

WEIGHING INEQUALITY IN A LESS NATURAL WORLD



The decline of nature is often equated to a loss of species, but what about the loss of biomass? Ecologist **John Woinarski** measures a growing disparity.

What is a fair allocation of the world's resources to nature? 60%? 30%? 3%?

One partial way of assessing the current allocation of resources is to compare the 'biomass' of different species (the number of individuals multiplied by their average weight over a given area). By this measure, nature's share of global resources has shrunk dramatically. Wild mammals, for example, now account for only about 3% of the total biomass of land mammals, while humans make up about one-third and domesticated mammals about two-thirds of the total. These confronting figures come from a 2011 analysis by Vaclac Smil.

Tracking changes in the relative composition of biomass over time, Smil concluded that the global biomass of wild vertebrates is 'now vanishingly small' compared to that of domestic animals, with this disparity widening sharply over the past century. From 1900 to 2000, the biomass of the world's mammals tripled, but that of wild land mammals halved. And whereas the biomass of humans in 1900 was about the same as that of all wild mammals, now it is 10 times greater.

But what of Australia? Although we have lost many species, there are still vast expanses of seemingly natural landscapes populated by native wildlife, and human populations are low by global standards.

The 'natural' in Australia

What is natural, and how has it changed? These are difficult questions to answer for Australia, where tens of thousands of years of Indigenous management has greatly influenced natural environments and the species they support. It is hard (and perhaps futile) to set ecological benchmarks based on an unmodified state of nature.

Even the state of nature just before Europeans arrived is hard to define, for the transformation since 1788 has been so rapid and extreme we remain largely ignorant of its extent. Recent studies reveal greater changes than previously realised. Startling evidence has come from subfossil deposits, mostly of bone fragments disgorged by owls at their roosts over hundreds or thousands of years. Within the past decade, we have learned ▶

CHANGES IN THE GLOBAL BIOMASS OF LAND MAMMALS OVER THE 20TH CENTURY

| | Humans | Wild mammals | Domesticated mammals | Total mammal biomass |
|------|-----------------|-----------------|----------------------|----------------------|
| 1900 | 13 tonnes (22%) | 10 tonnes (17%) | 35 tonnes (60%) | 58 tonnes |
| 2000 | 55 tonnes (31%) | 5 tonnes (3%) | 120 tonnes (67%) | 180 tonnes |

Biomass is measured here as dry weight (million tonnes of carbon). The figures come from Smil 2011 (see reference in Reading).

CATTLE:
2 million;
840,000 tonnes.

(excluding feral cattle)

Photo: Geoff Walan



FERAL HORSES:
300,000; 105,000
tonnes.

Photo: Michael J Barritt



FERAL PIGS:
750,000; 41,000 tonnes.

Photo: Michael J Barritt



FERAL DONKEYS:
150,000; 30,000 tonnes.

Photo: Julie Burgher



HUMANS: 245,000;
12,250 tonnes.

Photo: Tim Walker



**SALTWATER
CROCODILES:** 100,000;
12,000 tonnes.

Photo: Michael J Barritt



MAGPIE GEESE:
2 million; 4800 tonnes.

Photo: Richard Sneath



FERAL CATS:
1 MILLION; 3500
tonnes.

Photo: Julie Burgher





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FERAL CAMELS:
180,000; 81,000 tonnes
Michael J Barritt



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FERAL WATER BUFFALOS: 100,000; 55,000 tonnes.
Photo: Michael J Barritt



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RED KANGAROOS:
500,000; 19,000 tonnes.
Photo: Tim Rudman



●

AGILE WALLABIES:
982,000; 14,730 tonnes.
Photo: Craig Nieminski



●

CANE TOADS:
92 million; 9200 tonnes.
Photo: Michael J Barritt



●

BARRAMUNDI:
6500 tonnes.
Photo: Aldo van Zeeland



●

LITTLE RED FLYING-FOXES:
2 million; 900 tonnes.
Photo: Lisa Ridings



●

SINGING BUSHLARKS:
6 million; 120 tonnes.
Photo: rawshorty

Population sizes and total biomass in the Northern Territory for some of the most abundant native wildlife (green) and non-native animals (orange). The relative biomasses are represented by the circle. The values come from Woinarski (2014), with some modifications to better reflect average body weight, or due to management actions or other factors that have changed population size. Many of these estimates are inevitably imprecise, but represent the best available information.



Although there are fewer camels than red kangaroos in the Northern Territory, the camel biomass is about four times greater. Photo: Rune Johnsson

The native animal with largest biomass, the red kangaroo, has only about 2% of the biomass of cattle.

from such deposits that three previously unknown rodent species went extinct in the Kimberley (until recently thought to have an intact mammal fauna) and another in Queensland. Deposits on South Australia's Fleurieu Peninsula have revealed more mammal species occupied the area than was realised, and almost half rather than a third have been lost. Owl deposits in Gippsland tell the same story – species losses soon after colonisation in southeast Australia were much greater than realised (see *Wildlife Australia* Spring 2015).

The consequences of these losses are probably also greater than realised, for many of the lost species served important ecological functions. Recent studies show that losses of native burrowing mammals, for example, may be contributing to our continent's now far more destructive fire regimes. By increasing the breakdown of leaf litter, their extensive diggings once reduced the risk of fire ignition and fire spread (a service not replaced by rabbits).

Weighty changes

In a paper called *The illusion of nature* I recently tried to quantify the 'naturalness' of an Australian landscape that still seems largely natural – the Northern Territory – by comparing the biomasses of some common native wildlife, introduced animals, livestock and humans. Biomass provides some measure of the ecological importance of a species: roughly, the greater their biomass the greater is their impact on an environment.

My initial expectation – that the Northern Territory is still dominated by native wildlife – was dashed. Instead, introduced species make up by far the bulk of the biomass. The six species that contribute the most are all non-native. The native animal with largest biomass, the red kangaroo, has only about 2% of the biomass of cattle, which has the largest biomass of all. Because my calculations did not include feral cattle, the actual cattle biomass would be substantially higher than the value given here. 'Nature' is now in a minority even in some of Australia's most extensive natural landscapes, and introduced species now dictate much of the ecology.

There are some caveats to these calculations. There are surprisingly few reliable population estimates for Australia's wildlife species, so I couldn't be comprehensive. But those shown here comprise most of the common or large vertebrates in the Northern Territory, so the dominance by introduced species would not be much affected by including more native species.

A more serious bias is that invertebrates are ignored, because there is even less information about them. Their biomass (and ecological influence) probably greatly exceeds that of vertebrates, and most of it is likely to be of native species. One

of the few available estimates – of 2-2.5

grams of termites per square metre in a mulga woodland near Alice Springs – implies a total termite biomass in the Northern Territory of more than 6 million tonnes, which far exceeds the biomass of cattle.

Invertebrates aside, the dominance of introduced vertebrate species is likely to be even greater elsewhere in Australia, for people and livestock are more populous in other states. As far as I am aware, biomass has not been assessed for any state or the entire continent.

Saving native biomass

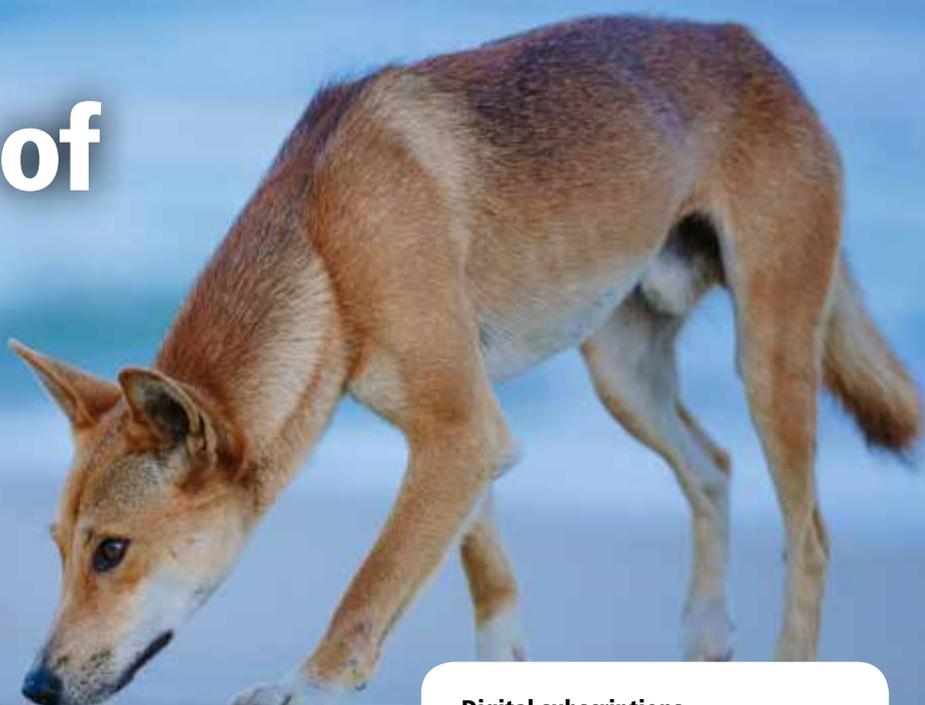
These biomass figures should make us take stock. With human populations and consumption rates surging, there seems to be an unstoppable momentum for the diminution of nature, in diversity and biomass. I see nothing reasonable about the fact that wild mammals now comprise just 3% of the world's land mammal biomass, or that livestock and feral animals make up the vast majority of vertebrate biomass in Australia. Ultimately, this is unlikely to be in our species' interest. As well as saving nature's diversity, we need to restore some balance in the weight of nature relative to that due to and for humans. ■

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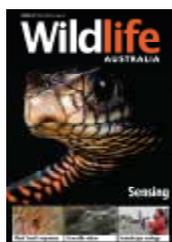
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