KILLING THEM SOFTLY WITH OUR SONG … NEGATIVE IMPLICATIONS AND OUTCOMES ARISING FROM THE MANAGEMENT OF DISEASE IN PERI-URBAN KOALAS.

Stephen Phillips, Kirsten Wallis, Amanda Lane & Grant Brearley

July, 2019

biolink pty ltd
ecological consultants

PO Box 3196, Uki NSW 2484
www.biolink.com.au

What is a paradigm?

In science and philosophy, a paradigm is a distinct set of concepts or thought patterns, including theories, research methods, postulates, and standards for what constitutes legitimate contributions to a field. Wikipedia

A common koala paradigm:

“*Diseases in the form of Chlamydiosis and/or KoRV collectively present a significant threat to the continued survival and viability of free-ranging koala populations in Australia*”

Some paradigm-fuelled perceptions about koala disease…

“Koalas in Australia dying from AIDS, habitat loss”
By Anna Coren, CNN
December 14, 2009 -- Updated 0723 GMT (1523 HKT)

“Koala AIDS Poses Increased Hazard to Australian Icon Already at Risk “
By Derek Henkle
June 16, 2010 08:00 PM

“Koala chlamydia: the STD threatening an Australian icon”
By Ari Daniel Shapiro PRI's The World, Brisbane

“Koala Chlamydia: One Direction Boy Band Members Fear Infection” (VIDEO)
David Moye *The Huffington Post*

These types of headlines have informed public perception of koala disease since at least the early 1980s ……….. but koalas are still here. Records accumulated by carer groups since late 1970s – 80s now offer insight into the issue by offering longitudinal data sets for analyses.

Q 1. What might optimum levels of reproductive output by female koalas at local population level say about the impacts of disease in wild koala populations?

Oestrus cycle: ~ 4 – 5 weeks
Gestation: ~ 4 – 5 weeks

and then….

Pouch life: 19 – 21 weeks.
Dependent back-young: 24 – 36 weeks.
Back young (semi - dependence): 37 – 48 weeks.

Dispersal: 51 – 88 weeks.

Source: Smith (1979); Handasyde (1986).

Sooo …

On average, female koalas produce < 1 joey /year over the term of their reproductive lives. This number approaches (but rarely exceeds) 1 in younger females, while progressively approaching (but never reaching) zero in older females.

If this is true, then in populations that are at demographic equilibrium, we might expect that the numbers of <u>adult</u> female koalas reproducing on an annual basis should approximate 50%.

Pilliga: 9/13 (69%)

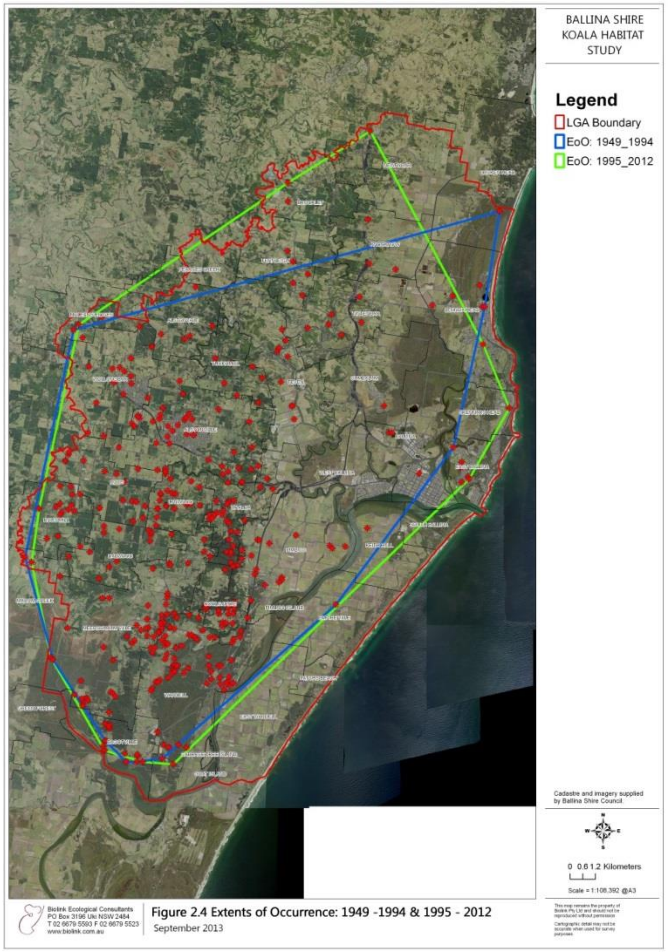
Port Macquarie: 7/12 (58%)

Gold Coast: 9/17(53%)

Ballina: 13/29 (45%)

biolink

The Ballina Koalas



<u>Size of LGA</u>: 49,200 ha
515 records 1900 - 2012

Area of Occupancy:
<u>1949 – 1994</u> (*n* = 190)
45.78% +/- 3.11% (95% CI) OAH

<u>1995 – 2012</u> (*n* = 190 rsr$_{s}$)
58.67% +/- 4.93% (95% CI) OAH

<u>Koala density</u>: 0.19 koalas/ha

<u>Population size</u>: 285 – 300 koalas in ~ 1,750 ha of Preferred Koala Habitat (PKH).

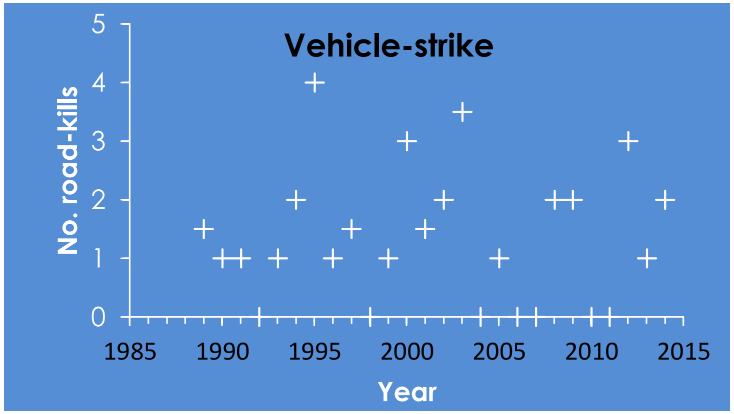
Source: Biolink (2014)

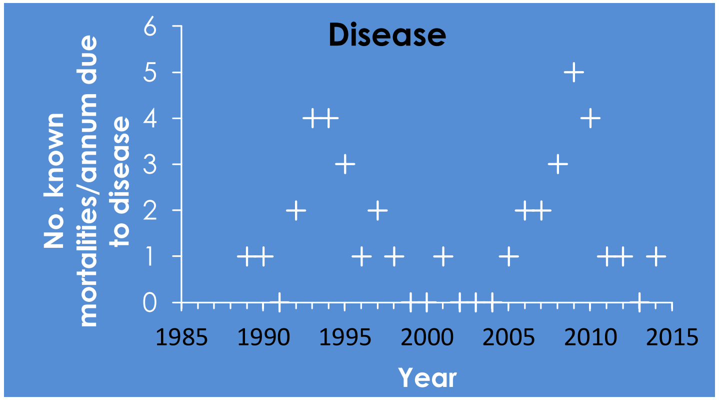
biolink

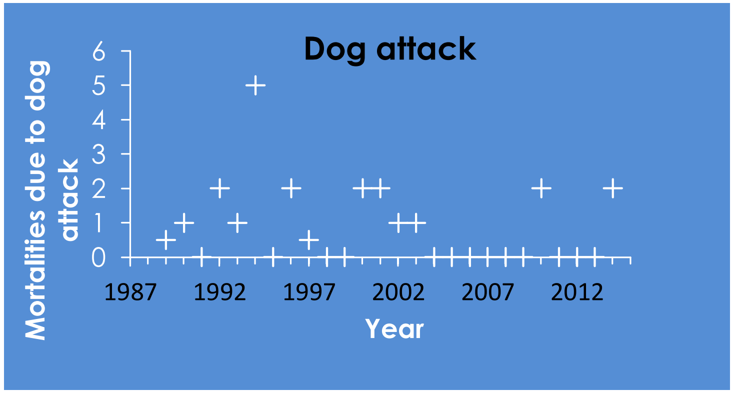
The Ballina Koalas (cont)

Breakdown of 217 koala mortalities in the Ballina LGA over time period 1989 – 2014.

In cases where cause of death was attributable to a known cause, 'disease' accounted for 36% of all known mortalities.

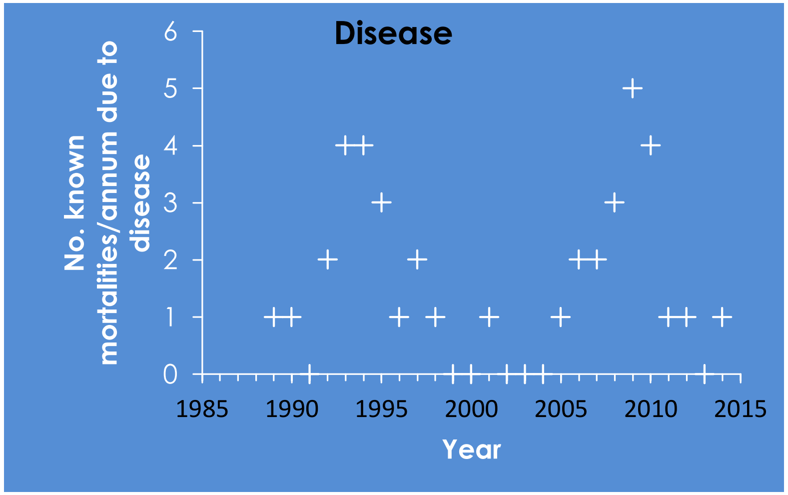


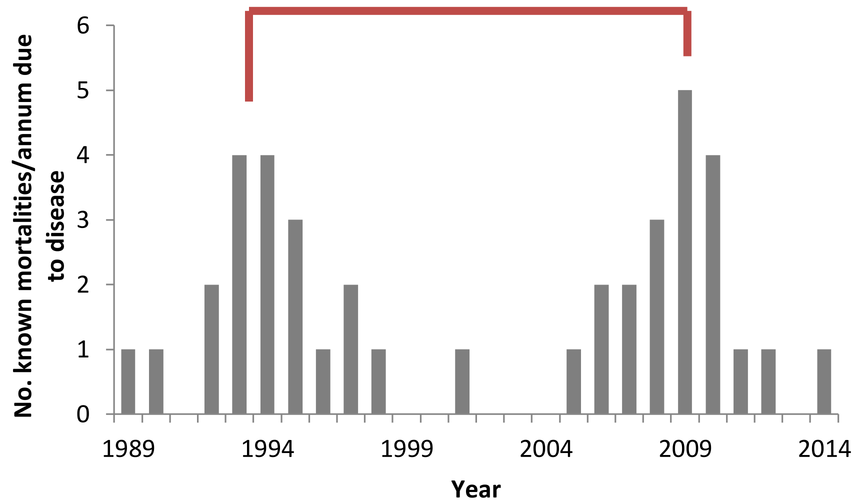




biolink

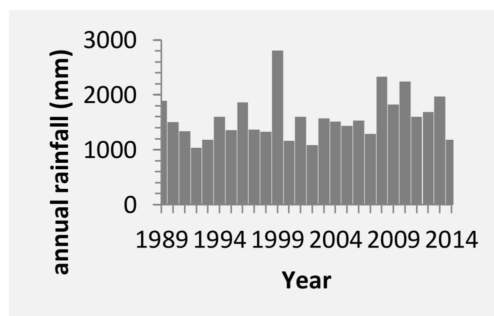
Q 2. What if mortalities due to disease ‘cycled’ in local populations over time in a way that was independent of other potential drivers?

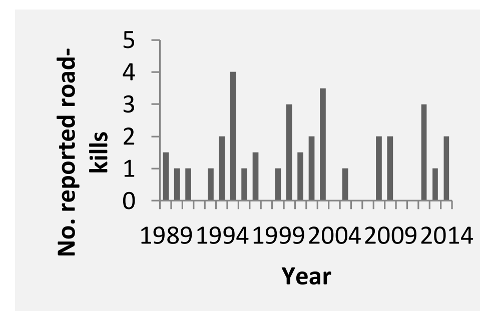




A 15-year disease mediated mortality cycle that appears to be independent of rainfall (or lack thereof) and other incidental harvesting events such as vehicle-strike.

Source: Phillips *et al* 2015.





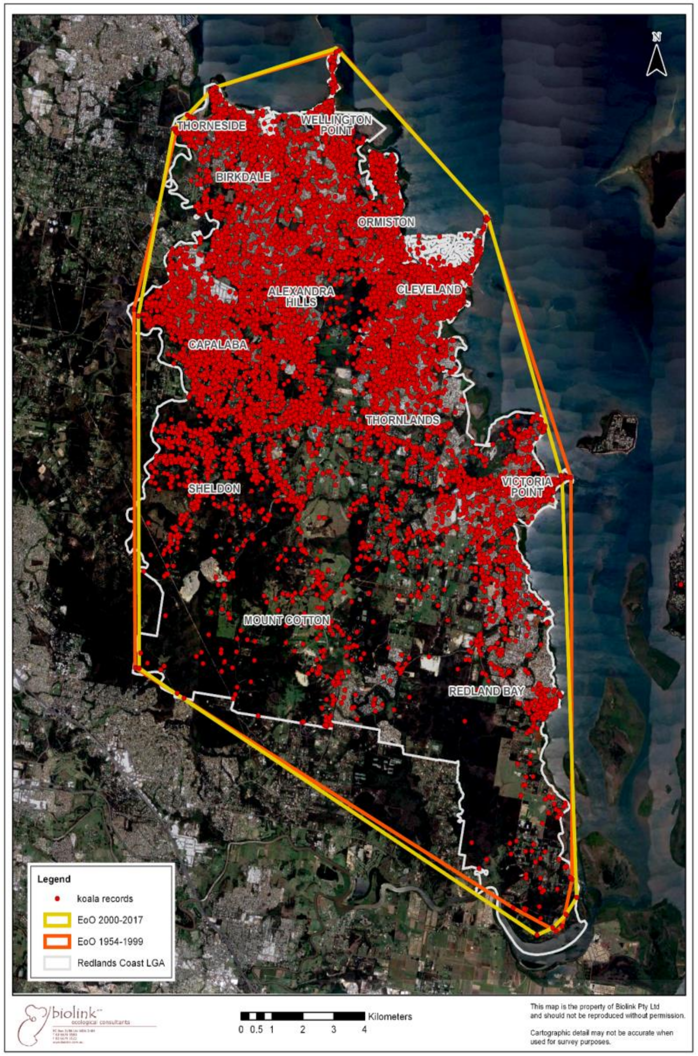
biolink

Working with paradigms

In 2015, a collective of researchers (Wilson *et al.*, 2015) argued that a strategic cull (of diseased animals) now would help the koala population begin to bounce back in the next 5 to 10 years.

Benefits
- Removal of diseased animals allows koalas without disease to occupy vacated habitat areas,
- Number of diseased koalas in population will decrease over time, and
- Reproductive potential will increase *visavi* population recovery.

The Redlands Koalas



<u>Size of LGA</u>: 52,000 ha
23,000 records 1943 - 2017

Area of Occupancy
<u>1954 – 1999</u>: 68.80% ± 0.95% (SE) (9,953 records)
<u>2000 – 2017</u>: 70.81% ± 0.72% (SE) (9,953 rsrs)

AoO (Field Survey 57 sites): 69.23% ± 14.49% (SE)

<u>Koala density</u>: 0.04 koalas / ha

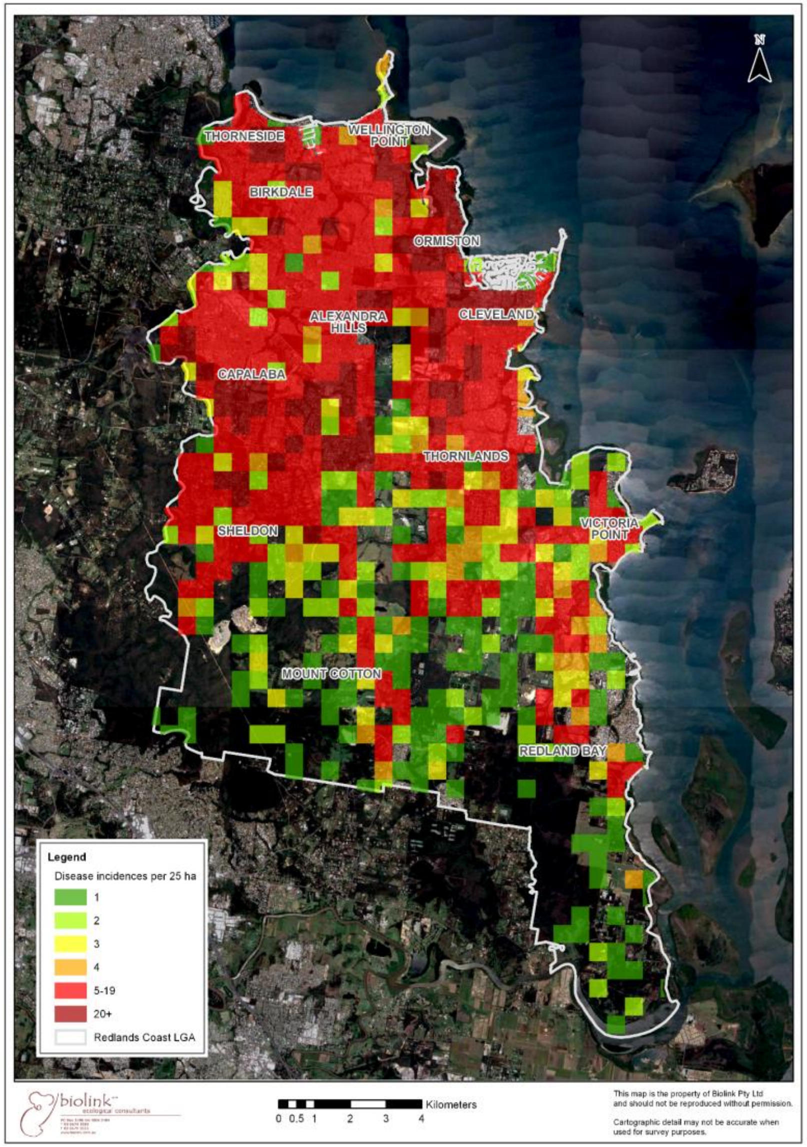
<u>Population size</u>: **334** koalas across ~ 8.5K of PKH.

Source: Biolink (2019)

The Redlands Koalas (cont)

Threat / risk assessment: 7,909 records collected over 20 year time period 1997-2017.

Reason	No. call-outs	Causes of mortality
Disease	59.60% (*n* = 4,714)	56.77% (***n* = 2,725**)
Vehicle-strike	24.97% (*n* = 1,975)	32.06% (***n* = 1,556**)
Dog Attack	8.41% (*n* = 665)	8.14% (*n* = 395)
Other / Unknown	7.02% (*n* = 555)	3.03% (*n* = 147)



The Redlands Koalas (cont)

Of the **4,714** koalas that were presented with disease **2,725** were recorded as having died.

Of koalas recorded as having died from disease, 84% (*n* = **2,292**) were the result of a decision to 'euthanase' the koala.

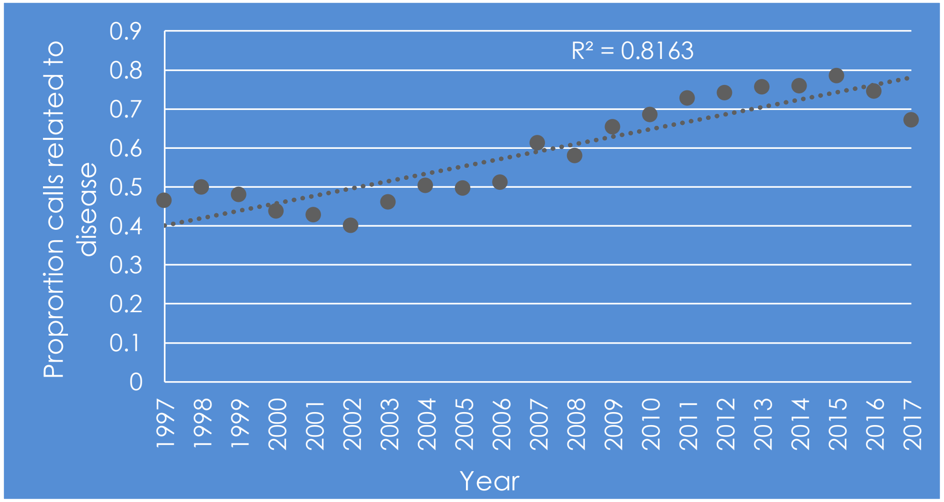
The numbers of koalas that were 'euthanased' exceeds that collectively attributable to vehicle-strike and domestic dog attack.

Given no change in the EoO or the AoO metrics, the primary driver resulting in a density reduction of koalas in the Redlands has been the removal and euthansia of animals deemed to be diseased, compounded / exacerbated by vehicle-strike.

In our view, the decision to euthanase is informed by a poorly considered decision pathway that pays little heed to ecological knowledge about koala population structure.

Consistent with results from studies on other taxa (*e.g*. Lachish *et al*. 2010; Peron, 2013), there is no evidence to indicate the removal of diseased animals from the Redlands population over a 20 year period has had any positive effect. To the contrary …

Year to year proportions of total koala call-outs that relate to 'diseased' koalas in the Redlands.



biolink

Moreover, a poorly informed euthanasia decision path ….

- imposes an unnecessary and dangerous selection pressure on a dynamic immunological relationship that only becomes dysfunctional in the presence of anthropogenic disturbance,

- results in the loss of koalas from the broader population and so has the potential to facilitate a) social dissolution and associated stressors, b) a further diminishment of reproductive output and c) ongoing population decline (see also Tuyttens *et al*. 2000 and McDonald *et al*. 2008), and

- results in the loss of alleles / genetic diversity that may impart hitherto unknown benefits to the population as a whole (McAlpine *et al*., 2017).

Its time for some new paradigms

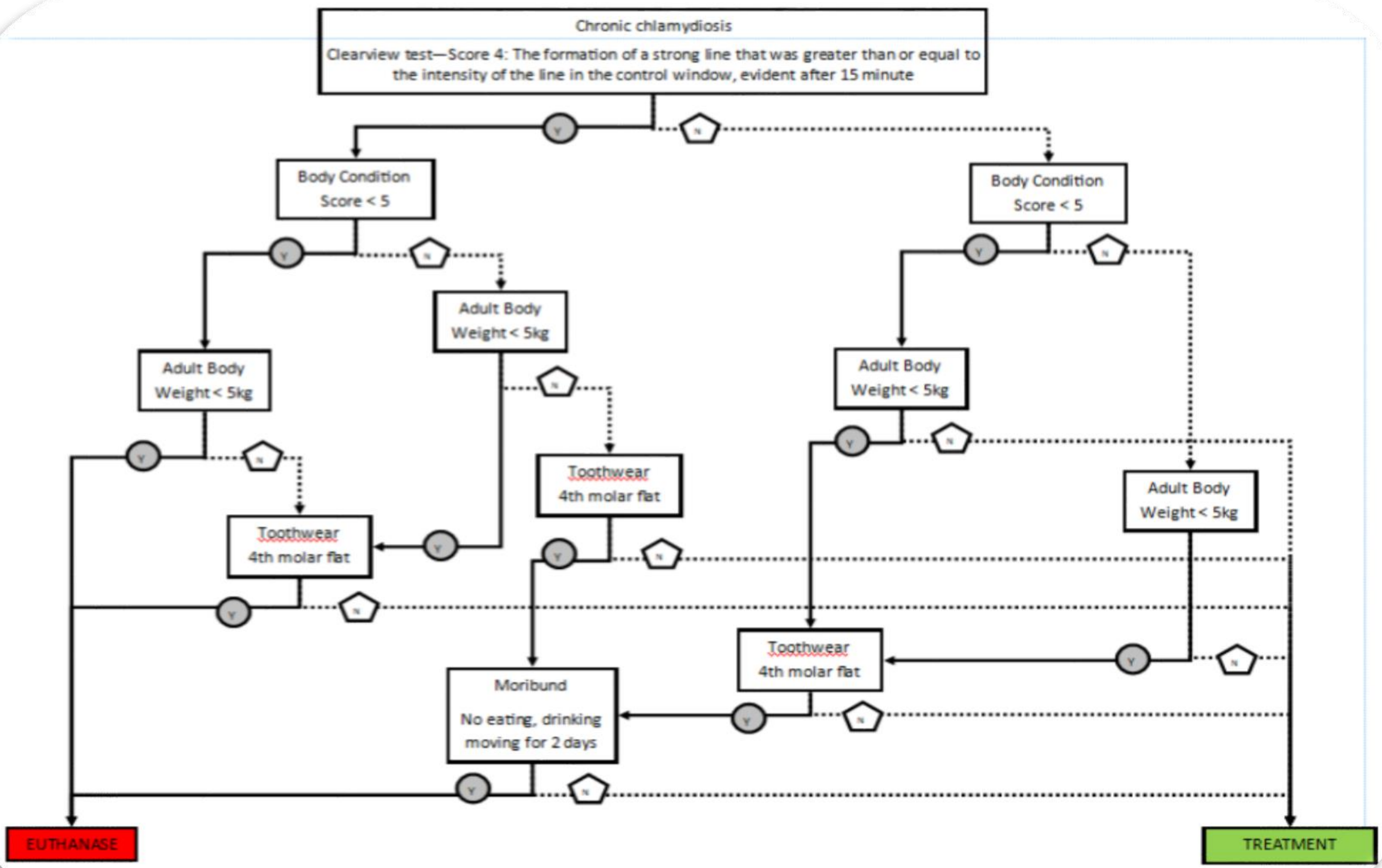
If there is an inherent capacity for koalas to maintain optimum population parameters in the presence of disease, then

Koala populations are capable of growth and/or recovery in the face of what we may perceive to be a chronic disease burden.

There is little justification for working to improve koala reproductive output in the interests of assisting recovery if we haven't addressed the real factors driving decline in the first instance.

Human activity is the catalyst, disturbance is the key variable, but killing koalas deemed to be diseased by a poorly informed decision path is not the answer ….. .

Towards some new lyrics / an informed euthanasia pathway (*It's a start, if you open up your heart..*)



Acknowledgments

Friends of the Koala, CoLS, Ballina Shire Council, NSW Roads & Maritime Services, NSW OEH (Save our Species), City of Redlands Council, Jade Krause, Linda Ambrose, Paul O'Callaghan.

References

Biolink (2013). *Ballina Shire Koala Habitat and Population Assessment*. Final Report to Ballina Shire Council.

Biolink (2019). Redlands Coast Koala Population and Habitat Assessment. Final Report to Redlands City Council.

Handasyde, K. A. (1986). Factors affecting reproduction in the female koala (*Phascolarctos cinereus*). PhD Thesis. Monash University.

Lachish, S., McCallum, H., Mann, D., Pukk, C. E. and Jones, M. E., (2010). Evaluation of Selective Culling of Infected Individuals to Control Tasmanian Devil Facial Tumour Disease. *Conservation Biology*, **24 (3)**, 841-851.

McAlpine, C., Brearley, G., Rhodes, J., Bradley, A. Baxter, G., Seabrook, L., Lunney, D., Liu, Y., Cottin, M., Smith, A.G., Timms, P. 2017. Time-delayed influence of urban landscape change on the susceptibility of koalas to chlamydiosis. *Landscape Ecology* **32,** 663-679.

McDonald, R. A., Delahay, R. J., Carter, S. P., Smith, G. C. and Cheeseman, C. L. (2008). Perturbing implications of disease control for wildlife ecology. *Trends in Ecology and Evolution*. **23 (2),** 53-56.

Peron, G. (2013). Compensation and additivity of anthropogenic mortality: life history effects and review of methods. *Journal of Animal Ecology* **82**, 408 – 417.

Phillips , S., Brearley, G., and Callaghan, J. *(*2015). *Koala Population Survey – Woolgoolga to Ballina Pacific Highway Upgrade Section 10 (Wardell to Coolgardie).* Final Report to NSW Roads & Maritime Services.

Smith, M. T. A. (1979). Notes on reproduction and growth in the koala *Phascolarctos cinereus* (Goldfuss). *Australian Wildlife Research* **6,** 5 – 12.

Tuyttens, F. A. M., MacDonald, D. W., Rogers, L. M., Cheeseman, C. L. and Roddam, A, W. (2000). Comparative study on the consequences of culling badgers (*Meles meles*) on biometrics, population dynamics and movement. *Journal of Animal Ecology*, **69**, 5677-580.

Wilson, D. P., Craig, A. P., Hanger, J., and Timms, P. (*2015*). The paradox of euthanizing koalas (*Phascolarctos cinereus*) to save populations from elimination. *Journal of Wildlife Diseases* 51(4), 833-842.