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Economic anatomy of the Bennett's wallaby (*Macropus rufogriseus*): Implications for understanding human hunting strategies in late Pleistocene Tasmania

Jillian Garvey*

Archaeology Program, School of Historical and European Studies, La Trobe University, Melbourne, Victoria 3086, Australia

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ABSTRACT

Humans in late Pleistocene southwest Tasmania focused on the medium-sized macropod, the Bennett's wallaby (*Macropus rufogriseus*), with recent skeletochronological (dental growth-increment) analysis of wallaby teeth suggesting that hunting occurred in upland and lowland valleys on a coordinated seasonal basis. The frequencies of wallaby body parts and elements in the zooarchaeological assemblages, in particular the dominance of hindlimbs and metatarsals, implies that humans were selectively targeting these elements as part of their high latitude economic strategy despite the relatively small size of the prey. To help understand the economic potential of this prey species a meat utility index based on the associated flesh weight per skeletal element was derived for the Bennett's wallaby. It was found the posterior parts of the animal, especially the femur, tibia/fibula, sacral vertebrate and pelvis were the highest ranked body parts, while the cranium, pectoral girdle, forelimbs and manus were of little economic value. These results were then compared to the distribution of wallaby body parts found in the zooarchaeological record from Kutikina Cave to help better understand human adaptation and decision-making in late Pleistocene southwest Tasmania.

1. Introduction

Utility indices provide estimates of the relative food values represented by different skeletal elements, and predict the likelihood of their selection and transportation by humans (Binford, 1978; Metcalfe and Jones, 1988). Since the establishment by Binford (1978) of economic utility indices for caribou (*Rangifer tarandus*) and sheep (*Ovis aries*), utility indices have been developed for both terrestrial mammals [e.g., Thomson's gazelle *Gazella thomsoni*, Grant's gazelle *Gazella granti*, wildebeest *Connochaetes taurinus*, impala *Aepyceros melampus*, (Blumenschine and Caro, 1986); red kangaroo *Macropus rufus* (O'Connell and Marshall, 1989); horse *Equus* (Outram and Rowley-Conwy, 1998)], and aquatic mammals [e.g., harp seal *Phoca groenlandica* and hooded seal *Cystophora cristata* (Lyman et al., 1992); harbour porpoise *Phocoena phocoena* (Savelle and Friesen, 1996); California sea lion *Zalophus californianus* (Savelle et al., 1996); bowhead whale *Balaena mysticetus* (Savelle, 1997); ringed seal *Phoca hispida* (Diab, 1998)], and one type of bird, the moa (Kooyman, 1984). These utility indices have been used as interpretive models to understand carcass exploitation and transportation, and also to identify site use. For detailed discussions on utility indices and their potential applications refer to Binford (1978), Thomas and Mayer (1983), Jones and Metcalfe (1988), Metcalfe and Jones (1988), Grayson (1989), Lyman (1992, 1994, pp. 223–234), Lyman et al. (1992), Reitz and Wing (1999, pp. 213–221).

This paper extends the study of utility indices to include the medium-sized macropod the Bennett's wallaby (*Macropus rufogriseus*), with a model that has the potential to be applied to other macropods. Very little is known about the carcass composition of the macropod, with previous studies focussing on the larger red kangaroo (*Macropus rufus*) and the Eastern grey kangaroo (*Macropus giganteus*) (discussed in Section 1.3). This paper aims to help fill this gap by developing a set of related utility indices of the Bennett's wallaby via the dissection of four animals. These indices are then applied to the late Pleistocene faunal assemblage from Kutikina Cave in southwest Tasmania (Kiernan et al., 1983), where the Bennett's wallaby has been identified as the most common human prey species (Garvey, 2006). This will provide important quantitative data that can be used to address apparent patterns in the late Pleistocene zooarchaeological record.

1.1. Late Pleistocene southwest Tasmania

The late Pleistocene caves of SW Tasmania contain an exceptionally rich faunal and stone artefact assemblage dated between 35,000 and 13,000 years ago (Allen, 1996; Cosgrove, 1999).

* Tel.: +61 394 792806; fax: +61 394 791881.
E-mail address: j.garvey@latrobe.edu.au

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Comprehensive faunal analysis of these sites has been provided by Geering (1983), Stern and Marshall (1993), Cosgrove (1995, 1999), Hartzell et al. (1999), Cosgrove and Allen (2001), Garvey (2006, 2007a) and Rose (2006), with more than 950,000 bones now analysed (Garvey, 2007b; Garvey and Sandy, in press). Full details concerning the excavation, taphonomic history, and chronology of the late Pleistocene southwest archaeological assemblages are provided by Kiernan et al. (1983) and Allen (1996).

All of the late Pleistocene southwest Tasmanian faunal assemblages are dominated by the Bennett's wallaby, accounting for 70–80% of the remains of the prey species, with the Common wombat (*Wombats ursinus*) constituting the majority of the remaining taxa (Cosgrove and Allen, 2001). Other minor prey elements consist of a wide range of animals including forester or Eastern grey kangaroo, pademelon, possum, platypus, native cat, Tasmanian native hen and emu (Cosgrove, 1999; Cosgrove and Allen, 2001; Garvey, 2006). Zooarchaeological research has focused on identifying differences in species abundance and distribution, body part representation, and element frequencies, within and between sites, to study human subsistence strategies (Cosgrove, 1999; Cosgrove and Allen, 2001; Garvey, 2006, 2007a, b). The relative abundance of wallaby skeletal elements in these sites (similar to that displayed in Fig. 1) indicates a preference for the long marrow bearing bones; the femur and tibia were systematically broken with helical fractures to the diaphyses and percussion marks from stone tools, while the metatarsals and phalanges of the pes or foot were split longitudinally (Cosgrove et al., 1990; Cosgrove, 1995, p. 80; Garvey, 2006; Pike-Tay et al., 2008). Other body parts such as the caudal vertebrae, girdle elements, forelimbs and manus (hand) elements were largely ignored (Fig. 1), suggesting differential selection and processing of particular body parts from a relatively small prey species. While much is now known about human butchery practises (Cosgrove and Allen, 2001; Garvey, 2006) and seasonal movements across the landscape (Pike-Tay et al., 2008), the mechanisms behind this apparent deliberate targeting of specific prey and respective body parts, has not been addressed. While the approximately 950,000 bones analysed from late Pleistocene southwest Tasmania provides a powerful zooarchaeological database, an investigation of the economic value of the Bennett's wallaby is required to better understand why humans preferred certain body parts of this species, when ranging between 11–15 kg, the entire carcass could have easily been transported whole.

1.2. The Bennett's Wallaby

The Bennett's wallaby belongs to the Family Macropodidae, which includes kangaroos, wallabies, hare-wallabies, tree-kangaroos and pademelons. All taxa are confined to Australia and New Guinea, and range in size from the small (approximately 1 kg) hare-wallabies, to the large red kangaroo (>80 kg). The macropod body shape is adapted to their unique form of locomotion; bipedal hopping. Thus their hindlimbs (including the pes or foot) are more elongate and muscular than their forelimbs, while their pelvic girdles are more robust than the pectoral girdle. To provide balance they have a very large and powerful non-prehensile tail, which can be used for extra support if standing on only their hindlimbs, or enables them to undertake pentapedal (walking on all four limbs and tail) locomotion. Macropodids are grazing and/or browsing herbivores that are typically nocturnal, although the larger species' may be active in the early morning and late afternoon.

The Bennett's wallaby belongs to the Genus *Macropus*, which includes the kangaroo, wallaby and wallaroo. It is a common large wallaby of south-eastern Australia, extending from southern Queensland, through New South Wales, across Victoria, the Bass Straight Islands and Tasmania. In Tasmania the Bennett's wallaby is smaller than on the mainland. It also the most common of the three extant species of macropods; the other two being the Eastern grey or forester kangaroo (*Macropus giganteus*), and the Tasmanian pademelon (*Thylogale billardierii*). It shows moderate sexual dimorphism with males averaging 15 kg and females weighing 11 kg (Watts, 1987). The Bennett's wallaby is widespread and abundant; occurring across Tasmania and many of the smaller offshore islands, with their range spanning from coastal plains to the highest alpine zones of >1200 m (Gibson

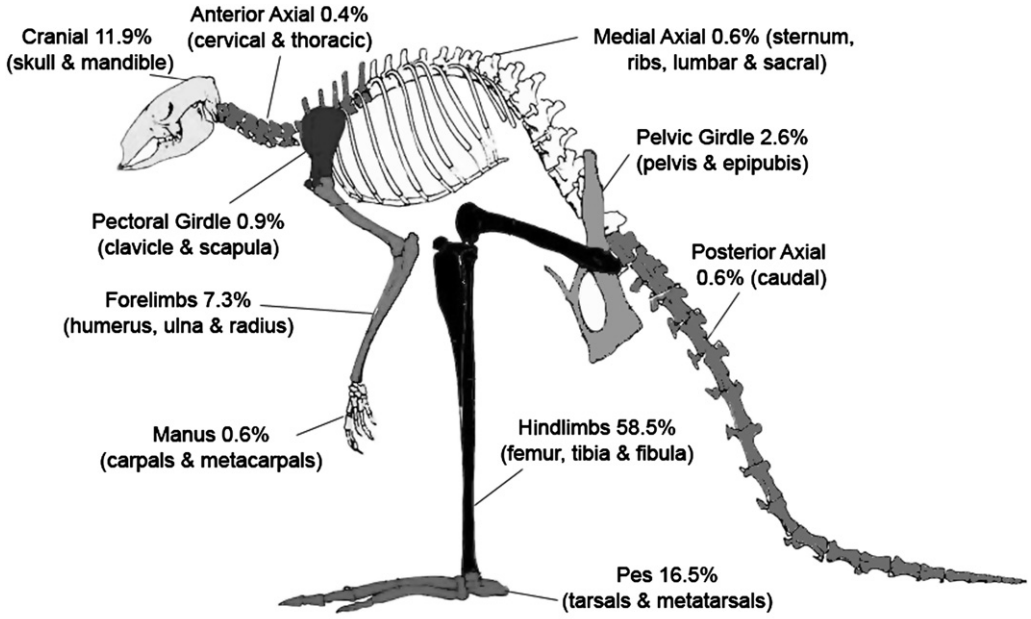

Fig. 1. Outline of Bennett's wallaby skeleton with the frequency (%) of the 10 body parts from Kutikina, southwest Tasmania (adapted from Hume et al., 1987, their Fig. 29.4). A similar pattern is apparent in all the late Pleistocene south-west archaeological assemblages.