which should be inserted in there. It is zero because the population is low. So it is inserted in there. It is actually zero.

The Hon. MARK PEARSON: Whereabouts?

Mr BRILL: It is zero. The quota for 2021 is zero.

The CHAIR: How was the population in Tibooburra—how did it get to the figure of 6,859 by 2020 if it was 450,000 in 2016?

Mr BRILL: Drought. Long-term drought.

The CHAIR: Why was there a quota given then if it was drought and if you knew, for example, by 2020 that there was only going to be 6,859 kangaroos as a result of drought? We knew that we were in drought in 2018. We knew that we were in drought in 2019. Why were kangaroo quotas given when you knew that the population was going to plummet and eventually reach almost zero as a result of that drought? How do you take drought into consideration?

Mr BRILL: Clearly no-one knew that the drought was going to be as severe as it was. The way the quota setting works is that we look at the long-term mean and then we look at the variation away from the mean. If it is a large variation away from the mean, then the quota is set at zero. In statistical terms it is two standard deviations. If it is between 1.5 and two standard deviations from the mean, the proportional quota is reduced to 10 per cent of the population. So the proportional quota system reacts to the falling quota but it does not pre-empt it.

The CHAIR: It looks like you are reacting a bit too late to that falling quota though, doesn't it? I mean, you are down at zero at the moment. It does look like you are reacting way too late to everything kind of screaming at you that kangaroo numbers are falling very quickly.

Mr BRILL: I believe the proportional population quota setting method works really well. I think the history is in the—

The CHAIR: Is this a demonstration of that then—the Tibooburra graph? Is that the demonstration that it is working really well?

Mr BRILL: That is grey kangaroos in Tibooburra?

The CHAIR: That is right.

Mr BRILL: Yes, that is right.

The CHAIR: So for the grey kangaroos in Tibooburra how is it working? Not very well? They are zero.

Mr BRILL: No, the quota is zero.

Ms MOLLOY: The quota is zero because of the impact that the drought has had on the population.

Mr BRILL: The population is not zero.

Ms MOLLOY: The population is not zero.

The CHAIR: Is it not? The population in 2020 was 600,859 and the quota was 600,782. Am I reading that incorrectly?

Mr BRILL: The quota in 2020 is based on the 2019 population.

The CHAIR: What do you think the population in 2021 is going to be then? Why is there not a figure there? Is it because we have not counted it yet?

Mr BRILL: It is because we count them in June-July each year.

The CHAIR: Do you think it is going to be higher?

Mr BRILL: I cannot speculate on what it is going to be.

Ms MOLLOY: We will know shortly.

The CHAIR: That is a worry though, is it not? That is a worry that you cannot—

Mr BRILL: I am not going to speculate in this forum what that will be.

The CHAIR: I think the graph speaks for itself.

The Hon. BEN FRANKLIN: We have got some time this afternoon, so I have a few agenda-setting questions. Could you start by explaining to us what we have learnt about the impact of drought, fires, floods and so on on kangaroo populations in the recent months and years?

Ms MOLLOY: I can certainly talk a little bit about the impacts of the drought and one of my opening comments around the fact that we have got data over 45 years. There has been quite a few periods where you can see that boom and bust following drought and floods with kangaroos over the years. It is a great asset to us to have that information so we can know what the population is doing. Immediately following a drought there is a period of boom and there is a period of bust obviously with drought, and that is what kangaroos have gotten used to over millions of years. They have a great ability to a lesser or greater extent, depending on the species, to cope with that drought and they are able to move around the landscape. One of the things that we are very conscious of, which goes to the previous question, is the importance of—particularly out in the western areas—those annual surveys and being able to put a quota on a population and keep monitoring that on a yearly basis, but also to suspend harvesting if the population drops below certain thresholds. We have got that ability to do that as well.

In terms of the fires, the fires predominantly—as everyone knows—were along the eastern seaboard and in the tablelands area and did not impact as much in the commercial kangaroo zones. In terms of how we deal with fire—I will pass on to my colleague in parks in a moment. Immediately following those bushfires there was a lot of activity and the immediate bushfire recovery plan that we put out. It was all hands on deck, particularly to try and protect our threatened species but also more broadly. We also recently, about a month ago, released our medium-term recovery plan. We are on a constant watch, if you like, over our native species and our threatened species around recovering from fire, but also seeing the impacts of the drought that has broken knowing that potentially we could have another drought in another couple of years. We are constantly keeping up to speed with the science in that area and also the data and the intel on the ground from our stakeholders. Mr Quirk, I do not know if you want to add any more in terms of fire.

Mr QUIRK: There are two things to the Committee I could respond with. One is—again, it is always dangerous to answer questions you are not being directly asked. The survey does not survey parks. So when they do the kangaroo surveys, it is surveying farmland. But Sturt National Park is over 100,000 hectares and Richard Kingsford at the University of New South Wales has got the Desert Ark project running up in the park. They have been keeping a very close eye on kangaroo numbers in that park. Richard made the comment that the numbers in the park where there is no shooting and no culling dropped 98 per cent in that last tail end of 2019-20. We did face the worst drought and, more so than drought, it really is what led to the fires. We had the greatest moisture deficit in terms of soil moisture and vegetation change that Australia has seen in its post-contact history. We have only got a very short window in understanding the Australian landscape, but the moisture deficit caught everybody out.

The Tibooburra numbers do not surprise me because Richard Kingsford was talking to us about what was happening on park. We went from about 200 kangaroos per hectare to two in that last six-month period. That was moisture stress. It was all about stress. That is really what led to our significant fire event. The issue for us around fire is we are doing an inordinate amount of survey work—probably the best—and it is sad that it took a tragedy to do it, but there is more effort going into post-fire monitoring after this fire event than I have seen in my 30 years in the parks service. One of the things that is being looked at is particularly the density of macropods and what numbers are occurring. We have had brushtails and some of our rarer species do quite well. I have got no published data, but some of the preliminary data suggests that some of the larger macropod numbers do seem to be down. That is something we are looking at very closely.

We have looked in those areas where we issue—the commercial side of the business is handled by the Biodiversity Conservation Investment Strategy [BCIS]. National Parks and Wildlife Service manages the economic harm component, which is really a non-commercial component. We have taken a very cautious approach about any non-commercial permit requests in the Eastern Division in those areas where fires occurred and they are all being subject to site inspections and checking. Interestingly, we are not getting a lot of applications. In response to fire, we are looking very closely at any issuing of licences for non-commercial harvesting in the Eastern Division in those areas around burnt landscapes because we are still coming to terms with what has happened. But my understanding is our numbers of requests are not that high at this stage.

The Hon. BEN FRANKLIN: Could I move back to the drought just for a moment. In your submission it notes that kangaroos can actually accelerate the onset of drought. My question is: Is there evidence that actually happened in the most recent drought and, if so, what management strategies were put in place and/or should be put in place to manage this impact?

Ms MOLLOY: I might ask one of my colleagues to comment on that if they can.

Mr BRILL: Certainly the grazier colleagues, or grazier stakeholders, that we deal with have reported that. We do not monitor pasture and we do not declare drought, so you would really have to refer that to DPIE

who do that.

The Hon. MARK PEARSON: Did they tell you how the kangaroos contribute to the drought and what they actually do that contributes to the drought?

Mr BRILL: No, what I was referring to was that they said that they believed that kangaroos accelerated the onset of drought. I guess it is from their perspective.

The Hon. BEN FRANKLIN: Finally in this round, can I go to a perennial issue throughout this inquirywhich has been the suggestion that kangaroo populations can only increase physiologically by 10 per cent per year. Is that the case and, if so, how does it work from here? If you are saying we have only got 2 per cent left inSturt National Park, what happens with the populations into the future? Or do you disagree with the premise that10 per cent is the number?

Mr BRILL: I disagree with the premise that that is a maximum reproduction rate. I would like to see the calculations and figures around that so that I can better understand the claims that are being made. But I disagree with that as a maximum rate.

The Hon. PENNY SHARPE: Just to stop there, we have had a couple of examples in the submissions. Could we provide them to you for you to come back to us on notice in relation to that?

Mr BRILL: Happy to do that.

Ms MOLLOY: Happy to do that.

ANSWER:

The 10 per cent maximum population growth rate is not correct. There are many instances and examples where the populations have exceeded 10 per cent annual rate of increase. The following provides background theory and explains the rates of increase shown in the peer reviewed scientific literature.

Population Growth Rate

Population growth rate (also referred to as the rate of increase) is defined as the per capita rate of growth of a population. It tells us whether population size is increasing, stable or decreasing, and indicates how fast it is changing. It is conventionally calculated as

$$\lambda = {}^{N_t}/_{N_{t-1}}$$

where λ = the finite rate of increase, and N refers to the number of individuals in the population at time t.

The finite rate is often converted to an exponential rate to improve interpretation and the ease of use mathematically (Caughley 1977). The advantages of the exponential rate (rather than the finite rate) include: (i) the rate is centred around zero for stable populations; (ii) the sign of the rate immediately indicates if the population is increasing (positive) or decreasing (negative); (iii) increases or decreases of the same magnitude have the same value, so a doubling of the population or a halving of the population have the same value, apart from the reversal of sign; and (iv) in contrast to finite rates, exponential rates can easily be converted from one unit of time to another (when the annual exponential rate of increase equals x the daily rate equals x/365). For these reasons, the Department refers hereon to the rate of increase as the exponential rate.

This simple method of calculating the rate of increase is the most commonly used method and it compares population abundance (or index of abundance) over two successive points in time. This method calculates the *observed* finite rate of increase and takes into account the influence that resources (such as food availability) and other factors such as predation, have on survival and fecundity. This observed rate is a completely *general measure* of rate of increase and makes no assumptions with respect to sex ratio, the age distribution of the population, that resources are superabundant, or that the rate of increase is constant over the period of measurement. When resources are superabundant, predation is absent and the sex ratio is female biased; survival and fecundity can reach their maximum rates. At this point, the observed rate of increase is the observed *maximum* rate of increase.

This is not the only method for calculating rate of increase. Rate of increase can also be calculated from age or stage-specific survival and fecundity values, commonly arranged into a lifetable. However, age or stage specific values of survival and fecundity are difficult to measure (Gaillard et al. 1998) and are

unknown for most kangaroo populations. Even relatively simple measures, such as the sex ratio and age distribution of a population—which are required to estimate rate of increase from a life-table—are unknown for most populations. It is for these reasons that lifetables are rarely used to estimate maximum rate of increase and doing so usually requires untested assumptions about a population.

In contrast, abundance estimates derived from regular broad-scale surveys are available for all kangaroo populations that are harvested, and therefore the rate of increase can be easily estimated.

Using broad-scale survey data, the rate of increase has been measured (and published in peer-reviewed scientific journals) for many populations of kangaroos. In western NSW, Bayliss (1987) calculated the maximum rate of increase for red kangaroo as 0.34–0.57 (equivalent to finite rates: 1.40–1.77) and for western grey kangaroos as 0.35–0.66 (equivalent to finite rates: 1.42–1.93). In a separate study, Caughley et al. (1984) estimated the maximum rate of increase for reds and western greys as 0.33–0.40 and 0.26–0.30 (equivalent to finite rates: 1.39–1.49 and 1.30–1.35), respectively. Cairns & Grigg (1993) estimated values for red kangaroo populations in South Australia to be between 0.38–0.92 (equivalent to finite rates: 1.46–2.51). For eastern grey kangaroos in the ACT, Banks (2000) estimated the maximum rate of increase to be 0.47–0.55 (equivalent to finite rate: 1.60–1.73).

The highest rates were observed following drought breaking rains (e.g. Bayliss 1987, Cairns and Grigg 1993, Caughley et al. 1984), when the combined effects of an unstable age distribution, imbalanced sex ratio in favour of females and abundant food resulted in an initial rapid rate of increase in the first year after drought-breaking rains, or when predators (primarily foxes) were heavily baited thereby removing predation as a factor (e.g. Banks 2000).

Maximum rates based on assumptions regarding theoretical populations, estimated vital rates and sources of data derived from numerous sites are likely to be highly inaccurate and misrepresent true maximum rates of increase. The claim that the maximum rate of increase of kangaroos is between 0.086–0.095 (equivalent to finite rates: 1.09–1.10) is not supported by empirical data.

Kangaroo management zones in NSW are divided into administrative units. The boundaries of zones are not correlated with underlying vegetation, topographic or climatic factors that may influence the distribution of kangaroos. In addition, there are no administrative boundaries controlling the movement of kangaroos, and, except for fences used to control the movement of livestock or exclude pest animals, kangaroos can move freely between zones. Large changes in abundance between years within a zone, that exceed the observed maximum rates of increase described above, have sometimes been observed. These are not unexpected and are most likely associated with changes in the availability of food resources within a zone, as has been observed in South Australia, where broad-scale movement of kangaroos was observed in response to rainfall that stimulated new plant growth (Pople et al. 2010).

References

Bayliss, P. (1987). Kangaroo dynamics. In ‘Kangaroos: Their Ecology and Management in the Sheep Rangelands of Australia’. pp. 119–134. (Cambridge University Press.) doi:10.1017/CBO9780511898082.011

Banks, P. B., Newsome, A. E., and Dickman, C. R. (2000). Predation by red foxes limits recruitment in populations of eastern grey kangaroos. *Austral Ecology* **25**, 283–291. doi:10.1046/j.1442-9993.2000.01039.x

Cairns, S. C., and Grigg, G. C. (1993). Population dynamics of red kangaroos (Macropus rufus) in relation to rainfall in the South Australian pastoral zone. *Journal of Applied Ecology* **30**, 444-458.

Caughley, G. (1977). ‘Analysis of Vertebrate Populations.’ (John Wiley and Sons: Chichester.)

Caughley, J., Bayliss, P., and Giles, J. (1984). Trends in kangaroo numbers in western New South Wales and their relation to rainfall. *Australian Wildlife Research* **11**, 415–422.

Gaillard, J.-M., Festa-Bianchet, M., and Yoccoz, N. G. (1998). Population dynamics of large herbivores: variable recruitment with constant adult survival. *Trends in Ecology & Evolution* **13**, 58–63. doi:10.1016/S0169-5347(97)01237-8

Pople, A., Grigg, G., Phinn, S., Menke, N., McAlpine, C., and Possingham, H. (2010). Reassessing the spatial and temporal dynamics of kangaroo populations. In ‘Macropods: the Biology of Kangaroos, Wallabies, and Rat-kangaroos’. pp. 197–210. (CSIRO Publishing: Collingwood, Australia.)

The Hon. BEN FRANKLIN: What do you think the maximum rate is?

Mr BRILL: I do not know what the maximum rate is. I would not speculate.

The Hon. PENNY SHARPE: I just wanted to ask a quick question. Ms Molloy, you said in your opening statement—and I noticed it is in the submission as well—about moving away from the description of "ecologically sustainable populations" to "ecologically viable populations". Why has there been a change?

Mr BRILL: The concept of sustainability is a concept that should be used around a use of something—you have a sustainable use of something. Whereas we are managing to an ecological viability of the population independent of the use. You might think it is semantics—

The Hon. PENNY SHARPE: No, I know that these things are chosen very carefully, which is why I am interested because I have not seen the change before.

Mr BRILL: It was chosen very carefully and it is really around the fact that "sustainable" is really a term that is used associated with the use of something.

The Hon. PENNY SHARPE: So, for example, sustainable you think is more, if we are talking about commercial harvesting, that there is a sustainable population for that as opposed to actually just a viable population that ensures that these species survive. Am I understanding that right?

Mr BRILL: I would express it as a sustainable harvest or an ecological viable population.

The Hon. PENNY SHARPE: Obviously, it is very clear how many kangaroos are killed for commercial harvest. Do you have the figures for non-commercial culling? Obviously, it is the responsibility of the National Parks and Wildlife Service. There are licences given and particularly now that tags are not required—I suppose my question is what percentage of the killing of kangaroos is non-commercial? Can you provide those numbers to the Committee? I apologise if they are somewhere in our material, but I have not been able to find them.

Mr KINGSWOOD: It is probably not in the material because it fluctuates. It depends on the species and it depends on the zone that we are looking at.

The Hon. PENNY SHARPE: Could you give species/zone figures perhaps for the past five years on notice? Not now, obviously.

Mr KINGSWOOD: On notice we could, yes.

The Hon. PENNY SHARPE: We are trying to get a handle on how much is commercial and how much is not, because obviously for this Committee one of the big issues that people are concerned about is the welfare of animals and humane killing of them. Someone suggested that they cannot be humanely killed. But, generally, we are just trying to get a handle on that. We are obviously interested also in the industry. We have just had evidence from the industry this afternoon that they believe the industry could be grown, but they actually see the biggest growth from those already being killed. But we just do not have a sense of how big that number is.

Mr KINGSWOOD: We can provide that for the last couple of years for you.

The Hon. PENNY SHARPE: That would be great.

Mr KINGSWOOD: It will also depend on the time of year and the year in relation to things like drought and impacts as well. So it becomes a very complex picture, but we can provide the figures.

The Hon. PENNY SHARPE: Yes, I know. The point, I suppose, is that it is clear that there are very clear pathways and requirements for the commercial activity. The concerns around animal welfare—and they have been expressed in numerous different ways over the course of these hearings—are that the non-commercial killing is being done by people who are not professionals and who are not necessarily actually required to reach the same standards in terms of animal welfare. They are doing their best to control animals on their properties. I am not trying to cast aspersions on farmers trying to do their job and manage their land, but we are just trying to get a grip on that so that we can look at it from the animal welfare aspect.

Mr QUIRK: We can take that on notice and get that data back to you. In the commercial zone we often recommend to farmers a range of options, but one of the options we suggest to them is that they use commercial harvesters for that very reason.

The Hon. PENNY SHARPE: Are you able to provide the Committee with the number that take you up on that?

Mr QUIRK: I do not think we would have that data, but I will take it on notice and see if we do.

ANSWER:

Tab T1 shows the number of kangaroos potentially harmed non-commercially each year as a range.

The National Parks and Wildlife Service (NPWS), does not centrally collect data on the provision or uptake of landholders engaging commercial harvesters. NPWS advises landholders to consider using a commercial harvester either during a conversation with a non-commercial licence applicant or through referral to the NPWS website .

The Department's Commercial Kangaroo Management Program does not collect data on the number of landholder consents given to commercial harvesters as a result of a property owner taking this advice from NPWS. Instead the Department is able to advise the total number of landholders providing consent to professional kangaroo harvesters for the past three years:

- 2019 – 2644
- 2020 – 2756
- 2021 – 2431 (to date).

The data is not available before 2019 because prior to 2019 tags were issued to properties instead of to individual harvesters. This means the total number of licences (or batches of tags) issued for kangaroo harvesting can be determined prior to 2019. However, because individual properties may have received multiple licences (or batches of tags) this is not the number of individual landholders or individual properties and is not comparable with the above figures.

The Hon. PENNY SHARPE: How many monitoring and compliance officers do you have to oversee the commercial and the non-commercial killing of kangaroos? That is probably a question for each of Mr Brill and Mr Quirk, I think. Or maybe Ms Molloy?

Ms MOLLOY: Yes, I can answer from the commercial end of the business, but there are also crossovers. We have got approximately 40 staff in our original compliance teams and they, as you know—

The Hon. PENNY SHARPE: Is that just for kangaroos?

Ms MOLLOY: No, they deal with all the compliance that we do across the number of pieces of legislation. But they are all authorised officers, so they can do work in any of those areas. I do not know off the top of my head, if I had to pick a number, how many specifically do kangaroo compliance work. We also work closely with our parks colleagues, if they need assistance. There is also, for the more sort of egregious cases or bigger cases, the specialist investigation unit people as well.

The Hon. PENNY SHARPE: Yes, I am familiar with that.

Ms MOLLOY: Yes, so that would be extra numbers. Can I work out a number? I probably could. I could probably take that on notice, yes.

The Hon. PENNY SHARPE: If you could just take that on notice and if you could also actually give us the figures for the number of complaints and the number of actual actions that have been taken as a result. The serious end, I think, is quite obvious.

Ms MOLLOY: Yes.

ANSWER:

Compliance staffing

In 2020–21, the average monthly Biodiversity and Conservation Division (within the Department's Environment, Energy and Science Group) compliance staffing was approximately 37 full-time employees (FTE) (as at 31 March 2021). Compliance staff work covers issues for native vegetation, threatened and protected species, Aboriginal cultural heritage, and commercial kangaroo management.

The Department's Legal Services Division also provides between five and eight FTE staff at any time, including specialist investigators and legal services for compliance, enforcement, and general investigative advice.

Complaints

This financial year (1 July 2020 – 30 June 2021), the NSW Environment Line received 556 complaints of alleged breaches across all compliance issue themes. 76 complaints/subsequent investigations related specifically to the commercial kangaroo management program.

Compliance and enforcement actions

In the 2020–21 financial year, the Biodiversity and Conservation Division took 63 compliance actions related to the kangaroo management program, including issuing:

- nine advisory letters
- 24 warning letters
- 14 official cautions
- 16 penalty notices.

The Hon. PENNY SHARPE: We have had lots of very distressed wildlife carers who believe that they have made reports both to the commercial and non-commercial—I am coming to you too, Mr Quirk, on the National Parks and Wildlife Service—but there is just no action taken as a result of what appears to be quite significant deviations from the rules and regulations under which they are supposed to be operating.

Ms MOLLOY: Okay. If we get any calls in through the Environment Line or to any of our officers they are certainly acted upon and put into our database and acted on.

The Hon. PENNY SHARPE: Could you give us perhaps the last five years' numbers on that?

Ms MOLLOY: Yes, and I think—correct me if I am wrong, Mr Brill, but I think in our annual reports we do have some data around compliance.

ANSWER:

During the last five financial years (1 July 2016 – 30 June 2021), the NSW Environment Line received 432 complaints of alleged breaches related specifically to the commercial kangaroo management program.

Ms ERRINGTON: The outputs.

Ms MOLLOY: The outputs.

The Hon. PENNY SHARPE: But specifically I am just after the kangaroos one.

Ms ERRINGTON: The kangaroo annual report.

Ms MOLLOY: Yes, I am talking about the kangaroo annual report. We do have some outputs—not specifics, obviously. But if that is not enough information we can try and get you some more.

The Hon. PENNY SHARPE: Mr Quirk, can you provide that for us for the non-commercial? Do you track the number of complaints and the activities of your officers?

Mr QUIRK: No, I am not confident that we can, but I will take that on notice. The question around compliance officers is a bit like the BCS. All our ranger staff are compliance staff. They are all authorised officers and they work across all of our regulatory activities, including kangaroo work. We also have access to four dedicated specialist field investigators that work with us across all of our business as well. So, yes, I can get you that number of rangers currently. It goes up and down. Currently it is in—I will not try and estimate it. I have a figure, but I will not quote it because I will be wrong. It is a larger group, but they work across everything that we do.

ANSWER:

NPWS does not have a central compliance case management database to track the total number of complaints received and actions taken. Complaints received via the public Environment Line are passed onto the relevant local staff to respond. The NPWS Wildlife Team records complaints received.

Complaints received by NPWS area offices are recorded locally. NPWS is exploring options for a central database to manage compliance related matters.

Complaints are referred to relevant compliance staff and other authorities for appropriate action. Internal guidelines outline procedures to respond to reported incidents. Where matters about non-compliance with the Code of practice for the humane shooting of kangaroos and wallabies for non-commercial purposes or any other act contrary to the *Prevention of Cruelty to Animals Act 1979* are reported, staff are directed to report matters to the RSPCA NSW or NSW Police.

As at July 2021, NPWS has over 130 rangers currently approved as 'authorised officers' to investigate and undertake compliance action. This includes matters relating to illegal harm of kangaroos.

Serious matters are referred to the Department's Specialist Investigations Section.

While not held by NPWS, the number of penalties issued by NPWS for offences relating to animals is available from Revenue NSW. However, the information is not searchable by animal type, and in the time available could not be interrogated to provide the information requested.

The Hon. PENNY SHARPE: Could you give us some specific data—I do not know what you have got—in relation to kangaroo-specific complaints around non-commercial culling?

Mr QUIRK: Yes. We have been involved in conversations. We do not have the same database, I will be honest, that BCS use and we should. It is something that is being worked on at the moment but—

ANSWER:

Over the last 10 years, the Department's Specialist Investigations Section was involved in 10 cases that involved harm to kangaroos. Of these, one case went to court and five warning/advisory letters were issued.

The Hon. PENNY SHARPE: I can feel a recommendation coming on, Mr Quirk.

Mr QUIRK: I can feel a recommendation coming on.

The CHAIR: Sorry, BCS?

Ms MOLLOY: Biodiversity, Conservation and Science Directorate—that is my area.

Mr QUIRK: We all work as one team, but we do have different law enforcement systems. But, yes, I will get you that information both on numbers and complaints.

The CHAIR: Do you have a law enforcement system for non-commercial culling? Is there one?

Mr QUIRK: A system?

The CHAIR: When you say you have different systems, what is there in place at the moment?

Mr QUIRK: Most of the complaints that come in in a law enforcement matter about wildlife are dealt with by the area staff where the complaints are raised.

The Hon. MARK PEARSON: And what is being dealt with? What happens? When a complaint is being dealt with, what is the action?

Mr QUIRK: It will depend on the nature of the complaint and the investigation. We really deal with three issues. One is breach of licence, which is a matter for our staff. Often they are firearms-related offences, which we pass to New South Wales police. If they are welfare-related matters we pass them on to the RSPCA and the Animal Welfare League. There are bits of legislation we do not have jurisdiction under, which includes firearms and welfare. But we deal with offences against our Act, so we work with other agencies.

The Hon. PENNY SHARPE: So the only thing you are really tracking is if say you have given them a licence to kill 100 kangaroos and they have killed 150 and there is a complaint, then you can take action?

Mr QUIRK: Yes. We will often go out and meet complainants on the ground and actually try and work out what the complaint is. So if it becomes clear during that matter that it is a welfare issue we will pass that on to the RSPCA. If it becomes clear it is a firearms issue—many of the complaints we get—

The Hon. PENNY SHARPE: Let us not assume that people are actually doing the wrong thing, but say someone has got kangaroos on their property, they are very concerned about it and you have given them a licence to kill 100 kangaroos. They have gone out and killed 100 kangaroos but it is clear that the animals have suffered greatly because they have not had the skills. The kangaroo has not been shot in the head. They are just lying around in a bad way. You have got wildlife rescuers who have rung the bell on this and said, "Look, we are really worried. This is very problematic." Is it a welfare issue?

Mr QUIRK: That is an animal welfare issue.

The Hon. PENNY SHARPE: So they would complain to you and you would just put them straight onto the RSPCA?

Mr QUIRK: Yes, we would pass the matter to the RSPCA.

The Hon. PENNY SHARPE: You have absolutely no responsibility for the animal welfare part of the killing of the kangaroos that you licence?

Mr QUIRK: It is a licence condition. The licence condition is to comply with the code and the code outlines guidelines for the humane killing of kangaroos. So it is a breach of the licence, but it is much more fundamentally a breach of the animal welfare provisions in New South Wales.

The Hon. PENNY SHARPE: So you flick it to the RSPCA but there is really no consequence for the person who has got the licence that you take? There is nothing that you actually do to change their behaviour or to investigate or deal with that issue. You send it to the RSPCA and then it is—is that how it is dealt with?

Mr QUIRK: We would generally take their advice on welfare matters, yes, that is right.

The Hon. PENNY SHARPE: Can you provide, on notice, the number of times you have taken action for a breach of the code under the licence that had been given? Can you provide that to us for the last 10 years?

Mr QUIRK: I will take that on notice.

The Hon. CATHERINE CUSACK: Just to follow up, when was the last complaint made to the RSPCA about a breach?

Mr QUIRK: I would have to take that on notice, I am sorry. We do not have that information with us.

The Hon. CATHERINE CUSACK: I am trying to understand. You have emphasised to us the importance of compliance, so does anybody there know about this area of compliance and even whether any complaints have been made to the RSPCA or if any RSPCA officers are even out there to investigate?

Ms MOLLOY: Ms Cusack, we have a lot of information in our compliance database. I do not have that immediately to hand here but we can certainly find that out for you and get back to the Committee.

ANSWER:

Revenue NSW holds data on the number of NPWS issued penalty notices for contravention of licence conditions. NPWS holds copies of this data for 2018 to 2020, during which time six penalties were issued for contravening licence conditions. However, this data does not reveal if any of these breaches related to the licensing condition requiring compliance with the Code of Practice for the humane shooting of kangaroos and wallabies for non-commercial purposes.

In the NPWS Wildlife Team's compliance tracker, seven incidents were noted as being referred to the RSPCA. This figure does not include matters that are forwarded to NPWS area staff, who then refer the matter to RSPCA after their investigations determine there is a welfare matter. NPWS retains records locally on its investigations.

RSPCA NSW indicates on its website that it has 'approximately 30 inspectors in NSW at any time which consist of the Chief Inspector, a Deputy Chief Inspector, team leaders, north regional inspectors, south regional inspectors and Sydney metropolitan inspectors.' NPWS is not routinely provided with data from the RSPCA regarding matters related to kangaroo reports.

The CHAIR: Is that in relation to non-commercial killing as well?

Ms MOLLOY: I can comment on commercial.

The Hon. CATHERINE CUSACK: I will go back to the counting because obviously from this Committee's point of view there is so much conflicting evidence about what the population numbers are. Why have you not considered using drones that use thermal imagery in order to count? I heard earlier in the evidence that line of sight is not great for a drone, I understand that. The thermal imaging is what is being utilised for other species for counting, so why is that not being considered?

Mr BRILL: Do you mean thermal imaging under an aeroplane or a helicopter?

The Hon. CATHERINE CUSACK: Drones. Drones that do thermal imaging on the ground. They go around and you get a map basically using thermal imaging of where all the animals are. It is a highly accurate way of population count. I am just disputing your earlier statement that drones are ineffective because of line of sight. My question relates to drone technology utilising thermal imaging, which would be particularly effective in winter at night time. Are you confident that you are using the best technology and count methods, including consideration of these methodologies?

Ms MOLLOY: I might answer that. We are confident that we are using the best available data and science and methods available to us across a State the size of New South Wales to do what we need to do both in the western zones and also on the tablelands. Yes, we are confident that at the moment we are using the correct technology and systems. However, as I said earlier we are always open to new technologies, new cost-effective technologies, that may be used in the future. That may be thermal drones but I am not a drone expert; I am not a thermal imagery expert either.

The Hon. CATHERINE CUSACK: I am not talking about a technology of the future; this is a current technology.

Ms MOLLOY: Yes.

The Hon. CATHERINE CUSACK: It must have been discarded for a reason. If you are confident you are using the best methodology, clearly this one must have been considered and discarded for a reason. Maybe you need to take that on notice why that is not being utilised. In terms of the reproduction rate you were asked earlier to respond to the scientific evidence that we have received that 10 per cent population growth is a maximum. What is the actual figure that you are using in the calculations you are doing for the cull? This question is slightly different to the one that you have already been asked. What is the figure that is utilised in that calculation?

Mr BRILL: The quotas are based on 15 per cent of the previous year's population estimate for grey kangaroos and 17 per cent for red kangaroos, except where they depart from the mean, as I described earlier, and then they can be reduced to 10 per cent.

The Hon. CATHERINE CUSACK: When you calculate that 17 per cent—I thought you said 10 per cent earlier but it is 15, is it, for the greys?

Mr BRILL: The standard figure, if you like, for both eastern greys and western greys and common wallaroos is 15 per cent. The standard figure for red kangaroos is 17 per cent. When the population falls to 1.5 standard deviations below the mean, then it drops to 10 per cent. Then if it is two standard deviations below it is zero.

The Hon. CATHERINE CUSACK: Given that we have been told that just to maintain the population that 10 per cent is the annual rate, you have culling figures that are higher than that. You must be using a reproduction figure surely when you arrive at those percentages that are committed to be culled?

Mr BRILL: No, we do not.

The Hon. CATHERINE CUSACK: No, you are not interested in that?

Mr BRILL: We are interested. We are always interested in better models. But the current model uses last year's population estimate, which is surveyed in June-July. We are about to start broadscale surveys across the western plains of New South Wales next week. Those surveys and calculations will form the basis of the 2022 quota and that will be calculated in normal population terms at 15 per cent for greys and 17 per cent for reds. We do not actually use—

The Hon. CATHERINE CUSACK: Why 15 per cent? Let us just stick with the greys. How did we get that 15 per cent figure? How is that worked out?

Mr BRILL: The science tells us. There has been historical science done that calculates that the sustainable harvest rate can be around about 15 per cent and that is how that is set, based on the best available science.

The Hon. CATHERINE CUSACK: Does that science include or not include reproduction and gestation periods and things like that?

Mr BRILL: I would have to get back to you. I do not know the full detail of what is included in that, I am sorry.

The Hon. CATHERINE CUSACK: Could you provide us with that science and the sources for that science that will give a fixed 15 per cent figure irrespective? Secondly, your submission refers to thresholds where culling can be suspended. Can you tell us—

ANSWER:

The original derivation of the 15 per cent quota was described in Caughley (1987), and subsequently confirmed by other researchers including Hacker et al. 2003, Hacker et al. 2004, McLeod et al. 2004.

References

Caughley, G. (1987). Ecological relationships. In 'Kangaroos: Their Ecology and Management in the Sheep Rangelands of Australia.' (Eds G. Caughley, N. Shepherd, and J. Short.) pp. 159-187. (Cambridge University Press: Cambridge.)

Hacker, R. B., McLeod, S. R., and Druhan, J. P. (2003). Evaluating Alternative Management Strategies for Kangaroos in the Murray-Darling Basin: Final Report. Murray-Darling Basin Commission, Canberra.

Hacker, R. B., McLeod, S., Druhan, J., Tenhumberg, B., and Pradhan, U. (2004). 'Kangaroo management options in the Murray-Darling Basin'. (Murray-Darling Basin Commission: Canberra, ACT.)

McLeod, S. R., Hacker, R. B., and Druhan, J. P. (2004). Managing the commercial harvest of kangaroos in the Murray-Darling Basin. *Australian Mammalogy* **26**, 9–22.

The CHAIR: Catherine, have you hit mute accidentally?

The Hon. CATHERINE CUSACK: Apologies. I am asking about the thresholds where culling is suspended. How are those thresholds calculated?

Mr BRILL: That is what I was talking about before. Based on the 45 years of population data for that zone and that species we calculate the mean. We also calculate the variation. Standard deviation is a measure of the variation.

The CHAIR: Catherine, would you mute when you are not talking?

Mr BRILL: The standard deviation—

The CHAIR: Catherine, can you mute? It is not done. I will text her.

Mr BRILL: Like most people I dislike my voice enough without hearing it coming back at me. I think we might be right now, are we?

The CHAIR: Yes.

Mr BRILL: So, Ms Cusack, we calculate the mean, the long-term mean, based on all of the monitoring that we have for that zone and that species. We calculate the variation and then a measure of the variation is this thing called standard deviation. When you are two standard deviations away from the mean or below the mean then quota is suspended or there is zero quota set. When you are 1.5 to two standard deviations below the mean then the quota is set at 10 per cent of the population.

The CHAIR: We might just interrupt. I am sorry but the Hon. Catherine Cusack has lost audio.

The Hon. CATHERINE CUSACK: I am back. I can hear.

The CHAIR: We just need to keep moving because we actually are running out of time. Mr Brill, if could finish answering this question and then we will go to the Hon. Mark Buttigieg.

Mr BRILL: Yes, happy to.

The Hon. CATHERINE CUSACK: Thank you.

Mr BRILL: Ms Cusack, are you happy with the explanation, or did you hear it, more importantly?

The Hon. CATHERINE CUSACK: I will put some more questions on notice, if that is okay.

The Hon. MARK BUTTIGIEG: Some of what I have to ask follows on from my colleague Ms Cusack's line of questioning. What I am picking up is that the estimated or assumed population growth is based on historical survey data as opposed to, for want of a better term without trying to sound pejorative, a biological approach or reproductive rate approach. Does it not make sense to actually listen to some of the hard science—the biological science—behind the limits to reproductive growth to feed into or to truth-check that historical survey data or are you not sure whether or not the biological data is being used in your estimates?

Mr BRILL: The biological data is a component, I am quite sure, of the sustainable harvest levels, but the second point I would make is that there is no evidence in the long-term history that commercial harvest has, in fact, regulated populations to any great extent. It is climate conditions, drought if you like, that make populations fall.

The Hon. MARK BUTTIGIEG: I am looking at your graph on the DPIE document, figure 3 from the *NSW Kangaroo Management Program 2021 Quota Report*. It talks about the combined red and grey kangaroo population estimates, authorised quotas and actual takes. When you say "combined red and grey kangaroo," does that cover the majority of species or is it only restricted to two species? I am not quite sure when you say "red and grey kangaroos". Is that the majority of the population of kangaroos in New South Wales?

Mr BRILL: Yes. I am not exactly sure which figure you are referring to.

The Hon. MARK BUTTIGIEG: It is the one where you start off with 1982 of a population of about—

Mr BRILL: In the submission?

The Hon. MARK BUTTIGIEG: It is the document entitled *2021 Quota Report*.

Mr BRILL: That is a bit different.

The Hon. MARK BUTTIGIEG: This is what you are basing your culls off, I imagine.

Ms ERRINGTON: We do annual surveys. Every year we do surveys in the Western Division. It is a spot count along a transect within a zone of how many animals there are, and then we use the model to extrapolate that to a population count and a quota. The reds and greys—eastern greys and western greys—do make up the bulk of the population from the commercial harvest, and then the fourth species that we manage is wallaroos more in the tablelands area.

The Hon. MARK BUTTIGIEG: I am following up from a line of questioning from my colleague Cate Faehrmann. She pointed out that what looks like has happened in that series from 1982 to present is that progressively there has been areas that have been added in. When you compare the population in '82 to now, you may not actually be getting an accurate picture because you have lumped in different areas as the years go by. It appears as though there is population growth on average when there may not have been. If you look at the '82 figure, it is around about 10 million red and greys and then in 2020 it is a bit above 10 million, which indicates that the long-term mean has stayed averaged. But when you add in those areas, you have actually lost a lot more because you have added clumps into the survey data. Am I right or not?

Mr BRILL: Yes, you are. There have been zone expansions, additional zones added—Central Tablelands, for example, has been added to the commercial cull; in fact, all of the tablelands since 1982. In terms of red and greys—greys include western and eastern greys basically in that graph.

The Hon. MARK BUTTIGIEG: We are making some assumptions here, but if you listen to some of the evidence we had on record over the past couple of days, particularly from those people who appear to have quite good qualifications in that reproductive biological sphere, if we assume that their 10 per cent figure is correct and we have a cull rate of 17 per cent and the population is artificially expanded as a result of adding those areasin, if we are sitting roughly the same as we were back in 1982, then it is possible that we are actually reducing the population quite dramatically with harvesting because 17 per cent as opposed to 10 per cent. If you just cannot physically grow the population beyond 10 per cent, then you are reducing by 7 per cent year on year. In the long run, once these figures are corrected for those extra areas added in, we could actually be reducing the population quite significantly in theory.

Ms ERRINGTON: I think we can affirm that by just having a look at the data and getting back to you on that one, Mr Buttigieg. We will take that one on notice, thanks.

ANSWER:

Please refer to the response provided on page 56 and 57 of this document.

The CHAIR: Why does the correction factor change over time? You would have heard the evidence that we heard on Friday and some today and I am sure in the submissions. You know that is one contention. People are concerned about the estimates that the department provides. There is something called a correction factor, which we heard about on Friday. Why does it keep increasing?

Mr BRILL: It does not.

The CHAIR: It does not change?

Mr BRILL: No. There is only one species and one survey situation we use a correction factor for. That is the common wallaroo with helicopter surveys on the tablelands. It is a correction factor of 1.85, and it is used because of the relatively low detection rate for wallaroos from helicopter surveys. That is the best available science. Clancy and his studies in Queensland established the 1.85 correction factor.

The Hon. MARK PEARSON: What is a variation factor?

Mr BRILL: A variation factor?

The Hon. MARK PEARSON: When there was discussion about calculating the number of kangaroos to be shot, part of that equation—I think you walked us through these steps. One of them was a variation factor. What is that?

Mr BRILL: One is talking about correcting individual counts. The correction factor, developed by Clancy in Queensland, is applied to individual counts to calculate a population estimate. The other is looking at a whole population and its variation around the long-term mean. Forty-five years of data—let's say the mean is 10 for argument's sake. There will be a variation. Each year will be over and above that, and statistics can calculate a variation in those populations. That gives us a good basis to work out when the population is low enough that we should be reducing quotas. The variation is nothing to do with surveys, nothing to do with calculating the population, but rather a method that is used to set the proportional quotas.

The CHAIR: Back to these incredible numbers around Tibooburra, which is the grey kangaroo temporal variation. The percentage change from 2014 to 2015 was actually 426 per cent. It changed from 44,000 to 234,000. How can you explain that change?

Mr BRILL: I would have to take that on notice, I am sorry.

ANSWER:

The grey kangaroo figures for the western plains zones include both eastern grey and western grey kangaroos. The Tibooburra commercial kangaroo management zone covers the north-western limit of natural range in NSW for these species, and consequently the population sizes of these species are always low. Eastern grey kangaroos are predominant in more easterly parts of NSW and the western greys are predominant in more southern parts of NSW. When conditions are favourable, kangaroo populations may be both breeding and migrating, resulting in large increases in population estimates. Conversely, during drought animals may move out of the management zone, reflected in a decline in population size.

The period in question corresponds with a period of increased rainfall between 2010–2016. This follows the drought from 2004 to 2009. Substantial growth rates often follow drought periods (albeit with a lag). This is likely an example of that. The drought period from 2016–2019 then resulted in a fall in the population because kangaroos emigrated out of Tibooburra zone or animals died (bust period).

The CHAIR: There are other large jumps. This is an inquiry that is looking at kangaroo numbers and with respect, Mr Brill, I would have thought that the team would realise the questions that were posed to us and the evidence that we heard on Friday. Some of that evidence was around these factors. We talked about the numbers. We talked about the numbers from 450,000. Were you are aware of and have you briefed yourself on the evidence that we heard on Friday?

Mr BRILL: Some of it, yes.

The CHAIR: Did you hear that we heard evidence about 450,000 in Tibooburra in Friday?

Mr BRILL: Not specifically, no.

The CHAIR: Would anybody else care to respond or know about that jump? I am the Chair and people

can call me to order, but this is really the crux of the matter, is it not? We are here today with government witnesses. We have had ecologists present, really worried about the data and how the Government is determining the numbers. I am here asking the experts, the last witnesses for this inquiry—or maybe we will have another hearing, actually. At this stage, you are the last witnesses. This was a key point of discussion. So you cannot say how—all you can do is take it on notice. You cannot fathom a guess how those numbers are determined, how you get a 426 per cent increase. Can I say in the last year there was a minus 86 per cent increase. That seems to indicate either the numbers are plucked out of thin air to justify take or it seems to indicate a gross mismanagement of kangaroos under this Government in terms of the commercial killing. Which one is it? Is it either of those?

Ms MOLLOY: I will make a comment on that. As I said earlier, we collect information on an annual basis. We use processes to collect that information that are scientifically robust. We have got 45 years' worth of data. If we cannot comment on one specific figure today, we will get back to you on that. But we stand behind what we do out in the field in terms of collecting that data and then subsequently analysing that data, the sophisticated models and statisticians that we use to advise us on the numbers.

The Hon. MARK PEARSON: Do you understand, because of the evidence that we have received from very credible scientists and witnesses, that your methodology is seriously in question?

Ms MOLLOY: We dispute that because we have got scientists and experts and statisticians that advise us on our scientifically robust way of collecting that data, interpreting that data and also analysing that data. Let us not forget—I have said it a few times now—it is very rare to have 45 years of data that you can analyse and try and predict and model what is going to happen around populations and it is annual surveys. We can see the population fluctuating, as my colleague Mr Brill said.

The Hon. MARK PEARSON: The question is the methodology. You might have your graphs and you might have your tables, but what is now seriously in question is the methodology—the instrument, the logarithm, the formula—that gets you those graphs and tables. We have received a great deal of very credible, robust scientific analyses of these figures and they are seriously in question. I need to point out to you—I do not know if you are actually aware of the absolute importance of getting these figures correct, because these animals are protected under three legislations in Australia, as I pointed out to you in the last budget estimates.

Ms MOLLOY: Yes.

The Hon. MARK PEARSON: If you have not got these figures correct, your department is authorising the killing of animals in a breach of possibly three legislations. So you have to have it absolutely right or we have people going out there killing animals which are actually protected as wild animals under three legislations. Do you understand the absolute seriousness of this?

Ms MOLLOY: Absolutely, and we take what we do very seriously and we are confident that our figures are correct. We can see how the population has fluctuated over the decades in relation to the boom and bust of drought and rain following drought and migration of kangaroos as well. We have got all that information and we use scientifically robust methods to collect it but also to analyse it and then interpret it. The other things thatI mentioned in my opening statement make sure that we check and audit and double-check and make sure that there is compliance with all of the things that we do to manage kangaroos.

The CHAIR: With the 450 per cent increase that I referred to before, you are not suggesting that that is a boom period, are you, Ms Molloy, from the year before? Four hundred and fifty thousand.

Ms MOLLOY: It may be or it may be movement of—it may be. I do not know the specific number.

The CHAIR: Mr Brill, are you a kangaroo expert?

Mr BRILL: No.

The CHAIR: Is anybody on the panel an expert in kangaroo biology?

Mr BRILL: No.

Ms MOLLOY: No, but we have got them in our team—in Mr Brill's team.

The CHAIR: The 450 per cent increase in a population—does that seem feasible to anybody on the panel or do you not have the expertise to answer that question? You have just said boom, Ms Molloy.

Ms MOLLOY: Potentially, yes. I would have to look at the figures in the area and movement.

The CHAIR: We have heard this a lot to justify—and I suppose as a committee, we are really trying to get to the facts and not this boom and bust we keep hearing about. With the boom of 450 per cent, I would suggest that is not a boom. Mr Brill, would you suggest that is a boom?

Mr BRILL: I am not going to put a tag on it like that. It is important to remember this is not a closed

population, so it is possible there is movement of kangaroos in and out of the area. That is why I took the question on notice because it is not as simple as just a number on a page.

The Hon. MARK BUTTIGIEG: Fundamentally, just as a matter of arithmetic honesty—perhaps that is the wrong phraseology. As a matter of analytical rigour, it strikes me that if you are going to present a bar graph that goes from '82 to 2021 and then lump in large swathes of population along the way, surely you have a control factor for that so that you are comparing like for like, but there has been no attempt to do that. It portrays the falsity that the population is exploding when it actually may not be. Can you see the issue here?

Mr BRILL: I can see that issue, yes.

The Hon. MARK BUTTIGIEG: Can I ask you just one follow-up. Has there been any attempt at estimating a baseline sustainable population of kangaroos—not based on, "Here's what we've got here and here's what we think it's doing," but actually an ecologically sustainable number of kangaroos per area based on science, or is it just, "Here's what we've got. Here's what we think it's growing at. Let's estimate a cull rate"? I am just trying to ascertain whether or not there has been any attempt at estimating what a good baseline population is. For example, in '82 it was 10 million. Has there been any attempt to say whether that is too much or too little?

Mr BRILL: I am not aware of any science to that effect.

Ms ERRINGTON: Are you talking about environmental loads, the amount the environment could sustain by hosting a certain population of kangaroos?

The Hon. MARK BUTTIGIEG: Presumably—not just the natural environment but the agricultural man-made environment as well, I guess.

Ms ERRINGTON: Certainly there is a lot of contributing factors there. That is not something we do, which is why we do the aerial surveys to do the population counts and look at sustainable population levels, which is the vibrancy of the population within a zone. That is why we set the quotas, but we can certainly look at research data. Just going back to the point earlier about the variation in the population increase, we do go back and look at the raw data that was collated for that particular region, the zone and the year and have a look and see what the contributing factors may or may not have been at that time. That is why we are happy to take that on notice, because we do not have the raw data available.

Ms MOLLOY: We can get you some information on that specific figure. We can go back to the raw data. We just do not have it here.

ANSWER:

The Department is not aware of any research that tries to determine an acceptable baseline that might balance the needs of kangaroo populations to be ecologically viable with the needs of agriculture and the expectations of the community. There are many stakeholders with different perspectives and expectations regarding the number of kangaroos that should be in the landscape.

Such a baseline could not be a single value or single density. It would need to be a range that considers fluctuations in seasons and also other factors, such as the productivity of the land, the competing land uses, etc.

The Hon. BEN FRANKLIN: Let us just pull back then, one level up. Could you describe, please, what you do to ensure that kangaroos are harvested at sustainable levels? We have had a lot of discussion about what the definition of sustainability is and what the numbers are and so on. If you can just lay out for us what you do to make sure that when kangaroos are harvested they are harvested at sustainable levels, that would be helpful.

Ms MOLLOY: I talked a little bit about it earlier, but the team can go into a little bit more detail. The surveys are done, there is an annual quota, and harvesters have to have a licence and licence conditions. They will be handed out tags based on the species and the zone, depending on the quota. There is a lot of compliance that we do and chiller inspections and checking licences, et cetera. There is a whole range of different things that we do to manage from the start of the year when we hand out the quota to handing out the tags to following up. There are regular returns. I know I am not talking about all of it here, Mr Brill and Ms Errington, but there are lots of things that we do to manage it from the start of handing out the quota to the end of the year where we do an annual report. We talk about what happened that year as part of the commercial kangaroo management program. Then we start the process again and also with the surveys as well. So, Mr Brill, I may have missed a few things.

Mr BRILL: Would you like more detail?

The Hon. BEN FRANKLIN: Sure, I would. Penny, did you want to follow up quickly?

The Hon. PENNY SHARPE: I have a specific question about method. You can come back to this. In one of the submissions, it says the following in relation to changing of your methodology for counting. It says that essentially the population survey methodologies have changed over time, which you would expect because there are different arrangements. One of the submissions said, "The long-term western district survey methodology in New South Wales, which abandoned the 2016 surveys in western New South Wales …" Is that true?

Mr BRILL: No.

The Hon. PENNY SHARPE: That is good to know. And then we have also changed the transects in which the surveys are done. Is that true?

Mr BRILL: That is true.

The Hon. PENNY SHARPE: What impact has that had and have you had a look at the impact on the changing of the transects, which I think happened in 2018?

Mr BRILL: I can outline what happened just so that we are all clear of that. Two changes occurred over the last five years or so and they happened at different times. That was quite deliberate. Historically, the surveys were flown east-west transects right across the State and they used a method called strip counting—originally 200-metre strips then 100-metre strips. I cannot remember the date of that change. In 2016 they moved to MRDS, which is marked recapture distance sampling. Do not let anyone tell you it means anything else.

The Hon. PENNY SHARPE: What does it mean? I have no idea.

Mr BRILL: It means marked recapture distance sampling.

The Hon. PENNY SHARPE: Can you explain that to the Committee? I have no idea what that means. The strip stuff made sense to me. This does not.

Mr BRILL: I can and will. Just go with me for a moment. I will explain the higher levels, then I will explain the detail of MRDS.

The Hon. PENNY SHARPE: Thank you. I appreciate it.

Mr BRILL: In 2016 they moved to MRDS. In 2017 they also used MRDS. In 2018 they changed the transects to zigzags in blocks—160-kilometre transects in 56 different blocks across the western plains. Something like 8,900-something kilometres of transects. That uses the much more sophisticated distance sampling method for analysis. Let me explain MRDS. In the fixed-wing aircraft we have the luxury of having at least six seats. We have a pilot and we have a safety person in the front, then in the two seats immediately behind we have four counters, two on the left and right. Those counters on the right or the left observe the same areas and they record what they see using an Xbox controller—so what your kids have been doing all these years might not be wasted.

The Hon. PENNY SHARPE: Good to know, Mr Brill.

Mr BRILL: That is recorded directly into a data logging computer. What we get basically is what—another term for marked recapture is double count. Two people count the same kangaroos in this case. They know because of the location and the timing of the recording that it is the same kangaroos. Sometimes one will miss those kangaroos. Sometimes the other one will miss those kangaroos. From that, the science and the statistics can calculate the detection function. One of the things they also record which is important in distance sampling is the distance from the centre-line. As you move away from the centre-line your ability to detect the animals declines and, in fact, declines quite sharply. So the detection function for each individual observer is really important in how that population is calculated.

The Hon. PENNY SHARPE: Can I just stop you there. Essentially you are arguing that, yes, they have changed. You believe that the MRDS methodology is more accurate. Has there been any comparison between the old transects and the new transects to see that there has not been some sort of massive change in the numbers as they appear under those two different methods?

Mr BRILL: As far as I know there was no parallel surveying—surveying the same populations by two different methods at the same time.

The Hon. PENNY SHARPE: No, that is right.

Mr BRILL: Although I believe science has done that in the development of the distance sampling method quite some time ago now. If you wanted, we could try to find that science.

The Hon. PENNY SHARPE: No. Your methodology has been challenged very heavily by the people

who have come before the Committee. There is no accusation in the questions that I am asking you. I am just simply trying to understand that you have chosen particular scientific methods. Clearly it is in the public's interest that as public servants you believe these to be the best. I am just trying to unpack the concerns that others have raised in relation to this. That is why I am asking. There is no trick here. If I understand correctly, you believe that the new method since 2016 to 2018 and now ongoing is basically better, and you do not have any concerns about some sort of perhaps underestimate of counting. In fact, if anything, it would sound to me like you are probably getting a more accurate count. Is that a fair summary of your—

Mr BRILL: We certainly believe marked recapture distance sampling will give us a more accurate count. The peer reviewed science will tell us that that is the best available science at this time for calculating broadscale populations. That is why we adopt it.

The CHAIR: In relation to that, we heard from a statistician on Friday. She has been involved in conducting wildlife surveys in South Africa, Kenya and other places and suggests that 4.8 per cent, I think, of the zone—DPI states that 4.8 per cent of the zone may be surveyed. Is that correct?

Mr BRILL: No.

The CHAIR: No? Is there a percentage of a zone that is surveyed?

Mr BRILL: I think the western plains is around about 1 per cent. I would have to get back to you to confirm if you want a confirmation of an exact figure.

The CHAIR: Yes. That would be good. She suggests, in fact, that drought and climate change is not taken into consideration when looking at these variables. Is that correct as well?

ANSWER:

0.96 per cent of the western plains survey area is covered by one of the 'bins' used to collect the survey data. However, for line transect sampling, the proportion of sample space does not dictate the variance in estimation. Rather, it is the number of individuals, or clusters of individuals observed (n). In the case of mark-recapture distance-sampling (MRDS), n represents either individuals or clusters independently and positively identified by both observers. For the surveys conducted since adopting MRDS, the number of animal groups detected exceed the recommended minimum by at least an order of magnitude for all species in all years (e.g. for red kangaroos, 4145, 3168 and 2799; and for grey kangaroos, 3216, 2220 and 1186, for the respective years 2018, 2019, and 2020).

Mr BRILL: The surveys survey the population there at the time. They do not need to take into account drought—the presence or absence. They are counting what is there at the time. There may have been drought leading up to what population is there at the time or there may be drought affecting what is there three months later but we count, in the surveys, what is observed on that minute that those counters fly past.

The Hon. MARK BUTTIGIEG: You talk about these strips of land. Let us call this room a strip. Does that mean every kangaroo in that area is counted or is it extrapolated that based on the density there is probably going to be this amount in that area? I was not clear on that how that worked.

Mr BRILL: The aeroplane, if we think of the western plains surveys, is fitted with rods that delineate distances on the ground. There are five what we call "bins" or "distance categories", if you like. They go from zero to 300 and it is split up. I think—do not quote me—it is zero to 20, 20 to 50 and so on and they get bigger as you go further out. The counters place the observed kangaroo or mob of kangaroos into one of those bins and, as I explained before, the closer it is to zero, the more likely they are to see it. The closer it is to 300, the more likely they are to miss it. I am not saying they are more likely to miss it. I am saying that the detection rate decreases as it goes further out. You cannot assume that they will all be seen. That is why we cannot just do a simple mathematical extraction for the amount seen multiplied by the area.

The Hon. MARK BUTTIGIEG: That question by my colleague, Ms Faehrmann, regarding the percentage, does that mean that methodology is only used for 1 per cent of a particular geographical area?

Mr BRILL: The surveys cover—I am pretty sure it is 1 per cent.

Ms ERRINGTON: Yes.

Mr BRILL: There you go. Ms Errington has confirmed that in the Western Division 1 per cent of the landmass occurs under that 300-metre band.

The Hon. MARK BUTTIGIEG: I see. But the actual quantum that you cover is the whole 100 per

cent? You cover the whole area?

Mr BRILL: We randomly place blocks in each zone. There are five to seven blocks or something like that in each zone. There are 56 blocks across the entire western plains surveys and each of those are 160 kilometres in length—or the transect is because it is zigzagged. It is actually a 50-kilometre by 20-kilometre block and it hasgot 160 kilometres of zigzagged transect in it. So 160 kilometres multiplied by 600 metres—I did the maths theother day and it comes out to 0.96 per cent, so it is pretty close to 1 per cent.

The Hon. MARK PEARSON: Can I just ask a couple of clarification questions. When the observers are observing, is there any magnification used for them to look through?

Mr BRILL: No.

The Hon. MARK PEARSON: You are saying that when these blocks are observed and counted, whatever form they might take be it zigzag or whatever, that essentially would count or constitute—what they are counting is approximately 1 per cent of a zone? Is that correct?

Mr BRILL: I would say yes, but Ms Errington has started a seed of doubt in my head.

Ms ERRINGTON: Each block that we have 50 by 20 kilometres—9.6 per cent of each block is accurately surveyed.

The Hon. MARK PEARSON: So the block is surveyed. What percentage is that of a zone?

Mr BRILL: The total 56 blocks make up 1 per cent of the entire western plains surveys.

Ms ERRINGTON: Nine zones.

The Hon. MARK PEARSON: A person observing, could they tell the difference between a grey goat and a kangaroo from that height?

Mr BRILL: Absolutely.

Ms ERRINGTON: Yes.

The Hon. PENNY SHARPE: Have you seen them do it, Mr Pearson? Have you seen Richard Kingsford do the birds? Sorry.

The CHAIR: Order! We have got 10 minutes.

The Hon. PENNY SHARPE: It is amazing.

The Hon. MARK PEARSON: This block—is it taken into account that during drought or various times and conditions that there would be more kangaroos in an area where there are water sources than not? Is it takeninto account that you are going to see more in some areas because of environmental changes or climactic changesto the zone?

Mr BRILL: The blocks in the western plains surveys are randomly placed and, other than a few tweaks after 2018 for safety reasons, we plan to stick with those. Certainly this year the same blocks will be surveyed. As was last year.

The CHAIR: Other concerns have been raised in a few submissions in relation to the wallaroo count in the Northern Tablelands, which increased by 269 per cent, I think, during drought conditions. Is there a reason for that?

Mr BRILL: I am not sure which table you are referring to.

The CHAIR: I think it is just the data, really. The table is what various people have told us has happened. Whether that is the situation—I do not have the reports in front of me. I have the data from some of the people who have gone through your reports.

Ms ERRINGTON: We spoke to Dr Cairns regarding that variation and he suggests that it is within an acceptable variation limit between years. Wallaroos predominantly can hide in the forested areas and at times they come into the open plains where then you may—lower down on the slopes where you pick up the count. But if they are in the trees, you will not see them as much. There can be variability within that count.

The CHAIR: Dr Cairns provided that in writing, did he? I wonder if you could take that on notice and provide if he has said that was all okay.

Ms ERRINGTON: We can take that on notice, yes.

ANSWER:

The population increase of 269 per cent referred to is the increase in wallaroo numbers across the three Northern Tablelands zones from the spring 2013 survey to the spring 2016 survey. Officially, the most recent drought in the Northern Tablelands was in 2017–2018 and the drought was not as severe in the Northern Tablelands as it was further south and west.

The 269 per cent increase in wallaroo numbers for the period 2013–2016 represents three consecutive years over which numbers increased by 39 per cent each year. This is not unfeasible, given that this period was a non-drought period. Between 2016 and 2019, during which the 2017–2018 drought occurred, wallaroo numbers essentially remained steady.

Note the precision of the wallaroo estimates is not as high as it is for the eastern grey kangaroo estimates because the surveys are specifically designed for surveying the much more abundant eastern grey kangaroos.

The 2016 and 2019 Northern Tablelands Survey reports provide some discussion of the changes in wallaroo numbers over the period 2013–2019.

The CHAIR: Mr Brill, has the Government agreed to import Bennett's wallabies from Tasmania to process here in New South Wales? Does that ring a bell?

Mr BRILL: The Government does not import kangaroos for processing at all.

The CHAIR: Have you approved the importation of Bennett's wallabies though from Tasmania to process by, I think, the Staughton Group?

Mr BRILL: Importation of Bennett's wallabies is quite legal, yes.

The CHAIR: So that has been agreed even though we do not have that species within the New South Wales commercial harvest management plan.

Mr BRILL: We have the species in New South Wales. It is not in the commercial harvest program. Correct.

The CHAIR: That is all above board according to our Biodiversity Conservation Act, is it, for us to be able to approve the importation of Bennett's wallabies from Tasmania to process here?

Mr BRILL: Yes.

The CHAIR: You gave that permission this year.

Mr BRILL: I did not need to give that permission. The licences were actually amended to make sure that was legal. There was never any—

The Hon. PENNY SHARPE: Who amended the licences?

Mr BRILL: I did.

The Hon. PENNY SHARPE: So there is an approval process, essentially, that you signed off on.

Ms ERRINGTON: It is allowed under the Biodiversity Conservation Act.

The Hon. PENNY SHARPE: Sure, but there had to be a decision made to allow this to occur.

Mr BRILL: There was a decision made to make sure that it was legal under their licences, yes.

The CHAIR: Has the department undertaken any kind of internal audit in relation to the kangaroo management program and whether compliance is—just an internal audit as to the systems and processes?

Ms ERRINGTON: We regularly review our systems and processes in terms of making continuous improvements around the administration. We have adopted a new wildlife licensing system over the last couple of years, which now provides better data and online licensing to move away from paper-based mechanisms to improve regulation and oversight of the program. We do look at how we can continuously improve our administration and regulation of the kangaroo program for that way. We do look at regular inspections from the broader compliance program around kangaroos as well as the other media that the compliance and regulation officers manage as well. There are a range of things that we do look at.

The Hon. PENNY SHARPE: Mr Quirk, does kangaroo culling occur in any national parks?

Mr QUIRK: That is a good question. It has been discussed a lot, but no, not that I am aware of. Other than there have been—in the feral-proof fenced areas it was raised as a possibility.

The Hon. PENNY SHARPE: That is like in Sturt National Park and those areas.

Mr QUIRK: Yes, Sturt. Those fenced areas where we have got exclusion fencing where we are trying to remove feral animals, there was a concern raised that large macropods can be problematic within the fences. There was talk of permitting culling but, as I understand it, in the end none have been culled. The animals have been moved out of the fences without the need to do so. It is an ongoing process in the small numbers in Sturt with one-way fences and letting the animals remove themselves.

The Hon. PENNY SHARPE: Have they been culled anywhere else?

Mr QUIRK: Not that I am aware of. We have discussed it. There has been a lot of conservation conversations around the role of kangaroos in grassland habitats in particular and whether their population densities are too high. It is a very contested conversation. I live in Canberra and the current cull is going on in Canberra at the moment. I have watched the changes in the woodland areas associated with kangaroos, but in New South Wales we have not done it. It is being pushed by a number of scientists as a live debate. You would have seen some of the papers published recently by Letnic and others maybe, but we have not taken it on. It is a debate that has probably run for 20 years in the Warrumbungles and elsewhere, but it has not been pursued in New South Wales.

The Hon. PENNY SHARPE: To date it has not actually occurred in New South Wales?

Mr QUIRK: No, it has not. The only reason I am cautious is I am trying to work out if there has ever been a problematic kangaroo. So, you know, if someone really pushes, I might find that there has been issues with individuals.

The Hon. PENNY SHARPE: Like an aggressive kangaroo in a picnic area or something?

Mr QUIRK: An aggressive kangaroo in a picnic area, yes.

Mr KINGSWOOD: Or euthanasia after an animal may have been hit by a car or something similar in a park.

The Hon. PENNY SHARPE: Obviously that is less of a concern.

Mr QUIRK: But as an ecological tool or a population tool, we have not used it. Other States have. We are one of the few States that has not.

The Hon. PENNY SHARPE: The kangaroo management program, how is that funded within the department?

Mr BRILL: The commercial kangaroo management program unit is essentially almost entirely—not entirely, but almost entirely—funded from licence fees and tag sales.

The CHAIR: I wanted to ask, in the couple of minutes I think we have left, about the industry itself. There has to be returns. Is that correct? How are they monitored? What is that system?

Mr BRILL: Harvesters have to submit monthly returns for each of their batches of tags that they order or purchase—so they are monthly returns. Chillers have to report weekly returns and processors report quarterly. That quarterly is for, essentially, export from New South Wales and internationally.

The CHAIR: Have there been any issues with those returns? Are they all done in a timely manner?

Mr BRILL: It depends a little bit on whose standards. They are very good, but I would like them to be better. I started this job in July last year and that is one thing I am working very hard to improve. But they are very good, like, they are high nineties. The harvest returns is high 90s per cent for last year. It is only 1.5 per cent or something that was not submitted at the end of last year. But I want 100. I want it as close to 100 as I can get.

Ms MOLLOY: Yes and that is part of our continual improvement process of some of our reporting and monitoring of what is going on and just trying to make sure everything is done to 100 per cent if possible.

The Hon. BEN FRANKLIN: I have just one question to put on notice.

The CHAIR: I think we will all have questions on notice.

The Hon. BEN FRANKLIN: We had a contention from a previous witness that we could in fact deal with this whole issue by providing approximately $10 million a year to ensure that (a) crop damage was dealt

with, which was about $4 million a year, and (b) fences were fixed, which was about $5 million to $5.6 million a year throughout the State, and that would mean that we would not need to do any culling of kangaroos at all. Could you, on notice, respond to that and whether those figures are reasonable?

ANSWER:

This view of the kangaroo management issues is simplified. Without commenting on the applicability of the actual figures quoted in the question the Department offers the following additional considerations:

- Welfare outcomes for many kangaroos could be much worse with no harvesting than under the current harvesting regime.
- The kangaroo industry is a small but important industry in regional NSW.
- The question does not allow any amount to offset competition for pastures.

The following reference may provide additional background on the broader range of impacts kangaroos can have:

Gibson, L.M.; Young, Michael D. Kangaroos: Counting the Cost. The Economic Effects of Kangaroos and Kangaroo Culling on Agricultural Production. In: Deniliquin, CSIRO Division of Wildlife and Rangelands Research; 1987. http://hdl.handle.net/102.100.100/269300?index=1

The Hon. MARK PEARSON: I have two very quick questions on notice.

The CHAIR: No.

The Hon. MARK PEARSON: I will write them to you.

The CHAIR: We will have more questions to provide you when we get the transcript back. You did take some on notice as well. The secretariat will be in touch with you with those questions on notice. Thank you for appearing today.

(The witnesses withdrew.)

The Committee adjourned at 17:00.

Tab T1 – The number of kangaroos potentially harmed non-commercially each year as a range (min – max),

where:

- Min. = the number reported as harmed by licensees
- Max. = the number reported as harmed plus the number authorised to be harmed for licences for which reports (or 'returns') have not been received.

The first four species listed (common wallaroo, eastern grey kangaroo, red kangaroo, and western grey kangaroo) are part of the commercial harvest program.

	Start year of licence											
	2016		**2017**		**2018**		**2019**		**2020**			
	Number harmed										**5 year total**	
	Min.	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
Common Wallaroo												
02 - Broken Hill	20	20			290	310	768	818	296	296	1,374	1,444
04 - Lower Darling			20	20	50	50	67	67	18	218	155	355
06 - Cobar										100		100
08 - Narrabri	280	960	584	734	715	1,629	150	940	64	69	1,793	4,332
09 - Armidale	308	523	151	245	547	927	493	678	77	97	1,576	2,470
10 - Coonabarabran	70	295	50	130	617	1,167	182	612	10	55	929	2,259
13 - Glen Innes	995	1,535	544	1,083	687	3,130	177	767	9	264	2,412	6,779
14 - Upper Hunter	438	548	331	351	1,119	1,524	341	801	137	287	2,366	3,511
16 - Southeast NSW	40	95	45	45	138	188	248	253	174	174	645	755
17 - Griffith North	75	125		40	308	1,018	40	290			423	1,473

	Start year of licence											
	2016		2017		2018		2019		2020			
	Number harmed										5 year total	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
18 - Griffith South							14	14			14	14
48 - Central Tablelands North	882	2,383	1,231	1,931	2,463	5,327	1,800	3,733	463	913	6,839	14,287
49 - Central Tablelands South	569	892	151	161	225	660	146	356	32	67	1,123	2,136
Non-commercial zone	10	10	50	110	189	479	132	192	105	120	486	911
Common Wallaroo Total	**3,687**	**7,386**	**3,157**	**4,850**	**7,348**	**16,409**	**4,558**	**9,521**	**1,385**	**2,660**	**20,135**	**40,826**
Eastern Grey Kangaroo												
01 - Tibooburra	968	968	2,024	2,024	1,285	1,585	510	1,010			4,787	5,587
02 - Broken Hill	797	847	1,403	1,403	7,905	9,145	3,907	4,032	1,050	1,075	15,062	16,502
04 - Lower Darling	75	125	350	350	3,340	7,725	664	1,689	167	1,343	4,596	11,232
06 - Cobar	1,480	1,480	1,013	1,418	1,378	2,928	100	100	250	450	4,221	6,376
07 - Bourke	500	600	1,800	1,850	5,724	8,924	1,900	3,190	250	1,100	10,174	15,664
08 - Narrabri	2,557	5,792	4,399	5,281	19,170	26,924	10,850	16,675	2,161	6,694	39,137	61,366
09 - Armidale	1,355	2,145	705	1,065	5,599	10,822	5,255	6,411	1,183	1,518	14,097	21,961
10 - Coonabarabran	3,002	5,986	3,747	6,102	15,922	29,964	7,457	11,322	588	1,363	30,716	54,737
13 - Glen Innes	2,638	4,498	1,848	3,449	4,519	16,475	1,619	7,819	150	1,765	10,774	34,006
14 - Upper Hunter	1,607	2,332	919	1,139	4,344	7,592	2,472	3,797	411	828	9,753	15,688

	Start year of licence											
	2016		2017		2018		2019		2020			
	Number harmed										5 year total	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
16 - Southeast NSW	30,432	54,635	35,493	61,197	74,158	109,541	59,312	79,688	31,097	46,803	230,492	351,864
17 - Griffith North	3,068	5,988	6,395	9,087	24,594	46,404	9,605	18,200	2,649	4,264	46,311	83,943
18 - Griffith South	6,178	12,168	7,213	11,842	13,877	33,833	9,818	19,706	4,305	6,983	41,391	84,532
48 - Central Tablelands North	15,777	27,317	15,493	25,304	27,458	60,561	13,074	28,173	6,251	8,131	78,053	149,486
49 - Central Tablelands South	13,763	25,890	10,931	19,085	20,164	57,077	11,425	21,455	3,823	9,430	60,106	132,937
Non-commercial zone	3,768	9,007	3,853	10,573	8,601	29,157	5,305	15,829	1,770	7,270	23,297	71,836
Eastern Grey Kangaroo Total	**87,965**	**159,778**	**97,586**	**161,169**	**238,038**	**458,657**	**143,273**	**239,096**	**56,105**	**99,017**	**622,967**	**1,117,717**
Red Kangaroo												
01 - Tibooburra	3,342	3,492	4,100	5,400	7,715	8,415	5	5			15,162	17,312
02 - Broken Hill	3,066	3,516	11,355	11,705	36,144	37,344	9,540	9,815	1,560	1,610	61,665	63,990
04 - Lower Darling	791	891	2,432	2,432	9,250	17,095	3,868	5,313	837	1,997	17,178	27,728
06 - Cobar	1,730	1,830	1,084	1,139	820	1,970	100	100	50	250	3,784	5,289
07 - Bourke	150	400	850	1,100	4,724	8,074	1,600	2,890	250	1,100	7,574	13,564
08 - Narrabri	334	959	2,012	2,366	6,921	9,181	3,634	5,939	500	1,980	13,401	20,425
09 - Armidale						100						100
10 - Coonabarabran	75	125	278	428	1,634	4,694	953	1,928		100	2,940	7,275

	Start year of licence											
	2016		2017		2018		2019		2020			
	Number harmed										5 year total	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
14 - Upper Hunter										20		20
16 - Southeast NSW						5	141	141	44	44	185	190
17 - Griffith North	712	912	2,417	2,557	8,340	18,502	3,372	5,247	1,982	2,402	16,823	29,620
18 - Griffith South	417	417	334	594	1,292	6,562	1,701	2,651	854	1,174	4,598	11,398
48 - Central Tablelands North			20	20	49	49					69	69
49 - Central Tablelands South	0	20	0	5						15	0	40
Red Kangaroo Total	**10,617**	**12,562**	**24,882**	**27,746**	**76,889**	**111,991**	**24,914**	**34,029**	**6,077**	**10,692**	**143,379**	**197,020**
Western Grey Kangaroo												
01 - Tibooburra	910	1,010	1,660	1,960	1,198	1,698	250	250			4,018	4,918
02 - Broken Hill	1,379	1,679	2,304	2,654	10,955	14,685	7,562	7,712	1,629	1,654	23,829	28,384
04 - Lower Darling	1,191	1,291	2,554	2,554	5,454	11,009	4,659	6,197	807	1,732	14,665	22,783
06 - Cobar	1,145	1,245	423	523	1,420	2,320	100	100	151	351	3,239	4,539
07 - Bourke		50	600	850	3,274	3,424	900	940		600	4,774	5,864
09 - Armidale					98	98					98	98
10 - Coonabarabran			147	147		100	188	398			335	645
14 - Upper Hunter					82	82					82	82

	Start year of licence											
	2016		2017		2018		2019		2020			
	Number harmed										5 year total	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
16 - Southeast NSW						5	50	50			50	55
17 - Griffith North	360	360	1,762	2,242	4,764	15,371	2,536	4,656	1,100	1,520	10,522	24,149
18 - Griffith South	115	340		300	135	5,255	515	1,040	61	181	826	7,116
49 - Central Tablelands South	20	20	40	40	29	29	23	23	4	19	116	131
Non-commercial zone			15	35		100					15	135
Western Grey Kangaroo Total	**5,120**	**5,995**	**9,505**	**11,305**	**27,409**	**54,176**	**16,783**	**21,366**	**3,752**	**6,057**	**62,569**	**98,899**
Commercial Species Total	**107,389**	**185,721**	**135,130**	**205,070**	**349,684**	**641,233**	**189,528**	**304,012**	**67,319**	**118,426**	**849,050**	**1,454,462**
Red-necked Wallaby												
08 - Narrabri		49	45	45	55	55		35			100	184
09 - Armidale	67	67	0	25	322	342	444	524	120	150	953	1,108
10 - Coonabarabran	20	90	40	100	15	120	28	113	0	0	103	423
13 - Glen Innes	470	1,020	170	433	427	1,952	119	349		130	1,186	3,884
14 - Upper Hunter	59	59	150	150	199	274	143	143	28	50	579	676
16 - Southeast NSW	101	165	143	248	69	129	299	424	243	773	855	1,739
17 - Griffith North	50	50									50	50
48 - Central Tablelands North	180	460	142	232	277	937	340	690	209	509	1,148	2,828

	Start year of licence											
	2016		2017		2018		2019		2020			
	Number harmed										5 year total	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
49 - Central Tablelands South	130	153	50	55	0	30	2	2	2	7	184	247
Non-commercial zone	13	64	47	124	115	425	189	513	15	73	379	1,199
Red-necked Wallaby Total	**1,090**	**2,177**	**787**	**1,412**	**1,479**	**4,264**	**1,564**	**2,793**	**617**	**1,692**	**5,537**	**12,338**
Swamp Wallaby												
08 - Narrabri		50	45	45	32	32	10	45			87	172
09 - Armidale					252	252	256	256			508	508
10 - Coonabarabran					11	11	12	12			23	23
13 - Glen Innes	15	15		37	10	50	17	67			42	169
14 - Upper Hunter	37	37	135	135	16	101					188	273
16 - Southeast NSW	59	69	54	54	22	128	31	146	72	142	238	539
18 - Griffith South					17	17	32	32		10	49	59
48 - Central Tablelands North					24	194	130	170	2	42	156	406
49 - Central Tablelands South						20	30	70	0	0	30	90
Non-commercial zone	33	63	16	91	44	309	112	238	7	36	212	737
Swamp Wallaby Total	**144**	**234**	**250**	**362**	**428**	**1,114**	**630**	**1,036**	**81**	**230**	**1,533**	**2,976**
Non-commercial Species Total	**1,234**	**2,411**	**1,037**	**1,774**	**1,907**	**5,378**	**2,194**	**3,829**	**698**	**1,922**	**7,070**	**15,314**

	Start year of licence											
	2016		2017		2018		2019		2020			
	Number harmed										5 year total	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Grand Total	108,623	188,132	136,167	206,844	351,591	646,611	191,722	307,841	68,017	120,348	856,120	1,469,776