New research suggests massive marsupials lived in treetops in early Australia

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Reconstruction of Nimbadon lavarackorum mother and juvenile (Peter Schouten). Credit: *PLoS ONE*, doi:10.1371/journal.pone.0048213.g002

(Phys.org)—Researchers from the University of New South Wales and

the University of Adelaide in studying fossils of *Nimbadon lavarackorum*, an extinct wombat-like marsupial, have concluded that the animal likely lived among the treetops of Australia's rain forests approximately 15 million years ago. The new research is based on an analysis of bones discovered in a cave in the Riversleigh in north-west Queensland, the team explains in their paper published in the journal *PLUS ONE*, and make *N. lavarackorum*, at approximately 150 pounds, the largest herbivore to have lived in the forested canopies that once flourished in the area.

N. lavarackorum belonged to a family of large marsupials known collectively as diprotodontids that all went extinct approximately 11,000 years ago as Australia became drier. *N. lavarackorum* is believed to have lived during the Middle Miocene, which spans 11.6 to 16 million years ago. The bones examined belong to a collection of 26 different specimens retrieved from a cave in the years following their discovery in 1993. The large group apparently fell into the cave for unknown reasons.

In studying the collection of bones and comparing them to other fossils as well as the bone structure of modern animals, the researchers found that parts of *N. lavarackorum* very closely resemble parts of the modern Koala, which of course lives in trees. Both have very mobile elbow and shoulder joints, big claws and very strong forelimbs – all characteristics necessary for living in trees. They also found that the back end of the animal more closely resembled that of a modern orangutan – strong short hind legs and strong gripping feet that would have allowed it to hang upside down if need be to reach far hanging fruit. It also had a large bulbous nose that presumably helped it sniff out food.

What's most remarkable about *N. lavarackorum* the researchers note, is its size, roughly that of modern humans. Virtually all other mammals of its size that lived in the area during the time when much of Australia was covered with rainforests were ground dwellers – it's also the only

member of Diprotodontidae believed to have lived in trees.

More information: Black KH, Camens AB, Archer M, Hand SJ (2012) Herds Overhead: Nimbadon lavarackorum (Diprotodontidae), Heavyweight Marsupial Herbivores in the Miocene Forests of Australia. *PLoS ONE* 7(11): e48213. doi:10.1371/journal.pone.0048213

Abstract
The marsupial family Diprotodontidae (Diprotodontia, Vombatiformes) is a group of extinct large-bodied (60–2500 kg) wombat-like herbivores that were common and geographically widespread in Cenozoic fossil deposits of Australia and New Guinea. Typically they are regarded to be gregarious, terrestrial quadrupeds and have been likened in body form among placental groups to sheep, rhinoceros and hippopotami. Arguably, one of the best represented species is the zygomaturine diprotodontid Nimbadon lavarackorum which is known from exceptionally well-preserved cranial and postcranial material from the middle Miocene cave deposit AL90, in the Riversleigh World Heritage Area, northwestern Queensland. Here we describe and functionally analyse the appendicular skeleton of Nimbadon lavarackorum and reveal a far more unique lifestyle for this plesiomorphic and smallest of diprotodontids. Striking similarities are evident between the skeleton of Nimbadon and that of the extant arboreal koala Phascolarctos cinereus, including the powerfully built forelimbs, highly mobile shoulder and elbow joints, proportionately large manus and pes (both with a semi-opposable digit I) and exceedingly large, recurved and laterally compressed claws. Combined with the unique (among australidelphians) proportionately shortened hindlimbs of Nimbadon, these features suggest adept climbing ability, probable suspensory behaviour, and an arboreal lifestyle. At approximately 70 kg, Nimbadon is the largest herbivorous mammal to have occupied the forest canopies of Australia - an ecological niche that is no longer occupied in any Australian ecosystem and one that further expands the already significant niche diversity displayed by marsupials

during the Cenozoic.