

COMPOSITION OF BROWSES CONSUMED BY MATSCHIE'S TREE KANGAROO (*DENDROLAGUS MATSCHIEI*) SAMPLED FROM HOME RANGES IN PAPUA NEW GUINEA

Ellen S. Dierenfeld, MS, PhD^{1}, Daniel Okena, BScF², Oliver Paul, MSc³, and Lisa Dabek, MS, PhD^{2,4}*

¹*Ellen S. Dierenfeld, LLC, Animal Nutrition Consulting, St. Louis, MO 63128, USA.*

²*Papua New Guinea Tree Kangaroo Conservation Program, Papua New Guinea.*

³*Forest Research Institute & Lae National Herbarium, Papua New Guinea.*

⁴*Woodland Park Zoo, Seattle, WA 98103, USA.*

Abstract

Matschie's tree kangaroo (*Dendrolagus matschiei*), native to Papua New Guinea (PNG), is an endangered browsing species managed in 25 North American zoos. Excess body condition may contribute to poor reproduction observed in these zoo populations; zoo – housed individuals can weigh up to 50% more than healthy free-range individuals (Blessington & Steenberg, 2007; Travis *et al.*, 2012). Variable diets fed in zoos are readily digestible, comprising high sugar and starch ingredients, along with a low fiber content and few browses offered (Carlyle-Askew & DeBo, 2018). The current study was undertaken to provide comparative data for more detailed evaluation of captive diets, animal health and welfare assessments.

Twenty-six samples ($n=24$ spp.) of foods eaten, including ferns, shrubs, vines, orchids, herbaceous plants, and tree leaves, were collected from the YUS Conservation Area on the Huon Peninsula at ~1800 m altitude. Samples were weighed fresh in the field and transported to the Lae National Herbarium in PNG for drying and confirmed identification, before transporting to the US for analysis of primary nutrient composition and minerals. Water content averaged $76\pm 10\%$ (mean \pm SD), requiring rapid processing to avoid spoilage in the field. On a dry matter (DM) basis, foods averaged moderate protein ($11\pm 5\%$), and soluble carbohydrate ($27\pm 8\%$) content, along with exceptionally low starch ($1\pm 1\%$) and crude fat ($3\pm 2\%$) values, and moderate to high values in fiber fractions (neutral detergent fiber $52\pm 13\%$, acid detergent fiber $39\pm 10\%$, lignin $15\pm 6\%$). Calculated metabolizable energy content of native forages averaged 1.9 ± 0.3 Mcal/kg DM (ruminant model). Macromineral concentrations (DM basis) were not exceptional (calcium $1.1\pm 1.0\%$, phosphorus $0.2\pm 0.1\%$, magnesium $0.3\pm 0.2\%$, potassium $1.8\pm 0.9\%$, sodium $0.02\pm 0.02\%$), and select trace minerals were within anticipated ranges for herbivores (copper 12 ± 13 mg/kg, iron 48 ± 26 mg/kg, zinc 34 ± 18 mg/kg) with the exception of manganese (268 ± 225 mg/kg), which could be considered on the high end of dietary adequacy for most herbivores.

These data provide useful information that can be used to adjust nutrient targets for dietary development and feeding management of captive populations of tree kangaroos. In particular, native foods eaten by Matschie's tree kangaroos contain very little starch, moderate quantities of protein, fat, and sugars, and much higher fiber levels (approximately 2-fold) compared to current diets or nutrient recommendations for this species. Incorporation of high starch dietary ingredients (including grain-based manufactured products as well as many vegetable items) should be closely controlled, due to the potential negative effect of starch-consuming microbes on survival/efficacy of fiber-fermenting bacteria in this foregut-fermenting marsupial. Inclusion of palatable, high-fiber

substitute browse species (branches including leaves and twigs) should be considered an essential diet component, rather than an enrichment treat for optimal gut health. These fibrous constituents that can be utilized by tree kangaroos and their gut microbes as primary sources of nutrition cannot be completely substituted through the feeding of green, leafy domestic produce, which simply does not contain adequate fiber content.

Future studies are suggested to evaluate digestibility of low compared with high fiber diets in tree kangaroos, linked with investigations of gut and fecal microbiota, body and coat condition, fecal consistency, overall health parameters and reproductive outputs. More analytical detail on non-structural carbohydrate fractions, including soluble fibers, in diets of free-ranging tree kangaroos may also lead to improvements in captive diets and feeding management.

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Literature Cited

Blessington J and Steenberg J (2007) Tree Kangaroo (*Dendrolagus spp.*) Husbandry Manual, 3rd ed., Association of American Zoos and Aquariums, Silver Spring, MD.

Carlyle-Askew B and DeBo D (2018) Nutritional survey of diets fed to Matschie's tree kangaroos (*Dendrolagus matschiei*) in human care. AZA Conference, Seattle, WA. (poster)

Travis EK, Watson P, and Dabek L (2012) Health assessment of free-ranging and captive Matschie's tree kangaroos (*Dendrolagus matschiei*) in Papua New Guinea. *J Zoo Wildl Med* 43(1):1-9.