

# **Yes - There Are Kangaroos that Live in Trees !**

The Tree-Kangaroo and Mammal Group's Tree-kangaroo Fact-File

## **Discovery**

The Lumholtz's tree-kangaroo is named after the Norwegian naturalist-explorer, Dr Carl Lumholtz, who obtained a number of animals during several months spent in the rocky districts of the Herbert River in 1882. It was recorded at the time that Aboriginal people who were very familiar with the tree-kangaroo called it "Boongarry". Although it is also known as "Mabi" or "Muppie" by the Ngadjon-Jii people of the larger Malanda area (Atherton Tableland). It is the totem of one of the elders and therefore enjoys special protection among the local population. The following largely focuses just on this species.

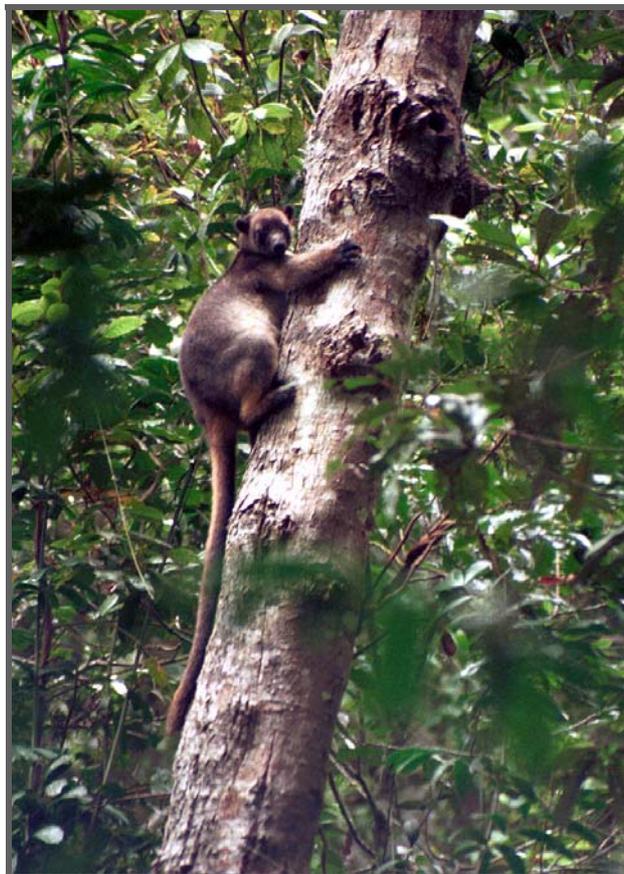


Photo: B Stirn

## Taxonomy – Evolution

Not only sharing its habitat with possums, but also its distant ancestry the Lumholtz's tree-kangaroo belongs - like all kangaroos and possums - to the marsupial order of *Diprotodontia* - they all have only two(*di*-) incisors that are protruding(*-proto*-) teeth(*-dontia*) at the front of their lower jaw.

Further down the taxonomic level, tree-kangaroos, being proper macro-(big) -pods(foot), i.e. kangaroos, are therefore placed in the family *Macropodidae*. Therein the latin term for the tree-kangaroo genus is *Dendrolagus*, meaning tree-(*dendro*) -hare(*lagus*). In tandem with the genus name the scientific species name in the Lumholtz's case is: *Dendrolagus lumholtzi*.

Kangaroos started to evolve from possum-like ancestors that lived in the trees (i.e. were arboreal) about 50 million years ago. Evidence for this ancestry is still present in the most primitive kangaroo, the Musky rat-kangaroo. Although ground-dwelling its hind foot still features a 'thumb-like' toe, resembling that of a possum's foot and lacking in all other kangaroos.

Tree-kangaroos supposedly evolved from kangaroos that led a terrestrial (living on the ground) lifestyle. As to why they "re"-turned to arboreality (life in the trees) no-one knows. Recent DNA research suggests a closer relationship of tree-kangaroos with rock-wallabies (genus *Petrogale*) than with any other macropods and therefore they are conceived as sister groups within the macropods. This and the rock-wallabies' capability to master rocky terrain and even small leaning trees might present a hint towards a relatively early split of a tree-kangaroo/rock-wallaby ancestor from the main kangaroo lineage. It seems that the modern ground-dwelling kangaroos (genus *Macropus*) started to diversify into the present suite of species only after the tree-kangaroo/rock-wallaby line had branched out to evolve their own characteristics about 25 million years ago. The ancestor of the tree-kangaroo genus is thought to have emerged about 7.5 million years ago and over the last 7 million years the tree-kangaroos radiated into the present day set of species.

There is one other species of tree-kangaroo in Australia, the Bennett's tree-kangaroo (*Dendrolagus bennettianus*) and at least 8 other species in New Guinea. Because of their comparatively long feet (and backed by most recent DNA research) the two Australian species, together with the Grizzled tree-kangaroo (*Dendrolagus inustus*), are seen as more basal (primitive) than the rest of the genus.

## **Distribution – Habitat**

Both Australian species are listed as 'rare' under Queensland's Nature Conservation Act. Both live in the rainforests of the Wet Tropics bioregion of North Queensland, Bennett's from about Cooktown south to the Daintree River, including the Mt Windsor Tableland, and Lumholtz's from the Daintree River south to the Herbert River gorge. They may overlap with each other on the Mt Carbine Tableland inland of Mossman.

Bennett's Tree-kangaroo can be found on the coastal lowlands as well as the ranges, and extends along riparian strips into drier eucalypt forest.

Despite being recorded to have been common in lowland rainforests prior to large-scale clearing of its lowland habitat the Lumholtz's tree-kangaroo is rarely seen below 300m altitude and its highest densities now occur in complex rainforest on basalt soils of the Atherton Tablelands (750m-1100m). Nevertheless there are populations in the tableland's less complex rainforests on poorer soils as well as in wet sclerophyll forests (i.e. eucalypt forests – still relatively wet, but drier than rainforest and with a rainforest understorey) on the western fringe of the Wet Tropics bioregion and in riparian vegetation (rainforest species) along watercourses throughout the region.

## **Physical Characteristics**

Tree-kangaroos feature some distinct body characteristics which enable them to live in trees, unlike their ground-dwelling kangaroo cousins. These include: their exceptionally long, pendulous tail facilitating balance; stronger forelimbs, shorter and broader hind feet, longer, curved claws on feet/paws and spongy soles/'palms'- all features that help with balancing and gripping and therefore climbing.

The teeth are adapted for 'shearing' leaves rather than 'grinding' grass. Tree-kangaroos are medium-(to large)-sized mammals with females featuring a forward-opening pouch (marsupium) containing four teats - a 'secondary womb' for young, that are being born as foetuses, completing their development there. The Bennett's tree-kangaroo is one of the largest tree-kangaroo species, whereas the Lumholtz's is one of – if not the smallest.

The Lumholtz's tree-kangaroo's face, head, back of ears, neck, shoulders, upper back, upper forepaws, upper hindfeet, under-surface and terminal third of the tail are blackish-brown. The lower back is sprinkled with lighter coloured fur. They have a 'sweat-band' of lighter, yellowish-grey fur across the forehead, down the cheeks and on the throat. The ears are short and rounded. The under-surface of body, inside of legs and outside of lower legs is also yellowish-grey. Sometimes there is a bare patch at the base of tail where the animal sits on. Juveniles and sub-adults have a pronounced tuft on the tail. Males seasonally have an orange flush of colour (varies greatly between individuals) on the belly, inside and outside the lower half of the thighs.  
(paragraph reproduced and modified with permission from Johnson, P., 2003. Kangaroos of Queensland.)

Bennett's is distinguished from Lumholtz's by the lack of contrasting pale forehead and tail markings. The area of distribution-overlap between the two species (Black Mountain Corridor area) is apparently very small, though and only very few people ever saw the two species at the one occasion.

## **Tips for Tree-kangaroo Spotting**

You will be looking for something the size of a basketball, if it is high in a tree, or of a small dog, if you can see it more closely. Often it is the long pendulous tail that is first sighted in the canopy of a tree.

They are extremely hard to spot. Even the people researching them have a hard time actually seeing them - despite that they have radio collars on their study animals and know fairly exactly where they are.

Looking straight up into the trees is no good! Try looking as horizontal as possible into the canopy, possibly from sloping terrain. Drizzle weather is good tree-kangaroo spotting weather. They come out to the edges or on branches that stick out of the denser foliage to catch the wind-drying-effect - not so in more substantial rain, though. A good time is late afternoon to early evening, because the females then leave their fixed day spots and start moving around. One can try spotlighting, too - the tree-kangaroo's eyeshine is not as bright as the possum's, but still reasonably stands out from the background in a dull ruby red. Don't approach the animals too close at night as they are much more skittish than during the day and will readily jump off the trunk/branch and take off.

## **Nutrition**

All kangaroos and wallabies are foregut fermenters (i.e. they break down their food in the first part of the stomach), but notably the tree-kangaroos are the only marsupial arboreal folivores (browsers) that ferment their browse in the foregut. They don't feed on Eucalyptus foliage, which is high in certain toxic compounds and can only be utilised by hindgut fermenters, e.g. possums and the Koala.

The Lumholtz's tree-kangaroo is primarily a leaf eater, but also occasionally consumes fruits and flowers from quite a wide variety of native rainforest trees. It is also known to feed on the leaves of wild tobacco and lantana, both invasive weeds.

## **Activity**

Latest research has found that the Lumholtz's tree-kangaroo's activity pattern is not purely nocturnal as previously thought, but 'cathemeral', meaning 'intermittently active throughout the 24h period'. During the relatively brief sleeping bouts of almost up to an hour the animal's head simply sinks on the chest or even down in between the feet – like in the group's logo - , depending on the animal's position on a branch, in a fork, a vine tangle or sometimes even on top of tree-ferns. The Lumholtz's tree-kangaroo does not use tree hollows or builds nests for sleeping. One hypothesis suggests that, as a result of its low-energy diet, the need to feed pretty much continuously prevents them from more extensive, uninterrupted sleeping.

## **Locomotion**

Living arboreally (in the trees), it is a good 'tree climber' (also another local term for the animals) with very sharp, strong claws, powerful forelimbs and a mixed quadrupedal/bipedal (four-limb/two-limb) locomotion. Capable of moving its hindfeet independently, i.e. walking, tree-kangaroos are the only kangaroos that can move backwards – essential to get around in a dense, three-dimensional habitat. It uses its long, but not prehensile ('gripping') tail as a counterbalance – maybe the reason for its length, given the considerable weight of the animal. It can not curl its tail around branches (like some possums do) and descends from trees in a sliding fashion, tail first and then jumps off the trunk, sometimes already from up to 10m!

On the ground the primary locomotion is a bipedal hop or walk for fast and slow movement respectively. Very short distances can also be mastered quadrupedally.

## **Home range**

The area a Lumholtz's tree-kangaroo lives in is not called a territory, but a home range, because territories in biological terms are areas that are actively defended/patrolled, which this species does not do. The notion that the home ranges of Lumholtz's tree-kangaroos are maintained primarily by scent marking rather than by sheer physical presence seems to be true at least for females. Adult males might confront migrating subadult males when encountered while crossing the resident's home range. In regrowth rainforest fragments male home ranges are reported to average between approximately 2ha in size, whereas a female occupies around 0.7ha of habitat. Female home ranges are always and almost completely located within the resident male's home range, but exclusive (non-overlapping) of other female's (although mothers and daughters might share parts of their respective home range, if the daughter didn't disperse during maturation).

## **Social Structure**

Lumholtz's tree-kangaroos appear to live in 'relatively loose' reproductive units of 3 to 5 adult individuals, consisting of one resident male and several females. These units are aptly being labelled 'harems'. Notwithstanding subadult and at-foot offspring live amongst the adults. In regard to their respective adult same-sex peers, both sexes maintain exclusive home ranges (a bit less than 1ha for females and about 2ha for males). However, the male home range overlaps with those of all females of the harem. Being intolerant of individuals of the same sex results in a relatively solitary lifestyle. Nevertheless, on average a resident male visits each of 'his females' home range every 3<sup>rd</sup> to 4<sup>th</sup> day, coming relatively close to the female (approximately within 20-30m), but rarely closes in to more direct contact (in touch or within 10m). The only continued close-contact social interactions appear to be courtship prior to mating, mating itself and mother-offspring interactions. If two similar-sized animals are seen together, most likely it is a female and its last year's offspring at foot. On occasions though, it might be adult male and female, but almost certainly never adult same sex pairs. In the case of three animals present, very likely it would be a mother with this year's and last year's offspring. Notably, close encounters - and even touch-contact - between resident adult males and male offspring have not been observed to be aggressive.

## **Reproduction**

Marsupials have a unique method of reproduction in which the young is born in a very undeveloped state. It is then suckled, usually in a pouch, which it vacates gradually as it develops and becomes more independent in feeding and moving. It finally reaches adulthood only after having permanently vacated the pouch.

In their reproductive mode, tree-kangaroos are quite extreme as far as marsupials are concerned. They display one of the longest marsupial offspring development/maturation periods and, if compared with similar-sized marsupials, they have the longest.

Not much is known about their reproduction in the wild. The only published data is from captive animals at QPWS facilities at Cape Pallarenda, north of Townsville. However, very recent field research (yet unpublished) aims to shed some more light on things in the wild and personal communication thereof is in parts presented below.

It is not known for sure if they mate and give birth only at certain times of the year, i.e. if they have a seasonal reproductive pattern. At least in captivity they show a kind of seasonality, as most young are born during the wet season. Recent research from the wild suggests a similar pattern. In addition there are records from wildlife carers of orphaned young that must have been born at different times of the year. In concordance with the ecological paradigm of arboreal folivores having a low overall reproductive potential, Lumholtz's tree-kangaroos have been found to produce about one young per year.

The fertile period of female tree-kangaroos (oestrous) in general is estimated to be about 2 months (approximately a bit less than 60 days). In captive Lumholtz's tree-kangaroos the oestrus cycle ranged from 47 to 64 days.

Provided a female is fertile, mating in captive Lumholtz's tree-kangaroos takes place over at least 2 days in repeated, brief episodes of approximately 20 minutes and is fairly violent from the male's side. If mating is successful the female becomes pregnant. Pregnancy (with animals it is called gestation) takes about 45 days in captive Lumholtz's tree-kangaroos. Embryonic diapause (i.e. suspended embryonic development during adverse environmental conditions, a common feature in macropods) has not been observed in captive Lumholtz's tree-kangaroos.

Ending gestation, one young (weighing only a few grams) is born and it takes the foetus less than 5 minutes to crawl just with its forelimbs (hind limbs are just beginning to develop) to the pouch entrance. In the pouch it (permanently) attaches to a teat and continues to develop for about 3 months.

At 3 months old, weighing about 100 grams, hair starts to grow, and at 4 months of age they open the eyes. First emerging from – but not leaving – the pouch at about 5 months old, they then gradually cease returning to the pouch from foraging over the next 3 to 4 months. In captivity they vacated the pouch permanently aged about 8-9 months. At this point a considerable growth 'explosion' was observed until the offspring was weaned at an age of about 13 months. From recent research in the wild it is estimated that they accompany the mother for another year (subadult males might stay in the mother's home range even for up to yet another year) before they start to find their own area to live and reproduce, i.e. disperse.

## **Threats - Predation**

There are three major threats to Lumholtz's tree-kangaroos: habitat degradation and habitat loss; cars and dogs, and natural predation.

Only 12% of the Lumholtz's tree-kangaroo habitat is in protected areas, i.e. national parks. The highest densities of Lumholtz's tree-kangaroos though occur on the Atherton Tablelands, mostly on private land where their habitat is prone to alteration, fragmentation or destruction for commercial purposes, such as agriculture, dairy farming and logging for timber.

Although they appear to live quite happily in small isolated patches of rainforest and in riparian strips of vegetation along watercourses, populations are not able to sustain themselves in these kinds of habitats because the actual numbers are too low to maintain genetic health. They need regular influx from stable core populations, such as those at Curtain Fig Forest, the Malanda Scrub and the Crater (Mt. Hypipamee) NP. In order to travel to new areas to live, predominantly young males in their dispersal phase have to cross open ground or roads, where they frequently get killed by dogs and cars.

If frightened they just 'freeze' and blend in with their surroundings unrecognisably, which characterises their main predator avoidance behaviour. When even more distressed they vocalise with a "fft-fft-fft" sound and/or leap off a tree (from as high as 15m) and take flight on the ground. This might be a good strategy to escape their natural predators such owls, eagles and pythons, but on the ground they have no chance against dogs or dingoes.

As a result of a TKMG community survey in 2000 we received reports of more than 300 dead tree-kangaroos over the last 15 years. 75% of dead tree-kangaroos were road kills and about 10% were dog kills. The actual numbers almost certainly are much higher. One of the causes of those deaths is the lack of appropriate dog control on the Atherton Tablelands.

Activities of the TKMG like the introduction of tree-kangaroo road signage in high tree-kangaroo roadkill areas, the promotion and implementation of wildlife tunnels in road upgrades as well as revegetation initiatives and wildlife corridor plantings aim to alleviate the pressures on this unique species.

November 2004 by Lars Kazmeier for The Tree-Kangaroo and Mammal Group Inc.  
For corrections, additions, etc.: Contact Lars Kazmeier: [lakaz@austarnet.com.au](mailto:lakaz@austarnet.com.au))



[www.tree-kangaroo.net](http://www.tree-kangaroo.net)

Notes:

## List of Sources

Bowyer, J.C., Newell, G.R., Eldridge, M.B.D., 2002. *Genetic effects of habitat contraction on Lumholtz's Tree-kangaroo (Dendrolagus lumholtzi) in the Australian Wet Tropics*. Conservation Genetics **3**, 61-69

Bowyer, J.C., Newell, G.R., Metcalfe, C.J., Eldridge, M.B.D., 2003. *Tree-kangaroos in Australia: are D. lumholtzi and D. bennettianus sister taxa?* Australian Zoologist **Vol 32 (2)**, 207-213.

Fisher, D.O., Owens, I.P.F., 2000. *Female home range size and the evolution of social organization in macropod marsupials*. Journal of Animal Ecology **69**, 1083-1098.

Fisher, D.O., Owens, I.P.F., Johnson C.N., 2001. *The Ecological Basis of Life History Variation in Marsupials*. Ecology **82 (12)**, 3531-3540.

Flannery, T. F., Martin, R. and Szalay, A. 1996. *Tree-kangaroos: A Curious Natural History*. Reed, Melbourne.

Goosem, S. and Tucker, N. 1995. *Repairing the Rainforest: Theory and Practice of Rainforest Re-establishment in North Queensland's Wet Tropics*. Cassowary Publications, Wet Tropics Management Authority.

Johnson, P.M. 2003. *Kangaroos of Queensland*. A Queensland Museum Guide, Queensland Museum, Brisbane.

Johnson, P.M. & Delean, J.S.C. (2003). *Reproduction of the Lumholtz's Tree-kangaroo, Dendrolagus lumholtzi (Marsupialia: Macropodidae), in captivity, with age estimation and development of the pouch young*. Wildlife Research **30**, 505-512.

Kanowski, J.J. 1999. *Ecological determinants of the distribution and abundance of the folivorous marsupials endemic to the rainforests of the Atherton Uplands, north Queensland*. Ph.D. Thesis, James Cook University, Townsville.

Kanowski, J.J., Hopkins, M.S., Marsh, H. and Winter J.W. 2000. *Ecological correlates of folivore abundance in north Queensland rainforests*. Wildlife Research **28, Vol 1**, 1-8

Kazmeier, L., 1998. *Den Use of Three Sympatric Possum Species in a Tropical Australian Rainforest*. Diploma-Thesis, Friedrich-Alexander University, Erlangen-Nuernberg, Germany.

Laurance, S. G. 1996. *The Utilisation of Linear Rainforest Remnants by Arboreal Marsupials in North Queensland*. MSc Thesis, University of New England, Armidale.

Laurance, W. F. 1990. *Comparative responses of five arboreal marsupials to tropical forest fragmentation*. Journal of Mammalogy **71**: 641-653.

Laurance, W. F. and Bierregaard, R. O. 1997. *Tropical Forest Remnants*. University of Chicago Press, Chicago.

Lumholtz, C.S., 1889. *Among Cannibals: An Account of Four Years Travels in Australia, and of Camp Life with the Aborigines of Queensland*. John Murray, London

Martin, R. W. 1992. *An Ecological Study of Bennett's Tree-kangaroo (Dendrolagus bennettianus)*. World Wide Fund for Nature. Project 116.

Martin, R.W., 1995. *Field observations of predation on Bennett's Tree-kangaroo (Dendrolagus bennettianus) by an Amethystine python (Morelia amethystina)*. Herpetological Review 26, 74-76

Newell, G. R. 1998. *Lumholtz's Tree-kangaroo*. Nature Australia **25**: 31-39.

Newell, G. R. 1999a. *Australia's tree-kangaroos: current issues in their conservation*. Biological Conservation **87**: 1-12.

Newell, G. R. 1999b. *Home range and habitat use by Lumholtz's Tree-kangaroo (Dendrolagus lumholtzi) within a rainforest fragment in north Queensland*. Wildlife Research **26**: 129-145.

Newell, G. R. 1999c. *Responses of Lumholtz's Tree-kangaroo (Dendrolagus lumholtzi) to loss of habitat within a tropical rainforest fragment*. Biological Conservation **91**: 181-189.

Pahl, L. I., Winter, J. W. and Heinsohn, G. 1988. *Variation in responses of arboreal marsupials to fragmentation of tropical rainforest in north eastern Australia*. Biological Conservation **46**: 71-82.

Procter-Gray, E. 1985. *The Behaviour and Ecology of Lumholtz's Tree-kangaroo, Dendrolagus lumholtzi (Marsupialia: Macropodidae)*. Ph.D. Thesis, Harvard University, Cambridge, Massachusetts.

Queensland Department of Main Roads, 2000. *Fauna Sensitive Road Design. Volume 1 - Past and Existing Practices*. Queensland Department of Main Roads, Technology and Environment Division, Brisbane.

Rothschild, F.R.S., F.Z.S. & Dollman, G., 1936. *The Genus Dendrolagus - A Monograph*. Trans. Zool. Soc., Part 6, 1936, 477-548

Strahan, R. 1995. *The Mammals of Australia*. Australian Museum, Reed New Holland

The Tree Kangaroo and Mammal Group, 2000. *Community Survey of the Distribution of Lumholtz's Tree-kangaroo*

Tracey, J. G. 1982. *The Vegetation of the Humid Tropical Region of North Queensland*. CSIRO, Melbourne.

Tucker, N. 2000. *Linkage restoration: interpreting fragmentation theory for the design of a rainforest linkage in the humid Wet Tropics of north-eastern Queensland*. Ecological Management and Restoration **1**:35 - 41.

Williams, S. E., Pearson, R. G. and Walsh, P. J. 1996. *Distributions and biodiversity of the terrestrial vertebrates of Australia's Wet Tropics: a review of current knowledge*. Pacific Conservation Biology **2**: 327-362.

Wilson, R. 2000 *Impact of Anthropogenic Disturbances on Tropical Rainforest Ringtail Possums* Ph.D Thesis, James Cook University, Townsville.

Winter, J. W., Atherton, R. G., Bell, F. C. and Pahl, L. I. 1991. *Distributions of selected north-eastern Australian rainforest mammals*. pp. 155-175 in G. Werren and P. Kershaw (Eds.) *The Rainforest Legacy*. (Vol. 2). A.G.P.S., Canberra.

Winter, J. W., Bell, F. C., Pahl, L. I. and Atherton, R. G. 1987. *Rainforest clearfelling in northeastern Australia*. Proceedings of the Royal Society of Queensland **98**: 41-57.

Compiled in Nov 2004 by Lars Kazmeier for The Tree-Kangaroo and Mammal Group Inc..  
(For corrections, additions, etc.: Contact Lars Kazmeier: [lakaz@austarnet.com.au](mailto:lakaz@austarnet.com.au))